ENVIRONMENTAL IMPACT ASSESSMENT

Poultry Farm Development Project at N. Ehdhufarumairah

August 2016

Proposed by:

Ocean Quartier Properties Pvt Ltd

Prepared by:

Ahmed Jameel (EIA 07/07)

Ibrahim Faiz (T06/15)

For **Water Solutions** Pvt. Ltd., Maldives

.

Contents

List of Figures and Tables

ސާރާ ހުލާސާ

މިރިޕޯޓަކީ ނ. އެދުފަރުމައިރަށުގައި ކުރިއަށް ގެންދިއުމަށް އެކުލަވާލައިފައިވާ ކުކުޅު ގެންގުޅުމާއި ކުކުޅު ބިސް ހެއްދުމާއިބެހޭ މަސައްކަތުގެ ސަބަބުން އެރަށުގެ ތިމާވެއްޓަށް ކުރާ އަސަރުތަކާއިބެހޭ ބެލުމުގެގޮތުން ކޮންސަލްޓަންޓުން ކުރާއިރުގައި ޕްރޮޕޯނަލް އަށް ވޯޓަރ ސްޕްރެޝަން ޕްރޮޖެކްޓް ސަރަހައްދުގެ ތިމާވެށްޓަށް ކުރާ އަސަރު ދިރާސާކޮށް ބަޔާންކޮށްފައިވާ ރިޕޯޓެކެވެ. މިރިޕޯޓަކީ ތިމާވެއްޓަށް ކުރާ އަސަރުތަކާއިބެހޭ ގަވާއިދު (ގަވާއިދު ނަންބަރު 93/4) ދަށުން މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އެންވަޔަރަންމަންޓްގެ ތިމާވެއްޓަށް ކުރާ އަސަރު ބަލާ ދިރާސާކޮށް ހުށަހަޅާ ރިޕޯޓް ތައްޔާރުކުރުމުގެ 2012 ގައި ބަލާނުކުރެވިފައިވާ އުސޫލުތަކާ އެއްގޮތަށް އެންވަޔަރަންމަންޓް ޕްރޮޓެކްޝަން އެޖެންސީން މިމަސައްކަތަށް ދޫކުރެވިފައިވާ ޓަރމްސް އޮފް ރިފަރެންސާއި އެއްގޮތަށެވެ.

ނ. އެދުފަރުމައިރަށުގައި ކުކުޅު ގެންގުޅުމާއި ކުކުޅުބިސް ހައްދާ މަޝްރޫއުގެ ޕްރޮޕޯނަންޓަކީ ކުރިއަށް ކޮންސަލްޓަންޓު ޕްރޮޕްރައިޓަރ ޕްރައިވެޓް ލިމިޓެޑް ދިހުރުމުގެ ކުރެން ދުނިޔޭގެ ތިމާވެށްޓަށް މިނިސްޓްރީ އޮފް ފިޝަރީޒް އެންޑް އެގްރިކަލްޗަރއިންނެވެ. މިމަޝްރޫއު ކުރިއަށް ގެންދިއުމުގެ މައިގަނޑު މަޤްސަދަކީ ނ. އަތޮޅުގައި ކުކުޅުގެންގުޅުމުގެ ސިނާއަތް ތަރައްޤީކޮށް، އިޤްތިޞާދީ ބޮޑުތަކެއް ހޯދުމާއި އަދި ބާޒާރުގައި ކުކުޅު އިމްޕޯޓުކުރުމެވެ.

މިމަޝްރޫއުގެ ދަށުން ނ. އެދުފަރުމައިރަށުގައި ކުކުޅުގެންގުޅުމުގެ މަސައްކަތް ކުރިއަށް ގެންދިއުމަށް ބޭނުންވާ އިމާރާތްތަކާއި ވަސީލަތްތައް ބިނާކުރުމާއި ކުކުޅުގެންގުޅުމުގެ މަސައްކަތް ކުރުން ހިމެނެއެވެ. އިމާރާތްކުރާ ތަންތަނުގެ ތެރޭގައި ޖެނެރޭޓަރު، އިދާރީ އިމާރާތްތަކާއި މުވައްޒަފުންގެ އިމާރާތް، ފެނާއި ކަރަންޓްގެ ނިޒާމާއި ސޮފްޓްވެއަރ ބޭނުންކުރެވޭ ބޭނުންކުރެވޭގޮތަށް ގޯތިތެރޭގައި ނަރުދަމާގެ ނިޒާމާއި ކުކުޅު ގެންގުޅޭ ހައުސް ތަކެއް ގެނެސް ހިމެނެއެވެ. މިމަޝްރޫއުގެ އިމާރާތްކުރުމުގެ މުއްދަތު 48 މަހަށް ދެމިގެންދާނެ ކަމަށް ލަފާކުރެވެއެވެ. މިމަޝްރޫއަށް ހުށަހަޅާފައިވާ މަސްޓަރ ޕްލޭނަކީ މިނިސްޓްރީ އޮފް އެގްރިކަލްޗަރ އިން ހުއްދަދެއްވާފައިވާއެވެ.

Non-Technical Summary

This report discusses the findings of a social and environmental impact study undertaken by Water Solutions Pvt. Ltd. at the request of Ocean Quartier Properties Pvt Ltd. This EIA report covers layer chicken poultry farm development project at Ehdhufarumairah, Noonu Atoll.

Ehdhufarumairah is located on the eastern side of Noonu Atoll. This island is leased to Ocean Quartier Properties Pvt Ltd by Ministry of Fisheries and Agriculture. Ocean Quartier Properties Pvt Ltd is the proponent of this project. Ocean Quartier Properties Pvt Ltd had acquired knowledge and information about commercial layer chicken poultry and officials of the company had travelled to Srilanka and Thailand and visited different layer chicken poultry farms projects to gain more experience and information on different poultry businesses which could be development in islands of Maldives.

The project is proposed in Ehdhufarumairah. The vision is to establish layer chicken farm in Ehdhufarumairah which ensure commercial and environmental sustainability of producing chicken eggs locally. The main aim of this poultry farm project is to lessen import of chicken eggs to meet the local demand. Work is planned for sustainable layer chicken poultry farming ensuring the use of environment friendly technology. Under this project, sea cucumber feed materials will be made using the organic waste on the island and provide sea cucumber farms in the region.

The proposed layer chicken poultry would be developed by importing layer type chicks from Srilanka from CP Farm, rearing chicken in the island in cages till it is old enough to lay eggs when they are 21 weeks olds. The poultry farm would be automated as to manage the feeding operations to the layer chickens, collection of eggs from the cage houses and removal of manure from the cages houses as waste material. The project will develop the necessary infrastructure in the area of power, water, sewage and wastewater to make the proposed poultry project sustainable. The project also involves developing accommodation and living areas for the researchers and famers on the island.

The EIA was undertaken to assess the environmental and social impacts of this project. Based on the assessment, it has been identified that the major impacts of the project will be felt on the terrestrial environment during the construction stage. Ehdhufarumairah is not a large uninhabited island that could develop a large poultry farm. The development on the island will have impacts on marine environment from construction of jetty and outfalls. During the operational stage, environmental concerns are much less and are associated with energy, water, and waste and wastewater management.

The mitigation measures are provided in the report with alternatives. It is vital to conduct the activities, during both construction and operational stage, in line with mitigation measures emphasized in the report. Socio-economic impacts of the proposed project will be creation of job opportunities in the atoll and development of the poultry industry in the country. This project will create enormous economic opportunities both in the construction and operational stage through creation of both short-term and permanent jobs and business opportunities especially for the locals at Velidhoo and Manadhoo. This project will introduce and promote the development of layer chicken poultry for the production chicken eggs on commercial scale enabling Maldives to provide additional avenue for employment and income generation.

Towards the end of the report, a monitoring programme has been suggested which covers components of terrestrial, coastal and marine environment. It is important to follow this monitoring programme not only to comply with the regulation but also to ensure that the impacts are measures in realistic terms.

1 Declaration of the consultants

This EIA has been prepared according to the EIA Regulations 2012, issued by the Ministry of Housing and Environment. I certify that the statements in this EIA study are true, complete and correct, to our best of knowledge and ability.

Name: Ahmed Jameel(EIA 07/07)

Signature:

Name: Ibrahim Faiz (EIA T06/15)

Signature:

2 Proponent Commitment

OCEAN QUARTIER PROPERTIES

Date: 4 September 2016

Mr. Ibrahim Naeem,

Director General,

Environmental Protection Agency,

Male', Maldives

Dear Mr. Naeem,

Re: Financial commitment to undertake mitigation measures and environmental monitoring proposed in the EIA for Poultry Farm Development Project at N. Ehdhuffarumairah

We would like to confirm our financial commitment to the proposed mitigation measures and the monitoring programme that has been highlighted in the EIA report that has been specifically prepared for the above referred project.

Sincerely,

Jirat Petnunthawong
Director
Ocean Quartier Properties Pvt. Ltd

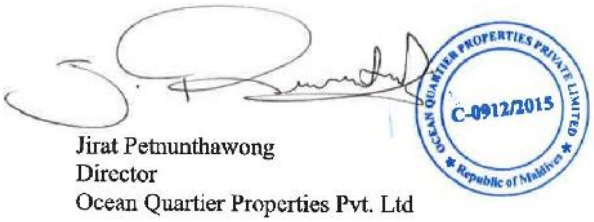
OCEAN QUARTIER PROPERTIES PRIVATE LIMITED
C-0912/2015
Republic of Maldives

Ocean Quartier Properties Pvt. Ltd,
H.Bandosge, 2nd Floor, Dhubugasmagu, Male' Republic of Maldives Tel.+960 3303585

3 Proponent Declaration

As the proponent of the proposed project, we guarantee that we have read the report and that to best of our knowledge all non-technical information provided here are accurate and complete.

Signature:



Jirat Petnunthawong
Director
Ocean Quartier Properties Pvt. Ltd

4 Introduction

This Environmental Impact Assessment report (EIA) has been prepared to fulfil the requirements of the Environmental Protection and Preservation Act, law no. 4/93 for the development of layer chicken poultry farm in Ehdhufarumairah Island, Noonu atoll. The project proponent is Ocean Quartier Properties Pvt Ltd.

4.1 Structure of the EIA

The report has been structured to meet the requirements of the EIA regulations 2012 issued by the Ministry of Environment, Energy and Water. Hence, the report will provide an executive summary at the beginning. Sections that will follow include the project description in detail, existing environmental conditions, justifications given by the proponent for undertaking the proposed project components and alternatives. Alternatives to proposed components or activities and environmental considerations would be suggested. A mitigation plan and monitoring programme before, during and after the works will also be suggested.

4.2 Aims and Objectives of the EIA

The objective of the report is to:

- Assist in mitigating impacts caused due to the agriculture development.
- Promote informed and environmentally sound decision making.
- To demonstrate the commitment by the proponent on the importance of environmental protection and preservation.
- To fulfill the obligations of the proponent to undertake an EIA under Clause 5 of the Environmental Protection and Preservation Act of the Maldives.
- Undertake the project work with minimum damage to the environment.

4.3 EIA Implementation

This EIA has been prepared by a local environmental consulting firm, Water Solutions. Water Solutions have been chosen by the proponent as the environmental consultants for this project. The team members were:

- Ahmed Jameel, Environmental Engineer (EIA Registration No: EIA 07/07)
- Ibrahim Faiz - (EIA Registration No: EIAT 06/15)

4.4 Terms of Reference

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

4.5 Desk Study Review

A literature review was conducted to acquire background information on the site and its environment as well as to identify possible environmental impacts of similar developments in island settings. In this context, the EIA Regulations 2012, best practices from similar development activities, studies undertaken in similar settings around Maldives and previous documents/historical publications was considered.

The literature review comprised of, but is not limited to, the following:

- EIA for agricultural development in Sh. Ekasdhoo Island, 2014

- EIA for Poultry Farm Development in M. Maahura, 2015

- Master plan concept submitted by the proponent to Ministry of Fisheries and Agriculture.

- Relevant regulations, including fisheries and agriculture regulations, Dewatering

Regulation and Regulation on cutting down and uprooting trees.

5 Policy, Legal and Administrative Framework

The project conforms to the requirements of the Environmental Protection and Preservation Act of the Maldives, Law no. 4/93. The EIA has been undertaken in accordance with the EIA Regulation 2012 of the Maldives by a registered consultant. Furthermore, it adheres to the principles underlined in the regulations, action plans, programmes and policies of Ministry of Fisheries and Agriculture, Ministry of Environment and Energy and Environmental Protection Agency. These are discussed in detail in the following sections.

5.1 Laws and Regulations

5.1.1 Environmental Protection and Preservation Act

Article 5 (a) of the Environmental Protection and Preservation Act (Law No. 4/93) addresses the submission of an EIA (Majilis, 1993). It states that an EIA shall be submitted to Ministry of Environment before implementing any developing project that may have a potential impact on the environment. This project complies with this Act.

5.1.2 Protected Areas and Sensitive Areas

Under Article 4 of the Environment Protection and Preservation Act, the Ministry of Environment is vested with the responsibility of identifying and registering protected areas and natural reserves and drawing up of rules and regulations for their protection and preservation.

As part of the Environmental Regulation, EPA has established list of 'sensitive sites' in the Maldives. Although not formalized as a regulation, the sensitive list is mentioned in the recent Regulation on Dredging and Reclamation (Regulation number 2014/R-13, see Section 5.7, page34). The sensitive sites, according to EPA are sites in the Maldives (islands, reefs, mangroves, inter-tidal areas) where developments ought to be restricted, regulated or controlled. Some view those sites mentioned in the sensitive list have no meaning because there is no evidence to show any 'sensitive features' of the areas.

Ehdhufarumairah is not a protected island and the island is not included in an environmentally sensitive area list maintained by EPA. Hence this regulation is not relevant to the proposed project.

5.1.3 Environmental Impact Assessment Regulation 2012

The Ministry of Environment has issued EIA regulation on May 2012, which guides the process of undertaking the Environmental Impact Assessment in the Maldives – This guideline also provides a comprehensive outline of the EIA process, including the roles and responsibilities of the consultants and the proponents. This regulation outlines every step of the IEE/EIA process beginning from application to undertake an EIA, details on the contents, minimum requirements for consultants undertaking the EIA, format of the EIA/IEE report and many more.

The guidance provided in this Regulation was followed in the preparation of this EIA report. The EIA has also been prepared by registered consultants.

5.1.4 Law on uninhabited islands of Maldives 20/98

The law on uninhabited islands determines the leasing of uninhabited islands for all other purposes except resort development, which includes the proposed project. Also it includes leasing of the islands for community use and other uses such as plantation of trees, uprooting of trees in the uninhabited islands. The methods of the leasing are mentioned from the article 11 to article 16. All the articles in the law are adhered to in the proposed project.

5.2 Waste management Regulations

The Ministry of Environment has developed national waste management regulations. The key elements of the regulations include: ensure safe disposal of solid waste and encourage recycling and reduction in waste generated, develop guidelines on waste management and disposal and advocate enforcing these guidelines through inter-sectoral collaboration and ensure safe disposal of chemical, industrial and hazardous waste.

Waste management for the proposed project during the construction and operation phase will be in line with this regulation. The waste generated from the project site would be taken to the island waste management facility or *Thilafushi* for processing and disposal.

5.3 Regulation cutting down, uprooting and export of trees

The Regulation on cutting down, uprooting, digging out and export of trees and palms from one island to another was recently issued by the Ministry of Environment, Energy and Water. Clause 5 (a) of the regulations states that Prior to the commencement of any project(s) that would require the indiscriminate removal and export of trees/palms from one island to another for the purpose of agriculture, development/development, construction or any other purpose, it is mandatory under the Regulation to prepare an EIA Report stating clearly the details of the Project(s) with all necessary information and submit the same through the relevant Ministry to Ministry of Environment and Energy and the project(s) can only commence upon the grant of written approval from the MEE.

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

According to Article 3 (a) no trees can be cut or uprooted within the 15m zone inside from the vegetation line of an island. If there is any mangrove areas in the island, no trees and be uprooted, dig out or cut within the 15m buffer zone around the mangrove area (Article 3 (b)). Uprooting and cutting of the trees would be carried out as outlined in the regulations. Two trees would be planted for each tree removed.

5.4 Regulation on advertisement of food products

According to the regulation of advertisement of food products, any advertisement relative to a food product must go through the approval process of the department of public health. Thereby the advertiser must submit the details of the product, details of the advertisement, method of delivery and details of the advertiser to the department for prior approval. Furthermore, any claims in the advertisement such as "cholesterol free" must be properly justified to the department through adequate means such as laboratory test reports. All the relevant articles of the regulation are understood and will be adhered to in the propose project.

5.5 Regulation on the works of port health

The regulation details out the aspect of health on the importing of products through sea freighting. It includes the aspects of disease control, quarantine and import of live animals. In the article 14 which relates to the import of chickens it states that the any chicken that is imported must be have the documentation of proper vaccintation such as fowl pox. All the relevant articles of the regulation are understood and will be adhered to in the propose project

5.6 Guidelines for Domestic Wastewater Disposal

The guideline is developed and implemented by the Environment Protection Agency. The guideline is to improve public health through improved sanitation and cleaner and safer environment by regulating the disposal of domestic wastewater.

The proposed project has been proposed based on the requirements of this guidelines and EIA has been undertaken within the parameters defined by this regulations. All domestic waste will be disposed as per the guidelines provided by EPA. Hence, the treated wastewater will be as per the following guidelines.

Parameter	**MEEW guidelines for maximum allowable concentrations for discharge into deep sea**
Biochemical Oxygen Demand (BOD_5)	40 mg/l

Chemical Oxygen Demand (COD)	50 mg/l
Suspended Solids	150 mg/L
pH	5 -9.5
Oil & Grease (After effective fat/Grease trap)	5 mg/L

Figure 1: Treated wastewater quality standards to be achieved.

5.6.1 Post EIA Monitoring, Auditing and Evaluation

The environmental monitoring programme given in EIA report is an important aspect of the EIA process. The monitoring programme outlines the objectives of the monitoring; the specific information to be collected; the data collection program, and managing the monitoring programme. Managing the monitoring programme requires assigning institutional responsibility, reporting requirements, enforcement capability, and ensuring that adequate resources are provided in terms of funds, skilled staff, etc.

The monitoring programme outlined in this report will comply with the EIA Regulations 2012.

5.7 Environmental Permits

5.7.1 Decision Statement (EDS)

The EIA Decision Statement is issued on successful evaluation of the EIA report by the EPA, Ministry of Environment and Energy. EIA Decision Statement governs the manner in which the EIA project activities must be undertaken.

5.8 Responsible Institutions

The main government institutions that have roles and responsibilities relevant to this project are summarised below.

5.8.1 Environmental Protection Agency

The Environmental Protection Agency (EPA) of the Ministry of Environment and Energy 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 EPA 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.

5.8.2 Ministry of Environment and Energy

The Ministry of Housing and Environment is mandated for the effective implementation of the Environmental Protection and Preservation Act (law 4/93) of the country and has the statutory power over issues related to the environment. It has the central control over the environment protection, management, conservation and environmental emergencies. The Ministry operates mainly at a policy level and the more regulatory and technical assessment activities are mandated to the Environmental Protection Agency (EPA). In this respect EPA has now been mandated to manage all issues relating to Environmental Impact Assessment of individual projects.

5.9 Relevant Policies

5.9.1 Third National Environment Action Plan

The Third National Environment Action Plan is divided into principles, results and goals to achieve the results. Some of the fundamental principles prescribed in NEAP 3, which have been incorporated into this environmental impact assessment exercise include local democracy, informed decision making, continuous learning and improvement, right to information and participation and most importantly the complementing role of environmental protection in socio-economic

development. The proposed project is expected to provide a learning experience in terms of effectiveness of the use of EIA as a planning instrument and appropriate monitoring for which specific focus is laid in Objective 24.1 of NEAP 3 (Ministry of Housing, Transport and Environment, 2009).

5.9.2 National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan 2016-2025 (NBSAP 2016-2025) seeks to ensure that threats to biodiversity are addressed, biodiversity is conserved, sustainably used and benefits arising from them are shared equitably. It also encompasses ways of addressing gaps, challenges and constraints highlighted in earlier sections. It is a living document that will have the capacity to adapt to changes in national conditions, capacities and to the changes in the international arena. In implementing the proposed project activities due care would be given to ensure that the national biodiversity strategies are adhered to. The proponent has committed on conservation and protection of the environment while undertaking this proposed project.

5.10 International Conventions

5.10.1 Convention on Biological Diversity

The Maldives is a party to the United Nations Convention on Biological Diversity. The objective of the convention is "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding. The proposed development activities outlined in this project does not fall on any area recognised for its ecological value. Therefore it is unlikely there will be a major loss of biodiversity. The loss is not going to be significant at atoll or national level. Yet, it is recommended that the developer ensures that mitigation measures are taken to reduce the impact of terrestrial biodiversity.

6 Project Descriptions

6.1 Project Proponent

The proponent for this project is Ocean Quartier Properties Private Limited and they will be investing to develop poultry farm at Ehdhufarumairah in Noonu Atoll. The island has been awarded to Ocean Quartier Properties Private Limited by Ministry of Fisheries and Agriculture. The proponent for this project is familiar with commercial poultry farm and is already active in different types of business in the Maldives.

Ocean Quartier Properties Pvt. Ltd is an international investment company. The company is registered within the Republic of Maldives. Ocean Quartier Properties invests in resort developments, constructions, agriculture, marine cultures, aviation, energy and real estates. With our experiences and respectable finical background, our company promises to deliver unique and luxury project within the Republic of Maldives.

6.2 Project Location and Study Area

The proposed poultry farm development project would be implemented at N. Ehdhufarumairah. The project location and boundary are illustrated in Figure 2. Nearest inhabited islands Manadhoo and Velidhoo at 8 km and 10 km respectively. Nearest airport to the project site is *Ifuru Domestic Airport* located at 45 km west from project site.

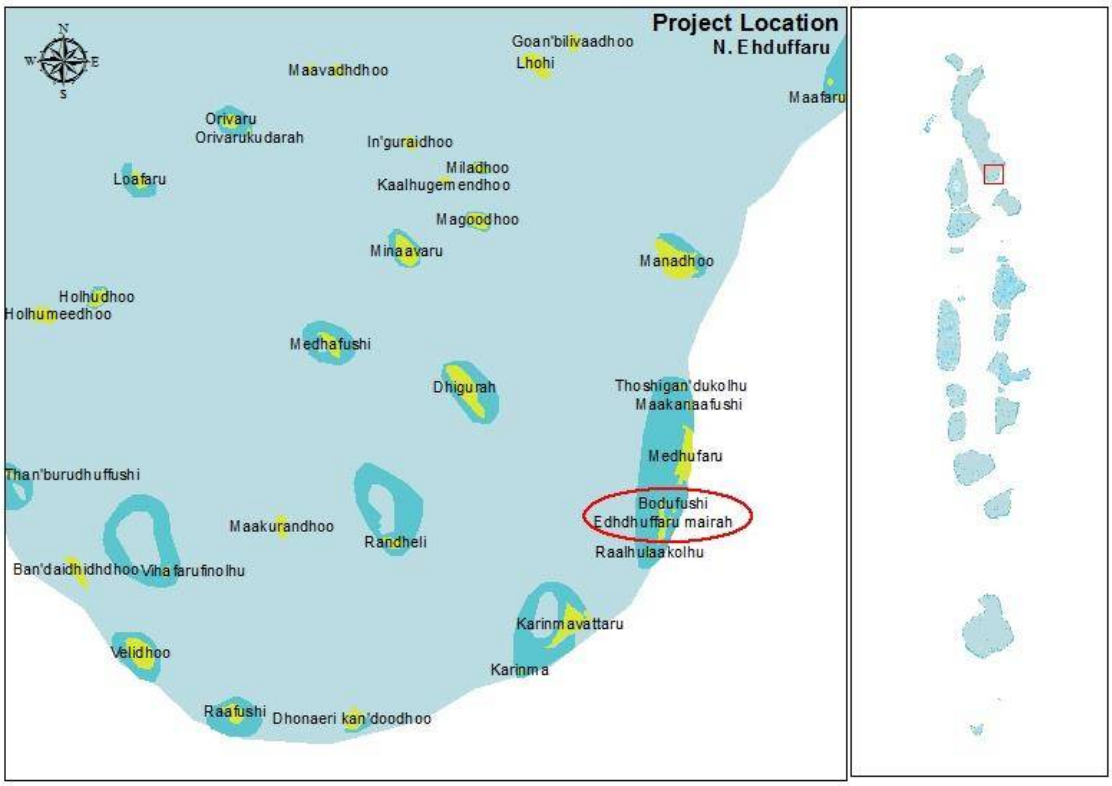


Figure 2: Project Locations

Ehdhufaru Island was previously used as small scale agricultural island as the island has rich soil suited for agriculture. People from nearby inhabited island Manadhoo, Fohdhoo, frequently come to Ehdhufaru to harvest coconut.

6.3 Need and Justification

In order to increase the productivity of the Maldives economy and to ensure the availability and affordability of food staples for the citizens it is to ensure the access of such paths for food production locally on the islands. The islands should not only be used for tourism but it is important

to use these islands to increase the economic productivity in areas such as poultry farm development. It has been a challenge to develop a commercially viable poultry product on an island without compromising the natural environment of an island.

In order to cater to the requirement of the tourists and some expatriate population together with the population of the discerning local consumer, the country imports all kinds of food items including some exotic foodstuff to keep highest standards of availability to match with the best hospitality service in the world.

Maldives has very insignificant production of eggs and poultry products compared to the demand. In the past 5 years, it has been importing more than 100 million eggs. Imports in the year 2013 are estimated at 115 million eggs at a value of US Dollars 9.6 million. Of these imports about 25% are brown eggs while the rest are white. Brown eggs are much higher priced than white eggs.

Several attempts have been made by private entrepreneurs as well as by development agencies to promote poultry production activity in Maldives but have not met with success for a variety of reasons. The main reasons being lack of proper guidance on production and husbandry practices, small size of projects and inadequate planning to ensure sustainability. Only one project in the private sector is working for the past several years. Another major factor is the high price of poultry feed which has not received any focussed attention perhaps since there was not high enough demand for it to be approached on a commercial basis.

For all its requirements, the country is totally reliant on import of eggs. Eggs are imported majorly from Australia, India, Malaysia, Sri Lanka, Turkey, U.A.E. and U.S.A. As will be seen from above data there is an increase of 22.1% in quantity and 93.3% in value of import of eggs from 2009 till 2013. The cif price per egg has also gone up from .82 MVR to 1.29 MVR representing an increase of 57.3%.

With the increase in local population, tourist trade and general increase in income levels, the demand for eggs is likely to go up in years to come. Poultry egg production therefore offers a very good business opportunity if run scientifically and efficiently on a commercial scale.

Import into Maldives is of two types of eggs.' Brown medium to large size' – and 'white medium to small size'. Other than the eggs which are imported to suit the needs of resorts which is a "higher end clientele", and to a very small extent the local population in Male of the 'discerning consumer' and the 'expatriate' community, a large majority of eggs is white, relatively small in size and imported mostly from India.

A very large percentage of the tourists to Maldives come from Europe and Europe predominantly consumes brown eggs. The European visiting Maldives therefore naturally wants and prefers to eat Brown eggs. Brown eggs are normally larger than the white eggs being imported into Maldives. This has led to a perception that Brown eggs are better in quality than white. Therefore, the brown egg has become the preferred egg in the resorts.

A study of data on import of eggs from 2009 – 2013 shows that over 70% of the eggs imported into Maldives are white and approximately 25% Brown which are imported from Australia, Malaysia, USA and Sri Lanka. It can therefore safely be assumed that approximately 25% (or more) of all egg requirements will be of Brown coloured eggs.

Several initiatives have been undertaken by Development agencies and the private sector to produce eggs in Maldives. Unfortunately with the lack of infrastructure and a not so well guided approach, the initiatives have not had much success for the activity to grow into a progressive commercial enterprise.

The main aim of this poultry farm project on the island of N. Ehdhfarumairah is develop a chicken layer farm to produce fresh chicken eggs for local market. Use of poultry farming will reduce the dependency on imported dietary products and also increase the food security. Increased use of alternative technologies of food production is a main part of the country's economic diversification plan and for sustainable development.

