

**ENVIRONMENTAL MANAGEMENT PLAN  
FOR THE CONSTRUCTION OF THE  
LAMBERTS EAST WIND FARM**

**Submitted to:**

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## **1.0 INTRODUCTION**

### **1.1 Purpose**

The Barbados Light & Power Company Limited (BLPC) recognises its responsibility to minimize the effects of its construction activities on the environment, and seeks to provide leadership by promoting environmental awareness and accountability.

This environmental management plan (EMP) for the construction phase of the Project has been developed following the completion of the environmental impact assessment (EIA) for the project. The purpose of this EMP is to:

- Support the Barbados Light and Power Company's commitments to minimize environmental effects;
- Document environmental concerns and appropriate protection measures; and
- Provide instructions to relevant project personnel regarding procedures for protecting the environment and minimizing environmental effects, thereby supporting the project goal of zero incidents.

This EMP identifies the environmental requirements for all activities associated with the construction of the new wind farm and associated structures, and also provides implementation guidelines to help ensure compliance with the environmental recommendations as defined in the EIA.

The EMP is intended to be a practical document which clearly outlines the mitigative measures to be implemented by Project employees during the construction phase in order to protect the environment and minimize potentially adverse effects. The EMP is the principle vehicle for ensuring that mitigation is implemented as directed by all applicable regulatory requirements and provides an opportunity to outline responsible construction practices

BLPC constructs all facilities in accordance with good industry practices to minimize the effects on the environment. The Company will commit the necessary resources to meet the following environmental objectives:

- a) **Use of Resources** - To conserve non-renewable resources through efficient use and, where appropriate, to use renewable resources.
- b) **Waste Reduction & Disposal** - To minimise the creation of waste by reuse and recycling of materials and by implementing the use of recyclable materials. Procurement procedures will recognize the need to minimize waste where practical by purchasing supplies with

minimal packaging, substituting hazardous products with less hazardous products and using recyclable products. To dispose of all waste in a safe and sustainable manner and to minimise the release of substances which cause damage to the natural environment.

- c) **Product Safety** - To ensure the safe and secure supply of electricity to the consumer.
- d) **Risk Reduction** - To minimise the environmental, health, and safety risks to employees and the public, by employing safe technologies and operating procedures and by constantly being prepared for emergencies.
- e) **Education and Training** - To increase the awareness and understanding of environmental issues by our employees.
- f) **Public Information** - To keep employees and the public informed on environmental issues relating to Company operations.
- g) **Quality Management** - To establish regular inspections and periodic audits of the Company's operations by suitably qualified persons.

## **2.0 PROJECT DESCRIPTION AND SCOPE OF THE ENVIRONMENTAL MANAGEMENT PLAN**

The Lamberts East Wind Farm will comprise of 11 wind turbines to generate approximately 10MW of power to the grid. Each turbine will have a tubular tower of up to 55m height, and three rotor blades with a maximum rotor diameter of 56m. The rated output of each turbine will be approximately 900 kilowatts (kW) at optimum wind speeds. A small transformer enclosure will be located at the base of the turbines, and there will be a small building on the site to house the control and metering equipment. A wind monitoring mast with instrumentation will complete the site installation.

Underground power cables will link the turbines to the control building and there will be an overhead transmission line from the control building to connect the plant to the grid at the Trent GS. This line will be at 24 kilovolts and consist of 4 wires carried on wooden poles.

The wind farm will feed approximately 30 million kWh annually into the local grid system, producing over 4% of the island's electricity and equivalent to meeting the electricity needs of 11,000 homes.

This EMP provides a framework for addressing environmental issues for the construction of the new facilities in a repeatable, organized and responsible manner consistent with

the policy of the Company to be a good corporate citizen. It identifies the scope of the environmental requirements, provides implementation guidelines, and procedures.

### **3.0 MANAGEMENT OF THE EMP**

#### **3.1 Conditions of Approval**

The plant approval is subject to conditions as may be set out in the approval from the Chief Town Planner. Where there is a difference in the conditions of approval and the environmental guidelines and standards presented herein, the conditions of approval take precedence. The operator must refer to the approval document to ensure that all conditions are met.

#### **3.2 Roles and Responsibilities**

Construction Staff will ensure that the environmental commitments of this document and the EIA will be met and that work proceeds in compliance with environmental regulations and Construction Specifications.

