

2.0 REVIEW OF RELEVANT LEGISLATION AND POLICIES

2.1 Town and Country Planning Act

The legislation relating to environmental protection for new and expanded developments includes a number of acts in addition to the provisions under the Town and Country Planning Act (TCPA), which control and mitigate adverse effects on coastal and heritage resources and in sites of natural scenic beauty. Specific criteria relating to air emissions, warm water discharge and water quality changes allowed by new developments are determined under the TCPA, which allows the Chief Town Planner to request information which assists in assessing an application for a new development.

The planning objectives and policies of the Government of Barbados are described within the *National Physical Development Plan (Draft) - Amended 1998*. The *National Physical Development Plan (Draft)* provides:

“a vision for the future growth and development of the Nation by setting out policies to guide relationships among land uses, community facilities and physical infrastructure. It is also intended to coordinate public and private development initiatives in Barbados to the year 2010, within a framework of sustainable development”.

The *National Physical Development Plan (Draft) - Amended 1998* provides the following guiding principals for planning policies and the approval of new developments:

- The efficient use of land, resources and finances of the nation;
- The promotion of social equity, health and safety for all residents;
- The conservation, protection and enhancement of environmental and man-made resources;
- A settlement structure that maintains and creates vibrant and safe places for people to live, work and play; and,
- The management of growth so that it occurs in an orderly fashion while ensuring that environmental features and agricultural lands are maintained.

The *National Physical Development Plan (Draft)* aims to manage the natural environment and resources to ensure the best use of their aesthetic, educational, ecological, recreational, and economic benefits. It protects the physical environment by establishing:

- general environmental planning policies which apply to all land use designations throughout the island;
- policies respecting development in the Coastal Zone Management Plan Areas; and,
- policies to control development in natural hazard lands including gullies, escarpments, coastal and other erosion areas and flood prone lands.

2.1.1 Special Industry

The *National Physical Development Plan (Draft)* recognizes the importance of industries that require controlled siting to prevent incompatible development within built-up areas. Specific industry types are listed. These are designated as “Special Industry” and the intent is to:

- Recognize and protect existing special industrial areas;
- Direct uses which are incompatible with special industry (such as residential, recreation, tourism, etc.) to locations which are well removed from existing special industry sites; and,
- Ensure that new special industrial development will not produce negative impacts on natural areas or sensitive urban land uses.

The Proposed Trents Generating Station is designated as Special Industry. The planning controls for Special Industry include:

- A detailed review of proposals for residential, tourism or community developments within 500 m of a Special Industry. The proposals will only be accepted if they will not be negatively affected by the Special Industry;
- Applicants requesting planning permission for a new special industry development, or an expansion of an existing facility are required to complete an Environmental Impact Assessment;
- New special industry sites will be encouraged to locate where:
 - the existing infrastructure can support the development, otherwise the proponent must pay the full costs of upgrading;
 - they are not in the proximity of a Zone 1 Water Protection Area;
 - they will not negatively impact sensitive land uses (residences, tourist areas, community facilities);

- they will not negatively impact on environmentally sensitive areas, coastal environment or National Heritage Conservation Areas; and,
- they are adjacent to existing industrial sites.
- New developments not meeting the site location objectives will need to demonstrate how the negative impacts will be mitigated;
- Developments must adhere to the Water Protection Zone Policies which protect groundwater resources; and,
- Outside materials storage is to be screened from public view.

2.1.2 Environmental Impact Assessments

In order to complete the review of the application, the Chief Town Planner may request a report constituting an Environmental Impact Assessment (EIA) for any development, which has the potential for a significant environmental effect. In addition, the *National Physical Development Plan (Draft)* defines a series of "Special Industries" that are designated as requiring an EIA where the applicants are requesting planning permission for a change in use to or to an expansion of the facility.

The new Trents Generating Station and associated pipelines is considered to be a Special Industries project requiring an EIA.

The Government of Barbados, Ministry of Health and the Environment, has prepared the document *Environmental Impact Assessment Guidelines and Procedures for Barbados, 1998* which outlines the EIA process and requirements.

In the case of a simple application with minor impacts, the assessment may be an EIA of limited scope. Where the project involves the potential for more significant impacts, the EIA required will be more comprehensive. Generally, the process is an interactive one, involving meetings and discussions between the Town & Country Planning Department and others as determined by the Chief Town Planner, including the relevant governmental agencies and departments.