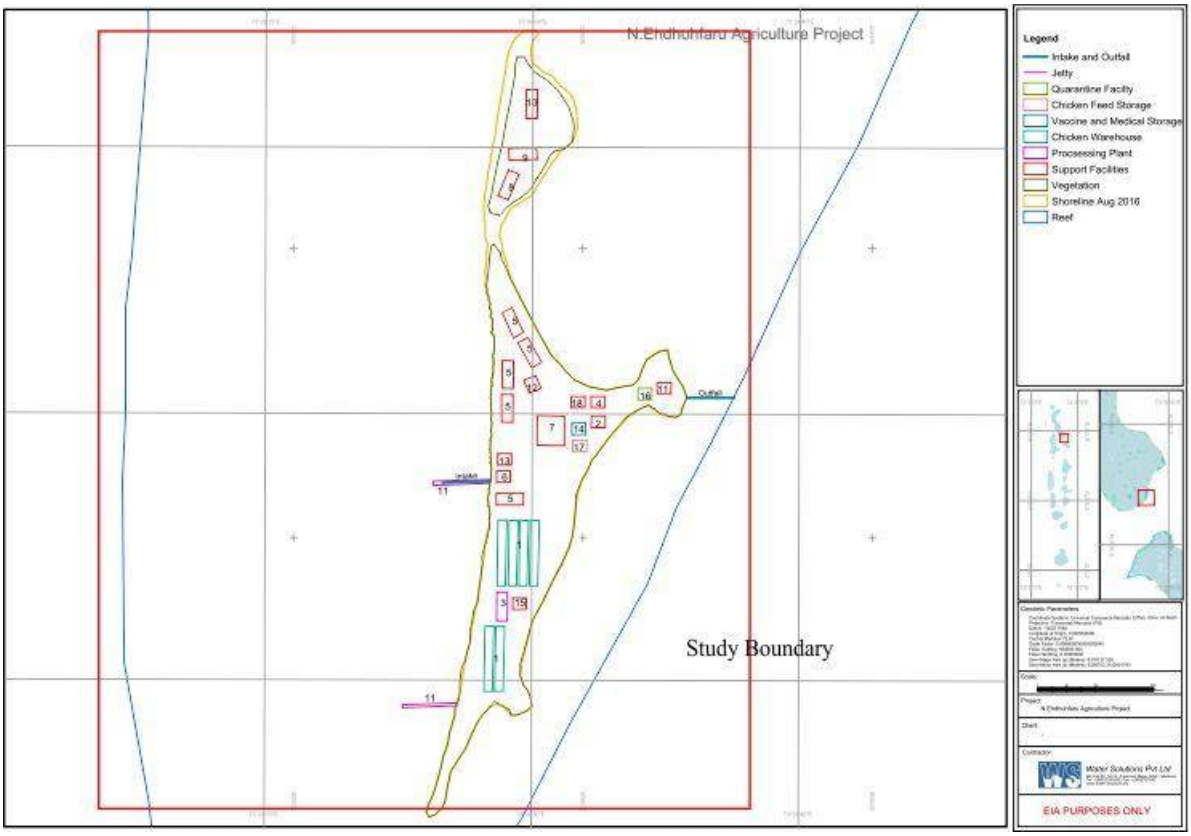


Figure 3: Project Boundary

A chicken egg contains 6-7 g of protein. Egg protein is one of the highest quality proteins. It contains all the essential amino acids required in the diet of human beings and is of such high quality that nutritionists use the egg as a standard of reference against which other protein foods are evaluated. An egg also contains five to six grams of easily digestible fat and it contains both saturated and unsaturated fatty acids. The amount of desirable unsaturated fatty acids are more than those found in most other animal products. Eggs are also low in calories and can be readily included in a nutritionally balanced low-calorie diet. They contain sufficiently high quantities of all the essential vitamins except vitamin C. Fat-soluble vitamins like A, D, E and K and water-soluble vitamins like the B-Complex are also present. Egg yolk is high in cholesterol and carotenoid pigments which play important physiological roles in the body. A shelled egg can be considered the only natural food that cannot be adulterated. Hence chicken egg is increasingly preferred in the diet of the people that is further facilitated by improving standards of life.

There are a multitude of benefits to Maldivians if development of a domestic egg production industry is successful. For example, in addition to increasing food security by reducing dependence on imports and increasing nutrition through provision of an alternative to fish as a protein source, domestic egg production will also raise island incomes through increased opportunities for employment and entry into local markets.

6.4 Project Details

The main aim of this poultry farm project on the island of Ehdhufarumairah is to develop a commercially viable layer chicken poultry for chicken eggs on the island. The projects will establish, commercial production of chicken poultry by operating and managing a fully functioning facilities for a large scale chicken egg production facility. The proposed facility on the island would produce 1 million eggs per month when it's fully operational.

6.4.1 Infrastructure

The proposed layer chicken Poultry production and operation facility can be developed on the island. The facility developed at the island would be able to

produce one million eggs per month requires 36,000 birds in production every year for which the following land and buildings are required.

- Three poultry houses
- One brooder/grower house
- Office/store building
- Staff accommodation
- Mosque
- Other facilities required to support the operation on the island.

6.4.2 Input

Baby chicks, feed, medicines and vaccines would be sourced from Sri Lanka and Thailand. The most important factor is the regular and reliable availability of Poultry Feed from good sources. This will be sourced from Sri Lanka.

6.4.3 Layer Chicken Farm

Chicken egg is one of the most consumed food in the Maldives, both in the local domestic market and the resort/hotel market. Currently an insignificant quantity of chicken egg is produced for local consumption. The project entails development of a poultry farm for the production of chicken eggs. In the long run building on the success of chicken egg farm, the business will allow related diversification into chicken meat. The intention is cultivating and promoting local sustainable food solutions.

Layer-type chicks would be reared in cages. The cages would be fitted at a height of 75 cm above floor level with feeders and drinkers fitted on the sides, running along the length and width of the cages. Cage houses meant for chikcs need not have sidewalls, and weld-mesh cover may be provided up to the bottom floor level. The cage mesh size would be 1.25 x 1.25 cm for the floor and 2.5 x 5.0 cm on the sides to allow birds to take feed and water. The facility would have environmentally controlled to remove hot air by exhaust systems and fresh air introduced through inlets by negative pressure. Air temperature, relative humidity, lighting, ammonia level, ventilation rate, etc., will be monitored and controlled automatically. Birds with the best micro-environment will grow faster with better feed efficiency.

Figure 4: Layer chicken house

A minimum distance of 30 m between brooder and layer houses would be maintained. The number of buildings required varies according to the length of intervals between receiving each batch of chicks. Based on this, the layer farm will be established as 1 + 2 pattern - One brooder cum grower house + two layer houses. The chicks would be received at 28-week intervals.

6.4.4 Brooder Management (0-8 weeks)

As for broiler chicks, brooding arrangements would be made to provide layer chicks with the required warmth. The brooder guards would be arranged in a circular fashion on the litter material with the necessary heating arrangements. The house may be prepared beforehand for this purpose and kept vacant for a considerable length of time (a minimum of two weeks). The health of the chicks when they arrive at the farm would be checked.

Lighting for brooding must be provided for 23 hours for the first three days and afterwards only during the night up to three weeks. The layer type chicks need not be provided with additional lighting after four weeks until they start laying at 20 weeks.

The floor space allowance during the brooder stage is 675 cm2 per bird. Feeder space allowance required is 1.0 cm per bird up to four weeks, 2.5 cm up to eight weeks. Drinker space allowance per bird for the same periods is 0.5 and 1.0 cm per respectively. Carefully watch the growth of the birds and monitor their water and feed consumption regularly.

TABLE 4.1 Feed and water intake by 1 000 chicks

Age in(wk)	Feed intake/ week (kg)	Water intake/ day (litre)	Body weight at end of the week (g)
1	40	15	60
2	90	25	105
3	140	45	160
4	200	65	230
5	250	80	300
6	280	95	370
7	310	105	440
8	350	120	530

6.4.5 Grower Management (9-20 Weeks)

Growers would be reared in the brooder-cum grower house. Floor space allowance has to be increased to 1 260 cm2 per bird. Feeder space to be given is 6-8 cm per bird. One linear feeder of 120 cm in length and 8 cm in depth must be provided for 40 grower birds. Raise the height of the feeder as their age increases.

6.4.6 Layer Management (21-72 Weeks)

Cage rearing facilitates easy management, easy collection of eggs, needs less space, gives a lower percentage of broken eggs, better egg weight, a cleaner egg production, easy culling and a reduced mortality rate.

Grower birds are transferred to layer houses at the end of the 18th week after deworming, dipping and protective vaccinations against Newcastle disease. A linear feeder 180 cm long and 10 cm deep will suffice for 35 layer birds. A free supply of feed at all times has to be ensured. Layer mash with 17 percent crude protein, 2 600 Kcal per kg of M.E, 2.75 percent calcium and 0.80 percent available phosphorous must be provided.

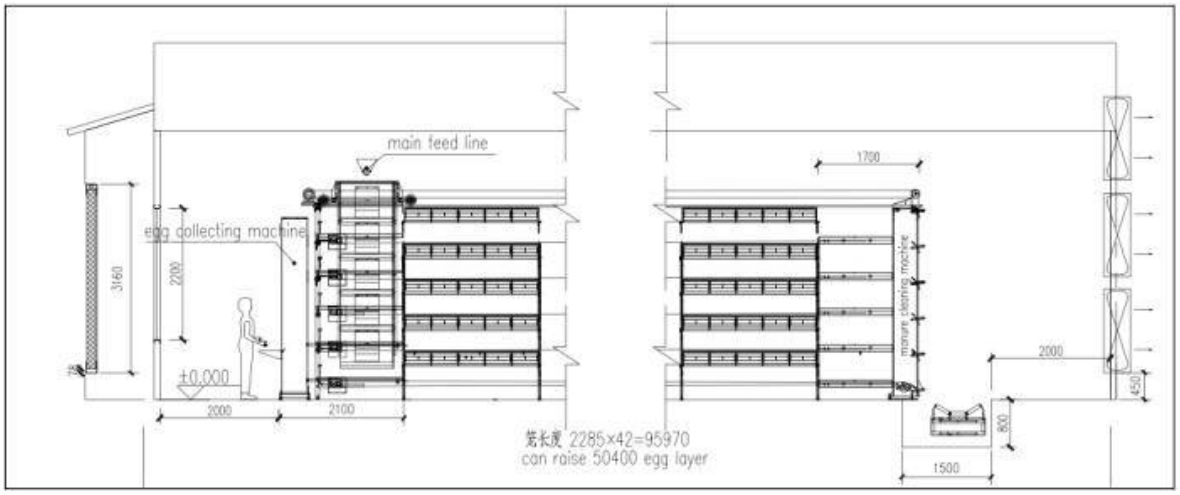


Figure 5: Cross section of layer chicken automated house

Artificial lighting must be provided during the laying stage by a minimum of one 60 watt bulb for every 20 m2 area. Start giving 20 minutes of additional lighting per week from 21 weeks of age and continue increasing it until a total day length (natural day length + duration of artificial lighting) of 16 hours per day is reached. It should be maintained at that level until 72 weeks of age. Day length should never be decreased during the laying period. Egg laying starts at 20-21 weeks and the rate of laying (percentage production) increases every week to reach a level of 90 percent and above after 26 weeks of age, which is maintained well beyond 36 weeks of age, even up to 40-42 weeks. Afterwards, it comes down slowly to reach 70 percent or less by 72 weeks of age. When the egg production goes below 65 percent, it is uneconomical to retain the layers unless the egg price is exceptionally high. They are then sold to the meat market as spent hens.

The layer type of chickens lay their eggs mostly during the period before noon. Eggs may be collected twice in the morning and once in the afternoon. The frequency of egg collection has to be increased to four or five times daily during peak. Preferable to have an air-cooled room for the storage of eggs. Specially designed plastic or cardboard trays must be used to collect eggs. Usually collecting trays with a 30-egg capacity are used.

6.4.7 Chicken Feed

Feeders are devices used to hold the feed. They will be fully automatic. They will be linear made of metal. Sufficient feeding space per bird would be provided, depending on their age. The feeder space available with a given feeder can be approximately calculated by multiplying the length by two and the required number of feeders per batch calculated in this way.

Figure 6: Chicken feed

Water drinkers would be used to provide clean, water to the broilers using hanging drinkers. Sufficient space for these drinkers would be provided for so that each bird can drink water easily.

6.4.8 Vaccination

Layer chicken chicks are vaccinated against several different diseases. Some infectious pathogens (such as Salmonella) can also be transmitted via the egg (vertical transmission) from the breeder hen to the chick. The most common vaccines used are against Newcastle disease virus, infectious bronchitis virus, avian pneumo virus and infectious bursal disease. Vaccines are delivered via spraying or via drinking water. Spray vaccination is the preferred and most effective administration technique for respiratory type vaccines.

6.4.9 Religious slaughter

According to Halal, Qurrbani/Udhia (Muslim) slaughter laws, an animal needs to be slaughtered without prior stunning. It requires an accurate cut of the throat with a sharp knife to minimize suffering and the slaughter needs to take place in an officially regulated slaughterhouse.

6.4.10 Rendering – By-products/waste

Many of the by-products of chicken slaughter can be used. Many chickens die before slaughter, either at the growing-out farm or on route to the processing plant. These birds are carried with waste. Sick or deformed chicks are culled—taken from the flock and killed after hatching, and these bodies must also be disposed. Unused viscera and parts also produce waste. A significant waste produced in chicken farming is the faeces of the birds. Because the flocks are so large, birds typical for growing-out farm, the amount of faeces is enormous. With right rendering process these waste can be used to produce fertilizer for crops for local farmers.

As part of the social responsibility programme, creating awareness on other advance poultry fram techniques among the Manadhoo and Velidhoo community would be implemented.

6.4.11 Egg-laying

Egg-laying Chicks are placed in the Layer houses four weeks prior to egg-laying age (20 weeks old). A continuous conveyor belt runs through the houses to the egg-packing room, this conveyor belt provides an efficient automated method of transporting the eggs to the egg-packing room without the risk of breakage.

6.4.12 Egg-packing

Eggs are transported into the egg-packing room on a single metal conveyor belt, which runs through all the laying houses. The eggs are then subjected to a manual inspection during which the cracked and deformed eggs are discarded. The eggs are then graded and separated according to sizes and then packed by an automated packing machine with a capacity of 650 trays per hour.

6.4.13 Feed

The performance of chickens depends to a very large extent on the quality of feed. Good quality of feed is a very important input to get proper growth during the brooding and growing period. Good growth during the brooding and growing period is a crucial factor for the flock to make good egg layers. Quality feed is also very important during the laying period to get optimum production during the laying cycle. Regular uninterrupted supply of good quality feed therefore assumes great importance in performance of poultry flocks. Feed should also not be stored for too long (>4-6 weeks), because with extended storage the micronutrients in feed (vitamins and minerals) lose their potency.

Since all feed is imported and will be imported till there is a local feed manufacturer, for the sake of economy on landed cost it will be desirable to import one container (17.5 to 19.5 tonnes) at a time.

6.4.14 Feed mixing

Feed is mixed according to the demand and type of feed required for consumption. The chicks require different feed during the pre-laying growth phase and egg-laying phase.

6.4.15 Manure storage and transportation

Manure from the hens is collected on a separate plastic conveyer belt and transported to the opposite side of the house (opposite to the eggs). This ensures that the risk of contact between the eggs and manure is minimal. The manure is collected at the rear end of the house and loaded onto trucks to be transported to crop farms.

Manure produced from the chickens is moved to the ‘dirty’ end of the houses and deposited on thrown concrete slabs outside the houses. The manure is then conveyed up into a truck to be transported out to crop farms.

6.4.16 Workshops

The farm has a motor vehicle workshop, which includes a small pit and jacks. This workshop would be able to maintain tractors and vehicles. The site would also have a general storage area.

6.4.17 Chemical/vaccination storage, usage and disposal

The site would have a store for chemical and vaccination storage rooms. Management would keep a current stock of all required vaccinations and inoculations that may be required during the flocks’ life. The store manager would utilises a ‘first-in-first-out’ system to ensure that no stock is kept for prolonged periods of time. The disposal of waste bottles and medicine containers is removed from site in a biohazard container and disposed at Vandhoo waste management facility.

6.4.18 Biosecurity

6.4.18.1 Quarantine Process

Main target of the project will be development of a sustainable layer chicken poultry farm on the island to supply chicken eggs to the local market. However, at the initial stage of the project, it is proposed to import 1 week old layer chicken type chicks from Srilanka using the highest international standards for transportation and quarantine of live chicks to prevent the entry of any undesirable organisms.. During this process every importance will be given to minimize the risk of any disease transfers and cautionary practice will be taken with the help of the government bodies and experts in the field. Animals destined for transfer will be placed in the quarantine facility for health examination, certification and disease testing as required. All species at all stages will be screened for diseases regularly by selecting random samples. If found any disease immediate actions will be taken to inhibit the further spreading of the disease.

6.4.18.2 Rearing shed

The Farm will be fenced separated area with a single entrance with shower-in facility. Natural vegetation provides a buffer zone within this fenced area. This allows the production of healthy pullets as long as biosecurity principles are strictly carried out at all times. The single entry point to the site would have vehicular spray disinfection (entire wheel perimeter) that provides sufficient spray for the undercarriage of any vehicle entering onto the premises.

6.4.18.3 Laying houses

The houses are cleaned regularly with good internal environmental conditions. Energy-saving globes have been installed in all houses. Cages in houses would have access to two (shared) drinker nipples for 18 birds per cage. The facility would have a controlled entry point with shower block for entry. Entry control and mandatory showering prior to entry would applies not only to daily staff but all persons including maintenance/construction personnel and visitors.

6.4.18.4 Manure management

The farm is expected produces 5,200 kg of chicken manure daily from their houses. The management has proposed to produce sea cucumber feed material from the manure which is generated as by product from the chicken farm. All manure produced from the chicken houses would be transported to be used as organic feed material.

The laying houses are equipped with plastic conveyor belts, which collect the manure below the cages of the birds. The conveyor belt is operated every second day and moves the manure to the back of the house where it is dumped onto a concrete slab. Every second day, the manure is elevated onto a truck by a moveable conveyor belt, and transported to crop farms.

During the rainy season and when manure application is not required the manure is stored under tarpaulins at the end of the crop fields to ensure that there is no spread of contamination from dissolving manure.

6.4.18.5 Health and Safety

The management of the farm will always ensure the health and safety of the farm, workers and visitors will always be required to adhere to the rules and regulations enforced by HPA, Maldives Food and Drug Authority and other concerned authorities in the country.

6.4.18.6 Control of diseases

Control of spread of disease and disease outbreak is an important aspect for the development and operation of the layer chicken poultry farm at the island. Layer chicken chicks are vaccinated against several different diseases as step to prevent the spread of disease at the island. Vaccines are delivered via spraying or via drinking water. Spray vaccination is the preferred and most effective administration technique for respiratory type vaccines.

Disease prevention strategies includes use of antibiotics when required on the chickens, use of medication (vaccinations), drugs added to feed for disease prevention, serological testing, drinking

water chlorination, strict entry at the main gate to facility, including spraying of vehicles, personnel walk through treated water bath and use of PPE, no poultry from outside is allowed into the farm, personnel living on-site are not allowed to rear chickens, quarantine facility for grower houses personnel with showers, sterilized canned foods and vehicle, regular flushing of drinking lines and manure is disposed of at distance chicken cage houses.

6.5 Technology Transfer

This project proposed for Ehdhufarumairah will be carried out using modern technology used in layer chicken farming. Layer-type chicks would be reared in cages. A continuous conveyor belt runs through the houses to the egg-packing room, this conveyor belt provides an efficient automated method of transporting the eggs to the egg-packing room without the risk of breakage. The laying houses are equipped with plastic conveyor belts, which collect the manure below the cages of the birds.

Apart from promoting layer chicken farming on the island, promoting awareness among the youth of the Maldivian society will also be carried out. For this purpose, students from schools of the neighbouring islands will be invited to the island and work carried out will be shown and information will be provided. Also, poultry farmers will be invited from region to Ehdhufaru every year and work on the island will be shown and information will be provided.

6.6 Employment Opportunities

Under this project, 60 employment opportunities would be created in four years' time. Layer chicken farming on the island would be carried out on this island using modern technology and stakes are high for employing locals to carry out almost all the work.

This company with a team of Maldivian employees has hands-on experience to work with locals and has the capability to carry out the project employing Maldivians. During the first five years of this project, layer chicken farming Project will be a project which employees 95% of Maldivians.

Just like any other field, opportunities to attain higher degrees in this field and to hone the skills and capabilities would be given for the employees. To establish Ehdhufaru as a pleasant working environment good quality accommodation blocks for staff will be built as well recreation facilities will be arranged.

Also, ferry services will be arranged between Ehdhufarumairah and neighbouring islands so as to ease the staff for their trips to their home island. The aim is to make the island a work place where all staff are Maldivians and after the start of the project, in two years' time, all resources would be used to make this a reality.

6.7 Environmental management and infrastructures

The project proposed to carry out at the island is planned for 20 years. Thus, it is obligatory to develop the infrastructure of the island in order to carry out the work in a sustainable way.

6.7.1 Construction of the Jetties

Two jetties will be constructed on the western side of the island to give access to supply vessels and to facilitate transportation of products from the layer chicken farm on the island. The jetties will be constructed using precast concrete columns. The jetties will be standard width (~2.5metres) and will withstand the weight of a loaded utility vehicle. The jetty head will be L-shaped.

This method involves constructing the columns encased with a concrete footing. The footings will then be placed on their fixed locations and they will be evenly cut to the required height and connected by the supporting horizontal truss. Once these horizontal trusses are in place, then construction of the decking of the jetty will be undertaken. Afterwards, plumbing, electrical and fire networking lines will be laid.

6.7.2 Power plant and diesel tanks

The proposed project requires uninterrupted supply of electricity. As such, risk of power failure will be mitigated by using two redundant diesel power generators. The size of these generators is

approximately 40kva for the plant and for additional power requirements for staff accommodation and other general services for the island. Suitable sized concrete diesel storage tanks will be store near the power plant. The power plant and diesel tanks will be installed by experienced local contractors.

6.7.3 Water Resources

The primary water source at the island would be rainwater. A secondary source would be desalinated water using reverse osmosis. A desalination plant with a capacity of 50 cubic meters per day is proposed to be installed during the early stage of the project. . The estimated daily water demand for the development in the operation would be 30 m3, inclusive of the requirements for layer chicken farm and staff on the island.

Two rainwater tanks with capacity of 100 tonnes will be installed near the accommodation area. A main pump house and smaller pump stations on a needs-basis will be constructed to manage the combination of water sources and flow. Groundwater will not be frequently used on the island. The exact amount of water required for layer chicken farm system is difficult to determine, since water requirements depend on several factors, and lack of availability of detailed data for similar projects in similar conditions. The water requirement for Ehdhufaru is estimated at 30 m 3 / day and 25 m 3 /day in the dry and wet season respectively.

6.7.4 Seawater intake

The intake would have a HDPE pipe of 100 mm in diameter which would be located on western side of the island. The feed water would be taken at a depth 3 meter below the water level, inside the lagoon of the island.

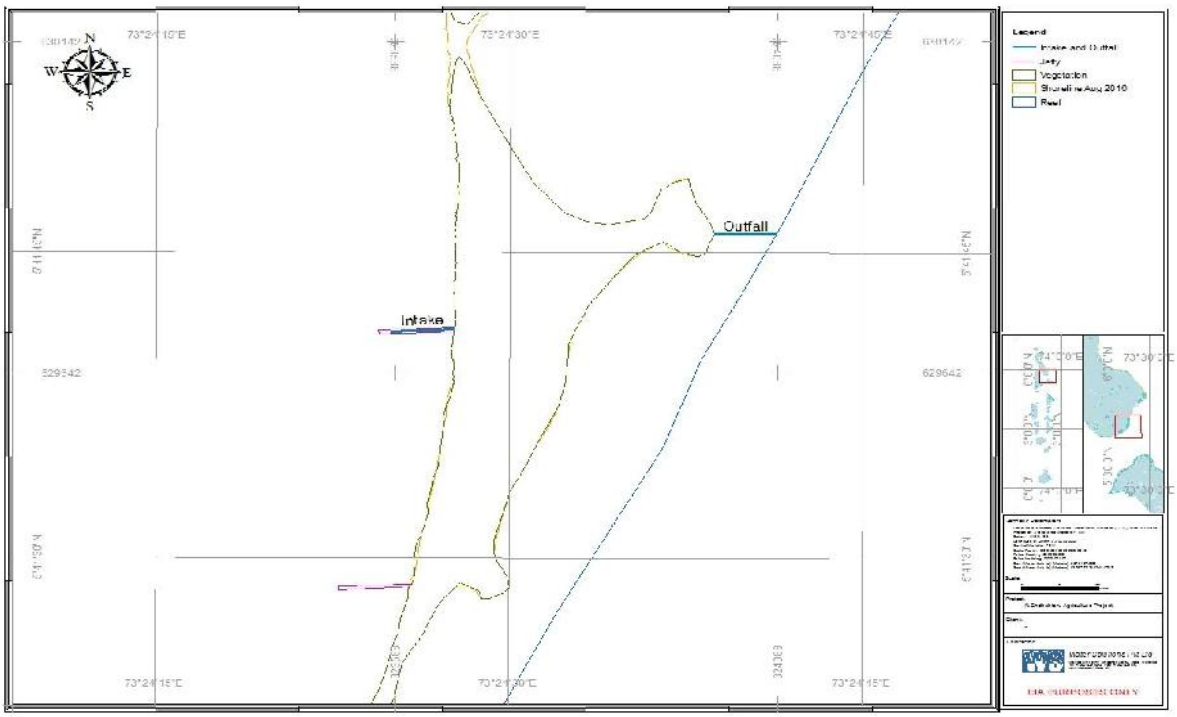


Figure 7: seawater intake and outfall

6.7.5 Jetty

Jetties will be constructed on the western side of the island to give access to supply vessels and to facilitate transportation of products from the farm.

6.7.6 Staff Infrastructure and Management

Accommodation buildings will be constructed on the island. A block will be built for staff accommodation and a block for executive staff. In addition to this project office, guard room, mosque, laundry, general stores, kitchen and staff restaurant will be built separately.

Staff involved in the farming operations will live permanently on the island. The researchers and others involved with agro-farming research will visit to island.

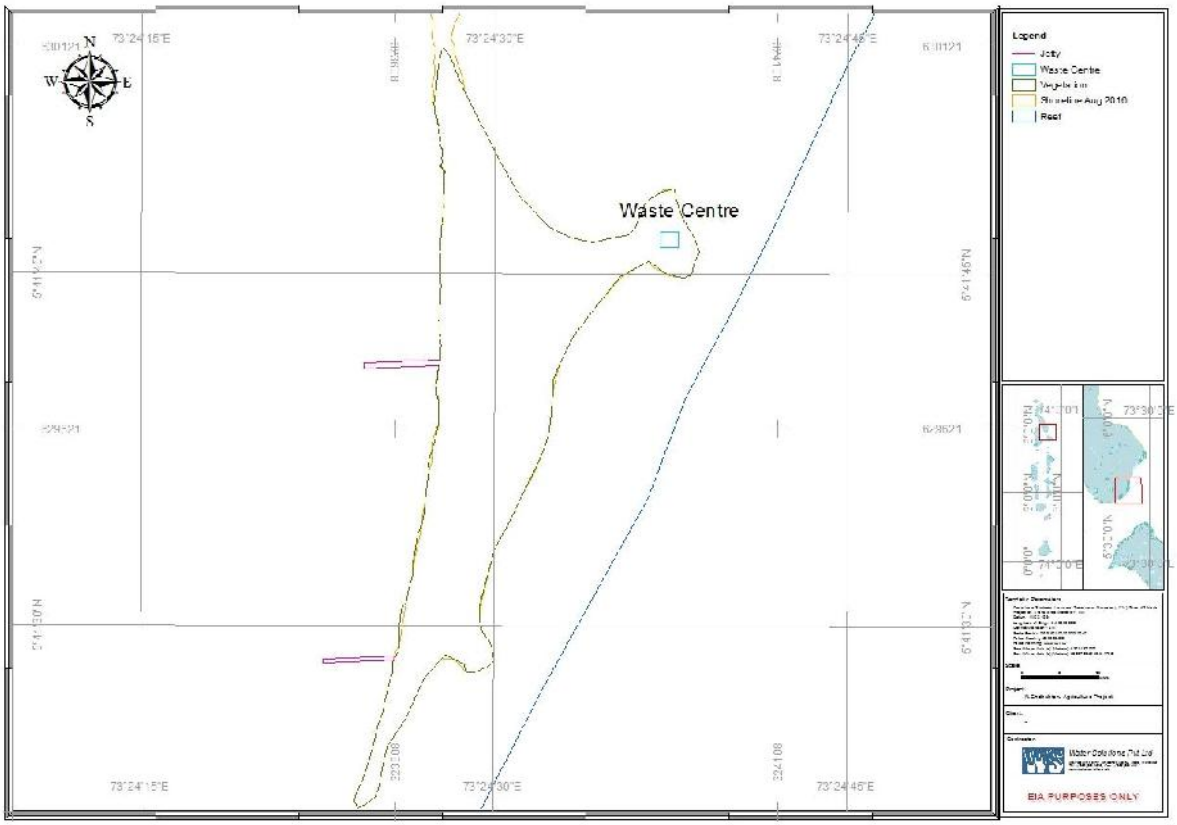
Under this project, 60 employment opportunities would be created in two years' time. Chicken layer-farming is to be carried out on this island using modern technology and stakes are high for employing locals to carry out almost all the work .

6.7.7 Septic Tank System

The sewage system will include septic tanks and outfall. The sewage outfall is proposed to be located on the eastern side of the island extending beyond the house reef up to -5.0 m. The site with best flushing is on the southern side but construction costs are very high. The eastern side will provide good tidal flushing. Sewage treatment plant is being considered but given the very small workforce proposed for this island, such a system so far appears infeasible.

6.7.8 Waste Management

A waste management site would be designed and developed as part of the development. The site will be demarcated and equipped with waste management equipment. The site would be able to manage general domestic waste and industrial waste from the chicken farm.



Specific areas will be designated for waste sorting, especially for temporary green waste storage. A shredder will be placed for green waste which will be composted to be used as fertilizer and mulch. All waste (non-green) from the island will be transported via registered vessels to the nearest registered waste management facility at Vandhoo.

The proposed waste management site will have any incinerator. The incinerator would be side loading, single chamber incinerator with a total load capacity of 150kg. The incinerator would be

fuelled by diesel and a 230volt electricity supply. The incinerator would be fitted with a 10 meter stack. Waste oil and grease will be stored in sealed containers and transported to the nearest waste management facility at Vaandhoo Island.

The proponent will be registering on-site waste management site and any vessels used for transporting waste to Vandhoo as per the Waste Management Regulation 2013.

6.7.9 Vegetation Clearing

Vegetation clearance will be carried out for creating space for building structures. Total clearance will be needed for building structures on land. Vegetation clearance will be undertaken using local labour and utilizing other tools such as chain saws, axe, spades etc. No trees should be cut or uprooted within the 15m zone inside from the vegetation line of the island (Article 3 (a,b) of regulation cutting down, uprooting, digging out and export of trees). It is estimated that 11,9340 m2 of vegetated area of the land would be cleared as part of the project.

Lagoon area	4,239,121.00	m²
Island area	144,823.00	m²
vegetation area	123,022.00	m²
built up area	18,360.00	m²
Area to be cleared area on the island	11,934.00	m²

The areas which are marked for clearance have mostly coconut palms, screw pines and low bushes. It is estimated that 123 coconut palms would be removed as part of the project. Most of these coconut trees are located on southern side of the island. Please refer to the map attached as Figure 8 of this document. The area on northern side of the island, where most of the support facilities would be developed has less coconut palms. These are mostly covered by bushes and screw pines. A detail account of the vegetation of the island would be provided in the first monitoring report submitted as part of the post environmental monitoring programme for this project.

