FINAL REPORT

ENVIRONMENTAL IMPACT ASSESSMENT

FOREST PEN (VEDAVILLE) DEVELOPMENT
ST. ELIZABETH/WESTMORELAND

FOR SUBMISSION TO:
THE NATURAL RESOURCES CONSERVATION AUTHORITY

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Introduction

Sunnycrest Enterprises is proposing to implement a multifaceted development on the approximately 527 ha. Forest Pen Property. This development will include residential sub-division, hotel, eco-tourism, health, spiritual and sports facilities.

The Forest Pen Property is strategically located on the border of St. Elizabeth and Westmoreland, 0.8 km north-east of the fast growing Whitehouse area (Map 1). Nestled in the foothills of the Westmoreland Mountains, the property offers an excellent view of the ocean in a tranquil setting.

The proposed development will complement other eco-tourism attractions such as Font Hill Beach Park, Black River Safari and Y.S. Falls, all in close proximity to the development. The proximity of developing communities such as Whitehouse, South Sea and Black River provides an excellent opportunity for growth in this area. Excellent access roads, electricity, telephone and other social services serve the area.

Site Description

Drainage

The average rainfall depth over the property is estimated at 1100 mm/year. The property is characterized by undulating limestone hills and depressions with elevation ranges from 20 m above sea level in the western section of the property to 140 m above sea level in the northern section (Map 2).

Drainage on the property is predominantly internal to limestone depressions, and consequently there are four perennial ponds on the property. These perennial ponds will be integrated as a part of the proposed drainage system for the development to control and reduce the flow of surface run-off. Surface runoff from the property is west to Mammee Gully, east to Luana Spring/Spanish Gully and south to Scots Cove (Map 3). All three drainage systems are seasonal.

There are two perennial springs on the property (Map 3). The flow in both springs is very low (less than 3.0 l/sec) and contaminated by faecal coliform.

The property is underlain by the Gibraltar-Bonnygate Limestone Formation that functions as the principal aquifer in the area (Map 4). There is one well on the property that can be used for some of the water demand of the development. There is also the potential to drill additional wells on the property.

Avifauna

Forty-eight (48) species of birds including three hundred and eight (308) individuals were observed during the point count period (Appendix 3). Of these, fourteen (14) were Jamaican endemic species (Table 1). Additionally there were seven (7) Jamaican endemic sub-species present. Nine (9) species of migratory birds were recorded (Table 2), and all were neotropical migrants. The overall area therefore has a relatively diverse bird community.

Flora

The main vegetation communities are disturbed secondary thicket, overgrown pasture and ruinate. The vegetation of the Forest Pen property has many elements of wet limestone forest. However, an extensive period of human impact including its continued use for grazing livestock, has created an impression of a more dry, scrubby, xeric vegetation community.

Key Environmental Impacts and Mitigation Measures

Drainage

The proposed development will result in the removal of vegetation, construction of roadways and buildings. This will result in a reduction of the infiltration capacity of the underlying soil/rocks in certain areas and consequently increased surface runoff. Surface runoff from the property is to the limestone depressions and in some instances to the seasonal gullies to the east, west and south of the property (Map 3). **Runoff from the**

property is expected to have negligible impact on the wetland and the coastal environment.

Mitigation

The depressions on the property should be retained to capture surface runoff and should not be utilized for any type of development. Silt fencing to be used in areas contributing runoff to gullies during construction period to avoid sediment-laden run-off entering coast and affecting reefs.

Sewage Treatment and Disposal

Inappropriate sewage disposal at the site could have a negative impact on groundwater quality in the aquifer below the site. Therefore appropriate sewage disposal systems must be designed for all phases of the development.

Mitigation

For all proposed apartment / townhouse clusters, and housing lots below 560 sq. m., a centralized septic tank/ reed bed arrangement is proposed as part of the initial infrastructure. For housing lots above 560 sq. m., an on-lot septic tank / reed bed facility shall be constructed by individual developers.

Central sewage disposal systems are proposed for the hotel, industrial park, commercial facilities and other communal areas. Treated effluent from these systems will be used for irrigation and excess discharged to existing earth drains and gullies on site.

There should be no subsurface disposal of sewage via absorption pits on the property. The proposed septic tank and reed bed methodology should be included as a caveat to the sales agreement/title.

Solid waste Disposal

During the construction phase of the project, significant amount of solid waste will be generated that may result in both ecological and visual impacts from improper disposal.

During the operational phase of the project significant amount of solid waste will be generated from households, hotel, villas, cottages, industrial and commercial complexes. Western Parks and Markets will collect household solid waste. Arrangements with commercial waste contractors will have to be made for industrial and commercial complexes. The developer has received confirmation from Western Parks & markets re the collection of solid waste from the proposed development NSWA.

Mitigation

Solid waste generated during the construction should be stockpiled on the site and utilized for infilling where appropriate or removed on a regular basis to an approved disposal site.

A waste management plan (waste reduction, collection, disposal and reuse/recycle) to be implemented in the latter phases of the project to deal with hotel, industrial and commercial waste.

Water Supply

The present water supply in the general area is inadequate to satisfy the development demand. With the implementation of the Whitehouse Water Supply Project, there will be adequate water in the system to satisfy the development needs. If the water supply project is not implemented the developer has the option to construct well(s) on the property. **The proposed development will not impact negatively on water supply availability in the Whitehouse area. The developer has obtained preliminary approvals from WRA to establish wells on property to meet development needs.**

Bird Diversity

The decrease in vegetative cover will inevitably result in a decrease in the numbers of birds and bird species found in the immediate vicinity by way of direct destruction and/or displacement. The species that are expected to be most adversely affected by a decrease in forest cover on the property are highlighted in Appendix 1.

Mitigation

1. **Maintain forested corridors between the forested areas of the property and those of adjoining properties as far as is possible.**
2. **Areas of high plant diversity, relatively tall continuous tree canopies should be prioritized for preservation over areas with extensive Logwood trees.**

Vegetation Loss

The construction of buildings and golf course can result in some vegetation loss. However, this can be mitigated as indicated below. The regrown areas where thickets and small stands of trees are to be found coincide with proposed recreational areas where the existing vegetation would be conserved. If trees have to be selectively felled there would be no loss of rare, threatened or endangered plant species. There would be some loss of habitat for epiphytes, which require larger species for support. However, the epiphytes on the property with the exception of the orchid *Oncidium luridum* are abundant throughout all areas and their populations would not be affected.

Mitigation

Minimal disturbance of vegetation cover in areas designated for picnic, nature reserve, nature trails and orchard.

Selective cutting in other areas inclusive of the area designated for the golf course.

For areas of significant loss of vegetation, the developer has the option to replant similar vegetation at other sections of the property (See Environmental Management Plan).

1.0 INTRODUCTION

Sunnycrest Enterprises is proposing to implement a multifaceted development on the approximately 527 ha. Forest Pen Property. This development will include residential sub-division, hotel, eco-tourism, health, spiritual and sports facilities.

Subsequent to the review of the Project Information Form submitted for this project, the NRCA had requested the preparation of an environmental impact assessment report. In order to comply with the environmental legislation of Jamaica Sunnycrest Enterprises had contracted the services of Geo Technics Ltd. to prepare an Environmental Impact Assessment (EIA), according to NRCA approved Terms of Reference (Appendix 1), in 2000. The report has been amended to address these areas of concern where applicable to reflect the current situation of the proposed project site to date.

The report provides details on the proposed development to support the Permit Application, Project Information Form and Application for Licence to Discharge Sewage Effluent or Trade Effluent which are required by the Authority to assess the proposed development.

The preparation of this EIA report enables the developer to implement an environmentally friendly development and the NRCA to ensure that the project has the minimum possible adverse impact on the environment. The NRCA has the mandate to protect and manage the natural resources of Jamaica.

1.1 BACKGROUND

The Forest Pen Property is strategically located on the border of St. Elizabeth and Westmoreland, (0.8 km) 0.5 miles north-east of the fast growing Whitehouse area (Map 1). The 527 ha property, nestled in the foothills of the Westmoreland Mountains offers an excellent view of the ocean in a tranquil setting. The current vegetation on the property reflects many years of anthropogenic influence and change in land-use. Currently the property is used for informal resource extraction and stray animal grazing, but until 1990 it was operated as a cattle ranch.

The proposed development will provide an interesting mix of residential, recreational, tourism, entertainment, light industry and commercial activities. The intention of the project is to undertake a development with a wholistic and scientific approach in tune and in harmony with Nature's Universal Laws. The name of the development "Vedaville" is derived from "Veda" a Sanskrit word for "Knowledge based on Nature's Supreme Universal Laws" is indicative of the nature of the proposed development. This approach guarantees the development of a safe, harmonious and environmentally friendly community.

The proposed development will complement other eco-tourism attractions such as Fonthill Beach Park, Black River Safari and Y.S. Falls, all in close proximity to the development. The proximity of the proposed development to communities such as Whitehouse, South Sea and Black River provides an excellent opportunity for growth in this area. Excellent access roads, electricity, telephone and other social services serve the area.

1.2 APPLICABLE ENVIRONMENTAL LEGISLATION AND APPROVALS

1.2.1 Natural Resources Conservation Authority Act, 1991

The main environmental legislation applicable to the project is the NRCA Act of 1991, and its regulations. The Natural Resources Conservation (Permits and Licences) Regulations, 1996, in effect since January 1 1997, requires the application for a permit to undertake any enterprise, construction or development of a prescribed description or category in a prescribed area. The prescribed categories and area (The island of Jamaica and the territorial sea of Jamaica) are specified in the Natural Resources (Prescribed Areas) (Prohibition of categories of Enterprise, Construction and Development) Order, 1996, which has also been in effect since January 1, 1997.

A Project Information Form (PIF) accompanies the application for a Permit. Under Section 10 of the NRCA Act an EIA will be required for projects, which upon evaluation of the PIF, have the potential to adversely impact upon the country's natural resources. A

permit to construct is issued after the PIF and/or the EIA report has been reviewed and satisfied the requirements of the NRCA. An EIA is being done for this project as under the prescribed categories and area Order, hotels or resort cottages of more than 12 rooms must apply for a permit and the NRCA requested one from the developers subsequent to the review of the PIF.

All developments that will discharge effluent during the operational phase will have to apply for a licence from the NRCA. The licence will be for a maximum of 5 years and will have specific conditions attached. A licence can be revoked if the conditions are not met.

A condition for the issuing of a licence is the keeping of environmental records for 10 years. Therefore, this infers that an EIA study must involve the preparation of an Environmental Management Plan for the operational phase.

Fees associated with the application and granting of permits and licenses are in Section 24(1) of the regulations and range from $2,000 to $15,000.

1.1.2 Environmental Health Unit

The Environmental Health Unit (EHU) of the Ministry of Health is responsible for enforcing compliance with environmental health regulations. The EHU must review and approve sewage treatment facility designs. It also has responsibility for occupational health and safety.

1.1.3 Town and Country Planning Authority Act

The Town and Country Planning Authority Act (TCPA) requires that when land is modified for building, lease or sale, plans must be submitted to the TCPA for approval. The TCPA has responsibility for ratifying Development Orders containing land use plans and regulations, as well as for controlling the development of the land by coordinating the building of roads, protecting, conserving and developing resources.

1.1.4 Water Resources Act

The Water Resources Authority (WRA) was established by the Water Resources Act of 1995, and has the responsibility for management of Jamaica's surface and underground water resources. The WRA undertakes assessment of the resources available for water supply for both public and private interests. The Authority issues licenses for abstraction of surface and underground water. The mission of the WRA includes ensuring rational and equitable allocation of the nation's water resources, to reduce conflicts among water users.

1.1.5 Parish Council

Under the Local Government legislation, the St. Elizabeth and Westmoreland Parish Councils have the legal right to examine the developments proposed for these parishes, working in concert with the Town Planning Department. The Parish Councils have to give approval for the construction of all developments.

1.3 METHODOLOGY

1.3.1 Avifauna Survey

- **Census Method**

The census method used to sample the bird population was point counts. This method produces data that reveals the bird species present, their abundances and habitat use. The bird census was conducted on the evening of January 20, 2000 between the hours of 3:45 p.m. and sunset and on January 21, 2000 between sunrise and 11 a.m. Additional avifauna surveys were conducted in 2005 to strengthen the earlier studies undertaken on the proposed site. An update Avifauna survey has been attached as a supplemental report to this environmental impact assessment report.

Point counts began three (3) minutes after reaching each point and the duration of the counts was ten (10) minutes. All species and numbers of individuals of each species both seen and heard during the count period were recorded. All points were censused once.

- **Sample Site Location**

A total of twenty (20) points were censused using a stratified sampling method in which the points were not evenly spaced over the entire study area but rather grouped to form sample sites in certain predetermined areas. The result was a sampling of the area by points representing the available land use types with specific emphasis on the more forested areas of the property. All points visited were paced out with the aid of a compass to ensure that no two points were closer than 150 meters to the next nearest point count.

The following biases should be noted:

(a) Time of Year

The survey was conducted at a time of year when birds are generally not breeding. They are therefore much less vocal and investigative. Birds are therefore more difficult to identify in dense vegetation.

(b) Number of points visited.

Give the constraints of the project, the area could not be totally covered by points. By plotting the increase in bird species against the number of sample points, it is shown that the area appears to be under-sampled and as such it may be assumed that a few species present in the area were not recorded after twenty point counts (Figure 1).

1.3.2 Vegetation Survey

The vegetation was described at six locations, representative of the different community types found on the property. Forest structure parameters such as canopy height, diameter at breast height and basal area were used to characterize the vegetation cover. The species observed were recorded and presented in a species list. Any endangered, endemic or rare species were identified.

1.3.3 Socio-Economic Survey

Assessment of the socio-economic environment was conducted over a two-day period and entailed a site survey to determine current land-use on site and in the surrounding

communities. Informal interviews were conducted with members of the adjoining communities of Long Hill, Fustic Grove, Shrewsbery, Grandville and South Sea Park to get their perception of the proposed project, and their views on the future development of the area.

Data from the field survey was supplemented by desktop research, which included a review of the UDC South West Coast Development Plan; the Social Development Commission's Parish Profile, Development Orders and other legislative documents, as well as previous studies done. Demographic data was derived from the 1991 Census for Jamaica.

Traffic analysis was facilitated from data obtained from a recent traffic survey that was conducted in December 1999. The traffic count was done along the Whitehouse corridor in the vicinity of the project site between the hours of 9:00-10:00 a.m, and 4:00-5:00 p.m. Major traffic streams were noted to give an accurate picture of the traffic and transportation situation that currently exists.

A traffic impact assessment was recently undertaken at the request of the National Works Agency. A copy of this report has been provided to enhance the previous traffic analysis conducted in 1999. The updated report provides the detailed findings of the traffic flow within the proposed developments' immediate environs.

1.3.4 Water Demand and Surface Runoff Estimation

The methodology employed to estimate water demand and surface runoff is presented in Appendices 2 and 7, as well as the Engineers Report.

2.0 DESCRIPTION OF EXISTING ENVIRONMENT

2.1 CLIMATE

The closest meteorological station with long-term data is located at Crawford east of the property. The mean minimum temperature at Crawford is 18.6 ^{o}C, occurring in February and the mean maximum temperature is 31.9 ^{o}C, occurring in August.

The average rainfall depth over the property is estimated at 1100 mm/year. The dry season is from December to March and the wet season from September to November. The night breeze is from northeast to southwest and the day breeze from southeast to northwest.

2.2 TOPOGRAPHY AND DRAINAGE

Undulating limestone hills and depressions characterize the property. The elevation ranges from 20 m above sea level in the western section of the property to 140 m above sea level in the northern section (Map 2).

Drainage on the property is predominantly internal to limestone depressions, and consequently there are a number of ponds on the property. The base of the ponds is lined with clay and some are perennial. Outflow from these ponds is by evaporation and percolation into the subsurface and to the seasonal gullies.

Surface runoff from the property is west to Mammee Gully, east to Luana Spring/Spanish Gully and south to Scots Cove (Map 3). The Spanish Gully discharges to the wetland east of Crawford. The Mammee Gully and the Scotts Cove Gully discharge directly to the coast. All three drainage systems are seasonal.

2.3 GEOLOGY

The property is underlain by the Gibraltar-Bonnygate Limestone Formation. In the southwestern section of the property, this formation occurs as marl, inter-bedded with hard limestone units. This can be observed at the quarry close to the entrance of the property. For the remainder of the property the formation occurs as a hard, recrystalline, massive and well bedded sequence. In the areas where bedding is observed, the thickness of the beds ranges from 0.2m to 0.3m.

Between the property and the coast, the Coastal Limestone Formation outcrops as a pale yellowish-brown, poorly consolidated marl. The Coastal Limestone Formation overlies the Gibraltar-Bonnygate Limestone Formation.

No major geological faults were observed on the property either from field observations or from aerial photo interpretation. Extensive fracturing and jointing is evident in the competent Gibraltar-Bonnygate Limestone Formation.

2.4 HYDROLOGY

2.4.1 Surface Water Hydrology

There are two springs on the property (Map 3). Spring No.1 is located at approximately 76 m above sea level on the western bank of the seasonal Spanish Gully. Reports are that the spring is perennial. The flow recorded in January 2000 was very low, less than 1.5 L/sec (20 gpm), and sinks into the bed of the gully approximately 15 m from the source.

Spring No. 2 is located at approximately 104 m above sea level. The flow in this spring is also reported to be perennial. The flow recorded during January 2000 was approximately 3.0 L/sec (40 gpm) and discharges to a pond east of the spring.

There are four perennial ponds on the property, all located in limestone depressions lined by low permeability clay. Except for the pond in which Spring No. 2 drains, the other ponds are sustained by surface runoff from the property. The total and faecal coliform in the ponds and both springs is greater than 2,400 MPN/100ml.

With the exception of the two small springs mentioned above, there are no perennial streams on or adjacent to the property.

2.4.2 Groundwater Hydrology

The property is underlain by the Gibraltar-Bonnygate Limestone Formation that functions as the principal aquifer in the area (Map 4). In the southwestern section of the property, the formation occurs as marl, inter-bedded with hard limestone units. The permeability of

the limestone in this area is relatively low, hence the initial low yield of the well drilled in this area.

For the remainder of the property the formation occurs as a hard, well-bedded sequence with abundant solution features and ponds which have developed in the numerous depressions on the property. The occurrence of fractures, bedding and solution features is an indication of high secondary permeability and consequently a high potential for groundwater development by wells in this aquifer.

Between the property and the coast is the coastal aquiclude which occurs as pale yellowish-brown marly limestone (Map 4). The coastal aquiclude function as a sub-surface barrier to groundwater flow from the aquifer to the sea, thus ponding groundwater in the aquifer. The coastal aquiclude, by functioning as a barrier to groundwater flow, also functions as protection to the aquifer from saline intrusion.

Springs represent points of groundwater discharge from the aquifer. The occurrence of 90the springs at 104 m elevation suggests there is a perched aquifer(s) above the main aquifer. The groundwater table in the main aquifer is less than 30 m above sea level, as evident from the existing well on the property.

Recharge to the aquifer below the property is from rainfall over the aquifer and subsurface recharge from the northern section of the aquifer beyond the boundary of the property (Map 4).

2.5 AVIFAUNA

Forty-eight (48) species of birds including three hundred and eight (308) individuals were observed during the point count period (Appendix 3). Of these, fourteen (14) were Jamaican endemic species as listed below (Table 1).

Table 1: Endemic Birds Identified in the Project Area

1. Jamaican Becard	2. Sad Flycatcher
3. Orangequit	4. Rufous Tailed Flycatcher
5. Jamaican Euphonia	6. White-chinned Thrush
7. Red-billed Streamertail	8. Jamaican Vireo
9. Jamaican Tody	10. Arrow-headed Warbler
11. Jamaican Pewee	12. Yellow-shouldered Grassquit
13. Jamaican Elaenia	14. Jamaican Woodpecker

Additionally there were seven (7) Jamaican endemic sub-species present. Nine (9) species of migratory birds were recorded (Table 2), and all were Neotropical migrants. That is, North American breeding species which winter in Jamaica and the wider Caribbean. The overall area therefore has a relatively diverse bird community. Much of the property is covered by Logwood scrub forest. This represents a disclimax, successional vegetation type which develops in dry areas with relatively deep soil which has undergone cycles of clearing, cutting, burning, cultivation and/or grazing followed by regrowth. Logwood scrub forest is a poor habitat for birds and native vertebrate wildlife in general.

Table 2: Migratory Birds Recorded in Project Area.

COMMON NAME	SCIENTIFIC NAME	STATUS
Black Throated Blue Warbler	*Dendroica virens*	W1
Prairie Warbler	*Dendroica discolor*	W1
American Redstart	*Setophaga ruticilla*	W1
Black and white Warbler	*Mniotilta varia*	W1
Worm eating Warbler	*Helmitheros vermivorus*	W2
Northern Parula	*Parula Americana*	W1
Northern Waterthrush	*Seiurus noveboracenis*	W1
Magnolia Warbler	*Dendroica magnolia*	W2
Ovenbird	*Seiurus aurocapillus*	W1

W- Winter Migrant 1 Common in Suitable Habitat 2- Uncommon

Nevertheless the species diversity of the area is boosted by a profusion of small ponds across the property. The surface water on the property has three major effects on the avifauna;

a. It creates a readily accessible source of water in what might otherwise be a harsher environment able to support fewer species at lower densities.
b. It has attracted several species of birds found only in areas with a reliable supply of water and its associated aquatic life. Examples of these species are the Common Moorhen, Northern Waterthrush and Belted Kingfisher. The sample area containing ruins from the plantation era and its associated spring, has the highest numbers of individuals and species.
c. It creates a moist environment which produces a source of food (be it plant or invertebrate life) not available in the dryer areas.

Eight (8) of the species identified are listed nationally as uncommon, including three (3) endemics, two (2) resident non-endemics, and three (3) migratory species (Table 3). However, none of these species are currently considered to be nationally or globally threatened or endangered (Stattersfield A. J et al. 1998).

Table 3: Uncommon Bird Species Occurring within the Forest Pen Area

Endemic Species	Non-endemic Resident	Neotropical Migrant
Jamaican Becard	Ruddy Quail-Dove	Worm-eating Warbler
Rufous-tailed Flycatcher	Mangrove Cuckoo	Belted Kingfisher
Yellow-shouldered Grassquit		Magnolia Warbler

2.6 FLORA

Historically the Forest Pen property encompassed a variety of plant communities including several types of seasonal evergreen or deciduous forests whose distribution were largely regulated by local hydrology and microclimate. However, since colonial times the land has been changed by many years of anthropogenic influence and these forests have been removed to accommodate agriculture and settlement. The result has

been that the original primary forest has been lost and replaced by a mixture of pasture, successional communities and a wide variety of introduced plants now naturalized. The main vegetation communities are disturbed secondary thicket, overgrown pasture and ruinate. The vegetation of the Forest Pen property has many elements of wet limestone forest. However, an extensive period of human impact including its continued use for grazing livestock, has created an impression of a more dry, scrubby, xeric vegetation community.

A few areas near depressions have aquatic communities with floating plants and other herbaceous plants that require very wet conditions. Most plant growth habits were observed namely, herbs, shrubs, trees, climbers and epiphytes. There was a wide range of species with ferns, bromeliads and orchids being represented. There was only one endemic found which was the climbing cactus, *Hylocereus triangularis*. The lone orchid species found was *Oncidium luridum,* which is a common orchid. Both mature and juvenile individuals of this orchid were seen indicating that the population is healthy.

Sample sites were located in various areas of the property to give additional information on vegetation associations (Map 5). Six (6) samples sites were used to characterise the vegetation types present on the property. Forty-four species of plants were identified in the project area (Appendix 4).

- **Location 1**

This site was atop a hill near the existing farm house. The area comprised regrown pasture which was dominated by the shrub, *Eupatorium odoratum*. There were very few trees which included Pimento. Low growing herbs and grasses were abundant. Occasional twiners were seen between the low vegetation.

- **Location 2**

This was a small thicket which had trees with an average canopy height of 15m. The diameter at breast height of these trees ranged from 11.4 cm through to 44.3 cm. Within this area cutting down a 100 m^2 area would result in the loss of an average basal area of

3498 cm^2 for tree species found in that area. There was some leaf litter on the ground which was in various stages of decomposition. This indicated that the area was fairly undisturbed.

- **Location 3**

This area near the ruins was somewhat open, with shrubs ranging in height from about 1 to 1.5 m in height. Trees present in this area included domestic trees such as Ackee as well as common woodland/pasture trees such as Bastard Cedar and Prickly Yellow.

- **Location 4**

This was by the pond east of the ruins where the soil in the immediate area was moist. It contained several plants typical of moist environments such as Water Grass and Red Ginger. Surrounding the pond was a Logwood thicket with trees ranging in diameter at breast height from 15 cm through to 45 cm.

- **Location 5**

This was located near the bridge over the Spanish Gully and consisted of a thicket of mixed species. Several ferns could be seen on the ground as well as on the trees. Both species of *Tillandsia* (bromeliads) were abundant as epiphytes on the trees.

- **Location 6**

This was a small thicket with trees such as Majoe Bitter, Maiden Plum and Prickly Yellow. The trees had a wide range in diameter with the smallest individual having a diameter at breast height of 9 cm and the largest of 66.6 cm. Most trees had diameters of approximately 18 cm. The trees were fairly widely spaced with typical distances of 1.7 m, 1 m and 2 m. The average distance was about 2 m and this created a very open canopy. The ground had limestone outcrops in some places while other places were covered with leaf litter.

The locations described can be said to be typical of the different community types found throughout the property, hence their selection for description. As previously mentioned, the site is highly altered with very few areas that appear semi-natural.

2.7 SOCIO-ECONOMIC SETTING

2.7.1 Population

The project site is located on the south-west coast of Jamaica, and straddles the parishes of St. Elizabeth and Westmoreland, but more than two-thirds of the property lies in St Elizabeth. The sphere of influence therefore covers the southeast and central constituencies of the parish. Census figures for 1991 indicate a total population of 63,354 persons for the two constituencies combined. However, the population of the smaller area analysed for the purpose of this study was estimated at 11, 936. This area stretches from the coastal area of Scots Cove to Bluefields and comprises the communities of Whitehouse, Culloden, Belmont and the smaller interior neighbourhoods of Long Hill, Fustic Grove, Shrewsberry and Grandvale.

A gender breakdown of the southeast and central constituencies shows an almost even male: female ratio as indicated in the Table 4.

Table 4: Population of Sphere of Influence

Total	**Males**	**Females**	**Constituency**
27,228	14,263	12,965	South East
36,126	17,945	18,172	Central
63,354	**32,208**	**31,150**	

Source: 1991 Census, STATIN

As is characteristic of the national profile, the population is a relatively youthful one, with the majority of residents falling in the 19 and under age group, and older persons accounting for a smaller proportion of the population (Table 5). This is significant as

there are more persons falling in the economically active age group for which jobs and other economic opportunities must be created.

Although the coastal strip is fairly well populated as many persons prefer to locate their homes on beachfront property, the interior is also well developed. Population density is low and the UDC South Coast Development Plan indicates an average density of 16 persons per acre. The potential therefore exists for additional housing and supporting infrastructure in the area.

Table 5: Age Structure of Population

Age Group	Total	Male	Female
0-19	38,328	14,754	13,574
20-39	18,582	9,603	8,979
40-59	8,399	4,212	4,187
60-79	6,388	3,264	3,124
80 +	1,477	598	879

Source: 1991 Census, STATIN

2.7.2 Land use

The site is a greenfield and is presently undeveloped. There are three buildings on the property, one serves as the residence of the caretaker and the other represents accommodation for workers on the property. The 527 ha property is fairly well secured and, as such, squatting is non-existent. Landless farmers have however encroached on the property, and the well-watered flat areas serve as good pastureland. There is also evidence of illegal logging activities.

Although presently overgrown by a succession of secondary vegetation, the site was originally used for sugarcane cultivation and pastureland. An old brick ruin, which appears to be part of a great house, remains on the property as a relic of the plantation era. An Archaeological Survey was undertaken to identify similar ruins on the property to

determine their significance in relation to historical monuments. Refer to Archaeological Survey for further details.

The project site falls within the boundaries of the South Coast Development Plan where land-use is extensive, as significantly large areas are owned by a few persons who have not developed the land intensively. Land capability seems low and as such agriculture has given way to pasture. The agricultural land-use of the area is summarised in Table 6.

Table 6: Agricultural Land Use

Land-Use	**Acreage**
Improved Pasture	11,705.33
Food Forest	444.20
Extensive mixed agriculture	4,245.04
Intensive mixed agriculture	3,257.10
Sugar cane	1,537.37
Abandoned sugar lands	408.43
Bananas	12.6
Orchard crops	7.5

Source: South West Coast Development Plan, Socio-economic Survey, UDC, 1991

Although cattle rearing is the dominant land use, mixed agriculture is still an important economic activity in the area. The major crops grown are coconuts and pimento, while food forests produce ackee, breadfruit, sweet sop, limes, cashew, mango and soursop.

2.7.3 Housing and Settlement

The region is rural in character, but urban expansion is evident, particularly along the coast. This is evidenced by the growing numbers of villas and guest houses, which have sprung up in response to the gradually opening up of the south coast to tourism. Outlying attractions such as the Font Hill Beach Park, Holland Bamboo, YS Falls and the Black River are major pull factors for tourists along the southern coast. The housing

development of South Sea Park about15 years ago has set a trend for planned housing expansion in the area.

Whitehouse is characterised as a sub-regional growth centre, absorbing much of the development potential of Black River, the parish capital of St. Elizabeth. There are two commercial banks, a shopping centre, a gas station, a small bakery and several snack and grocery shops. Industrial activities revolve around fish/conch processing. Lower level services are offered in the neighbouring communities of Culloden, Beeston Spring and Petersville.

The interior villages are typical rural settlements with immense potential for growth and expansion. These include Grove, Shewsberry, Cotterwood and Brompton. Housing is a mix of older structures built of wood (58%) and new residences built of block and steel (38%) (UDC, 1991). These are quite substantial homes with all the necessary conveniences for modern-day living. It is apparent that much of the wealth is generated from outside and may be attributed to remittances from overseas as well as investments by returning residents.

While there is no critical need for housing, the demand has been growing steadily from returning residents for serviced residential lots. Home ownership is high and based on data obtained from the UDC South West Coast Development Plan, 95% of homes are owned without mortgages. Most of the houses are single family detached homes.

2.7.4 Employment

It is estimated that approximately 40% of the labour force 18 years and over are unemployed. Of the remaining 60% most persons are self-employed in low-skilled jobs (UDC, 1991). Both unemployment and underemployment are limiting factors to the potential for further development of the area. As such the region has an ample labour-surplus with a pool of labour waiting for employment opportunities.

Long term employment is available at the few government-run organisations (schools, post office, police station, health centres) and limited private sector entities (fish packaging operations, bars, shops, guest houses and villas). The self-employed are primarily engaged in fishing, subsistence farming, vending, hair-dressing and dress-making.

Fishing is traditional and is an important income generating activity. It is not uncommon to see vendors along the roadside offering freshly caught fish and lobster. A few fish vending stalls are also set up at strategic locations along the coast. The main fishing centres are Scotts Cove, Whitehouse (twin beach), Auchindown, Belmont and Bluefields. Scotts Cove is famous for its fried fish and bammy which is a well-developed activity generating income for many persons.

2.7.5 Skills

The UDC Survey indicates that whereas approximately 22% of the population have attained secondary education, only a mere 2% have received tertiary education, and most household heads have very little or no formal education. The basic skills of fishing and farming are passed down from one generation to the next, and are practiced at the subsistence level, requiring very little technological applications. As is typical in rural Jamaica, there is apathy towards formal education and training based on the perception that wealth is not generated through educational achievement. Residents are content to be functionally-literate as long as they are able to “hustle” and “higgle”.

Limited skills training in dress-making and craft is offered through Community-Based Organisations (CBOs) and Non-Governmental Organisations (NGOs). These include the Bluefields People’s Community Association, Whitehouse Fisherman’s Co-operative, Whitehouse Neighbourhood Watch, Parent Teachers Associations and youth clubs.

2.7.6 Social Services

- **Water**

The National Water Commission provides Whitehouse and the surrounding communities with water, but many homes, particularly in the smaller districts, are without piped water. They rely on private tanks and drums, springs and rivers for water supply. This raises a serious public health issue as water obtained from these sources is untreated. Surface water is generally inadequate, and the entire south west coast needs an improved water supply system to facilitate new developments in the area.

The domestic water supply source to the Whitehouse area is the Ennis Spring, which in 1998 had an average output of 440 m^3/d (0.097 MGD). This source serves the communities of Whitehouse, Culloden and Farm with an estimated water demand of 1,636 m^3/d (0.36 MGD). The existing water supply source to the area is extremely inadequate to satisfy the present demand.

The Ministry of Water through Carib Engineering Corporation Limited (CECL) is presently at the design stage of a project to supply an additional 12,230 m^3/d (2.69 MGD) of domestic water to Whitehouse and environs. The proposed sources for this additional supply is the Dalentober Well to the east and Goat Gully Spring to the west. The project is to be implemented within the next 12 months (personal communication with CECL). With this additional supply, there will be adequate water in the system to satisfy the proposed development needs.

- **Telephone**

Telephone services were made available through the government with a line capacity of 256. These are concentrated along the coastal strip, and many of the interior communities do not have this service. The present line capacity will have to be expanded to accommodate the proposed development, several phases of which will rely heavily on modern telecommunications.

- **Public Health**

This region has six health clinics, one hospital and several private doctors. The Black River Hospital located approximately 4 kilometres from Whitehouse is the main public facility accessed by residents of the area. The White House Health Centre, which is a Type IV facility offers a range of services and is also heavily patronised by residents.

- **Traffic and Transportation**

The project site is located on the east-west corridor that links the south coast to the capital city, Kingston. Traffic en route from Kingston and its environs to the tourist resort of Negril use this corridor on a daily basis. As a result, traffic tends to be heavy, especially during the holiday seasons. An analysis of the traffic burden in the vicinity of the site was conducted. Table 7 presents a summary and includes total traffic flowing in a westerly and easterly direction.

Table 7 : Traffic Analysis

Time	Cars	Buses	Trucks	Vans/Pickups	Bicycles	Total
10:00 am – 11:00 am	267	40	47	146	8	461
3:00 pm – 4:00 pm	186	35	42	138	6	406
Total	452	75	89	284	14	867

The traffic survey indicated a relatively high volume, with a peak during morning hours. Motor cars accounted for the highest category and represented a combination of private cars and route taxis. An attempt was made to distinguish route taxis from private cars, but this presented some difficulty, as most of the public passenger cars did not carry the designated plates. However most of the public transportation needs are met by mini buses. Most of the vans and pickups were commercial vehicles transporting goods form across the island.

The road network is relatively good, and seems adequate to handle the current traffic burden. However, the proposed project is likely to generate more traffic, and special provisions will have to be made to accommodate this anticipated burden. As the traffic

load increases, special provisions will have to be made for pedestrian precincts, and traffic signals to allow for the free and safe passage of vehicles on the project site.

2.7.7 Community Perception

Most of the residents and community groups consulted gave positive responses to the proposed development. While many were not aware of the details of the proposed project, they readily applauded this initiative, pointing to employment opportunities and the general opening up of the region to tourism. Specific community needs expressed include:

a) Development projects that include the communities
b) Light industries that would absorb some of the skills available
c) Technical and vocational skills training centre
d) Improvement in social services, especially telecommunications and water
e) The provision of recreational facilities as these are currently non-existent
f) Need for solid waste management, especially along the coastal strip to prevent further environmental degradation

The proposed project will help address some of these needs as discussed Section 4.0.

2.8 ARCHAEOLOGY

The entire southwest coast forms part of an extensive Taino Settlement in Westmoreland, stretching from Negril in the west to Whitehouse in the east. This is evidenced by the discovery of artefacts that point to prehistoric agricultural activities. Also the discovery of certain types of fish bones have led the Jamaica National Heritage Trust (JNHT) to believe that fishing was the primary source of economic activity for the Tainos.

The project site appears rich in archaeological treasures, as is evidenced by the old ruins located on site. Given the extent of the property, it is likely that treasures of historical and cultural significance could be buried at several locations. Data from the Archives of the National Institute of Jamaica indicate that the property dates back to 1755 and was originally owned by David Fyffe, a landed palntation owner. He acquired adjoining

properties in 1769 and 1790 for the purpose of growing sugar cane and rearing cattle. The entire property was 556 ha, on which he built a great house, and houses for workers on the plantation. In 1866, he sold the property to Grandvale Limited, and the owners continued to produce sugar cane and rear cattle.

3.0 DESCRIPTION OF THE PROPOSED PROJECT

3.1 SITE LAYOUT

The development will occur on 527 ha of the Forest Pen property and will include tourism, recreational, spiritual, residential, commercial and light industry development. The site layout is shown in Map 6. The development will include:

- Subdivision of approximately 265 ha of the property into lots ranging from 563 sq.m to 2.0 ha (6,054 sq.ft to 5 acre lots)
- One 360-room hotel, guesthouses, resort cottages and villas and retirement homes.
- Sports facility to include mini golf course and mini stadium.
- Commercial complex to include shopping mall, entertainment complex and conference center.
- Health related facilities - meditation center, stress management center, health spa and rehabilitation and fitness center.
- Industrial complex - information technology, light manufacturing, electronics and data processing.
- Education and spiritual facilities.
- Eco-tourism facilities including horseback riding, cycling, hiking and jogging trails, camping and plantation tours.

3.2 CONSTRUCTION AND PHASING

The project is to be implemented in three phases. Phasing consideration for the project will be based on the availability of funding. At present there is an agreement in principle for overseas equity financing. It is anticipated however that after all necessary approvals have been obtained, and the development will proceed as follows:

3.2.1 Phase 1 Years 1 - 3

Phase one will be implemented in the first three years of the project. It will include completion of the final Sthapatya Veda Designs and infrastructure development (roads, light, water and telephone), subdivision of 263 ha into 563 sq.m -2 .0 ha lots, meditation centre, orchards (40.5 ha), picnic (7.7 ha) and nature trails (25 ha).

3.2.2 Phase 2 Year 3 - 7

During Phase 2, which will span years 3 – 7, the infrastructure development for the remainder of the project will be completed (roads, light, water, telephone and central sewage disposal system). Subdivision of 80 ha into 0.2 ha lots, construction of villas and cottages (40 ha), educational, spiritual, health, commercial and sports complex, including golf course (49 ha), are to be completed in this phase.

3.2.3 Phase 3 Years 7 -10

Phase 3 will occur during years 7 – 10. It will include completion of the hotel development and industrial park complex.

3.3 SITE DRAINAGE

Storm water runoff from the site will be controlled via **curb and channel** drains along the side of the roads. There are a number of naturally clay lined, limestone depressions on the property that presently store surface runoff from the property in the form of ponds. Stormwater from the road will be diverted to these depressions and used to enhance the aesthetics of the development and provide irrigation water for the open spaces (green areas).

In instances where storm water runoff exceeds the storage capacity of these depressions, the excess water will be diverted to the seasonal gullies located at the eastern, western and southern section of the property (Map 3).

3.4 Water Demand and Supply

The preliminary estimate of water demand by sector for the proposed development is presented in Table 8. The approach used to estimate water demand is presented in Appendix 2.

Table 8: Potable Water Demand and Tank Capacity

No. of units X 300 litres per capita per day X No. of persons per family = total requirement or demand in litres/ day

No. of persons per family as per different lots / Unit.:

- Top End Luxury Housing = 10
- Deluxe Housing = 10
- Enhanced Housing = 5
- Economy Housing = 6
- Guest House = 3
- Dormitories = 2
- Cottages = 3/5
- Retirement Resort = 2
- Commercial Lots = 10
- Industrial Lots = 50

Tank No.1:

- 66 X 300 X 10 = 198000 L (Deluxe Housing)
- 34 X 300 X 4 = 40800 L (Deluxe Cottages)
- 67 X 300 X 5 = 100500 L (Cottages-Single & Double)
- 9 X 300 X 5 = 13500 L (Cottages: A-frame)
- 3 X 300 X 10 = 9000 L (Upper Deluxe Housing)
- 66 X 300 X 5 = 99000 L (Enhanced Housing)
- 270 X 300 X 6 = 486000 L (Economy Housing)

- **Total = 946800 litres/day or Approx. 1000000 litres/day**

Tank No.2:

- 39 X 300 X 10 = 117000 L (Villas)
- 141 X 300 X 10 = 423000 L (Deluxe Housing)
- 26 X 300 X 10 = 78000 L (Upper Deluxe Housing)
- 122 X 300 X 5 = 183000 L (Cottages)
- 96 X 300 X 3 = 86400 L (Guest Houses)
- 335 X 300 X 5 = 502500 L (Enhanced Housing)

- **Total = 1389900 litres/day or Approx. 1500000 litres/day**

Tank No.3:

- 27 X 300 X 10 = 81000 L (Villas)
- 94 X 300 X 10 = 282000 L (Deluxe Housing)
- 32 X 300 X 50 = 480000 L (Industries)
- 3 X 300 X 75 = 67500 L (Commercial/Technology)

- **Total = 910500 litres/day or Approx. 1000000 litres/day**

Tank No.4:

- 326 X 300 X 5 = 489000 L (Enhanced Housing)
- 77 X 300 X 3 = 69300 L (Guest Houses)
- 598 X 300 X 6 = 1076400 L (Economy Housing)
- 116 X 300 X 2 = 69600 L (Retirement Resort)
- 12 X 300 X 10 = 36000 L (High End Luxury Housing)
- 21 X 300 X 10 = 63000 L (Commercial Lot)

Total = 1803300 litres/day or Approx. 2000000 litres/day

Grand Total = 5,500,000 liters/day

Based on the existing plans for the proposed development, the estimated average day water demand for the development on completion is 5,500 m^3/day. The development will be done on a phased basis, with the domestic sector in the first phase. The average day domestic water demand for the development is 4,890 m^3/day.

The present water supply to the Whitehouse area from the Ennis Spring is 440 m^3/day. The domestic water demand of the communities served by this source is 1,636 m^3/day or a water supply deficit of 1,196 m^3/day.

The Ministry of Water through Carib Engineering Corporation is presently at the design stage of a project to supply an additional 12,227 m^3/day of domestic water to Whitehouse and environs. The proposed source for this additional supply is the Dalentober Well to

the east and Goat Gully Spring to the west. The project is to be implemented within the next 12 months. With this additional supply, there will be adequate water in the system to satisfy the domestic water demand of the proposed development.

The property is underlain by a productive aquifer. In the event that the proposed Whitehouse Water Supply Project is not implemented in time, the developer has the option of using the existing well on the property and/or construct new well(s) to satisfy the development needs. Two potential well sites are shown in (Map 6). To construct a new well or to abstract water from the existing well, a license/permit is required from the WRA. The water quality of the existing well or a new well will determine the suitability for domestic supply and the treatment requirements.

The irrigation component of the water demand (1818 m^3/d) of the proposed development will be met from Spring No. 2 (259 m^3/d), treated sewage effluent (606 m^3/d) and surface runoff detention in the ponds.

3.5 SOLID WASTE DISPOSAL

Western Parks and Markets Ltd. is responsible for solid waste collection in the general area. Solid waste generated during the construction phase of the project will be collected by the developer(s) and disposed at the approved disposal site(s). During the operational phase it is expected that the solid waste generated in the residential areas will be collected by Western Parks and Markets. Western Parks & Markets has received correspondence confirming their intention to collect solid waste from the proposed development. This includes collection from the commercial district for a fee which is to be determined.

3.6 SEWAGE TREATMENT AND DISPOSAL

The residential component is the first phase of the development to be implemented.

For all proposed apartment / townhouse clusters, and housing lots below 560 sq. m., a centralized septic tank/ reed bed arrangement is proposed as part of the initial

infrastructure. For housing lots above 560 sq. m., an on-lot septic tank / reed bed facility shall be constructed by individual developers.

With the development of the other components of the project (commercial, industrial etc) in the second and the third phase, a central sewage treatment system consisting of sewage pond (lagoons) is proposed. The area reserved for the central sewage treatment system is shown in Map 6**.** Treated effluent from the central sewage system will be used to irrigate the golf course and other green areas on the property. The Environmental Health Unit has agreed in principle to the proposed sewage disposal system (Appendix 7).

The layout of the proposed sewage treatment and disposal system is present on the site plan and technical details for the design are highlighted in Section 2 of the Engineers Report.

4.0 IMPACT ASSESSMENT AND MITIGATION

The proposed Forest Pen (Vedaville) Development plan features a unique combination of projects that includes: a technology park or informatics centre, a commercial centre, residential areas, eco-tourism, golfing and a range of recreational facilities. Given its location and scale of operation, the project has the potential to impact the environment and socio-economic landscape of the region within which it is located in both positive and negative ways. The potential impacts identified are presented below.

4.1 DRAINAGE

The proposed development will result in the removal of vegetation, construction of roadways and buildings. This will result in a reduction of the infiltration capacity of the underlying soil/rocks in certain areas and consequently increased surface runoff. Surface runoff from the property is to the limestone depressions and in some instances to the seasonal gullies to the east, west and south of the property (Map 3).

The estimated predevelopment and post development surface runoff from the property is presented in Appendix 7. The magnitude of the surface runoff is overestimated given that the maximum 24-hour rainfall is used in the computation. The runoff estimation shows

that there will be a 23 to 30 percent increase in surface runoff from the southern and eastern drainage units. For the western drainage unit the increase in surface runoff is estimated at 58 to 65 percent.

The area on the property contributing surface runoff to the three seasonal gullies represents less than 5 percent of the total drainage area of these gullies. The increase in surface runoff as a consequence of the proposed development will be negligible in comparison to the total runoff in these gullies. **Runoff from the property is expected to have negligible impact on the wetland and the coastal environment.**

Mitigation

The depressions on the property should be retained to capture surface runoff and should not be utilized for any type of development. Silt fencing to be used in areas contributing runoff to gullies during construction period to avoid sediment-laden run-off entering coast and affecting reefs.

4.2 SEWAGE DISPOSAL

Inappropriate sewage disposal at the site could have a negative impact on groundwater quality in the aquifer below the site. Therefore appropriate sewage disposal systems must be designed for all phases of the development.

Mitigation

For all proposed apartment / townhouse clusters, and housing lots below 560 sq. m., a centralized septic tank/ reed bed arrangement is proposed as part of the initial infrastructure. For housing lots above 560 sq. m., an on-lot septic tank / reed bed facility shall be constructed by individual developers. Reed Beds are suited for the property given the high evapotranspiration rate (5.48 mm/day). The evapotranspiration rate exceeds rainfall depth for most of the year hence the very dry conditions experienced in this area.

Central sewage disposal systems are proposed for the hotel, industrial park, commercial facilities and other communal areas. Treated effluent from these

systems will be used for irrigation and excess discharged to existing earth drains and gullies on site.

The system will be designed to produce effluent that is in compliance with NRCA sewage effluent discharge standards. Approvals for this system will be obtained from the relevant authorities at that time. There should be no subsurface disposal of sewage via absorption pits on the property. The proposed septic tank and reed bed methodology should be included as a caveat to the sales agreement/title.

4.3 SOLID WASTE DISPOSAL

During the construction phase of the project, significant amount of solid waste will be generated that may result in both ecological and visual impacts from improper disposal. Such material will be stockpiled on the site and utilized for infilling where appropriate or removed on a regular basis to an approved disposal site.

During the operational phase of the project significant amount of solid waste will be generated from households, hotel, villas, cottages, industrial and commercial complexes. Western Parks and Markets will collect household solid waste. A waste management plan (waste reduction, collection, disposal and reuse/recycle) will be implemented in the latter phases of the project to deal with hotel, industrial and commercial waste.

4.4 WATER SUPPLY

With the implementation of the Whitehouse Water Supply Project, there will be adequate water in the system to satisfy the development needs. If the water supply project is not implemented the developer has the option to construct well(s) on the property. **The proposed development will not impact negatively on water supply availability in the Whitehouse area.**

4.5 BIRD DIVERSITY

The decrease in vegetative cover will inevitably result in a decrease in the numbers of birds and bird species found in the immediate vicinity by way of direct destruction and/or

displacement. The species that are expected to be most adversely affected by a decrease in forest cover on the property are highlighted in Appendix 1.

Mitigation

3. **Maintain forested corridors between the forested areas of the property and that of adjoining properties as far as is possible.**
4. **Areas of high plant diversity, relatively tall continuous tree canopies should be prioritized for preservation over areas with extensive Logwood trees.**

4.6 VEGETATION LOSS

The construction of buildings and golf course can result in some vegetation loss. However, this can be mitigated as indicated below.

Mitigation

The regrown areas where thickets and small stands of trees are to be found coincide with proposed recreational areas where the existing vegetation would be conserved. If trees have to be selectively felled there would be no loss of rare, threatened or endangered plant species. There would be some loss of habitat for epiphytes, which require larger species for support. However, the epiphytes on the property with the exception of the orchid *Oncidium luridum* are abundant throughout all areas and their populations would not be affected.

For areas of significant loss of vegetation, the developer has the option to replant similar vegetation at other sections of the property (See Environmental Management Plan).

4.7 TRAFFIC AND TRANSPORTATION

The transportation of earth material to the site during the construction phase may lead to dust and road spillage. These potential impacts are of a temporary nature. During the

operational stage, there will be increased traffic flow both from residential and non-residential areas within the development.

Mitigation

- **Ensure that material transported to the site during the construction phase is properly covered and the trucks fitted with tailgates.**
- **Approval must be obtained from the relevant authority(s) to control the flow of traffic on the Whitehouse main road and proper traffic signs and pedestrian safety measures erected/constructed.**

4.8 EMPLOYMENT

It is projected that the development will generate jobs for a wide cross-section of persons, many of which can be drawn from the labour pool in the region. This includes both skilled and semi-skilled labour. The long-term employment opportunities provided by the hotel, villas and cottages will be a major benefit of the project. However, it is anticipated that significant training programmes will be needed due to the low percentage of persons with adequate formal training.

Street vending and growth of informal activities-itinerant vendors catering to labour camp during construction phase, and tourists and workers during operational phase

4.9 HOUSING

Implementation of the project will result in the provision of much needed housing solutions for persons within the middle and upper income streams. Over 1,100 residential lots (including Town House strata development) will be provided ranging from 563 sq. m – 2 ha (6,053 sq.ft to 5 acres), some of which will include houses complete with modern facilities. The demand for both serviced lots and houses have been growing steadily especially among returning residents who wish to retire in an upscale residential area that is relatively stable and secure. Included in the development plans is a home for the elderly, which will cater to the needs of those who wish to spend their "autumn" years

within this type of setting.

4.10 ARCHAEOLOGY

Presently, there is an old ruin on the property that will be restored and developed as an attraction. The restoration must be done in an appropriate manner in order to ensure that its historic value is preserved.

Mitigation

An intensive archaeological survey has been conducted employing the services of the Jamaica National Heritage Trust (JNHT) prior to clearing and construction of the site. The JNHT will be responsible for documenting all artefacts present and will dig for resources that may lay buried underground. During site clearance and construction, the JNHT will also commission a "watching brief" to rescue any additional historical materials unearthed

4.11 OTHER IMPACTS

The development of an informatics park will represent the first such initiative for rural Jamaica. This will open up the entire south west coast to information technology, enabling e-commerce and other related high-technology services which should boost tourism activities.

Construction of a commercial village, which includes shopping mall, cinema and theatre, will provide the type of tertiary level services not currently offered in the region. While the cinema will offer much needed entertainment, the theatre will offer a stage for the local productions and a performing arts venue for a variety of cultural expositions.

Construction of villas and guesthouses, golf courses and the opening up of nature trails will boost tourism in the region. This type of development will also complement existing attractions such as the Black River Tour and Water sports activities, Holland Bamboo sightseeing, Font Hill Beach Park and the YS Falls. Substantial foreign exchange

earnings should be realised.

Development of Meditation centre should appeal to persons who choose the alternative lifestyle. This will be the centrepiece of the project and will include Yoga training and other facilities for spiritual growth and development. This centre should appeal to tourist, and will represent a further diversification of the tourism product. The expansion of tourism also has the potential to transform this predominantly rural area into a semi-urban type settlement region which would not only benefit the local community, but the national economy as well.

Opening up of the region to further investment-the project should result in the flow of additional investments in the area. A project of this scale should attract persons offering auxiliary services such as banking and commerce, construction, maintenance and telecommunications.

Growth of the region could induce positive values and attitudes resulting in improved social behaviour and a greater sense of community.

Silt fencing and rock berms will be utilised to minimise soil erosion and loss. Silt fencing will encompass all areas where earth moving is in progress. They will prevent the entry of soil laden surface run-off into gully course, which will ultimately lead into the sea, and can impact adversely on vulnerable ecosystems such as coral reefs. The use of rock berms can assist in the prevention of erosion along gully banks and access roads.

5.0 ENVIRONMENTAL MONITORING PLAN

The Environmental Monitoring Plan (EMP) is for both the construction and operational stages of the development and is applicable to the three (3) proposed construction phases. Waste Management, erosion prevention, resource protection (faunal, floral and archaeological), and environmental auditing are some of the main elements of the EMP. The EMP for the operational phases focuses on the tourism, health, sports and educational facilities.

5.1 COMMITMENT OF DEVELOPER

The commitment of the Developer to effective environmental management provides the channel whereby strategies are transformed from the documented form and implemented. For the Vedaville Development, the developer is committed to implementing a comprehensive environmental management programme. The project manager/developer and Operations Manager have ultimate responsibility for the achievement of environmental targets during the construction and operational phases, respectively. The environmental programme commits the company to allocation of sufficient resources, continuous improvement of environmental management practices in order to fulfill social and ethical responsibility and compliance with national and international standards.

The developer is responsible for the:

- Allocation of Resources
- Risk Assessment
- Ensuring that the environmental policy is in place and communicated to all workers
- Designating role of staff members in EMP
- Appointment and monitoring of environmental management team

5.2 ASSIGNMENT OF RESPONSIBILITY

For effective implementation of an EMP, there must be assignment of specific tasks. The developer and his project/construction site manager have ultimate responsibility for the implementation of the EMP and ensuring that objectives are met. However, specific tasks will be delegated to construction supervisors who will have reporting responsibility to the project or construction site manager (Figure 2).

5.3 CONSTRUCTION PHASE

The Construction Phase includes construction of the meditation centre, villas and cottages, hotel, design and implementation of the ecotourism attraction. Roads will be built and other infrastructure such as electricity, water and telephone provided.

The monitoring activities for this phase will focus on ensuring timely implementation of mitigation measures and environmental protection procedures as specified in the EIA report and project design.

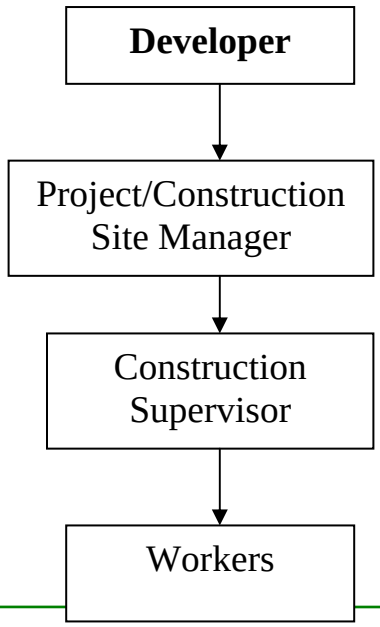
5.3.1 Dust Nuisance

The arid nature of the area and the presence of marly soil predicate that there will be dust nuisance during construction of roads and excavation for construction of buildings. The Construction Site Manager must put in place measures to mitigate excessive dust generation. This will include provision of water trucks for wetting of exposed areas of the site and covering of stockpiled material where feasible.

5.3.2 Disposal of Construction Debris.

Appropriate disposal sites must be identified for the disposal of construction debris. This is not the function of the Parks and Markets Company. The Construction site manager must ensure that debris is not dumped in gullies. This can cause flooding during high rainfall events and pollute coastal areas into which the gullies discharge.

Figure 2: Flow Diagram showing assignment of Responsibility for EMP Implementation.



5.5.3 Sewage Disposal Facility.

There must be provision of appropriate disposal method for sewage generated during the construction phase. This can consist of low flush toilets flowing into septic tanks that discharge into absorption pits, or chemical toilets. The septic tanks must be designed to give a minimum of 24 hours retention of the sewage influent. The geology of the area and the low water table makes this method suitable for sewage disposal during the construction period. The developer must ensure that this is put in place.

5.5.4 Selective Cutting of Vegetation

In areas where the development will require removal of vegetation, there must be selective cutting. This must be the direct responsibility of the construction supervisor in charge of clearing of any area where there is significant vegetation cover. The areas to be cut must be clearly demarcated (for example using flagging tape), the workers clearing given clear instructions and adequate levels of supervision.

5.5.5 Use of Silt Fencing

Silt fencing must be used in areas prone to erosion and especially those adjacent to or contributing to the run-off into gullies. This is important to prevent silt-laden water entering the coastline and impacting on sensitive ecosystems such as coral reefs.

5.5.6 Replanting of Vegetation

In order to facilitate the construction of buildings there may be areas where there will be significant loss of vegetation. This can be mitigated through replanting exercises at other identified locations on the property. This must be done during the construction phase at the most appropriate time (for example, when excavation work is complete). The areas to be replanted must be clearly identified.

5.5.7 Solid Waste Management

Adequate solid waste containers must be provided for garbage collection to minimise entry into gullies and ultimately into the sea. Workers must be instructed to use garbage containers and their use or lack of use monitored where possible.

5.4 OPERATIONAL PHASE

The operational phase includes operation of the various facilities inclusive of hotels/villas, golf course, sewage treatment system (s), ecotourism attraction, educational, sports and health facilities. This phase therefore generates a myriad of areas of potential impacts that must be addressed. The potential measures include:

- ⇒ Efficient Operation of Sewage Plant
- ⇒ Sewage Effluent quality monitoring
- ⇒ Utilization of Sewage Effluent for Irrigation of green areas
- ⇒ Development of a Management Plan for the Ecotourism Attraction
- ⇒ Regulation/Monitoring of Pesticide use
- ⇒ Application of Recycling and reuse programmes
- ⇒ Developmental and implementation of a solid waste management strategy
- ⇒ Ground and Surface Water Quality Monitoring

5.4.1 Monitoring Programme for Sewage Effluent

The NRCA usually requests that Sewage effluent is monitored on a monthly basis for at least the first year of operation for compliance with national environmental standards (Appendix 5). Thereafter, the wastewater will be sampled and analysed less frequently, as required by the NRCA. The parameters recommended for monitoring include the following:

- Biological Oxygen Demand (BOD) (mg/L)
- Suspended solids)mg/L)
- pH
- Nitrate (mg/L)
- Phosphate (mg/L)
- Faecal Coliform (MPN/100 ml)
- Helminth eggs

A licence must be applied for from the NRCA for discharge of sewage effluent by the proposed Sewage treatment plant. It is therefore unlikely that the NRCA requires a separate licence for discharge of wastewater stored for irrigation purposes. However, the ponds will be storing sewage effluent and surface run-off for varying periods of time without aeration. Therefore, there can be changes in water quality due to anaerobic activity and it is recommended that monitoring of water quality is done periodically.

Results of all wastewater analyses will be recorded in an appropriate manner and records made available to the NRCA on any site visits which may occur. Records are also required for the sewage plant under the Permit and Licence Regulations that specify that records must be kept for at least 10 years. Forms to be used for recording of data are shown in Appendix 6.

5.4.2 Monitoring of Irrigation Water

Sources of irrigation water can be placed in three categories: The main source of irrigation water will be from the sewage effluent generated by the sewage treatment plant(s). This will be stored in ponds on the course or pumped directly into the irrigation system. Other sources will be gray water, spring no.2 and the existing well on the property. The monitoring of this water must be done according to Water Resources Authority guidelines.

5.4.3 Recycle and Reuse programme

The recycle and reuse programme can include:

a. Sorting of solid waste and integration into local, regional or national recycling programmes. For example, cardboard, plastic, paper and organic matter.

b. Composting of organic matter to produce soil conditioner/fertilizer for organic farming will be an integral part of development.

c. As mentioned before, reuse of all wastewater for irrigation purposes.

5.4.4 Establishment of Buffer Zones Golf Course and Ponds

The surface run-off from the golf course has the potential to enter the ponds present on the property and appropriate measures must be taken to lessen the loss of pesticides and fertilizers to the ponds. For example, the application should not be done just before heavy rainfall periods, where feasible. Where possible, vegetation strips can be established around the ponds as buffer strips, or where already in existence, protected.

The golf course will not be close to any gullies and therefore is not expected to significantly affect the quality of surface runoff into these drainage channels during rainfall events.

5.4.5 Operations Manual for Golf Course

The operations manual for the golf course will detail the measures which will ensure safe storage, handling, formulation and application of hazardous materials such as pesticides and fertilisers. It will address vehicle maintenance procedures and disposal of waste oils, and maintenance of erosion control measures. It will also monitor the landscaping programme and specify that only indigenous material is to be used.

5.4.6 Safety Programme

The use of hazardous materials on the golf course requires implementation of a safety programme for maintenance personnel. Areas to be addressed include:

- Material Safety Data Sheets for each chemical stored in the material storage area shall be located in a bound notebook at the facility for easy access in the event of a minor leak or spill within the area.

- Protective gear must be worn at all times for the handling and application of pesticides. These include overalls, respirators/masks, and appropriate foot and head wear. Pesticides must not be applied while facing into the wind.

- Only the maintenance crew must use pesticides approved by the Pesticide Control Authority at all times.

- Disposal of pesticide containers must be by compacting and burying. They must not be burnt, washed in water bodies or reused for storage of potable liquids or edible solids.

- Pesticides and fertilisers must be applied at recommended dosages to minimise loss in runoff into gullies and ultimately into the marine environment.

- All water storage areas external to the golf course must be properly fenced to prevent easy access and creation of a hazardous condition to the general public.

5.5 REGULATORY REQUIREMENTS

Compliance with both national and international environmental standards and regulations is an integral part of the EMP.

National Standards

The Natural Resources Conservation Authority (NRCA) which was established by the NRCA Act of 1991, is the principal environmental agency in Jamaica. The NRCA Act and its regulations have been formulated to facilitate effective management of Jamaica's natural resources. The regulations include the Natural Resources Conservation (Permits and Licences) Regulations, 1996 and the Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, 1996.

Under the Permits and Licences regulations, an application has to be made to the NRCA for a Permit to construct for categories of developments specified in the Order. This must be accompanied by a completed Project Information Form (provided by the NRCA) which gives relevant information on the project. The NRCA determines if an environmental assessment is necessary prior to granting a permit, subsequent to a review

of the PIF. A permit to construct is issued after the PIF and/or the EIA report has been reviewed and satisfied the requirements of the NRCA.

Compliance with environmental standards will be assessed through audits and on-going monitoring.

There are no standards specific to irrigation water in Jamaica. However, the national environmental standards for discharge of wastewater specify that effluent must comply with value for designated parameters subsequent to discharge to soil or water (Appendix 5).

World Bank Standards - Irrigation Water

World Bank Standards will be used for irrigation water monitoring and are shown below.

Irrigation Water Standards- World Bank

Parameter	**Maximum Value**
Coliforms	**Less than 100 MPN/100 ml**
Helminth standard	**< 1 viable intestinal nematode egg per liter (> 99% egg removal)**

5.6 ENVIRONMENTAL AUDITING

Environmental auditing is an important environmental management tool which will be used to evaluate the performance of the facility with regards to environmental protection and compliance. Detailed environmental audits will be conducted bi-annually for the first year and annually thereafter, unless special circumstances[1] determine more frequent auditing.

[1] For example: unusual contamination events

Environmental audits will:

- Evaluate efficiency of waste treatment methods
- Evaluate efficacy of pesticide use and application monitoring programme
- Evaluate waste water storage
- Examine waste monitoring records
- Assess the storage of hazardous material
- Assess the disposal of hazardous material
- Evaluate employee awareness re environmental protection
- Determine if facility is in compliance with environmental standards.
- Inform management team on how well their environmental management programme is working.
- Provide solutions for environmental challenges encountered.
- Set targets for EMP for the following pre-audit period.
- Prepare an environmental audit report.

5.7 UPDATE OF ENVIRONMENTAL MANAGEMENT PLAN

The EMP will have specific targets for each year that will be evaluated by the annual environmental audit. The audit can make recommendations which will necessitate changes in the EMP.

The EMP will be reviewed on an ongoing basis as new environmental challenges arise or targets/objectives are achieved. The Operations Manager will ensure that this review occurs in a timely manner.

Targets for the first year of operation will be set six months after the start-up period and baseline conditions have been established. Examples of targets include:

- ➲ Improve efficiency of pesticide and fertiliser application by ____%.
- ➲ Achieve _____% compliance with environmental standards.
- ➲ Increase staff awareness by ____ %

5.8 STAFF TRAINING

Staff training is an integral part of the EMP. In order for an EMP to be effectively implemented, staff must be trained in environmental awareness, safety, and safe waste disposal practices.

6.0 CARRYING CAPACITY FRAMEWORK

6.1 Introduction To Carrying Capacity

Carrying Capacity may be defined as the potential of an area to sustain a population of animals without exhaustion of the natural resources, deterioration of the quality of the environment, or reducing the well being of the individuals within the population.

The main factors to be considered as relevant to the determination of carrying capacity are:

i. Population levels;
ii. Patterns of resource demand and/or use;
iii. Environmental yield potential and resource flows;
iv. Resource sensitivity;
v. Resource use impacts;
vi. Site vulnerability; and
vii. Environmental absorption capacity.

Carrying capacity is therefore not a fixed, unchanging limit or point, as it is determined by the interaction of the above factors, all of which are variable. Additionally, some factors are linked, others are independent. Lastly, carrying capacity is dependent on factors both internal and external to the system under examination.

Carrying capacity was originally developed in relation to management of animal populations, and came into use for human activities in the 1960s and 1970s.

Determination of carrying capacity in relation to human activities is usually approached through a definition of its components, namely:

i. **Ecological Carrying Capacity** – concerned mainly with the biological factors in the ecosystem, such as species sensitivities, vulnerabilities, life history, etc. It depends on a complex interaction of internal and external factors.

ii. **Social Carrying Capacity** – concerned mainly with the level of comfort of a host population, and the adequacy of social services.

iii. **Physical Carrying Capacity** – concerned mainly with the adequacy of associated space and infrastructure.

iv. **Economic Carrying Capacity** – concerned mainly with issues of costs and benefits.

Despite the attractiveness of the carrying capacity concept, the application suffers from a number of constraints.

First, human activities produce impacts on the receiving systems. Though not all changes are necessarily bad, a determination of "acceptable" change must involve an understanding of the nature, scale, and long-term impacts of that change. For example, not all species have the same sensitivities, and a particular action will therefore affect different species differently, which can ultimately change the ecological integrity of an area. The same applies to changes affecting the physical components of an ecosystem.

Related to the above is the second problem in carrying capacity determination, that of uncertainty. Information on species present, ecological processes, and nature of impacts over the long term is often unavailable. Additional considerations include the occurrence of secondary and tertiary level impacts from each action, and the occurrence of ecological cycles affecting both physical and biological factors. As such, results are often extrapolated, and selection of "indicator species" or "monitoring parameters" is often a feature of carrying capacity studies.

Thirdly, carrying capacity can be influenced by external inputs. The use of external inputs to increase carrying capacity is often questioned on the basis of sustainability. Additionally, it can be argued that external inputs represent shifting of capacity from other areas.

6.2 Recreational Carrying Capacity

Recreational carrying capacity is concerned primarily with balancing concerns about the quality of the (recreational) experience and the resource impacts of getting that experience. The concern about quality of experience relates to the issues of crowding and/or satisfaction, and introduces the factor of human values into the process. The value judgment applies when it is determined that one state (of the ecosystem being used) is better than another, or that one type of experience is preferable.

Determination of the type of experience that should be provided by a recreation setting is undertaken as part of management planning. Whatever the decision-making process, the type of experience to be provided is usually stated in the management objectives for the site, and management objectives are statements of value judgment.

Once the ecological resources and processes have been identified, and the management objectives set, the manager can then manipulate a number of factors to achieve the

management objectives. The set of factors that can be manipulated are often referred to as "management parameters", and are basically the use patterns (use level, activity type, timing, distribution, etc.).

Based on the above, a number of writers have suggested that carrying capacity can be broken down into two parts; the impact component (environmental change) and the evaluative component (the acceptability of change). As a result, it is often argued that deciding the limits of acceptable change (LAC) is the key to determination of carrying capacity.

The **Limits of Acceptable Change** can be defined as the extent and types of human-induced changes that are acceptable in a given area.

6.3 Carrying Capacity Framework for Vedaville Development

Based on the above discussions, it is recommended that the approach to be followed in setting a carrying capacity value for Vedaville should include the following steps:

a. Determine the Limits of Acceptable Change;
b. Conduct a monitoring programme to determine the impact levels from the activities; and
c. Determine the carrying capacity.

The areas within the Vedaville development to which recreational carrying capacity apply are the nature reserve (37 ha), the nature trails (25 ha) and picnic area (7.7 ha). The property has been severely impacted by human activities, and will require a level of restoration in order to provide high quality recreational experiences based on the aesthetic attributes of the area.

A wide range of ecotypes is present on the property, ranging from forests remnants to overgrown pasture. To create a functional nature reserve (that can accommodate at a minimum the species presently using the site) some replanting will be necessary. However, two conditions apply. First, the nature reserve should be connected to all the ecotypes, and areas outside the property, by well-defined vegetation corridors. This will facilitate free movement of bird and other faunal species, thereby reducing the risk to the existing populations. Secondly, a range of ecotypes should be maintained on the property. If this is not done, faunal species that prefer open areas may be negatively impacted by the development. For the area supporting the nature trails, trails should be designed to create the illusion of solitude.

Given the need to provide users of the facility with a quality experience while minimizing environmental damage, the following parameters should be considered as integral to the monitoring phase of the carrying capacity determination; (a) diversity and size of the bird populations, (b) erosion of trails and (c) visitor perception of the quality of the experience.

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APPENDIX 1

TERMS OF REFERENCE

The detailed Terms of Reference for the proposed EIA study are as follows:

1) Ensuring that the developers are aware of the legislation relevant to the protection of the environment and the project is implemented within the legislative framework of Jamaica.

2) Liaison with relevant government agencies such as the NRCA, ECD, WRA, TPD and the Parish Council for St. Elizabeth and Westmoreland, in order to incorporate the requirements of these agencies within the EIA report.

3) Discussion with persons with the surrounding community to ensure community involvement in the project.

4) Compilation and assessment of information on the existing biological and physical environment. This will involve:

   - Water quality analysis for springs located on the property.
   - Description of existing flora and fauna of the terrestrial ecosystem
   - Description of the existing climatic condition.
   - Identification of any rare or endangered species present.
   - Description of the geology of the area.
   - Description of the watershed condition.

5) Compilation and assessment of information on existing socioeconomic condition in the area. This will involve:

   - Information on employment and housing.
   - Existing uses of land and water sources.

- Any cultural/historic sites present.

6) Provision of a description of the proposed development and activities associated with site preparation, construction and operational phases.

7) Assessment of solid waste disposal during the construction and operational phases.

8) Assessment of the proposed sewage disposal system.

9) Identification of potential positive and adverse impacts of the development on the socioeconomic, physical and biological resources. This will include impacts on :

- Groundwater quality and quantity
- Terrestrial vegetation and ecosystem
- Employment
- Existing social services

10) Provision of mitigation measures for adverse impacts identified.

11) Analysis of the NO GO alternative.

12) Preparation of Environmental Management Plans for the construction and operational phases.

13) Preparation of an ecological and physical carrying capacity..

STUDY TEAM

The team engaged to carry out the study included the following individuals:

Velva Lawrence, B.Sc., M.Phil.	Team Coordinator
Earl Wright, B.Sc., M.Sc.	Hydrogeologist
Lloyd Gardner B.Sc. M.Sc.	Resource Management Planning
Thera Edwards, B.Sc.	Vegetation Ecologist
Leo Douglas, B.Sc	Ornithologist

APPENDIX 2

DOMESTIC WATER DEMAND

The number of units in each domestic water demand category is:

- Top End Luxury Housing = 12 units
- Deluxe Housing = 330 units
- Enhanced Housing = 727 units
- Economy Housing = 868 units
- Guest House = 173 units
- Villas = 66 units
- Cottages = 232 units
- Retirement Resort = 116 units

The assumed number of persons per category is:

- Top End Luxury Housing = 10
- Deluxe Housing = 10
- Enhanced Housing = 5
- Economy Housing = 6
- Guest House = 3
- Cottages = 3/5
- Retirement Resort = 2

The total number of persons multiply by the per capita water consumption of 0.3 m^3/person/day gives the daily domestic water demand.

Irrigation Demand

Irrigation will be required for the 46 ha golf course, 20 ha picnic area, a small orchard and an estimated 54 ha landscape area. The irrigation water demand is a function of the type of crop grown and the climatic condition at the site. The irrigation water demand is estimated for varied crops in the Black River Basin for the month of March. The factors considered in the estimation are:

a) Crop Evapotranspiration (Et_{crop}) = 5.48 mm/day

b) Crop Coefficient (k_c) = 0.8 (dimensionless)

c) Effective Precipitation (P_{eff}) = 0.677 mm/day

d) Irrigation Efficiency (I_{eff}) = 80 %

e) Irrigable Area = 120 ha.

The irrigation water demand = $[(Et_{crop} \times kc) - P_{eff}] \div I_{eff}$

Irrigation will be done using sprinklers for approximately 8 hours per day.

Industrial and Service Demand

Detailed plans of the proposed industrial development are not yet available. Preliminary indications are that light manufacturing such as garment factories will be encouraged. A lump sum figure, typical for a small industrial complex is assumed.

APPENDIX 3 BIRD SPECIES RECORDED AT SAMPLE SITES AND BIRD SPECIES LIST

APPENDIX 4 FLORA SPECIES LIST

APPENDIX 4 FLORA SPECIES LIST

FAMILY	BOTANICAL NAME	COMMON NAME	HABIT
Ferns			
	Adiantum melaleuca		
Polypoidiaceae	*Nephrolepis sp.*		
Polypoidiaceae	*Polypodium heterophyllum*		Twiner
Polypoidiaceae	*Polypodium sp.*		
Monocotyledons			
Araceae	*Syngonium auritum*	Five Finger	Climber
Bromeliaceae	*Tillandsia fasiculata*		Epiphyte
Bromliaceae	*Tillandsia setacea*		Epiphyte
Commelinaceae	*Commelina sp.*	Water Grass	Herb
Cyperaceae	*Cyperus sp.*		Herb
Liliaceae	*Sanseviera trifasciata*	Tiger Cat	Herb
Orchidaceae	*Oncidium luridum*	Brown Gal	Epiphyte
Zingiberaceae	*Guillainia purpurata*	Red Ginger	Herb
Dicotyledons			
Anacardiaceae	*Comocladia pinnatifolia*	Maiden Plum	Tree
Anacardiaceae	*Mangifera indica*	Mango	Tree
Anacardiaceae	*Metopium browneii*	Burnwood	Tree
Asclepiadaceae	*Asclepias currasavica*	Red Top	Herb
Asclepiadaceae	*Calotropis procera*	French Cotton	Shrub
Asteraceae	*Eupatorium odoratum*	Jack-in-the-Bush	Shrub
Bombaceae	*Ceiba pentandra*	Silk Cotton	Tree
Cactaceae	*Hylocereus triangularis*	Prickle Withe	Climber
Caesalpiniaceae	*Cassia alata*	King of the Forest	Shrub
Caesalpiniaceae	*Haemotoxylum campechianum*	Logwood	Tree
Convolvulaceae	*Ipomoea sp.*		Climber
Euphorbiaceae	*Croton humilis v.humilis*	Pepper Rod	Shrub
Euphorbiaceae	*Croton linearis*	Rosemary	Shrub
Malavaceae	*Sida sp.*	Broomweed	Herb
Mimosaceae	*Adenanthera pavonina*	Red Bead Tree	Tree
Mimosaceae	*Inga vera*	River Koko	Tree
Mimosaceae	*Leucaena leucocephala*		Tree
Mimosaceae	*Samanea saman*	Guango	Tree
Moraceae	*Cecropia peltata*	Trumpet Tree	Tree
Moraceae	*Ficus sp.*	Fig	Tree
Myrtaceae	*Pimenta dioca*	Pimento	Tree
Nyctaginaceae	*Pisonea aculeata*	Cockspur	Shrub/Climber
Nymphaeaceae	*Nymphaea ampla*	Water Lily	Herb
Piperaceae	*Piper amalago v. amalago*	Black Jointer	Shrub
Rubiaceae	*Morinda royac*	Strongback	Shrub
Rubiaceae	*Psychotria sp.*		Shrub
Rutaceae	*Fagara martincensis*	Prickly Yellow	Tree
Sapindaceae	*Blighia sapida*	Ackee	Tree
Sapotaceae	*Manilkara zapota*	Naseberry	Tree
Simaroubaceae	*Picramnia antidesma*	Majoe Bitter	Tree
Solanaceae	*Solanum torvum*	Susumber	Shrub
Sterculiaceae	*Guazuma ulmifolia*	Bastard Cedar	Tree
Verbenaceae	*Lantana camara*	Wild Sage	Shrub

ENVIRONMENTAL IMPACT ASSESSMENT
VEDAVILLE DEVELOPMENT

GEO TECHNICS Ltd
APRIL 2000

APPENDIX 5 - TRADE AND SEWAGE EFFLUENT STANDARDS

SEWAGE EFFLUENT STANDARDS

Immediate Technology Based Effluent Standards

PARAMETER	EFFLUENT LIMIT
BOD_5	20 mg/l
TSS	30 mg/l
Nitrates (as Nitrogen)	30 mg/l
Phosphates	10 mg/l
COD	100 mg/l
pH	6-9
Faecal Coliform	1000 MPN/100 ml
Residual Chlorine	1.5 mg/l

Proposed Sewage Effluent Standards

PARAMETER	EFFLUENT LIMIT
BOD_5	20 mg/l
TSS	20 mg/l
Total Nitrogen	10 mg/l
Phosphates	4 mg/l
COD	100 mg/l
pH	6-9
Faecal Coliform	1000 MPN/100 ml
Residual Chlorine	1.5 mg/l

Suggested Ambient Water Quality Criteria

PARAMETER	EFFLUENT LIMIT
BOD_5	5 mg/l
Nitrates	0.1-1.0 mg/l[1]
Phosphates	0.1-1.0 mg/l[1]
DO	(TBS)
Faecal Coliform	200 MPN/100 ml

TRADE EFFLUENT STANDARDS
SEPTEMBER 1995

PARAMETER	STANDARD LIMIT
Ammonia/Ammonium	1.0 mg/L
Barium	5.0 mg/L
Beryllium	0.5 mg/L
Boron	5.0 mg/L
Calcium	No Standard
Chloride	300 mg/L
Colour	100 TCU
Fluoride	3.0 mg/L
Iron	3.0 mg/L
Magnesium	No Standard
Manganese	1.0 mg/L
Nitrate (Nitrate + Nitrite)	10 mg/l
Oil and Grease	10 mg/L or <0.01 kg/1000 kg product
PH	6.5 - 8.5, pH units
Phenols	0.1 mg/l
Phosphate	5.0 mg/L
Sodium	100 mg/L
Sulphate	250 mg/L
Sulphide	0.2 mg/L
TDS	1000 mg/L
Temperature	2°C < or > Avg Ambient Temperature
TOC	100 mg/L
TSS	Max Day < 150 mg/L Monthly Avg 50 mg/L
Heavy Metals	
Arsenic	0.5 mg/L
Cadmium	0.1 mg/L
Chromium	1.0 mg/L
Copper	0.1 mg/L
Cyanide (Free HCN)	0.1 mg/L
(Total CN)	0.2 mg/L
Lead	0.1 mg/L
Mercury	0.02 mg/L
Nickel	1 mg/L
Selenium	0.5 mg/l
Silver	0.1 mg/L
Tin	No Standard
Zinc	1.5 mg/L
Total Heavy Metals	**2.0 mg/L**

Stream Loading	
BOD_5	<30 mg/L
COD	0.1 kg/1000 kg product or <100 mg/L
DO	>4 mg/L
Bacteriology	
Coliform Total	<500 MPN/100 Ml
Coliform Fecal	<100 MPN/100 ml

APPENDIX 6

ENVIRONMENTAL MANAGEMENT PLAN
Vaedaville Developments Ltd.

WASTE WATER MONITORING RECORDING FORM

DATE PERSON COLLECTING SAMPLE

ANALYTICAL PERSONNEL/LABORATORY

PARAMETER	RESULTS	COMMENTS
BOD (mg/l)		
COD (mg/l)		
pH		
Nitrate (mg/l)		
Phosphate (mg/l)		
Oil and Grease (mg/l)		
Fecal coliform MPN/ 100 ml		
Sulphate (mg/l)		
Suspended Solids(mg/l)		
Helminth Eggs (No. of viable nematode eggs/L)		

Other parameters can be added as required.

APPENDIX 7: SURFACE RUNOFF ESTIMATION

Runoff from the drainage area was estimated using the Rational Method, where:

$$Q = CIA \quad \text{(Equation 1)}$$

Q = Peak Runoff (cusecs)
C = Dimensionless runoff coefficient, based upon degree of imperviousness and infiltration capacity of the drainage surface.
A = Drainage Area (acres)
I = Average rainfall intensity (in/hr) lasting for a critical duration (t_c) and corresponding to the return period (T) used in the design.

The drainage area (a) contributing runoff to the site was delineated on a 1:12,500 scale map and the area determined by planimetering. The runoff coefficient (C) was obtained from published tables and considering the characteristics of the drainage area.

The average slope (Y) of the drainage area was determined based on an analysis of the topographic map of the area. The hydraulic length (l) was measured directly from the 1:12,500 scale map. The curve number (CN) was obtained from published tables by the Soil Conservation Service and considering soil type and land-use. The curve number (CN) is for Soil Group C (clay loam) and forested land with poor cover

Rainfall intensity representing the maximum 24-Hour Rainfall for the Crawford Gauging Station is used in the analysis.The parameters used in the estimation of surface runoff is presented in Tables A1 and A2. The Computed surface runoff is presented in Table A3.

Table A1: Parameters Used to Estimate Runoff

Catchment	Total Area (acres)	Impervious Area (acres)	Curve Number	Hydraulic Length (ft)
Eastern Unit	400	140	86	3500
Western Unit	498	438	86	8400
Southern Unit	302	124	86	5500

Table A2: Runoff Coefficients and Rainfall Intensity

Return Period (hrs)	T2	T5	T10	T25
Runoff Coefficient - Pre Development	0.35	0.39	0.41	0.45
Runoff Coefficient -Post Development	0.61	0.65	0.70	0.75
Rainfall Intensity (mm/hr)	69	113	142	179
Rainfall Intensity (in/hr)	2.72	4.45	5.59	7.05

Table A3: Estimated Surface Runoff

		Surface Runoff (m^3/d)			
Return Period (Yrs)		**2**	**5**	**10**	**25**
Eastern Unit	Predevelopment	10.76	19.65	25.96	35.94
Eastern Unit	Post development	13.56	24.24	32.39	44.32
Western Unit	Pre development	8.14	14.84	19.60	27.13
Western Unit	Post development	10.62	18.90	25.29	34.56
Southern Unit	Pre development	13.43	24.47	32.32	44.74
Southern Unit	Post development	22.20	38.85	52.43	70.97

APPENDIX 8: CORRESPONDENCE

OFFICE OF THE DEPUTY PRIME MINISTER AND
MINISTRY OF LAND AND ENVIRONMENT
1 DEVON ROAD, P.O. BOX 272, KINGSTON 6, JAMAICA
Telephone 927-9941-5; Fax 929-7343

June 11, 2001

Mr. John Ledgister
Managing Director
Sunnycrest Enterprises Limited
P O Box 24
Lacovia
St. Elizabeth

Dear Mr. Ledgister

Re: Proposed Vedaville Jamaica Development Project

We would like to take the opportunity to thank you and your team for the presentation of preliminary plans for the captioned proposed development to our office and the relevant development approval agencies. Subsequently to this presentation and a review of the Project Proposal document which was circulated to the development approval agencies, we have received a number of favourable responses.

First and foremost, the Ministry of Agriculture has expressed a willingness to release the property for urban development as these land are very marginal in nature for agriculture. The Water Resources Authority has confirmed that sufficient ground water can be obtained from the local acquifer system within the Vedaville property boundary to support the development. This agency also advised that they would foresee no difficulty in granting the necessary permit and license for abstraction and use of the water for the project.

The Ministry of Transport and Works has sent us a copy of a letter expressing no objection to the proposed development and suggested guidelines to assist with the preparation of detailed drainage and subdivision plans.

Lastly and most importantly, the key subdivision and development approval agencies, the Town Planning Department/National Environment and Planning Agency (NEPA) the St. Elizabeth and Westmoreland Parish Councils, have all expressed written support for the project in principle, subject to the submission of the detailed plans.

The offices of the Prime Minister and the Deputy Prime Minister and Minister of Land and Environment consider this proposed development to possess great potential to contribute significantly to the development of the area and Jamaica as a whole. It also offers excellent potential for prospective investors in our country.

Based on the progress that has been made so far to satisfy approval requirements, we are in the process of preparing a Cabinet Submission to request an Approval in Principle from the Cabinet. This will confirm government's support for the project and permission to proceed with the development.

We wish you all the best with this development and all future endevours.

Sincerely,

Rollin Alveranga
Actg. Senior Director
Planning Policy and Standards

cc. Rt. Hon. P. J. Patterson
Prime Minister
1 Devon Road
Kingston 6

Hon. Seymour Mullings
Deputy Prime Minister and
Minister of Land and Environment
1 Devon Road
Kingston 6

Mr. Franklin McDonald
Chief Executive Officer
National Environmental and Planning Agency
10 Caledonia Avenue
Kingston 10

NATURAL RESOURCES CONSERVATION AUTHORITY

10 Caledonia Avenue, Kingston 5, Jamaica W.I.
Tel: (876) 754-7543, 754-7544, 754-7547, 754-7548, 754-7549, 754-7550 Fax: (876) 754-7595, 754-7596
E-mail: nrca@infochan.com TOLL FREE HELP-LINE: 1-888-991- 5005 Web Site: http://www.nrca.org

Ref. L11/164

May 5, 2000

Mr. Earl Wright
Director
Geo Technics Limited
11 Cedar Valley Way
Kingston 6.

Dear Sir:

Re: Revised Terms of Reference – Vedaville Development, St. Elizabeth

The revised Terms of Reference has been reviewed and has been found to be acceptable. The following additions however must be incorporated in the final document, a copy of which must be submitted to the Authority:

- "Scope of Work for Baseline Evaluation and Impact Assessment"
  Information on both endangered and endemic species should be compiled (second paragraph)
- "Methodology"
  The statement "Analysis of water sample collected from the spring" and "Avifauna survey using morning and evening counts" should be substituted with "Biological resource survey and analysis to include but not be limited to avifauna, insects and plants".
- A map showing clearly the proposed sites for each part of the development inclusive of the phasing,
- A vegetation map including all plants which fall within the required 25cm at 1m above the ground category.
- A proper location map that includes two georeferenced points.

Yours sincerely

for Anthony McKenzie
for Executive Director.

Managing and protecting Jamaica's land, wood and water
A Government of Jamaica Agency

NATIONAL WATER COMMISSION

Water is life

Corporate Office: 26-48 Barbados Avenue, P.O. Box 65, Kingston 5, Jamaica W.I. Telephone: (876) 929-5430 - 5
Fax: (876) 929 – 6285, Cable: "NATWATER"

May 22, 2000

Earl Wright
Geo Technics Limited
PCJ Building
Hope Gardens
Kingston 6

Dear Mr. Wright,

RE: Vedaville Development - Forest Pen Property , St Elizabeth

We note your undated letter requesting information on NWC's position regarding water supply for the proposed Vedaville Development in St. Elizabeth. Please be advised of the following:

(a) NWC is not now in a position to provide water to new developments in the area of your proposed development.

(b) NWC is in the process of upgrading the water supply for the Whitehouse/Bluefields area. This upgrading work should be completed within the next 12 months. On completion of the upgrading work, an additional 0.8 mgd will be available to serve Bluefields and its environs. The source of this supply is the Goat Gully Spring.

(c) Efforts are being made to further improve the water supply to that general area by incorporating the Dalintober Well, located about 6 miles south-east of Whitehouse. This well will provide another 1.4 mgd to the supply system.

The current supply shortfall in the area is about 0.8 mgd. The upgrading work now being undertaken will therefore just address the existing shortfall.

Extending water to new developments will depend on incorporating the Dalintober Well. We are prepared to work with you to see how you could contribute to efforts to make this extension possible.

Yours truly,

Vernon Barrett
General Manager Systems Development & Planning

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GEO TECHNICS LTD.

GEOTECHNICAL AND GEOLOGICAL INVESTIGATION • PERCOLATION TESTING • WATER RESOURCES EVALUATION
WATER WELL DESIGN • GROUND WATER CONTAMINATION ASSESSMENT

11 CEDAR VALLEY WAY KINGSTON 6
Telephone: (876) 977-2596, 977-6126; Telefax: 977-2182; e.mail: geotec@wtjam.net

May 1, 2000

National Water Commission
Strategic Planning Department
28 Barbados Avenue
Kingston 5

Attention: Mr. Vernon Barrett - General Manger

Dear Sirs,

RE: Vedaville Development- Forest Pen Property

Sunnycrest Enterprise Limited is proposing to develop the Forest Pen Property to provide a mix of residential, recreational, eco-tourism and commercial activities. The property is located on the border of St. Elizabeth and Westmoreland, approximately 0.8 km, north-east of Whitehouse.

Geo Technics Limited were contracted to conduct an Environmental Impact Assessment (EIA) Study as required by the Natural Resources Conservation Authority. An integral part of the study is an assessment of the availability of domestic water to satisfy the demands of the development.

Review of the present water supply situation to the general area shows that the present water demand exceeds the available supply. We are aware however that the **Ministry of Water (MoW)** through **Carib Engineering Corporation Limited (CECL)** is presently at the design stage of a project **(Whitehouse/Bluefields Water Supply)** to supply an additional 12,230 m3/d (2.69 MGD) of domestic water to the area. This addition supply is estimated to satisfy the domestic water demand over the next 20 years.

With the implementation of this project there will be adequate water to satisfy the demand of the proposed development as shown below:

Development Water Demand	**0.420 MGD**
Present Supply (Robins River/Ennis Spring)	0.147 MGD
New Supply (Goat Gully/Dalintober Well)	2.690 MGD
Total Supply	**2.837 MGD**

Present Domestic Demand	0.657 MGD
Excess Supply	**2.180 MGD**

Were the Whitehouse/Bluefields Water Supply Project not implemented, the developer has the option to drill well(s) on the property to satisfy the water demand of the development. This option is already presented to the Water Resources Authority for their consideration.

In this regard therefore we are requesting NWC's position with respect to water supply for the proposed development.

The issue of sewage treatment and disposal will be addresses in the EIA Study after consultation with the Environmental Health Unit, Ministry of Health (MoH).

