INITIAL ENVIRONMENTAL EXAMINATION

For the Proposed installation of a Meterological Mast in Gaafaru island, North Kaafu atoll

Proposed by

STAR Renewables Consortium

Prepared by

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July 2010

Table of Contents

Table of Figures

Table of Tables

Declaration of the Consultant

I certify that the statements made in this Initial Environmental Examination are true, correct and complete to our understanding and knowledge of the proposed project and its location.

Name: Abdul Aleem, EIA 09/07

Signature:

Date: 24 July 2010

Non-Technical Summary

The purpose of this Initial Environmental Examination (IEE) report is to fulfil the requirements of the Environment Protection and Preservation Act to undertake an assessment of effects on the natural and human environment of the proposed installation of a meterological mast in the island of Gaafaru.

The project involves construction of a meteorological mast commonly called "Met Mast" as the first phase of a much larger project, Development and operation of a wind park on the reef of Gaafaru. The development and operation of the Wind Park is a priority for the Government of the Maldives in order to meet the "Carbon Neutral Maldives 2020" strategic goals.

In order for this wind park to be feasible, adequate data has to be collected. This proposed project is therefore the first phase of the project which involves installation of an 80 meter tall mast in the island of Gaafaru.

The project is proposed in an area of the island where presently there is only boat building activities and the area being open pose no threat to any terrestrial tree species. The project does not involve cutting of any trees to erect the mast and hence is not considered to be environmentally damaging. The mast will be placed on concrete footings which will be buried at a depth of 5 feet and hence ensure that a firm support is provided. A total of seven footings will be constructed and this itself does not pose any environmental threats.

The positive impacts or benefits of the project are enormous. These include, the collection of long term regional weather data that is not presently available in Maldives, promotion of renewable energy and increasing the awareness of renewable energy among the public, and lastly but not least, indirect social benefits from the project that results in increased visitors to the island by the project personnel. If data collected in this phase is adequate and feasible, the wind farm project in Gaafaru will take place and hence will bring enormous economic benefits to the island and the country.

There are very few environmental impacts and they are also considered to be negligible or very minor.

The project is therefore not considered to be of any threat to the environment, but has more social and economic benefits.

1 Introduction

1.1 Introduction

This Initial Environmental Examination (IEE) report has been prepared to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives to assess the impacts of the proposed construction and installation of the metrological mast in Gaafaru island, north Male' atoll.

The construction of the meteorological mast is the first phase of a much larger project, Development and operation of a wind park on the reef of Gaafaru.

Following is an outline of the larger project for which the meteorological mast is installed.

- Development and operation of a wind park on a reef on the Gaafaru atoll near the capital city of Male' with a projected total installed capacity of up to 75 MW (the Wind Park) , and

- Development and operation of a Gas-to-Electric power plant as back-up power source near the capital city of Male', with a projected total installed capacity of up to 50 MW (G-t-E Plant);

The development and operation of the Wind Park is a priority for the Government of the Maldives in order to meet the "Carbon Neutral Maldives 2020" strategic goals and in order to achieve this, G-t-E Plant is a crucial intermediary step in order to secure a stable and reliable switch for the operation of the Wind Park.

In order for this project to take place, adequate bankable data on wind needs to be collected. Therefore it is important to have a metrological mast set up on the island of Gaafaru to produce Bankable Data for a period of less than 18 months in order to cover both the seasons the Maldives. This Met Mast will gather the necessary information at levels of 50 and 80 meters above sea level to ascertain the viability of the Wind Park project at this location. These readings will have to validate the assumptions made earlier on basis of the NERL data sheets which were used to form the initial numbers. In the meantime, planning and engineering will based on the existing available information.

This IEE will therefore focus on the construction and installation of the meteorological mast only.

1.2 Aims and Objectives of the IEE

The main objectives of the report is to address the potential adverse and positive environmental impacts of constructing and installing the meterological mast in Gaafaru island, north Male' atoll.

The report also provides legal protection with regard to the proposed development. From the perspective of the Proponent, the main objective of the IEE is to fulfil the obligations of the proponent to undertake an EIA as required by Clause 5 of the Environmental Protection and Preservation Act of the Maldive. In doing so, the IEE establishes qualitative and quantitative values for the existing environment enabling future generations to benefit from the information and to appreciate the concerns of the present generation with respect to the environment. Furthermore, the IEE emphasizes the need for the present generation to be responsible for their actions and to minimize the burden they place on the environment.

2 IEE Implementation

This EIA was carried out by Water Solutions Pvt. Ltd. The IEE team members include local expertise in environmental impact assessment, environmental engineering, and coastal management. The team members include:

- Ahmed Jameel, B.Eng., Environmental Engineering
- Abdul Aleem, MPH and BSc. Environmental Health
- Mohamed RIyaz, Surveyor
- Adrien Cebrian, Coastal Engineering student
- Hamdhulla Shakeeb, Surveyour

3 Project Description

3.1 The Proponent

The project is proposed by Star Renewables Consortium. The project will be undertaken together with the local partner, Maldive Investments Holding Pvt. Ltd. MIH is the local agents for the STAR RENEWABLE ENERGY CONSORTIUM In the Maldives. Omar Maniku is the Managing Director. Omaru Manik (Maizaan) is a well known businessman in the Maldives who runs many successful businesses throughout the Maldives.

3.1.1 STAR RENEWABLES CONSORTIUM

The STAR Renewables Consortium is a formed by a group of partners led by Saudi Trading and Resources Company Limited (STAR) and which brings together into a consortium the critical professional skills, contacts, expertise and financing capabilities to deliver the Project for STELCO.

The principal members of the Consortium are as follows:

1. STAR (Project Lead)
2. Jirehouse (Project Support)
3. 2SQR (Project Technical Lead)
4. Windcon Global Services (Project Technical Support)

STAR

Saudi Trading and Resources Co Ltd is a private company based in Riyadh, Saudi Arabia and engages in a wide range of investment activities in the Gulf, such as retail, telecommunications and information technology, real estate, travel and tourism, financial services and insurance brokerage as well as energy projects. It is active in entering into key strategic partnership and joint venture relationships in the Gulf with major international companies and conglomerates, e.g., Reuters, AIG.

It is providing the strategic and financial lead to the Project.

Jirehouse

Jirehouse engages in a number of private finance initiatives in the UK and internationally for both its own account as well as for its clients. Jirehouse provides a wide range of private international legal, tax and fiduciary services to a diverse range of individual and corporate clients through Jirehouse Capital and Jirehouse Capital Trustees Limited, both English legal practices and which are regulated by the Solicitors Regulation Authority. It also has trust and fiduciary affiliates based in Nevis, Luxembourg and Netherlands (www.jirehouse.com).

It is providing legal and financial support to the Project.

2SQR-Energy

The goal of the 2SQR-Energy Group *("To Secure Energy Group")* is to be a leading competitive and innovative private energy group, committed to the production and application of renewable energy.

The group has taken on renewable energy innovation as its mission, established CO2 reduction business as its core strategy, and regards the clean production of bio mass-based energy as a major breakthrough.

The activities of the 2SQR Energy Group range from bio fuels to wind energy and biomass-based energy. 2SQR Energy Group also has on-going efforts in developing innovative energy technologies with leading Cleantech institutes to address the issues of energy conservation and environmental care.

2SQR-Energy Group will co-operate closely with their Dutch partner IV-Group (www.iv-group.nl) on the engineering and project management (EPCM) side to ensure all necessary knowledge and experience is available to successfully implement the project. The scope of a EPCM service will vary depending upon the stage of project development at contract award, project size and client requirements. The most common EPCM role covers conceptual design through to commissioning and hand over. 2SQR-Energy and their partners have the capability to fully execute this scope.

If the feasibility study conducted has proven the Project to economical and technical feasible, 2SQR-Energy can develop a basic design for the Wind Park and the G-t-E Plant. Most of the technical capabilities are either in-house or will be brought into the Project through partnership with IV-Group and other specialised engineering companies, with whom 2SQR-Energy have a long relationship.

Windcon Global Services

Windcon Global Services Limited (WGS) is an Ireland based company providing support project services to its affiliates worldwide. The WGS group has extensive experience in the field of wind farm and solar park design and construction, having been involved in the construction and maintenance of leading wind park farms in UK, Ireland, Portugal, USA, Canada and Australia. It offers turnkey solutions to its customers including design, implementation and support. The WGS group has successfully implemented in excess of 1000 MW wind farm projects worldwide.

It will be providing the technical support for the Project.

3.1.2 Project Personnel

The key individual representatives for the Consortium, together with their local Maldivian partners, Maldive Investments Holding Pvt. Ltd) (**MIH Group**), are as follows:

- Project Co-ordinators: Khalid al-Sharfa (STAR Representative)
- Stephen David Jones (Jirehouse Representative)
- Project Director: Rene Prop (2SQR Representative)
- Assistant Project Director John Fabby (WGS Representative)
- Project Financing: Khalid al-Sharfa (STAR Representative)
- Stephen David Jones (Jirehouse Representative)
- Erik Huis (2SQR Representative)
- Wind Turbine Engineering: John Fabby (WGS Representative)
- Engineering Support:
- Wind Park IV- Group
- G-t-E Plant IV- Group
- Legal and Regulatory Matters: Stephen David Jones (Jirehouse Representative)
- Emir Habibi (STAR representative)
- Environmental Assessment: TBA

- Permits and licenses: Omar Maniku (MIH Group)
- STELCO/Government liaison: Omar Maniku (MIH Group)
- Public relations (International): Khalid al-Sharfa (STAR Representative)
- Public relations (Local): Omar Maniku (MIH Group)

This team will ensure that all the required multi-disciplined engineering and project management resources to cover all aspects of the entire Project are fully provided for:

3.2 Project Location

The proposed project takes place in Gaafaru island in North Male' Atoll, Maldives. Gaafaru is formed on the eastern rim of Gaafaru atoll, which is a natural atoll which is approximately 7.5 kilometers from north to south and 15 km from east to west. The atoll has an inner deep lagoon and a peripheral shallow lagoon. The island is formed on the eastern tip of the atoll. Gaafaru is about 60 km north of Male', the capital city.

Figure 1:Location of Gaafaru (Map: Water Solutions)

The population of Gaafaru is about 1500 and the island is 525 meters in length and 300 meters wide. There are three restaurants in the island and 4 shops. The main income generating activities for the islanders is through fishing and also income generated from the government jobs such as health centre and island office.

Figure 2: Aerial view of Gaafaru in Male' atoll with the proposed location for the Met Mast marked in red (Photo: Google Earth)

3.3 The Project

The project involves the construction and installation of an 80 meter meterological mast on the western tip of the island.