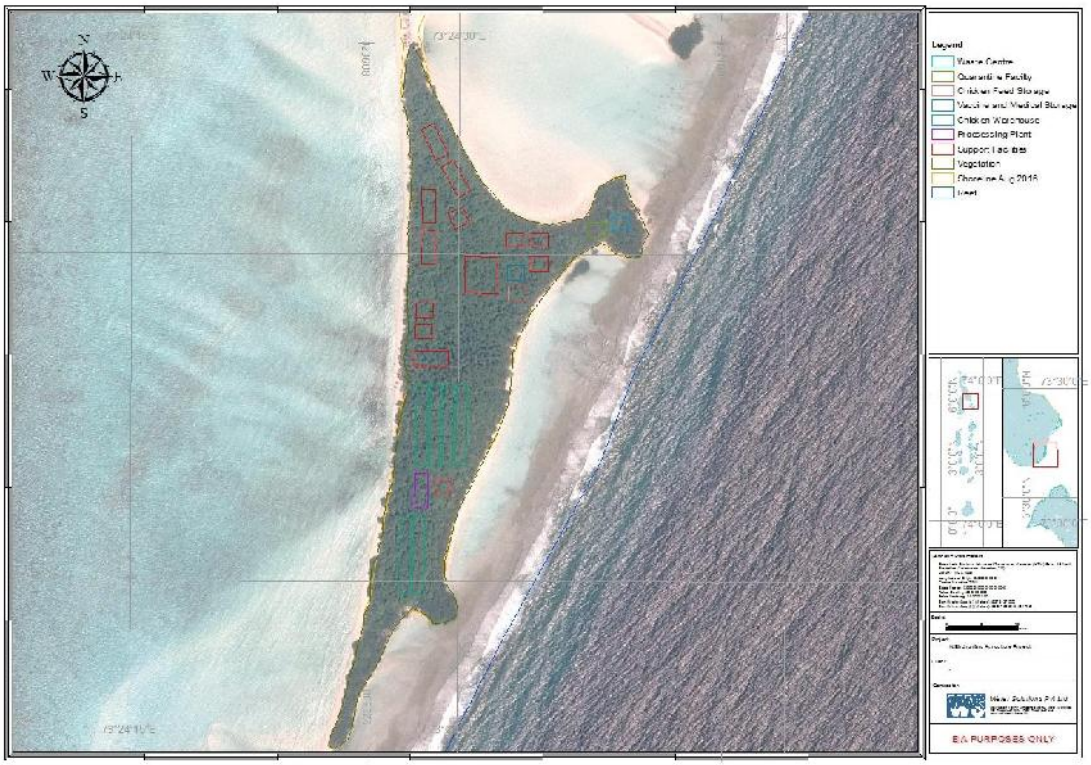


Figure 8: Area marked for vegetation clearance

6.8 Project Schedule

Construction is expected to begin in December 2016 upon receipt of the EIA decision statement. As soon as the EIA is approved and a decision statement is issued, the project activities will initiate, including mobilization and finalizing the contractor. Mobilization of the workforce will begin from then onwards (transporting materials and arranging other logistics). A draft project schedule is outlined below and a detail project schedule is attached as an annex.

	Timeline (months)																				
Activity	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
EIA																					
Approval for construction																					
Setting out, Site Clearance and Roads																					
Construction of Jetty																					
Construction of Staff Quarters and related infrastructures																					
Constructio of Powehouse																					
Constrution of RO Plant																					
Construcion of Layer chicken house																					
Construction of Laboraryory																					
Procment of Equipments																					
Machnaries, Plants, Pumps & etc																					
Fishing and clearing																					
Inspection																					
Commencement of operation																					
Marketting																					

Table 1: tentative work plan

6.9 Project Inputs and Outputs

6.9.1 Project Inputs

The types of resources that will go into this project and from where and how these will be obtained are given in the following tables.

Input resource(s)	Source/Type	How to obtain resources
Construction workers	Maldivians and foreigners	Companies labour
Water supply (construction period)	Rainwater and desalinated water	Rainwater harvesting for rainwater and desalinated water from seawater. 30 tonn RO plant would provide water during operations.
Electricity/Energy (construction period)	Power from 40 KWA generator	Purchase own generators
Construction machinery	Concrete mixer and general construction tools	Local suppliers
Transport (sea)	Sea transport by dhoni and speed boats. Materials to be transported in cargo vessels/dhoni.	Contractor to be in charge of this
Food	Mainly imported sources except a few locally available.	Local purchase
Fuel, Kerosene and LPG	Light Diesel, LPG Gas, Petrol, Lubricants	Local suppliers
Vaccines, chemicals and feeding materials	Imported vaccines, chemicals and feeding materials.	Import and purchase locally

Table 2: Matrix of major inputs during construction period

6.9.2 Project Outputs

The type of outputs (products and waste streams) and what is expected to happen to the outputs are given in the table below.

Products and waste materials	Anticipated quantities	Method of disposal
Sewage and wastewater Grey water/laundry wastewater	Estimated to be at 60 liters/person/day	Septic tanks
Vegetation clearance (greenwaste)	It is estimated that 123 coconut palms would be uprooted as part of the project	If an interested party is available, the coconut palms would be relocated to another island. If not, it would be disposed as green waste
Construction and general waste from construction activities	5 cubic meters of debris / week during construction phase	Stockpile and send to nearest waste management center
Hazardous waste	Approximately 100 liters of diesel and oils per month	Barreled and stored until disposal. transported to disposed to a designated waste disposal facility
Noise	Only localized to the island environment	-
Air pollution	Limited quantities of dust	Mainly arising as a result of dust emission from the construction work such as cement mixing, moving machinery and other processes. Only localized

Table 3: Matrix of major outputs of environmental significance during construction stage

6.9.3 Risks associated with the project

The risk factors associated with this project that could possibly have financial and environmental implications. There is a risk of project delays caused by bad weather. Since the project is scheduled to be completed in 48 months, construction period falls towards the south west monsoon which is the wet season. However, as the weather is unpredictable, bad weather can disrupt the construction, mainly material transport. During the initial stage of the project, access to the island would be difficult. Hence rough weather would delay the transportation of the construction material to the island. However, it is unlikely to be a significant risk as the project is planned for an over a long period of time.

Contagious disease and virus outbreak is risk for a layer chicken poultry farm. And some he diseases are also contagious to human. Disease prevalence varies from one area to the other. The problems that may trigger disease must avoided. All these conditions will be avoided to the best of Farm's abilities. Another thing considered in the risk assessment is the mortality of the chickens which is inevitable since Farm is dealing with living things. This can be managed with good management and has been calculated to range between 5-10%.

Risks associated with poor contractor performance can be avoided or minimized by awarding the contract to only experienced contractors with experience in working in similar situations. Therefore, work delays will be least impacted. The most important risk associated with this project is the damage to the terrestrial environment as a result to the overall construction process. The mobilization of equipment, movement of labour in and out of the island and use of lagoon for various other purposes will definitely be a risk, especially if workers are not briefed properly about the fragile environment. This is mostly associated with abuse by unskilled workers during the construction period. These risks can be minimized by awarding the contract to experienced contractors and for those who can manage the labour force and control these activities and provide environmental protection plans and adhere to them. These issues will be addressed by the project proponent.

Use of automated technology for the operation of layer chicken farm on an island is a risk. Technology is good but they also have their disadvantages. Technicians and engineers need to be trained and retained as to make the operation smooth with any breakdowns.

The project need to consider risks and have contingency plans for unprecedented events. As per the health risks, the layer chicken farm would have in-house veterinary doctor that will have regular check-ups with the chickens while giving them the best environmental conditions. Proper preventive management practices will allow to minimize occurrence of such events.

7 Methodology

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 coral reef areas as the marine environment.

In order to study the existing environment of the island, the following data collection methodologies were used during the field visits undertaken in 28 - 29th July 2016 to the island. Field visits mainly covered water quality, terrestrial flora, fauna, marine environment and lagoon condition of the proposed project sites. In addition, stakeholder consultations were carried out on 28th July 2016 at Velidhoo Island Council.

7.1 General Methodologies of data collection

Conditions of the existing environment were analyzed by using appropriate scientific methods. The environmental components of the study area were divided into marine and terrestrial environment. The marine environment of the island covered the house reef, especially western and eastern side of the island, around the area of the proposed jetty as part of the development. The terrestrial environment covered vegetation of the island.

7.2 Mapping and Location identification

The entire island, including some section of the reef line, shore line, vegetation line and marine survey locations were mapped. Mapping was undertaken using hand held differential GPS. The location of data collection sites were marked using handheld GPS. These data collection points include water sampling locations, marine survey areas and proposed borrow area.

7.3 Marine Survey

To assess the benthic composition of the survey site, an LIT transect of 20 meters were undertaken. The benthic categorization was focused on categorizing life forms followed under the Reef Check protocol, which emphasises on benthic composition categorizing such as hard corals, sand, rock and others. The emphasis is not on recording corals to their species levels, but rather the general coral and other life forms such as hard and soft corals. This method is more accurate as the percentage of healthy coral cover and other life forms can be more accurately recorded even by a non-experienced surveyor. Recording corals to their species levels will pose difficulty if the surveyor is not familiar with the different coral types. This method is universally used throughout the world by Reef Check surveyors and hence it has been used.

This LIT method was also complimented by qualitative methods, such as visual observations and through the use of photos. Fish counts were also undertaken to get a snapshot of the fish population through swim survey. Details of these methodologies are discussed in the methodology section.

The following are definition of benthic categories used in this survey.

- HC: All living coral including bleached coral; includes fire, blue and organ pipe corals
- SC: Include zoanthids but not anemones (OT)
- RKC: Coral that has died within the past year; appears fresh and white or with corallite structures still recognizable
- NIA: All macro-algae except coralline, calcareous and turf (record the substrate beneath for these); Halimeda is recorded as OT; turf is shorter than 3cm.
- SP: All erect and encrusting sponges (but no tunicates).
- RC: Any hard substrate; includes dead coral more than 1 yr old and may be covered by turf or encrusting coralline algae, barnacles, etc.
- RB: Reef rocks between 0.5 and 15cm in diameter
- SD: Sediment less than 0.5cm in diameter; in water, falls quickly to the bottom when dropped.

- SI: Sediment that remains in suspension if disturbed; recorded if color of the underlying surface is obscured by silt.
- OT: Any other sessile organism including sea anemones, tunicates, gorgonians or non-living substrate.

General impression and quantitative results of the sites surveyed are described in the marine environment section.

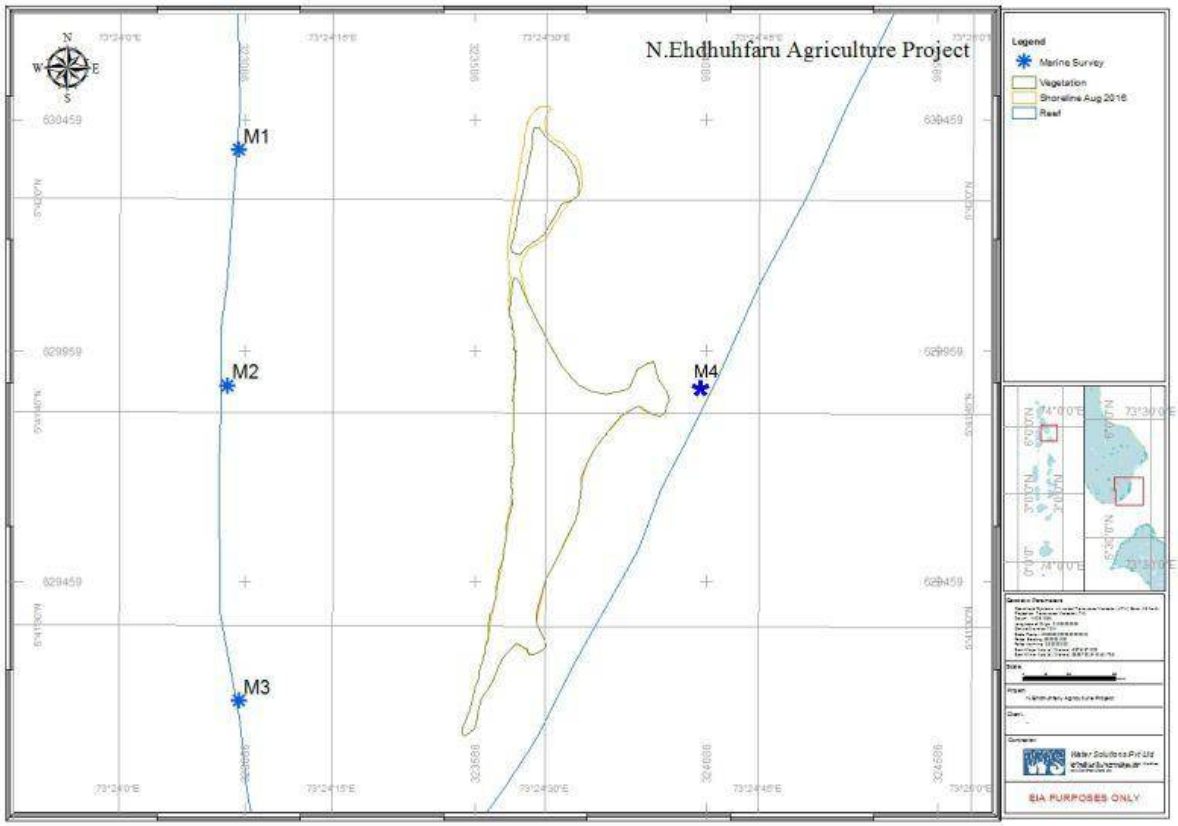


Figure 9: Marine water sampled locations and marine surveyed location of the Island

7.4 Bathymetric survey

A bathymetric survey was undertaken for the purpose of EIA to assess the baseline condition of the proposed jetty area on western side of the island. The bathymetric survey map is attached as annexed as an annex D to this report.

7.5 Ground water quality

The ground water samples were tested onsite using handheld digital water test kit. Using a GeoXT GPS, the positions of the locations were identified.

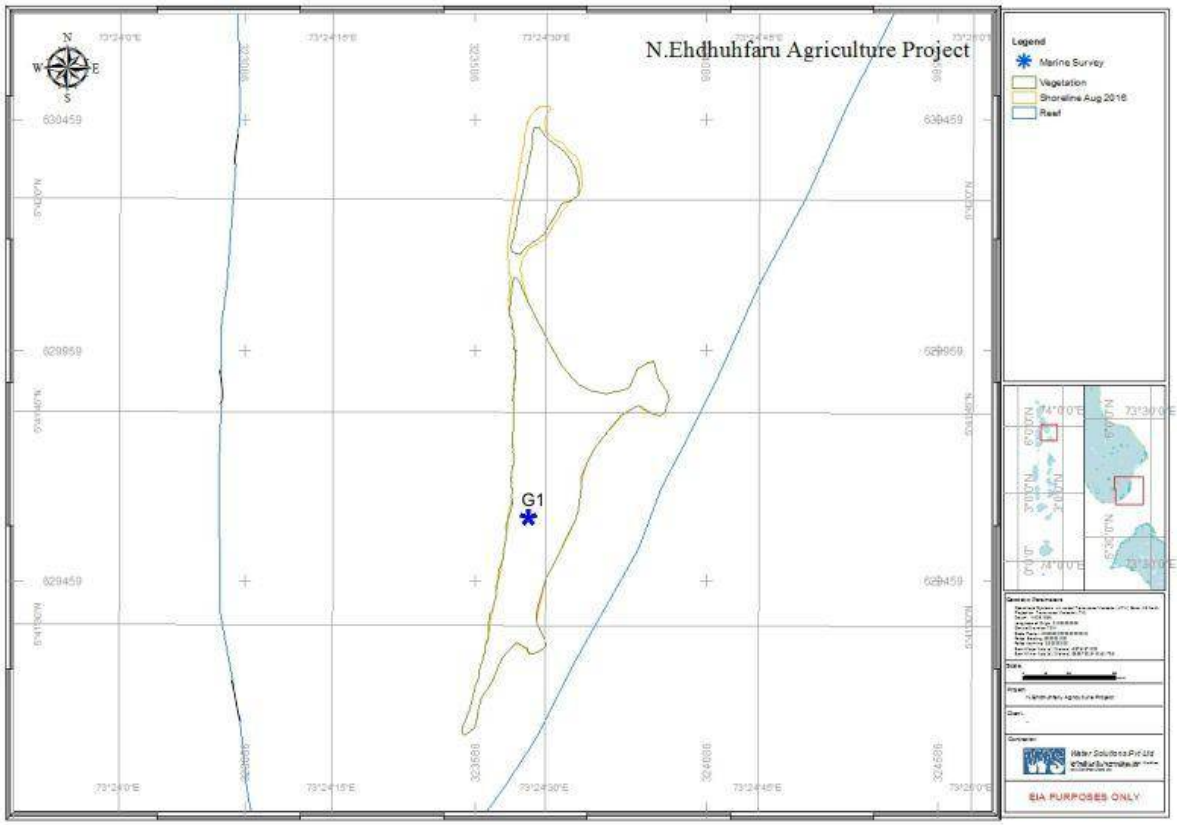


Figure 10: groundwater sampled locations

7.6 Socio-economic condition and stakeholder consultation

A stakeholder consultation was undertaken as part of the Environment Impact Assessment for the layer chicken poultry farm project. The purpose of the consultation is to get stakeholders view on the project and analyse the potential impact of the project might have on the residence of the island. Consultations were held through meetings at Male' with government stakeholder and Noonu Atoll with local stakeholders during the EIA field visit to the project site.

7.7 Data Analysis

The EIA consultants used their experience and knowledge in their respective fields to analyse the data from the previous studies and field visits in order to determine the potential impacts of the proposed project, the severity of effects arising from these impacts and how any adverse impacts can be best mitigated and positive impacts enhanced. This analysis provides recommendations on actions and mitigation measures and provides the basis for the formulation of the environmental monitoring plan. The process and findings of the study is reported in the EIA report compiled for this project.

7.8 Report Format

The report format and structure presented here follows the report formatting guidelines issued by EPA.

8 Existing Environment

The baseline information of the proposed project and surrounding area were collected through primary data collected during the study period and available secondary data. The environmental baseline data includes general geography, meteorology, geology, terrestrial and marine environment, bathymetry, tidal conditions, etc. A detailed description of baseline data compiled through the surveys and monitoring is provided in the subsections.

8.1 Geographic Setting

Maldives has a total of 1,192 islands, distributed over 26 natural atolls that encompass an area of approximately 107,500 km^2 of which less than 0.3 percent is land area. The country's total land area is estimated to approximately 300 km^2, with islands varying in size from 0.5 km^2 to 5.0 km^2. Only 197 of the islands are inhabited. The islands consist of coral, sea grass, seaweed and sand dune ecosystems which are of great ecological and socio-economic significance.

Located 167 km north of Malé, Ehdhufarumairah island is considered as a large size uninhabited island in Noonu Atoll. Ehdhufarumairah is located at geographical coordinates 05°41'38.17"N 73°24'29.9 E. The island has an area of 14.5 hectares. The nearest island is Velidhoo and Manadhoo. Ifuru Airport is the nearest domestic airport.

8.2 Geological Conditions

The islands occupy the central portion of the 3,000 km-long Laccadive-Chagos submarine ridge, which is a major feature of the Indian Ocean seafloor. They form a double chain of north-south oriented parallel atolls separated by an inner sea. The atolls rest on a submarine plateau that is 275-700 m deep, 700 km long and up to 130 km wide. Several east-west trending deep channels (~1000m) separate the atoll groups.

Figure 11: Existing environment of the Island

The islands are low-lying and began forming between 3,000 and 5,500 years ago. They represent the most recent deposition along a submarine plateau that is underlain by approximately 2,100 m of mostly shallow-water carbonates resting on a slowly-subsiding volcanic foundation. Island shorelines consist of sand, gravel, and a variety of engineering structures. The country's beach systems are highly dynamic and subject to seasonal conditions, especially from monsoons. Although Maldives is located away from the main pathways of tropical cyclones, the presence of gravel beach ridges and cemented conglomerates attest to the fact that storm waves are an important element in the development of the islands.

Erosion and accretion are, in fact, ongoing processes to which local communities have adapted in the past. Increases in population and the development of permanent infrastructure in close proximity to shorelines, however, have made erosion a prominent hazard to the country's social and economic well-being.

It is estimated that 80% of the islands are one metre or less above mean sea level. Their low elevation makes them particularly vulnerable to storms and changes in sea level. The prospect of global sea level rise and its potentially catastrophic impact on low-lying islands makes erosion management all the more urgent.

8.3 Coastal Environment

This section will look at the coastal zone of the island environment which is the area between the vegetation line and the reef flat. Therefore, this section will cover the following:

- Existing environmental conditions of the coastal environment of island
- The different proposed components of the project that will impact upon the coastal environment

Figure 12: Ehdhufarumairah in 2002, 2010 and 2014

8.3.1 Features of the coastal environment

8.3.1.1 Lagoon

The lagoon associated with the island system is very large. The depth of lagoon varies from 1 m to 6.2 m. The shallow lagoon surrounds the island on eastern and northern side. The deeper lagoon is found on western side of the island. The lagoon surrounds the island consists of sandy bottom on western and northern side and rocky bottoms with live corals and coral rubbles on eastern side. In terms of the area and the biodiversity the entire lagoon and coral reefs are in healthy state but varying in different areas of the coral reef.

Figure 13: The island have a defined lagoon

8.3.1.2 Beach

There is distinctive variation in beach composition around the island. However, the beach extent is seen to vary from different parts of the coastline. The island has a sandy beach area on western and northern side of the island. A rocky beach area is found on eastern side of the island. The beach material on sandy beach area is mainly composed of loose skeletal carbonate sediments. The beach material on rocky beach area is mainly composed of small rocks and rubbles. The islands beach is highly dynamic. The beach moves with the season. However erosion has occurred in south western side end of the beach revealing beach rocks in some areas. Eastern side of the island has beach rocks and is exposed to the Indian Ocean. Annex provides beach profiles taken at the shoreline of the island.

Figure 14: Island beach on western side of the island

Figure 15: Island beach on northern side of the island

Figure 16: beach erosion is visible on some parts of the island

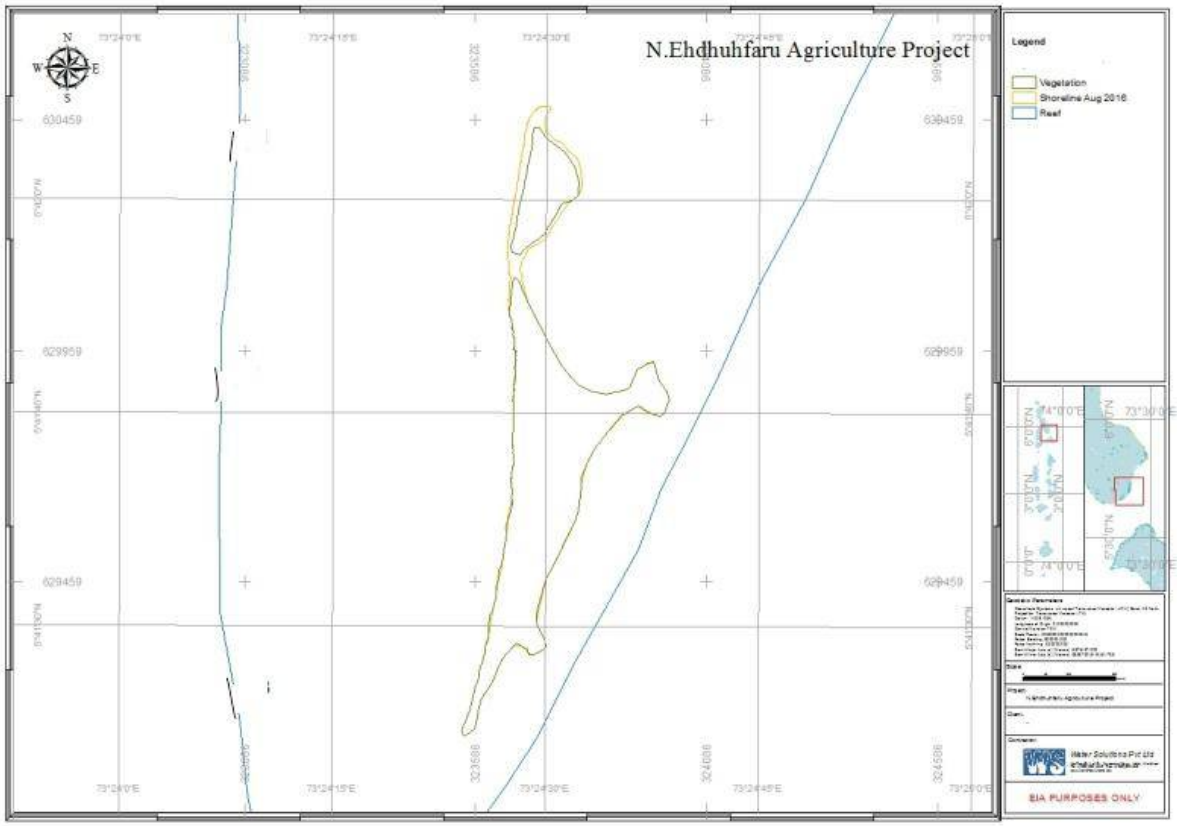


Figure 17: Shoreline of the island

8.4 Meteorological Conditions

Meteorology at Maldives is monitored by the Maldives Meteorological Service (MMS) through three stations as detailed in Table 2below. The stations monitor rainfall, temperature, wind and tide levels at the islands. The secondary data presented in this section has been sourced from recordings of MMS monitoring stations.

Table 2: Geographical Coordinates of the Meteorological Centres in Maldives

Location	Latitude	Longitude	Tide gauge
National Meteorological Centre, Malé	04.19°N	73.53°E	Yes
HD. Hanimaadhoo Meteorological Office	06.75°N	73.17°E	Yes
L, Kadhdhoo Meteorological Office	01.86°N	72.10°E	No

Hourly meteorological data was also collected from Hulhule for the period 1995-2015. The data includes parameters such as atmospheric pressure, temperature, humidity, wind speed and direction and precipitation which is provided in the subsequent section

8.4.1 Climate

Maldives is located at the equator and experiences monsoonal climate. Maldives has two distinct seasons; dry season (northeast monsoon) and wet season (southwest monsoon). In these two seasons the temperature remains more or less the same. . Northeast monsoon extends from January to March. Since Maldives consists of small islands and are surrounded by sea, hot days are often tempered by cooling sea breezes and evening temperatures drops. Throughout the year, temperature remains almost same in the Maldives. However, daily temperature ranges from around 31^{o}C in daytime to 23^{o}C in night-time. The mean daily maximum temperature for Central parts (Hulhule) of the

Maldives is 30.5°C and minimum temperature is 25.7°C. On the other hand, mean daily maximum and minimum temperature for South (Gan) is 30.9°C and 24.5°C, respectively.

The wet season- southwest monsoon runs from mid-May to November. In this season Maldives experiences torrential rain. Central, Southern and Northern parts of the Maldives receive annual average rainfall of 1924.7mm, 2277.8mm, and 1786.4mm, respectively. The highest rainfall ever recorded in the Maldives with in 24 hour period was on 9th July 2002 at Kaadedhdhoo Meteorological Office and amounts to 219.8mm of rainfall. Maldives being located at the equator, receives plentiful of sunshine throughout the year. On average Southern atolls (Gan) of the Maldives receives 2704.07 hours of sunshine each year. Furthermore, on average central (Hulhule) parts of the country receives 2784.51 hours of sunshine per year. The relative humidity in Maldives ranges from 73% to 85%.The monthly average sunshine and rainfall is presented in the figure below.

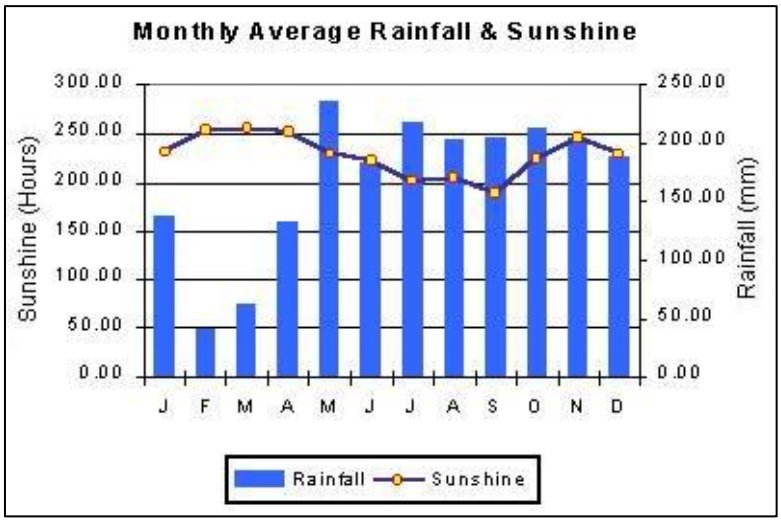


Figure 18: Monthly Average Rainfall and Sunshine

8.4.2 Tide levels

The tidal regime is semi-diurnal with diurnal inequalities (twice daily). That means 2 high tides and 2 low tides per day, with different heights. Typical spring and neap tidal ranges are approximately 1.0 m and 0.3 m, respectively.

8.4.3 Currents

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

During the course of the day, currents change twice with the changing tide and monthly with the moon cycles. The result therefore is a very complex change in current direction. In Maldives, it has been well researched and documented that the currents are induced by wind and thus, during the two monsoons, the direction of currents is very much related to the wind direction.