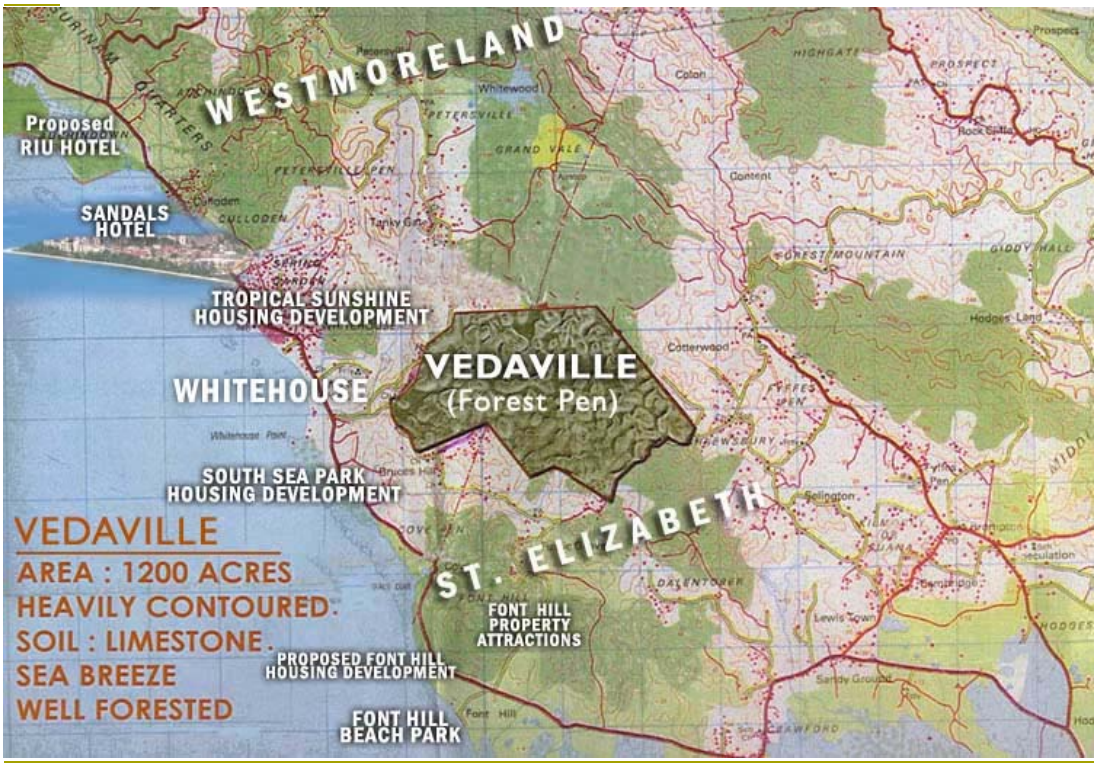
Anticipation you early response.

Yours truly,
GEO TECHNICS LIMITED

Earl Wright
Director

Cc. MR. John Ledgister - Sunnycrest Enterprise

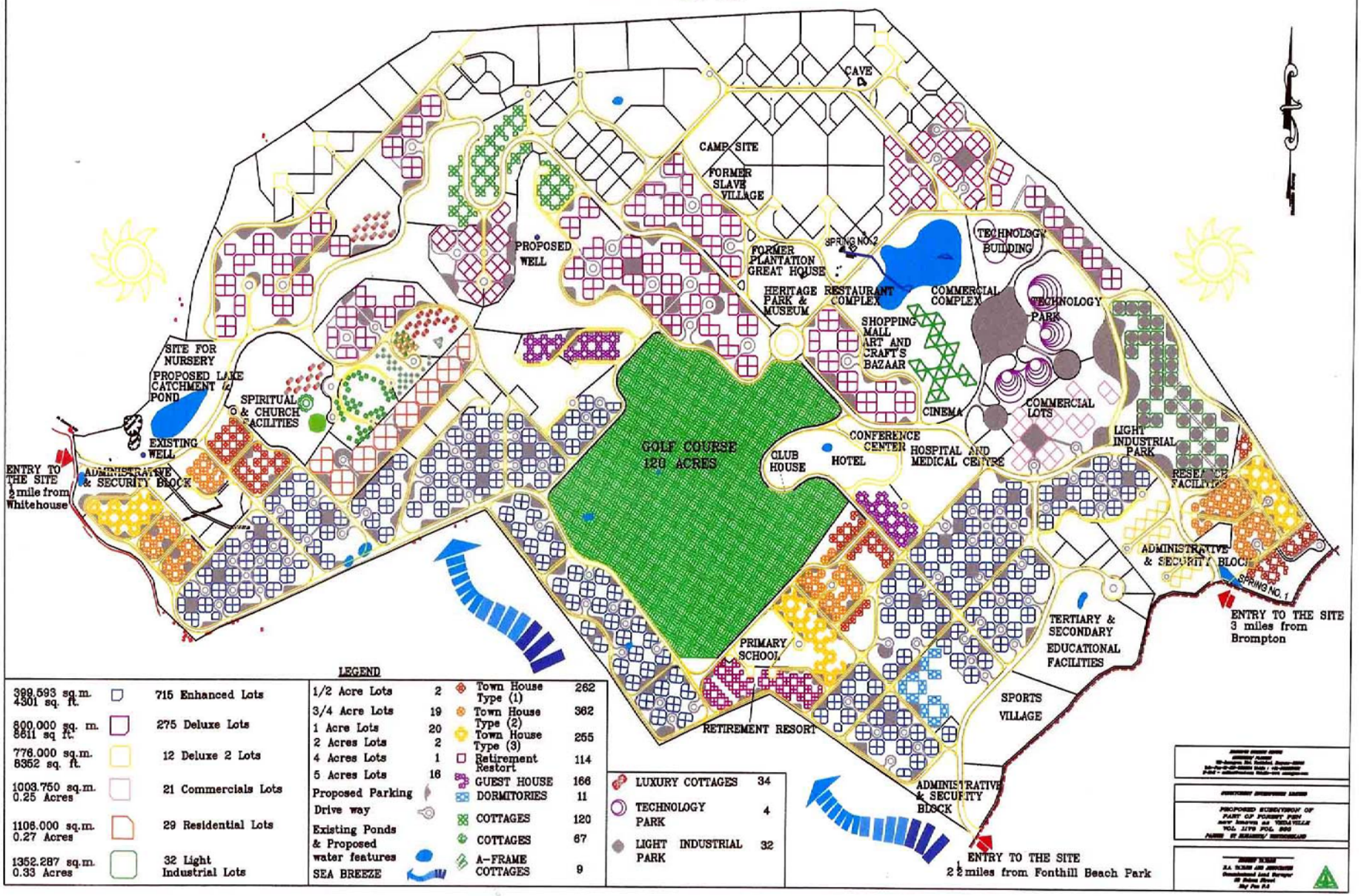
Maps & Diagrams



VEDAVILLE JAMAICA– Whitehouse

Proposed all inclusive Community Tourism Resort Development

PART OF FOREST PEN

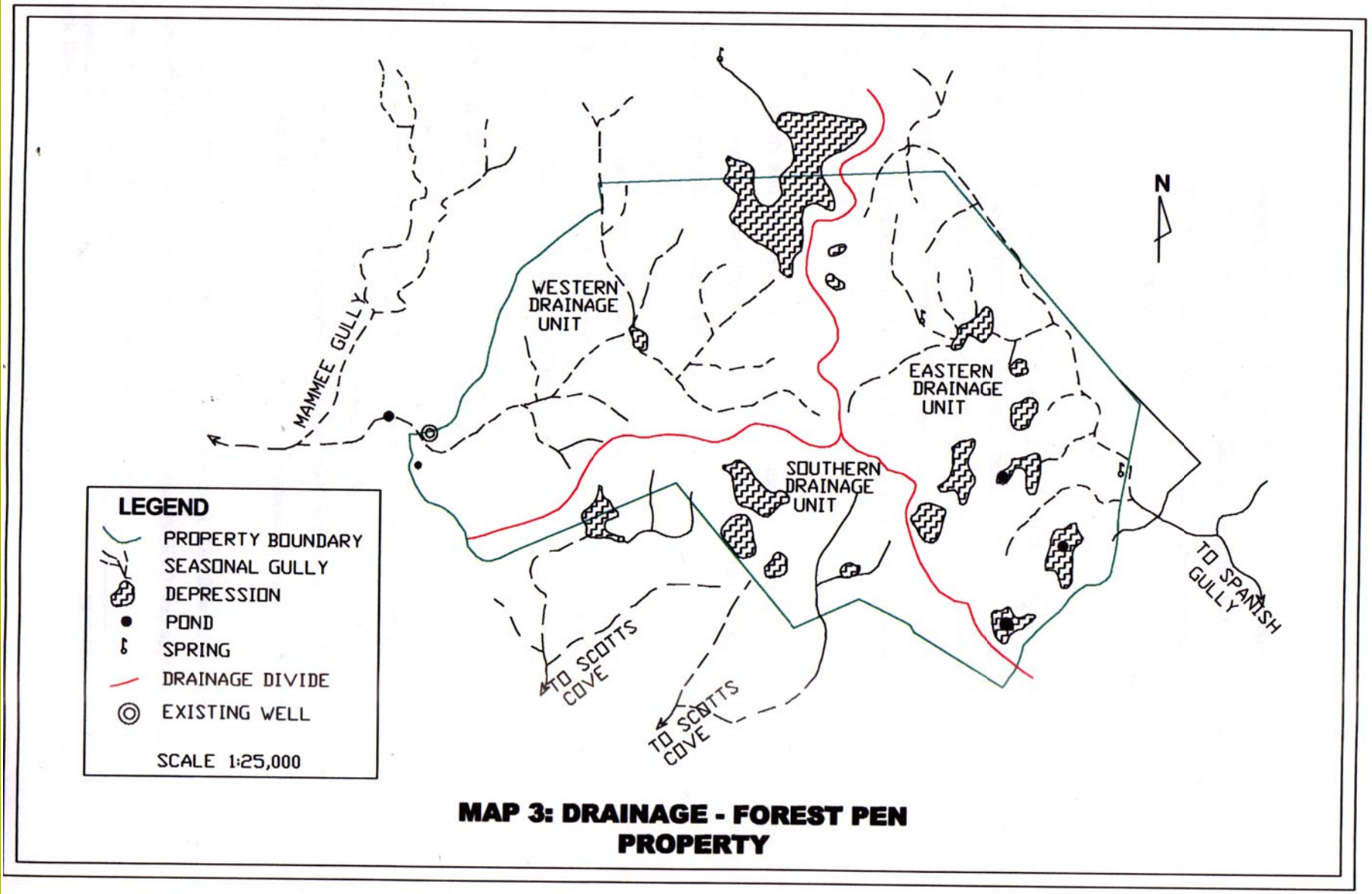


LEGEND

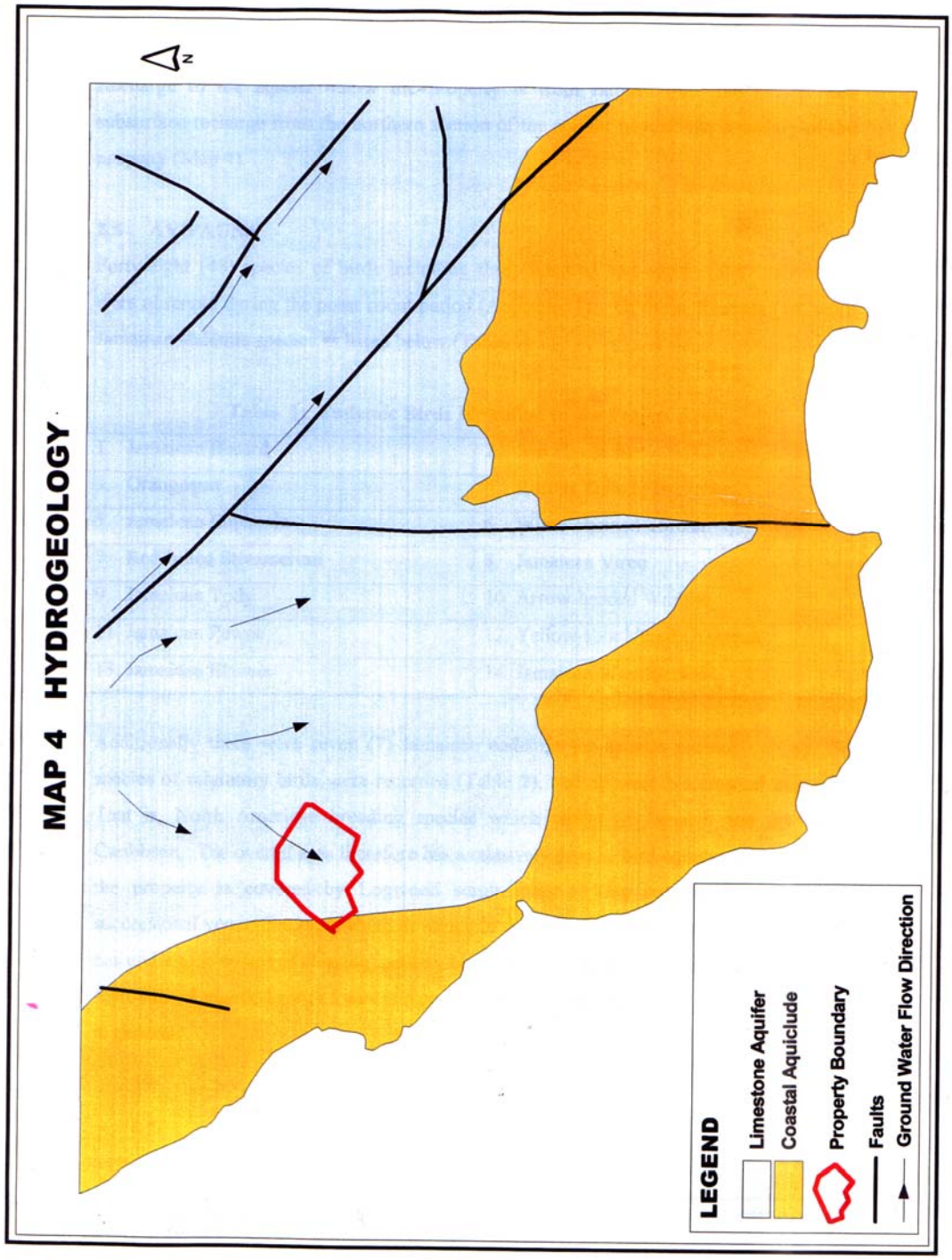
399.593 sq.m. 4301 sq. ft.	715 Enhanced Lots	1/2 Acre Lots	2
800.000 sq. m. 8611 sq ft.	275 Deluxe Lots	3/4 Acre Lots	19
776.000 sq.m. 8352 sq. ft.	12 Deluxe 2 Lots	1 Acre Lots	20
1003.750 sq.m. 0.25 Acres	21 Commercials Lots	2 Acres Lots	2
1106.000 sq.m. 0.27 Acres	29 Residential Lots	4 Acres Lots	1
1352.287 sq.m. 0.33 Acres	32 Light Industrial Lots	5 Acres Lots	16
		Proposed Parking	
		Drive way	
		Existing Ponds & Proposed water features	
		SEA BREEZE	

Town House Type (1)	262
Town House Type (2)	382
Town House Type (3)	255
Retirement Restort	114
GUEST HOUSE	166
DORMITORIES	11
COTTAGES	120
COTTAGES	67
A-FRAME COTTAGES	9

LUXURY COTTAGES	34
TECHNOLOGY PARK	4
LIGHT INDUSTRIAL PARK	32



MAP 3: DRAINAGE - FOREST PEN PROPERTY


MAP 4 HYDROGEOLOGY
N
LEGEND
Limestone Aquifer
Coastal Aquiclude
Property Boundary
Faults
Ground Water Flow Direction

MAP 5: BIRD SURVEY POINTS AND VEGETATION COVER
LEGEND
PASTURE
OVERGROWN PASTURE
SECONDARY FOREST/THICKETS
MIXED WITH RUINATE
⑤ BIRD SURVEY POINT
[2] VEGETATION SAMPLE SITES
SCALE 1:15,000

