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1.0 INTRODUCTION

1.1 Project Background

The Buddy's International Hotel is under construction in the Providence area of East Bank Demerara. The 250 room hotel is being constructed on a plot of land approximately 3.2 *ha* in area situated at Tract 'BS' Block 2, Public Road, Plantation Providence to the north of the Guyana Cricket Stadium also under construction, Figure 1.1.

Figure 1.1: Location map of Buddies Hotel project

This Environmental Impact Assessment (EIA) was conducted by Caribbean Engineering and Management Consultants Inc (CEMCO Inc.) for the Buddy's International Hotel Project. The study was commissioned by Buddy's International Hotel Inc. 'The client' in order to fulfill the requirement for obtaining an environmental permit from the Environmental Protection Agency (EPA).

The Environmental Protection Act, 1996, effectively established the EPA as the principal authority for environmental management in Guyana. The Environmental Protection Act establishes the requirement for an Environmental Impact Assessment (EIA) for certain projects. Part IV of the act requires all developers of any project list in the Fourth Schedule, or other projects that may significantly affect the environment, to apply to the EPA for an Environmental Permit. This Project falls within the Fourth Schedule. The Environmental Protection Act therefore forms the legal framework for undertaking this EIA.

The EIA report will form part of the documentary evidence in support of a permit application to the EPA. The Terms of Reference (TOR see Appendix 1) outlines the scope of work of the EIA project activities. Terms of Reference for the EIA was developed for this project following the EIA guidelines of the EPA. A draft Terms of Reference was submitted to the EPA and a public scoping meeting held to discuss the proposed project with the public. Comments received from the EPA and the public were then used to modify the draft to arrive at the final Terms of Reference for the EIA.

1.2 Objectives

The main objectives of an EIA are to identify the significant potential impacts both positive and negative that may result from a proposed project. The EIA provided recommendations to mitigate negative impacts and maximize benefits on all aspects of the surrounding environment (physical, biological, social). The other general objectives of the EIA include:

- Scope issues and concerns regarding the proposed project that needs to be addressed;
- Conduct an audit of works to date.

- Gather baseline information describing the existing environment of the project site and immediate surroundings
- Present and discuss alternatives to the proposed project.
- Engage stakeholders in the EIA process;
- Inform corporate decisions about tourism/hotel planning and development; and
- Promote development that is environmentally and socially sustainable.

1.3 Environmental Impact Assessment Team

A multi-disciplinary team was assembled to carry out the work. The core team is made up of the following persons:

- Raymond Latchmansingh, B.Sc., MICE Eng - Project Director
- Aedan Earle, M.Sc. – Geologist /EIA Specialist -Team leader
- George Campbell, M.A. - Socioeconomic/Tourism Specialist
- Kwesi Nkofi, B.Sc, Biology - Ecology Specialist
- Hemwantie Tiwari, B.Sc, Environmental Science – Environmental Officer
- Marciano Glasgow, B.Sc, Environmental Science – Environmental Officer

1.4 Methodology

This study has been carried out in accordance with Guidelines for Environmental Assessment as set forth with Section III – Environmental Impact Assessments of the Environmental Protection Act of Guyana (1996). Consultation formed a key part of this study and involved a range of stakeholders, from (Central and Local Authorities); to service providers (utilities as well as commercial operations), key stakeholder entities. Baseline data for the study area was generated using a combination of:

- Field Studies
- Analysis of Maps, plans, aerial photos
- Review of reports and background documents
- Structured Interviews
- Laboratory analyses

The data collection methodologies employed for this study are described below.

1.4.1 Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, drainage, and water quality. Water quality analyses were made of samples taken on 19 August 2006 at two (2) sample stations to assess baseline water quality conditions of the project site. The sampling stations were selected based on their location relative to the discharge points of major water streams, and to their risk of contamination. Samples were collected from an earthen drain that separates the hotel from Nandy Park community on northern boundary and from a drain that is located along the western boundary of the property. Each sample was collected in the middle of the channel approximately 0.2 meters below water surface and stored in pre-cleaned 2 litres sample bottles.

The samples were analysed for the following parameters as requested by the EPA:

- pH
- Dissolved Oxygen
- Turbidity
- Nitrate
- Phosphate
- Total suspended solids

1.4.2 Biological Environment

The status of the terrestrial flora and fauna of the study area were determined by a review of literature relevant to the area, by discussions with local persons, and by field investigations. Observations were made of the flora and fauna in the project area and surrounding lands as well drainage canals on the northern and western boundaries. Observations were also made of the eastern sugarcane cultivation and the southern Cricket Stadium area. Nocturnal observations were carried out with emphasis on the northern environment. Interviews were conducted randomly among residents in the immediate vicinity and with workers on site at the project area for anecdotal information.

1.4.3 Socioeconomic Environment

The socioeconomic analysis consisted of two main aspects which may be loosely categorized as rapid appraisal work (RAW) and a baseline survey (BLS). The RAW included visits, interviews with individuals and groups of residents and officials, discussions with stakeholders, and site visits and inspection to the area. The methodology applied was based on some elements of participatory rural appraisal (PRA), viz.:

- Focused Group Discussions
- Key Informants Interviews
- Small group meetings with key stakeholders
- Review of secondary sources of information on the area and
- Observation of land use in close proximity to the proposed site.

The communities surveyed in this project zone of immediate impacts were:

- Nandy Park
- Peters Hall and New Providence
- Greenfield park.
- Industrial area in providence.

A rapid appraisal approach was used to capture opinions about the project. In-depth structured interviews as well as non-structured *ad hoc* discussions with non targeted individuals and groups of individuals within the defined communities and with key informants.

The second approach was the administered Baseline Survey (BLS). The design of the survey instrument was driven by the objectives of the EIA. As such, the BLS sought to determine socio-economic characteristics, land use, awareness about the project, and perceptions of the potential impacts that may arise from the implementation of the project. The total number of interviews conducted were 319 non-targeted and 13 targeted (comprising mainly those in Key Informants list appended).

1.5 Limitations to the Study

The timing of the conduct of the EIA created the main limitation as construction work on the hotel was quite advanced when the study was commissioned. The acquisition of baseline information on the pre-construction physical environment was limited to a comparison with surrounding undisturbed lands. This however was determined to be a reasonable approach as the entire area is fairly homogenous in terms of physiography and ecology.

2.0 PROJECT DESCRIPTION

2.1 Introduction

The Buddy's International Hotel is being constructed on a plot of land approximately 3.2 hectares in area situated at Tract 'BS' Block 2 along the East Bank Highway with approximate geographic coordinates N 6^{o} 45.7' and W 58^{o} 10.7', Figure 2.1.

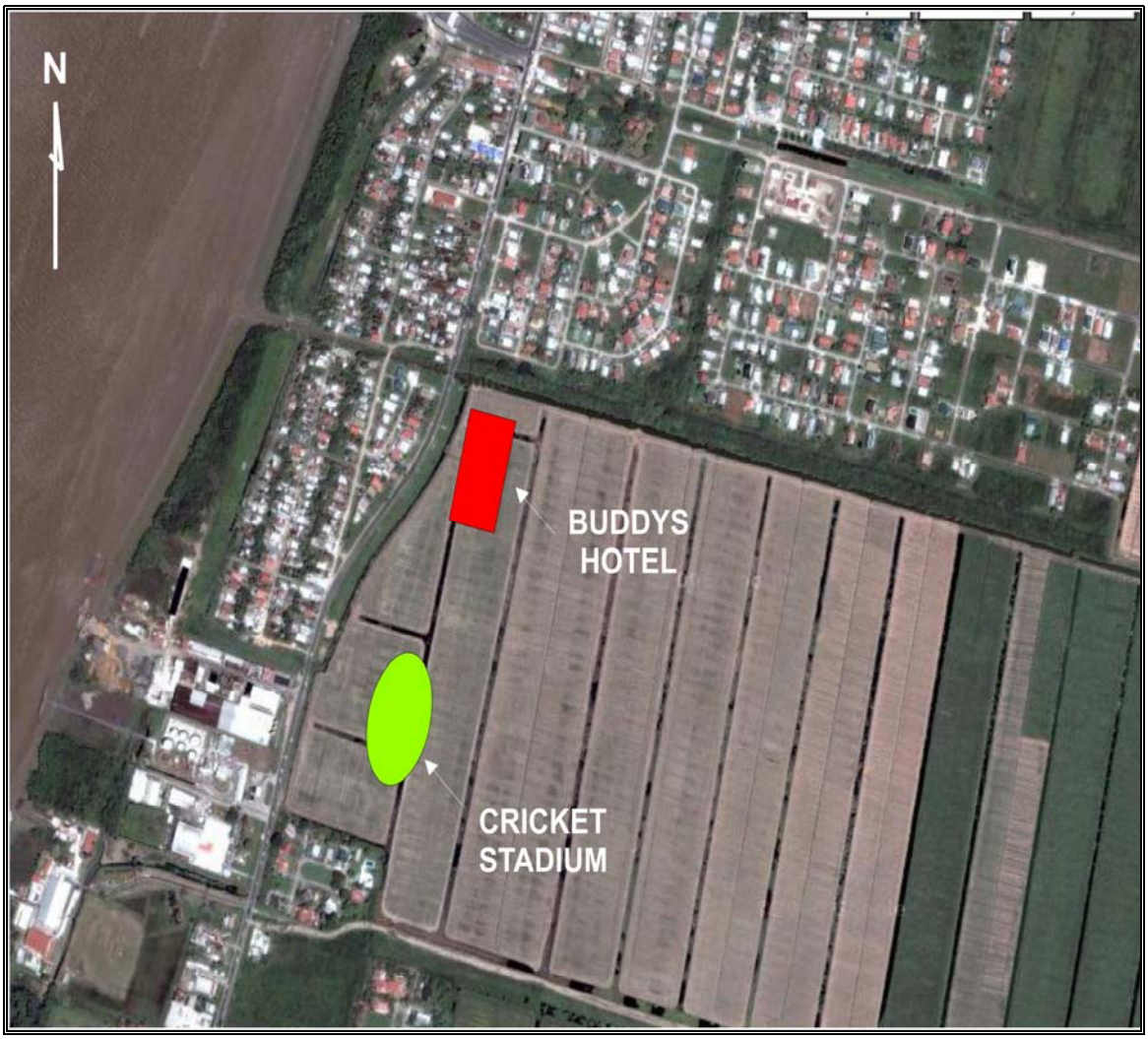

Fig 2.1: Location of Buddies Hotel.

The housing community of Nandy Park is located to the North of the hotel site across the four-lane road and a small drainage channel running along the western property boundary. The Providence community is located to the west of the site.

Adjacent to the project site is a construction of the Cricket Stadium.

The hotel is flanked by two housing communities, namely New Providence which is located immediately west of the hotel and Nandy Park which is located south of the hotel area.

Plate2.1.1: Cricket Stadium North of Project Site

Plate 2.1.2: New Providence housing scheme west of Project Site

Plate 2.1.3: Nandy Park housing scheme North of Project Site

A luxury apartment building is currently under construction immediately to the east of the hotel site while the cricket stadium is under construction to the south of the site. The hotel is being developed to provide accommodation for the Cricket World Cup 2007 matches to be played in Guyana as well as to add to the general stock of first class accommodations in Guyana.

Plate 2.1.4: showing apartment building east of hotel under construction and sugar cane plantation.

The Buddy's International Hotel is being developed on lands originally used by GUYSUCO as a sugarcane plantation which was subsequently abandoned Plate 2.1.4. The lands have been acquired by the Guyanese Government and recently designated as a site for housing and other developments.

2.2 Hotel Components

The hotel will include two hundred and thirty air conditioned rooms and twenty suites contained in a five storey building, See Appendix 6. (Conception ACAD drawing) The hotel will feature rooms with dimensions of 14 ft x 28 ft including internal fixtures and washing facilities. Figure 2.3 shows the layout of the main hotel components. The lobby area will house several small shops. A restaurant, conference room hair salon, gym, washing facilities and small shops are located to the rear of the hotel flanking a 60 ft x 100 ft. swimming pool. There will be two sets of fire escapes and an internal staircase as well as three elevators.

South of the main building is the parking lot which will provide parking for over three (300) vehicles. Basket ball and tennis courts are located in the north eastern corner of the property. A well and filter plant as well as the sewage treatment plant will be located along the northern boundary of the property.

Fig 2.2: Layout Plan of Hotel

2.3 Construction Methodology

The design of the hotel is essentially a reinforced concrete construction, see appendix 6 (ACAD Drawing front and elevation).The building foundation is piled and comprise 436 No piles 65 feet in length and having pile caps. All beams and columns are of reinforced concrete. Internal walls are constructed with hollow concrete blocks on the ground floor while the higher floor internal wall consists of sheet rock with aluminum studs.

A drop ceiling hangs 10' below each concrete floor level consisting of sheet rock and framed in kabukali and silverbali. The plumbing lines and electrical conduits will be housed within the drop ceiling. The front bays of the building will be covered with tinted tempered glass. Floors will be covered with ceramic non slip tiles and marble.

2.4 Support Services

2.4.1 Utilities

The hotel will have an electrical demand of about 600 KVA that will be supplied by the Guyana Power and Light Company. A standby generator will be installed with an output capacity of 600 KVA and will be housed in a sound proof building.

A well will be installed on the property. It is expected that the plastic cased and screened well will attain a depth of 70 feet. A filtration plant will deliver over 300 gallons of potable water per minute. A concrete cistern measuring capable of storing about 30,000 gallons will be installed.

Modern televisions, cable, telephone and internet services will be installed providing state of the art telecommunication services.

2.4.2 Waste Disposal

A self contained package sewage treatment plant will be installed to treat an estimated 37500 Gallons per day. The plant will carry out three stages of treatment, *primary*, *secondary* and *tertiary treatment* resulting in an effluent stream and a sludge residue.

The plant will treat all the waste water generated by the hotel including sewage, laundry washing and kitchen.

The sewage treatment plant will produce tertiary effluent that will meet EPA effluent drainage standards or equivalent (WHO effluent standards).

Effluent Characteristics after Treatment

- BOD- 20 mg/L
- TSS-20 mg/L
- pH- 6.0-8.0
- Fecal Coliform concentration- 200/100 mL
- Chlorine residual- 0.5 mg/L

The final effluent will be discharged into a drainage channel along the northern boundary of the hotel property which leads directly into the Demerara River less than 200m away. With this level of treatment the effluent water can be used as grey water for irrigation and other non-potable uses.

2.4.2.1 Sewage Treatment Plant

The package waste water treatment plant being installed by the developer is an extended aeration sewage treatment plant. The main components of the plant are shown in Fig 2.4.2.1 and described below. The components include:-

- Pre-treatment stage
- Aeration chamber
- Settling chamber
- Dosing chamber/sand filter

The effluent from the hotel will be discharged into wet wells and fed to the treatment plant by lift pumps through underground piping and manholes to facilitate cleaning of the pipes. Screens will be installed in the wet wells to remove untreatable matter.

The first stage in the treatment is in the aeration chamber which is responsible for 90% of the treatment process. Bacteria grown in the aeration chamber breaks down the biodegradable matter in the waste water stream to produce a suspended sludge.