8.5 Marine Protected Areas and Sensitive Areas

There is no Marine Protected Area (MPA) within 5km radius of the project site. However, there are 2 sensitive areas within this range to the project site. Parts of N. Vattaru and N. Bodufinolhu are declared sensitive areas near the project site. However, these areas are very far from the project site and will not be impacted by the project activities. Bodufinolhu is 4.21km north to the Ehfhuffaru mairah while Vattaru is approximately 3km south to the project site. Vattaru has an important wetland area and embayment area which is considered as nursery area for sharks and rays. Bodufinolhu is declared sensitive as the island is a roosting area for marine birds.

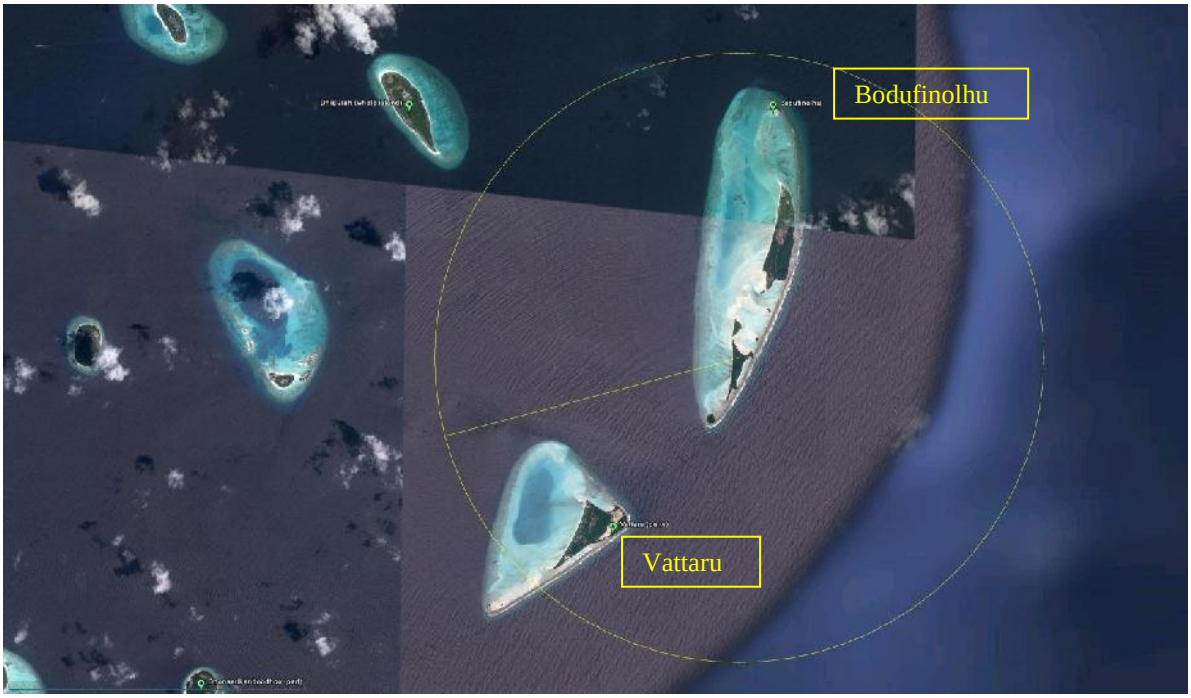


Figure 19: Sensitive areas within the 5km radius of the project site (Data sourced from EPA website)

8.6 Vulnerability of the island to storm surges

The primary sources of natural hazard risks in Maldives are strong winds during monsoons or freak storms, earthquakes, island interior flooding caused by heavy rain, coastal flooding caused by high surf, storm surge, prolonged strong monsoonal wind, high astronomical tides or tsunamis, and sea level rise. Coastal flooding related flooding and wind damage can be considered as the most frequent natural hazards that occur in Maldives (see Maniku (1990), Luthfy(1994)). Most of these risk factors (apart from earthquake, wind damage and rainfall flooding), stems from the extremely low elevation of all Maldivian islands: the average elevation is 1.5 meters above sea level. In spite of the occasional natural hazards, Maldives in general is relatively from high risk natural disasters.

Spatial variations in hazards are evident across Maldives (Maniku, 1990). Northern atolls are more exposed to intense storm systems, increasing the risk of wind damage in these atolls. In comparison, southern atolls experience less storms systems, but are more exposed to flooding events, probably as a result of exposure to intense South Indian Ocean storm surges and wind-waves during south west monsoons. Southern atolls are also more likely to experience earthquakes.

8.7 Marine Environment

Three sites were surveyed to assess the marine environment as baseline for reef benthic community of the island. The marine survey locations are illustrated in the Figure 9. The geographical coordinates and the locations are outlined below.

Table 3: GPS coordinates of the survey locations

Marine Site 1	5°42'23.5 N	73°24'07.8 E
Marine Site 2	5°41'50.8 N	73°24'06.5 E
Marine Site 3	5°41'22.8 N	73°24'08. 7 E
Marine Site 4	5°41'44.34"N	73°24'42.27"E

8.7.1 Coral reef

Three sites were surveyed to assess the marine environment as baseline for reef benthic community. The locations are outlined in Figure 9. Three sites were from west side of the island reed.

8.7.2 Status of coral reef at site 1

Site 1 was chosen from the west side of the island reef. This area of the island reef is lively with lots of fishes and corals. However, rocks and rubbles dominate the benthic composition of the site. Massive and Digitate coral species are observed here. Some of the corals in this site are recovering from bleaching. The following graphs and tables outline the percentage benthic composition at site 1.

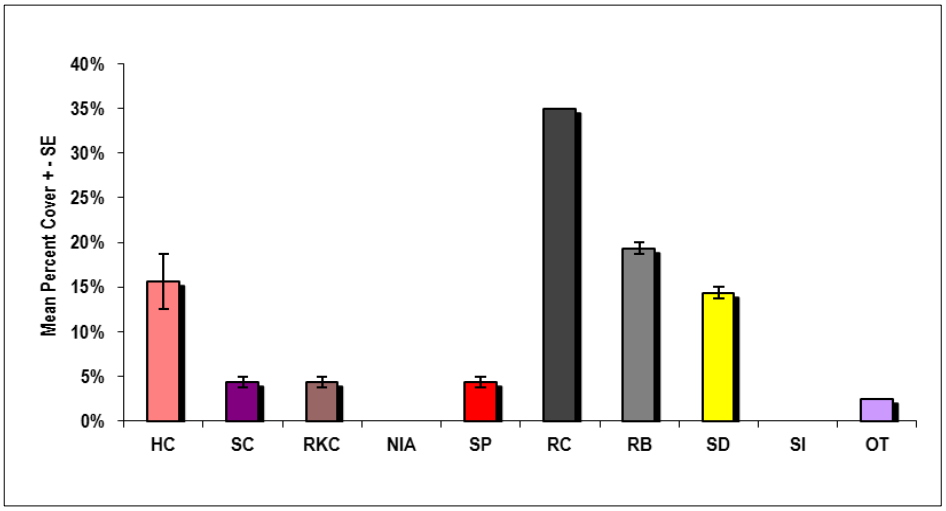


Figure 20: Percentage benthic composition at site 1 (August 2016)

Table 4: Percentage benthic composition at site 1 (August 2016)

Live reef cover	Mean % per segment	SE
HC	16%	3%
SC	4%	1%
NIA	0%	0%
SP	4%	1%
OT	3%	0%
RKC	4%	1%
RC	35%	0%
RB	19%	1%
SD	14%	1%
SI	0%	0%

Live coral cover at site 1 was 16%. Of the non-living components, rocks dominated this area with 35%. Percentage of coral rubbles is 19%. Bleached corals were recorded. Some of the bleached corals were observed to be recovering while some are recently killed because of algae growth.

8.7.3 Status of coral reef at site 2

Site 2 was also selected from west side of the island. Similar to site 1, massive coral dominate the live coral species in this location. The area is dominated by rocks and coral rubbles. Effects of bleaching event are also observed in this location. Some of the bleached corals are recovering while few recently killed corals were observed. In terms of fish population, site 2 is healthier than site 1 with lots of reef associated fish species observed here. The following graphs and tables outline the percentage benthic composition at site 2.

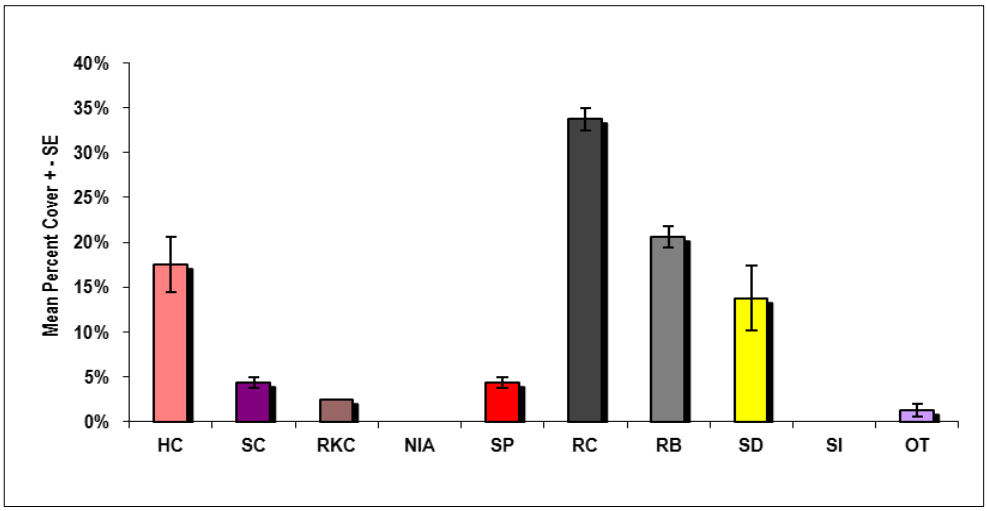


Figure 21: Percentage benthic composition at site 2 (August 2016)

Table 5: Percentage benthic composition at site 2 (August 2016)

Live reef cover	Mean % per segment	SE
HC	18%	3%
SC	4%	1%
NIA	0%	0%
SP	4%	1%
OT	1%	1%
RKC	3%	0%
RC	34%	1%
RB	21%	1%
SD	14%	4%
SI	0%	0%

Live coral cover at site 2 was 18%. Of the non-living components, rock dominated this area with 34%. Percentage of coral rubbles is 21%. No bleached corals were recorded or found, and no algae recorded. Similar to site 1, bleached corals were recorded on site 2 also. Some of the bleached corals were observed to be recovering while some are recently killed because of algae growth.

8.7.4 Status of coral reef at site 3

Site 3 was selected from south west side of the island reef. Marine environment of site 3 is very similar to site 1 and 2. Massive coral dominates the live coral species in this site. A large school of Black Surgeon Fish was observed in this area. In terms of fish population, this site has the most fish species compares to site 1 and 2. Rocks and rubble dominate the benthos of the area. Similar to site 1 and 2, this site also has impacted from bleaching and some of the corals are recovering from it. The following graphs and tables outline the percentage benthic composition at site 3.

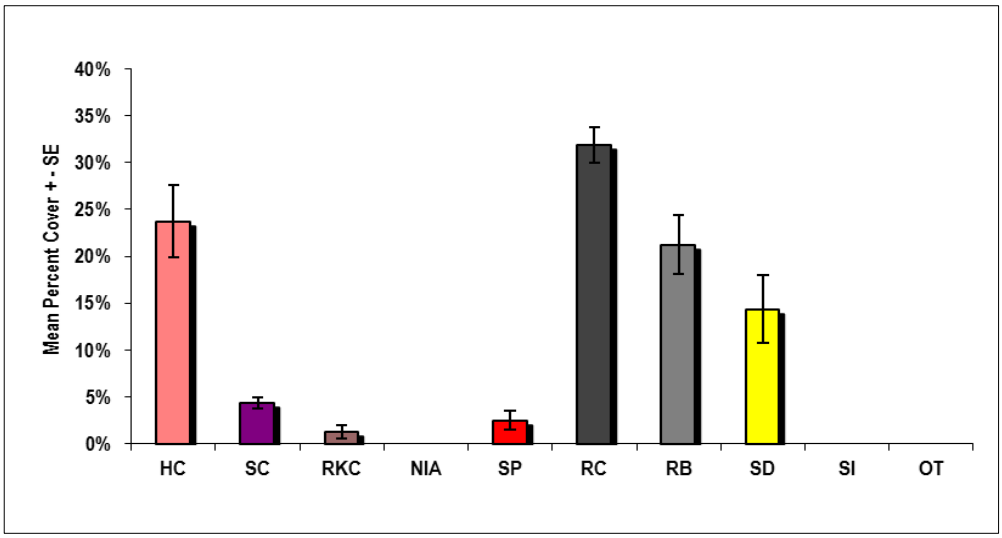


Figure 22: Percentage benthic composition at site 3 (August 2016)

Table 6: Percentage benthic composition at site 3 (August 2016)

Live reef cover	Mean % per segment	SE
HC	24%	4%
SC	4%	1%
NIA	0%	0%
SP	3%	1%
OT	0%	0%
RKC	1%	1%
RC	32%	2%
RB	21%	3%
SD	14%	4%
SI	0%	0%

Live coral cover at site 3 was 24%. Of the non-living components, rocks this area with 32%. Percentage of coral rubbles is 21%. No bleached corals were recorded or found, and no algae recorded. Similar to site 1 and 2, bleached corals were recorded on site 3 also. It is observed that massive corals are bleached more than other types of corals. Some of the bleached corals were observed to be recovering while some are recently killed because of algae growth.

8.7.5 Status of coral reef at site 4

Site 4 was chosen from the eastern side, where the outfall is proposed. Site 4 is not considered as a very healthy site and does not have a steep slope. The reef is heavily impacted by the waves especially during north-east monsoon. The reef structure resembles a similar geography that of a very exposed coral reef. The entire area is dominated by coral rubbles, making this area very unattractive.

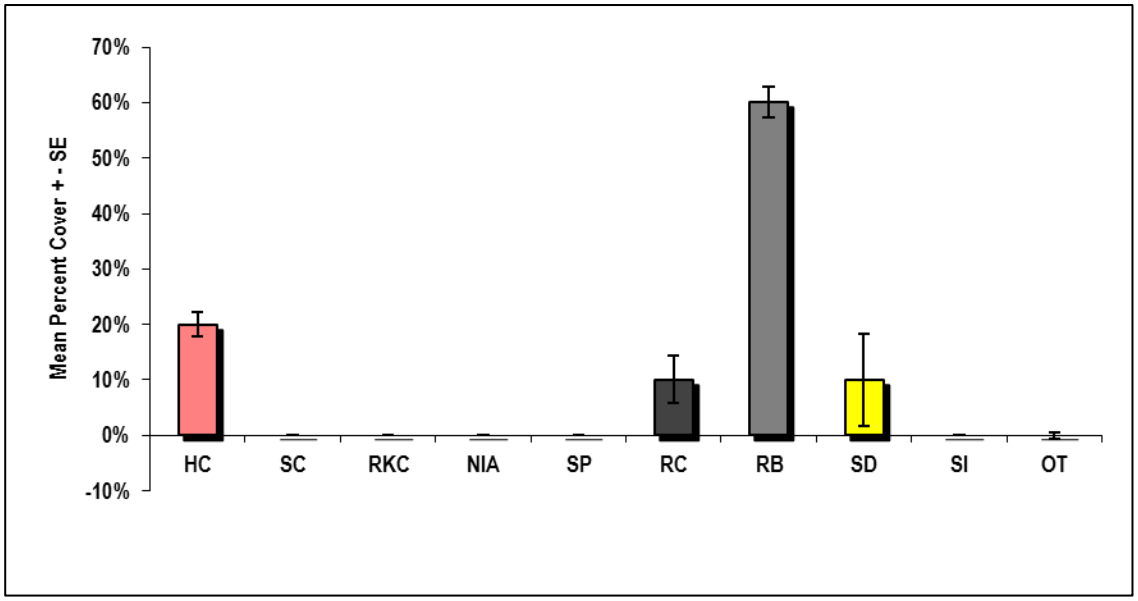


Figure 23: Percentage benthic composition at site 4 (August 2016)

Live reef cover	**Mean % per segment**	**SE**
HC	20%	4%
SC	0%	0%
NIA	0%	0%
SP	0%	0%
OT	0%	0%
Non-living reef cover	**Mean % per segment**	**SE**
RKC	0%	0%
RC	10%	4%
RB	60%	14%
SD	10%	7%
SI	0%	0%

Live coral cover at site 1 was 20%. Of the non-living components, rubbles dominated this area with 60%. Percentage of rocks is 10%.

Figure 24: Marine photos from survey sites 1, 2 and 3 (August 2016)

Figure 25: Marine photos from survey site 4 (August 2016)

8.7.6 Status of fish abundance

The amount and type of fish present at a given site can be a good indicator of the marine environment. For example, increased grazers are generally a sign of increased nutrients in the area, thus decreased coral cover and increased algal cover. Similarly, more live corals will attract more fish and some of the fishes are associated with different types and growth forms of corals. For example, Damselfish like *Dascyllus sp.* or *Chromis sp.* are common fish found in branching corals and large schools are often seen around healthy branching corals. For the fish census, only indicator families were recorded as per Reef Check protocol. Fish counts for site 1 are outlined below

Table 7: Fish census survey results for site 1

	0-15m	16-30m	31-45m	46-60m
Butterflyfish, Family Chaetodontidae	2	3	-	1
Surgeon Fish Family Acanthuridae	7	5	3	6
Damsel Fish Pomacentridae	8	6	4	1
Grunts/Sweetlips/Margates Family Haemulidae	-	-	-	1
Snapper Family Lutjanidae	6	1	3	-
Barramundi cod *Cromileptes altivelis*	-	-	-	-
Wrasses *Labridae*	5	3	8	2
Bumphead parrotfish *Bolbometopon muricatum*	-	-	-	-
Other parrotfish ONLY >20cm Family Scaridae	2	3	6	4
Moray eel Family Muraenidae	-	-	-	1

Grouper ONLY >30cm Family Serranidae	**0-20m**	**25-45m**	**50-70m**	**75-95m**
30-40 cm	-	-	-	-
40-50 cm	-	-	-	-
50-60 cm	-	-	-	-
>60 cm	-	-	-	-

Rare animals sighted (#/type/size)	**0-20m**	**25-45m**	**50-70m**	**75-95m**

Sharks	-	-	-	-
Turtles	-	-	-	-
Mantas	-	-	-	-
Other	-	-	-	-

Fish counts for site 2 are outlined below

Table 8: Fish census survey results for site 2

	0-15m	16-30m	31-45m	46-60m
Butterflyfish Family Chaetodontidae	1	2	2	-
Surgeon Fish Family Acanthuridae	7	3	5	7
Damsel Fish Pomacentridae	5	10	3	6
Grunts/Sweetlips/Margates Family Haemulidae	2	-	-	1
Snapper Family Lutjanidae	2	1	-	2
Barramundi cod *Cromileptes altivelis*	-	-	-	-
Wrasses *Labridae*	2	4	7	2
Bumphead parrotfish *Bolbometopon muricatum*	-	-	-	-
Other parrotfish ONLY >20cm Family Scaridae	12	3	4	3
Moray eel Family Muraenidae	-	1	-	-

Grouper ONLY >30cm **Family Serranidae**	**0-20m**	**25-45m**	**50-70m**	**75-95m**
30-40 cm	-	-	1	-
40-50 cm	-	-	-	-
50-60 cm	-	-	-	-
>60 cm	-	-	-	-

Rare animals sighted (#/type/size)	**0-20m**	**25-45m**	**50-70m**	**75-95m**
Sharks	-	-	-	-
Turtles	-	-	-	-
Mantas	-	-	-	-
Other	-	-	-	-

Fish counts for site 3 are outlined below

Table 9: Fish census survey results for site 3

	0-15m	16-30m	31-45m	46-60m
Butterflyfish Family Chaetodontidae	2	-	3	4

Surgeon Fish Family Acanthuridae	13	12	17	9
Damsel Fish Pomacentridae	8	5	6	4
Grunts/Sweetlips/Margates Family Haemulidae	4	1	-	-
Snapper Family Lutjanidae	2	1	-	1
Barramundi cod *Cromileptes altivelis*	-	-	-	-
Wrasses *Labridae*	6	7	4	8
Bumphead parrotfish *Bolbometopon muricatum*	-	-	-	-
Other parrotfish ONLY >20cm Family Scaridae	6	6	3	4
Moray eel Family Muraenidae	-	1	-	-

Grouper ONLY >30cm **Family Serranidae**	**0-20m**	**25-45m**	**50-70m**	**75-95m**
30-40 cm	1	-	1	-
40-50 cm	-	-	-	-
50-60 cm	-	-	-	-
>60 cm	-	-	-	-

Rare animals sighted (#/type/size)	**0-20m**	**25-45m**	**50-70m**	**75-95m**
Sharks	-	-	-	-
Turtles	-	-	-	-
Mantas	-	-	-	-
Other	-	-	-	-

Fish counts for site 4 are outlined below

Table 10: Fish census survey results for site 4

	0-15m	16-30m	31-45m	46-60m
Butterflyfish Family Chaetodontidae	5	-	4	3
Surgeon Fish Family Acanthuridae	12	4	13	9
Damsel Fish Pomacentridae	8	5	6	4
Grunts/Sweetlips/Margates Family Haemulidae	4	1	-	-
Snapper Family Lutjanidae	2	1	-	1
Barramundi cod *Cromileptes altivelis*	-	-	-	-

Wrasses *Labridae*	5	7	4	8
Bumphead parrotfish *Bolbometopon muricatum*	-	-	-	-
Other parrotfish ONLY >20cm Family Scaridae	5	6	7	3
Moray eel Family Muraenidae	-	1	-	-

Grouper ONLY >30cm **Family Serranidae**	**0-20m**	**25-45m**	**50-70m**	**75-95m**
30-40 cm	1	-	1	-
40-50 cm	-	-	-	-
50-60 cm	-	-	-	-
>60 cm	-	-	-	-

Rare animals sighted (#/type/size)	**0-20m**	**25-45m**	**50-70m**	**75-95m**
Sharks	-	-	-	-
Turtles	-	-	-	-
Mantas	-	-	-	-
Other	-	-	-	-

A= Abundant (Meaning that during the 15 minute time swim survey, species counts were recorded more than 50, hence it is difficult to count their numbers).

C=Common (Meaning that during the 15 minute time swim survey, they were spotted occasionally and throughout the survey, but their numbers were less than 50)

R=Rare (Meaning that during the survey, only few of these species were observed, often 1 or 2.

8.7.7 Proposed jetty construction area

This project proposes to construct 2 jetties on the west side of the island lagoon to access the island. These jetties will be constructed on pre-casted concrete piles allowing water movement beneath them. The lagoon on the west side of the island is mainly covered with sand and rubbles. No live corals were observed on any of the proposed jetty locations.

Figure 26: Aerial photo of the west side lagoon of Ehdhuhfaru island. Benthic composition of the lagoon on this side of the island is dominated by fine sand (Photo taken on August 2016)

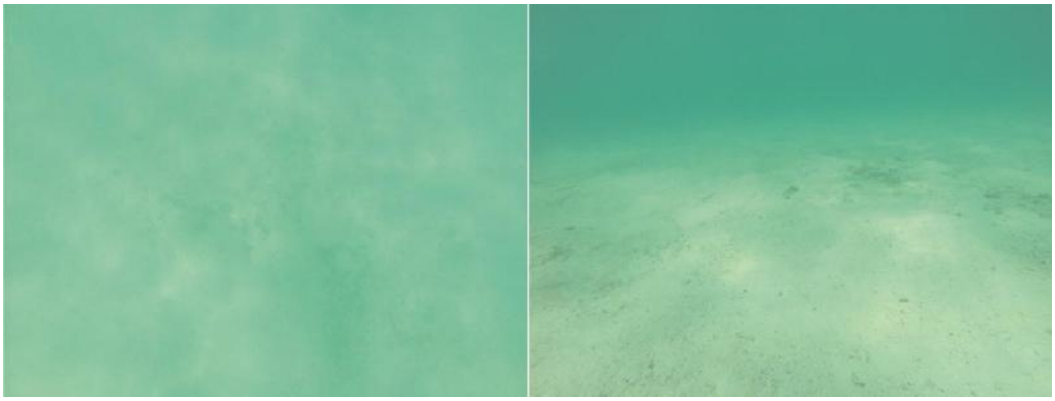


Figure 27: Marine photos taken from west side of the island lagoon

8.8 Bathymetry around the Island

As part of this assessment, a rapid bathymetric survey was undertaken to assess the condition of the lagoon where jetty is being proposed. The bathymetric survey was undertaken using a spot depth meter and a Trimble GPS. The bathymetric survey results provided in this report shall not be used for engineering designs to estimates the fill volume.

The bathymetry survey result is attached as an annex D of this report.

8.8.1 Marine water quality

The primary objective of the marine water quality sampling was to determine the baseline conditions of the marine water in the project site. See Figure 9 locations of the water sampled points. Qualitative and quantitative assessments were made on seawater from four location. The following table illustrates the result of the marine water quality test.

Table 11: Results of the marine water quality tests undertaken at the island

Water Quality	Units	M1	**M2**	**M3**	**M4**
Physical appearance		Clear	Clear	Clear	Clear
Electrical Conductivity	us/cm	51,105	52,540	55,100	51,140
Temperature	C	28.0	28.1	29.2	28.9
Total Dissolved Solids	mg/L	26,664	29,750	28,102	26,082
Salinity	mg/l	33,300	33,280	33,185	33,250
pH		8.1	8.2	8.2	8.0
Turbidity	NTU	0.0	0.0	0.0	0.0
Suspended solids	mg/l	12.0	9.0	5.0	9.0
Faecal coliforms	count/ml	-	-	-	0
Total coliforms	count/ml	-	-	-	0

8.9 Terrestrial Environment

The terrestrial environment of Ehdhufarumairah was studied by selecting few transect at different regions of the island. Visual and qualitative surveys were carried out during the field trip to island. Transects were selected to study the floral composition along the island vegetation and inner vegetation. Tree classification and enumeration were undertaken during the process.

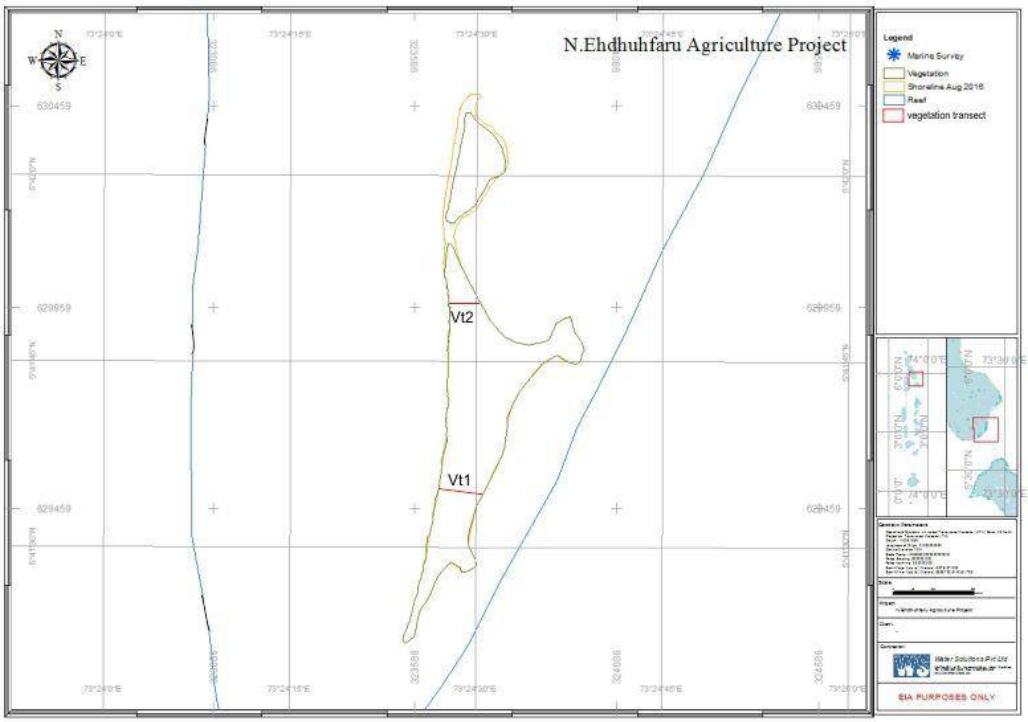


Figure 28: Transect locations

8.9.1 Floral Landscape

The landscape of island can be considered as mature and diverse, representing that of many other such uninhabited islands in Maldives. Since the vegetation of the island is very diverse and thick, there is difference between the vegetation in different parts of the island. The island has a diverse range of vegetation ranging from coastal vegetation found on the periphery of the island, mature vegetation in the center of the island.

Figure 29: Vegetation of southern side of the island

8.9.2 Results of Transect Survey

8.9.2.1 Transect A

The vegetation along this section was found to contain 8 species. They are shown in Figure 30. The dominant species observed in this section is *Screw pine*. Inner vegetation of the island has numerous amounts of matured *Cocos nucifera* plants.

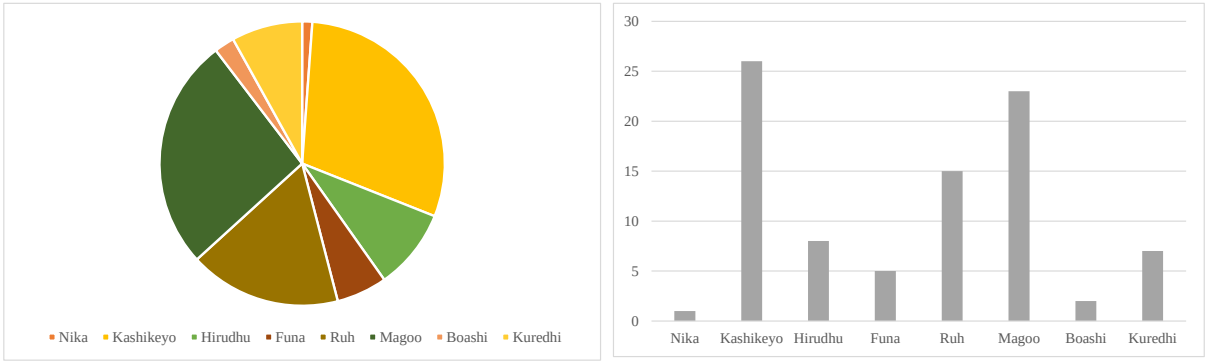


Figure 30: Frequency and average height of plant species found in transect A

Figure 31: Vegetation in transect A

8.9.2.2 Transect B

The vegetation along this section was found to contain 7 species. They are shown in Figure 32. This transect was taken at the edge of the vegetation and hence is dominated by plants like *Scaevola taccada* (Magoo). A banyan tree is also found in this transect.