The aim of this mast is to collect wind data for at least 18 months in order to make sure that the wind speeds in this region at heights between 50 to 80 meters is adequate for wind turbines. The aim of the mast is therefore to collect data for the Gaafaru wind farm project.

The installation of the mast is a simple project that does not have any environmental impacts at all. The project involves construction of six (7) concrete foundation pads of same dimensions. They will be placed in a triangle with two concrete pads on each axis, where the centre will be the location of the mast. The rest of the six pads will be used to tie the supporting steel wires that will run from the base of the concrete pads to the mast.

The detail drawings of the mast and the concrete pads are attached as an annex.

3.3.1 Construction Methodology

The installation of the mast would be according to the following steps.

The mast is assembled in pieces, meaning that each length of the mast will be bolted.

The location where the concrete foundation pads are to be constructed will be fixed using a total station.

Once the location is fixed, the concrete footings will be constructed by excavating the foundation area to five (5) feet depth. Concrete and the steel framework for the footings will then be placed and left for curing.

Once the footings are placed, the steel sections of the mast will be assembled one by one. During the assembly process, the reinforced steel cables will also be fixed from the mast to each of the six foundation pads.

The weather data collecting devices are simple computer operated units that will be fixed at 50 and 80 meters.

Figure 3: The met mast is delivered on site in sections in a container. Once the foundations are in place, they will be fixed on top

3.4 Project Implementation

The proposed works are expected to be started by early August 2010 and last up to one month. This includes the construction of foundation pads and the assembly of mast.

3.5 Project Boundary

The project is limited to the western corner of the island where the waste disposal site and boat yard is currently at. The boundary of the project is outlined in the site plan attached as an annex.

3.6 Project Justification

3.6.1 Energy Consumption in the Maldives

An energy study conducted in 2002 indicated that about 50% of the country's primary energy is used for electricity generation and nearly over 40% used for transport and fishing (transport of fishing vessels inclusive).

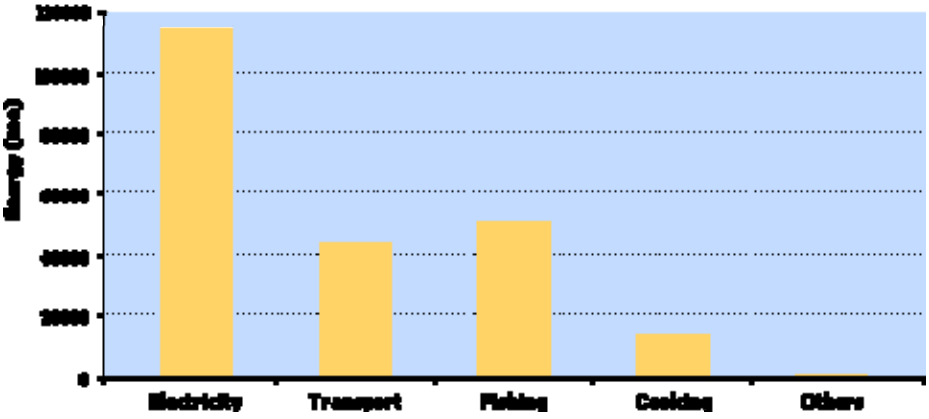

Figure 4:Primary energy usage for different sectors in the Maldives (2002) – source MEEW

3.6.2 Renewable energy use

The Government of Maldives is aware of global warming and subsequent climate change scenarios particularly on the small island nations like the Maldives. Fossil fuel used as source of energy is major contributor to global warming and renewable energy technologies are constantly sought after by the Maldives. However, according to the Ministry of Environment, "RE technology applications in the Maldives are limited to mainly solar photovoltaic systems in navigation lights and telecommunication systems, as well as modest use of water heating in Male' and in resort islands. Although the country is expected to continue to rely on imported fuels to meet its energy needs, some RE resources are recognized as potential alternatives, being indigenously available, having minimal environmental impacts and contributing to the balanced provision of services to dispersed island communities" (MEEW 2007).

The Government is committed to promoting sustainable energy in the country and is currently in the process of formulating policies, plans and activities on energy conservation, efficiency and renewable energy use. MEEW is also now actively pursuing several inter-related initiatives to overcome the existing barriers to the widespread development and application of renewable energy technologies. The Ministry has recently

launched an energy initiative named SMILES (Strengthening Maldivian Initiatives for a Longterm Energy Strategy).

3.6.3 The importance of this project

The development and operation of the Wind Park is a priority for the Government of the Maldives in order to meet the "Carbon Neutral Maldives 2020" strategic goals and in order to achieve this, G-t-E Plant is a crucial intermediary step in order to secure a stable and reliable switch for the operation of the Wind Park. Changing from predominantly diesel driven engines to more sustainable energy solutions therefore not only improves the country's performance towards Carbon neutrality, but also make the Maldives less dependent on, gradually but surely, the rising prices of fossil fuels.

The Government has chosen, among others, to opt for wind technology to reach their strategic 2020 goals. The capital city of Male' currently consumes more than 50 MW. The wind farm project is projected to supply the greater Male with the minimum capacity of 50 MW from the installed capacity of 75 MW of wind power from the projected wind farm in Gaafaru which is approximately 60 Km and the back up at Hulhumale.

The location has been chosen because NREL ocean satellite data in combination with local wind readings (taken from 2003) have shown that the area between $4^0$30' N and 6^0 30' North Latitude has good-to-excellent wind resources. Male' is at 4^0 11' N whereas Gaafaru is at 4^0 45' N.

The wind availability at this location is expected to generate power only during approximately 60% of the year (7 months, May to November). The average wind speed in the high season exceeds 5 to 6 m/sec in the lower heights, whereas in the low season winds are expected to be between 3 and 4 m/sec, which is on the edge of the cut in wind speed of 4 m/sec. However, and more importantly, these readings were only taken at a height of **10 meters**.

Larger wind turbines of 2 – 3 MW with a hub height of 80 metres require mean wind speeds of approx 15 m/sec and whether these mean wind speeds are available at the required height of 80 metres needs to be determined through accurate wind measurements. Therefore, on its face, there is a case for a viable project but it is far from conclusive until the wind measurements are taken at the requisite hub heights.

In addition to the above, there also has to be an overall assumption that the Wind Park will be, by definition, an offshore Wind Park because of its close proximity to the sea (and indeed is likely to be built on shallow sea bed rather than on reclaimed land). This will be subject to feasibility studies

Therefore it is important to have a metrological mast set up on the island of Gaafaru to produce Bankable Data for a period of less than 18 months in order to cover both seasons in Maldives. This Meteorological Mast or more commonly called "Met Mast" will gather the necessary information at levels of 50 and 80 meters above sea level to ascertain the viability of the Wind Park project at this location. These readings will have to validate the assumptions made earlier on basis of the NERL data sheets which were used to form the initial numbers. In the meantime, planning and engineering will based on the existing available information.

4 Project Setting

4.1 Introduction

This section will look at the different policies and legislations and how the project conforms to existing policies, plans, guidelines, regulations, laws and international conventions.

Since environmental legislation is at its infancy in the Maldives, there are very few environmental policies, regulations or laws in the country. The main legal instrument is the Environmental Protection and Preservation Act (Law No. 4/93) of the Maldives passed by the Citizen's Majlis in April 1993. This Act provides the Ministry of Environment with wide statutory powers of environmental regulation and enforcement. This umbrella law covers issues such as environmental impact assessment, protected areas management and pollution prevention.

Of relevance is also the national energy policy, which was drafted recently. A national energy policy was recently introduced and the main points of this policy are elaborated in the relevant section in this Chapter. This chapter also looks at other relevant national policies, guidelines and regulations which may have some relevance to the project.

4.2 Overview of environmental regulatory framework

It is necessary to provide an overview of the different environmental laws, regulations, policies, guidelines and standards in this document to guide the Proponent. However, it should be noted that not all these have specific relevance to the Project. Those legislative elements which are of specific relevance have been indicated within the document.

4.2.1 Environmental Protection Act

The main legal instrument pertaining to environmental protection and preservation for sustainable development in the Maldives is the Environmental Protection and Preservation Act (Law No. 4/93) of the Maldives passed by the Citizen's Majlis in April 1993. The Articles of the Environmental Protection and Preservation Act (Law No. 4/93) address the following aspects of environmental management:

- Guidelines and advice on environmental protection shall be provided by the concerned government authorities;
- Formulating policies, rules and regulations for the protection and conservation of the environment in areas that do not have a designated government authority carrying out such functions shall be carried out by MEEW;
- Identifying and registering protected areas and natural reserves and drawing up of rules and regulations for their protection and preservation;
- An EIA shall be submitted to MEEW before implementing any developing project that may have a potential impact on the environment;
- A project that has any undesirable impact on the environment can be terminated without compensation;
- Disposal of waste, oil, poisonous substances and other harmful substances within the territory of the Maldives is prohibited. Waste shall be disposed of only in the areas designated for the purpose by the government;

- Hazardous, Toxic or Nuclear Wastes shall not be disposed of anywhere within the territory of the country. Permission should be obtained for any transboundary movement of such wastes through the territory of Maldives;
- The Penalty for Breaking the Law and Damaging the Environment are specified; and
- The Government of the Maldives reserves the right to claim compensation for all damages that are caused by activities that are detrimental to the environment.

4.2.2 Second National Environment Action Plan

The aim of NEAP II is to protect and preserve the environment of the Maldives and to sustainably manage its resources for the collective benefit and enjoyment of present and future generations.

Main strategies of the NEAP II are:

- Continuous assessment of the state of the environment in the Maldives, including impacts of human activities on land, atmosphere, freshwater, lagoons, reefs and the ocean; and the effects of these activities on human well-being;
- Development and implementation of management methods suitable for the natural and social environment of the Maldives, and the maintenance or enhancement of environmental quality and the protection of human health, while at the same time using resources on a sustainable basis;
- Consultation and collaboration with all relevant sectors of society to ensure stakeholder participation in the decision making process;
- Preparation and implementation of comprehensive national environmental legislation in order to provide for responsible and effective management of the environment; and
- Adhering to international and regional environmental conventions and agreements and implementation of commitments embodied in such conventions.

NEAP II specifies priority actions in the following areas.

- climate change and sea level rise
- coastal zone management;
- biological diversity conservation;
- integrated reef resources management;
- integrated water resources management;
- management of solid waste and sewerage;
- pollution control and management of hazardous waste;
- sustainable tourism development;
- land resources management and sustainable agriculture; and
- human settlement and urbanisation.

NEAP II contains environmental policies and guidelines that would be adhered to in the implementation of the proposed project activities.