The EIA is initiated after the Terms of Reference for the project are agreed upon with TCPD. The contents of the EIA Terms of Reference are required to include the following broad categories:

- An outline of the environmental issues and the disciplines required for studying them.

- A list of the government and other agencies that appear to have an interest in the application. A consultation program is also included.
- A proposed program for consultation with the local public.

The steps involved in completing the EIA following the approval of the Terms of Reference for the scope of the study, include gathering of data, consulting with the public and agencies having an interest and completing of the EIA document for circulation. Discharges to the environment, waste management, fire safety issues and other details are required for the EIA. Upon completion, the EIA is submitted to TCPD for review by the Environmental Impact Assessment Review Panel, which receives comments from interested agencies and the public.

When the panel is satisfied that the EIA addresses the environmental impacts, approval is provided which may include conditions. The Chief Town Planner allows no development of the site, without prior approval.

2.2 Relevant Environmental Legislation and Standards

The relevant legislation affecting the environmental management and energy sector development are included below. No legislative guidelines exist for air emissions, or water quality from power stations in Barbados. In the interim, before National standards and guidelines are developed, it is the intention of relevant governmental agencies to apply international standards and guidelines, e.g., World Bank, US EPA, on a sectoral basis. However, guidelines to mitigate the effects of social and industrial activity on the coastal environment are already available for use.

The **Barbados National Trust Act** allows for a listing of places of natural beauty with their animal and plant life, and the pursuance of a policy of preservation. As a result, the Barbados National Trust has a vested interest in the proposed project to ensure that not only is it consistent with the future landscape but also that the industrial outputs from the facility will not compromise its aim of preserving areas of natural beauty.

The **Marine Pollution Control Act** has been enacted to control the release of pollutants to the sea and provides the government with the mandate to investigate sources of pollution and to require monitoring by the discharger, and with the framework for establishing regulations prescribing environmental standards such as effluent criteria. The Act makes it an offence to release any pollutant in violation of the applicable standards and requirements. Discharged pollutants will be required to be registered, and measures implemented to reduce the pollutant level whenever a violation of the standards exists. End of pipe standards are currently being developed and are expected to be enacted in 2006. The plant will need to meet these standards.

The **Coastal Zone Management Act** covers the management of coastal resources such as the development on shoreline and activities that will impact on the beach and marine environment. This act calls for the delimitation of a coastal zone management area and a plan to control the use to which the zone is put. The plan will include policies and standards for developments, controls of water quality and the exploitation of the marine resources in the zone. A key part of the act is the protection of the beaches and coral reef surrounding Barbados.

The **Shipping Pollution Act** incorporates the **Oil in Navigable Waters Act**. The Act generally prohibits the disposal of potentially deleterious materials into the marine environment. Section 6 and Section 14 of the Act are relevant to this EIA as they deal with pollution entering the near-shore environment from land sources. These sections make it an offence to discharge various hydrocarbons into the marine environment and specify reporting requirements and associated penalties.

The **National Conservation Commission Act** affects is mainly concerned with the protection of the coastal environment. The functions of the Commission are to:

- Conserve the natural beauty, topographic features ... of Barbados;
- Control, maintain and develop ... beaches of Barbados;
- Secure the observance of sanitary and clean conditions at ... beaches ... in Barbados;
- To maintain and assist in maintaining ... existing and future beach facilities; and,
- To advise the Minister on:
 - the construction of beach and ancillary recreational facilities;
 - the removal of coral from the ocean bed or any other thing the removal of which might cause the encroachment of the sea; and,
 - such other matters relating to ... including matters pertaining to beach control and the protection of the sea coast of Barbados from erosion or encroachment by the sea as the Minister may refer to it for advice.

Under the first part of this Act, the proposed facilities should not impact on any features of natural beauty. The proposal may include the beaching of equipment via barge during the construction phase.

The **Health Services Act** makes the Minister "responsible for the promotion and preservation of the health of the inhabitants of Barbados." His functions include:

- The preservation, treatment, limitation and suppression of disease, including the conduct of investigations and enquiries thereof; and,
- The abatement of nuisances and the removal or correction of any condition that may be injurious to the public health.

The Act further empowers the Minister to make Regulations for a number of prescribed items including "the prevention, abatement or removal of nuisances and unsanitary conditions on premises." Following on this, the Minister has stated that "any chimney emitting smoke in such quantity or of such density as to be prejudicial or injurious to the public health" is deemed a nuisance and constitutes an offence.

The **Factories Act** addresses a number of environmental considerations including the disposal of wastes and effluents, ventilation, noise, removal of gas, dust or fumes, and special protective equipment. Section 45 (1) requires that effective arrangements be made for the disposal of waste and effluents. The Act does not, however, make provision for regulating the quality of the wastes discharged from the plant. Section 50 requires that effective and suitable provision shall be made for rendering harmless, as far as practicable, all fumes, dust, and other impurities that are likely to be injurious to health and are generated in the course of any process or work carried out. In Section 52, the owner or occupier of a factory is expected to take all practical steps to maintain the level of noise below a level which is likely to be injurious to workers. This act is being replaced by the **Occupational Health and Safety at Work Act** following enactment by the government. The new act will provide more prescriptive standards of safety and health in the workplace that are consistent with those of other jurisdictions.

The **Petroleum Act and Petroleum Storage Regulations** covers the storage of petroleum products in bulk stations and retail service stations. The majority of environmental information contained in the Act is in the Third Schedule, which details the following Environmental Standards:

- Licensed persons must comply with measures established by Environmental Protection Department;
- The Environmental Protection Department will undertake annual testing and inspection of storage tanks, critical lines, transfer hoses and valves. Defective tanks would have to be replaced with double wall fiberglass tanks with leak detection systems; and,
- The disposal of spent oil on site is prohibited.

The Third Schedule also specifies standards for retail stations. Although this may not be directly applicable to the BLPC site, it may be prudent to take into account the following standards for retail stations:

- oil and grease sumps for the collection of used oil must be approved;
- liquid waste from the service bay is to be directed to a soakaway or well by means of a properly maintained sump and grease interceptor; and,
- inspections by the Barbados Fire Department and Environmental Protection Department can be carried out when requested.

The Regulations primarily deal with petroleum storage. Regulation 30 refers to the Third Schedule of the Act (summarized above). Other information requirements contained in the Regulations that are relevant to environmental issues generally consisted of the following:

- A site plan showing proposed tanks, buildings, walls and embankments must be submitted to the Environmental Protection Department;
- Underground storage tanks must be constructed of fiberglass;
- Tanks must be surrounded by embankments or should be in a depression or excavation below grade;
- The enclosures surrounding the petroleum storage facilities must be sufficient to contain at least 110% of the volume stored;
- Enclosures must be drained by two or more pipes fitted with valves;
- Water must not be allowed to accumulate within the enclosures;
- Doorways to storage sheds must be above floor level, or the floor level must be below ground level, or the building must be constructed to contain all petroleum stored; and
- Precautions must be taken to prevent waste oil to escape into drains or watercourses, and these precautions must be approved.

The **Civil Aviation Act** dated 1983 and the **Civil (Air Navigation) Regulations** dated 1984 deal mainly with aircraft equipment, aircraft crew, air traffic control, and fatigue of the crew and the registration of aircraft. The Act also defines the airport traffic zone as having 3 km boundaries to a height of 600 meters, which would exclude the proposed generating site. The Act provides the airport with the authority to control activities within the airport zone that interfere with airport operations. Major projects proposed within the airport zone should be

reviewed with the airport management to ensure that there are no impacts on the airport operations.

In general, the Civil Aviation Act does not have major environmental requirements associated with the proposed project nor does it change the scope of this EIA. As part of the planning approval the airport authority will require that the stacks be lit with warning lights due to their height and may require them to be painted with markings.

2.2.1 Selected Project Standards and Guidelines

As there are no specific environmental legislative guidelines for power stations in Barbados, reference is made to other relevant governmental agencies to apply international standards and guidelines.

The World Bank Group Pollution Prevention and Abatement Handbook guidelines as published in 1998 for thermal power projects are the most comprehensive of the international finance institutions guidelines covering the main environmental issues of power plant developments. These were previously used in the assessments of the EIAs of the Spring Garden and the Seawell Generating Stations, and are the preferred standards for application to the Trents Generating Station. The World Bank Group guidelines are supplemented by other regulatory standards as follows:

Air Emissions

In relating to applicable air emissions standards for electrical power plants, there are two issues that need to be considered:

- The maximum mass emission rates of contaminants; and,
- The impacts of emissions on the ambient air quality.

Limits on mass emissions rates are applied to encourage the use of abatement technologies and moderate the long-range cumulative effects of multiple large sources (for example acid rain and the formation of ozone); whereas ambient standards are based on health criteria and are specified to protect the quality of the local airshed.

In practice, for most power plant design, the maximum emission rate typically determines the level of control technology to be applied, and the stack height influences the ambient air quality. For degraded airsheds, the emissions rates may need to be reduced below the regulatory standards to minimize the effects on ambient air quality.

The Government of Barbados refers to the US Environmental Protection Agency ambient air quality standards for new developments. The World Bank has established ambient air quality guidelines for the approval of thermal power plants that are based on, and equivalent to, the US

Environmental Protection Agency ambient air quality standards. As the World Bank guidelines also include maximum emissions rates (from the stack) for thermal power plants of different types, they have been selected as the most appropriate standards for assessing air emissions. These are listed in Table 2-1.

Table 2-1 Ambient Air Quality Standards Established by the World Bank for New Thermal Power Plants

Ambient Air Quality (At Property Boundary)	Maximum Concentration ($\mu\text{g}/\text{m}^3$)
Particulate Matter Annual mean, PM₁₀ (<10 μm) 24 hour mean values of PM₁₀ Annual average of Total Suspended Particulates 24 hour mean values of Total Suspended Particulates	50 150 80 230
Sulphur Dioxide Annual mean 24 hour mean values	80 150
Nitrogen Oxides, as NO₂ Annual mean 24 hour mean values	100 150

$\mu\text{g}/\text{m}^3$ = micrograms per cubic metre

PM₁₀ = particulate matter of less than 10 micrometres in size

Diesel engine driven power plants are sources of various regulated air pollutants, namely carbon monoxide (CO), hydrocarbons (HC), particulate matter (PM), sulphur dioxide (SO₂), and nitrogen oxides (NO_x). The NO_x emissions from diesel engines are normally of greatest concern as these are several times higher than other thermal conversion technologies. Emissions of SO₂ are fuel dependant and can be reduced by using a lower sulphur content fuel.

Although combined cycle plants emit the same air pollutants as diesel plants the emission rates are much lower when burning natural gas.

The World Bank has established maximum stack emission rates for power plants, as listed in Table 2-2. The stack emissions rates for the power sector recognize the various forms of generation and the economic implications of the control technologies.

Table 2-2 World Bank Emission Rates for Power Plants

Stack Emissions from Power Plants (Based on WBG)	Maximum Stack Emission Rates (mg/Nm³)
Particulate Matter TSP	50
Sulphur Dioxide Background air quality <50 µg/m ³ Total mass emission	0.20 tonnes/day/MWe 500 tonnes/day
Nitrogen Oxides Gas turbine plants (natural gas) Gas turbine plants (#2 fuel oil) Engine driven plants (resultant ambient air < 150 µg/m ³)	125 (dry @ 15% O ₂) 165 (dry @ 15% O ₂) 2,000 (dry @ 15% O ₂)

mg/Nm³ = milligrams per normal cubic metre (at reference temperature of 0°C and 1 atmosphere pressure)

Noise

The Environmental Protection Division of the Ministry of Housing, Lands and Environment does not have legislated standards for noise levels but does include conditions for noise abatement in new projects. It also investigates noise complaints.

The World Bank has established general standards for noise from power plants. Noise levels should be less than the levels of Table 2-3, at receptors outside of the property boundary or a maximum increase of 3 dBA above background.

Table 2-3 Ambient Noise Objectives, World Bank

Area (Outside of Property Boundary)	Day (dBA)	Night (dBA)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Wastewater

The Barbados Water Authority has a **zone rule** for private sewage and industrial discharges to soakaways. The **zone rule** regulates the disposition of wastes depending on the water zone in which the site is located. Water zone 1 is the most sensitive and protected and zone 5 the least sensitive. The Trents site will be in water zone 3 and the criteria for discharge are as follows:

- a) No soakaway pits shall exceed 40 feet in depth.
- b) In the case of pits without fissures or satisfactory absorption capacity, sewage shall be disposed of by septic tanks of approved design with effluent discharge to soakaway pits. A separate pit must be provided for sewage.
- c) All domestic waste shall be disposed of to a soakaway pit or septic tank or surface disposal as in Zone 2 as the case may be.
- d) Sewage disposal by dry pit shall be permitted.
- e) No rain or surface waters shall be discharged into a sewage pit.
- f) Petrol and fuel tanks shall be enclosed in approved leak-proof reservoirs to the satisfaction of the Water Board.

New wastewater standards are proposed under the Marine Pollution Control Act. These are currently undergoing public review and are expected to be enacted in 2006. The standards are designed in two sections: (a) ambient standards and (b) discharge standards. The current policy is that where a parameter is not in the discharge standards list then the ambient standards will be the maximum discharge level unless the applicant can show that there are no adverse effects from the discharge. The complete list of standards is contained in Appendix F. Discharge standards depend on whether they occur within the reef (defined as Class 1 waters which will include all land based discharges), or outside the reef (Class 2 waters).

The sewage discharge from the facility will need to meet the following “Domestic End of Pipe Standards” as indicated in Table 2-4.

In addition, discharges from treated sump drainage and the tank farm drainage will need to meet the criteria of the “Petroleum Hydrocarbon End of Pipe Standards” (Table 2-5).

Table 2-4 End-of-Pipe Discharge Standards for Sewage Wastewater

Parameter	End of Pipe Standard for Discharge into Class 1 Waters
Biochemical Oxygen Demand	30 mg/L
Total Suspended Solids	30 mg/L
Total Nitrogen (organic and inorganic)	5 mg/L
Total Phosphorus (organic and inorganic)	1 mg/L
pH	6-9
Faecal streptococci	Geometric mean of min. 5 samples should not exceed 35 colonies/100 mL in any 30-day period.
Faecal coliform	Geometric mean of min. 5 samples should not exceed 200 colonies/100 mL in any 30-day period. No more than 10% of samples to exceed 400 colonies/100 mL.
Total Residual Chlorine	0.1 mg/L
Fats, Oils and Grease	15 mg/L
Floatables	Not visible

mg/L = milligram per litre
 mL = millilitres

Table 2-5 End-of-Pipe Discharge Standards Petroleum Hydrocarbons

Compound	End of Pipe Standard for Discharge into Class 1 Waters (mg/L)
Total Petroleum Hydrocarbons	Maximum daily discharge concentration: 10 Average consecutive 30-day concentration: 5
Total Oil and Grease	Maximum daily discharge concentration: 10 Average consecutive 30-day concentration: 5
Total Organic Carbon	Maximum daily discharge concentration: 110 Average consecutive 30-day concentration: 55

Groundwater

The plant will release wastewater to a soakaway pit, as is normal industrial practice. The above standards for discharge will ensure compliance with Barbados criteria.

There are no specific groundwater standards to cover remediation in the event of a hydrocarbon spill; or to use as a reference for monitoring in the area of fuel storage facilities. However other jurisdictions have developed standards based on the remediation of soils and

groundwater impacted by petroleum products. Environmental standards used in Ontario, Canada for the clean up of spills to groundwater from fuel handling facilities are shown in Table 2-6. There is no potable use of the groundwater beneath the Trents site and hence the non-potable standards are recommended. Although the non-potable standards do not have a value for petroleum hydrocarbons it is recommended that this be monitored as a precursor for determining impacts.

Table 2-6 Groundwater Remediation Criteria Ontario, Canada

Compound	Ontario Groundwater Remediation Criteria (µg/L)		Recommended Site Criteria (µg/L)
	Non-potable Use	Potable Use	Groundwater
Benzene	1,900	5	1,900
Ethylbenzene	28,000	2.4	28,000
Toluene	5,900	24	5,900
Xylenes	5,600	300	5,600
Lead	32	10	32
Methyl Tert Butyl Ether	50,000	700	50,000
Petroleum Hydrocarbons (gas/diesel)	No Value	1,000	1,000
Petroleum Hydrocarbons (heavy oil)	No Value	1,000	1,000