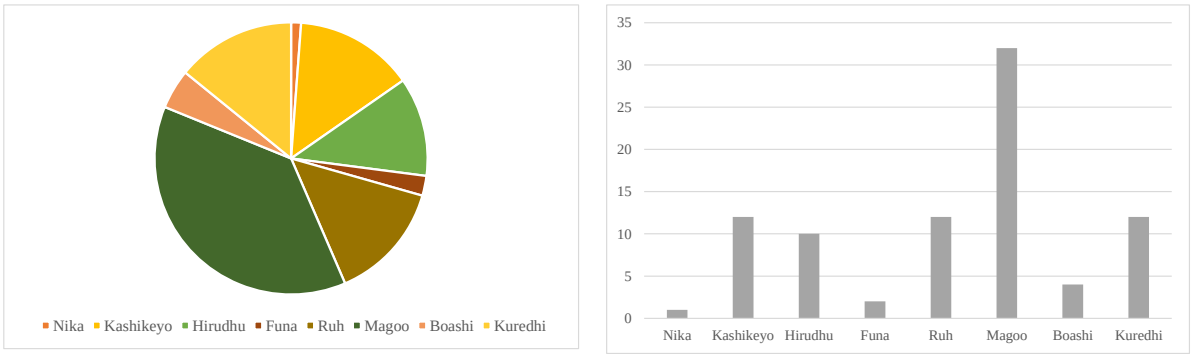


Figure 32: Frequency and average height of plant species found in transect B

8.9.3 Terrestrial Animals

During the field visit different types of birds were observed. Tringa glareola was observed on the beaches of the island. Ocypode spp. and Coenobita spp. were found on the beaches. Further inland geograpsus grayi was found.

8.9.4 Sustainable Yield of Groundwater

Although the groundwater quality has not been represented contours, the point source data was used to determine the areal size of the freshwater lens. The areal size of the freshwater lens for the natural island of Ehdhufaru is estimated to be 11.0 hectares.

The size of the natural island is about 14.4 hectares. The ratio of the freshwater lens to the island area is about 0.51. The groundwater recharge from rainfall is estimated to be 0.8 m/year and sustainable yield from the groundwater aquifer is estimated to be 72 cubic meters per day.

Island area (ha)	14.4
Estimated freshwater lens area (ha)	11
Ratio of freshwater lens area to island area	0.51
Estimated recharge from rainfall (m/year)	0.8
Estimated sustainable yield (m/year)	0.24
Estimated sustainable yield (m3/day) (to nearest 1)	72

Figure 33: Sustainable Yield of Groundwater for Ehdhufaru (after Falkland, 2002)

8.9.5 Groundwater Quality

Groundwater quality was assessed from locations as presented Figure 10 from the island. The results are illustrated below.

Parameters tested	Gw 1
Physical appearance	Clear
Nitrates (mg/L)	-
pH	7.4
Temp (C)	27.0
Phosphates (mg/L)	-
Suspended solids (mg/L)	15
Electrical conductivity (us/cm)	970

Table 12: Results of the groundwater quality in Ehdhufarumairah island

8.9.5.1 Soil

Soil conditions vary widely across island. The low lying south eastern parts are primarily wetland areas, comprising thick wet humus layers on top of coral rubble conglomerate. In comparison the outer rim areas of the island possess extremely hard substrata of coral-sand conglomerate around the ground water level mark.

Ehdhufarumaihrah is a fertile island in Maldives where agricultural had been carried out by the past island caretakers. Since the island is large and the island had good soil, the island had been used for agriculture.

The soil structure of the island was studied using a soil profile compiled across the vegetation transect A site as shown in Figure 34. Since topographic variation of the island did not change that much, a soil profile location was chosen to analyse within the island. Soil taxonomy analysis of site shows a depth of water level at 1.2 m. A small layer of humus with dark fine sand was visible for a half meter at the top.

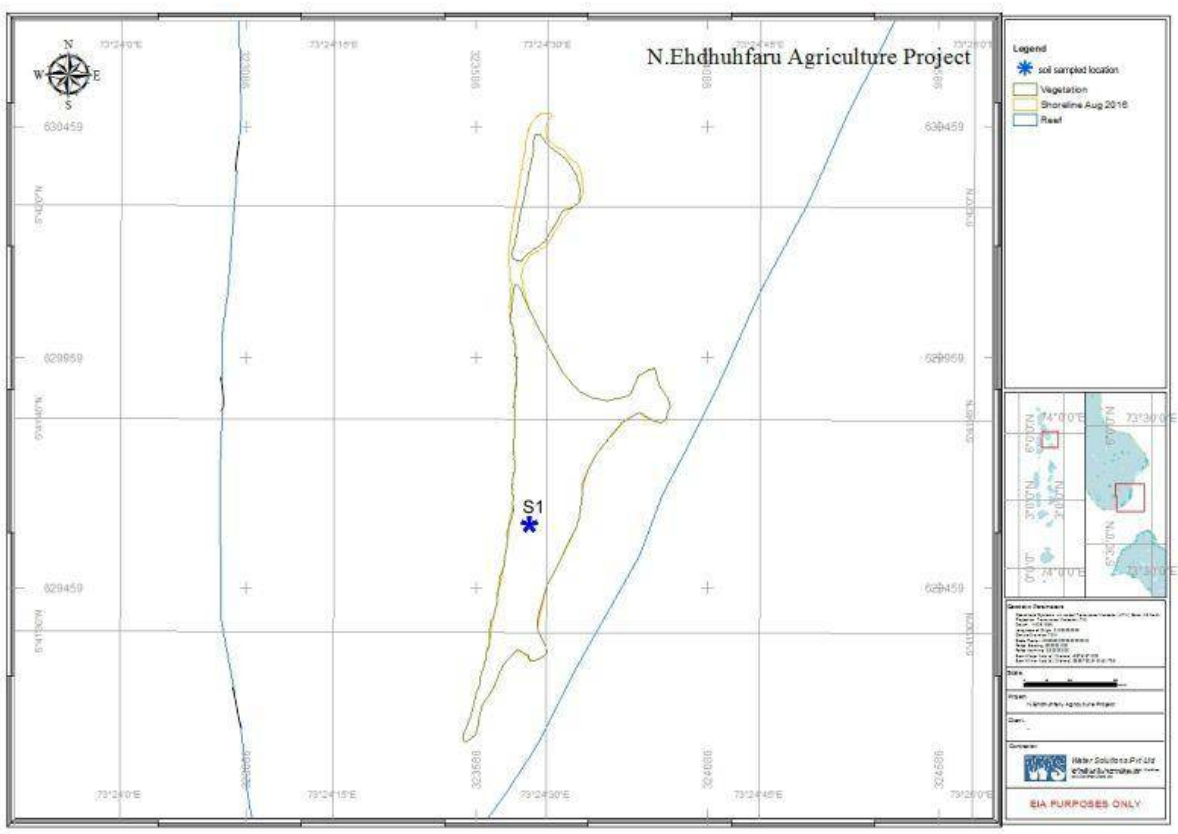


Figure 34: soil sampled locations

8.9.6 Hazards and Disasters

8.9.6.1 Vulnerability to Natural Disasters

The islands of the Maldives are less prone to tropical cyclones and are only impacted in the northern part of the country by weak cyclones that formed in the southern part of the Bay of Bengal and the Arabian Sea. Since 1877, only 11 cyclones crossed the archipelago. Most of the cyclones crossed Maldives north of 6.0o N and none of them crossed south of 2.7o N during the period. All the cyclones that affected Maldives were formed during the months of October to January except one, which formed in April (UNDP, 2006).

The northern atolls have a greater risk of cyclonic winds and storm surges. This reduces gradually to very low hazard risk in the southern atolls. The maximum probable wind speed in Zone 5 is 96.8 knots (180 kilometres per hour) and the cyclonic storm category is a lower Category 3 on Suffir-Simpson scale. At this speed, high damage is expected from wind, rain and storm surge hazards (UNDP, 2006).

The following figure shows historical earthquakes around Maldives; and three events of magnitude above 7.0 struck the region which had their sources in the Indian Ocean (UNDP, 2006).

UNDP (2006) identified that hazard risk from earthquake is low for the Maldives and considered as a disaster risk for only islands located in the south of the country.

Maldives faces tsunami threat largely from the east, and lower threat from the north and south. Islands along the eastern fringe of the atolls are more prone to tsunami hazard than those along the northern and southern fringes. Islands along the western fringe experience a relatively low tsunami hazard. Historically, Maldives has been affected by three earthquakes which had their sources in the Indian Ocean. Of the 85 tsunamis generated since 1816, 67 originated from the Sumatra Subduction zone in the east and 13 from the Makran Coast Zone in the north and Carlsburg Transform Fault Zone in the south. The probable maximum tsunami wave height is estimated at 4.5 metres.

8.9.6.2 Natural Vulnerability of Ehdhufaru

The islands of the Maldives have natural characteristics which make them vulnerable to disasters such as tsunami. An island's Natural Vulnerability depends on the geographic and geomorphologic characteristics of the island. These include geographic features of the island like the side of the country where the island is located, the formation of the island, location of the island respect to the atoll, orientation of the island, region of the country where island is located, level of shadow to the island from the reefs and other islands; area of the inland lake found on the island, width of the island's house reef, coastal defence structures on the island, shape of the island and the area of the island. A Model to Integrate the Management of Hazards and Disasters in the National Sustainable Development Planning of the Maldives which was developed as part of the Masters of Science (Hazard and Disaster Management) thesis at the University of Canterbury (2007) identified the relationship between natural characteristics of the island and the *natural vulnerability* of the islands using the data that was collected following the Indian Ocean Tsunami.

Based on this research, the natural vulnerability of Ehdhufaru was found to be low for flooding disasters such as that caused by tsunami or high waves approaching the island from the east.

9 Analysis of Alternatives

This section looks at alternative ways of undertaking the various alternatives of the proposed project. There are two basic options: (1) leave the island as its form without undertaking the development (no project option) or (2) undertake development of the proposed layer chicken farm on the island (undertake the project options). If the project were to continue, it would be necessary to take technical and social aspects of the project into consideration and ensure that these concerns are adequately considered before taking decisions. It is therefore important to consider practicable options and ensure that the best available options are chosen. The following section details the development options.

9.1 No Development Option

The "No Development Option" implies not proceeding with the poultry farm development project on the island. The advantage of this option is that adverse environmental impacts associated with the project are avoided. The disadvantages are: high cost of imported poultry products including chicken eggs and live chicken to consumers, lack of job opportunities for locals and training opportunities for locals.

Hence the socio-economic benefits outweigh the potential negative environmental and social effects. Therefore, the "No Development Option" is not recommended as the island had been leased from Ministry of Fisheries and Agriculture to develop a poultry farm on the island.

9.2 Design Alternatives

9.2.1 Alternative Energy Source

With the help of scientists in relevant fields the project team can investigate alternate means of generating the required energy for the island from renewable sources. These will include use of solar thermal technology. Solar thermal technology can be utilized for desalination plant so that the water requirements of the island can be met without the need to use energy for desalination.

9.2.2 Use land to develop an organic layer chicken farm

The land of the island could be used to develop a wild chicken poultry farm in most of the island. This would reduce the investment cost for the setting up of facilities to host the chickens and other related systems. This alternative has not been considered as the island is not that large enough to develop a commercially viable poultry farm.

9.2.3 Alternative locations for the water intake

Alternative method to obtain the feed water will be to use a borehole at the island. Boreholes had been used in many islands to obtain the source water for the RO plants.

9.2.4 Alternative Sewerage System

It is proposed to install a septic tank sewerage system on the island. However, a networked sewerage system with a supporting Sewerage Treatment Plant can be considered. An STP could reduce the ground water pollution and related health effects associated with it. In particular, the proposed poultry activities on the island may be able to reuse the treated water from STP. The small number of people on the island is unlikely to severely affect the island and operating a septic tank system is possible.

10 Stakeholder Consultation and Socio Economic Impact

10.1 Socio Economic Profile

The total population of Maldives was 341,256 in 2014 (Census, 2014). In July 2006, the population of the Maldives was 298,968 (Census, 2006). There is 1.56% increase in average annual growth of population from 2006 to 2014. In 2006 the population of the Maldives crossed the 300,000 mark. Total Maldivian population is projected to reach over 400,000 by 2025 (Table 13).

Table 13: Sex ratio of population by locality (source: National Bureau of Statistics, 2014)

Locality	1985	1990	1995	2000	2006	2014
Republic	107.94	105.25	103.69	103.23	102.68	103.13
Male'	129.63	120.70	115.49	108.59	100.56	98.87
Atolls	101.43	100.36	99.93	101.28	103.82	105.93
HA	92.59	92.25	91.25	88.21	87.85	83.39
HDh	87.23	85.79	88.67	88.76	85.91	84.15
Sh	93.18	91.71	91.23	90.67	89.55	83.46
N	90.35	87.24	88.77	85.47	84.57	84.19
R	98.86	98.89	96.05	96.31	93.65	91.09
B	105.49	100.52	102.98	108.28	107.99	93.22
K [1-]	128.51	227.72	211.33	227.04	239.74	125.68
Ari Atoll [2-]	99.27	-	-	-	-	-
AA	-	136.10	134.09	132.34	136.33	102.85
ADh	-	99.96	119.94	129.43	129.06	98.38
V	121.64	134.39	113.21	127.37	121.82	119.78
M	97.73	100.10	99.14	96.67	105.59	95.07
F	89.42	84.60	92.28	101.95	94.37	91.67
Dh	97.24	96.86	98.71	102.28	107.82	95.49
Th	94.21	92.09	96.32	93.98	98.57	97.11
L	98.05	101.44	96.52	101.71	106.12	98.77
GA	99.80	98.45	97.54	99.93	102.65	108.13
GDh	90.44	92.94	94.99	92.92	96.03	102.24
Gn	86.35	91.30	88.08	85.24	87.20	83.06
S	88.66	83.90	84.96	80.70	87.28	90.88

Source: Population and Housing Census 2014

One third of the population lives in the capital, Male, which has an area of less than 2 sq. km. The rest of the population is scattered over approximately 198 Islands. The average population size of these islands is 900. Only 15 islands have over 2,000 inhabitants, while 11 have less than 200. The dispersed population is not only a constraining factor to equitable and balanced social and economic development, but also imposes serious development challenges – particularly in terms of transportation and utilities.

The Table 14 below shows the population of the islands in Noonu Atoll. There is 0.95% average annual decrease of growth rate from 2006 to 2014.

Table 14: Population of the islands in Noonu Atoll

Undertaking the poultry project will help to create additional incentive for the development of the atoll. The island is situated strategically near Velidhoo and Manadhoo and is a potential island to create development to the island.

Table 15: Population Noonu Atoll in percentage of the republic total

Atoll	locality	Resident population								
		Total			Maldivians			Foreigners		
		Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
	Republic	**402,071**	**227,749**	**174,322**	**338,434**	**171,962**	**166,472**	**63,637**	**55,787**	**7,850**
	Male'	**153,904**	**85,438**	**68,466**	**129,381**	**64,443**	**64,938**	**24,523**	**20,995**	**3,528**
	Atolls (Includes Administrative and Non- Administrative Islands)	**248,167**	**142,311**	**105,856**	**209,053**	**107,519**	**101,534**	**39,114**	**34,792**	**4,322**
	Administrative Islands in Atolls	**11,229**	**5,403**	**5,826**	**10,483**	**4,782**	**5,701**	**746**	**621**	**125**
N	Henbadhoo	491	187	304	475	181	294	16	6	10
N	Kedhikolhudhoo	1,326	592	734	1,285	561	724	41	31	10
N	Maalhendhoo	666	324	342	633	305	328	33	19	14
N	Kudafari	453	226	227	414	195	219	39	31	8
N	Landhoo	665	292	373	652	284	368	13	8	5
N	Maafaru	715	331	384	697	319	378	18	12	6
N	Lhohi	615	313	302	571	275	296	44	38	6
N	Miladhoo	819	354	465	799	338	461	20	16	4
N	Magoodhoo	255	125	130	252	123	129	3	2	1
N	Manadhoo	1,397	697	700	1,295	618	677	102	79	23
N	Holhudhoo	1,638	764	874	1,508	651	857	130	113	17
N	Fodhdhoo	228	110	118	215	100	115	13	10	3
N	Velidhoo	1,961	1,088	873	1,687	832	855	274	256	18

locality	Resident population								
	Total			Maldivians			Foreigners		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Republic	402,071	227,749	174,322	338,434	171,962	166,472	63,637	55,787	7,850
Male'	153,904	85,438	68,466	129,381	64,443	64,938	24,523	20,995	3,528
Noonu Atoll	11,229	5,403	5,826	10,483	4,782	5,701	746	621	125
% of Noonu Atoll	2.79	2.37	3.34	3.10	2.78	3.42	1.17	1.11	1.59

Source: Population and Housing Census 2014

Table 16: Summary of socio economic environment of the atoll

Demography	
Economic Activities	Agriculture, resort jobs and government sectors are the main income generating employment in the islands. There are few reef fishing vessels which sell their catch to nearby resorts. Most of the islands employment is in government sector and tourism sector. Home gardening is also done in some households. There is no space for wide agriculture activities in the island.
Public transport	There are atoll ferries daily. These ferries travels all the islands of the atoll and Velidhoo and Manadhoo are popular destination for people to travel. Manadhoo is the atoll capital and hence a lot of people travel to the island for health facilities. There are regular ferries of speed boats between Manadhoo, Velidhoo and Male'.
Water Supply	There is no desalination plant at the islands. Groundwater and rainwater are the main source of water.
Waste Management	Waste is managed in island waste management centre at Velidhoo and Manadhoo. Velidhoo Council informed that current condition of island waste management centre is not very good and needs to be upgraded and some waste needs to be buried or transported to Vandhoo.

Energy Supply	There is 24 hours electricity provided into all households in all island. STELCO is the service provider.
Health	Atoll Hospital at Mandhoo and Health Center at Velidhoo
Education	O level
Road based transport	Even though road condition of the Velidhoo is not very good, road development project had started at Manadhoo. There are many land transport vehicles in the island including more than motorcycles, vans, pickups and a car and bicycles.

10.2 Socio Economic Impact of Poultry project

10.2.1 Positive Impact of project

The project would help to improve job opportunity and availability of chicken eggs to the residents of Velidhoo, Manadhoo and other islands in the atoll. This would be a huge benefit for the Noonu Atoll community. This project will increase the economic activity at the islands which would create additional employment opportunity to the resident community.

10.2.1.1 Opportunities for Tourism Sector- Guest Houses

Demand for Guest house are increasing at a faster speed in Noonu Atoll. Guest houses are being operated at Velidhoo. It is anticipated, more and more guest houses would be built on inhabited islands. The proposed project at Ehdhufarumairah would facilitate the development of the guest houses at Manadhoo and Velidhoo as it would enable to provide a more stable and balance diet to the guests at the island. Ehdhufarumairah would be an additional attraction to the guests at the Velidhoo and Manadhoo to explore the poultry farming in small islands.

10.2.1.2 Opportunities for Construction Industry

The poultry farm development project will create job opportunities directly and indirectly starting from the planning stage, construction stage, and indirectly or directly to other businesses such as transportation sector, supply of goods & services, retail and whole businesses, cafés and restaurants, and more businesses at Velidhoo, Manadhoo and Noonu Atoll. This will create an environment for the youth participation in the development of the project.

10.3 Stakeholder Consultation

10.3.1 Ministry of Environment & Energy

During the stakeholder consultation meeting, the Ministry of Environment and Energy noted that poultry farm development project is important to increase the food security of the Maldives. Enhancement and development of the agriculture sector is an important step that has been incorporated in the Intended Nationally Determined Contribution of the Maldives that had been developed as part of the Climate Change Paris Agreement. However Ministry of Environment and Energy noted that such development should not be at the expense of the environment. Hence it is important to protect and preserve the natural identity of a typical island of the Maldives while developing the island for poultry farm.

10.3.2 Environment Protection Agency

EPA officials were consulted on 30th August 2016 through a meeting held at EPA. Following are the main points discussed during the meeting.

- EPA is aware of a proposed poultry farming project at N. Ehdhuhfaru
- Scoping meeting for this project was completed on 25th August 2016. Main concerns of EPA regarding the project were discussed in this meeting.
- The island proposed for this project is not a declared protected area or a sensitive area.
- Ministry of Fisheries and Agriculture has guidelines and regulations for these types of projects. Developer needs to meet these guidelines and regulations at all the stages of project implementations.
- Ministry of Fisheries and Agriculture and MFDA needs to be consulted for more details about importing and management of poultry birds.
- All the possible impacts of the project on environment and nearby communities need to be reported in the EIA.

10.3.3 Ministry of Fisheries and Agriculture

Ministry of Fisheries and Agriculture was consulted as part of the EIA. Ms. Aminath Aroosha, Director from Ministry of Fisheries and Agriculture was consulted as part of the stakeholder consultation on 1st September 2016. The concept and project proposal has been approved by Ministry prior to leasing the island to the proponent. Following are the main points discussed during the consultation.

- There are regulations and guidelines that need to be followed when importing poultry birds for farming.
- There is a quarantine process that needs to be followed when importing live animal for farming.
- Special permit needs to be taken from Ministry of Fisheries and Agriculture for this process.
- For the import of pet animals, a registered pet shop is required. However, poultry birds do not require a registered pet shop hence can be imported by an individual or a company.
- Import permit from Ministry of Fisheries and Agriculture should be taken 7 days before the import date. Owner information and information of personnel responsible for import should be provided to Ministry.
- Amount and scientific name of the birds should be provided to Ministry.
- For the import process, a veterinary health certificate from the origin country is required. There are listed countries in the Ministry from which the birds can be imported.
- If there are identified bird diseases in the country of import, vaccination to the birds should be given prior to import to Maldives.
- At the time of import and quarantine process, original of veterinary health certificate and import permit should be presented.
- During the quarantine process, birds will be checked physically for any illness. Special tests will be done to test for bird flu.

- Ministry has a veterinarian who can be consulted for technical information regarding the poultry process.
- Bird Import Regulation has some guidelines for the poultry farm which needs to be adhered during the operation.
- If the farm is operated in inhabited island, Ministry will visit the farm in every 6 months for inspection. If the farm is in an uninhabited island, ministry will visit minimum once a year for inspection.
- There are few cases of disease outbreaks reported to Ministry from some of the poultry farms of Maldives. During such cases, Ministry should be informed immediately. Ministry will do an inspection and the outbreak should be dealt as per the Ministry advice.

10.3.4 Developer and Project Team

Consultations were held with the proponent at various stages of the development process. Water Solutions have been in dialogue with proponent for the past few months. Advice and consultations were provided to the client on various aspects of the project, more specifically on the environmental impact assessment process and the permits required getting the project initiated. Advice was given on the most appropriate locations for outfall, jetty construction, taking in to consideration the importance of offsetting these structures at a reasonable distance from live corals and the reef crest.

10.3.5 Noonu Atoll Council

Noonu Atoll Council noted that project is an important project to the atoll. The council welcomes the government effort to implement this project at the atoll. Atoll Council is very positive for the project. The Atoll Council is waiting anxiously to start the project at an earliest possible date.

Copy of EIA was sent to atoll council and receipt slip is attached as annex H.

10.4 Health Protection Agency

Officials from HPA were consulted as part of the EIA consultation process on 1st September 2016. HPA informed that currently they do not have any mandate on operating poultry farms on uninhabited island and Ministry of Fisheries and Agriculture is the responsible agency for such projects. HPA only monitors food servicing places such as Café and Restaurant

10.5 Maldives Food and Drug Authority

Ms Shabeena (3014322) from Maldives Food and Drug Authority were consulted as part of the EIA consultation process on 1st September 2016. Below are the main discussion outcome points.

- Poultry farms need to be approved from the MFDA. Layout of the establishment needs to be submitted to MFDA for approval and construction should to be carried out as per the approved layout.
- Operation of the poultry farms should be in line with the regulations of MFDA.
- Once the farm is registered and operation starts, MFDA will inspect the farm every 6 months. After the inspection, MFDA will provide a permit which lets the farm products to be commercially used. This permit needs to be reapproved in every 6 months.
- Products from such a farm should also be registered in MFDA. The labels used for the products also need to be submitted to MFDA for approval.
- Any advertisements of the products need to be approved from MFDA before using it publicly.

10.6 Consultation with Residents of Velidhoo

Residents of Velidhoo were consulted at the island during the field visit to Ehdhufarumairah. The residents noted that any development at Ehdhufaru would help to create job opportunity for the residents at Velidhoo. Ehdhufaru is ose to Velidhoo and hence it would be easier for the people to go for work during the day and return to home in the night. Having layer chicken farm poultry at Ehdhufaru would help to increase the chicken and chicken egg available at Velidhoo.

The residents are not concerned about the potential environmental impacts of the project activities on the island, house reef and lagoon.

10.7 List of people consulted

Following are the names and designation of the persons consulted.

Name	Designation	Office
Ibrahim Naeem	Director General	EPA
Yazeed	Director	EPA
Fathimath Reema	Assistant Director	EPA
Ahmed Anwar	Assistant Director	MEE
Hamdhoon	Assistant Director	MEE
Ahmed Jameel	Consultant	Water Solutions Pvt Ltd
Abdul Aleem	EIA Consultant	Water Solutions Pvt Ltd
Hassan Shah	EIA Consultant	Water Solutions Pvt Ltd
Ibrahim Faiz	Environment Consultant	Water Solutions Pvt Ltd
Ms. Aminath Aroosha	Director	Ministry of Fisheries and Agriculture (3339226)
Ms Shabeena	Scientific Officer	Maldives Food and Drug Authority (3014322)
Abbu	Resident	Velidhoo
Ali	Resident	Velidhoo

11 Environmental Impacts and Mitigation

11.1 Impact Identification

The proposed layer chicken poultry farm development at Ehdhufarumairah is expected to have impacts on the existing terrestrial environment of island. These include clearing areas of vegetation on the island. The project is also expected to impact the livelihood of the beneficiaries and also impact the existing society of Velidhoo, Manadhoo and nearby islands in many ways. In preparing this EIA report, various methodologies were used to collect information on the existing environment and identify the impacts of the project. Impact identification has been focused on the environment. Impacts have also been identified for short and long term. It is only though identifying the likely impacts; the mitigation measures can be identified and implemented. It is also one of the objectives of this EIA to identify the impacts and propose mitigation measures.

11.2 Assessing Impacts

Environmental impacts of the proposed project have been examined through a number of processes. These include consultations with the stakeholders, field surveys, observations and assessment, and field experience gained from similar development projects implemented throughout the country. Potential positive and negative impacts on the environment have been considered. In general, the impacts of the project have been assessed for terrestrial, marine and social environment.

The impacts of the proposed project on the terrestrial environment of the proposed area have been looked into and are considered to be significant. The most significant impact on the environment due to the project would be to the clearance of the vegetation of the island.

All impacts have been categorized into short-term and long-term. Most of the short-term impacts are related to vegetation clearing during constructional phase, while the long-term impacts are associated with risk of impacting the groundwater. Possible negative impacts on the environment have been considered in worst-case scenario to recommend mitigation measures in the best possible ways so that these impacts would be minimized and perhaps eliminated in both constructional and operational phases.

The following table outlines the impact assessment matrix and the scores for the 17 categories derived for this project.

Table 17: Impact assessment matrix for the project

		Impacts		
	Total score	Negative (1-3)	Neutral (4 -7)	Positive (8 -10)
Air pollution	2	x		
Waste	3	x		
Water pollution	3	x		
Noise/Vibration	5		x	
Amenity	5		x	
Ground water conservation	5		x	
Energy	5		x	
Energy efficiency	5		x	
Access to quality green space	5		x	
Flooding	5		x	
Transport	5			x
Biodiversity	1	x		
Local environmental quality	3	x		
Resource depletion	5		x	
Health gain	5		x	
Employment	9			x
Socio-economic implications	8			x

11.3 Magnitude of impacts

This EIA identifies and quantifies the significance of adverse impacts on the environment from the proposed project. Impacts on the environment were identified and described according to their location/attribute, extent (magnitude) and characteristics (such as short-term or long term, direct or indirect, reversible or irreversible) and assessed in terms of their significance according to the following categories:

- Negligible – the impact is too small to be of any significance;
- Minor – the impact is very minor and not serious
- Minor adverse – the impact is undesirable but accepted;
- Moderate adverse – the impact give rise to some concern but is likely to be tolerable in short-term (e.g. construction phase) or will require a value judgment as to its acceptability;
- Major adverse – the impact is large scale giving rise to great concern; it should be considered unacceptable and requires significant change or halting of the project

11.4 Uncertainties in impact prediction

Environmental impact prediction involves a certain degree of uncertainty as the natural and anthropogenic impacts can vary from place to place due to even slight differences in ecological, geo-morphological or social conditions in a particular place. There is also limited data and information regarding the particular site under consideration, which makes it difficult to predict impacts. The level of uncertainty, in the case of this project is expected to be significant due to the unavailability of necessary data, lack of clear understanding of the activities that can change the hydrology of the site. Nevertheless, considering that there will be uncertainties and under taking voluntary monitoring of natural processes as described in the monitoring programme given in this report would reduce the impact of the uncertainty in the impact identification process. .

11.5 Environmental impacts and mitigation measures

Environmental impacts assessed of the project based on the criteria's described above are discussed in detail in Table 18. The matrix provides the impacts during construction stage for terrestrial environment as well as the cost of mitigation for each impact identified.