4.2.3 National Biodiversity Strategy and Action Plan

The goals of the National Biodiversity Strategy and Action Plan are:

- Conserve biological diversity and sustainably utilize biological resources;
- Build capacity for biodiversity conservation through a strong governance framework and improved knowledge and understanding; and
- Foster community participation, ownership and support for biodiversity conservation.

In implementing the proposed project activities due care would be given to ensure that the national biodiversity strategies are adhered to.

4.2.4 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 rules and regulations for their protection and preservation. At present there are no rules and regulations made available to the public on the designation and protection of habitats and heritage areas.

The proposed project does not have any negative impact on any protected areas or sensitive areas.

4.2.5 National energy policy

The national energy policy which was recently launched is of particular relevance to the proposed project. The stated objectives of the energy policy are:

- Ensure a continuous and economically viable diversity of energy supplies to sustain socio-economic development, without compromising the environment, health and safety.
- Guarantee accessibility of affordable and reliable energy services to all people.
- Enhance national energy security by promoting indigenously available renewable sources of energy while creating new jobs and strengthening the economy.
- Protect the environment and health of the people by ensuring environmentally sound energy supply and usage.
- Promote energy conservation and energy efficiency to achieve optimum economic use of renewable and non-renewable sources of energy and reduce consumption without lowering the quality of service rendered.
- Ensure transparency of energy sector planning and operations to attract both national and international investors where appropriate.

The Energy Policy calls for increasing the share of renewable energy use in the Maldives and for the use of "indigenously available" sources and energy efficiency, which are the primary objectives of the proposed project.

4.2.6 Regulation on providing electricity services

Under this regulation, construction of the powerhouse and, handling and storage of fuel must be according to standards issued by Ministry of Construction and Public Infrastructure and MEEW respectively. This regulation is not of specific relevance to this project.

4.2.7 Ban on coral mining

Coral mining from the house reef and the atoll rim has been banned through a directive from the President's Office dated 26th September 1990. Coral will not be mined and used in any of the civil works including the construction of the foundation pads in the proposed project.

4.3 Relevant International Environmental Legislation

The Maldives is party to several international conventions, treaties and protocols on environmental protection and preservation as well as sustainable development. These include:

Maldives is party to several international conventions, treaties and protocols on environmental protection and preservation as well as sustainable development. Of the several conventions ratified by the Maldivian Government, the following are of some relevance to the proposed project:

- **United Nations Convention on Climate Change (UNFCCC) and the Kyoto Protocol** which aims at minimising greenhouse gases to reduce or combat potential impacts of global climate change, global warming and associated effects such as sea level rise, which are thought to have devastating impacts on the Maldives, a fragile small island nation. The proposed project has specific relevance to these conventions. The only negative aspects of the proposed project that applies to this convention are the use of barges and site mobilisation machinery during the construction phase, especially their emissions, as well as the use of pumps which consume electricity from diesel generators emitting greenhouse gases. These aspects are of little relevance.
- **Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for S. Asia**. The objectives of Male' Declaration include assessing and analyzing the origin and causes, nature, extent and effects of local and regional air pollution; developing and/or adopting strategies to prevent and minimise air pollution; setting up monitoring arrangements beginning with the study of sulphur and nitrogen and volatile organic compounds emissions, concentrations and deposition. The proposed project aims at reducing atmospheric pollution and neutralising the impact of air travel to the Maldives.
- **United Nations Convention on Biological Diversity (UNCBD)** with the objective of "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". Maldives was one of the first nations to ratify UNCBD. Maldives has developed the National Biodiversity Strategy and Action Plan (NBSAP) in 2002. Formulation of NBSAP was through wide consultation and extensive stakeholder participation. The proposed project will ensure that biological resources are not threatened through appropriate project management and continuous environmental monitoring.

4.4 Framework for Environmental Assessment

The enforcement of EIA regulation in the country began with the formulation of the Environmental Protection and Preservation Act (Law 4/93) in April 1993 in order to protect, preserve and safeguard the fragile environment of the country. The Environmental Act gives very high prominence to safeguarding the environment with regard to all the development activities. It is currently implemented by the Environmental Protection Agency of the Ministry of Environment. EPA's mandate includes:

- organizing, developing and managing systems for environmental monitoring, including periodically evaluating the actual state of the environment, and forecasting environmental changes;
- evaluating environmental impact assessment reports for new projects and monitoring reports for existing facilities; and
- issuing and revoking certificates based on compliance with environmental standards.

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

4.4.1 Environmental Impact Assessment Regulation

The Ministry of Environment, Energy and Water has issued the EIA Regulations 2007, which came into effect from 15 May 2007. The objectives of this Regulation is: streamlining the project approval process; guaranteeing consistencies in the assessment of similar proposals; providing instructions on preparing quality EIA documents; improving coordination among government agencies; and ensuring greater transparency and accountability in decision-making. Although the Regulation has certain drawbacks, it paves way for stringent EIA compliance procedures in the Maldives.

This IEE has been prepared according to the requirements of the EIA Regulations. A scoping process was undertaken, based on which the Ministry decided that an IEE would be sufficient for the proposed project.

4.5 Environmental Permits required for the Project

The only environmental permit to enable construction work under this project to proceed would be a decision regarding this IEE from the Ministry of Environment, Energy and Water. The IEE/EIA Decision Statement, as it is referred to, shall govern the manner in which the project activities must be undertaken. This IEE report assists decision makers in understanding the existing environment and the potential impacts of the project. The Decision Statement will only be given to the Proponent after a review of this document following which the Ministry may request further information, or provide a decision if further information is not required. In some cases, where there are no major environmental impacts associated with the project, the Ministry may provide the Decision Statement while at the same time requesting further information. Due to the nature of the proposed project, it is not expected that the Ministry would ask for intensive environmental monitoring and reporting.

5 Existing Environment

5.1.1 General Climatic Condition

Site specific data on climate were not taken, but nationwide climatic conditions were taken into consideration. There is very little variation in the climate from one part of the country to another.

The Maldives are located in the Monsoon Belt in the North Indian Ocean. The climate is divided into two distinct periods. The North-East monsoon lasts from December to April while the South-West monsoon lasts from May to October. These monsoons are relatively mild because of the country's location on the equator. The North-East monsoon is characterised by gentle and dry winds while the south-west monsoon brings with it heavier rains. The winds are usually stronger during the south west monsoon especially during June and July. The relative humidity generally ranges between 75 to 80%.

The Maldives experience a tropical climate with a mean annual temperature of 30.8°C with a day time high of 32 °C, night time lows rarely drop below 25.5°C (SoE 2004). The average annual rainfall amounts to 1900mm, and there is an increase in the rainfall from north to south. The average annual rainfall in the north is 1977mm; in the south, it is 2470mm (Pernetta 1993). This indicates that the south is wetter than the north; the wettest months are May, August, September and December. The driest are January to April. Open water evaporation rates are in the range of 6mm per day; transpiration from plants is also high (SoE 2004).

5.1.2 Currents

The currents which affect Gaafaru can be expected to be tidal currents, wind-induced currents, wave-induced currents and/or oceanic currents. Available data indicates that wind driven currents are the dominant form of currents around Gaafaru as is the case for the other islands of the Maldives. Wave induced currents in the form of overwashing, and in some locations long shore currents due to waves breaking on the reefs obliquely to the line of the reef, also affect the current regime. Due to the limited tidal range, tidal currents tend to have a very weak influence on the overall current patterns within the reefs and around the islands.

5.1.3 Waves

Gaafaru is exposed to short wind-generated waves from south and east at the island is on the southeastern rim of Gaafaru Atoll, with a channel south and Kaashidhoo channel north of the Gaafaru atoll. Thereofore, the impact of oceanic swells and surf waves are experienced on the eastern, southern and western shore.

5.1.4 Tides

Tides in the Maldives are a mixed diurnal – semidiurnal type. The maximum tidal range in most locations is about 1m. No measurements of the tidal variation at Gaafaru were taken. The Hulhulé station is the closest tidal station. There is very little variation in tidal changes between Hulhulé and Gaafaru. Hence, tide records for Hulhulé are refered.

The tide height varies between 88 cm and 110 cm during the spring tide, and its range is as small as a few centimetres during the neap tides. The height of the tide is also affected by the weather. Winds influence the water level and high sea levels outside the atolls are caused by storm surges and wave set-up. The tidal data extracted from 'Admiralty Tide Tables – Indian Ocean and South China Sea, Vol3 (NP203)', 2005 are given in Table 5.3.

Table 1:Tidal Data for Hulhulé

Type	Level (m MSL) at Port of		
	Male	Addoo	Ihavandhoo
Highest Astronomical Tide (HAT)	+0.64	+0.64	+0.64
Mean Higher High Water (MHHW)	+0.25	+0.24	+0.32
Mean Lower High Water (MLHW)	0.15	0.14	0.22
Mean Sea Level (MSL)	0.00	0.00	0.00
Mean Higher Low Water (MHLW)	-0.15	+0.04	-0.08
Mean Lower Low Water (MLLW)	-0.35	-0.26	-0.38
Lowest Astronomical Tide (LAT)	-0.56	-0.56	-0.56

Source: Admiralty Tide Tables, 2005

5.2 Existing terrestrial environment

This section covers the existing terrestrial environmental conditions of the project boundary and the nearby areas that are likely to be impacted by the proposed works.

The installation of the meteorological mast involves construction of concrete foundation pads and it is being done in an open area of the island. There are no significant trees or mature trees in the vicinity of the project location mainly because this is the area of the island which has been reclaimed few years ago for the harbour construction. As s result, only limited and few trees are found in this area.

5.3 Methodologies of data collection

The methodology for data collection is by visiting the island and investigating the site using multiple field data collection techniques. They are:

- Visual observations to ascertain the area impacted
- Photographs to complement the visual observations
- Ground water quality data collection using WQ meters
- Mapping the area and the nearby structures
- Habitat mapping by physically counting the number of trees. This method was used as the area has very limited amount of trees.

Data collection locations were referenced using handheld differential GPS (sub meter accuracy). These locations and the data collected using the GPS was fed into a GIS.

5.3.1 Condition of the environment in the project area

The marine environmental concerns in the project area are trees. However, there are very limited tees in the project area and hence it pose no issues as far as terrestrial habitat destruction is concerned. The Met Mast will be erected on open area supported by cables running from top to the ground level, which will be fixed to foundation pads laid on the ground in a triangular axis. The foundations will be laid at 5 feet below the ground.

Below are the results of the terrestrial mapping survey results.

Name of tree species	Aprox Height (m)	Frequency
Dhiggaa (Hibiscus tiliaceus)	5	2
Dhiggaa (Hibiscus tiliaceus)	4	5
Magoo (Scaevola taccada)	2	5
Magoo (Scaevola taccada)	2	6
Coconut palm (Cocos nucifera)	3	5
Kuredhi (Pemphis acidula)	10	3

Table 2: Terrestrial survey results

Below are the results of the groundwater quality tests.