The following sections outline the roles and responsibilities of construction staff with respect to environmental management:

- (a) The General Contractor (**CONTRACTOR**) for the construction of this Project is responsible for the implementation of the measures outlined in this Construction EMP.
- (b) The **CONTRACTOR's** site Foreman or Supervisor will be responsible for the coordination and implementation of all the measures outlined in this document. Workers shall be made aware of the existence of this EMP and who the **CONTRACTOR** designates will be if there are environmental issues of concern.
- (c) The **CONTRACTOR** will ensure that a copy of this EMP is available on-site and the site Foreman or Supervisor is familiar with its contents.
- (d) A representative designated by BLPC will act as the **SITE ENGINEER**.

#### **3.3 Documentation**

An important part in implementing the environmental practices during construction is ensuring that all relevant and pertinent documents are available to construction staff as well as regulatory agencies. The following measures should be implemented to ensure that all information is properly disseminated:

- (a) All relevant Project documentation shall be present on site at all times including, specifications, construction drawings, EMP, and all permits and approvals;
- (b) All practices, and procedures outlined in these documents shall be implemented and adhered to; and
- (c) The **CONTRACTOR** will ensure that any reporting required by regulations or this EMP is conducted in a timely manner.

#### **4.0 ENVIRONMENTAL PROCEDURES**

The procedures included in this section of the Construction EMP outline the Mitigative Measures and Best Management Practices (BMPs) that will be implemented throughout construction to minimize the potential effects on the environment. The procedures included in this document will be modified/updated to meet the changing needs of the Project as it proceeds through the design and construction phases.

Environmental management involves compliance with: local planning requirements and environmental regulations; adherence to BLPC's own guidelines, practices and procedures; and conformity with good management practices and standards of the industry.

The environmental aspects of the construction of the wind farm are as follows:

- (a) Agricultural Soils;
- (b) Contaminated Soils;
- (c) Vegetation Clearing;
- (d) Erosion and Sediment Control;
- (e) Traffic Control;
- (f) Dust Control;
- (g) Equipment Emissions;
- (h) Noise Control;
- (i) Petroleum, Oils, and Lubricants (POL) Storage, Handling and Disposal; and
- (j) Fuel and Hazardous Material Spills.

#### **4.1 Agricultural Soils**

The conservation and maintenance of both agricultural and forest soils are of primary concern during construction. Construction activities have the potential to have long-term impacts by changing the physical and chemical properties of these soils and affecting productive capability and future land use. The most common impacts are loss of topsoil resulting from construction activity or erosion, mixing of subsoil and topsoil, and compaction.

- (a) Ensure that topsoil is removed from any agricultural work areas prior to grading or trenching;
- (b) Ensure that topsoil and subsoil piles are separated;
- (c) Ensure that topsoil is not used for trench backfill or padding;
- (d) Ensure that topsoil and subsoil are restored in the proper sequence;
- (e) All topsoil stripping shall be monitored by construction staff to ensure that topsoil is removed to the correct depth;
- (f) All stockpiled topsoil material shall be protected from erosion.

#### **4.2 Contaminated Soils**

Soil excavation is required for the installation of the turbine foundations. During these activities, it is possible that soil or water suspected of contamination from known or unknown sources may be encountered.

The purpose of these environmental management practices, which includes detailed procedures, is to set out the recommended steps for consistent, safe and environmentally responsible handling of such soil or waters. It will assist construction personnel in:

- (a) Identifying soil suspected of contamination;
- (b) Identifying contaminated soil;
- (c) Minimizing risk to human health and safety, and to the environment when such soils are encountered;
- (d) Handling such soil in a manner that is in compliance with the relevant environmental legislation; and
- (e) Minimizing risk to the construction schedule.

The procedures outlined apply to situations either foreseen or unforeseen. Where excavations of soils suspected of contamination are anticipated prior to the project, the **SITE ENGINEER** should be contacted as early as possible in the planning stages.

For the purposes of this EMP and for construction of the Project, some standard definitions for Suspect and Contaminated Soil are as follows:

**Suspect Soil:** A soil suspected of being contaminated, based on either sight, smell, past or present land use, or a combination thereof.

**Contaminated Soil:** A soil containing a substance or material whose concentration exceeds regulated limits, or may:

- (a) pose a threat to worker health or safety;
- (b) pose a threat to the environment; or
- (c) pose a threat to public safety.

**Contaminated Water:** Liquids, water and/or free product hydrocarbons, which by association with contaminated soils, represent a risk similar to that of contaminated soil.

In the event that contaminated areas are identified during construction activities the following general measures will be followed:

- (a) suspend all work in the immediate area;
- (b) notify the **SITE ENGINEER** of the situation;
- (c) the **SITE ENGINEER** will advise BLPC;
- (d) BLPC will conduct a preliminary site assessment to determine whether the soil in question could potentially be contaminated;
- (e) secure the area to prevent additional disturbance;
- (f) contact the landowner and the Environmental Protection Department for direction on appropriate mitigation;
- (g) a mutually acceptable restoration plan will be developed in consultation with the Environmental Protection Department; and
- (h) deploy specialists to the area to direct clean-up and disposal of contaminated materials, if applicable.

In areas of foreseen contaminated soil or waters, circumstances and characteristics of the contaminated soil and/or waters will be known and previous reports or investigations will have, in most cases, collected the data necessary for handling and mitigation. In most, if not all cases, the Environmental Protection Department will have been consulted on the foreseen areas and the planned mitigation, if any, for these situations. In all cases of "*Foreseen areas of Contamination*" contaminated soils will be excavated and returned to the location discovered, unless directed otherwise.

In the event of discovery of unforeseen suspected or contaminated soil and/or waters, the following detailed procedure will be implemented.

The mitigation procedure consists of the following steps:



- A. Identification;
- B. Preliminary Assessment;
- C. Secure Suspect Soil and Excavated Area; and
- D. External Contacts

Each of these steps is described in detail below:

**A. Identification:**

Suspect soil can usually be identified by sight and smell observations (dependent upon the contaminant present). Some obvious signs of contamination include, but are not limited to:

- (a) Soil discoloration
- (b) Unusual or different soil texture
- (c) Unusual odour
- (d) Vegetation distress
- (e) Standing water with a hydrocarbon sheen
- (f) Abandoned industrial waste (storage tanks and/or infrastructure)

When either suspect or contaminated soils are encountered during excavation, work in the area will be suspended. The **SITE ENGINEER** will be informed immediately.

**B. Preliminary Assessment:**

BLPC has the responsibility for conducting a preliminary site assessment of the situation. Based on the evidence (sight, smell and land use), BLPC will assess whether the soil in question could potentially be contaminated. Some questions BLPC should answer when assessing the situation are:

- (a) What is the specific location where the suspect/contaminated soil was encountered?
- (b) What are the adjacent land uses?
- (c) Who encountered the suspect/contaminated soil?
- (d) How was it encountered? Was it dug, oozing, flowing, solid, etc.?
- (e) How much was excavated or encountered (volume of soil/liquids recorded)?

- (f) Can it be determined without a third party consultant whether or not the suspect soil is in fact contaminated?
- (g) Should boreholes or test-pits be installed and the soils sampled and tested?

Being able to answer most or all of these questions will assist other internal/external parties (i.e. BLPC), in determining what course of action to take. As a precautionary approach, any suspected materials will be sampled by BLPC for laboratory analysis.

Based on the preliminary assessment, and in conjunction with discussion with the work crews, and the Environmental Protection Department, BLPC may decide that continued delay of the work is not warranted, and work should continue.

### **C. Secure Suspect Soil and Excavated Area:**

In the event that suspect/contaminated soil is encountered, the area will be secured and any unnecessary contact with the soil will be avoided. Work in the vicinity of these soil and/or waters will be moved to another location at the work site wherever possible. Any suspect/contaminated soil that has been excavated will be secured using the available resources. Potential securing methods will include:

- a) placing the soil on a plasticized tarp;
- b) covering the soil with a plasticized tarp to isolate it from other materials;
- c) storing the soil away from any watercourses, watersheds, crops, etc.; and
- d) placing berms around the tarp to isolate and contain the soil.

If an excavation can be safely left open, the area will be secured as is, until further direction can be obtained. If the excavation cannot be safely left open, then it will be backfilled.

Work will be suspended if:

- a) continuing to excavate in a suspect/contaminated site could pose a threat to the health and safety of the worker(s);
- b) installing pipe in contaminated soil may compromise the integrity of the pipe at a later date; or

- c) issues of non-compliance with environmental legislation may result from continuing to work in areas of contaminated soils.

BLPC will ensure that situations involving suspect/contaminated soil are handled appropriately including the proper removal, treatment, and disposal of any soil and/or waters, if necessary.

In most, if not all cases contaminated soils will be excavated and returned to the original location. If, in consultation with the Environmental Protection Department, it is determined that the soil presence poses an increased environmental risk to adjacent "clean" properties, than previously occurred, clean-up and remediation measures may be necessary. These measures will be developed in consultation with regulatory agencies in the event this occurs.

#### **D. External Contacts:**

The factors that determine which external parties should be involved in a suspect/contaminated soils incident include:

- (a) location (i.e., property owners)
- (b) nature of contamination
- (c) source of contamination

Property owners will be considered as external contacts, whether they are private or public entities. BLPC will be responsible for determination of what external contacts will be made and when these contacts will be made.

### **4.3 Vegetation Clearing**

The removal of any trees, crops or vegetation from the proposed Project site right of way (ROW) will be required to facilitate construction activities associated with access roads and turbine sites. To minimize the potential impacts of vegetation removal the following environmental practices shall be implemented:

- (a) Larger woody material and agricultural crops shall be considered for salvage and use;
- (b) All other cleared material shall be disposed of in an appropriate manner that is approved by the **SITE ENGINEER**;
- (c) All clearing activities shall be confined to the approved working areas as approved by the **SITE ENGINEER**;

- (d) The clearing of large trees shall be minimized where possible.

#### 4.4 Erosion and Sediment Control

Erosion and sediment concerns can arise both during the construction phase of the Project and following construction when the site clean-ups have occurred. Suitable mitigative measures are therefore required for temporary site conditions which occur for a relatively short period during the construction phase as well as for the permanent conditions following the completion of the facilities and cleanup of the work sites.

The grade or slope of the working areas that will be disturbed during the construction phase will determine the amount and complexity of the mitigative measures that will be required to ensure adequate erosion and sediment control. Generically, erosion and sediment control measures will include the application of structures such as:

- (a) Runoff Controls - diversion berms, cross trenches, chutes, check dams, interceptor swales;
- (b) Erosion Control - diversion ditch and dispersion aprons, gravel sheeting, mulch, erosion control blankets; and
- (c) Sediment Control - sediment fence, straw bale barriers, filter berms, sediment traps, settling ponds.

The following points and definitions comprise the basic principles of erosion and sediment control. The **CONTRACTOR** shall implement these measures where there is a risk of surficial erosion and loss of soil:

- (a) Areas where soil or subsoil has been exposed shall be stabilized by:
  - grading exposed areas to a slope which minimizes the potential for erosion;
  - applying appropriate erosion and sediment control measures; and
  - seeding, mulching or covering with erosion control matting where deemed appropriate by the on-site Inspector or Engineer.
- (b) Sediment and erosion control structures shall be installed prior to site disturbance and meet the quality as outlined in the construction or manufacturers specifications. These measures shall only be removed when the disturbed area is stabilized.
- (c) Sediment and erosion protection measures shall be inspected daily and also during or immediately following heavy rain events. Sediment fences and buffer “zones” shall be maintained in an effective working condition.

#### 4.5 Dust Control

During dry conditions, excessive dust may be generated from the work sites and access roads. This may have a detrimental impact on the local environment, construction safety or integrity, and may also cause disruption to the normal activities of nearby residences.

The **CONTRACTOR** will implement the following procedures to ensure potential impacts from construction are minimized:

- (a) the **CONTRACTOR** will apply dust suppressants such as water, calcium chloride, or tree lignin based dust suppressant on the work sites as required (calcium chloride will not be used on agricultural fields);
- (b) the **CONTRACTOR** will ensure rock drills are equipped with dust collectors in good working order;
- (c) the **CONTRACTOR** will ensure adequate control of dust at work sites that are in proximity to nearby residences;
- (d) the **SITE ENGINEER** and the **CONTRACTOR** will consult with local road authorities prior to application of dust suppressants on public access roads; and
- (e) the **CONTRACTOR** will ensure that in areas of sensitive land use dust generation is monitored and controlled.

#### 4.6 Equipment Emissions

Construction equipment produces emissions typical of gas or diesel fuelled vehicles. Generally, emissions may cause occasional nuisance problems on construction sites; however, they do not present significant problems outside the construction site due to their transitory nature. The following procedures will be implemented to ensure potential impacts from emissions are minimized:

- a) The **CONTRACTOR** will ensure that all construction equipment operates with the standard emissions controls that each piece of equipment was originally equipped with: and
- b) The **CONTRACTOR** will ensure that all vehicles are maintained in a proper fashion in order to minimize emissions.

#### 4.7 Traffic Control

An important consideration during construction will be the impacts on traffic during the wind farm construction as much of the routing will occur along existing roads and residential streets. Where it will be necessary to modify the existing traffic flows in areas of construction, modifications may include partial lane closures, full lane closures, and road closures with detours.

The **CONTRACTOR** will implement the following procedures to ensure potential impacts from construction are minimized:

- (a) Provide the Ministry of Public Works Traffic Division with the construction schedule and any potential road closures at least one month in advance to minimize conflicts with other road work. This schedule will be updated weekly;
- (b) The public will be provided with advance information on road closures through weekly announcements in the newspapers and through radio and television;
- (c) Road closures will be posted with detour signs and the detour routes will be fully sign posted throughout to ensure traffic follows the correct routing;
- (d) An assessment will be done of the routing for major equipment transfers from the port in advance to identify any constraints;
- (e) Where partial and full lane closures, proper road signs, flag persons and/or temporary traffic lights will be utilized to assist traffic movement; and
- (f) The route of the access track to the site will be chosen to minimize the disturbance of aesthetics.

#### **4.8 Noise Control**

During construction, excessive noise from construction equipment may become a nuisance to nearby residents. The following procedures will be implemented to ensure potential impacts from construction are minimized:

- (a) the **CONTRACTOR** will use noise abatement equipment, in good working order, on all heavy machinery used on the project; and
- (b) wherever possible, the **CONTRACTOR** shall minimize noise levels during construction.

#### **4.9 Petroleum, Oils, and Lubricants (POLs) Storage, Handling and Disposal**

By implementing proper handling storage and disposal of POLs during construction, the likelihood of accidental events that result in impacts to the environment are greatly reduced. The following procedures will be implemented to ensure the proper handling, storage and disposal of these materials:

- (a) Fueling and lubrication of equipment shall occur in designated and approved locations;

- (b) Regular inspections of hydraulic and fuel systems on machinery shall be done, and leaks shall be repaired immediately upon detection;
- (c) Washing, servicing and fueling of mobile equipment shall not be allowed within 30 m of a waterway or drainage systems;
- (d) Waste oils and lubricants shall be retained in a tank or closed container and disposed of in an approved manner;
- (e) Greasy or oily rags or materials subject to spontaneous combustion shall be deposited and stored in an appropriate receptacle. This material shall be removed from the work site on a regular basis and shall be disposed of in an approved existing waste disposal facility; and
- (f) All hazardous materials shall be stored with secondary containment and properly signed.

#### **4.10 Fuel and Hazardous Materials Spills**

This Contingency Plan presents a detailed response system to deal with accidents such as the release of petroleum, oils, or lubricants (POLs) or other potentially hazardous liquids. The objectives of the Plan are to minimize:

- (a) danger to persons;
- (b) pollution of land and water;
- (c) extent of affected area;
- (d) degree of disturbance during clean-up; and
- (e) degree of disturbance to wildlife.

The following general mitigative measures are provided to help ensure potential impacts from spills during construction are minimized:

- a) Reduce the need for hazardous substances by substituting for less harmful ones;
- b) Incorporate appropriate preventative and response measures;
- c) Provide environmental awareness training to contractors and workers involved in the Project, including the handling, clean-up, reporting and disposal of contaminated material;
- d) Maintain appropriate spill response equipment in a readily accessible location;
- e) Report all spills to applicable authorities;

- f) Inspect equipment (e.g. construction vehicles and exhaust systems) to ensure vehicles with obvious fuel or oil leaks does not enter the project area; and
- g) Use approved herbicides.

In addition to these Project specific response plans and general mitigative measures, the *"National Oil Spill Contingency Plan for Barbados"* provides a coordinated approach of key government agencies and the petroleum sector to spill response. It covers oil spills to land and to the marine environment. The plan incorporates the following:

- a) Assigns duties and responsibilities to government personnel and the petroleum sector in responding to a spill;
- b) Identifies the location, acquisition, and maintenance of equipment and supplies available for containment and cleanup in the event of a spill;
- c) Provides a system of surveillance and reporting for early notification of spills;
- d) Establishes a national response centre from which to coordinate resources and response personnel;
- e) Provides oil spill response procedures for containment, dispersal, cleanup and disposal; and
- f) Provides a link to international agencies for assistance and resources, should this be necessary.

The primary responsibility for the clean-up and associated costs lies with the discharger. However, the Director of the Central Emergency Relief Organization (CERO) will act as the National Coordinator for the spill and has the overall responsibility for monitoring the cleanup operations.

To provide advice and resources to deal with spills the Barbados National Response Team has been formed, which includes government agency and industry membership. This team is chaired by the Chief Environmental Engineer of the Ministry of Physical Development and recommends policy for emergency preparedness in dealing with spills.

The National Coordinator will activate the Barbados National Response Team upon notification of a spill. The response to a spill is described in five phases:

1. The discharger should immediately provide notification of a spill. In some cases, the spill may be discovered and reported by others. The spill report should be as complete as possible and include:
  - (a) Name, address and telephone number of reporting source;



- (b) On-scene telephone number;
  - (c) Exact location and time of spill;
  - (d) Estimated amount and type of pollutant;
  - (e) Source of pollutant and cause of spill;
  - (f) Actions being taken to control spill;
  - (g) Wind Speed and direction; and
  - (h) Speed and direction of current; damage observed.
2. The spill will be investigated for severity and impacts. Based on this assessment, the resources of the Barbados National Response Team will be deployed as necessary. For more serious spills additional assistance from external resources may also be requested.
3. Measures will be taken to contain the spill and reduce the spread or impact. Under some circumstances dispersants may be necessary.
4. The clean up activities will be undertaken to recover as much oil as possible. Disposal of the recovered materials will be done to the satisfaction of the Environmental Protection Department of the Ministry of Physical Development and Environment.
5. Documentation of the incident will be provided including any sampling results and costs for cleanup.

### **Response Action Plan**

- (a) Training of personnel is the responsibility of the **CONTRACTOR** and all appropriate personnel will be trained before commencement of work on the Project.
- (b) The individual who discovers a leak or spill shall immediately attempt to stop and contain the leak or spill as per instructions received during personnel training courses.
- (c) Work in the immediate area of a spill or leak shall be halted and the spill shall be reported to the **SITE ENGINEER**;
- (d) BLPC will report spills to the Environmental Engineering Department and the Coordinator for the National Oil Spill Response Team as per applicable regulatory requirements.

- (e) The **CONTRACTOR** will submit a written report to the Environmental Engineering Department as required by applicable legislation. A copy will be provided to BLPC.
- (f) The **CONTRACTOR** will have the full authority to take appropriate action without unnecessary delay.
- (g) The **CONTRACTOR** shall assume the overall responsibility of coordinating a clean-up which will include the following actions:
  - (i) deploy on-site personnel to contain the spilled material using a dyke, pit, absorbent material or booms, as appropriate;
  - (ii) assess site conditions and environmental impact of various clean-up procedures;
  - (iii) choose and implement an appropriate clean-up procedure;
  - (iv) deploy on-site personnel to mobilize pumps and empty drums (or other appropriate storage) to the spill site;
  - (v) apply absorbents as necessary;
  - (vi) remove any contaminated soil as directed by the Site Engineer;
  - (vii) dispose of all contaminated debris, water, soil, cleaning materials, and absorbents by placing in an approved disposal site; and
  - (viii) take all necessary precautions to ensure that the incident does not recur.
- (h) During the construction activities, the following spill response resources shall be available at an appropriate location in readiness to respond to accidental releases of fuels and/or hazardous materials:
  - (i) absorbent materials (e.g., absorbent pads, Sorb-All, vermiculite);
  - (ii) small equipment such as shovels, rakes, tool kit, sledgehammer, buckets, stakes, tarpaulins, one empty drum, protective equipment; and
  - (iii) fire extinguisher(s).