Table 18: Matrix of environmental impacts and mitigation measures

Environmental Aspect	Potential Impacts to the environment	Mitigation Measures proposed	Cost of Mitigation
Environmental impacts during construction phase			
Site mobilization and temporary stores	Impacts will be felt during the mobilization and stockpiling of materials during the mobilization stage.	During early stage of mobilisation, site storage will focus on areas that will have buildings as part of the development. This reduce the need to clear unnecessary vegetation of the island.	Cost included as part of the project.
Sewage and wastewater impacts	Improper methods of disposing sewage and waste water will contaminate the groundwater.	The sewage and wastewater collected and would be discharged through septic tank system	Cost included
Water	Rainwater will be used during construction stage. The groundwater of the island would be used for workforce during the construction stage. Additionally desalinated water would be used as additional source of water during the operation.	Rainwater will be harvested and stored in rainwater storage tanks. Groundwater will be used for the staff use on the island. Desalination plant would be installed by an experienced contractor.	Cost included
Energy generation	Use of energy for construction activities has an indirect negative impact on the environment through consumption of fuel.	Temporary generators would be installed during the initial phase of the construction.	Cost included as part of the project.
Construction of the jetty	Impact on the lagoon bottom and sedimentation of the lagoon. Impact on the sand movement and sediment hydrodynamics.	Construct a permanent jetty that will be used during the operation stages. Jetty would be constructed using columns.	Cost included as part of the project..
Waste management	Impact of solid waste can be detrimental to the marine and the terrestrial environment if they are not managed properly. Solid waste generated during the construction stage will include organic, inorganic such as plastics all of which require adequate disposal. Construction waste, especially hazardous waste will impact the environments if they are not properly disposed. Hazardous materials in the construction period are identified as items like empty paint buckets, waste oil, chemicals and batteries. In addition to hazardous waste, construction debris will also have negative impacts if they are not disposed properly. Improper disposal or long term storage of these materials on site will lead to abuse and possible mismanagement of these materials, which may become a nuisance to the environment, especially the sensitive lake environment.	Measures include converting of green waste and other organic waste into compost and fertiliser. Burnable waste such as paper, card board boxes etc. would be burnt on the island. Work force will be provided with filtered rain water for drinking thereby reducing the need for mineral water and hence reducing the impact of plastic bottles and their management and disposal. General food waste will be used to create compost and organic fertiliser. All construction waste including hazardous materials will be stockpiled and stored on the island. Organics and other non-hazardous materials will be separated. Construction waste will be taken to Vandhoo waste management centre once in four months.	Contractors should bear the cost for transportation of construction waste to nearest waste management centre
Vegetation clearing	Vegetation clearance to prepare land for building structures and processing facilities will have a significant impact on the islands vegetation in terms of the area of vegetation loss. Since that	Felling of large mature trees should be avoided as much as possible. Only the sites of buildings and footpaths should be cleared and removal of shrubs should be limited to the minimum	Cost included in the project

Environmental Aspect	Potential Impacts to the environment	Mitigation Measures proposed	Cost of Mitigation
	large area of the island had been cleared, the area marked for clearance is low. It is estimated that 95 coconut palms would need to be uprooted as part of the project. Due to the small size of the island, majority of the island vegetation is needed to be cleared and impact of that will be significant.	extent required. In accordance with the regulation on cutting and uprooting of trees, 246 coconut palms would be planted. These would be planted on the periphery of the crop fields. The coconut palms would provide a demarcation of the crop fields that would be developed at the island as part of the project.	
Impact of outfall construction	Outfall of the septic tank system and RO will be constructed on eastern side of the island.	The outfall would be placed at 3 -5 m below the water level outside the reef on eastern side of the island. The outfall pipe size will be minimum 100 mm. The outfall will be anchored with concrete blocks. Such protection for outfall pipe is required since it would be subject to wave actions.	Mitigation cost included in the project
Noise and air pollution	Ehdhufarumairah is an isolated island. Noise impacts are therefore going to be localized to the Island only. The exhaust gases from machineries will be very limited in quantity compared to the surrounding environment. The gaseous emissions will be directly released into the atmosphere where there will not be any opportunities for them being trapped and therefore the plume of gas is expected to get diluted.	Noise is not expected to be a concern due to the intermittent nature of noise sources such as machineries. However construction workers, who are prone to high noise levels such as machinery operators, should be provided with proper personal protection equipment (PPE) such as ear muffs.	No mitigation cost.
Environmental impacts during Operation phase			
Creation of cumber feed / fertiliser	The waste stream at the island would have a relatively large component of organic waste. This includes organic waste from layer chicken farm, green waste from the island, food waste from kitchens. As to minimise the impact waste, the organic waste would be separated and sea cucumber feed material and fertiliser would be made and sold to local market.	Organic waste from the kitchen, landscaped areas and narrow walk paths will be composted at the waste management centre. The organic waste from poultry farm operation would be used to make feed material which could be used for sea cucumber farms.	Mitigation cost included in the project
jetty	Impact on hydrodynamics and sand transport around the island. Impacts are going to be minor as the jetty will be constructed on columns and they will be spaced adequately to allow current flow thereby reducing sediment stagnation and accumulation.	The impact of jetties on the beach can be understood after carrying a monitoring programme Spacing the jetty columns adequately so that sediment and current can flow with least disruption.	No additional costs
outfall	Impact on the marine environment as a result of waste water disposal.	Monitoring programme should be conducted at the outfall location.	Cost will be included in the project
Domestic waste water	Improper methods of disposing sewage will contaminate the groundwater.	Septic tanks will be constructed as per the guidelines of EPA.	Costs will be included in the project budget
Energy generation	Contribution to the increase in greenhouse gases.	Energy managed only based on demand. Energy generation would be based on diesel generator sets	Costs included in the project

Environmental Aspect	Potential Impacts to the environment	Mitigation Measures proposed	Cost of Mitigation
Water production	Contribution to the increase in greenhouse gases through the use of diesel generators.	Only produce water based on demand during the dry period using RO plants. Compliment other sources such as harvesting of rainwater.	Costs included in the project
Collection and storage of rainwater	Harvesting too much of water will reduce the recharging the groundwater lens and may impact on the natural balance on the island. To facilitate the recharging of the groundwater, the rainwater storage capacity has been limited.	The rainwater will be harvested and used as an important supplementary source of water at the island. The roof catchments of the buildings at the staff area is designed for harvesting water. Harvested rainwater will be stored at tanks at the staff area. The tanks will be protected from contamination and precautions will be taken to prevent the breeding of mosquitoes in the tanks.	Costs included in the project
Control of mosquitos	Could become a nuisance and a public health hazards.	Regular fogging and prevention measures to combat mosquitoes breeding such as regular cleaning and maintenance of roof gutters in the staff area and farm areas	Costs will be included in the project budget
measures for possible leakage and pollution by land based activities	To reduce the impact of land based activity on the island's environment, fertilizer and pest control methods would be adopted.	Proposed layer chicken farm project at the island has adopted an integrated approach to reduce the impact of the poultry activity on the island's environment.	Costs will be included in the project budget
Creation of employment opportunities	Impacts are expected to be positive as employment opportunities generated clearly has the potential to reconcile economic and environmental concerns and give a practical meaning to sustainable development. Other positive impacts can include the generation of revenues for maintaining natural environments, creating jobs and wealth, development of the poultry sector and diversifying the economy.	-	-
Development of human resources	The direct employment generated by the project will stimulate human resource development and increase the number of skilled workforce in the country. Furthermore, employment opportunity will increase in Noonu atoll region.	-	-

Table 19: Summary of the impacts and their characterization

	Impact type (NEG or POS) +	Significant (H/M/L)*	Direct	Indirect	Magnitude # (N/M/MA/MoA/MaA)	Short term	Long term	Unavoidable	Reversible	Irreversible	Cumulative	Mitigation Required
Impacts during construction stage												
Site mobilization	Neg	L	x	x	M	x		x	x			x
Temporary storage of fuels and hazardous materials.	Neg	L		x	N	x		x	x			x
Domestic wastewater impacts	Neg	L		x	M	x			x			x
Water generation	Neg	L		x	M	x	x		x			x
Energy generation	Neg	L	x		M	x	x		x			x
Waste management	Neg	M	x	x			x	x			x	X
Impact of Jetty construction	Neg	H	x		MA	X		X	X	-	-	X
Impact of outfall construction.	Neg	H	H	X	MA	x		x	x			x
Noise and air pollution	Neg	L	x		M	x		x	x			x
Terrestrial impacts during construction stage including vegetation clearing	Neg	H	x		MA		x	x	x			x
Structures on land	Neg	H	x		MA		x	x	x			x
Construction phase impacts on the lagoon.	Neg	M	X		M	X		x	x			x
Operational stage impacts												
Jetty	Neg	L		X	MA		x		x		X	x
Outfall	Neg	M		X	N		X		X			X
Creation of sea cucumber feed material and organic compost	Neg	M		X	N		X		X			X
Impact on the groundwater	Neg	L		x	M		x	x	X		X	x
Generation of solid waste and wastewater	Neg	L		x	M		x	x	X		X	x
Impact from the tanks (mosquito breeding)	Neg	L		x	M		x	x	X		X	x
Energy generation	Neg	L		x	N		x	x	X		X	x
Socio-economic impacts												
Socio-economic impacts	POS	H	x	x		x	x	x			x	
Creation of employment opportunities	POS	H	x	x		x	x	x			x	
Development of human resources	POS	H	x	x		x	x	x			x	

+ **POS** = positive impacts, **NEG**= negative impacts, * **H**=high, **M**=Moderate, **L**=Low, # **N**=Negligible, **M**=Minor, **MA**=Minor Adverse; **MoA**= Moderate adverse;**MaA**=Major Adverse

12 Recommendation

Based on the findings of the EIA, the EIA team makes the following recommendation to the current project design that is proposed for the layer chicken poultry farm development at Ehdhufarumairah.

12.1 Undertaking a detail level survey

The contractor needs to undertake a detail level survey at the island to determine levels of the islands as part of the project. The contractor shall undertake a detail mapping of the island before and after the project. The contractor shall submit the initial survey report before commencing the project and final survey report after project is completed to EPA and MOFA.

12.2 Environmental Monitoring

Environmental monitoring is essential to ensure that potential impacts are minimized and to mitigate unanticipated impacts. It is recommended that environmental monitoring to be carried by the contractor during project phase to monitor the impact of project on the island's environment. It is recommended that this activity would be carried out as per the proponent's committed for this development.

12.3 Environmental Supervision

It is recommended that proponents to undertake the environmental supervision during the implementation of the project as to ensure the project is implemented as outlined in the EIA report. The client or its consultant needs to provide necessary technical advice and guidance to the design of the project and undertake supervision and environmental monitoring during the implementation of the project.

13 Environmental Management and Monitoring

13.1 Introduction

Environmental monitoring is essential to ensure that potential impacts are minimized and to mitigate unanticipated impacts. The parameters that are most relevant for monitoring the impacts that may arise from the proposed layer chicken poultry farm project at Ehdhufarumairah are included in the monitoring plan. Monitoring will be carried out as a follow up activity of the environmental impact assessment and mitigation of possible negative impacts from the proposed project.

The purpose 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.

13.2 Monitoring Programme

Outlined here are project specific monitoring requirements that the proponent shall include in their annual monitoring programme. This monitoring programme for the proposed project includes at bi-annual monitoring and covers the three stages of the project implementation.

Stage 1**:** Immediately before starting development work

Stage 2**:** During project work

Stage 3**:** 6 months after the completion of the project

The monitoring needs of each stage are discussed in detail below:

Stage 1

- Shorelines of the existing island
- Ground water and marine water quality
- Vegetation cover and its extent
- Coral reef health
- Noise level

Stage 2

- Shorelines of the existing island
- Ground water and marine water quality
- Vegetation cover and its extent
- Coral reef health
- Noise level

Stage 3

- Shorelines of the existing island
- Ground water and marine water quality
- Vegetation cover and its extent
- Waste management
- Coral reef health
- Noise level

13.3 Monitoring Timetable

The following table shows the frequency at which the different parameters may be monitored at different phases of the poultry farm development project implementation.

Table 20: Monitoring framework

Monitoring Schedule	**Monitoring Attribute**	**Indicator**	**Methodology**	**Responsible**	**Monitoring Report**
Start of the project	Shorelines of the islands	Beach dynamics	Low, high and mean tide line as to monitor the beach	Proponent	Monitoring Report 1 – at the start of the project
	Groundwater quality	pH, Salinity, EC, nitrates and phosphates	In-situ and laboratory measurement	Proponent	
	Marine water quality	Marine water quality	In-situ and laboratory measurement	Proponent	
	Vegetation cover	Vegetation line and cover	Aerial photo	Proponent	
	Noise level	Noise level at monitoring locations	Noise meter	Proponent	
During the implementation of the project	Shorelines of the islands	Beach dynamics	Low, high and mean tide line as to monitor the beach	Proponent	Monitoring Report 2 – during the project implementation work
	Groundwater quality	pH, Salinity, EC, nitrates and phosphates	In-situ and laboratory measurement	Proponent	
	Marine water quality	Marine water quality	In-situ and laboratory measurement	Proponent	
	Vegetation cover	Vegetation line and cover	Aerial photo	Proponent	
	Noise level	Noise level at monitoring locations	Noise meter	Proponent	
After completion of the project	Shorelines of the islands	Beach dynamics	Low, high and mean tide line as to monitor the beach	Proponent	Monitoring Report 3 – 6 months after completion of the project
	Groundwater quality	pH, Salinity, EC, nitrates and phosphates	In-situ and laboratory measurement	Proponent	
	Marine water quality	Marine water quality	In-situ and laboratory measurement	Proponent	
	Vegetation cover	Vegetation line and cover	Aerial photo	Proponent	
	Waste management	Quantify of waste and waste stream	Waste survey	Proponent	
	Noise level	Noise level at monitoring locations	Noise meter	Proponent	

13.4 Monitoring Report

An environmental monitoring report would be compiled and submitted to the EPA six months after the completion of the project, based on the data collected for the monitoring the parameters included in the monitoring plan given in the EIA.

The annual environmental monitoring report will include details of the site, strategy of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed.

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

13.5 Cost of monitoring

It is estimated that during the project implementation phase, the annual monitoring cost would be US$ 25,000.

14 Conclusion

This EIA report covers proposed layer chicken poultry farm development project at Ehdhufarumairah, Noonu Atoll. Poultry farm projects on uninhabited islands are classed as projects which require Environmental Impact Assessment (EIA) under the Environmental Protection and Preservation Act (law 4/93). This report discusses the findings of a social and environmental impact study undertaken by Water Solutions Pvt. Ltd. at the request of Ocean Quartier Properties Pvt Ltd, who is undertaking the poultry farm development project at island.

Ehdhufarumairah is located on the eastern side of Noonu Atoll. This island is leased to Ocean Quartier Properties Pvt Ltd by Ministry of Fisheries and Agriculture. The vision is to establish layer chicken poultry farm in Ehdhufarumairah which ensure commercial and environmental sustainability. The main aim of this poultry farm project is to lessen import of chicken eggs to meet the local demand. The proposed layer chicken poultry would be developed by importing layer type chicks from Srilanka from CP Farm, rearing chicken in the island in cages till it is old enough to lay eggs when they are 21 weeks olds. The poultry farm would be automated as to manage the feeding opertions to the layer chickens, collection of eggs from the cage houses and removal of manure from the cages houses as waste material. The project will develop the necessary infrastructure in the area of power, water, sewage and wastewater to make the proposed layer chicken poultry farm project sustainable. The project also involves developing accommodation and living areas for the researchers and famers on the island.

The EIA report has identified the major impacts of the proposed layer chicken poultry farm development project. It has been assessed that this chicken farm development project will have impacts on terrestrial, marine and coastal environment both during the construction stage and the operation stage. It has been assessed that the most significant negative impacts from the proposed development will be on the terrestrial environment from the proposed vegetation clearance required for the construction of buildings and other structures. The island is small for a commercial scale poultry farm activity. A significant part of the island would be cleared for the development of proposed buildings. The island has large number of coconut trees which should be uprooted. These coconut trees could be replanted somewhere else on the island. If possible building structures should be adjusted to avoid uprooting of matured and sensitive trees. Taking this into consideration and due to size of the island, area of the vegetation which would be removed would have significant negative impacts on the islands environment. Impacts on the marine and coastal environment will also have negative impacts in certain areas. Most of these impacts are limited to project boundary only.

During the operational stage, poultry farm is expected produces 5,200 kg of chicken manure daily from their houses. Organic was from the operation would be used to produce sea cucumber feed material as a by-product from the operation. The operation of the poultry farm is likely to increase the nutrient content of the soil that may eventually enter surface waters as run off. However, it is difficult to quantify this impact as there will be the mix use both organic and inorganic chemicals on the island. Hence, these changes can be assessed only through monitoring of the groundwater lens of the island.

Positive impacts of the project arise as the socio economic impacts project. This project will create enormous economic opportunities both in the construction and operation stage through creation of both short-term and permanent jobs and business opportunities especially for the locals. This project will introduce and promote the development of layer chicken poultry systems on commercial scale enabling Maldives to provide an additional avenue for employment creation and income generation.

This assessment showed that the negative impacts to the island environment system arising from this proposed project will be relatively high compared to other such projects. This is because large area of the island's vegetation would be cleared as part of the proposed project. However, in terms of benefits to socio-economic environment this project is will be beneficial as it promotes the growth of the poultry farming development, its research and knowledge in the country. Once the project begins, the locals employed will gain valuable knowledge and skills through technology and knowledge transfer.

Despite the many socio-economic advantages of this project, there are serious concerns about the project and how the island was selected for such a project. It appears that the island was leased to a private developer without due consideration of its natural environment. As consultants, we are in the opinion that the island was not carefully assessed to investigate its suitableness to a poultry farm project. The size of the island and its protection was not considered when leasing this island. This project cannot be feasible without establishing the required infrastructure on the island. However, to setup the required infrastructure, vegetation clearing is required. Therefore this is another drawback for this project. The available space for development is not adequate for the proposed project and the infrastructure.

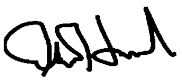
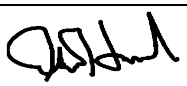
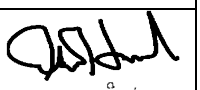
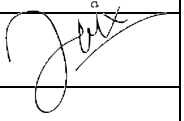
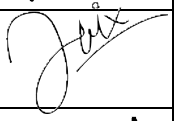
The development of any project will have its impacts on any environment. It is impossible to develop an island without impacting the environment.

15 Acknowledgements

Water Solutions acknowledge the support and assistance of the following team members who made this project a successful project.

- Ahmed Jameel, Environmental Engineer (EIA Registration No: EIA 07/07)
- Ibrahim Faiz, Junior Consultant (EIA Registration No: EIA T06/15)
- Hamdhulla Shakeeb, Surveyor
- Water Solutions Staff

16 People who have assisted in the preparation of this report

Chapter	Page number	People who assisted in data collection and report writing	EIA registration number (only for those registered consultants)	Signature
Introduction		Ahmed Jameel	EIA 07/07	
Project Description		Ahmed Jameel	EIA 07/07	
		Hamdhulla Shakeeb		
Project Setting (Legislative section)		Ahmed Jameel	EIA 07/07	
Existing Environment		Ahmed Jameel	EIA 07/07	
		Ibrahim Faiz	EIA T06/15	
		Hamdhulla Shakeeb		
Impact and Mitigation		Ahmed Jameel	EIA 07/07	
Stakeholder Consultations		Ahmed Jameel	EIA 07/07	
		Ibrahim Faiz	EIA T06/15	
Monitoring		Ahmed Jameel	EIA 07/07	
Recommendations and conclusion		Ahmed Jameel	EIA 07/07	

17 References

Adam, M.S. (2006), Vulnerability and adaptation of the fisheries sector in the Maldives – NAPA Project, MEEW, Maldives.

CDE, 2015, EIA for the proposed agricultural development project in Dheburi dheytherey vaadhoo Island, Raa Atoll

Jameel (2007) A Model to Integrate the Management of Hazards and Disasters in the National Sustainable Development Planning of the Maldives, University of Canterbury, unpublished thesis

Ministry of Environment and Construction (2004), *State of the Environment 2012*,

Ministry of Environment, Energy and Water, (2006), By law about the cutting down, uprooting, digging out and export of trees and palms from one island to another. (Unofficial translation,

Ministry of Housing and Environment, (2012) *Environmental Impact Assessment Regulations*

Ministry of Planning and National Development (April 2006), Maldives Population and Housing Census 2006,

Mohammed Ibrahim Luthufee, G.Soasanee, (1995), Dhivehi Rajjege Geographyge Vanavaru, Part 1 and 2,

MPND, 2000, *First Regional Development Project SDR Atoll Link road EIA*,

Miller MW and Sluka RD (1999) Patterns of Seagrass and Sediment Nutrient Distribution Suggest Anthropogenic Enrichment in Laamu Atoll, Republic of Maldives. Marine Pollution Bulletin 38, pp 1152-1156

Naseer, A. (2003) The integrated growth response of coral reefs to environmental forcing: morphometric analysis of coral reefs of the Maldives. PhD Thesis,, Dalhousie University, Halifax, Canada

UNDP, 2007, *Detail Island Risk Assessment of Maldiv*es

UNDP (2006) Developing a Disaster Risk Profile of the Maldives, UNDP, Male', Maldives

Water Solutions, 2015, *EIA for the Proposed Agri Farming Development in Ekasdhoo*, Shaviyani Atoll

18 Annex A: Terms of reference

203-EIARES/PRIV/2016/459

Terms of Reference for Environmental Impact Assessment for Development of a Chicken Farm on the island of Ehdhuffaru Mairah, Noon Atoll

The following ToR is based on the application form and the scoping meeting held on 25th August 2016 for undertaking the Environmental Impact Assessment for the proposed chicken farm development at Ehdhulfaru Mairah, Noonu Atoll. The Proponent of the project is Ocean Quartiers Properties Pvt Ltd.

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

1. **Introduction to the project** –Describe the purpose of the project and, if applicable, the background information of the project/activity and the tasks already completed. Objectives of the development activities should be specific and if possible quantified. Define the arrangements required for the environmental assessment including how work carried out under this contract is linked to other activities that are carried out or that is being carried out within the project boundary. Identify the donors and the institutional arrangements relevant to this project.

2. **Study area** – Submit a minimumA3 size scaled plan with indications of all the proposed infrastructures. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites (e.g. coral reef, sea grass, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds).Relevant developments in the areas must also be addressed including residential areas, all economic ventures and cultural sites.

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

   Task 1. Description of the proposed project – Provide a full description and justification of the relevant parts of the project, using maps at appropriate scales where necessary. The following should be provided (all inputs and outputs related to the proposed activities shall be justified):
   The main activities of the project are:

   - Project inputs and source of inputs
   - Project outputs and how these outputs will be managed

   Farm details
   - Source of livestock, eggs etc.
   - Feeding materials
   - Farm layout and methods to be used.

   Construction of jetties and other coastal infrastructure:
   - Location and size of jetty on a map;
   - Justification for the selection of these locations;
   - Material and method of jetty construction
   - Justification for selecting the methods and equipment;

Environmental Protection Agency
Green Building, 3rd Floor, HandhuvareeHingun
Male', Rep. of Maldives, 20392
Tel: [+960] 333 5949 [+960] 333 5951
Fax: [+960] 333 5953
Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

Site preparation and vegetation clearance

- Vegetation clearance required, in terms of numbers and types of trees to be removed
- Relocation of trees within the island or possibilities for relocation to another island
- How green waste would be managed

Water desalination plant:

- Location, desalination capacity, technology and water quality monitoring system;
- Pipeline construction methods, general scheduling and concept level drawings;
- Justification for the location of the water intake and brine outfall pipelines;
- Methodology and locations for water intake, and outfall pipe installation
- Emergency water supply plan.

Power supply means and fuel storage:

- Location and size of generators and other generating related facilities;
- Fuel storage (means of storage), types, volume and transportation and transfer technique;
- Emergency power supply plan;
- Low energy consumption ventures and energy efficiency measures considered.

Sewerage and wastewater treatment plant:

- Plant location, capacity and justification;
- Describe discharge water quality, testing system and emergency plan;
- Justify outfall site selection including the distance from the reef and depth of the pipe using oceanographic and ecological information.
- Describe equipment needed and construction methods for laying the offshore pipeline including handling transportation.

Solid waste management facility:

- Location justification, carrying capacity, materials to be collected and equipment required for demolition, management of the demolition waste, management of the construction waste and waste created during operational phase;
- Transportation mechanisms and costs;
- Recycling ventures and awareness activities within the island.

Disease control methods and quarantine facilities

- Methodology to be used for disease prevention and control
- Methodology to be used in case of a disease outbreak
- Any quarantine facilities on the island
- Disposal methods of dead animals

Processing

- Processing method and equipment to be used
- Packing details
- Waste created during processing and how it would be managed

Temporary facilities:

- Construction methods, scheduling and operation of temporary facilities including power generation, oil storage, water supply, waste water treatment, accommodation facilities, waste management and decommissioning. Temporary construction site set up location needs to be identified. And locations for any pre-casting activities.

Task 2. Description of the environment – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project (e.g. monsoon season). Identify baseline data gaps and identify studies and the level of detail to be carried out by consultant. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that data collected is suitable for use as a baseline. As such all baseline data must be presented in such a way that they will be usefully applied to future monitoring. The report should outline detailed methodology of data collection utilized.

The baseline data will be collected before construction and from at least two benchmarks. All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points, reef transects, vegetation transects and manta tows sites for posterior data comparison. Information should be divided into the categories shown below:

Climate

- Temperature, rainfall, wind, waves (including extreme conditions)
- Risk of storm events;

Physical parameters (use maps where appropriate)

- Tidal ranges and tidal currents;
- Wave climate and wave induced currents;
- Wind induced (seasonal) currents;
- Shoreline (high tide/ low tide) and Vegetation line of the island (including the small connected island);
- Depth profiles of any areas are that are planned to be dredged; and
- Ground water quality assessment parameters; Temperature, pH, salinity, ammonia, phosphate, sulphate, hydrocarbons, total and faecal coliforms from 3 locations.
- Sea water quality measuring these parameters: Temperature, pH, salinity, turbidity and Total Suspended Solids, BOD, total coliforms, faecal coliforms at the outfall site.
- Maximum ground water yield must be calculated if ground water is to be used for any activity.

Biological parameters: Land-water run-off could affect the marine environment:

- Identify marine protected areas (MPAs) and sensitive sites such as breeding or nursery grounds for protected or endangered species (e.g. coral reefs, spawning fish sites, nurseries for crustaceans or specific sites for marine mammals, sharks and turtles). Include description of commercial species, species with potential to become nuisances or vector.
- Vegetation survey of the island
- Marine habitat status including coral reef health, seagrass beds and benthic and fish community description at jetty locations and outfall location and a control site. Select a control site far from the outfall location and a test site at representative distance from the outfall discharge site;

Socio-economic environment - present a socioeconomic profile of the Noonu Atoll.

Hazard vulnerability:

- Vulnerability of area to flooding and storm surge.

Absence of facilities in the country to carry out the water quality tests will not exempt the proponent from the obligation to provide necessary data. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Legal requirements:

- Approval from Ministry of Fisheries and Agriculture;
- Any relevant regulations and international agreements related to poultry farming from relevant ministries.
- Information of any permits required from Maldives Food and Drug Authority and MoFA.

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

Impacts on the natural environment

- Water run-off impacts from pesticides and fertilizers on marine environment: include changes in seawater quality assessments especially water turbidity and sedimentation and changes in benthic and fish community structures
- Impacts on ground water quality;
- Impacts on unique or threatened habitats or species (if any); and
- Impacts on terrestrial environment
- Impacts due to pollution and waste

Impacts on the socio-economic environment

- Impacts on food prices and availability;
- Impacts on island employment, income and economy diversification;
- Impacts of increased demands on natural resources and services especially waste management

Construction related hazards and risks

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

The methods used to identify the significance of the impacts shall be outlined.

Task 5. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures. Measures for both construction and operation phase shall be identified. Cost the mitigation measures, equipment and resources required to implement these measures shall be provided. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included.

Task 6. Alternatives to proposed project – Describe alternatives including the "*no action option* "should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative". This should include alternative irrigation options, alternatives access locations, alternative farming options taking into account environmental, social and economic factors. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation.

Task 7. Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management. The report should provide a monitoring report submission schedule. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, cost commitment from responsible person to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided.

Task 8. Stakeholder consultation – Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders, government authorities. The report should state the outcomes of these consultations. Consultations need to be carried out with:

- Ministry of Fisheries and Agriculture regarding requirement of quarantine facilities, feeding guidelines, import of livestock and other project work
- Maldives Food and Drug Authority
- HPA

<u>Presentation</u>- 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 Regulations 2012 and the relevant amendments.