Parameter	Aprox Height (m)
Electrical Conductivity (EC)	746 us/cm
Temp (C)	28
Salinity (parts per thousand)	0.3
TDS (mg/L)	336
pH	8.3
Nitrates (mg/L)	2.3
Phosphates (mg/L)	0
Sulphates (mg/L)	0

Table 3: Terrestrial survey results

The following photos illustrate the condition of the existing environment where the met mast will be constructed.

The proposed area where the met mast will be constructed. This area is clear of vegetation

The proposed location

Boathouse adjacent to the proposed location.

6 Environmental Impacts

6.1 Introduction

This section identifies potential environmental impacts due to the construction and installation of the Met Mast in Gaafaru, north Male' atoll. This project has more positive social impacts rather than any negative environmental impacts.

6.2 Impact Identification

Impacts on the environment were identified and described according to their location/attribute, extent (magnitude) and characteristics (such as short-term or long term, reversible or irreversible) and assessed in terms of their significance according to the following categories:

Positive Impacts or Benefits – the impact is of benefit (desirable) to the local communities, business as well as the environment;

Negligible– the impact is too low to be of concern at all

Minor adverse – the impact is undesirable, but accepted;

Moderate adverse – the impact gives rise to some concern, but is likely to be tolerable in the short-term (e.g., construction phase), or will require a value judgement 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 in, or the halting of, the project.

Since it is difficult to distinguish between direct impacts (i.e., resulting directly from a specific activity) and indirect impacts (i.e. induced by a series of ecological, social or economic knock on effects and bearing no apparent connection to any specific activity), such distinctions have not been made. All possible impacts that may be related to project specific activities are identified.

Table 4: Summary of impacts, characterization and mitigation measures

Environmental and social Aspect	Potential Impacts to the environment / society	Mitigation Measures proposed	Magnitude of impacts (negligible/Minor/minor adverse/moderate adverse/major adverse/ positive)	Significance of the impact (low/moderate/high)	Duration of Impact	reversibility	Cost of mitigation
Impacts on the terrestrial environment	No impact as the area is open land with few young trees and mainly bushy vegetation. The orientation of the foundation footings have been designed to avoid any buildings and trees. No site clearance is needed in this area, hence no green or other solid waste aniticpated.	Re-orient the foundations so that no trees need to be removed for the project.	Negligible	Low	Short term	Reversible	No cost involved in mitigating this.
Visual Impact	Erection of an 80 meter tall mast will have an artificial element to the surrounding. Thus, there will be a visual impact. However, the island already has Wataniya and Dhiraagu towers, almost as same height. Hence, this is not a concerning visual impact.	No mitigation can be applied for this component.	Moderate Adverse	Low	Long term	Reversible	No cost involved in mitigating this.
Impacts on groundwater quality	The foundation footings will be excavated to 5 feet deep and hence, the water table in this area would be temporary affected. There are no households nearby who use groundwater .	Excavating to the only required depth and filling as soon as the concrete is dry. If dewatering is required, then it should be done as per the MWSA guidelines. No major dewatering is anticipated as the foundation pads are	Minor	Low	Short term	Reversible	MRf 3,500.00

Environmental and social Aspect	Potential Impacts to the environment / society	Mitigation Measures proposed	Magnitude of impacts (negligible/Minor/minor adverse/moderate adverse/major adverse/ positive)	Significance of the impact (low/moderate/high)	Duration of Impact	reversibility	Cost of mitigation
		relatively very small.					
Noise impacts	Not considered to be significant as the location is in an industrial area of the island where boat building activities are presently undergoing. This project will not generate any noise than the ambient noise levels in this area.	Limiting the working hours / days to the shortest possible time and completing the work as soon as possible.	Negligible	Low	Short term	Reversible	No cost involved in mitigating this.
Safety issues and precautions	Not considered to be a safety hazard to the public as the mast will be erected in an industrial area, away from the population centre. The mast will be fixed with steel reinforced cables to maintain its position.	Ensure that the steel cables are fixed as per the manufacturer's guidelines. Ensure that the concrete footings are placed appropriately and that they are constructed as per the engineers guidelines.	Minor	Low	Short term	Reversible	Cost is indirect, that is the cost of engineering drawings and supervision of the works.
Social impacts	The project will have positive social impacts. The construction of the mast brings people to the island, including technical expertise, workers and others who oversee the project. There is a an increase in demand for accommodation and local purchase of goods and other items. Hence, the local economy		Positive	High	Long-term	-	-

Environmental and social Aspect	Potential Impacts to the environment / society	Mitigation Measures proposed	Magnitude of impacts (negligible/Minor/minor adverse/moderate adverse/major adverse/ positive)	Significance of the impact (low/moderate/high)	Duration of Impact	reversibility	Cost of mitigation
	is stimulated . In the long term, the met mast provides valuable weather data for the entire country that will be used as a basis to design and implement renewable energy projects in the country.						
Waste impacts	The construction of the mast is not going to generate any waste except for very minor quantities. The project will utilize approximately 200 bags of cement and hence the empty cement packages will be the most significant waste generated. Other materials such as aggregate will only be brought to the required quantity. No site clearing is required, hence no green waste will result.	Disposing the empty cement packages to the waste management area which is adjacent to the proposed project location	Minor	Low	Short-term	Irreversible	-

7 Stakeholder consultation

This chapter explains the outcomes of the stake holder consultations held. Stakeholder consultations were undertaken with key agencies, groups of people randomly selected from the island. The following is the outcome of stakeholder consultations undertaken with relevant groups and people.

7.1 EIA scoping meeting and consultations with the EPA and Energy Authority

An EIA scoping meeting was held at EPA participated by representatives from EPA, client, energy Authority and the consultants. Discussions were held among the groups about the project and which areas need to be focused for this project. In general the following issues were discussed.

- EPA advised the client and the consultant to focus on specific areas such as the terrestrial environment as well as the social environment.
- Emphasis is to be given as to how the waste management will b undertaken.
- EPA advised the consultant to undertake stakeholder consultations and to include public views in the IEE report.
- The report is to be compiled

7.2 Consultations with the island counselor

Consultations were held with Ahmed Azim, the island counselor and following are the outcomes of the consultation.

- The atoll office has leased the land to the proponent.
- Feels that this is a good project for the country and the island.
- At present, the island does not get many tourist visitors and as a result, there is very limited tourist business. If this project goes as per the plan, then it is anticipated that people and tourists would visit the island to see the wind farm and stimulate the local economy.
- Looks forward to the day that the wind farm project is implemented in the island.
- The project is very politicized by the island community meaning that some people who are against the project spread rumours about exaggerated negative impacts of the project.
- Does not feel that there is any negative environmental impacts of this project.

7.3 Consultations with the a contractor

Consultations were held with a local contractor to obtain his views on the project.
Name: Mohamed Naeem,
Age: 40 years
Profession: Construction worker

- As per the information received, this project is very useful.
- If the wind farm project is implemented, then he forsee enormous benefit for the country and the island as a whole.
- Is well aware of the different phases of the project.
- Does not feel that this project has an y negative environmental impacts.
- Worked in the first powerhouse project of the island and is well aware of the energy costs associated with diesel fuel. If this project is successfully, then there will be huge cost savings in energy.
- Feels that more tourists will be attracted to the island as a result of this project. It is anticipated that the wind farm, if implemented would attract visitors as this would be the first of its kind in the Maldives.

7.4 Consultations with Katheeb

Consultations were held with the Kuda Katheeb (island chief).
Name: Mohamed Ismail Fulhu,
Profession: Island Chief

- As the island is already saturated, he forsee that the expansion of the island would occur towards western lagoon and hence, do not see this project a problem.
- At present, the project location is empty and is mainly used for boat building.
- During the planning side, was not involved in the project and so is not very aware of the entire project.
- Feels that any projects in the island will have positive impacts.
- There will be increase in income and jobs to the islanders as a result of this project.

7.5 Consultations with an ordinary citizen

Consultations were held with an ordinary citizen
Name: Ibrahim Shafeeg
Age: 38 years
Profession: Carpenter

- Is well aware of this project.
- Feels that the community will benefit greatly from this project.
- Don't forsee any negative environmental impacts resulting from this project.
- Feels that this is a dream project and will not be able to see any project of this scale in his lifetime.
- Already this project has proved to be beneficial to the community. Many people including technical experts, construction workers and surveyours have visited the island as part of the project and as a result they have stimulated the local economy already.
- There will be lots of direct and indirect benefits of the project.
- Don't think that the mast will be a nuisance to the island and do not forsee any negative impacts to the island as this area is not planned for any purpose.
- Any person who is aware of this project is generally very positive about the project.
- There are people in the island opposed to the project, who are actually people not well informed about this project.

- Strongly believes that this project could be a reality now that the met mast will be installed in the island.

8 Environmental Monitoring

8.1 Introduction

The proposed project is the first of its kind in the Maldives and it is important that appropriate environmental supervision and monitoring be undertaken during the implementation of the project. Environmental monitoring is essential to ensure that potential impacts are minimized and to mitigate unanticipated impacts. Monitoring will be carried out as part of the environmental impact assessment and monitoring requirements addressed in this EIA report. The following table summarizes the aspects of monitoring.

Due to the nature of this project, very limited monitoring parameters will be observed and monitored.

8.2 Cost of Monitoring

The proponent has committed fully for the monitoring programme outlined in this report. The total cost of undertaking the regular monitoring is estimated to be US$300 per month. This cost will cover the salary of one project personnel based on the island, who will be the local representative in the island. Monitoring will be undertaken by this person.

8.3 Duration of Monitoring

Monitoring will be focused mostly during the construction period, which is to ensure that the foundation footings are placed as per the plan and that the met mast is erected and fixed adequately as per the planned methodology.

8.4 Methods of Monitoring

During the construction stage, onsite supervision of the construction will be undertaken to ensure that the work is according to the plan.

8.5 Monitoring Responsibility

Monitoring responsibility will be with the client and financial provisions will be made in the project to undertake the monitoring.

8.6 Monitoring Report

A detailed monitoring report will be compiled after the completion of the civil works.

8.7 Monitoring parameters

During the construction stage, the following monitoring parameters will be checked.

- Depth of excavation of the foundation pads
- Duration of the construction period

- Any complains by the public with regard to the project, either noise or any other.
- Monitor whether the orientation of the footings are placed as per the planned outline so that they do not interfere with any structures in this area.
- Any physical hazard or accidents recorded during the installation of the mast

Sources of Information

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9 Appendix: Terms of Reference for IEE

Environmental Protection Agency
Ministry of Housing, Transport and Environment
Male', Republic of Maldives

Terms of Reference for Initial Environmental Examination

The following is the TOR for undertaking the IEE of **the proposed Erection of the Wind Mast at K. Gaafaru, Maldives** based on the seoping meeting held on the 21st June 2010.

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

2. *Study Area - Specify the boundaries of the study area for the assessment.*

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

Task 1. Description of the Proposed Project --.

a) *Brief deseription of the proponent and proposed project components. A full description of how the project activities will be undertaken including work method for constructing structures in the coastal environment, how matured trees will be removed(if it is to be done), project concept, duration and schedule of the project, the relevant parts of the project, need and justification of the proposed changes.*
b) *Clearly labeled site plan of the development indicating the location of proposed activity, site plan indieating all existing structures shall also be included, using maps at appropriate scales where necessary.*
c) *inputs(e.g. manpower, machineries, energy and materials) and outputs(e.g. length of protection, quantity of sediment pumped) related to the proposed activities, project costs, their need and justification*

Task 2. Deseription of the Environment – include a description of the existing environmental conditions of the project site with photos of the site where relevant. 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 may be usefully applied to future monitoring.

Specific emphasis should be placed on the following environmental aspects of the project:

- *Ground water quality parameters shall specifically include;, salinity, pH, temperature and phosphates , sulphate, nitrates, COD*
- *Aviant fauna in the area,*
- *Methods used for field assessment*

Where baseline data is to be eollected, careful consideration must be given to the design of the survey and sampling programme. Data collection must focus on key issues needing to be examined for the IEE. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that the data collected is suitable for use as a baseline to monitoring impacts.

All survey locations shall be referenced with Geographic Positioning System (GPS) including sampling points, reef transects, vegetation transects, manta tows and soil sampling sites. All water samples shall be taken at a depth of 1m from the mean sea level or mid water depth for shallow areas. At least two benchmarks shall be used when undertaking the baseline assessments. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

Task 3 Determine the Potential Impacts of the Proposed Project – The IEE report should identify all the impacts and shall determine and analyze all the significant impacts for the proposed redevelopment. Particular attention shall be given to impacts associated with the following:

- *aviant fauna in the area,*
- *visual impacts,*
- *Impacts on ground water quality,*
- *noise impacts,*
- *safety issues and precautions,*
- *social impacts, community consultations,*
- *waste impacts and management at operational and construction stages*

It should also describe the methods used identify the significance of the impacts outlined. In particular, the impacts should be described for both during the construction stage and also during the operational stage. The report should outline the uncertainties in impact prediction and also outline all the positive and negative: short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 4. Stakeholder Consultation:- As the main stakeholder is the island community, extensive consultations shall be done with key community members, , i.e. Atoll / Island counsellor, Island community. Key line agencies from the Government including the Ministry of Housing, Transport and Environment/Energy Department and Maldives Energy Authority should be consulted and their views shall be incorporated. Province Office, which was not involved during scoping exercise shall be involved throughout the IEE process and their comments, concerns, views and recommendations shall be discussed. List of participants of the scoping meeting as well as community consultations shall be attached.

Task 5. Mitigation measures - Identify possible measures to prevent or reduce significant negative impacts to acceptable levels

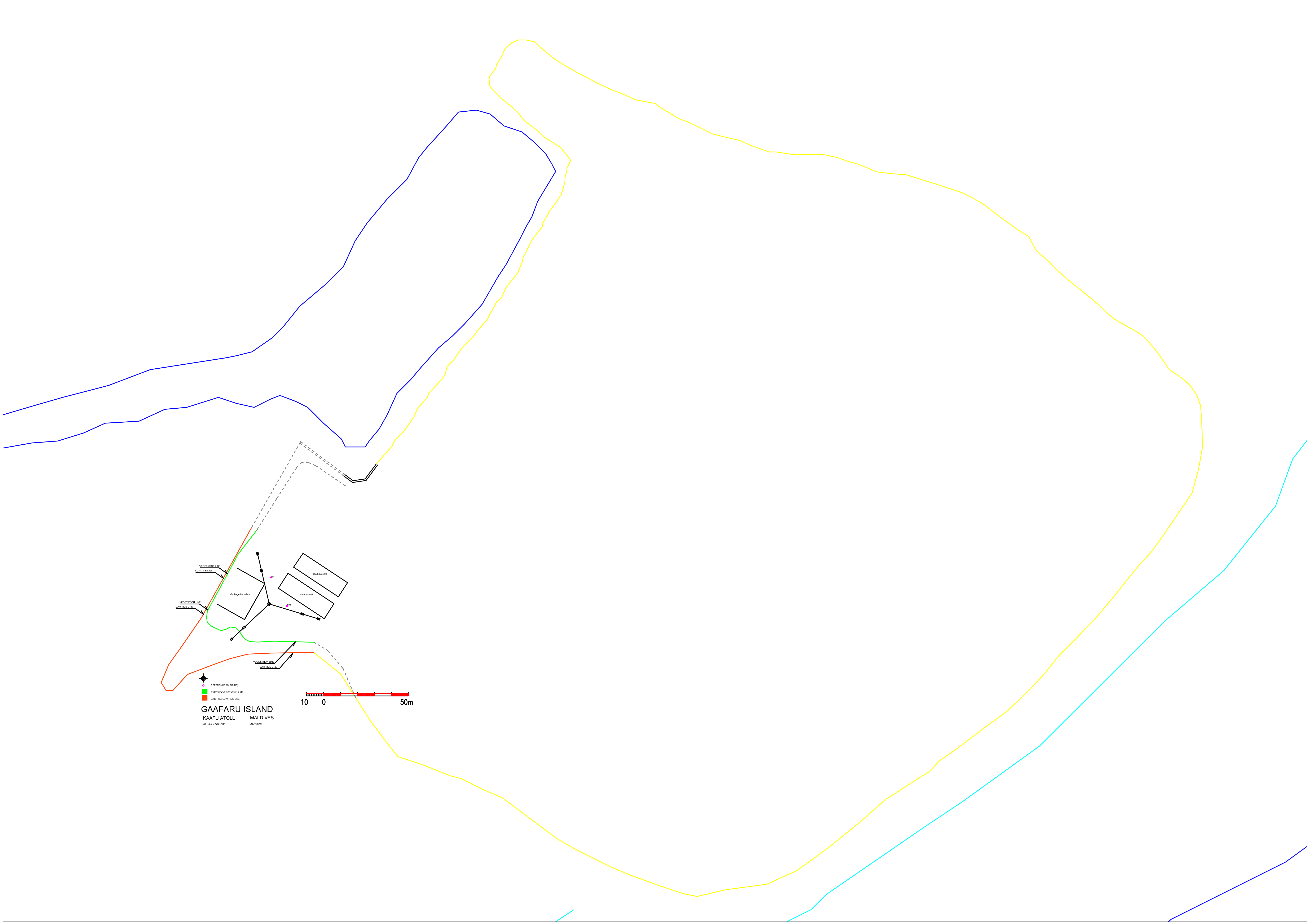
Task 6. Environmental Monitoring Plan - The monitoring programme should focus on monitoring needs prior during construction as well as during operational phase. The costs of monitoring, monitoring responsibilities and timing willingness/commitment to undertake long-term monitoring must be included.

Presentation - The environmental impact statement report, to be presented in print and digital format, will be concise and focus on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations for any references used in interpreting those data. The environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Report, 2007.

.....

28 June 2010

10 Appendix: Map of Gaafaru showing the proposed project site



VEGETATION LINE
LOW TIDE LINE
VEGETATION LINE
LOW TIDE LINE
Garbage boundary
RF1
RF2
boathouse 02
boathouse 01
VEGETATION LINE
LOW TIDE LINE
REFERENCE MARK (RF)
EXISTING VEGETATION LINE
EXISTING LOW TIDE LINE
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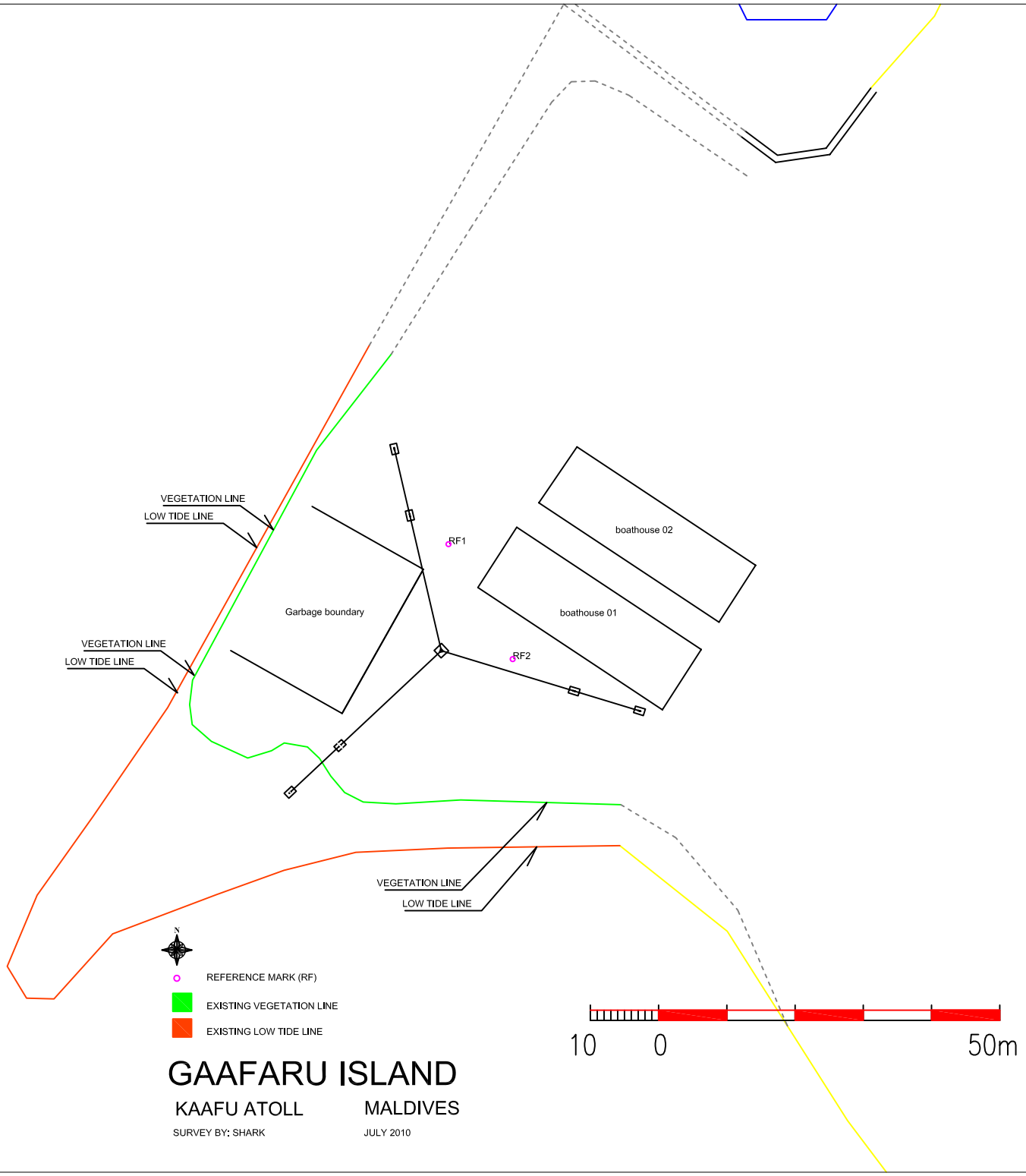
0
50m
GAAFARU ISLAND
KAAFU ATOLL
MALDIVES
SURVEY BY: SHARK
JULY 2010

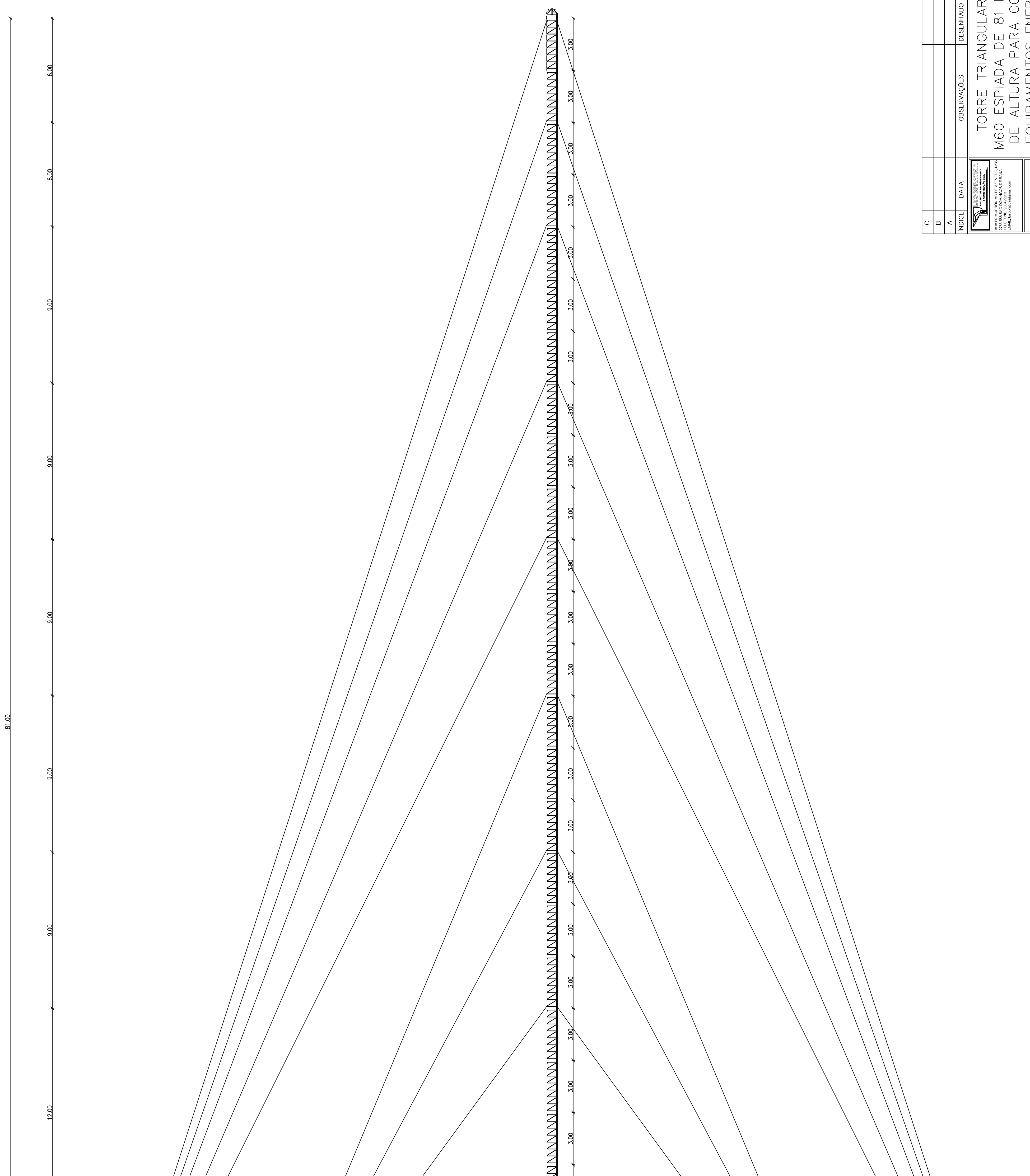


GAAFARU ISLAND

KAAFU ATOLL MALDIVES

SURVEY BY: SHARK JULY 2010

11 Appendix: Engineering details of the meteorological mast



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A				
B				
C				

LUSOPRATICA
PROJECTOS DE ENGENHARIA E CONSTRUÇÃO LDA.
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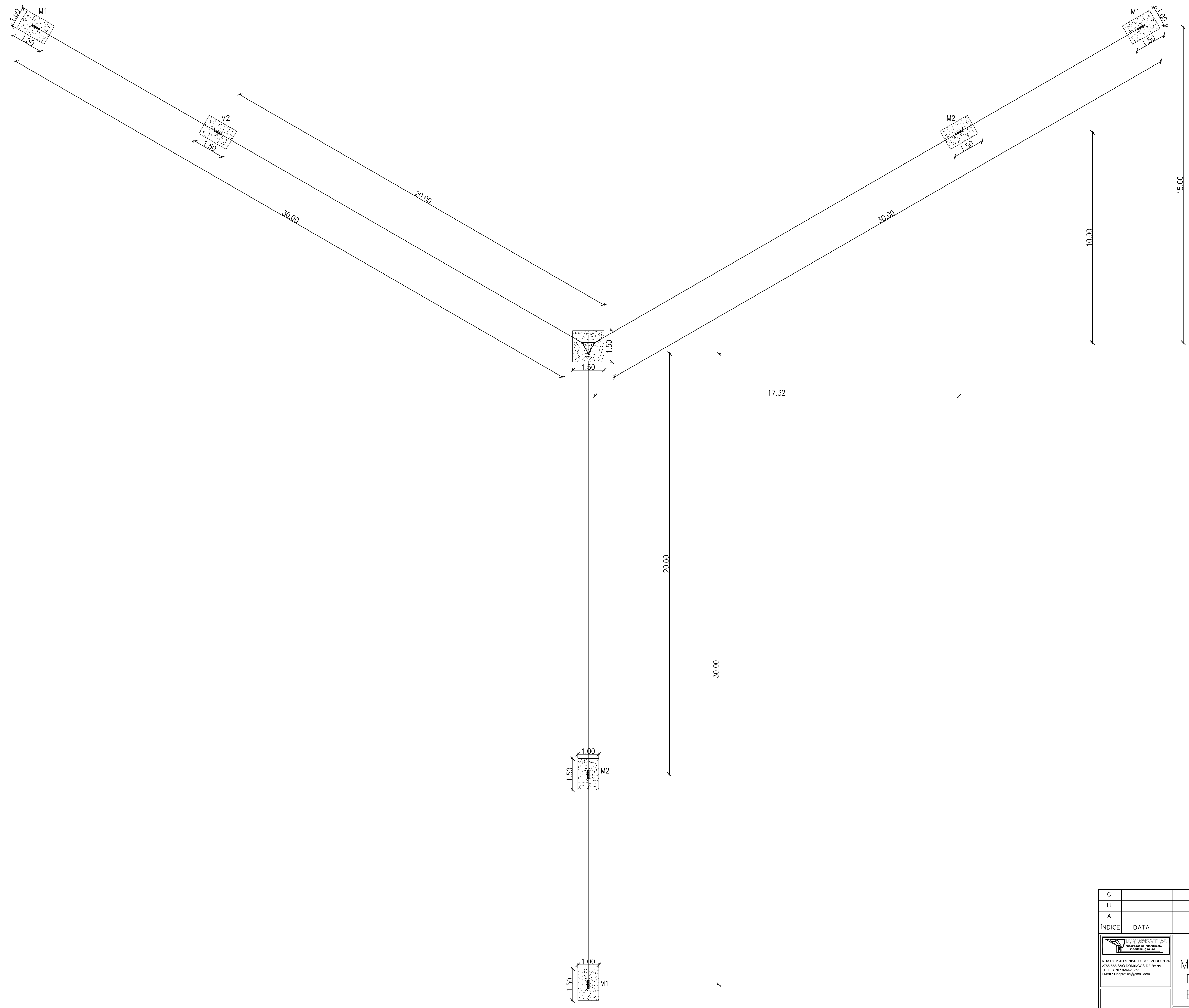
TORRE TRIANGULAR MODELO M60 ESPIADA DE 81 METROS DE ALTURA PARA COLOCAÇÃO EQUIPAMENTOS ENERGIA EÓLICA

ALÇADO DA TORRE

DESENHO: 1
ESCALA: 1/300

DESENHADO POR: J.M.CORREIA
VERIFICADO POR:
DATA: 18.03.2009



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PLANTA DA TORRE

DESENHO 2

ESCALA 1/250

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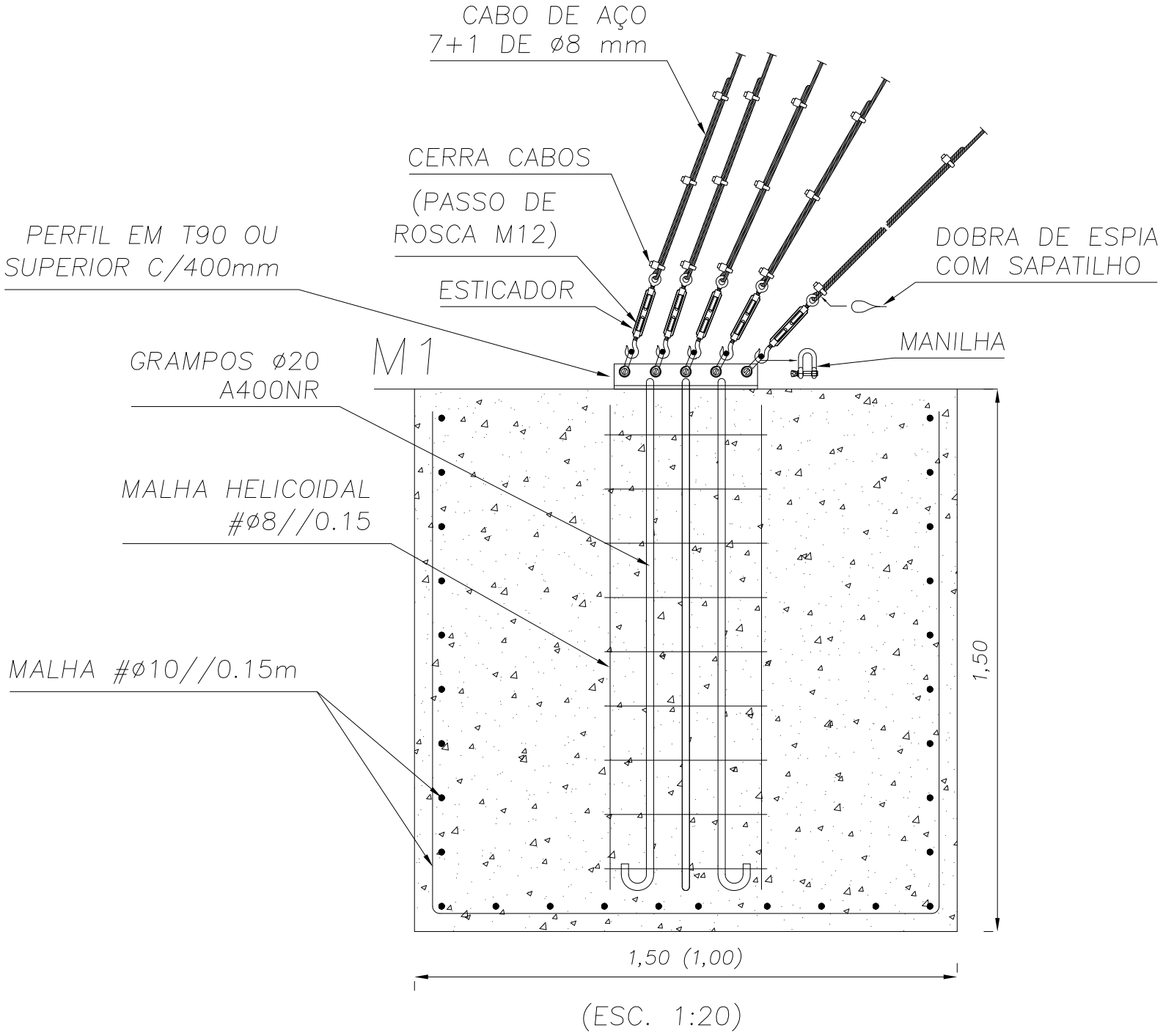
DATA 18.03.2009



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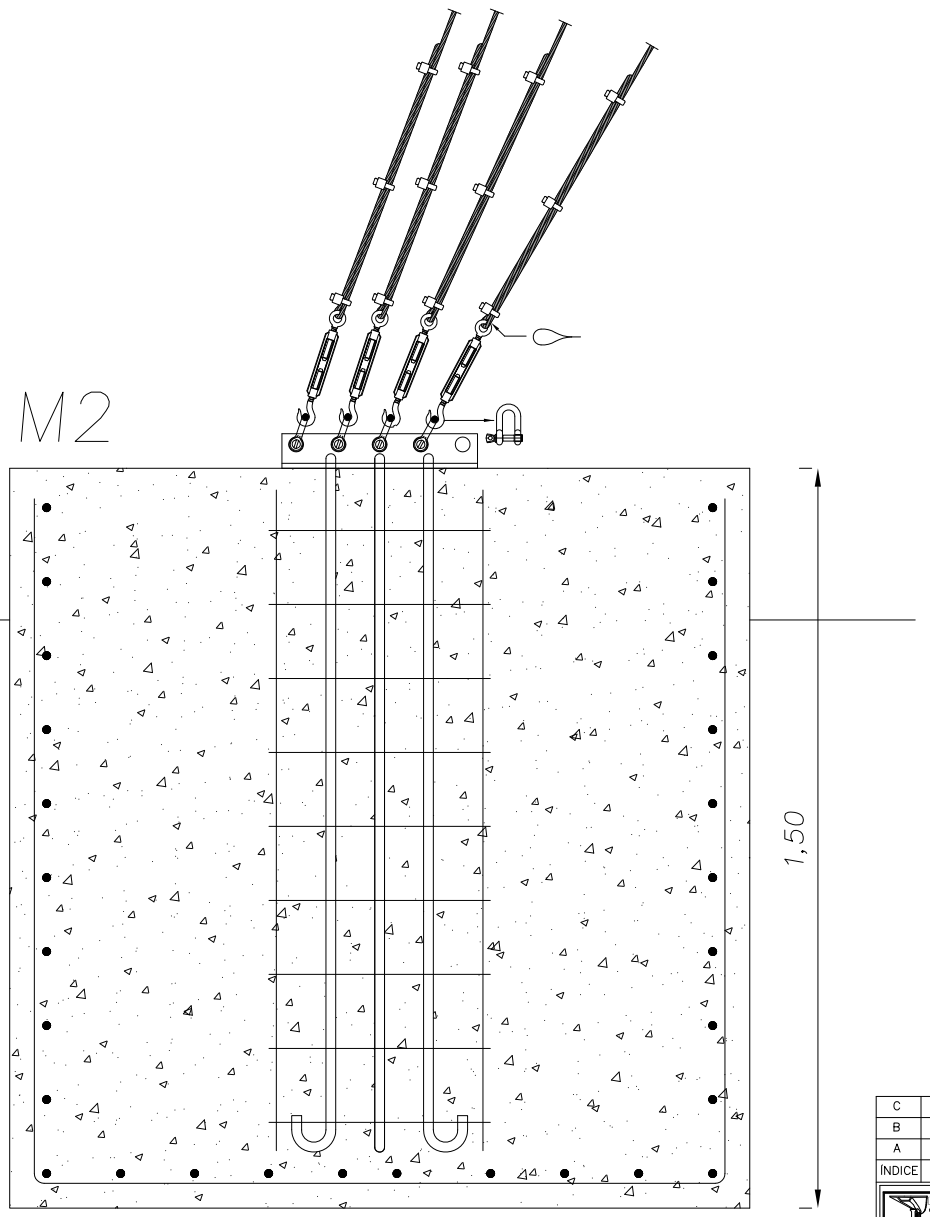

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AÇO: A400NR
RECOBRIMENTO: 5cm
AÇO EM PERFIS: Fe 360
AÇO EM PARAFUSOS E
ELEMENTOS DE LIGAÇÃO: Fe 510

INDICE	DATA	OBSERVAÇÕES	DESENHADO POR:	VERIFICADO POR:
C				
B				
A				

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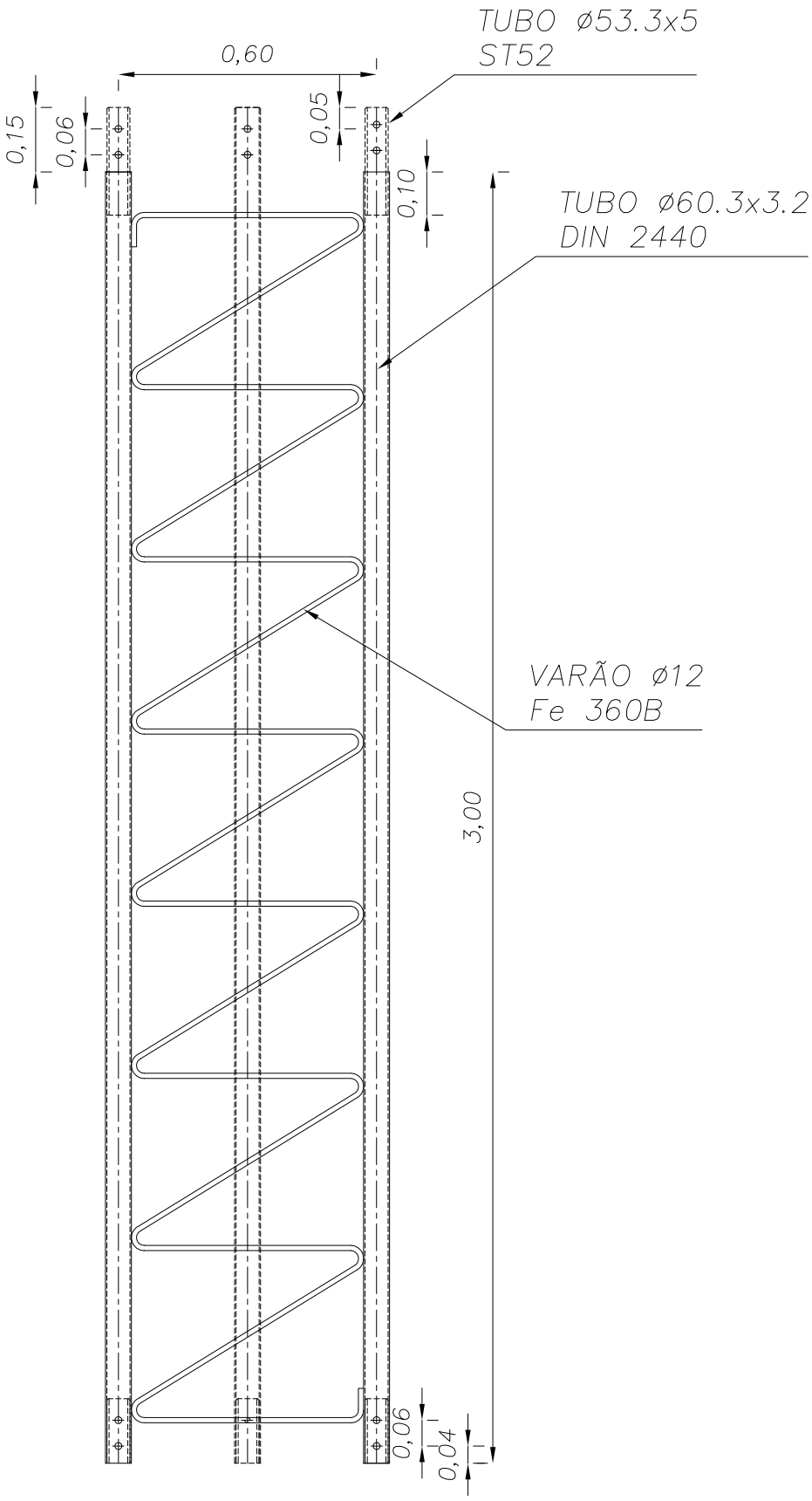
TORRE TRIANGULAR MODELO M60 ESPIADA DE 81 METROS DE ALTURA PARA COLOCAÇÃO EQUIPAMENTOS ENERGIA EÓLICA

GRAMPOS ESPIAMENTO BETÃO ARMADO

DESENHO: 4
ESCALA: 1/20

DESENHADO POR: J.M.CORREIA
VERIFICADO POR:
DATA: 16.03.2009



QUARTELADA
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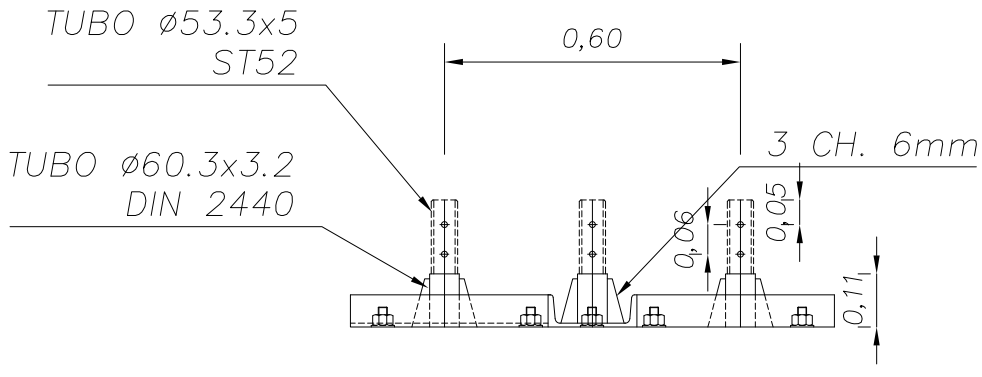
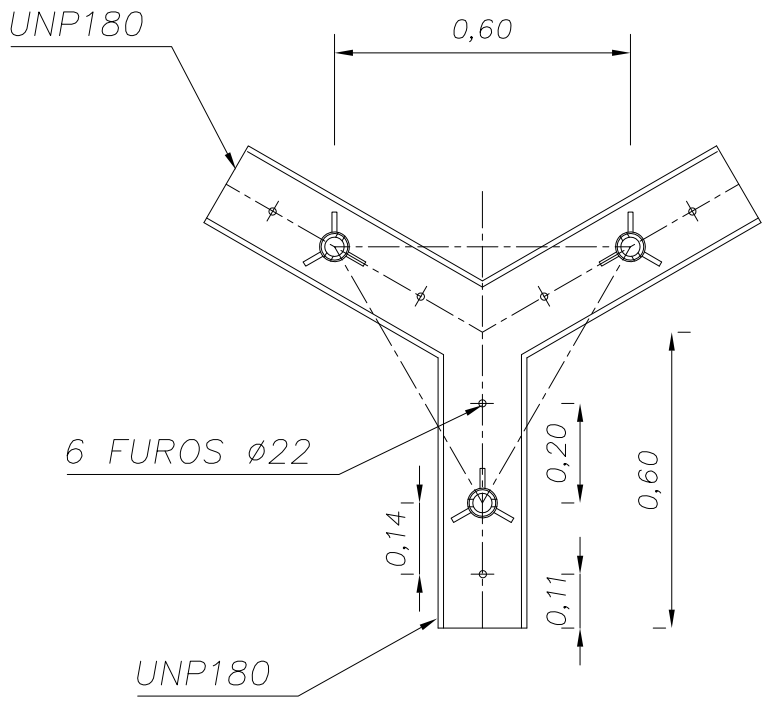
PARAFUSOS M16 NA LIGAÇÃO
DE CADA TROÇO (CLASSE 8.8)





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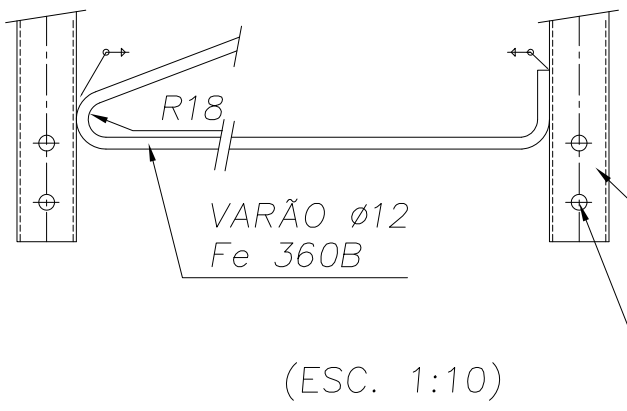

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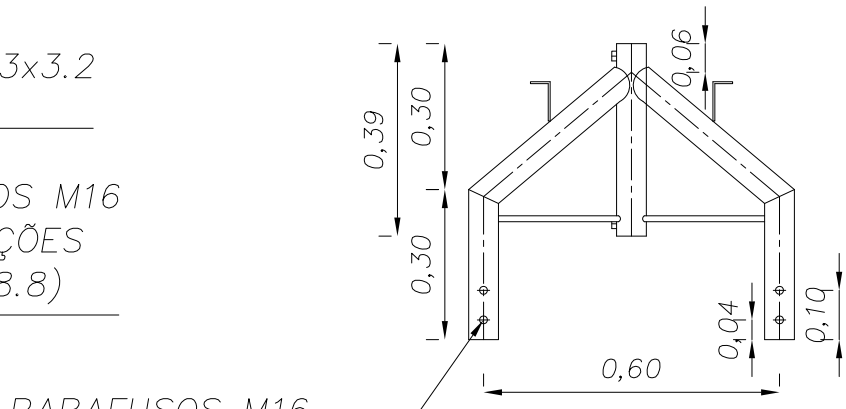

PARAFUSOS M16
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(CLASSE 8.8)

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AÇO: A400NR
RECOBRIMENTO: 5cm
AÇO EM PERFIS: Fe 360
AÇO EM PARAFUSOS E
ELEMENTOS DE LIGAÇÃO: Fe 510

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TORRE TRIANGULAR MODELO
M60 ESPIADA DE 81 METROS
DE ALTURA PARA COLOCAÇÃO
EQUIPAMENTOS ENERGIA EÓLICA

PORMENORES E
GEOMETRIAS

DESENHO 5
ESCALA 1/20;1/10

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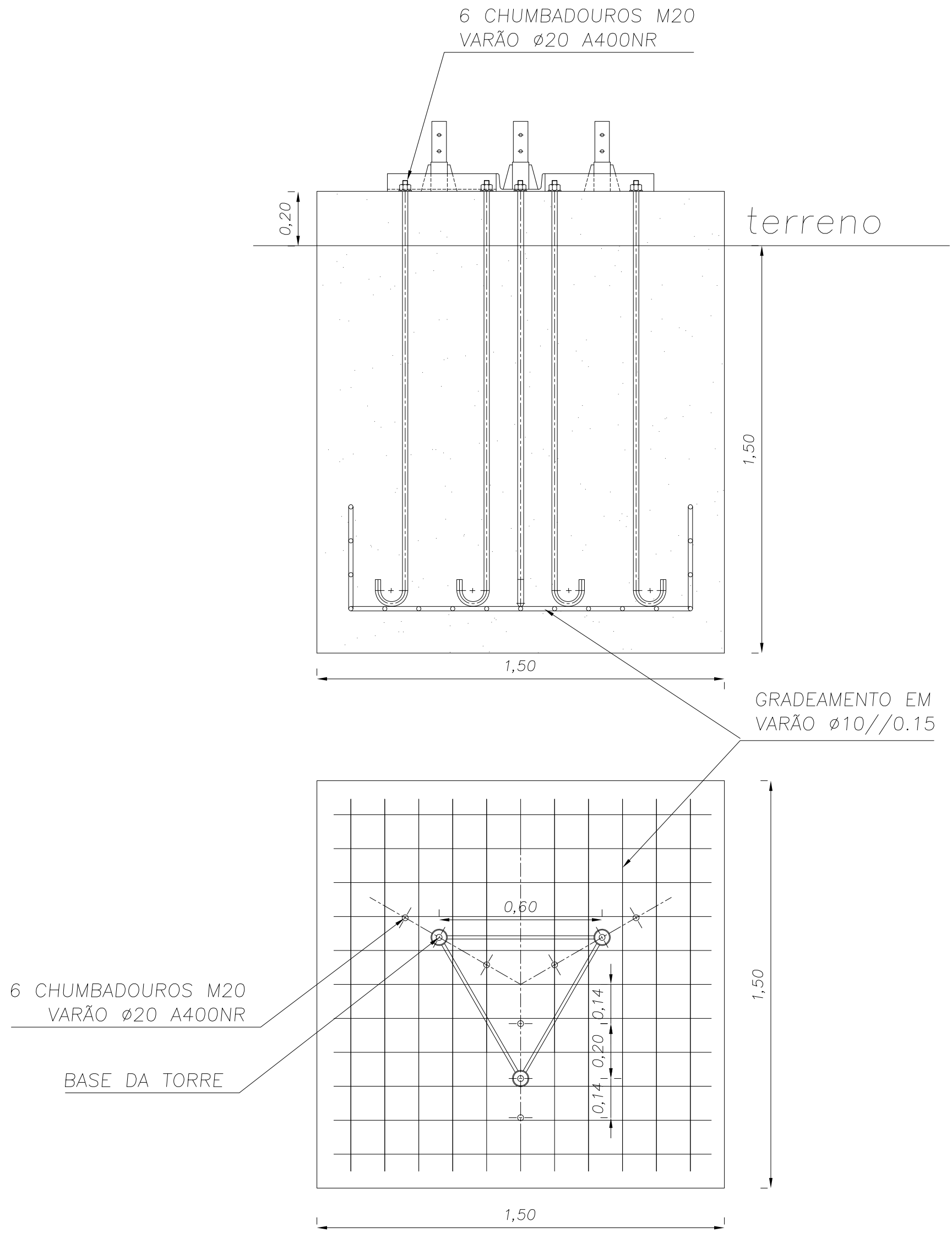
VERIFICADO POR:
DATA 16.03.2009



PORMENOR DOS CHUMBABOURIOS E MACIÇO DE BETÃO
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AÇO: A400NR
RECOBRIMENTO: 5cm
AÇO EM PERFIS: Fe 360
AÇO EM PARAFUSOS E
ELEMENTOS DE LIGAÇÃO: Fe 510

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FUNDAÇÃO DE TORRE TRIANGULAR MODELO M60 ESPIADA DE 81 M DE ALTURA PARA COLOCAÇÃO EQUPAMENTOS ENERGIA EÓLICA

BASE DA TORRE
BETÃO ARMADO

DESENHO: 3
ESCALA: 1/20

DESENHADO POR:	VERIFICADO POR:	DATA
J.M.CORREIA		18.03.2009