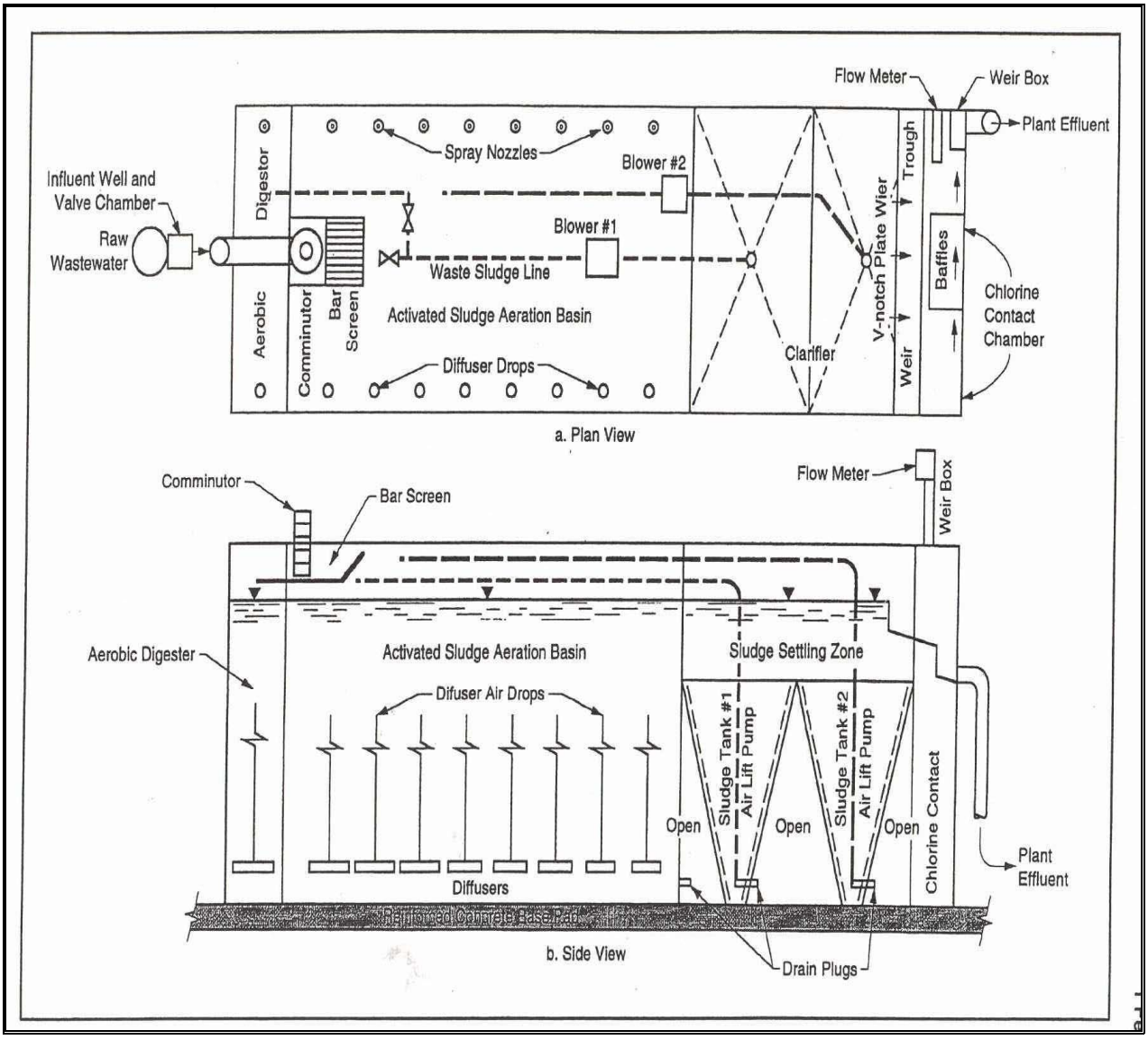

Fig 2.4.2.1: Showing components of Sewage Treatment Plant

The microorganisms in the suspended sludge is removed in the settling chamber and pumped back into the aeration chamber. The clear liquid at the top of the settling chamber is at this stage

85-90% treated. The final polishing of the effluent is carried out in a dosing chamber where the effluent passes through a sand filter and then chlorine is added for disinfection.

The installation of the plant will include the construction of tanks, installation of piping and pumps. The actual package system will be half buried in the ground. The installation will be fenced and walkways with rails and ladders will provide safety features for inspection of the plant. The main electrical controls will be housed in a control room.

Treated effluent from the system will be discharged into the drainage channel running along the northern boundary of the hotel property. The effluent leaving the treatment plant facility and entering the drainage channel is considered to be treated to tertiary levels and this effluent water quality meets the WHO effluent standards used by the EPA.

Instructions for proper installation and maintenance of the treatment plant is presented in Appendix 2. This includes detailed maintenance procedures and schedules together with common problems and solutions to ensure proper operation of the system

2.4.2.2 Solid Waste

Solid waste generated by the hotel will primarily consist of domestic type waste including paper, plastics, packaging, and food waste. Waste collection and storage containers such as skips will be provided throughout the hotel site. The waste will be collected on a regular basis by a private waste haulage contractor and dumped at the Mandela dump site, and later the landfill site proposed at Hagen Bosch, East Bank Demerara.

2.5 Employment

The hotel will provide job opportunities during the construction and operational phases of the project both as direct and indirect employment. During the construction phase 200 hundred jobs are expected to be created directly from the construction activities. These include jobs for both skilled and unskilled construction workers. It is expected that these workers will be filled by persons available from the surrounding communities. In addition the provision of construction

materials and services such as trucking stimulate local and regional economic activity and generates jobs indirectly.

During the operation the hotel will generate a wide range of job opportunities including managerial, service, maintenance and technical positions. A total of 200 job positions are projected to be needed to operate the hotel. These positions will be filled by qualified persons locally and regionally. Where necessary the hotel will undertake staff training and as a last resort will employ overseas workers if suitably qualified persons are not available in Guyana.

2.6 Project Status (Audit of Activities)

2.6.1 Introduction

This EIA was commissioned by Buddy's International Hotel Inc. after construction of the hotel had commenced. This section of the report serves as an audit of activities undertaken to date including site clearance and construction activities. The brief audit report has been requested by the EPA during consultations at the scoping stage of the EIA process in order to finalize the terms of reference.

2.6.2Construction status

The hotel is 80% complete, Plate 2.6.2.1 and 2.x front and rear view of building) with the site clearance, foundation and superstructure structural components complete. All internal and external concrete blockwork is complete. Glass cladding, internal and external finishes, electrical, plumbing, fencing, swimming pool, ancillary buildings and well for water supply and drains are ongoing.

Plate 2.6.2.1: Front View of Hotel under construction

Plate 2.6.2.2: Rear View of Hotel under construction

The swimming pool and the support service structures are partially complete, Plate 2.6.2.2 & Plate 2.6.2.3 (view of pool and buildings). The potable water producing well has been dug to a depth of 68 feet with final pump installation under way Plate 2.6.2.4.

Construction of buildings to house the water filtration plant as well as the waste water treatment plant infrastructure have not begun. Infrastructure such as the parking lots, tennis and basket ball courts a have not been constructed. Landscaping of the hotel surroundings has not commenced.

Plate 2.6.2.2 : Showing swimming pool under construction

Plate 2.6.2.3: Showing adjoining restaurant building under construction.

Plate 2.6.2.4: Well has been dug up to 68 feet

2.6.3 Health & Safety

Random checks on the construction works indicated that there was no systematic use of safety equipment by workers. However safety equipment such as work helmets and dust masks were seen in use.

2.6.4 Solid Waste Disposal

Checks on the hotel site during construction indicated that solid waste including ruble, lumber, paper and plastics were temporarily stored on the ground and subsequently disposed of off-site.

Plate 2.6.4.1: Construction waste

Plate 2.6.4.2: Construction waste material

2.6.5 Material Storage

Materials such as coarse and fine aggregate are stockpiled. Lumber, steel, cement and other materials were stored in covered storage areas.

Plate 2.6.5.1: picture of storage building beside site office

2.6.6 Fuel Storage

A small amount of diesel fuel is currently stored on site in 50 gallon steel drums for the operation of a stand–by generator. In addition there is storage for diesel used for construction equipment.

2.6.7 Noise

The use of heavy equipment during site clearance and construction works has generated above normal noise levels. Residents however have not indicated that a significant noise nuisance was created by the construction activities.

2.6.8 Dust Pollution

Dust as airborne particulates is generated by earth moving and other construction activities. Wind disperses the dust carrying it away from the source. The wind itself generates dust by carrying away fine particles from material stock piles and from dry ground surfaces.

Plate 2.6.8.1: Showing low level dust on internal site roadway

The distance of nearby communities has reduced the effects of dust pollution generated by the hotel construction activities. The high level of rainfall during the construction period has in itself contributed to a reduction of dust pollution, and other control measures such as ground wetting was carried out when necessary.

2.6.9 Construction Staffing

The hotel construction has employed over 200 construction workers to date surpassing initial projections. Most of the workers have come from nearby communities. There has been increased economic activity due to the hotel construction both locally and within the construction services and materials supply sectors.

3.0 LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

The Environmental Protection Agency mandates that an Environmental Impact Assessment is required for any project which has the potential to impact the environment. Construction and operation of hotel a will result in impacts on the environment and consequently this statutory requirement must be met. National and local level policy statements, legislation and regulations are also relevant to the environmental impacts of the development and implementation of this project.

This section of the EIA presents the policies, statutory requirements and guidelines which impact the environmental and social assessment process relevant to the construction and operation of a hotel.

3.2 National Policy

In the National Environmental Action Plan (NEAP), 2000, the Government of Guyana has outlined its environmental policy objectives for the sound management of the environment and natural resources. Twelve policy objectives were outlined. Those applicable to the proposed facility landfill are listed below.

- Ensure prior environmental assessments of proposed activities, which may significantly affect the environment.
- Raise consciousness of the population on the environmental implications of economic and social activities through comprehensive education and public awareness programs.
- To ensure the performance of environmental assessments of activities which may affect the environment, The Environmental Protection Act was made law in June 1996 and the legal framework for undertaking environmental impact assessments was

3.3 EPA's Role in EIA's

The Environmental Protection Act mandated four functions for the EPA which relate to environmental assessment. These are:

- to take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of natural resources;
- to promote the participation of members of the public in the process of integrating environmental concerns in planning for development on a sustainable basis;
- to ensure that any development activity which may cause an adverse effect on the natural environment be assessed before such activity is commenced and that such adverse effect be taken into account in deciding whether or not such activity should be authorized.
- to give development consent which entitles the developer to proceed with the project.

3.5 The EIA Process

The Environmental Protection Agency has indicated that an environmental impact assessment is a mandatory requirement for the issuance of an environmental authorization for the operation of a hotel. Commencement of the environmental impact assessment process must be preceded by an application for an environmental authorization and a summary of the project. After this submission, the EPA publishes a notice of the project in at least one daily newspaper. A summary of the project is made available to members of the public for a period of 28 days. Within this period the EPA accepts written submissions to the Agency related to the project .A public consultation meeting is held after/during this 28 day period. Additional concerns of the public are noted at this forum and the EPA provides comments to the EIA Consultants for finalization of the Terms of Reference (TOR) of the EIA.

During the environmental impact assessment process the developers and consultants are required to consult members of the public, interested bodies and organizations. The developer and consultant must submit to the EPA, the EIA report for evaluation and recommendations. The EPA along with relevant sector agencies review the EIA during this sixty day period to ensure

that the EIA is in line with any plans, guidelines, regulations or codes of practice developed by the EPA and sector agencies. Copies of the EIA and the findings of the review by EPA and sector agencies are passed to the EAB for review and recommendation.

A public meeting, chaired by the EAB/EPA is held at the end of the 60 days period. Additional comments are provided by members of the public at this meeting.

A final EIA is then prepared to address the comments of the EPA, the sector agencies, the public and the EAB to address issues in the TOR initially agreed to but excluded from the EIA.

The EAB will then recommend to the EPA whether the EIA is acceptable and the conditions to be attached to the Environmental Permit, should it be granted.

The EPA takes into account the recommendations of the EAB and sectoral agencies, comments of the public and its own review, and decides whether or not the project should be approved. For approved projects, the EPA issues an Environmental Permit with the terms and conditions necessary to effectively manage the environment.

3.6 Environmental Protection Regulations

Regulations on Hazardous Waste Management, Water Quality, Air Quality and Noise Management were established under the Environmental Protection Act in 2000. These pollution management regulations were developed to regulate and control the activities of developmental project during construction and operation. Standards establishing the permissible parameters under these regulations are being developed and EPA is currently engaged in a public awareness exercise to sensitize businesses and the public at large about the regulations.

For Noise Management Regulation, the EPA is responsible for setting noise levels for activities such as entertainment, transportation and commercial and construction activities. The Water Quality Regulation protects Guyana's waters by controlling discharges of waste matter into any of the coastal and inland waters or land.

The Hazardous Waste Management Regulation protects Guyana's environment from clinical wastes from medical care in hospitals, and waste from the production and preparation of pharmaceutical products. The EPA is responsible for establishing guidelines for the proper disposal, treatment, storage or any other activities related to the handling of hazardous wastes. For Air Quality Regulations, the EPA is responsible for determining and establishing the allowable level of atmospheric pollutants that can be emitted which would adversely affect the health of plants, animals and humans.

3.6.1 Water Quality Regulations 2000

These regulations require registration and environmental authorization by any person whose construction, installation, operation, modification or extension of any facility cause the discharge of effluents. They cover parameter limits of effluent discharges, new sources of effluent discharges, fees for registration and environmental authorizations, sampling points, records and reports and general provisions for the registration of water effluent, biological integrity, spills or accidental discharges and standard methods of analysis. Guidelines on the discharge of effluents and disposal of liquid wastes are detailed in these regulations. However no standards for water quality for construction operations have been developed as of this date. However, for this project, the following WHO standards shown in **Table 3.6.1.1** may be applicable as they are being used in the interim by the EPA while national standards are being developed.

Table 3.6.1.1 Environmental Water Quality Standards

Parameters	**Standard (WHO)**
Physical text	
pH	6.5 – 8.5
Conductivity	N/A
Total suspended solids	25 mg/ L
Dissolved oxygen	≥ 4 mg /L
Turbidity	max. day < 150 NTU
Temperature	-
Anions	
Alkalinity	nil
Sulphate	250 mg/L
Heavy metals	
Calcium	145 – 250 mg/L
Copper	nil
Iron	0.3 mg / L
Lead	nil
Mercury	nil
Zinc	nil
Sodium	70 mg / L

3.6.2 Air Quality Regulations 2000

These regulations require the registration and environmental authorization of persons with facilities that emit air pollution from any process into the atmosphere as outlined in the regulations. Elements related to parameter limits on air contaminants and emission sampling is also stated in the regulations. Schedule I outlines provisions for air pollution-monitoring index. The list of air contaminants for which parameter limits are to be set by the Agency are also detailed in the regulations. No air quality standards are established for mining projects in these regulations. Below in **Table 2-2** are Ambient Air Quality Standards for consideration.

Table 3.6.2.2 Air Quality Standards.

Pollutant	World Bank Std.
Nitrogen Dioxide (NO2) Maximum 24-hour average	150mg/m^3
Particulate Matter(PM10) 24-hour average	70mg/m^3
Sulphur Dioxide (SO2) 24-hour average	125mg/m^3

3.6.3 Noise Management Regulations 2000.

Under these regulations operations that emit noise in the execution of various activities such as construction, transport, industry, commerce and any institution are required to apply to the Agency for an environmental authorization. The EPA is responsible for the establishment of standards for permissible noise levels in industry, construction and other areas. The categories for permissible noise levels to be established by the EPA were identified as follows: Residential, Institutional, Educational, Industrial, Commercial, Construction, Transportation and Recreational. The EPA has not established noise level standards as yet but has adopted the GNBS local interim noise standards which stipulate level of:

- 50 decibels during the night for residential areas
- 55 decibels during the day for residential areas
- 70 decibels during the night for industrial areas
- 75 decibels during the day for industrial areas

3.7 Relevant Sectoral and National Policy and Legislation

3.7.1 Town and Country Planning Act, 1946

This Act provides for the orderly and progressive development of land, cities, towns and other areas, being urban or rural in order to preserve their amenities. Under this Act the CH&PA has the authority to implement a planning scheme in consonance with the Act. The Greater Georgetown Development Plan has been produced with a view that a revised Act would

incorporate the recommendations outlined in the plan. This would be primarily for the district of Georgetown, and similar plans are underway for other areas.

3.7.2 Occupational Safety and Health Act 1997

The identification of the health and safety hazards during the operation of the proposed development must be seen as a key element for assessment. The Occupational Safety and Health Act 1997 outlines the procedures for establishing a factory site, regulating it and mandates that health and safety facilities are provided, maintained and the industrial establishment complies with the regulations under the Act.

In keeping with the laws and regulations, a description of the established management procedures to monitor and manage occupational health and safety hazards is critical for this project.

3.7.3 Roads Act, 1909

This Act concerns the administration, maintenance and construction of roads. It also governs the movement of vehicles on land.

3.7.4 Motor Vehicles and Road Traffic Act, 1940

Deals with the licensing, regulation and use of motor vehicles and the regulation of traffic upon roads.

3.7.5 State Lands Act, 1903

This Act ensures the proper administration and regulation of lands, rivers and creeks of the State. It allows the President to grant leases or licenses for the use of State property.

4.0 DESCRIPTION OF PROJECT ENVIRONMENT

4.1 Introduction

This chapter describes the hotel site as well as its surroundings in terms of the physical, biological and socio-economic characteristics. The construction of the hotel started before the EIA study began and therefore the physical and biological features existing pre-construction have been modified significantly. In order to assess the pre-construction conditions the surrounding areas in close proximity and similar to the hotel site were examined.

This is a reasonable approach since the area disturbed is relatively small and lies within a much larger area that is homogenous in it bio-physical characteristics. Plate 4.1 shows the footprint of the hotel within the larger context of expansive cane fields and surrounding communities as well as the proximity of the hotel site to the Demerara River. Physical, biological and socio-economic assessments were carried out and the results are presented below.

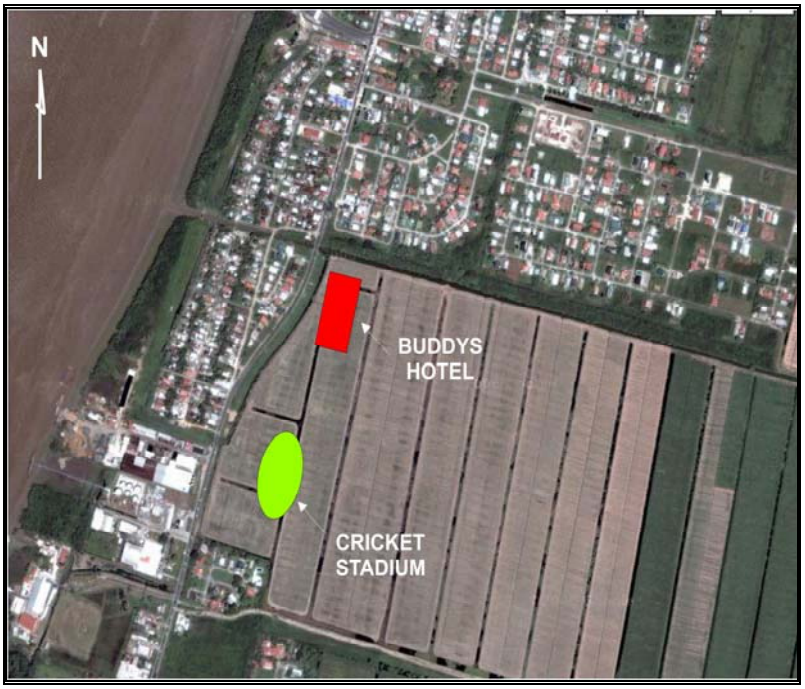

Plate 4.1: Showing footprint of Hotel

In general the site was highly disturbed before the site was cleared and construction began. The surrounding communities, the industrial estate and the ongoing construction projects around the hotel site have all modified the existing environment before construction began.

4.2 Physical Environment

4.2.1 General Setting

The hotel site is located on a relatively flat coastal plain that extends along the Guyana coast from the East Bank of the Demerara River eastwards to the Berbice River. The coastal plain slopes gently to the sea and forms a distinct ecological and geomorphologic region dominated by swamps, mangrove forests, tidal flats, and mud banks.

The coastal plain on which all the major settlements and agricultural lands are located is at or slightly below sea level. A system of sea defences, dams, irrigation canals, drainage channels, sluice gates and pumping stations prevents flooding of the coastal plain from the high tide.

4.2.2 Climate

The climate in Guyana is strongly influenced by the Inter-tropical Convergence Zone (ICZ) causing a bi-modal annual variation of climate variables. There are two wet seasons with peak rainfall in May and December, and two dry seasons with lows in March and November. Figure 4.2.2shows the typical monthly annual rainfall recorded at the Botanical Gardens rain gauge station in Georgetown which is the closest to the hotel site location.

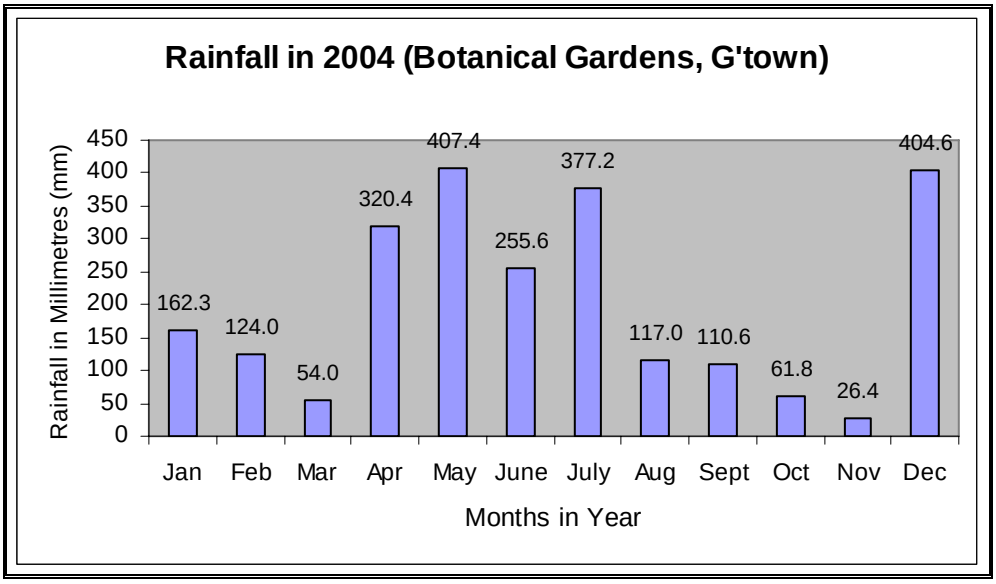

Figure 4.2.2 Annual rainfall recorded at the Botanical gardens in Georgetown *(Source: Georgetown rainfall data 2004, Hydrometeorlogical Division, Ministry of Agriculture).*

In general, annual rainfall in Guyana decreases to 1700 mm toward the east of the country.

Average daily temperature is 25.9 degrees Celsius and the annual variation in average daily temperature is only about 2 degrees Celsius. The average diurnal variation is about 6 degrees Celsius. Warmest months are September and October. Coolest months are January and February. The average sunshine amounts to 45% of the total daytime.

Annual Potential Evapotranspiration (PET) amounts to 1350 – 1500 mm. Relative humidity is high and fairly constant throughout the year.

4.2.3 Topography

The hotel site is located about 1 km from the East bank of the Demerara River. It is flat with negligible grade and is bounded by an artificial drainage channel to the north and the west, Plate 4.3.1. There are no distinct geomorphological features and the land surface is about 1 meter below high water level.

Plate 4.2.3 Drainage channel to north and west of hotel.

4.2.4 Soils

The project site is located on the Coastal Plain of Guyana where the soils are predominantly alluvial deposits over organic material and silts comprising the Demerara clay with localized pockets of peat (pegasse). Four different types of clays are associated with the Demerara Formation; the Mara Clay, Brickery Clay, Tuschen Clay and Lama Muck. At the project site the clay exposed at the surface consists of the Demerara Clay.

Plate 4.2.4: Project site is predominantly clay

4.2.5 Ground Water

Available water resources to meet the projects needs are not considered a problem. Projected abstraction rates from this well will not impact on water resources available to Guyana Water Incorporated for serving the rest of the area. Guyana Water Incorporated has two pumping plants in the vicinity of the Hotel. They are located at Eccles and Covent Garden. Abstraction is from the A Sands which is located approximately at 732 ft depth at Eccles and 670 ft at Covent Garden. Abstraction is not generally affected if the boreholes are more than 1000 ft apart (Phreatic influence). Tests conducted over years indicate that water levels are not changed significantly as they are constantly being recharged by surface water from the White Sands. The plants have capacities of 64,000 gal/ per hour each at Eccles and Covent Garden. However abstraction is 55,000 gal/hour at Eccles and 54,900 gal/hr at Covent Garden. The boreholes of both wells are 14" diameter.

The Project will be extracting 100% of its water requirements from a 680 foot well it is currently drilling. A water treatment facility will be installed to ensure the integrity of the hotels domestic water.

4.2.6 Surface Drainage

As part of the old sugar plantation the area of the hotel site was drained by a network of drainage channels that discharge via sluice gates into the Demerara River, Plate 4.2.6.2. The drainage channel that forms northern boundary of the hotel property Plate 4.2.6.1 is a major channel that discharges into the Demerara River via the Peters Hall sluice to the west of the hotel site. A smaller drainage channel is found on the western side of the property that connects to the larger channel. The entire network is connected Peters Hall sluice which also drains the residential areas in Republic Park, Nandy Park and Bagotstown. These areas are well drained and the hotel effluent will not impact significantly on the system.

Plate 4.2.6.1:Drainage Canal north of the Project Area

Plate 4.2.6.2:Drainage Outfall to the Demerara river West of Project Area

4.2.7 Water quality

The following table provides baseline values for various water quality parameters

Table 4.2.7. Water quality parameters

Sample Identification	pH	TSS	DO	Turbidity	Nitrates	Phosphates
Side Canal	6.54	104.33	2.21	14.1	2.22	1.11
Front Canal	6.82	33.67	1.80	26.4	3.55	1.78

pH

The pH values for the stations sampled were normal.

Dissolved Oxygen (DO)

Dissolved oxygen concentrations were low, below saturation levels.

Turbidity

Turbidity levels are good for the all stations.

Nitrate

Nitrate levels are indicators of contamination by sewage wastewater and/or fertilizers from agriculture. Nitrate levels higher than 1 micro-mole (μM) or 0.65 mg/l NO3 usually indicate nutrient enrichment from one or both sources. NitrateConcentrations exceeded 1.0 μM at sampling point. This is influenced by runoff of fertilizers from Guysuco cane field, east of the project site.

Phosphate

Of the stations sampled, phosphate concentrations are above the required limit. This is influenced by fertilizer runoff from the Guysuco cane fields.

4.2.8 Natural Hazards

The flat low lying nature of the project site makes it susceptible to flooding after long duration of intense rainfall. Flooding in the zone is not considered a widespread threat. Reports of flooding after heavy rainfall, was confined to some sections in Nandy Park, Peters Hall and Providence. The most flood prone area is reported as Providence and this area is not drained through the Peters Hall sluice. During the conduct of the rapid appraisal survey in this community, land surrounding some homes was observed to be inundated after only moderately heavy rainfall of limited duration. Explanations for this varied but several residents pointed to overgrown and clogged drains and some maintained that the Providence sluice was often inoperative due to lack of maintenance.

The flood event of 2005 is a reference point for community memory of flooding. Respondents questioned pointed to severe flooding during the period but of limited duration. In the industrial area, serious flooding was also reported in 2005, and is still seen as a potential threat to the area. The client has put in place a system of concrete drains around the periphery of the building, see drainage plan of site Fig 4.2.8 and as mentioned before the Peters Hall Sluice is capable of taking off the additional volume of stormwater.

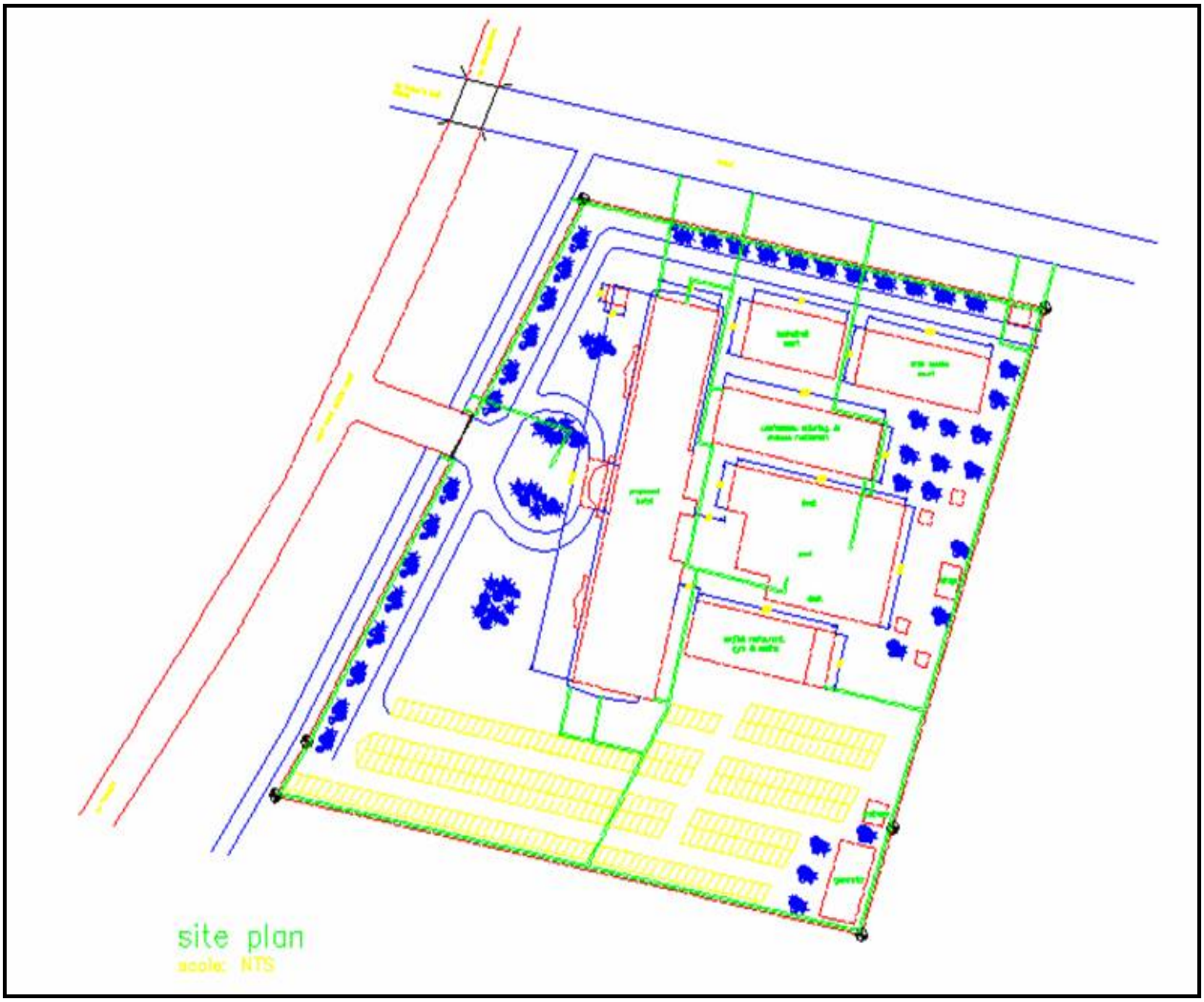

Fig: 4.8.2 Showing Drainage Plan of hotel site (depicted by green lines)

4.3 Biological Environment

4.3.1 Ecological Setting

The hotel site is a highly disturbed site ecologically as it was part of the GUYSUCO sugar plantation. The clearance of the land for construction removed the remaining sugar cane plants with only a few grass and shrubs remaining on the periphery of the site, Plate 4.x.

Plate 4.3.1.1: typical Vegetative cover on project site

Large drainage channels that drain the land around the site form an artificial aquatic habitat. The construction of the hotel is not expected to change the drainage channels. There are no endangered species or sensitive habitat on the hotel site.

Plate 4.3.1.2: drainage channel at the hotel site.

4.3.2 Flora

Sugar cane was previously cultivated on the site, but the area has been abandoned for several years. The "natural vegetation" is now comprised of secondary disturbed vegetation, primarily shrubs, herbaceous plants and several species of grasses, including razor grass and volunteer sugar cane *Saccharum officinarum* plants. Table 4.3.2 lists the species of plants found in the hotel site and it immediate surroundings.

Table 4.3.2 showing Flora at Buddy's Hotel Vicinity

Family & Common Name	**Scientific Name**	**FAMILY & Common name**	**Scientific Name**
ANNONACEAE		EUPHORBIACEAE	
Monkey Apple	*Annomata glabra*	Antidesma	*Antidesma phaesambilla*
ARACEAE		FABACEAE	
Muku Muku	*Montricardia arborescence*	Shak Shak	*Crotalaria inrana*
		Shak Shak	*C. retusa*
ASTERACEAE			
Railway Daisy	*Wedelia trilobata*	MIMOSACEAE	
		Giant Shame Bush	*Mimosa pigura*
BORAGINACEAE			
Clammy Cherry	*Cordia tetranda.*	MYRTACEAE	
Black Sage	*Cordia curassiva*	Jamoon	*Syzygium cumini*
		Guava	*Psidium guajava*
BROMELIACEAE			
Bromilad vine	*Bromiliad sp.*	POACEAE	
		Para grass	*Brachiaria mutica*
CAESALPINPINIACEAE		Crab grasas	*Digitavia ciliaris*
Carrion Crow Bush	*Senna alata*	Bahama grass	*Cynodon dactylon*
		Bamboo grass	*Hymenachne amplexicanalis*
CECROPIACEAE		Sour grass	*Paspalum conjugatum*
Conga Pump	*Cecropia sp.*	Sugarcane	*Saccharum officinarium*
		Water grass	*P. repens*

COMMELINACEAE		PONDICHERIDAE	
Caner grass	*Commelina diffusa*	Water Hyacinth	*Eichhornia crassipes*
CONVOLVULACEAE		PTERIDACEAE	
Morning Glory	*Ipomoea trilobata*	Fern	*Acrustichum sp.*
CYPERACEAE		SALVINIACEAE	
Bisi Bisi	*Eleocharis elegans*	Aligator eye	*Salvinia auriculata*
Razor grass	*Cyperus luzulae*		
		SOLANACEAE	
		Buru Buru	*Solanum stramonifoliuym*

Aquatic vegetation observed in the canals include alligator eye (*Salvinia auriculata*) and water lettuce (*Pistia stratiotes).* The species listed in Table 4.3.2 were either seen growing on the periphery or in the northern strip of land and other immediate surroundings, or in water bodies in these places.

Plate4.3.2.1: Aquatic Vegetation in Canal North of Hotel

Plate4.3.2.2: Canal located in front of Hotel

4.3.3 Fauna

Fauna such as crickets (*Gryllus spp*.), butterflies, wasps, flies, beetles, and birds such as cattle egret (*Bubulcus ibis*), kiskadee, dove (*Columbina passerina*), yellow plantain are frequently seen. The canals are reported to contain fishes such as hassar, houri, patwa, sunfish, silverfish, and reptiles including Caimans. Table 4.3.3.1 lists the dominant species of fauna observed on the hotel site and the surrounding areas.

Table 4.3.3:1 showing Flora at Buddy's Hotel Vicinity Fauna at Buddy's Hotel Vicinity

FAMILY & Common Name	**Scientific Name**	**FAMILY & Common Name**	**Scientific Name**
FISHES		**BIRDS**	
CICHLIDAE		ARDEIDAE	
Patwa	*Cichlosoma bimaculata*	Crane	*Bulbus ibis*
Sunfish	*Grenicichla alata*	Great Egret	*Egrtta alba*
ERYTHRINIDAE		COLUMBINIDAE	
Huri	*Hoplias malabaricus*	Dove	*Columbina passerine*
PIMELODINAe		ICTERIDAE	
Kasi	*Rhamdia quelen*	Yellow plantain	*Icterus nigrogularis*
SIMORIDAE		Carib Greackle	*Quiscalus lugubris*
Hassar	*Hoplosternum littorale*	JACANIDAE	
Silverbait	*Astanyax sp.*	Spurwing	*Jacana jacana*
		TROCHILIDAE	
AMPHIBIANS		Spectacled hummingbird	*Schistos geofforyi*
BUFONIDAE		TUDIDAE	
Crapaud	*Bufo marinus*	Cocoa Thrush	*Turdus fumigatus*
HYLIDAE	*Hyla sp.*	TYRANNIDAE	
		Kiskadee	*Pitambus sulphuratus*
REPTILES			
CROCODYLIDAE		**MAMMALS**	
Aligator	*Caiman crocodylus*	CHIROPTERA	
TEIIDAE		Fruit Bat	*Pteroput gigantus*
Salipenta	*Tupinambus tebuixin*	RODENTIA	
TROPIDURIDAE		Cane rat	*Halochilus braziliensis*
Lizard	*Trapidorus hisperus*	**INVERTEBRATES**	
VIPERIDAE		DIPTERA	
Labaria Snake	*Bothrops atrox*	Flies	
		Moquito	
		HYMENOPTERA	
		Ants	
		LEPIDOPTERA	
		Yellow Morpho	

Like the flora the fauna are very common and can be found throughout the coastal plain especially on abandoned agricultural lands water logged soils and drainage and irrigation networks along the coastal agricultural belt. The Demerara River and the East Bank Highway are natural barriers for animals wishing to migrate across them. The Drainage Canal is a minor barrier, while the progressive populating of areas such as Nandy Park and Republic Park would have definitely had adverse effects on faunal migration as well.

4.4 Social

4.4.1 Introduction

The main purpose of the socio economic analysis is to place the proposed development project within the context of the human environment upon which it will have an important influence. This sub section essentially deals with the socioeconomic context of the area i.e. land use patterns; population and demography, infrastructure etc.

4.4.2 Socio-Economic Setting

The project area is mainly characterized by a mixture of residential settlement, manufacturing entities and trading activities.

Fig 4.4.2: Showing surrounding communities and industrial site.

The predominant settlement type in the area is low income housing (New Providence and Peters Hall). Some middle income housing (Nandy Park) and a smaller population of upper income housing (New Providence and Greenfield Park).

Plate 4.4.2.1: New Providence Housing Area

Plate 4.4.2.1: peters Hall housing area

Plate 4.4.2.3: Green field Park Housing Area

Plate 4.4.2.4: Nandy Park Housing Area

4.4.3 Land use

The main land use in the zone, in spatial terms, is settlement and industrial use. Other types of land use in the project area are those commonly associated with residential communities such as schools, commercial offices, food and entertainment establishments, churches or temples and state security and other services. The Project represents a significant addition to the land use pattern in the zone. The largest employer within the local NDC comprises some 9 medium to large entities which dominates the local economy; these entities are into manufacturing or distribution of a range of products. According to informed opinions, the Industrial Area contribute some direct employment within the zone, however it is it is unlikely that this employment is significant.

More recently, the Providence Stadium complex, the new four lane road and the accommodation related construction activity being undertaken, are reported to have created important new jobs. The construction activity in the zone must be viewed as a microcosm of the driving elements in Guyana's long term development strategy. The current expansion of East Bank Demerara Road, previously a two-lane road into a 4 lane road is consistent with Guyana's development potential from the constraints of an inadequate road network. As the most important road into or out of Georgetown, the highway will be catalytic to the emerging development corridor, of which, current developments are a precursor. Similarly tourism is regarded by planners as one of the quickest and most cost effective routes by which to accelerate Guyana's development.

The Project is therefore fully consistent with the enhanced linkage between Georgetown and the international airport at Timheri that the highway is designed to facilitate.

In terms of the population structure of the project area, the basic 1991 demographic profile indicates a slowly growing population, one which is moderately pyramidal in age distribution and also about evenly split between genders.

	
Plate 4.4.3.1: Macorp Industrial Area	*Plate 4.4.3.2: Toolsie Persaud Group of companies*

4.4.4 Infrastracture

4.4.4.1 Solid Waste Collection and Sewage

In the Eccles Ruimveldt area garbage collection is done twice monthly. While communities acknowledged that the service was punctual, the fortnightly collection cycle must be considered grossly inadequate. In the upper income communities mobile residents can exercise alternative options for acceptable disposal of accumulated garbage. The same is not the case in the lower income communities, which collectively contribute the higher percentage of domestically generated waste. The practice in these communities is to burn or dump.

The rapid appraisal survey indicated that the great majority of homes and establishments in the zone, operated with flush toilet to soak ways for handling sewage. A few outside pit latrines are still in use according to community members.

4.4.4.2 Health Centers

Three public health centers are available to communities within the zone, although situated outside of the Eccles Ramsburgh area. They are located in Agricola, Herstelling and also Georgetown. These clinics offer mainly maternity and child care services. The level of health care services they offer is partly limited by their proximity to the Georgetown Public Hospital Corporation and the availability of private medical care in Region 4 including private hospitals. Georgetown Public Hospital is the main health care providing facility in Guyana. It offers a full range of medical firms. A modern diagnostic center is planned for Diamond in the Grove Diamond district. This facility will be less than 5 miles south of the Project. In relation to the zone, the current health facilities, both existing and planned, appear reasonably adequate in terms of the ratio of patients to health care professionals although diagnostic and treatment equipment is reported to be limited. Residents of the zone can access health care services within reasonable proximity. With the completion of the current construction developments in the zone, and the consequent inflow of new residents, workers and visitors, stresses will continue to build on health facilities closest to the zone.

In relation to tourism development, both emergency and elective health care facilities would need upgrading to bring them on par with more competitive visitor destinations in the Caribbean. Fairly extensive emergency medical response planning is being undertaken for the ICC's World Cup in 2007. This will see upgrading of the capacity of the health services to respond to given threat scenarios. Included are improved systems and procedures for emergency evacuations to neighboring countries if necessary.

The approach taken by the Project in providing emergency medical assistance to its guests, is to have two private medical doctors on call.

4.4.4.3Fire Services

The nearest fire brigade station to the zone is located in West Ruimveldt. This facility has one unit with a current water carrying capacity of 500 gallons. However the main Georgetown station is the designated response facility for the zone. Currently it operates with four units, the largest tenders having a water carrying capacity of 2000 gallons. Access to water in the zone is facilitated by the canal system since there are no fire hydrants. The Peters Hall canal and waterways run close to the Project and the service has developed both capacity and expertise in tapping into such system.

The overall fire fighting infrastructure available in Region 4 is not modern, though it is capable of handling the great majority of fires it responds to. The Project will be equipped with a modern sprinkler system and fire hydrants, and will institute fire safety measures consistent with prescribed local building standards for this type of development. The Guyana Fire Services has approved the building plans for the project and will undertake periodic inspection to ensure compliance with the conditions of that approval.

4.4.4.5 Police Stations

The Providence Police Station is situated in the zone. It is one of several within Region 4 falling under the command of Georgetown. The senior rank person at the station is at the level of Inspector. A formal request to the Commissioner of Police for data relating, among other things, to staffing levels and number of crimes reported to the station annually was denied on grounds of security. The Guyana Statistical Bureau does not publish crime data. However, key informants did not regard crime as a problem in the zone. This opinion was shared by several community members. In fact, a few respondents commented on the Project perhaps posing a threat to the peacefulness of their respective communities, since the heightened entertainment and visitor profile of the zone, could attract criminal elements. In relation to internal security, the hotel will operate with trained security personnel on property.

4.4.4.6 Transportation and Traffic

The public transit system serving the zone is characterized by both a formal and informal system of carriers. These range from registered minibuses and cars to unregistered cars. Minibuses and taxis commute between outlying districts within the city as well as between Regions. The public transport system is regarded as being inadequate and somewhat unregulated. The problem is exacerbated by the need to meet the significant demand of work force commuters who travel within Georgetown and neighboring areas. However a primary and secondary road network facilitates movement of private and commercial traffic throughout the city and from surrounding areas.

During a 24 hour period at full occupancy, the Project could generate close to 1000 commuters entering and leaving the Project through its two lane single entrance. A significant percentage of the hotels labour force will probably arrive by public transport. This will make it necessary to ensure that ingress and egress points can accommodate this public transport flow during peak hours. Standing taxis for hotel guests can be managed by stacking and visitor commuting will probably peak in relation to flight movements. Peak visitor traffic is likely to be outside of normal peak hours Staff parking has been also been designed for.
Stakeholders confirmed that there were concerns relating to the movement of traffic through the area particularly for large sporting events. However it is known that traffic handling scenarios are continuously being reviewed and

Traffic Counts.

The traffic counts in **Table 1.2** were extracted from a larger count, originally conducted by CEMCO over a 12 hour period on 11 September 2005. The location of the Count was South of HB. Peters Hall on the East Bank Highway and provides an acceptable indication of likely current flows past the Project. Counts were conducted over the 12 hour period from 6AM – 6PM.

TABLE 4.4.6.1 TRAFFIC COUNT: NUMBER OF VEHICLES BY TYPE

TYPE OF VEHICLE	SOUTH BOUND	NORTH BOUND	TOTAL FOR 12 HOUR COUNT	% OF TOTAL VEHICLES
PRIVATE CARS	1539	1478	3017	23.50
HIRE CARS	457	390	847	6.59
JEEP	150	236	386	3.00
VANS	659	567	1226	9.55
LIGHT TRUCKS	381	347	728	5.67
MEDIUM TRUCKS	692	632	1324	10.31
HEAVY TRUCKS	122	109	231	1.79
TRAILERS	10	13	23	0.18
HORSE CART	21	19	40	0.13
MINIBUS	1678	1613	3291	25.64
BUSES	48	48	96	0.75
MOTOR CYCLES	477	430	907	7.06
PEDAL CYCLES	353	368	721	5.63
TOTALS	**6587**	**6250**	**12837**	**100**

The data confirms general observation, that mini-buses (25.64%) and private cars (23.50%) together account for about 50 % of the vehicles moving through the area. Trucks of all sizes rank third (18%). South bound traffic (6,587) was only marginally greater than north bound (6,250). Figures available, show that there were two peak volume periods. The first was between 7:00AM and 8:00AM during which 10.7% of all vehicles passed. The second was between 5:00PM and 6:00PM during which the percentage was 12.1 %. Inspection of the data shows that the remaining traffic flows were reasonably evenly distributed over time.

4.5 Project Zone

The socio economic impact of a hotel development is mainly a function of its size, concept and location in relation to:

1) its local environment and community setting, and
2) the wider community it serves and will influence.

The immediate Project zone (zone) of impact is defined to include the near communities of Peters Hall, Nandy Park, Providence, New Providence, Greenfield Park and Providence Industrial Area. These communities have already either been experiencing the hotel's presence via construction related impacts or can reasonably be expected to, during its day to day operations. The communities of special interest were therefore taken as:

Peters Hall

A residential community comprising 160 houses adjacent to Nandy Park on the opposite side of the highway.

Nandy Park

A residential community comprising 113 houses on the northern border of the project

Providence

To be defined in relation context used, as the mainly residential community of 132 houses, between Peters Hall to the north and the Industrial Area to the south.

New Providence

A residential community of 39 houses south of the project.

Greenfield

The southern most and smallest of the residential communities in the zone, comprising 12 houses.

Providence Industrial Area

The industrial area towards the southern end of the NDC comprising an important economic enclave of 9 distinct entities.

4.6 Community Perspectives and Concerns.

The rapid appraisal approach outlined in the methodology was used to garner information on the community's perception of the project. The impacts identified by the community were entirely positive. The great majority of respondents when asked to rate the importance of the Project, saw it as "necessary". The reasons given were directly related to:

1) direct and indirect employment opportunities created by the hotel, and
2) benefits to Guyana's tourism development.

Negative comments on the Project were entirely related to impacts experienced during the current construction phase. Only a small percentage of respondents in Nandy Park and Greenfield Park reported negative impacts of the project. The complaints were in relation to noise pollution and the disturbances associated with pile driving and heavy equipment usage during the night. In Greenfield Park, two residents complained of wall cracking and dust pollution.

Table 4.6.1 The Rapid Appraisal Community Results.

Communities	**Total Number of Houses**	**Number of Persons Interviewed**	**Average Confidence Level in the Community of Survey Team in Findings**
Nandy Park	113	56	96 %
Peters Hall	160	106	85%
Providence	132	136	90%
New Providence	39	13	94%
Greenfield Park	12	8	85%
Totals	**456**	**317**	**Avg.**

One of the objectives of these surveys was to determine how the Project was perceived by the communities and what, if any, where the main concerns expressed about it. In offering their opinions members were encouraged to think in terms of 'community' rather than 'self', since this normally elicits a more inclusive response, an important requirement with rapid appraisal approaches.

The following tables summarize the responses to the issues probed.

Table: 4.6.1.2 Need for the Project

Question: How do you feel about the project generally?

Community	**Badly Needed**		**Necessary**		**Not Very Necessary**		**No Opinion**		**Total**	
	No	%	No	%	No	%	No	%	No	%
Peters Hall	1	1	88	85	7	7	8	7	104	
Nandy Park	6	11	46	82	1	2	3	5	56	
Providence	22	17	86	65	16	12	8	6	132	
New Providence	2	15	10	77	1	8	0	13	13	
Greenfield Park	0	0	8	100	0	0	0	08	8	
Total	**31**	**10**	**238**	**76**	**25**	**8**	**19**	**6**	**311**	**100**

76% of respondents felt that the Project was necessary and a further 10% felt that it was badly needed. Overall 86% felt that there was justification for the Project whereas 14% either thought it unnecessary or had no opinion. Individuals varied in the specific reasons underpinning their ratings but aggregated across all respondents the reasons given approximate this distribution.

- Justification for they Project based on accommodation needs for World Cup Cricket 42%.
- Justification based on tourism development in general 41%
- Justification based on accommodation needs in general 8%
- Justification based on employment generation 8%.

As to be expected, the lines of distinction were not always sharply drawn. Of the 25 "not necessary" responses, 51% thought the market would not support the Project and 28% thought the Project would attract criminal elements. The remaining percentages comprised a mix of reasons, the single most significant relating to the unsuitability of the location (10%).

Table: 4.6.1.3 Attitude to the Project in relation to Community.

Question: How do you feel about the project in relation to your Community?

Community	**Positive Feelings**		**Negative Feelings**		**Don't Know or Care**		**Total**	
	No	%	No	%	No	%	No	%
Peters Hall	73	82	9	10	7	8	89	
Nandy Park	54	96	1	2	1	2	56	
Providence	105	85	19	15	0	0	124	
New Providence	12	92	1	8	0	13	13	
Greenfield Park	7	88	0	0	1	12	8	
Total	**251**	**87**	**30**	**10**	**9**	**3**	**290**	**100**

Of the 290 respondents, 251 or 87% indicated that they were positive about the Project. This support, relative to community numbers responding, was strongest in Nandy Park, but little meaningful difference separated most communities. The most important reasons given for being positive were related to: community development (37%) aesthetic improvement of the general area 33% and increased recognition of the communities (16%). Job creation (3%) was not an important reason for feeling positive about the Project.

Table: 4.6.1.4 Awareness of Adverse Construction-Phase Impacts

Question: Are you aware of any adverse effects related to the construction phase of the hotel

Community	**Yes**	**No**	**Total**	**%**
Peters Hall	22	62	84	33
Nandy Park	3	48	51	20
Providence	2	102	104	40
New Providence	1	12	13	5
Greenfield Park	6	-	6	2
Total	***34***	***224***	***258***	***100***

Of a total of 258 respondents, 224 were not aware of adverse effects on any community, during the construction phase, to date. Neither were they anticipating that any would occur during the

rest of this phase. Of those who were aware and stated a reason, dust (42%) and other solid waste issues (21%) and noise 16%) were the most often cited.

Table: 4.6.1.5 Awareness of Positive Construction-Phase Impacts

*Question**:** Are you aware of any positive effects related to the construction phase of the hotel*

Community	**Yes**	**No**	**Total**	**%**
Peters Hall	54	33	87	30
Nandy Park	31	23	54	19
Providence	62	66	128	44
New Providence	5	8	13	4
Greenfield Park	2	6	8	3
Total	**154**	**136**	**290**	**100**

Approximately 53% of all respondents had some awareness of positive benefits the Project was delivering to date. This awareness being strongest in Peters Hall and most evenly distributed in Providence. As might be expected, the predominant benefit described related to employment (84%) with such other reasons as more entertainment activity and focus being placed on the communities, ranking much less in importance.

4.7 The Project and Tourism

4.7.1 The Project in the Context of Tourism Development Planning.

There is widespread agreement that Guyana's comparative advantage lies in targeting nature based and adventure tourism as its main attractions. Opportunities are also recognized in heritage and culture tourism and nature based interest activities generally referred to as ecotourism. Guyana is greatly endowed with bio diversity in both flora and fauna. It can offer unparalleled resources in rainforests, waterfalls and rivers

Other tourism visionaries, such as the proprietor of the Buddy's hotel, entrepreneur with several hospitality and entertainment related properties and developer of the Project, sees opportunities in less traditional markets, such as sports tourism even while recognizing that in Guyana's situation, a first class hotel property will attract visitors across the spectrum of tourism markets.

He sees his development as catering just as much to the needs of the business travel market, the convention market, the eco tourism or adventure tourism market, or travelers, in the future from other Latin American destinations, using Georgetown as a gateway to the Eastern Caribbean. In this perspective he is correct. His approach to marketing is less driven by the need to identify niche overseas markets to tap into, as to simply ensure, through the competitive marketing strategies and the quality of his product, market share penetration of the 400,000 annual visitors (about 60,000 exclusive of visiting Guyanese).

4.7.2 Community Opportunities Created by the Project

It is being projected by the ICC that 37,650 visitors will come to Guyana during the 2-3 week period of the World Cup cricket, this according to the LOC.

The hotel is targeting full occupancy over this period. The LOC's accommodation and visitor experience committee has indicated that the hotel has already been earmarked to accommodate the single largest group of TOMS (teams, officials, media and sponsors). During normal operations the Project expects to operate at an average occupancy level of 30% or the equivalent of about 150 on-property guests. Opportunities therefore exist for enterprising individuals within the communities to target the type of goods and services both needed by the hotel and associated

with tourist expenditure. Activities that are responsive to these needs in other parts of the Caribbean can guide local entrepreneurial interests. These activities are often more cost effective to out-source.

4.7.3 The Project's Contribution to the Economy

The Project's contribution to the economy is not dissimilar in concept to the benefits derived from tourism.

- The creation of new job opportunities, both direct and indirect.
- The earning of foreign exchange.
- The contribution to tax revenues.
- The promotion of human resources development by adding to the bank of skills in tourism.
- The enhancement of property values in the zone.

Some benefits can be roughly quantified although some will accrue more rapidly than others. For example:

Direct employment generated by the hotel is already projected at 375 employees inclusive of the construction phase.

Average per capita tourism expenditures for hotel staying guests, is estimated at US$ 171 for Guyana. Visitor expenditure figures are not yet available in Guyana. The estimate was inferred from data averaged for Jamaica (US$ 141, Barbados US$185, Aruba (US$135) & The Bahamas (US$218) Annual guest expenditure arising from the Project can be estimated at US$9.36M per annum on average occupancy levels of 30% or 130 guests (double occupancy).

Because the Project has taken full advantage of available tax incentives, its contribution to government revenues will not materialize until after the 5 year exemptions it enjoys. The developer estimates that the worth of these tax incentives during the construction phase will be about US$1M.

The capital investment in the Project is estimated at between US$8M – US$10M and about 75% of that investment is already in the ground or between US$6M and US$7.5M.

These are at best indicative of the economic benefits that could occur. Indirect employment, and the benefits flowing through the supply chain of goods and services should be significant, albeit very difficult at this stage to quantify.

5.0 ENVIRONMENTAL IMPACTS AND MITIGATION

An impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts therefore may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term or short-term, and extensive or local in effect. Impacts are termed cumulative when they add incrementally to existing impacts. Both positive and adverse environmental impacts could arise during the construction and the operations phases of the Hotel development project. These are discussed in this section. Since the Hotel is approximately 80% complete impacts that have occurred during construction are also discussed.

5.1 Construction Phase Impacts

5.1.1 Loss of Vegetation

The clearing and removal of trees and vegetation during construction has resulted in the loss of a significant part of the existing vegetative cover and, as a consequence, a reduction of arboreal habitat. The site had been an active ecosystem, but there was no sensitive habitat or endangered species there. So removal of vegetation did not constitute a significant impact although there was loss of habitat. Noise, vibrations, and intrusive activities related to construction works also will tend to scare away any animals remaining on the site after vegetation clearance.

Mitigation

- Landscaping of hotel site is important to restore vegetative cover and should also use native flowering plants to provide habitat and host plants for some species.
- Vegetation planted for landscaping and for aesthetic appeal should be maintained, and a maintenance programme should be established and implemeted
- Vegetation selected should be based on: suitability, habitat, flowering plants and shrubs.

5.1.2 Loss of fauna

All animals of the site area were affected by the clearing of the vegetation. Some habitats would have been destroyed. However, the absence of endangered or even threatened species would reduce considerably the significance of any impact on wildlife there.

The disruption was not significant as the species richness at the site was not high and the adjoining northern strip of land would have readily absorbed land animals displaced. Noise, dust

and fumes were the principal causes of adverse wildlife impacts. The aquatic animals were not affected except where there were pools on the land, and these were few.

Mitigation

None

5.1.3 Erosion of Cleared Areas

Vegetation clearance and excavation works related to construction of the hotel has exposed soils in the affected areas which have left them vulnerable to erosion by surface run-off and create the threat of water turbidity and sediment deposition in nearby drains and canals. This situation will exist only for the duration of the construction works before landscaping and drainage works reduce the susceptibility to soil erosion.

Some mitigation steps are still possible for the site and should be implemented forthwith.

Mitigation

- Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible
- Temporarily bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses
- Monitor areas of exposed soil during periods of heavy rainfall throughout the remaining construction phase.

5.1.4 Dust

Earth moving activities during the hotel building construction and offloading of material has generated a certain amount of air borne particulate matter (dust). This situation was worst during the dry season. Given the location of the site of the site, air borne particulates should not pose a serious hazard to residents in the vicinity or downwind of the construction.

Mitigation

- Access roads and exposed ground should be regularly wetted in a manner that effectively keeps down the dust.
- Stockpiles of fine materials (e.g. Loam) should be wetted or covered with tarpaulin during windy conditions.
- Workers on the site should be issued with dust masks during dry and windy conditions.

5.1.5 Noise

The use of heavy equipment during site clearance and construction works has generated above normal noise levels. Residents however have not indicated that a significant noise nuisance was created by the construction activities. Albeit annoying, this negative impact is only short-term (limited to the duration of the road construction works) and is not considered to be a significant threat to the health or well being of humans.

Mitigation

- Construction activities that will generate disturbing sounds should be restricted to normal working hours.
- The movement of heavy equipment should be restricted to standard daytime working hours

5.1.6 Construction Waste

Solid waste generated during construction work included typical construction waste (e.g. wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, etc.). Checks on the hotel site during construction indicated that solid waste including ruble, lumber, paper and plastics were temporarily stored on the ground and subsequently disposed of off-site.

This waste could negatively impact the site and surrounding environment if not properly managed and disposed of at an approved dumpsite. Solid waste, if allowed to accumulate in drainage ways, could cause localized flooding. Pooling of water, in turn, would create conditions conducive to the breeding of nuisance and health-threatening pests such as mosquitoes. Poor construction waste management constitutes a short-term, possibly long-term, negative impact.

Mitigation

- Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed of at an approved dumpsite.
- Proper solid waste receptacles and storage containers should be provided in sufficient numbers, particularly for the disposal of lunch and drink boxes, so as to prevent littering of the site.

5.1.7 Modification of surface drainage

The impervious surface created by the hotel building, adjoining restaurant, conference centre and other amenities will be about 75% of the hotel land area. Add to the surface areas of asphalted roads and it becomes apparent that the site will generate an additional amount equal to what would have previously infiltrated to the soil during the periods of prolonged rainfall. The client has put in place a system of concrete drains around the periphery of the building and as mentioned before the Peters Hall Sluice is capable of taking off the additional volume of storm water.

Mitigation

The appropriate design and construction of a storm water drainage system will adequately mitigate storm water drainage (see drainage network plan).

5.1.8 Employment

This is a positive impact of the Buddy's hotel Project. At this stage of construction it is estimated that over 200 persons are employed. These levels of short-term employment opportunities would have a positive impact on the local economy and on regional unemployment.

Mitigation

N/A

5.2.2 Water supply

The Project will be extracting 100% of its water requirements from a 680 foot well it is currently drilling.A water treatment facility will be installed to ensure the integrity of the hotels domestic water.

Available water resources to meet the projects needs are not considered a problem. Projected abstraction rates from this well will not impact on water resources available to Guyana Water Incorporated for serving the rest of the area.

5.2.3 Sewage Disposal

Mitigation

Provide adequate water treatment and storage facilities to ensure adequate supplies for the development.

Sewage generated by Hotel will be collected and pumped to the wastewater treatment plant. The acquisition of a packaged sewage treatment plant for the development will be of obvious environmental benefit. The potential long-term issue relates to improper maintenance of the sewage collection and treatment system such that inadequately treated effluents become discharged to the open environment. Improper disposal of sludge is also a potential issue.

Mitigation:

- Retain a fully qualified operator to ensure proper operation and maintenance of the STP.
- Ensure preparation and provision of a plant operations and maintenance manual.
- Undertake regular monitoring and testing of effluent to ensure compliance with EPA sewage effluent standards and regulations.
- Final siting of the STP should be at least 20 m from any watercourse

5.2.4 Solid waste disposal

Poor garbage management at the hotel would lead to unsanitary conditions including vermin and fly infestation and odors as well as unsightly conditions. A private waste contractor will be responsible for collection and disposal of waste from the site.

Mitigation:

- The services of a reliable, certified contractor must be engaged for the timely and efficient removal of solid waste to an approved site.
- Collection bins must be adequate in number and appropriately spaced throughout the hotel environs.
- Ensure waste is disposed of at an Operational Landfill site.

5.2.5 Use of electricity

At present it is intended that Guyana Power and Light Co Ltd. will supply power for the development site from the existing mains running along the main road. The incremental demand will be within the capacity of the system and this will be confirmed in writing by the utility. The expansion should therefore not cause any supply shortages to the rest of the system. There will be a standby generator with an output capacity of 600 KVA in the event of a shortage of GPL power supply. This implies the production of noise, vibrations, and storage of diesel fuel and the related disturbances and nuisances.

Mitigation

Power generator should be in enclosed sound proofed room.

5.2.6 Traffic/ Parking

The Hotel facility provides parking for over 300 vehicles. With the recent introduction of the four lane highway on the East Bank Demerara road it is unlikely that the additional traffic induced by Buddy's International Hotel will cause any undue congestion in the near term.

Mitigation:

N/A

Environmental Impact	**Impact Type**								**Mitigation**		
Construction Impacts	**Positive**		**Negative**								
	Significant	**Not Significant**	**Significant**	**Not Significant**	**Short Term**	**Long Term**	**Irreversible**	**Cumulative**	**Required**	**Not Required**	**Reference**
Loss of Vegetation				X		X	X				
Loss of Fauna				X		X	X				
Dust				X	X				X		
Noise				X	X				X		
Construction Waste				X	X				X		
Modification of Surface Drainage				X		X			X		
Employment	X				X					X	
Environmental Impact	**Impact Type**								**Mitigation**		
Operation Impacts	**Positive**		**Negative**								
	Significant	**Not Significant**	**Significant**	**Not Significant**	**Short Term**	**Long Term**	**Irreversible**	**Cumulative**	**Required**	**Not Required**	**Reference**
Employment	X					X				X	
Water Supply						X				X	
Sewage Treatment				X		X		X	X		
Solid Waste Disposal				X		X		X			
Use of Electricity				X		X		X			
Use of Generator				X							
Traffic/Parking				X						X	

6.0 ENVIRONMENTAL MANAGEMENT MEASURES

Although the potential for direct environmental effects is lower during the post-construction phase period than during the construction period, it is very important that environmental management continues, ensuring that all construction areas have been properly cleaned up and that any residual environmental impacts have been mitigated. This section deals with management measures o be employed during the post construction phase.

6.1 Site Closure measures

- Upon completion of construction all construction detritus should be removed from the site and be disposed of at a designated landfill site. The site should be left in an acceptable state.
- Prior arrangements should be in place for reuse of some solid waste, including concrete, timber, glass and steel by contractors or other recipients. This is essential to reduce the potential of environmental contamination.
- Waste removed should be contained adequately in order to minimize spillage of materials and fugitive dust nuisance.
- Structural steel waste products may be sold to scrap metal merchants.
- Heavy equipment and machinery should be removed from the site.
- Fuel drums and oil should be properly removed to prevent spillage of any form and be disposed of appropriately.
- Re-vegetation should commence immediately so as to prevent exposure of soil and possible erosion of exposed areas.

6.2 General Emergency Response Measures

The operation of the proposed development will involve workers who may become ill or have accidents. In addition, disasters such as, floods and fires are real possibilities. The following measures should be implemented:

- Make prior arrangements with health care facilities such as a Health Centre in proximity to deal with any medical emergencies.
- Design a Hotel Evacuation Plan in the event of a fire. Fire evacuation plan should be developed for the hotel; this should include measures to follow exit routes. Maps of exit routes should also be made available to all guests.
- The hotel management should coordinate with mutual aid organizations/agencies such as with the local fire brigade to deal with emergencies at the hotel.
- Install fire hydrants within the proposed development.

6.3 Monitoring of Sewage Treatment Plant

This section deals with monitoring plans for the operation phase of the hotel project.
The following should be implemented.

- Undertake quarterly water quality monitoring exercises for one year to ensure that the development is not negatively impacting on the water quality of the area. The parameters that should be monitored are **dissolved oxygen**, **nitrates**, **total suspended solids, phosphates**, **turbidity and faecal and total coliforms**.
- It is recommended that both influent and effluent water quality be monitored on a quarterly basis. This information should be compiled and stored in a database by the facility manager or engineer and compared with EPA guidelines for compliance. Corrective action should be undertaken in the event of non-compliance. The recommended list of parameters and the point of sampling is summarized in Table 6.1.1.

Table 6.1.1 List of Parameters to be monitored at the STP

Influent	Effluent
BOD5 (mg/l)	BOD5 (mg/l)
TSS (mg/l)	TSS (mg/l)
Total Nitrogen (mg/l)	Total Nitrogen (mg/l)
Phosphates (mg/l)	Phosphates (mg/l)
COD (mg/l)	COD (mg/l)
PH	PH
Faecal Coliform	Faecal Coliform
Residual Chlorine	Residual Chlorine
Oil and Grease	Oil and Grease

- Dissolved oxygen and pH levels should also be monitored on a monthly basis in all of the ponds. Such monitoring should consist of monitoring of at least one location within each pond throughout the water column. Any organization with the capability to conduct monitoring of the listed parameters should be used to perform this exercise. It is recommended that a report should be given to EPA at the end of each monitoring exercise.

- Undertake daily assessment of the quantity of solid waste generated and keep records of its ultimate disposal. This is to ensure that the skips and bins do not become overfilled. Person(s) appointed by the developer may perform this exercise.

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APPENDICES

APPENDIX 1 Terms of Reference

Terms of Reference
Environmental and Social Impact Assessment (EIA)

for

Buddy's International Hotel Inc.

1. Introduction

Buddy's International Hotel Inc. is a Guyanese registered company under the Laws of Guyana with a Board of Directors. The company is in the process of establishing a 230 room International Hotel at Providence on the East Bank of Demerara. The facility is part of preparations for the hosting of Cricket World Cup 2007 in Guyana.

CEMCO Inc Consultants has been appointed by Buddy's International Hotel Inc to conduct the Environmental and Social Impact Assessment (EIA) of the proposed project.. As part of the EIA process a specialist team will be mobilised to carry out the necessary environmental and social baseline studies and impact assessment and mitigation as part of the EIA process.

2. Project Description

Buddy's International Hotel is being constructed on a plot of land approximately 3.2 ha situated at Tract 'BS' Block 2, Public Road Plantation Providence, East Bank Demerara and north of the Guyana Cricket Stadium.

The hotel will feature 230 rooms with dimensions of 14 ft x 28 ft including internal fixtures and washing facilities, a swimming pool 60 ft x 100 ft along with a lobby area which will accommodate several small shops. A restaurant will be constructed as a separated building from the hotel.

3. Objectives of the EIA

The objectives of this EIA are to:

- Scope issues and concerns regarding the proposed project that needs to be addressed;
- Conduct an audit of works to date.
- Gather baseline information describing the existing environment of the project site and immediate surroundings
- Present and discuss alternatives to the proposed project.
- Engage stakeholders in the EIA process;
- Inform corporate decisions about tourism/hotel planning and development; and
- Promote development that is environmentally and socially sustainable.

4. General Tasks

In the preparation of the EIA the consultant team will undertake the following tasks:

1. Provide a detailed Description of the Project including a brief history of the project and its current status. The description will involve plans, maps and graphic aids and include general layout (size, capacity, etc.); areas slated for development, construction and operation activities; construction methodology (buildings, piling, etc.), site management, operation and maintenance activities; project life span; plans for providing utilities, waste disposal and other necessary services; and employment.

2. Assemble relevant baseline information on the project environment which will describe the existing physical, ecological, demographic and socio-cultural aspects of the project site and its immediate surroundings. This will include:
   Physical Environment - topography; geology; soils; climate; hydrology; drainage; natural hazard exposure.
   Biological Environment - flora and fauna of the project area and surroundings,
   Socio-Cultural Environment - present population size of the project area, land

use, community structure, current development plans, recreation and public health, community perceptions and attitudes on the proposed project.

3. Identify and describe the relevant laws, guidelines, regulations and standards that would define the operating framework of the project.

4. Identify, and assess the potential significant positive and negative impacts of the project activities on the biophysical and socio-economic environment. Impacts will be discussed in terms of:- construction and post construction (operational) impacts, direct and indirect impacts, short and long-term impacts, reversible and irreversible impacts, avoidable and unavoidable impacts as well as cumulative impacts. Recommend appropriate and cost effective measures to mitigate negative impacts that avoid or reduce the impacts to acceptable levels.

5. Prepare an Environmental Management Plan that will include a Monitoring Plan, Emergency Response Plan and Closure Plan.

6. Determine alternatives to the proposed project including the 'no action' option.

5. Specific Issues to be addresses as part of EIA

The consultant team will address the full range of issues as it pertains to the proposed project with special consideration given to the following issues:

- Water supply and management
- Solid Waste Management
- Energy Use
- Noise
- Traffic and Parking
- Drainage and susceptibility to flooding
- Sewage disposal
- Tourism Requirements

6. EIA Report

The EIA Report will be organized as follows:

Executive Summary
Project Description
Policy, Legal and Administrative Framework
Description of Project site Environment and Baseline Conditions
Significant Environmental Impact Identification and mitigation measures
Environmental Management Plan
Project Alternatives
List of References and persons/Agencies consulted.
Appendices

7. EIA Submission

The EIA Consultant's Team will provide the following to the EPA:

- Electronic copies of the EIA Report
- 8 Copies of EIA Report with copies signed by EIA Team Members

APPENDIX 2 Sewage Treatment Plant Monitoring Plan

Sewage Treatment Plant Monitoring Plan

INSTALLATION

The package treatment plant must be installed under the supervision of a professional engineer. After the tanks and equipment are installed and the building or facilities are in use, the MANUFACTURER should be notified to start the system. Assign one responsible person to maintain the system. This person will become familiar with the system, will be able to recognize problems when they arise, and will serve as a contact for the manufacturer's representative. It is generally advisable to designate more than one person to be familiar with the plant and its operation. The assigned maintenance person should be instructed by the manufacturer in the operation and maintenance of the plant during the "Initial Operation". An operation and maintenance manual should be provided by the manufacturer to assist in the operation and maintenance of the system.

A. Collection System

1. Insure that there are no connections of roof drains, catch basins or other storm water sewers into the sanitary collection system. Extraneous water connections will hydraulically overload the wastewater treatment plant and cause failure.
2. Check for signs of loose sewer joints or damaged pipes by observing initial flows during dry and wet weather.

B. Treatment System

1. Be sure that tanks are kept completely free of any mud, sand, gravel, rocks, boards, etc.
2. The plant must be installed level with proper bedding and/or pads.
3. If the plant is to be installed partially or totally below grade, to prevent floating, please consult the manufacturer for proper installation procedures.
4. Backfilling should be completed after tanks are set to avoid wall stress and ponding around the plant.
5. If the tank is metal, the cathodic protection must be connected prior to backfilling.
6. Be sure the tops of tank walls are sufficiently above a finished grade to prevent surface water from entering the plant.

7. A suitable perimeter fence is required for safety and to prevent vandalism. A building is required to house plants when isolation of at least 250 feet cannot be provided from the closest dwelling.

8. The plant site should be reseeded or covered with gravel or wood chips.

9. A suitable access road to the plant must be provided for adequate maintenance.

10. Make sure skimmers and sludge returns are equipped with proper valving.

11. Floats in dosing chambers must be set at elevations noted on the approved plans to insure proper dosing of the filter.

12. If the filter walls are block, the block voids must be filled with grout and walls sealed inside and outside with tar.

13. Filter sand must be certified as acceptable prior to placement (effective size 0.4 - 1.0 mm; uniformity coefficient less than 3.0).

14. Insure that the chlorinator/dechlorinator units are installed correctly with the weir properly in place and an initial supply of tablets.

GENERAL PLANT INSTRUCTIONS

The following list should be completed by the manufacturer or the manufacturer's distributor to indicate the equipment on the system. The operation and maintenance manual should provide the manufacturer's suggested maintenance of each piece of equipment.

INITIAL OPERATION - START-UP

A. Equipment

1. Check blowers to be sure blower rotation is correct and check oil levels in blowers before starting up.

2. Make sure blower belts are properly aligned with proper tension.

3. Don't turn on froth spray pump before plant is completely filled. Foaming will usually subside after several weeks once solid levels are normal. Operation of the froth spray pumps should be discontinued once foaming subsides and restarted only as required.

4. Set skimmer and sludge returns initially at about 1/4 pipe flow; set skimmer depth at 1/8" below liquid level.

5. Make sure weirs are level to avoid short circuiting in the clarifier.

6. Air valves should be adjusted to obtain even mixing in the aeration chamber. The air valves should be adjusted to deliver the most air at the front of the aeration chamber while tapering lesser amounts as you progress towards the settling chamber.
7. Filter sand should be raked level, and only half of the filter should be operated at a time, allowing the beds to be alternated every 2 - 3 weeks. Rip rap should be placed around the splash pad to avoid scouring around the edges of the pad.
8. Pump float switches in equalization tanks and dosing chambers should be set in accordance with approved plans.
9. Chlorination/dechlorination chemicals should be filled and properly stored.

B. Operation and Maintenance Instructions

1. Equipment for continued maintenance should be available including a squeegee, extra blower belts, blower lubricant, and supply of chlorine tablets, settling test equipment, rake, and spare air filter.
2. Check to see if the operator has an understanding of the checklist of the required daily, weekly, monthly, and annual maintenance tasks.
3. If possible, a load of fresh sludge (seed) from another plant should be obtained to help speed up the start-up and development of a healthy biological culture to begin treatment. If this is not possible, then add a shovelful of dirt and a bag of dog food to the plant.
4. During start-up, sludge will be stringy and sticky until the plant obtains normal operational level, requiring daily scraping of the settling tank walls.
5. New blower belts have a tendency to stretch slightly and wear, check for slippage the first few weeks.

PLANT MAINTENANCE PROCEDURE

A. Daily Procedure

1. Check to see that all mechanical equipment is operating.
2. Check **pre-treatment device**. The pretreatment devices consist of a trash trap, bar screen, or comminutor. The most commonly used trash trap removes grease, leaves, sticks, rags, rubber, plastics, and rocks. Have the trash trap pumped out once a year or more often if grease in the plant becomes a problem. If the pretreatment consists of a bar screen, rake screen and haul away

the debris. Check aeration tanks for uniform roll. Adjust air according to Section IV under "Special procedures following plant shutdown". 4. Check to see that **sludge pumps** are returning at a uniform rate in a steady stream. The sludge return pipe should be flowing 1/3 to ½ full. (Note: The color of returning sludge and aeration tank contents should be a rich brown. No objectionable odor should be noted.)

5. Check the final settling tank for surface scum. If the plant has an air lift skimmer, check to see that it is in working order. **Skimmers should be operated only often enough and long enough to remove the accumulation of scum from the settling tank.** The elevation of the scum return pipe should be adjusted so that the skimming edge or notches will be about 3/8" below the liquid level. Break up the floating scum to aid its return through the skimmer. If there is no skimmer, skim off floating debris from the surface with a leaf rake and place in a sealed container. **Excessive grease or scum must be removed from the plant.** It should be hauled away. Odors and unsightly appearances must be avoided.

6. Check the foam control system for proper operation

7. Check the dosing tank and pumps, flow equalization tank and pumps, and tertiary (sand filters) for proper operation.

8. Check the chlorination and dechlorination for proper operation. Add tablets when necessary. Do not allow the supply of tablets in the container to become empty. The tablet feeders work best when filled with a maximum of 6-8 tablets at a time.

B. Weekly Procedure

1. Scrape the hopper walls of the settling tank to prevent an accumulation of sludge on the sides of hopper. Do this as required, or at least weekly.

2. Check the oil level in blower.

3. Wash down the plant structures with water from a building connection or from a water hose connection on the foam control pump. Clean trash and weeds from plant area.

4. Check lubrication of comminutor gear box (if any).

5. The sand filter should be alternated on a regular basis. Clean surface sand filters, approximately every two weeks. Only ½ of the filter should be used at a time. This will permit the sand beds to be rotated for cleaning purposes and allow one side to dry out and rest while the

other side is in operation. During the fall and winter months it is particularly important to keep both sides of the sand bed in good working order because the cold weather will significantly inhibit the ability to do maintenance. During bed cleaning all solids materials and weeds should be disposed of in an approved landfill.

C. Monthly Procedure

1. Check trash trap, if any, and have cleaned (pump out) when necessary. Trash traps should be pumped when scum and sludge occupy 35-40% of the liquid volume.
2. Lubricate blower bearings. (See Lubrication Section VII)
3. Check V-belts for proper tension and wear. Replace when necessary.
4. Check air filter and clean when necessary. Wash screen with fuel oil or kerosene.
5. If difficulties are encountered which cannot be handled by your maintenance personnel following this manual, service should be obtained from a qualified person such as the manufacturer's representative.

D. Annually

1. Wire brush and paint any rusted metal at least annually or when indicated.
2. Clean diffusers.
3. If the plant is located near trees, tarps should be placed over the tanks to prevent the intrusion of leaves which could clog plant equipment. This should be done in early fall. Tarps should remain in place in until the leaves are no longer a problem.
4. Check grading for structural integrity.

SAFETY

1. All gratings and fencing should be locked when unattended.
2. All gratings should be kept painted and inspected regularly for structural integrity.
3. Turn the power off when doing electrical work.
4. Become knowledgeable with the safety and storage requirements for any chemicals at the plant. (i. e. granular and tablet chlorine).
5. Do not smoke or eat until after thoroughly washing your hands. When possible gloves should be worn.

6. Do not enter a confined space without proper training in these potential hazards. Never enter a wet well or deep manhole without adequate ventilation. Do not enter a manhole while working alone.

7. Avoid wearing loose clothing around moving mechanical equipment. Do not get near motor blower belts when the blower is running or on automatic timer.

8. Keep the areas around the plant equipment weeded and mowed.

9. Be advised, one cannot swim in an aeration chamber which may be 10 to 15 feet. There is no buoyancy.

SPECIAL PROCEDURES FOLLOWING PLANT SHUTDOWN

Should the plant be shut down at any time for any reason after the initial startup, the following start-up procedure should be followed:

A. With the power off, turn the pulley on the motor and blower to check mobility. If the blower pulley cannot be turned freely by hand, remove the air cleaner and spray kerosene or "liquid wrench" into blower and work pulley back and forth so that it can be turned freely by hand;

B. Push reset button and check fuses in the starter and/or disconnect;

C. Push "start" button or throw disconnect to "on" position;

D. When the blower starts, the air should enter each tank, producing uniform roll or agitation in all aeration tanks. If there is a noticeable difference, adjust the valves to the diffusers to allow more or less air depending on the need, or check for clogging in the diffusers. If clogged, turn the blower off, loosen the union at the top of header lines, remove header and diffuser, clean diffuser, and reinstall. Check air relief valve to make sure it moves freely. Use liquid wrench if necessary.

E. If the plant is equipped with foam-control equipment, test its operation to see if there is a uniform spray from all nozzles. If the flow is uneven, the nozzles should be checked and cleaned. Foam control sprays should be operated only when necessary to control foaming in aeration tank.

MOST COMMON PROBLEMS AND PROBABLE SOLUTIONS

A. Motors Will Not Run -

1. General power outage.

2. Fuses blown. Replace or reset circuit breaker. If fuses blow repeatedly, have the power supply checked. **Do not replace fuses with those of a greater capacity than the name plate amperage.** Have an electrician check for motor run amperage verses the name plate amperage for proper operation.

3. Motors overloaded. Push reset button; check overload heaters if reset does not start motor.

B. Blower Cuts Out on Overload Protection

1. Inlet air filter plugged. Remove, clean, and replace air filter.

2. Low voltage - Check or have the voltage checked with volt meter **while unit is running**.

3. Air relief valve may not be working (balancing valve).

C. Excessive Foaming

1. Over-aeration. Reduce running time on timer system or adjust diffuser valves to reduce air input.

2. Lack of Solids - (Usually found only during first few weeks of operation.) Operate foam control and hose down.

3. Excessive use of detergents. Reduce amount used or change to soap or a low suds variety of detergent.

D. Foam Control System Not Working Properly

1. Foam control motor not running. Check power supply and push reset button.

2. Foam control motor running but not pumping. Pull pump and clean pump screen.

3. Foam control pumping but sprays not operating properly. Remove spray nozzles and clean.

E. Equipment Will Not Work on Automatic

1. Failure of time clock, if any. Have electrician check.

2. Overload may be released. Push reset button.

F. Sludge Accumulation on Top of Settling Tank

1. Air-lift skimmer not returning.

2. Sludge return pumps not returning or not returning enough. Check hoppers for sludge build up. If sludge lines are plugged, remove cap or plug at top of air-lift pump and clean the line with a pole or rod.

3. Excessive amount of grease. Check grease trap and clean, if necessary. Eliminate grease before it enters the bye baby boy

plant. A large grease trap should be installed **outside** the building to intercept kitchen wastes only.

4. Refer to special section on "Sludge Problems".

G. Excessive Solids Going Over Effluent Weir

1. Sludge pumps not returning or not returning enough. Check air lines and sludge air lift pump for blockage.

2. Short circuiting between aeration and settling tanks due to high capacity return of air lift sludge return and skimmer. Close air valve on sludge pump slightly to lower capacity. (Return pipe should run 1/3 to ½ full).Raise skimmer so that it skims only as directed. Operate skimmer only often enough and long enough to keep final tank reasonable clear of scum.

SLUDGE PROBLEMS

During the first few weeks of the plant operation, one of the most common problems is the accumulation of sludge on the sloping sides of the hopper of the settling tank (clarifier). This problem, like many other problems, may be almost completely eliminated by **proper care and maintenance procedures.** The purpose of the settling tank is to settle out and separate the solids that pass through from the aeration tank. The liquid in the settling tank must be relatively still to accomplish this purpose. However, one of the characteristics of sludge is that it is likely to be stringy and sticky during the early weeks of plant operation. As it settles toward the bottom of the settling tank, the hopper slopes are the most convenient place for the stringy, sticky masses of sludge to stop settling and come to rest. After a week or so, this continuous build up of sludge will become a spongy mass completely filling the lower portion of the tank. This will stop the normal movement of sludge to the hopper bottom so that it will not be picked up by the sludge

pump pipe for return to the aeration tank for pretreatment. After a short time gas will form in this spongy mass breaking it up into chunks of sludge that rise to the surface of the clarifier as scum. Here, if the condition persists, the scum will become a solid mass growing thicker as the sludge rises from the bottom. This solid scum accumulation prevents the equipment in the settling tank from performing properly. The skimmer, the foam control pump, and the final discharge. Weirs are all hampered in their operations. In addition, the scum will give off a very strong stench which makes for almost unbearable conditions in the surrounding areas.

These first paragraphs have been used to describe the undesirable sludge and scum conditions and their causes. Every day during the first few weeks of operation, the operator or some responsible person must visit the plant to see that all equipment is operating and to check the aeration and settling tanks. The factory serviceman will provide a small scraper to be used to keep the hopper slopes free from sludge build up. The hopper slopes begin about three to five feet below the liquid level. The operator should **GENTLY** scrape (with a swimming pool brush or squeegee on an appropriate pole) all around the hopper with a slow, easy, downward motion, just enough to help move the sludge toward the bottom of the hopper where it can be picked up by the sludge return pump. DO NOT STIR OR AGITATE SLUDGE ROUGHLY OR IT WILL BREAK UP AND RISE TO THE SURFACE. If this happens, the chunks must be dipped back into the aeration tank for further treatment.

The above outlined procedure should be followed faithfully until the plant bacteria begin to "work" efficiently. This is usually from three to five weeks depending on the strength of the raw sewage coming into the plant. In almost every case the above procedure will prevent sludge problems.

After the plant begins to "work", this procedure may be followed less frequently as the operator may determine from experience. The amount of sludge being returned to the aeration tank may be seen by watching the flow in the pipe or pipes that discharge into the aeration tank. The pipe (or pipes) should be flowing 1/3 to ½ full with a chocolate brown liquid and be free of objectionable odors.

In addition to sludge build-up, there are other associated conditions which may develop and need attention. It is possible for sludge return pipe to be discharging clear liquid when there may be three or four feet of sludge in the hopper. This occurs when soft sludge packs solid almost to the hopper bottom except for a narrow channel running down through the mass to the pump intake. Clear surface liquid is pulled down through this channel and up through the pump without disturbing the sludge mass. Therefore, visual checking of the amount or volume of flow in the sludge return discharge is not sufficient, thus the necessity of GENTLY moving the mass downward to the pump intake.

Another common condition is a plugged sludge pump. Sludge, being heavier than water, will normally settle to the hopper bottom of the settling tank. If the sludge pump is not returning at least "one-third of a pipe full" to the aeration tank, the slower movement of sludge will tend to allow the sludge to pack in the one foot square area at the hopper bottom and pump intake, then sludge begins to build up inside the pump tube until it is stopped completely. This may be remedied by shutting off air supply to all other equipment and opening the air control valve to sludge pump wide open. If this procedure does not plug the sludge airlift, the plug must be removed from the top of the airlift and the pipe cleaned by rodding it out. If mud should get into a plant, that which gets into the clarifier will sink to the hopper bottom where it mixes with the sludge and forms a heavier, more solid mass than sludge alone. **The sludge return pumps will not pump heavy mud**. Mud may be detected by **gently** pushing the scraper all the way to the hopper bottom and removing gently. If mud is present, it can be seen on the scraper. Its depth and density may be determined by probing with the scraper. If mud is deep and heavy, the liquids in the clarifier may have to be pumped with a power pump and the mud cleaned out manually.

When the vertical airlift becomes clogged with mud or sludge it may be necessary to remove the pipe plug at the top and rod out the vertical airlift.

Care should be taken to see that air lines to pumps do not become stopped or restricted by sludge or mud that might back up through the sludge airlift into the air lines. If this occurs, the air lines

and fittings must be removed and cleaned. After any cleaning or unstopping operations, be sure to set air valves for normal operations.

APPENDIX 3 Minutes of Public Scoping Exercise

Minutes of Public Scoping Exercise

Buddy's International Hotel
Public Scoping Meetings (Providence Primary School)

Date: **August 7, 2006**

Time: **17:10 hrs**

Venue: **Providence Primary School.**

Objectives: **To hold a scoping exercise for the Environmental Impact Assessment. To highlight some of the perceived environmental impacts and incorporate the concerns of all stakeholders, and more importantly, the public into the final Terms of Reference for the EIA study.**

EPA Officers:

Ms. Fianna Holder – Director (ag), Environmental Management Division – EPA

Ms. Preeya Rampersaud – SEO Authorisation, Environmental Management Division – EPA

Mr. Hance Thompson – SEO (ag) Response, Environmental Management Division – EPA

Mr. Neil Henry – Environmental Officer 11, Environmental Management Division – EPA

Representative from EAB

Mr. Neermal Rekha - Chairman

Ms. Vanessa Benn – Member

Representatives from Buddy's International

Niam Chan – Public Relations Officer

Representatives from the EIA Consultant Team (CEMCO)

R. B. Latchmansingh – Managing Director

Mr. Aedan Earle - Team Leader (EIA Specialist)

Ms. Hemwantie Tiwari – Environmental Officer

Mr. Marciano Glasgow – Environmental Officer

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"The Environment is Everybody's Business"

The Public Scoping session for Buddy's International Hotel at Providence commenced at approximately 15:10hrs. Ms. Fianna Holder chaired the meeting.

The chairperson called the meeting to order and outlined the purpose of the meeting. The chair then proceeded to introduce the members of the head table and asked the CEMCO consultants to introduce themselves and their area of expertise. She then presented the agenda for the meeting.

Ms. Holder reiterated to the participants of the meeting that the main focus of the gathering is to hear the concerns and issues that they may have had regarding the proposed new hotel being developed by Mr. Omprakash Shivraj (Buddy's), which will be used to inform the ToR for the Environmental Impact Assessment (EIA). She informed the gathering that the Environmental Protection Agency (EPA) was established some ten (10) years ago, under the EP Act 11 of 1996, which stipulates the requirements of EIA's for projects which will have significant environmental impacts to be conducted in the planning stage before a decision is made on the development. She said a project like this can have both positive and negative impacts and one of the objectives of the EIA is to determine what the baseline conditions are before the project commenced, how these conditions can change as the project proceed and how an Environmental Management Plan can mitigate against potential negative impacts.

Mr. Niam Chan using a power point presentation gave an overview of the project and the incentives the community of Providence and the entire country would obtained when the project is fully established. He described the location of the project which he said is about ten (10) minutes away from the international airport and ten (10) minutes away from Georgetown. He also said the hotel is located next to the stadium which is being constructed for Cricket World Cup (CWC) 2007. Mr. Chan told the gathering that one of the developer's intentions is to provide a top class hotel for CWC 2007 and to help to showcase Guyana to the forty thousand (40,000) plus guests that will be visiting Guyana during that time. He said that the hotel will fill

the gap of accommodation with the provision of two hundred and fifty (250) rooms and a number of amenities such as a variety of restaurants, international conference room, and disco along with recreational facilities such as lawn tennis court, basketball court, swimming pool and a bowling alley. He outlined other benefits that would be derived from the project;

i. High level of hospitality
ii. Promotion of tourism
iii. Helps to stimulate the country's economy
iv. Opportunity for employment to local people, 200 at present and a further 250 regular staff on completion
v. The need to be a part of the national drive for the preparation of CWC 2007

Mr. Chan also outlined in his presentation the amenities that were a part of the package of the hotel and mall project;

i. Sewage disposal – this he said will be achieved through the establishment of a package treatment plan which will bring all discharges to a suitable state before they are released into the environment.
ii. Solid waste disposal will be contracted to local contractors on a regular basis.
iii. Energy use – the project will utilise energy from the national grid, Guyana Power and Light, along with a number of noise free generators.
iv. Generators. These he said will be sound proof.
v. Potable water will be acquired for the project by a well sunk by the developer. The well will be complemented with a filter system.
vi. Drainage and flood prevention plan. The developer's representative made reference to the cricket stadium that is being built south of the hotel and said that it is 3 feet above high tide level. He also said that there will be concrete drains around the entire hotel.
vii. Traffic/parking. He said there will be parking space to accommodate 350-400 vehicles.

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Mr. Aedan Earle, representing the team of consultants, introduced the team members and gave an overview of what the EIA study would encompass and how the consultants would undertake the study using a power point presentation. He outlined three (3) main aspects of the intended EIA; identification of significant impacts, recommendations of appropriate mitigation measures and the use of the EIA as a planning tool.

He said that the purpose of the scoping is to allow the public to highlight environmental issues that will establish the terms of reference (ToR) for the EIA. He further summarised the draft ToR which will include all applicable laws, regulations, acts, conventions and environmental standards.

Mr. Earle gave a brief description of various aspects of the project.

Description of the environment - This includes the physical, biological, socio-economic environment.

The physical environment - This will include topography, geological, soil type and climate.

The biological environment - This will include the ecological aspects of both fauna and flora.

The socio-economic environment - This will include population size, land use pattern, community structure, recreational and public health facilities.

He indicated that one of the requirements of the EIA is to undertake an environmental audit of the construction work on site done to date. He said that the impact assessment will be done for both the positive and negative impacts on both the construction and operation phases and to recommend appropriate mitigation measures. He briefly outlined the environmental management plan which he said will include a programme of mitigation measures, a monitoring plan and an emergency response plan.

Specific issues to be addressed during the operational phase were listed as;

Water supply and management,

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Solid waste management,

Energy use,

Noise,

Traffic and parking,

Drainage and flooding,

Sewage disposal

The chairperson thanked both Mr. Chan and Mr. Earle. She then introduced representatives from the EPA and the members of the Environmental Assessment Board (EAB) and described the role of the EAB. She said other sectoral agencies were invited and sent copies of the ToR and project summary but unfortunately did not attend the meeting. It was indicated that to date only Guyana Tourism Authority had sent comments to the EPA. She also said that the EPA is one of the agencies fully involved with the project in its earliest stages involving public opinions in the decisions making. Ms. Holder also indicated the importance of the public attendance at these meetings, especially people that are located in close proximity to the proposed project as they are likely to be directly affected. As such, their concerns must be addressed in the ToR. She stated that stakeholders must have a voice in the development and planning process and this was one of the values of an EIA.

She then invited the public to make suggestions and comments on the project as well as any issues and concerns they might have. Ms. Holder then opened the floor for comments. She asked persons to state their names and where they represent/reside.

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Questions/Comments/Suggestions

Mr. F. Yaw asked about the sewage waste plant and the emergency response plan. He wanted to know if the plant failed what backup plan was in place. His concern was the sewage getting into the potable water system.

Mr. R. B. Latchmansingh (Consultant) responded positively to the query and said that a package was being developed by a company in the USA.

Mr. F. Yaw enquired about the developer's energy use. He wanted to know which options will be utilize, whether solar energy or electricity from the national grid.

Mr. A. Earle responded that the developer at that time did not know which option will be used but the option that will be less costly will be the first option.

Mr. F. Yaw said the project was being advertised as a hotel and mall but he did not hear the developer's plans for the mall during his presentation.

Mr. A. Earle responded that the word mall was not used in the true sense since the amenities provided will be more of an entertainment nature for guests. Mr. Chan further added that management was thinking of the security for the guests at the hotel and many persons frequenting the mall may pose a security threat. However, he said the idea was still an option available to the developer.

Mr. N. Chan commented that the management of the project at all times did not intend to do anything that will hurt the community be it environmentally, economically or socially. He said the project will try to utilise as much as possible local products.

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Mr. F. Yaw enquired about the importation of foreign staff and wanted local people to be trained and acquired jobs.

Mr. N. Chan responded that because of the thousands of guests that will be provided for and the high standards required by a four star international hotel, some skills will have to be imported. However, he said that the skills that are available will be used and training will be provided.

The chairperson proceeded to explain the next step in the process. She said the developer would be expected to conduct an environmental audit to determine what has been happening during the construction phase in the context of environmental management. She said after the EIA is completed and submitted a notice will published in the news papers. It will be made available to the public for sixty (60) days. The public will have the opportunity to scrutinise the document and if necessary make written comments to the EPA. The chairperson said that the EAB will be managing the process at that stage and conduct a public hearing to hear stakeholders' views on the EIA. If the document is found to be acceptable, the EAB will recommend to the EPA what terms and conditions should be placed in a permit.

The chair then asked if there was any more suggestions, questions etc. She said that officials will be available for 15 minutes after the meeting to have one on one discussions with the members of the public if they so desired.

There being no other comments, the chair then thanked everyone for attending the meeting and invited them to refreshments at the compliments of the developer. The meeting was concluded at 17:55 hrs.

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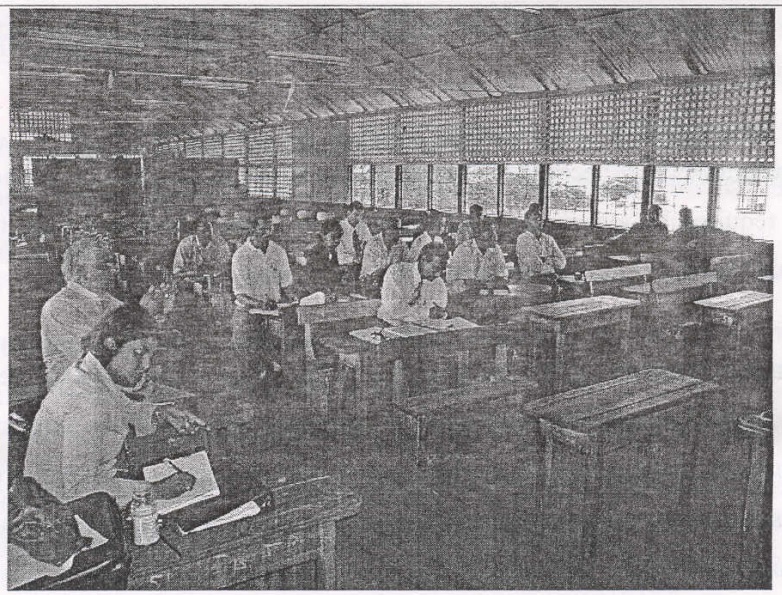
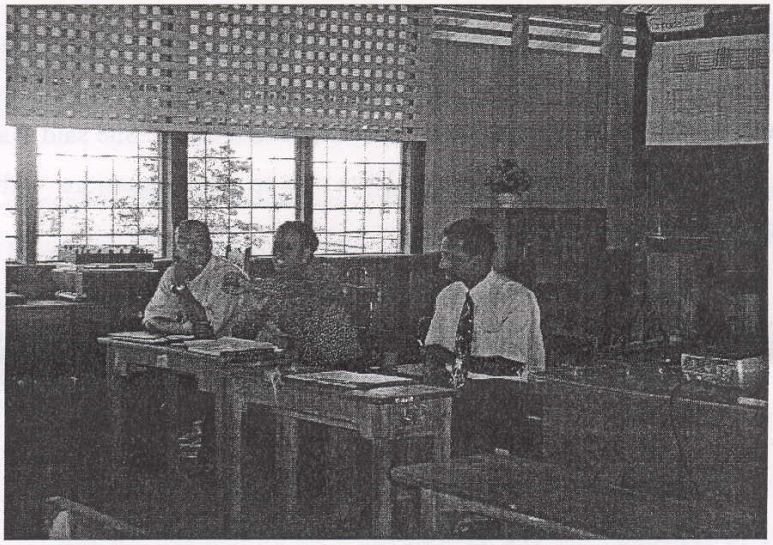


Picture # 1 showing members of the public and officials that attended the public scoping meeting



Picture # 2 showing the members of the head table Mr. Earle, Ms. Holder and Mr. Chan

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Public Scoping Meeting for Buddy's International Hotel and Mall Project, Providence, EBD
Providence Primary School – August 07, 2006
Registration Form

No.	NAME	AGENCY	DESIGNATION	OFFICE ADDRESS	TEL. NO.	FAX NO.	E-MAIL ADDR
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3.	F. YAW JR.				218.1211		RAS524036
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5.	Nikolaas Oudkerk	Lenyara LOC	Proj. Off. Design Eng.	91 Middle St.	226-2052	226-0501	nikolaas.oudker
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9.	Johann Earle	Stabroek News	Journalist	46/47 Robb St	2262333	2254637	stabroeknews
10.	Vanessa Benn	EAB					
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13.	Aniela Sears	"	"	"			
14.	[illegible]	Business school	major	43 Brickdam	2262319		
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APPENDIX 4 Species list Flora

Species list Flora

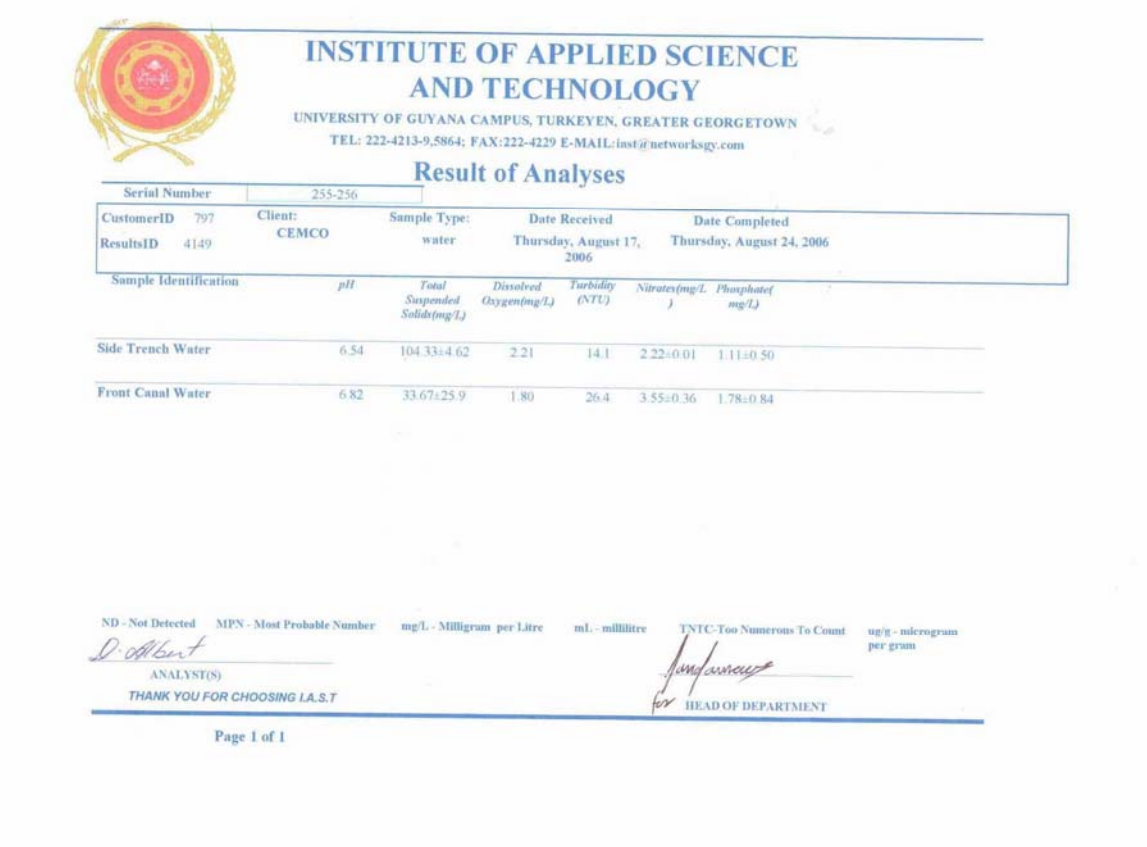
Family & Common Name	**Scientific Name**	**FAMILY & Common name**	**Scientific Name**
ANNONACEAE		EUPHORBIACEAE	
Monkey Apple	*Annomata glabra*	Antidesma	*Antidesma phaesambilla*
ARACEAE		FABACEAE	
Muku Muku	*Montricardia arborescence*	Shak Shak	*Crotalaria inrana*
		Shak Shak	*C. retusa*
ASTERACEAE			
Railway Daisy	*Wedelia trilobata*	MIMOSACEAE	
		Giant Shame Bush	*Mimosa pigura*
BORAGINACEAE			
Clammy Cherry	*Cordia tetranda.*	MYRTACEAE	
Black Sage	*Cordia curassiva*	Jamoon	*Syzygium cumini*
		Guava	*Psidium guajava*
BROMELIACEAE			
Bromilad vine	*Bromiliad sp.*	POACEAE	
		Para grass	*Brachiaria mutica*
CAESALPINPINIACEAE		Crab grasas	*Digitavia ciliaris*
Carrion Crow Bush	*Senna alata*	Bahama grass	*Cynodon dactylon*
		Bamboo grass	*Hymenachne amplexicanalis*
CECROPIACEAE		Sour grass	*Paspalum conjugatum*
Conga Pump	*Cecropia sp.*	Sugarcane	*Saccharum officinarium*
		Water grass	*P. repens*
COMMELINACEAE		PONDICHERIDAE	
Caner grass	*Commelina diffusa*	Water Hyacinth	*Eichhornia crassipes*
CONVOLVULACEAE		PTERIDACEAE	
Morning Glory	*Ipomoea trilobata*	Fern	*Acrustichum sp.*
CYPERACEAE		SALVINIACEAE	
Bisi Bisi	*Eleocharis elegans*	Aligator eye	*Salvinia auriculata*
Razor grass	*Cyperus luzulae*		
		SOLANACEAE	
		Buru Buru	*Solanum stramonifoliuym*

Species List Fauna

FAMILY & Common Name	**Scientific Name**	**FAMILY &Common Name**	**Scientific Name**
FISHES		**BIRDS**	
CICHLIDAE		ARDEIDAE	
Patwa	*Cichlosoma bimaculata*	Crane	*Bulbus ibis*
Sunfish	*Grenicichla alata*	Great Egret	*Egrtta alba*
ERYTHRINIDAE		COLUMBINIDAE	
Huri	*Hoplias malabaricus*	Dove	*Columbina passerine*
PIMELODINAe		ICTERIDAE	
Kasi	*Rhamdia quelen*	Yellow plantain	*Icterus nigrogularis*
SIMORIDAE		Carib Greackle	*Quiscalus lugubris*
Hassar	*Hoplosternum littorale*	JACANIDAE	
Silverbait	*Astanyax sp.*	Spurwing	*Jacana jacana*
		TROCHILIDAE	
AMPHIBIANS		Spectacled hummingbird	*Schistos geofforyi*
BUFONIDAE		TUDIDAE	
Crapaud	*Bufo marinus*	Cocoa Thrush	*Turdus fumigatus*
HYLIDAE	*Hyla sp.*	TYRANNIDAE	
		Kiskadee	*Pitambus sulphuratus*
REPTILES			
CROCODYLIDAE		**MAMMALS**	
Aligator	*Caiman crocodylus*	CHIROPTERA	
TEIIDAE		Fruit Bat	*Pteroput gigantus*
Salipenta	*Tupinambus tebuixin*	RODENTIA	
TROPIDURIDAE		Cane rat	*Halochilus braziliensis*
Lizard	*Trapidorus hisperus*	**INVERTEBRATES**	
VIPERIDAE		DIPTERA	
Labaria Snake	*Bothrops atrox*	Flies	
		Moquito	
		HYMENOPTERA	
		Ants	
		LEPIDOPTERA	
		Yellow Morpho	

APPENDIX 5 Water Quality Results

Water Quality Results



INSTITUTE OF APPLIED SCIENCE AND TECHNOLOGY

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Result of Analyses

Serial Number 255-256

CustomerID 797 Client: CEMCO Sample Type: water Date Received Thursday, August 17, 2006 Date Completed Thursday, August 24, 2006

ResultsID 4149

Sample Identification	pH	Total Suspended Solids(mg/L)	Dissolved Oxygen(mg/L)	Turbidity (NTU)	Nitrates(mg/L)	Phosphate(mg/L)
Side Trench Water	6.54	104.33±4.62	2.21	14.1	2.22±0.01	1.11±0.50
Front Canal Water	6.82	33.67±25.9	1.80	26.4	3.55±0.36	1.78±0.84

ND - Not Detected MPN - Most Probable Number mg/L - Milligram per Litre mL - millilitre TNTC-Too Numerous To Count ug/g - microgram per gram

ANALYST(S)

THANK YOU FOR CHOOSING I.A.S.T

for HEAD OF DEPARTMENT

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APPENDIX 6 Drawings

APPENDIX 7 Letters from utilities