<u>Timeframe for submitting the EIA report</u> – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

25th August 2016

Environmental Protection Agency
Green Building, 3rd Floor, HandhuvareeHingun
Male', Rep. of Maldives, 20392
Tel: [+960] 333 5949 [+960] 333 5951
Fax: [+960] 333 5953
Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

19 Annex B: Project Schedule

N.EHDHUHFARU

WORK PLAN AND INVESTMENT ESTIMATION PLAN

FIRST YEAR INVESTMENT :USD 1,000,000

DETAILS	USD	FIRST YEAR WORK PLAN AND INVESTMENT PLAN											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
EIA	12,000												
FERRY BOAT	200,000												
CLEANING AND ROAD	20,000												
JETTY	50,000												
STAFF QUARTERS AND OTHER RELATED INFRASTRUCTURE	483,000												
POWER HOUSE WITH GENERATOR	150,000												
WATER PLANT AND HOUSE	85,000												

SECOND YEAR INVESTMENT: USD 500,000

DETAILS	USD	SECOND YEAR WORK PLAN AND INVESTMENT PLAN											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
CONSTRUCTION OF PONDS	300,000												
FIRM EQUIPMENT PROCUMETS	200,000												

THIRD YEAR INVESTMENT : USD 1,000,000

DETAILS	USD	THIRD YEAR WORK PLAN AND INVESTMENT PLAN											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HACHERY WITH EQUIPMENTS	450,000												
LABOURATORY WITH EQUIPMENTS	500,000												
CARGO BOAT	200,000												
START OF FARMING	300,000												
START MARKETING	50,000												

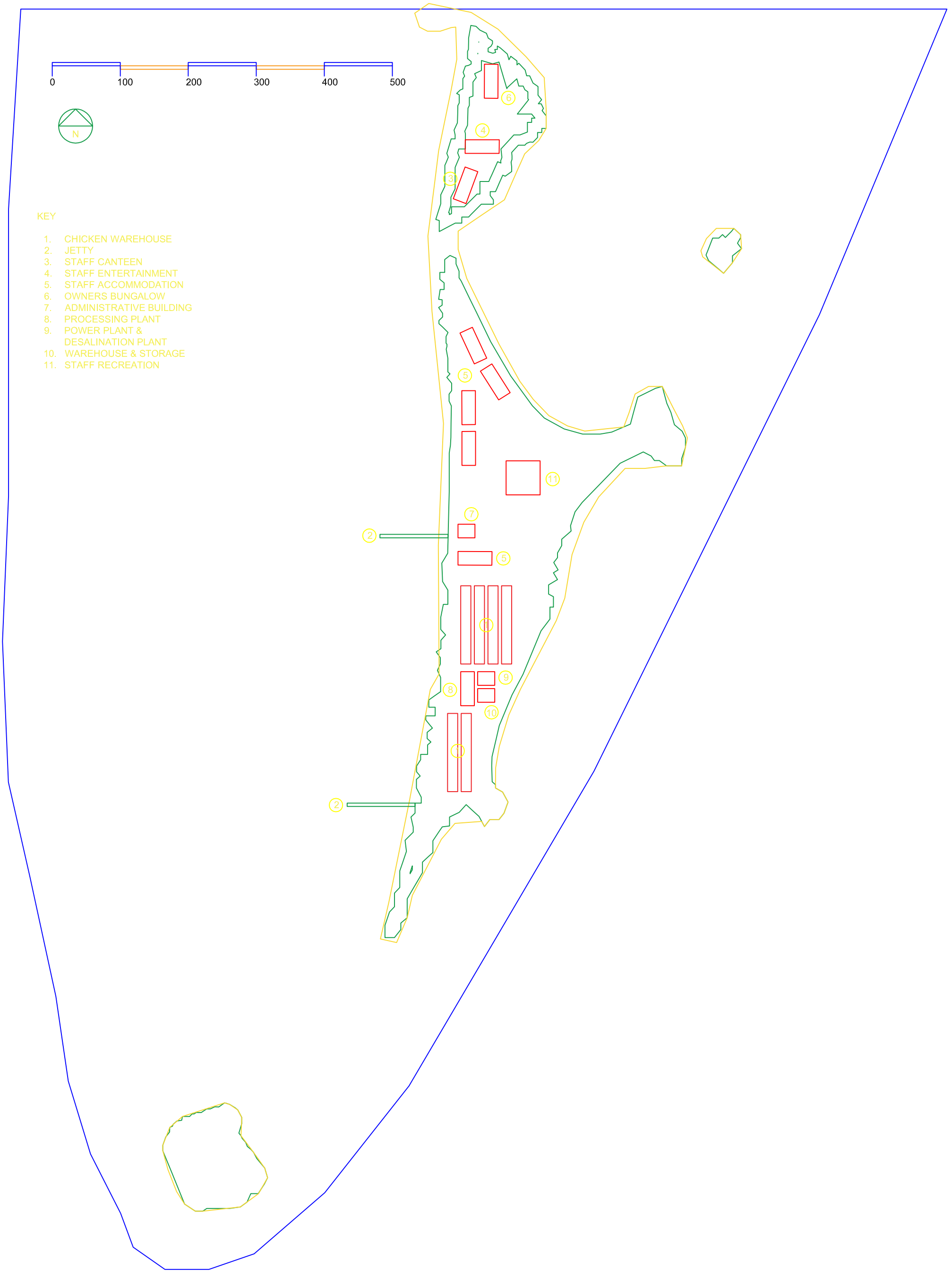
FOURTH YEAR INVESTMENT: USD 500,000

DETAILS	USD	FOURTH YEAR WORK PLAN AND INVESTMENT PLAN											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
FARMING	250,000												
MARKETING AND SELLING	250,000												

FIFTH YEAR INVESTMENT: USD 500,000

DETAILS	USD	FIFTH YEAR WORK PLAN AND INVESTMENT PLAN											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
FARMING	100,000												
MARKETING AND SELLING	100,000												
DEVELOPMENT OF FARM	200,000												
START CONSTRUCTION CANERY	100,000												

20 Annex C: Project details


0
100
200
300
400
500
N
KEY
1. CHICKEN WAREHOUSE
2. JETTY
3. STAFF CANTEEN
4. STAFF ENTERTAINMENT
5. STAFF ACCOMMODATION
6. OWNERS BUNGALOW
7. ADMINISTRATIVE BUILDING
8. PROCESSING PLANT
9. POWER PLANT & DESALINATION PLANT
10. WAREHOUSE & STORAGE
11. STAFF RECREATION

N.Ehdhuhfaru Agriculture Project

N

W E

S

1	Chicken Warehouse
2	Warewhouse and Storage
3	Processing Plant
4	Power Plant and Desalination Plant
5	Staff Accomadation
6	Administrative Building
7	Staff Recreation
8	Staff Canteen
9	Staff Entertainment
10	Owners Bungalow
11	Jetty
12	Mosque
13	Security Booth and Slaughter House
14	Vaccine and Medical Storage
15	Vetenarian Office
16	Quarantine Facilty
17	Chicken Feed Storage
18	Fuel Storage
19	Waste Management Centre

Outfall

Intake

73°24'15"E 73°24'30"E 73°24'45"E

323326 323826 324326

5°42'0"N 5°41'45"N 5°41'30"N

630110 629610

Legend

- Intake and Outfall
- Jetty
- Quarantine Facilty
- Chicken Feed Storage
- Vaccine and Medical Storage
- Chicken Warehouse
- Procsessing Plant
- Support Facilities
- Vegetation
- Shoreline Aug 2016
- Reef

72°0'0"E 74°0'0"E 73°30'0"E

6°0'0"N 3°0'0"N 0°0'0" 5°30'0"N

Geodetic Parameters

Coordinate Systems :Universal Transverse Mercator (UTM) Zone: 43 North
Projection :Transverse Mercator (TM)
Datum : WGS 1984
Longitude of Origin :0.000000000
Central Meridian:75 W
Scale Factor :0.999600000000000040
False Easting :500000.000
False Northing :0.00000000
Semi-Major Axis (a) (Meters) :6378137.000
Semi-Minor Axis (b) (Meters): 6356752.3142451793

Scale: 0 50 100 200 Meters

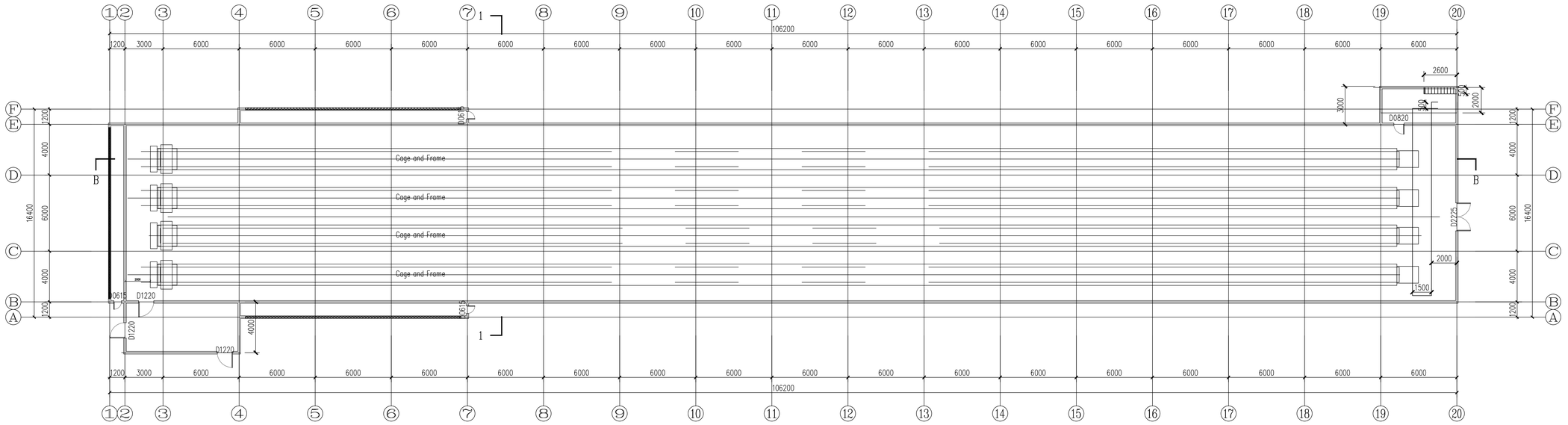
Project:
N.Ehdhuhfaru Agriculture Project

Client:
-

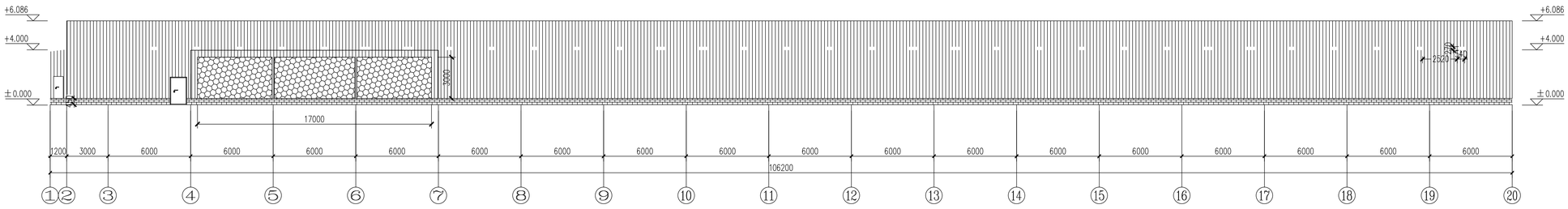
Contractor:

Water Solutions Pvt Ltd
Ma.Fas Eri 1st Flr, Ameenee Magu, Male', Maldives
Tel: +(960)3341643, Fax: +(960)331643
www.water-solutions.biz

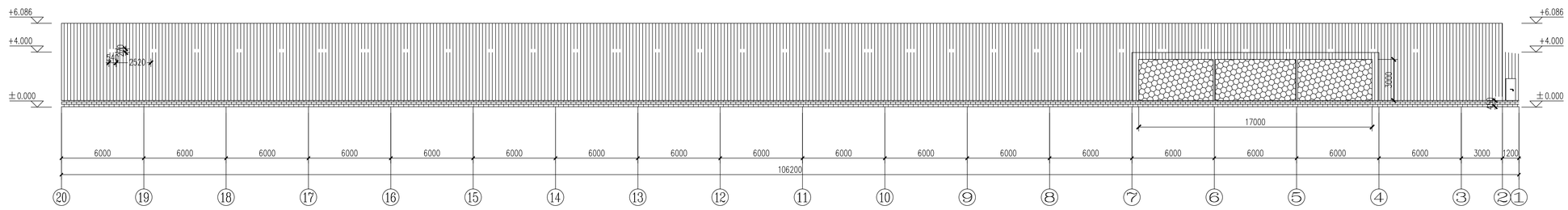
EIA PURPOSES ONLY



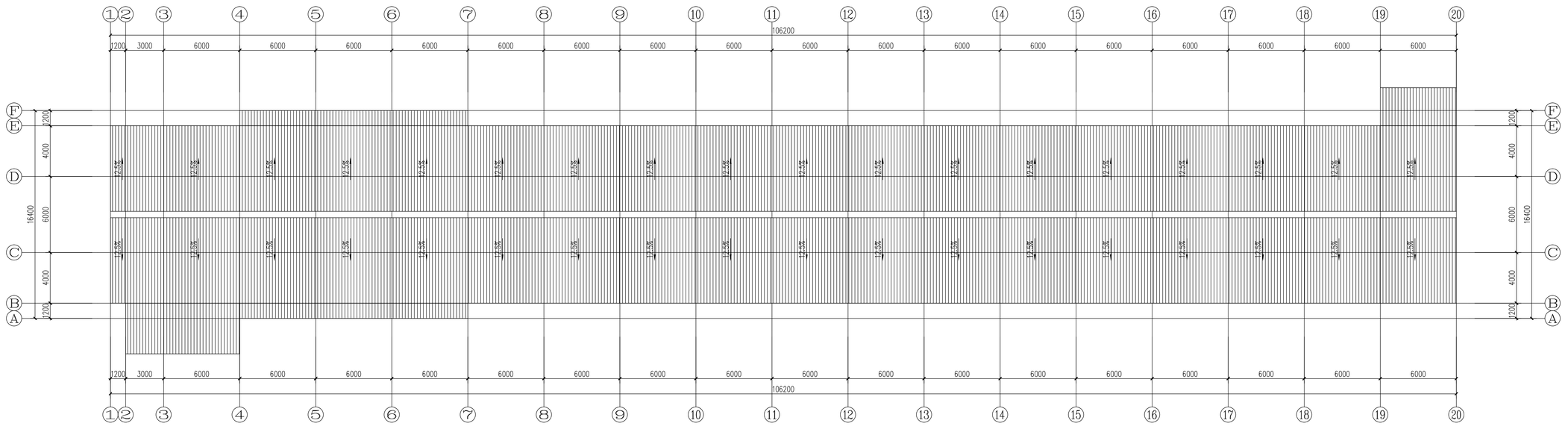
MAIN LAYOUT PLAN 1:100



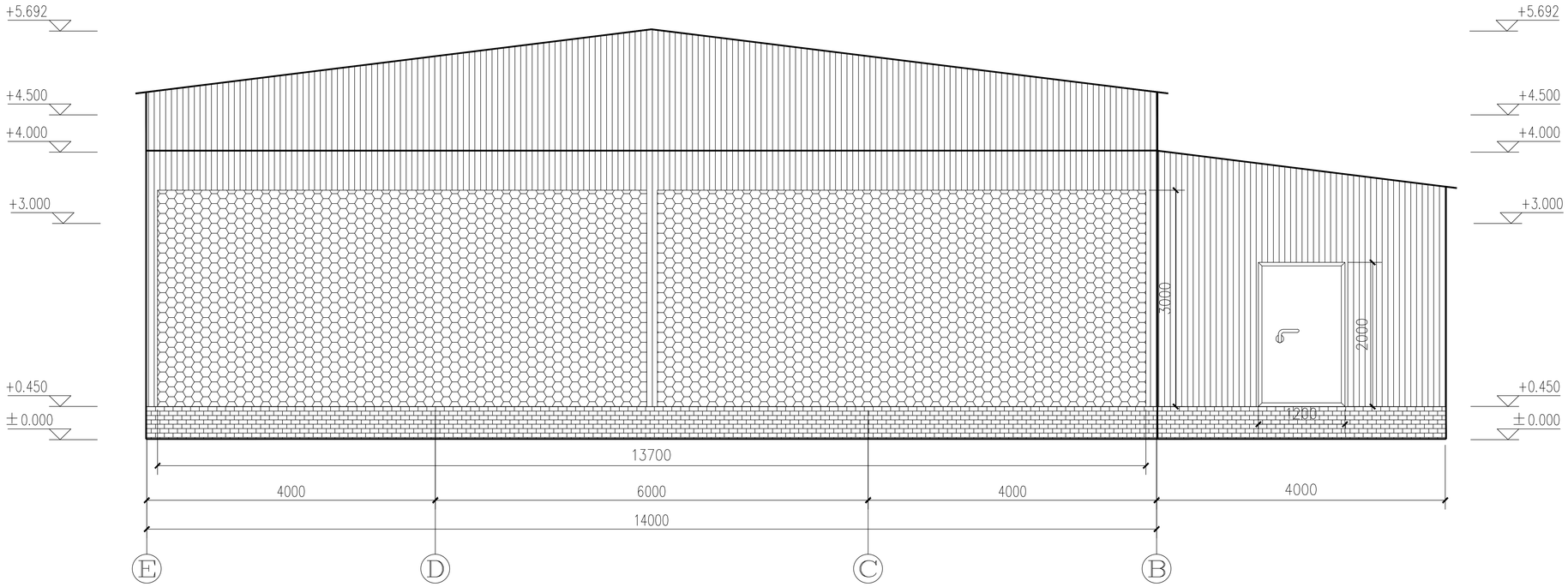
AXIS A–A ELEVATION 1:100



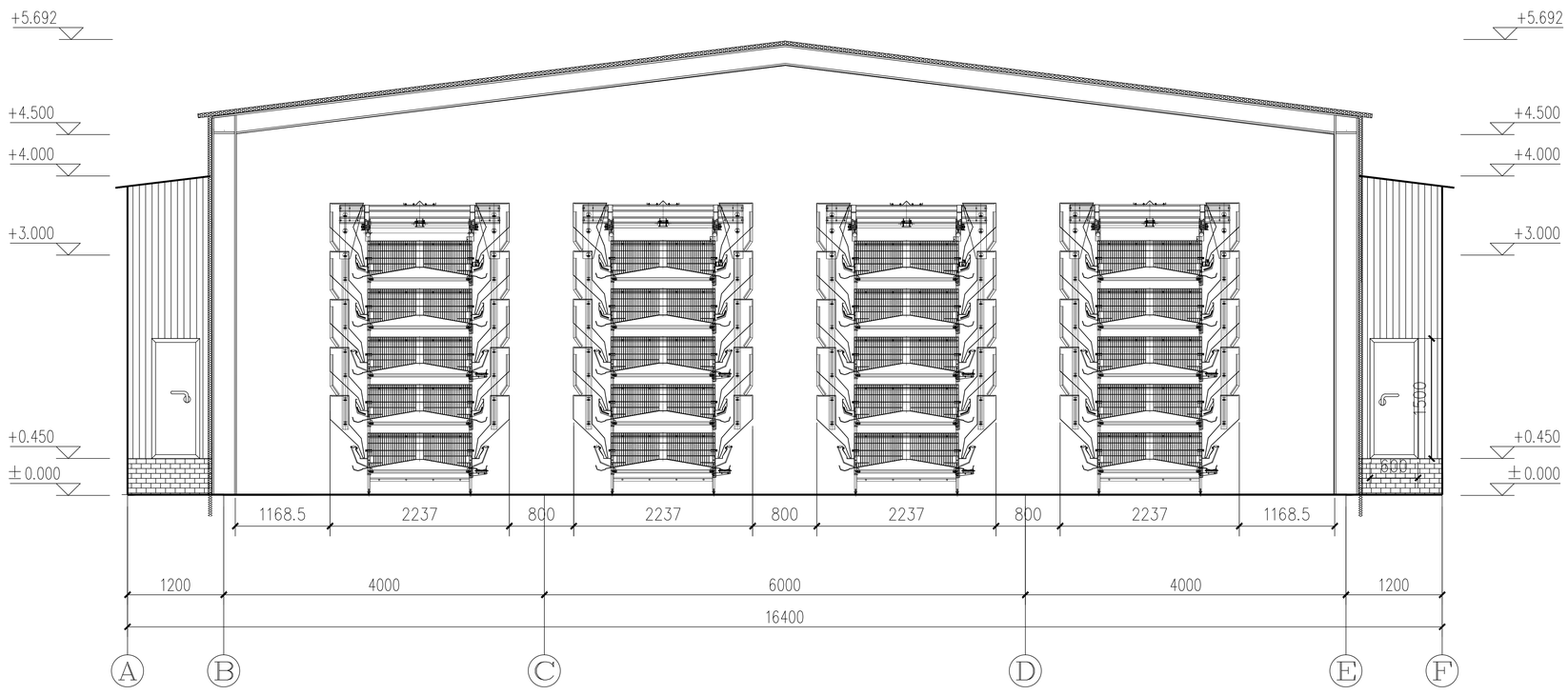
AXIS F–F ELEVATION 1:100



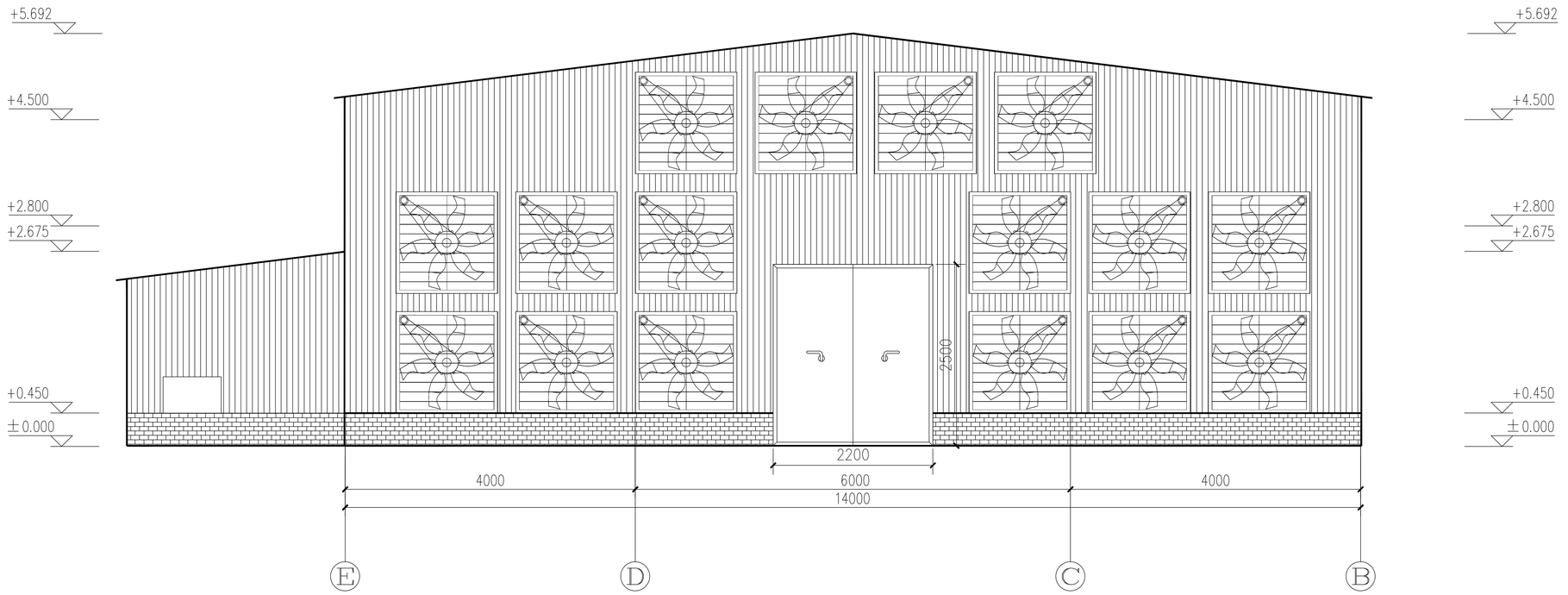
ROOF LAYOUT PLAN 1:100



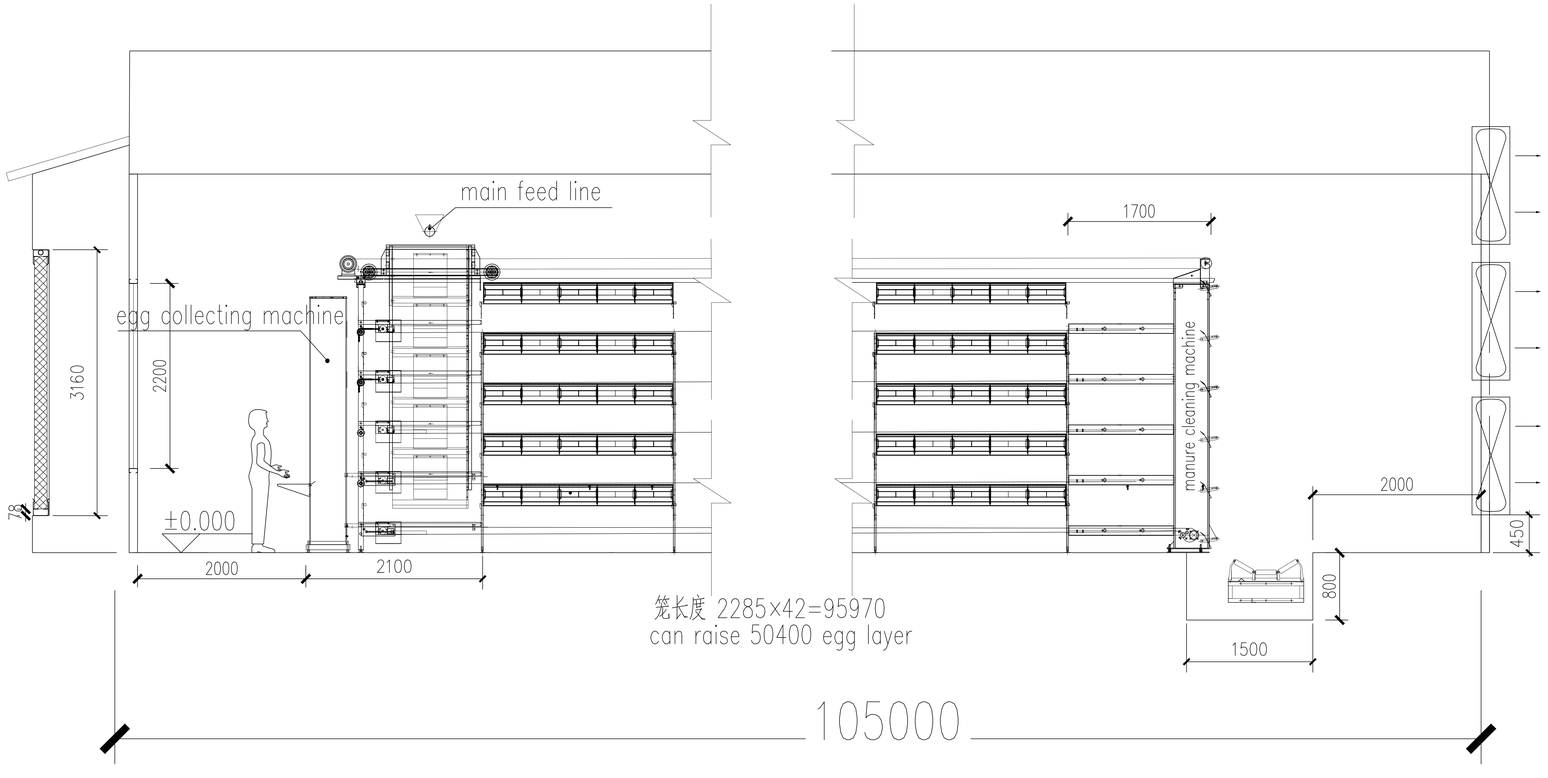
AXIS 1–1 ELEVATION 1:50



SECTION 1–1 1:50



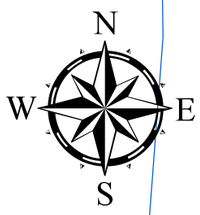
AXIS 20-20 ELEVATION 1:50



SECTION B–B 1:50

21 Annex D: Bathymetric chart

N.Ehdhuhfaru Shoreline

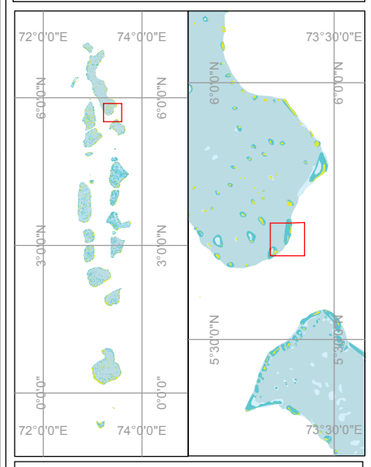


73°24'15"E 323382 73°24'30"E 323882 73°24'45"E 324382 73°25'0"E

5°42'0"N 630074 5°41'45"N 629574 5°41'30"N

Legend

- Vegetation
- Shoreline Aug 2016
- Reef



Geodetic Parameters

Coordinate Systems :Universal Transverse Mercator (UTM) Zone: 43 North
Projection :Transverse Mercator (TM)
Datum : WGS 1984
Longitude of Origin :0.000000000
Central Meridian:75 W
Scale Factor :0.999600000000000040
False Easting :500000.000
False Northing :0.00000000
Semi-Major Axis (a) (Meters) :6378137.000
Semi-Minor Axis (b) (Meters): 6356752.3142451793

Scale:

0 50 100 200 Meters

Project:
N.Ehdhuhfaru Agriculture Project

Client:
-

Contractor:

Water Solutions Pvt Ltd
Ma.Fas.Eri 1st Fl. Ameenee Magu, Male', Maldives
Tel: +(960)3341643. Fax: +(960)331643
www.water-solutions.biz

EIA PURPOSES ONLY

N.Ehdhuhfaru Bathymetry

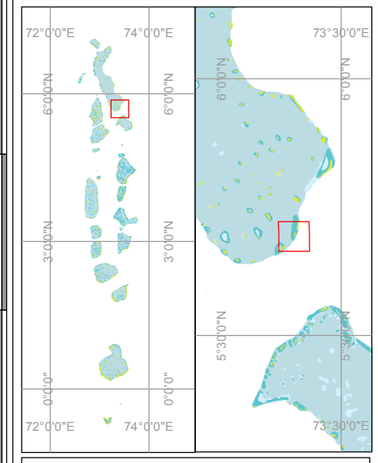
73°24'15"E
73°24'30"E
73°24'45"E
323707
5°41'45"N
629630
5°41'30"N
324207