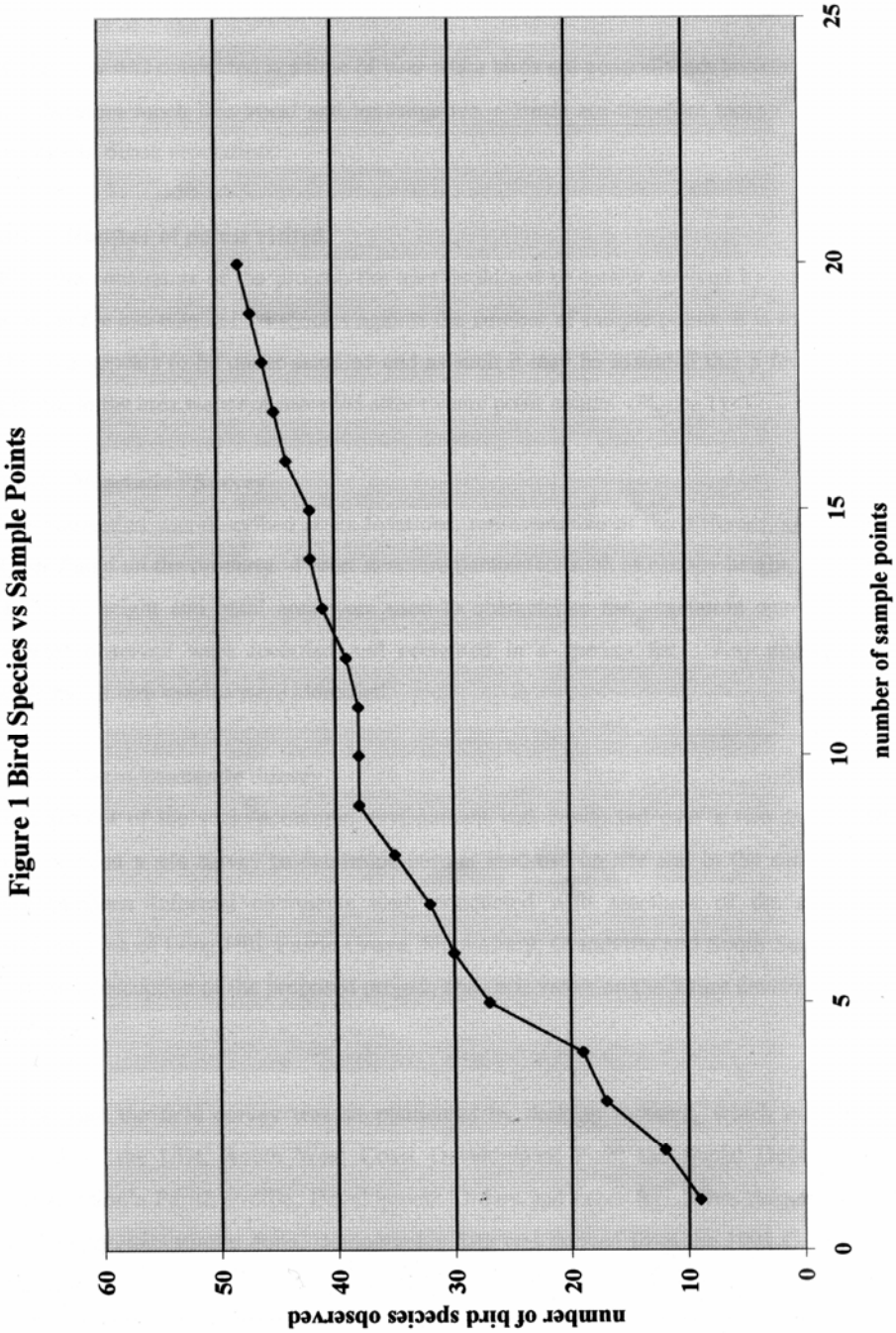


Figure 1 Bird Species vs Sample Points
number of bird species observed
0
10
20
30
40
50
60
0
5
10
15
20
25
number of sample points

APPENDIX 3A

BIRD SPECIES RECORDED AT SITE

	Common Names	Points at which surveys were conducted																			Number of Ind. of this species	% of points at which this species was observed
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	Cattle Egret							7	3													10	10%
2	American Kestrel			1						1					1			1				4	20%
3	Common Moorhen					3																3	5%
4	Rock Dove															1						1	5%
5	White-crowned Pigeon				2			1				1		1			1				1	7	30%
6	**Ruddy Quail-Dove**					1																1	5%
7	Common Ground Dove															2			1			3	10%
8	**Caribbean Dove**					1		3														4	10%
9	White-winged Dove								1													1	5%
10	Zenaida Dove			1	2	1	8					1		1								14	30%
11	Green Rumped Parrotlet												1					4				5	10%
12	Jamaican Parakeet					1					2		2			4	2				1	12	30%
13	Mangrove Cuckoo																			1		1	5%
14	Smooth Billed Ani	3	2		1	3													2	1	2	14	35%
15	Red Billed Streamertail	2								1	1				1	1		1				7	30%
16	Vervain Hummingbird	1			2							3						1		1	2	10	30%
17	**Jamaican Tody**	2										1	1			1			1			6	25%
18	Belted Kingfisher					1																1	5%
19	**Jamaican Woodpecker**		2		1		1	4	2	1	1	1		2	1	1	1			1		19	65%
20	**Jamaican Pewee**															1						1	5%
21	**Jamaican Elaenia**						1													1		2	10%
22	**Stolid Flycatcher**								1							1		2		1	1	6	25%
23	**Sad Flycatcher**											1					1					2	10%
24	**Rufous Tailed Flycatcher**		1												1	1						3	15%
25	Loggerhead Kingbird		1	1	2		1						1					1	1			8	35%
26	**Jamaican Becard**																			2		2	5%
27	**White-chinned thrush**	3	3	1			2	3	3	1	1		1	2	3		1	1			1	26	70%
28	Northern Mockingbird																	2	1			3	10%
29	**Jamaican Vireo**	1	1	2			1	1	1		1		1	1	2	3	1	1				17	65%
30	**Arrow-headed Warbler**					1											1					2	10%
31	Black-throated Blue Warbler					1	1		1						1							4	20%
32	Prairie Warbler	1	1	1															1		1	5	25%
33	American Redstart			1				1		1	1	1	1	1	2	1	1		2	1		14	60%
34	Black-and-white Warbler			1			1	1		1				1	1		1		1			8	40%
35	**Worm-eating Warbler**												1	1	1		1					4	20%
36	Northern Parula	1				1	2	1				1	2	4						1		13	40%
37	Northern Waterthrush					3							1									4	10%
38	Magnolia Warbler													1								1	5%
39	Ovenbird								1					1								2	10%
40	Bananaquit	1	2	1		1			1	4		4		3	1					3		21	50%
41	Yellow-faced Grassquit																	1				1	5%
42	**Yellow-shouldered Grassquit**																		1			1	5%
43	**Greater-Antillean Bullfinch**						3		3		1		4		1							12	25%
44	Jamaican Euphonia						1	1	1	1				1		1				1	1	8	35%

APPENDIX 3A

BIRD SPECIES RECORDED AT SITE

45	Orangequit						4	1			1	1								7	25%
46	Greater- Antillean Grackle																		1	1	5%
47	Shiny Cow-bird			1																1	5%
48	Jamaican Oriole			1		1	1			1				1				1		6	30%
	Total # of individuals by point	**15**	**13**	**11**	**11**	**19**	**23**	**27**	**19**	**11**	**9**	**15**	**17**	**20**	**16**	**19**	**15**	**11**	**11**	**15**	**11**	**308**	
	Total # of species by point	9	8	10	7	12	12	11	12	8	8	8	12	13	12	13	15	9	9	12	9		

Forest dependent species shown in bold.

APPENDIX 3B

BIRD SPECIES LIST

	Common Name	Scientific Name	Local Name	National Status
1	Cattle Egret	Bubulcus ibis	Ticks Bird or Gaulin	R1
2	American Kestrel	Falco sparverius	Lizard Hawk or Killy-Killy	R1
3	Common Moorhen	Gallinula chloropus	Mangrove Hen	R1
4	Rock Dove	Columba livia	Pigeon	I1
5	White-crowned Pigeon	Columba leucocephala	Ball Plate	R1
6	Ruddy Quail-Dove	Geotrygon montana	Copper Partridge	R2
7	Common Ground Dove	Columbina passerina	Ground Dove	R1
8	Caribbean Dove	Leptotila jamaicensis	White-belly	R1
9	White-winged Dove	Zenaida asiatica	White-wing	R1
10	Zenaida Dove	Zenaida aurita	Pea Dove	R1
11	Green Rumped Parrotlet	Forpus passerinus	Parakeet	I1
12	Jamaican Parakeet	Aratinga nana	Parakeet	R1
13	Mangrove Cuckoo	Coccyzus minor	Rain Bird	R2
14	Smooth-billed Ani	Crotophaga ani	Savanna Blackbird	R1
15	**Red-billed Streamertail**	Trochilus polytmus	Doctorbird	E1
16	Vervain Hummingbird	Mellisuga minima	Little Doctorbird	R1
17	**Jamaican Tody**	Todus todus	Robin Redbreast	E1
18	Belted Kingfisher	Caryle alcyon		W2
19	**Jamaican Woodpecker**	Melanerpes radiolatus	Woodpecker	E1
20	**Jamaican Pewee**	Contopus palidus	Pewee	E1
21	**Jamaican Elaenia**	Myiopagis cotta	Sarah Bird	E1
22	Stolid Flycatcher	Myiarchus stolidus	Tom Fool	R1
23	**Sad Flycatcher**	Myiarchus barbirostris	Little Tom Fool	E1
24	**Rufous Tailed Flycatcher**	Myiarchus validus	Big Tom Fool	E2
25	Loggerhead Kingbird	Tyrannus caudifasciatus	Loggerhead	R1
26	**Jamaican Becard**	Pachyrampus niger	Ricky-tee	E2
27	**White-Chinned Thrush**	Turdus aurantius	Hopping Dick	E1
28	Northern Mockingbird	Minus polyglottos	Nighting Gale	R1
29	**Jamaican Vireo**	Vireo modestus	Sewi-sewi	E1
30	**Arrow-headed Warbler**	Dendroica pharetra	Ants Picker or Ants Bird	E1
31	*Black Throated Blue Warbler*	*Dendroica virens*		W1
32	*Prarie Warbler*	*Dendroica discolor*		W1
33	*American Redstart*	*Setophaga ruticilla*		W1
34	*Black-and-white Warbler*	*Mniotilta varia*		W1
35	*Worm-eating Warbler*	*Helmitheros vermivorus*		W2
36	*Northern Parula*	*Parula americana*		W1
37	*Northern Waterthrush*	*Seiurus noveboracensis*		W1
38	*Magnolia Warbler*	*Dendroica magnolia*		W2
39	*Ovenbird*	*Seiurus aurocapillus*		W1
40	Bananaquit	Coereba flaveola	Yellow-belly	R1
41	Yellow-faced Grassquit	Tiaris olivacea	Squit or Grassquit	R1
42	**Yellow-shouldered Grassquit**	Loxipasser anoxanthus	Squit or Yellow-back Grasssquit	E2

APPENDIX 3B

BIRD SPECIES LIST

43	Greater Antillean Bullfinch	Loxigilla violacea	Black Sparrow	R1
44	**Jamaican Euphonia**	Euphonia jamaica	Cho-cho Quit	E1
45	**Orangequit**	Euneornis campestris	Orange Quit	E1
46	Greater Antillean Grackle	Quiscalus niger	Cling-cling	R1
46	Shiny Cow-bird	Molothrus bonariensis		I1
47	Jamaican Oriole	Jamaican Oriole	Banana Katie	R1

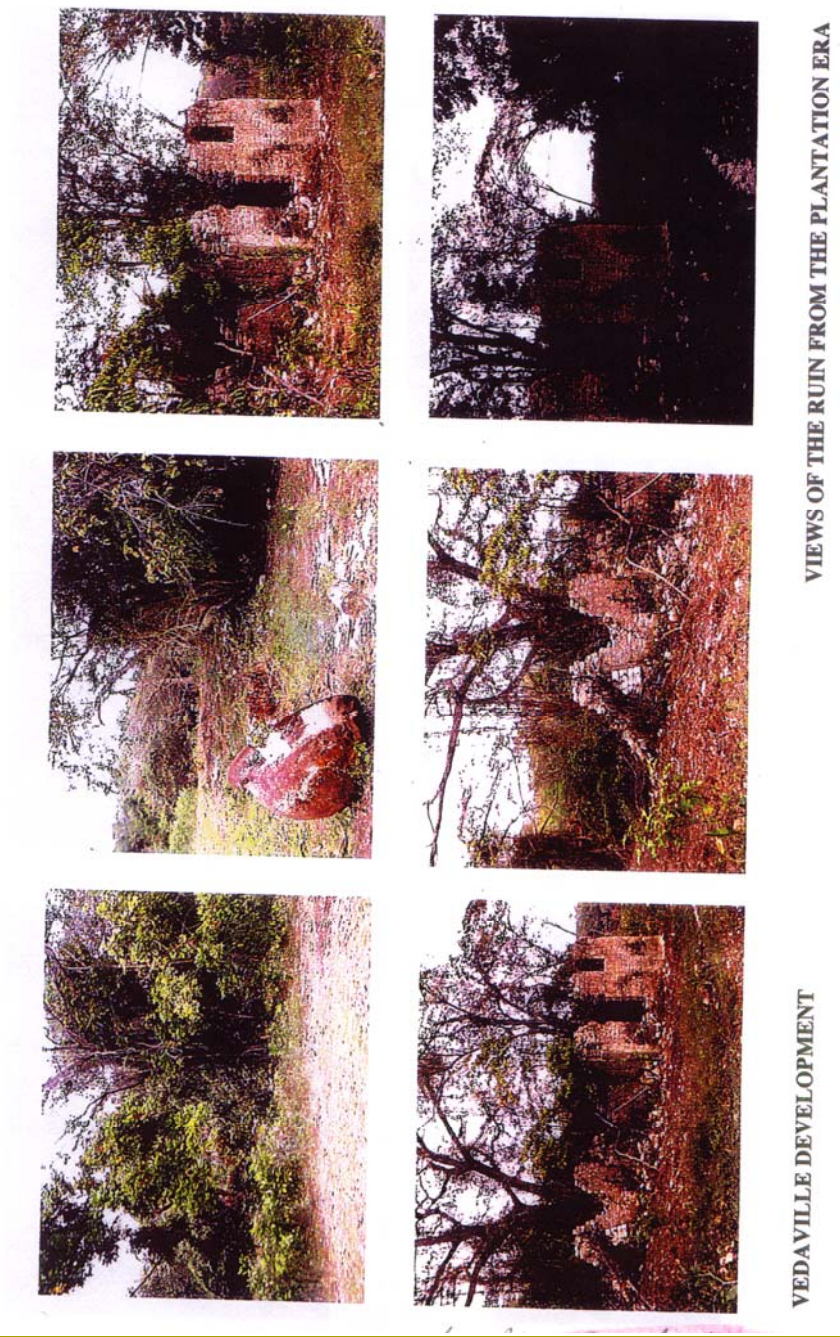
Key:

R - Resident; **E** - Endemic;
I - Introduced;
W - Winter Migrant

1 - Common in suitable habitat
2 - Uncommon

N.B. Endemic species shown in bold. Migratory species in italics.

APPENDIX 9: PHOTO INVENTORY



VIEWS OF THE RUIN FROM THE PLANTATION ERA

VEDAVILLE DEVELOPMENT

VIEWS OF THE SPRING, POND AND SURROUNDING HILLS

VEDAVILLE DEVELOPMENT