-1.6 -1.2 -0.1 -0.5 -0.3 -0.2 -1.7 -0.8 -1.2 -0.4 -0.6 -1.6 -0.3 -1.4 -0.7

-2 -1.3 -1.1 -0.35 -0.9 -1.9 -1.5 -1 -0.4 -0.8 -2 -1 -0.9 -0.3 -1.7 -1.4 -0.85 -1.4 -0.9 -0.3

Legend

- Bathymetry Points
- Vegetation
- Shoreline Aug 2016
- Reef



Geodetic Parameters

Coordinate Systems :Universal Transverse Mercator (UTM) Zone: 43 North
Projection :Transverse Mercator (TM)
Datum : WGS 1984
Longitude of Origin :0.000000000
Central Meridian:75 W
Scale Factor :0.999600000000000040
False Easting :500000.000
False Northing :0.00000000
Semi-Major Axis (a) (Meters) :6378137.000
Semi-Minor Axis (b) (Meters): 6356752.3142451793

Scale:

0 50 100 Meters

Project:
N.Ehdhuhfaru Agriculture Project

Client:
-

Contractor:

Water Solutions Pvt Ltd
Ma.Fas.En.1st Flr. Ameenee Magu, Male': Maldives
Tel: +(960)3341643, Fax: +(960)3341643
www.water-solutions.biz

EIA PURPOSES ONLY

22 Annex G: Beach Profiles

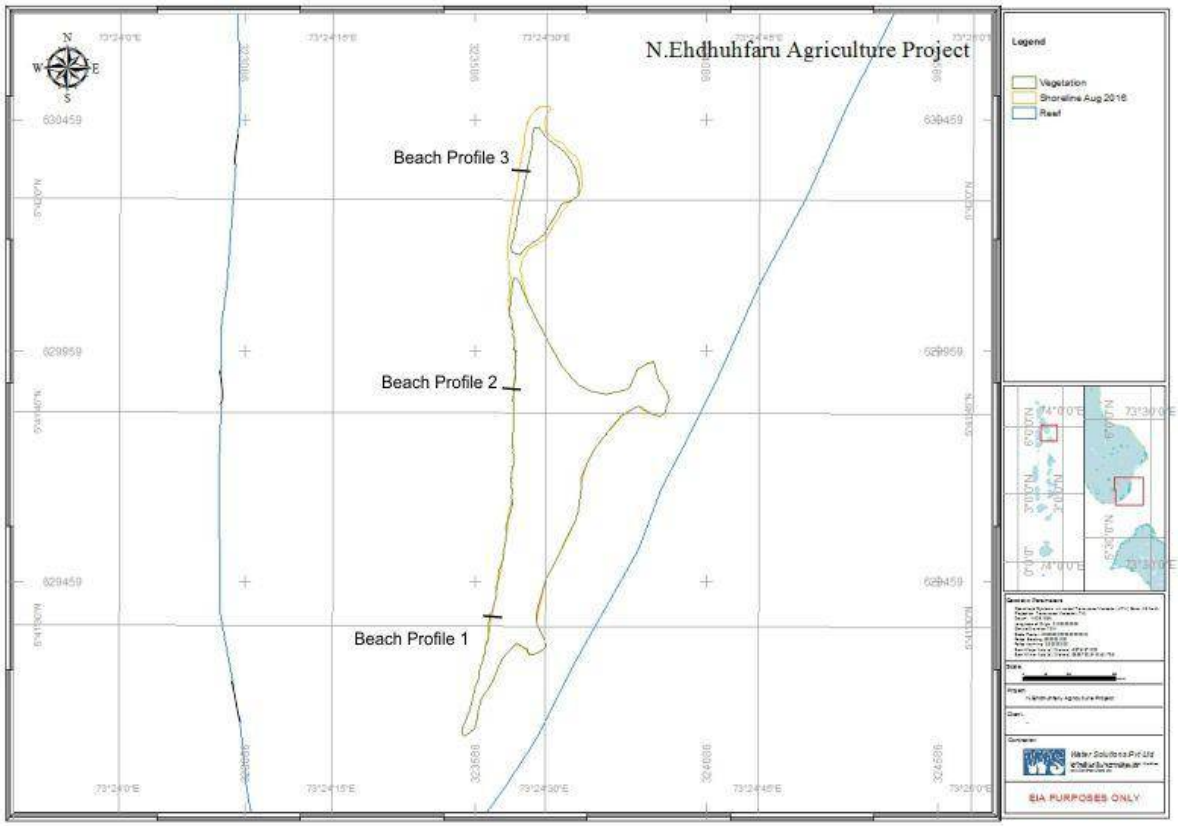


Figure 35: Beach profile locations

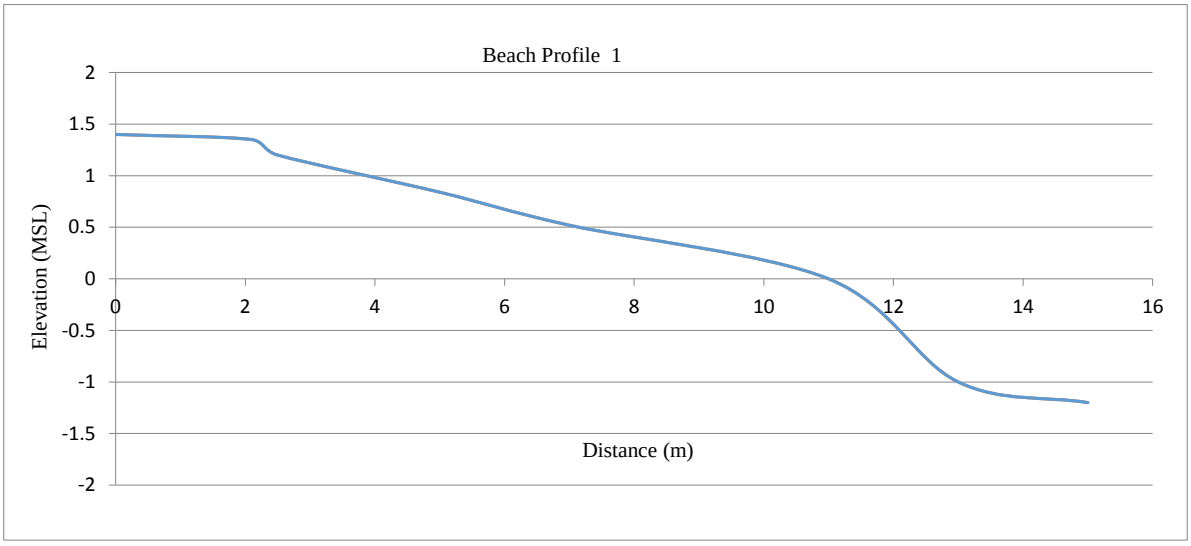


Figure 36: Beach profile 1

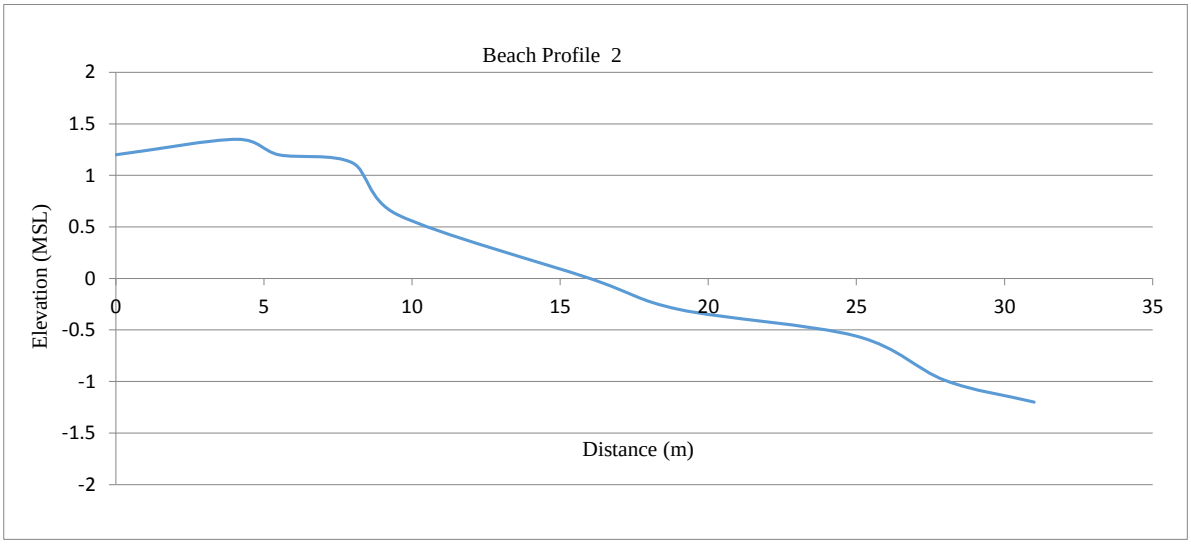


Figure 37: Beach profile 2

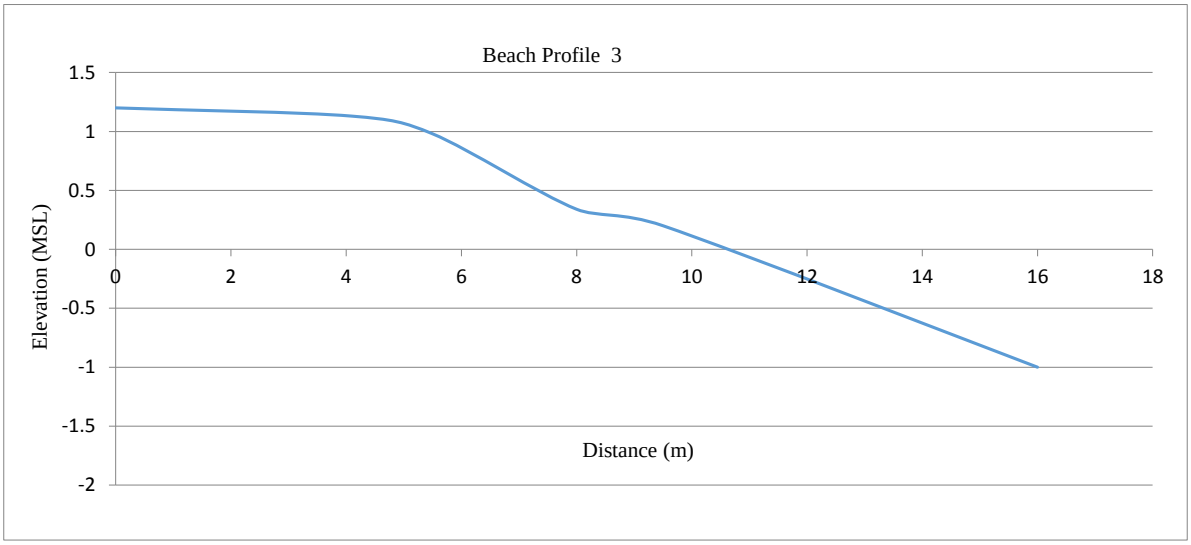


Figure 38: Beach profile 3

23 CV of other consultants

1.	**POSITION**	:	**Surveyor**
2.	**NAME**	:	Hamdhulla Shakeeb
3.	**CONTACT DETAILS**		G. Nanfasuvi ge Daisy Magu Male' Maldives Mobile:+(960) 7567075
4.	**DATE OF BIRTH**	:	26th Feb 1988
5.	**NATIONALITY**	:	Maldivian
6.	**EDUCATION**	:	**General Certificate of Education (GCE) Ordinary Level** Cambridge University, 2005 **General Certificate of Education (GCE) Advanced Level** Cambridge University, 2008 **Certificate in Surveying,** University of Moratuwa, Sri Lanka, 2009
7.	**OTHER TRAINING**	:	Padi Open Water Diver Advance Certificate in Computing

8. LANGUAGE & DEGREE OF PROFICIENCY :

	Speaking	Writing	Reading
English	Excellent	Excellent	Excellent
Dhivehi	Mother tongue	Mother tongue	Mother tongue

9.	**MEMBERSHIP IN PROFESSIONAL SOCIETIES**	:	-
10.	**COUNTRIES OF WORK EXPERIENCE**	:	Maldives & Sri Lanka
11.	**EMPLOYMENT RECORD**	:	

FROM: **1st August 2008** To: Present
EMPLOYER Water Solutions Pvt Ltd
POSITION HELD AND DESCRIPTION OF DUTIES Surveyor
Undertake field surveys required for environmental studies, development and monitoring. Produce CAD drawings of completed surveys and other drawings required for environment and sewerage projects

PROFESSIONAL EXPERIENCE

Project Name : **Setting out all Structures in L.Olhuveli**
Client : Evason Laamu Financing:
Period : 2008 Time Spent: 2 months
Position Held : Assistant Surveyor
Duties : Setting out of water villas

Project Name : **Bathymetric Survey of K.Summer Island**
Client : Summer island Financing:
Period : 2008 Time Spent: 2 days
Position Held : Assistant Surveyor
Duties : Bathymetric Survey

Project Name : **EIA Survey - redevelopment of in K.Giraavaru**
Client : TBI
Period : 2008 Time Spent: 1 day
Position Held : Assistant Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA for Coastal Protection of Embudu Village**
Client : Embudu Village
Period : 2008 Time Spent: 2 days
Position Held : Assistant Surveyor
Duties : Field data collected for the EIA report

Project Name : **Topographic Survey – Redevelopment of Bolifushi Resort**
Client : Jumeirah Maldives
Period : 2008 Time Spent: 2 Weeks
Position Held : Assistant Surveyor
Duties : Mapping the Existing structures

Project Name : **Environmental Monitoring B.Muhdhoo**
Client : Coastline Group
Period : 2008 Time Spent: 1 week
Position Held : Assistant Surveyor
Duties : Field data collected for the EIA report

Project Name : **K. Thulusdhoo Huraagadu**
Client : Island Community
Period : 2009 Time Spent: 1 week
Position Held : Assistant Surveyor
Duties : Field data collected for the EIA report

Project Name : **Topographic survey of Bolifufushi Resort**
Client : Eon Resorts
Period : 2009 Time Spent: 5 months
Position Held : Surveyor
Duties : Setting Out the all the strucures

Project Name : **AA. Moofushi**
Client : Constance Hotels
Period : 2009 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Gdh. Madaveli Land Reclamation EIA**
Client : MHTE
Period : 2009 Time Spent: 1 week
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Ghd. Hoadehdhoo Land Reclamation EIA**
Client : MHTE
Period : 2009 Time Spent: 1 week
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Environmental Monitoring of Gdh.Meradhoo**
Client : Jumeirah Maldives Financing:
Period : 2009 Time Spent: 2 days
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Topographic Survey of Lh.Felivaru**
Client : Northern Province Office Financing:
Period : 2009 Time Spent: 1 month
Position Held : Surveyor
Dties : Mapping the structures

Project Name : **Topographic Survey of Sonevafushi**
Client : Sonevafushi Financing:
Period : 2010 Time Spent: 1 day
Position Held : Surveyor
Duties : Mapping the structures

Project Name : **Topographic and Bathymetric Survey of K.Baros**
Client : Baros Financing:
Period : 2010 Time Spent: 1 day
Position Held : Surveyor
Duties : Collecting depths and mapping the island

Project Name : **Coral Planting in K.Boduhithi**
Client : Sunland Financing:
Period : 2010 Time Spent: 3 days
Position Held : Surveyor
Duties : Coral Planting

Project Name : **EIA Survey of K.Summer Island**
Client : Summer Island
Period : 2010 Time Spent: 2 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Conventional Centre in Addu City**
Client : MHE Financing:
Period : 2010 Time Spent: 2 days
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Maradhoo Football Ground**
Client : - Financing:
Period : 2010 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Halaveli**
Client : Halaveli
Period : 2011 Time Spent: 2 Weeks
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Environmental Monitoring of AA.Nika Island**
Client : Nika Island Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Nolhivaramfaru**
Client : MHE
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA survey of Sh.Vagaru**
Client : Viceroy Maldives
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA survey of Bandos Island Resort**
Client : Bandos Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA survey of AA.Maafushivaru**
Client : Maafushivaru Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Topographic Survey of Evasaon Laamu Olhuveli**
Client : Evason Laamu Financing:
Period : 2011 Time Spent: 2 Weeks
Position Held : Surveyor
Duties : Mapping Existing Beach Villas and corrected the map

Project Name : **EIA Survey of Hulhumale' Marina**
Client : HDC Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Ha.Kela Sewerage project**
Client : DCP Financing:
Period : 2011 Time Spent: 2 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Fihaalhohi**
Client : Fihaalhohi Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Topographic Survey of K.Summer Island**
Client : MOOKAI Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Setting out of breakwaters and reclaim area

Project Name : **EIA Survey of Summer Island**
Client : MOOKAI Financing:
Period : 2011 Time Spent: 1 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Equator Village (Addu city)**
Client : MOOKAI Financing:
Period : 2011 Time Spent: 2 days
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of F.Bilehdhoo Harbour**
Client : MTCC Financing:
Period : 2011 Time Spent: 2 days
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **Bathymetric Survey of Gdh.Thinadhoo Harbour**
Client : AKDA International Financing:
Period : 2011 Time Spent: 2 days
Position Held : Surveyor
Duties : Field data collection for Bathymetry. This Bar calibration, GPS Setup and echo-sounder operation during data collection

Project Name : **Environmental Monitoring of 8 Islands**
Client : MHE Financing:
Period : 2011 Time Spent: 4 weeks
Position Held : Surveyor
Duties : Field data collection for the EIA report

Project Name : **Environmental Monitoring of Ippantiv Island(Sri Lanka)**
Client : Qube Lanka Lesiure Properties Pvt Ltd Financing:
Period : 2011 Time Spent: 2 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Sh.Mathi-Komandoo Channel Dredging**
Client : Financing:
Period : 2011 Time Spent: 2 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

Project Name : **EIA Survey of Hdh.Kuldhuffushi Port Extentsion**
Client : Kulhudhuffushi Port Financing:
Period : 2011 Time Spent: 2 day
Position Held : Surveyor
Duties : Field data collected for the EIA report

CERTIFICATION:

I, THE UNDERSIGNED, confirm that:

(i) To the best of my knowledge, this CV correctly describes myself, my qualifications, and my experience
(ii) I have given my full consent to be included in this Proposal
(iii) I am available for the assignment as indicated/scheduled in this Proposal.

Hamdhulla Shakeeb

24 Annex H: Documents from Ministry of Agriculture

VISIT MALDIVES YEAR 2016

Ministry of Fisheries and Agriculture
Male', Republic of Maldives

މިނިސްޓްރީ އޮފް ފިޝަރީޒް އެންޑް އެގްރިކަލްޗަރ
މާލެ، ދިވެހިރާއްޖެ

ނަންބަރު:30-E/PRIV/2016/327

ހުސައިން ކާއިޒެއަރ ޒުރާފާޒިސް ޕްރައިވެޓް ލިމިޓެޑްގެ މެނޭޖިންގ ޑިރެކްޓަރ މިސްޓަރ ޒަކަރިއްޔާ ޢަބްދުއްރަޙްމާން

އަށް،

ވުދުން ސަލާމަށްފަހު ދަންނަވަމެވެ.

މި މިނިސްޓްރީގެ ނަންބަރު 30-E/PRIV/2016/308 (02 މޭ 2016) ސިޓީ އާއި ގުޅޭ ގޮތުން 03

މޭ 2016 ގެ ތާރީޚުގައި ޝަރުތުތަކާއިއެކު ސިޓީއާ ހަވާލުވި ދަންނަވަމެވެ.

ތިރީގައި ބަޔާންކުރެވިފައިވާ ކަންތައްތައް ފުރިހަމަކުރުމަށްޓަކައި މި ސިޓީގެ ތާރީޚުން ފެށިގެން 90 (ނުވަދިހަ)
ދުވަހުގެ މުއްދަތެއް މިހާ ފުރުޞަތުން ދިނީމެވެ. މިގޮތުން، ހަވާލުކުރެވިފައިވާ މުއްދަތުގެ ތެރޭގައި ތިރީގައި ބަޔާންކުރެވިފައިވާ ކަންތައްތައް
ފުރިހަމަ ކުރައްވާފައިނުވާނަމަ މި ސިޓީ ބާޠިލުކުރެވޭނެ ވާހަކަ ދަންނަވަމެވެ.

1. ބިޑުގެ ޕްރޮޖެކްޓް ވޯރކް ޕްލޭން ހުށަހަޅުއްވުން.
2. ބިޑުގެ އެންވަޔަރަމަންޓަލް އިމްޕެކްޓް އެސެސްމަންޓް (އީ.އައި.އޭ) ރިޕޯޓް ހުށަހަޅުއްވުން.
3. ބިޑުގެ އެކްސިކިއުޝަން ފީގެ ގޮތުގައި ދައްކަވަންޖެހޭ 855,738.00 (އަށްލައްކަ ފަންސާސް ފަސްހާސް ހަތްސަތޭކަ ތިރީސް އަށްރުފިޔާ)، ޕަރފޯމަންސް އިންޝުރެންސް ބޮންޑުގެ އޯޕަރޭޓަރުން ދައުލަތުގެ ފަރާތުން ބަލައިގަނެވޭ ބޭންކަކުން ހުށަހަޅުއްވުން.

އަދި ދަންނަވަމެވެ. ބަޔާންކުރެވިފައިވާ މި މިނިސްޓްރީން ސިޓީން ދަންނަވާލައިފައިވާ ފަދައިން، މިހާ ފުރުޞަތުން
ސީ.އެސް.އާރުގެ ބަޖެޓުގައި ކަރަން ހުށަހަޅާ ކަންކަމާއި، މި މިނިސްޓްރީގެ ޕްރޮސެސް ފަންޑިން ފަރާތްތަކާން ވަމީސާގެ މިންވަރާފަރު މި
މިނިސްޓްރީއާއި ދިމާ ފަރާތް ދެމެދު މަޝްވަރާކުރައްވާފައިނުވާނަމަ، ސްޓޭކްހޯލްޑަރުން ދެފަރާތުން އެއްބަސްވުމާ ޖެހޭގޮތަށް ހަމަޖެހިގެން
މަޝްވަރާކުރެއްވުމުގެ މަރުޙަލާ ނިމުމުން ކަމުގައިވެސް ދަންނަވަމެވެ.

އިޙްތިރާމް ޤަބޫލުކުރެއްވުން އެދެމެވެ.

٠٤ شعبان ١٤٣٧
11 މޭ 2016

ގާއިމުކުރީ

ޝަފީޤް ސައީދު
މިނިސްޓްރީގެ ނައިބު

ހުސައިން ކާއިޒެއަރ ޒުރާފާޒިސް ޕްރައިވެޓް ލިމިޓެޑް (ފޯން: 3303585)
ހ. ބަނދޭސްގެ / މާލެ

ކޮޕީ: މޯލްޑިވްސް އިންވެސްޓްމަންޓް ޑިވެލޮޕްމަންޓް އޮތޯރިޓީ
މިނިސްޓްރީ އޮފް ފިނޭންސް އެންޑް ޓްރެޜަރީ

بسم الله الرحمن الرحيم

Ministry of Fisheries and Agriculture

Male', Republic of Maldives

ފިޝަރީސް ޒާތް ޢިބާދަތާ ގުޅޭ ގަވާއިދު ފޯރުކުރުމުގެ ދަށުން، ދިވެހިރާއްޖެ

(FRM)30-E/PRIV/2016/38 :ނަންބަރު

ރ. ހަނިމާދޫ ކައުންސިލް ކަނޑައެޅުނު ކުލަ ދަތުރުކުރާ ދޯނިތަކަށް ދަތުރުކުރުމަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި،

ވަކިކުރުމަށް ހަމަނުވެ ދެމިހުރުން.

ދ. ފިޝަރީސް ބަލަހައްޓާ ނަންބަރު (FRM)30-E/PRIV/2016/35 (21 ނޮވެމްބަރ 2016) ވާހަކަ ދަންނަވާ ލިޔުން.

ތިރީގައި ބަޔާން ކުރާ ގޮތުގެ ދަށުން، ދެން ކުރިއަށް ދަތުރުކުރާ ދޯނިތަކަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި، ހަނިމާދޫ ކައުންސިލް ކަނޑައެޅުނު ކުލަ ދަތުރުކުރާ ދޯނިތަކަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި، 2016 ނޮވެމްބަރ 19 ވާ ދުވަހުގެ ކައުންސިލް ބައްދަލުގައި ކައުންސިލް ގަވާއިދު ހެދުމުގެ ކޮމިޓީ ގެ ބައްދަލުގައި ކަނޑައެޅުނު ގޮތުގެ ދަށުން، ދ. ހަނިމާދޫ ކައުންސިލް ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި، 2016 ނޮވެމްބަރ 20 ވާ ދުވަހުގެ ކައުންސިލް ބައްދަލުގައި ކައުންސިލް ގަވާއިދު ހެދުމުގެ ކޮމިޓީ ގެ ބައްދަލުގައި ކަނޑައެޅުނު ގޮތުގެ ދަށުން، ދ. ހަނިމާދޫ ކައުންސިލް ކަނޑައެޅުނު ކުލަ ދަތުރުކުރާ ދޯނިތަކަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި، ހަނިމާދޫ ކައުންސިލް ކަނޑައެޅުނު ކުލަ ދަތުރުކުރާ ދޯނިތަކަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި، 2016 ނޮވެމްބަރ 27 ވާ ދުވަހުގެ ކައުންސިލް ބައްދަލުގައި ކައުންސިލް ގަވާއިދު ހެދުމުގެ ކޮމިޓީ ގެ ބައްދަލުގައި ކަނޑައެޅުނު ގޮތުގެ ދަށުން، ދ. ހަނިމާދޫ ކައުންސިލް ކަނޑައެޅުނު ކުލަ ދަތުރުކުރާ ދޯނިތަކަށް ދެވޭ ހުއްދަ ގެންގުޅުމާ ގުޅޭ ގަވާއިދު ހެދުމަށް ކަނޑައެޅުނު ގަޑި،

25 Annex I: Proof of EIA Submission to Atoll Council

Ibrahim Faiz <faiz@water-solutions.biz>

EIA Report of the proposed poultry farm project at N. Edhuffaru Mairah

1 message

Ibrahim Faiz <faiz@water-solutions.biz> Sun, Sep 4, 2016 at 12:26 PM
To: admnhr.noon@gmail.com

Dear Sir / Madam,

Please find the attached EIA Report of the proposed poultry farm project at N. Edhuffaru Mairah and the letter requesting for the receipt notification.

Kindly send us back the completed EIA receipt notification in the letter as soon as possible.

--
Kind Regards

Ibrahim Faiz
B.Sc (Environmental Management)
Junior Environmental Consultant

Water Solutions Pvt. Ltd.
1st floor, Ma. Fas Eri, Ameenee Magu, Male', Maldives
Tel: (960) 3341643
Fax : (960)3331643
E-mail: faiz@water-solutions.biz
Website: www.water-solutions.biz

2 attachments

2016-09-04 WS-LTR-087 - N. Atoll Council EIA Submision N. Ehdhuffaru Poultry Farm.pdf
332K

Ehdhufaru Paultry EIA 2016 Council Copy_opt.pdf
2867K

3923/2016

4/9/2016

09/09/2016

05/09/16

بسم الله الرحمن الرحيم

WS

Water Solutions Pvt. Ltd. Reg No: C-344/2005

Ma. Fas Eri, Ameenee Magu, Male', Maldives

ނަންބަރު: WS/LTR/2016/87

ށ. އަތޮޅު ކައުންސިލްގެ ރައީސް އަށް،

ވުދުން ސަލާމަށްފަހު ދަންނަވަމެވެ.

(އީ.އައި.އޭ) ރިޕޯޓާއި ބެހޭ

ށ. އެއްދުއްފަރު މައިރަނދުގައި ކުކުޅު ފާމެއް ހެދުމުގެ މަޝްރޫޢާއި ބެހޭ އެންވަޔަރަމަންޓް އިމްޕެކްޓް އެސެސްމަންޓް (އީ.އައި.އޭ) ރިޕޯޓް ގެ ކޮޕީއެއް މިސިޓީއާއި އެކު ތިޔަ ކައުންސިލްގެ މަޢުލޫމާތަށްޓަކައި ފޮނުވީމެވެ. އަދި މިސިޓީގެ ތިރީގައި އޮތް އީ.އައި.އޭ. ރިޕޯޓް ފީޑްބެކްގެ ސްލިޕް ފުރިހަމަ ކޮށްދެއްވުމަށް ފަހު ފޯމު ސޮފްޓްކޮޕީއެއް އަދި ފެކްސް (3331643) ނުވަތަ އީމެއިލް - (faiz@water-solutions.biz) - ކޮށް ދެއްވުން އެދި ދަންނަވަމެވެ.

އިޙްތިރާމް ޤަބޫލް ކުރައްވުން އެދެމެވެ.

04 ސެޕްޓެމްބަރ 2016 މ.

ޚާދިމުކުމް

މުޙައްމަދު ފުޟައިލް

އެޑްމިން އެގްޒެކެޓިވް

WATER SOLUTIONS PVT LTD
Reg No: C-344/2005
Rep of Maldives

ށ. އަތޮޅު ކައުންސިލްގެ އިދާރާ (ފޯން: 6560012) (Email: admnhr.noon@gmail.com)

އީ.އައި.އޭ ރިޕޯޓް ފީޑްބެކްގެ ސްލިޕް.

އީ.އައި.އޭ ރިޕޯޓްގެ ނަން: ށ. އެއްދުއްފަރު މައިރަނދުގައި ކުކުޅު ފާމެއް ހެދުމުގެ މަޝްރޫޢާއި ބެހޭ އެންވަޔަރަމަންޓް އިމްޕެކްޓް އެސެސްމަންޓް (އީ.އައި.އޭ) ރިޕޯޓް

ބައިވެރިވާ ފަރާތުގެ ނަން: [illegible]

މަޤާމު: ށ. އަތޮޅު ކައުންސިލް [illegible]

އިދާރާގެ ނަން: [illegible] ށ. އަތޮޅު ކައުންސިލްގެ އިދާރާ

ތާރީޚް: 04 ސެޕްޓެމްބަރ 2016 ގަޑި: 01:52

ސޮއި: ސިއްކާ: