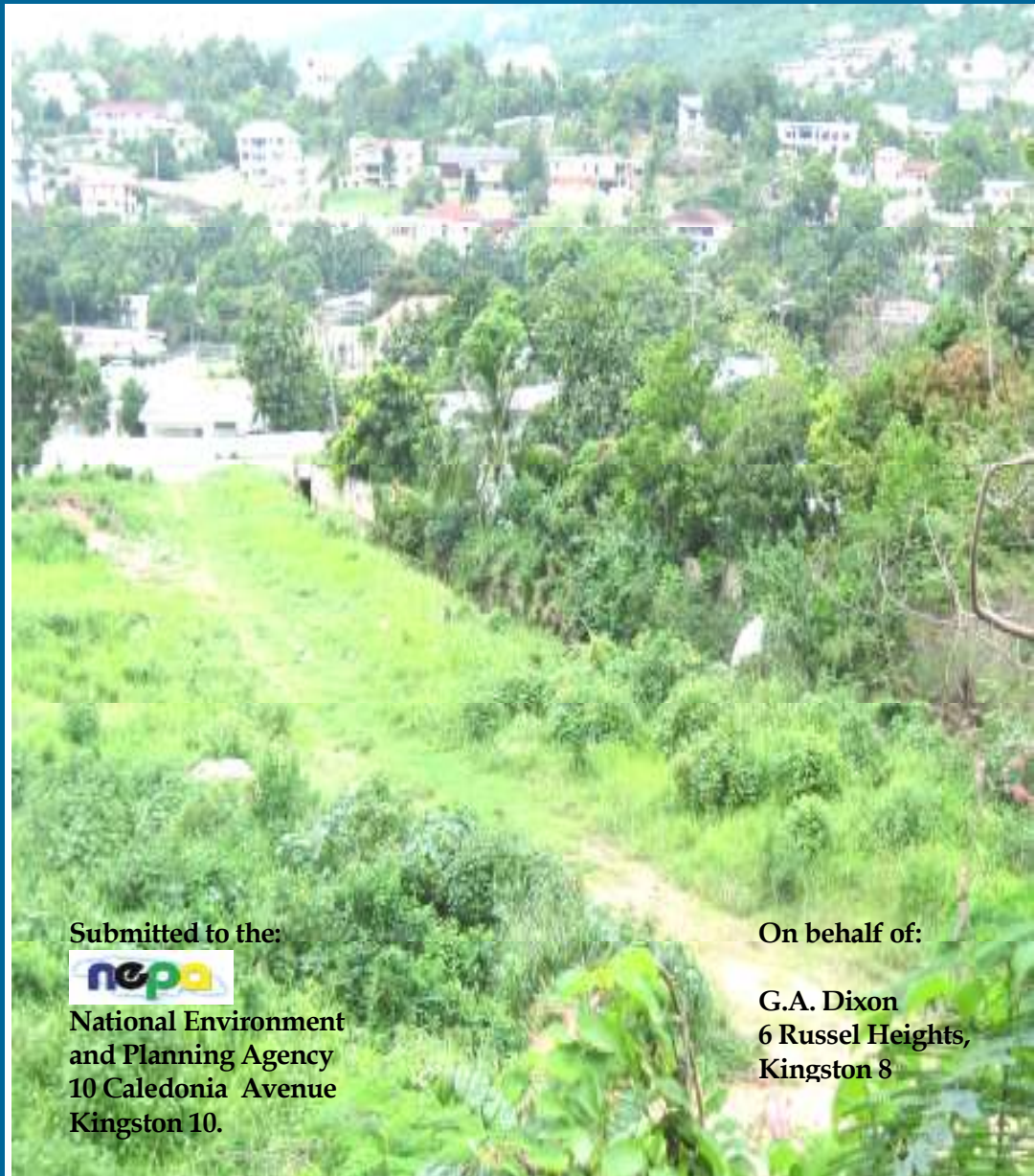




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# **ADDENDUM for ENVIRONMENTAL IMPACT ASSESSMENT**

**A PROPOSED RESIDENTIAL DEVELOPMENT –  
PART OF AMBASSADOR HEIGHTS, ST. ANDREW**



Submitted to the:



**National Environment  
and Planning Agency  
10 Caledonia Avenue  
Kingston 10.**

On behalf of:

**G.A. Dixon  
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2009 April 20

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## **Background**

Subsequent to the application for an Environmental Permit from the National Environment and Planning Agency (NEPA) (under Section 9 of the Natural Resources Conservation (NRCA) Act, 1991, and the Natural Resources Conservation (Permits and Licences) Regulations, 1996) for a proposed development at Ambassador Heights, St. Andrew, an Environmental Impact Assessment (EIA) report was submitted to the Agency in October 2008. The comments and observations, dated 2009 March 06, on the EIA were complied in correspondence to the Environmental Impact that was submitted. This Addendum addresses those comments and observations.

## **Introduction**

The Ambassador Heights development area is located in northern St. Andrew in south-eastern Jamaica. Specifically, the development area is part of suburban St. Andrew and falls within the Wagwater River Watershed Management Unit.

The site is located on the Mannings Hill Road, approximately 7.25 km (4.5 miles) north of Half-way-tree and 3.6 km (2.2 miles) southeast of the community of Mannings Hill (see Map 1). The Mannings Hill main road to Half-way-tree main road forms the western boundary of the site.

In the currently proposed development plan, an area of 23.02 acres will be developed into 100 residential lots with an additional three (3) lots zoned for wastewater treatment and recreational use.

## ADDENDUM

### TO AN ENVIRONMENTAL IMPACT ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT – AMBASSADOR HEIGHTS, ST. ANDREW

Below are the questions and comments which followed the review of the Environmental Impact Assessment, they are numbered and in bold print, the responses follow:

- 1) **The mitigation measures speak of what should be done instead of what will be done by the proponents to reduce or eliminate impacts.**

**Response:** When “should be done” instead of “what will be done” the presumption is not being made that the permit will be granted as this decision ultimately rests with NEPA. However, if the Agency prefers “should be done” this is complied with.

- 2) **Words such as ‘significant’, ‘substantial’ and ‘excessive’ used in describing possible impacts should not be used in the questions contained in the table assessing Environmental Issues, as the point of assigning rankings to each question is to determine the significance and magnitude of the activity itself. The use of these words may actually give the reader who sees a ranking of I (no impact) assigned in the impact column the false impression that a particular impact will not occur when actually it only means that it may not be significant. These questions should be rephrased and the answers given new ranking.**

**Response:** The ranking system was designed to rate the levels of impact from the greatest to the least potential impacts, therefore, the rating begins with emphasis on the potential severity of the impact (as indicated by the words “significant”, “substantial” and “excessive”, “incapable”, “inadequate”, strong, unstable, violate, thorough, create, contribute, impede, degrade, serious damage, conflict, considerable, excessive, impair, expose, exceed etc.)

As is mentioned elsewhere in the comments, there is the need to ensure that the layman understands the document and the emphases in the rating system are intended to serve that objective. In any case, only potentially significant impacts are of concern in the development process as where they are insignificant (not significant) they are irrelevant to nonexistent.

However, as required by NEPA please omit the above mentioned words.

- 3) **The introduction to the document states that one hundred (100) residential lots will be developed. Section 2.1 however states that approximately one hundred and twenty-three (123) such lots will be developed.**

**Response** Please refer to page 3 Section 2.1 that states the following:

“The proposed development will encompass approximately 123 primarily residential lots (120) on 93,176.77 square metres (23.02 acres) of land which has been earmarked for development”

- 4) **Page VI: Table of Contents  
List of Appendices is missing from the text.**

**Response:** Please see revised Table of Contents in Appendix I

5) **Page VIII: Executive Summary E1.1; Drainage and Sewage**

The potential environmental impact of the project on the Shingle Hut Gully and Mother Hector gullies needs to be studied and where necessary, measures must be implemented to mitigate against any long-term damage that might be caused by preconstruction activities.

▪ **Response:** Please see Appendix XI.

6) **The proposal is to treat sewage via septic tanks followed by reedbed. However the report does not indicate how the effluent emanating from the reedbed will be disposed of. This should be clearly stated. The proximity of a gully to the site may mean that consideration may be given to discharging the final effluent to this gully. Beneath this gully, groundwater is likely to be at significantly less depths below ground level, rendering the resource more vulnerable to surface sources of pollution. It is recommended by the Water Resources Authority that an absorption pit be constructed after the reedbed to receive the final treated effluent.**

**Response:** Please refer the approval letter submitted to NEPA by the Environmental Health Unit of the Ministry of Health that approves the treatment of effluent to the tertiary level rendering it safe for discharge into the gully (Please see Appendix XII). Besides this, please refer to **page 20, Section D** that indicates that “the hydrologic analysis of the nearest wells (Lakehurst, Corehole and Havendale exploratory) indicate that the piezometric surface is 78 metres below ground level”.

The WRA recommendations will be adhered to.

7) **Page XIV: E7; Significant Impact and Mitigation Measures:**

**Given the degree of slope and soil composition within the proposed area for development, there should be some consideration given to partnering with the Forestry Department and the Ministry of Agriculture to implement measures that would reduce runoff and the blockage of storm waterways. These measures should include but not be limited to: afforestation, planting of cover crops (to reduce erosion), the establishment of an agroforestry environment (planting of fruit trees) to reduce landslides and provide habitats for birds and the construction of terraces to reduce the flow of water down the slope.**

**Response:** The project proponent proposes a residential subdivision; however, site engineering would incorporate the best practices for building on slopes. Site erosion and sediment control measures would include the following:

1. Silt fence around the perimeter of the property.
2. The development would be phased, therefore, clearing would occur only on the area targeted for construction – site activities would be scheduled to minimize amount of exposed soil.
3. Creation of a sediment basin, berms along the major runoff routes along the gully.
4. Installation of sediment traps.
5. Construction debris and chemicals would also be managed to prevent them becoming pollutant sources in stormwater discharge).
6. Use of temporary mulch.
7. Protection of trees and preservation of mature vegetation.
8. Control measures for biological protection.
9. Control measures for physical in-stream condition controls.

The proposed landscaping for the property will include the replanting of tree species such as fruit trees and shrubs typical of the area. The lawns of new residences and open spaces will be regrassed.

- 8) **Erosion resulting from runoff contributes significantly to the exposure of boulders and other submerged rocks on the hillsides. Therefore, long-term measures should include frequent monitoring of these activities within the area of the development.**

**Response:** This has been added to the Monitoring Plan also the implementation of measures shown above.

- 9) **Page XVIII: Study Rationale**

The purpose of this section is unclear. The title would indicate a rationale for why the study, i.e. the EIA is necessary. This, however, was not presented. This section should either be rewritten to present the rationale for the study or removed. The associated Figure 1 would also become redundant. If this is to be kept, it is recommended for the Appendix.

**Response:** The Study Rationale outlines the objectives of the EIA which includes “*provides information required to analyze the significant socio-economic and environmental effects of the Proposed Action and determines whether a permit would be granted*” It is to be included among the Appendices ( Appendix II)

- 10) **Page 4: Section 2.2.2 - Potable Water**

The document states that “arrangements will be made between the developer and NWC to address water supply”. It is recommended that these arrangements be discussed early to determine whether or not the NWC is able to provide potable water for the development. If the NWC is unable to provide potable water to the development, then alternatives for water supply should be identified. This is important in light of the frequent water lock-offs that occur in the area (page 53, section 4.4.4.C).

**Response:** Please see NWC letter attached in Appendix III

- 11) **Page 4: Section 2.2.3 – Electricity/Telephone**

Is there an arrangement in place, in the form of a letter that substantiates the statement that “JPS would provide electricity to the development?” The capacity of JPS to provide electricity should be taken into consideration.

**Response:** Application for electricity service is not normally applied for until planning approval and environmental permits are in place. There are no plans to implement a renewable energy programme, therefore, JPS is the only available supplier of electricity.

- 12) **Page 5: Section 2.2.5 (i) – Solid Waste Disposal**

Has arrangements been made with the NSWMA for the collection of solid waste for the development in light of the fact that approval of service has to be obtained from them (page 55) in the form of a letter. If approval is not received from NSWMA and private trucks are to be used during the operation phase, will they also be used after the development is completed?

**Response:** Please see copy of NSWMA letter in Appendices (Appendix IV)

- 13) **Page 6: Section 2.3.1- Physical**

This section makes mention of the site being located between two inactive faults. An indication needs to be given as to how this conclusion was derived and its relevance to the “No Action” alternative. There is no historical evidence available to prove that the faults have been otherwise than inactive.

**Response:** The project area is hinged between two geological faults and is therefore influenced by these geological structures. These faults are not known to be seismically active and therefore slip motion/movement on the fault planes is not anticipated. Shepherd et al (1999) and the Kingston Seismic Hazard Assessment Project (1999) under the Caribbean Disaster Mitigation Programme (CDMP) have produced seismic maps for Jamaica and Kingston Metropolitan Area respectively. These are the most current seismic hazard studies done for Jamaica and have given estimated horizontal ground accelerations of 0.27 g and 0.3 g respectively for the project area with a 10 percent probability of exceedence in 50 years. This corresponds to a return period of 475 years.

There is no historical evidence to prove or disprove inactivity within Jamaica. There is a map, however, to show active faults, from which a fault's inactivity can be determined. This map was also prepared under the Kingston Seismic Hazard Assessment Project, see Appendix V. From the map it can be seen that there are no active faults within the Mannings Hill area.

**14) Page 7: Section 3.1.1 – Climate**

**Figure 2 is actually a Table and should be represented as such. In light of this, the numbering of the tables and figures would change throughout the remainder of the document. What is the purpose of the data provided in the table for May 2006? There was no mention of this in the text.**

**Response:** Even though the data is represented as a table in the image, it has no bearing on the fact that it is a figure and not a table. Figure 2 was copied from this website: <http://www.metservice.gov.jm/documents/documents/RainfallSummaryJune2007.pdf>

1. The image was copied in its entirety; therefore, it means that the rainfall data for May 2006 could not be deleted.
2. The title of the figure is *Parish Rainfall Summary for 2007*, no reference would have been, therefore, to May 2006 data. As was stated earlier, the data could not be deleted from the image and since the reference is cited it should be ignored.

**15) Page 9: Section 3.1.1.C – Winds**

**The last sentence on this page does not connect with that at the beginning of page 10; something has been omitted.**

**Response:** The information was corrected as can be see below:  
(...the east-south-easterly winds are at an average speed of 18 knots [21 miles per hour]. However, during the period December to March, the Trades are less dominant...)

**16) Page 17: Section 3.1.5.B – Surface Hydrology**

**Turnbridge Gully was mentioned as one of the surface drains that Shingle Hut Gully flows into. It is recommended that this gully be highlighted in Map 5 (page 19) to provide an overall view of the surface hydrology.**

**Response:** Please see revised surface hydrology map in Appendices (Appendix VI)

17) Page 20: Section 3.1.5 – Subsection D

Development at the proposed site is inadvisable considering that the proposed site is underlain by highly permeable soil, which renders it highly susceptible to point source pollution.

**Response:** The proposal is for a residential subdivision and the only anticipated significant source of point source pollution is the wastewater treatment plant. However, the EHU at the Ministry of Health has granted approval for the planned septic tank-reed bed system proposed which will treat wastewater to a tertiary level..

18) Page 22: Section 3.1.7, 50 year Return Period & 3.2.1, Flood Hazard

If the Shingle Hut Gully has the potential to transport large volumes of rocks and debris during heavy events that it threatens the eastern boundary of the property, how is it that it will be able to facilitate the volume of water expected from major storm events exceeding the 50-year return period?

**Response:** The NWA has assessed the proposal and found it acceptable based on their letter dated July 15, 2008 (Appendix VII)

19) Page 23: Section 3.2.3 – Earthquake Hazard and page 65, Table 1B – Earthquake/Seismic Impacts

The proposed site is located between two fault lines which makes it prone to seismic activity. Is the housing solution designed to withstand a seismic activity that is adjacent to it?

**Response:** The Project Proponent will ensure strict adherence to the Building Code.

20) Page 25-26: Section 3.3.2 – Birds, Tables 4-6

The 2<sup>nd</sup> column in these tables bears the heading “Common Names” while the 1<sup>st</sup> column has no heading. It is recommended that the 1<sup>st</sup> column bear the heading “Common Names” and the 2<sup>nd</sup> column “Local Names” as this is what is being presented.

**Response:** The recommended changes were made. Please see revised table in Appendices (Appendix VIII)

21) Page 29-31: Section 3.3.4 – Flora results and discussion

There was no mention of the endemic plants (location and/or abundance) [at least 3] in this section of the document. Only one endemic plant was mentioned on page 6, section “terrestrial”.

**Response:** The recommended inclusion of the endemic species found on the property can be seen below.

*“These species include Mango trees (Magnifera indica) and Ackee (Blighia sapida) some of which support a large community of bromeliads . It is not surprising that these trees were among the largest within the development areas; because of their value as food sources, they are often permitted to grow while surrounding trees are harvested for domestic and commercial uses. There was only one type of endemic species found on the property these are the endemic palms (Thrinax spp and Acrocomia spinosa).”*

22) Page 36: Map 6



It is recommended that the names of the respective enumeration districts (EDs) or communities that fall within the EDs be labelled on the map and represented in the key. At present, the colours provided do not provide that information.

23) Page 38-39: Section 4.3.2 – Employment and Income & 4.4.2 – Housing

It is recommended that if electoral districts and their respective numbers/divisions are used (e.g. ED West Rural 65 {page 39}) that the name of the area/community be also presented. The EIA is a public document and serves to inform. Writing the electoral district as presented in the example, does not inform readers of the area/community that is being referred to in the document.

**Response to Nos 22 and 23:**

Map 6 provides some information, however, ED boundaries are not necessarily confined to specific communities, however, please see revised Map in Appendices (Appendix IX)

24) Page 57: Section 4.6.3.A – Ambient Noise Level

What is the value of the “slow response for comparatively stable noise”?

**Response:** The Amprobe Noise Meter has two (2) response settings for measuring noise levels: 1) slow response – used for measuring comparatively stable noise and 2) fast response – used for measuring fast varying noise. Slow response was the setting chosen as noise on the property was stable.

25) Page 60-61: Figures 7-9

All the perceived positive and negative impacts as well as the most urgent need in the SIA were not included in the text of the document. This was, however, reflected in the graphs.

**Response:** The most urgent community need was reflected in the text. That was the repair of road networks that links the area to Havendale to the South and Stony Hill to the north. There were also other needs that were considered to be urgent; those needs were however, reflected in the graph. The changes can be seen below.

*The positive aspects of the proposed development are:*

- *development of the area (in the long term)*
- *job creation in the short-term*
- *development of the area*
- *increase the housing increase in property value*
- *improvement in infrastructure*

*The negative impacts of the proposed development are:*

- *increase in traffic could result in traffic congestion*
- *loss of biodiversity*
- *increase in incidents of flooding*
- *increase in crime rate*
- *exclusion of persons who currently use the property*

*“The most urgent community need identified by residents within the SLA area is that of repair to road network that links the area to Havendale to the south and Stony Hill to the north. In addition to road repair residents complained about the irregularity of their water supply and would like to see improvement. Adequate recreational facility and policing should be put in place and some residents considered employment to be the most urgent need “*

**26) Page 64: Table 1B**

It was reported that the Shingle Hut Gully is generally unstable; however, the mitigation/erosion protection measures put forward do not address this issue. On page 23, it was noted that because of this, the potential for erosion is increased with incremental increase of the development to the Gully. If this is the case, the layout of the houses/townhouses/lots in relation to the Gully should have been presented and discussed. What of barriers/buffers between the Gully and the development? What measures are necessary to prevent the Gully from being destabilized in order to protect the development?

**27) Page 65: Table 1B – Landslides and Geology and Earthquake/Seismic Impacts (mitigation)**

The document reports that based on general observations, the slopes are generally stable in areas undisturbed by construction. No differentiation has been made with respect to the types of slopes. However, the mitigation only speaks to steep slopes. What of the impact of construction or other earthwork activity on moderate and other slopes that may be found onsite?

**28) -**

Steep slopes near fault scarps, such as, the areas close to the Shingle Hut Gully should be avoided. Rockslides can occur on or near the steep gully bank slopes if the area is disturbed for development purposes.

Removal of boulders and loosely attached rocks in the project area is important in mitigating against rock/boulders which could be mobilized down the slopes from earthquake shaking; creating major rock fall hazard for the development.

**29) Page 67: Table 2A – Hydrology and Water Quality**

The proponent should state whether the project will alter the existing drainage pattern of the site or the area (including the alteration of the course of the stream or river), in a manner which will result in on-site or off-site erosion or siltation.

**30) -**

The duration of impact is given a rating of IV, which based on the rating scale, will have long term effects on the surrounding environment, through a possible increase in sedimentation of low-lying areas or increased levels of erosion in others. This alteration in the drainage pattern could overtime result in modifications to the natural path taken by the Shingle Hut or the Mother Hector gullies, causing further blockage of drains or siltation in other areas as well as flooding. This issue needs to be adequately addressed.

**31) Page 68: Table 2B – Flooding Impacts and Mitigation**

The development will increase the volume of the runoff off-site. The present drainage system does not have the capacity to manage the increased flow and this may affect communities downstream of

the Shingle Hut Gully such as Havendale, which already experience flooding with moderate to heavy rainfall events.

- 32) -  
What are the benefits of using U-drains to offset onsite flooding? This should be stated in the document. Why can other drains not be used? Is there a maintenance schedule for the drains? Who will be responsible for carrying out this activity?

The proponents should indicate who will be responsible and what plans are in place to ensure that the proposed necessary upgrade of the off-site drainage system is actually undertaken. Simply stating that the long term solution is for the Government to undertake the activity is unsatisfactory. Assurance needs to be given that the proponent indeed intends to ensure that flooding due to the inadequacy of the drainage system to accommodate the increased volume created by the development, will not occur and become a problem for surrounding communities in the future.

- 33) -  
If the two gullies, Shingle Hut and Mother Hector are the main carriers of storm water within the area, how can they be upgraded taking into account that the Shingle Hut drains through a geologically unstable area? If the gullies are not what is being referred to what is the drainage system in the vicinity of the development site that will be upgraded? There was no mention of such a system in the document.

#### Responses to Nos. 26 to 33

1. **Response to No 26:** Please see response to *Page 67: Table 2A – Hydrology and Water Quality* above – Downstream flooding impacts were taken in account when the approval was recommended by the NWA as the Project Proponent satisfied the requirements of the Agency.
2. **Response to No 27:** Please refer to response to *Page XIV: E7: Significant Impact and Mitigation Measures* above.
3. **Response to No 28:** No alteration of the drainage path because of the proposed development is anticipated given the clearly defined drainage system that presently exists. This was taken in account when the approval was recommended by the NWA.
4. **Response to No 29:** Boulders and loosely attached rocks on the property and adjacent to the proposed development would be removed.
5. **Response to No 30:** Site specific engineering works will be employed to stabilize the gully banks in the vicinity of the proposed development. In addition, there will be a buffer of 20 feet from the gully while the footprints of the housing solutions would be an additional 10-15 feet away (see Appendix X).
6. **Response to No 31:** Once the development is handed over to the Kingston and St. Andrew Corporation (KSAC) maintenance becomes the responsibility of that body.
7. **Response to No 32:** Please see excerpt from the EIA below. The paragraph below attempts to make further clarification, if the excerpt was misunderstood.

#### Page 68 of the EIA Mitigation/ Flood Protection Measures On-Site Flooding

*“ Flooding is not expected to directly impact the project area because the land slopes in all directions. Construction of pavement structures and buildings will result in a decrease in permeability and increase runoff during and after development. Flooding on site could occur if the system is blocked and could impact negatively on nearby communities; therefore, the preferred option is the design of u-drains for the development. The KSAC will be responsible for the drains once the project is complete”*

The project site will not be easily flooded due to the fact that the land is generally on a slopes. However, flooding on site could occur if the drains are blocked. The benefit of using U-drain on site is that it is easier cleaned; hence, it will not be easily blocked. Therefore, the incidence of flooding on

site will have a low probability of occurring. Other drains were not chosen because U-drains are more easily maintained compared others. The preferred option is the design of u-drains for the development.

8. **Response to No 33:** Please see response to *Page 22: Section 3.1.7, 50 year Return Period & 3.2.1, Flood Hazard* above. In addition, the Project Proponent would upgrade/improve the culvert along Mannings Hill Road where the Shingle Hut Gully crosses the road. Please see the engineering assessment conclusion included in the Appendices (Appendix XI) that states that “*The final disposal of stormwater run-off from the site will be in the Shingle Hut Gully which is able to facilitate the volume of water expected from major storm events exceeding the 50-year return*”

**34) Page 69: Impact and Mitigation – Risk Management**

The proponent should present **Standard Operating Procedures for onsite use, storage, and disposal of chemical to be used by the development. The use of berms and hard surfaces for the storage of chemicals in the event of spills should be explored.**

**Response:** These recommendations are to be adopted by the Project Proponent.

**35) Page 71: Hazards – Impacts on Public Safety,**

**Structures, and Ecology -It is quite erroneous to say that the project will not result in flooding damage during torrential rain events. Although the impact may be indirect, this impact will at the very least be low to moderate and should therefore be assigned an impact rating of no less than II.**

**Response:** The assessment did not find that the development by itself would contribute to flooding damage. However, the impact has been revised as shown below.

**Table 4A:** Hazards: Impacts on Public Safety, Structures and Ecology

ENVIRONMENTAL ISSUES	IMPACT	SIGNIFICANCE	DURATION OF IMPACT	DIRECT/INDIRECT IMPACT
<b>Hazards -Natural</b>				
Would the project:				
a) Result in substantial damage from flooding caused by torrential rainfall?	II	II	II	II

**36) Page 72: Table 5A – Biology: Significant Impacts and Mitigation**

More assessment needs to be done to ascertain the long term impacts of the removal of trees that currently serve as a habitat for approximately 50% of the property’s birds. It also needs to be established whether trees similar to those that were inhabited by the bird species will be replanted.

**37) Page 72: Table 5B – Flora and Fauna**

**[Direct Impacts]** The change in land use will dramatically alter the fauna composition and a complete loss of endemic fauna, how can the development further enhance the area. Clarification is necessary.

**[Indirect Impacts & Aesthetic Enhancement]**

Why are the endemics observed on the property mentioned here instead of the Flora section in the document? In addition, there is no prior mention of bromeliads in the document.

38) [Aesthetic Enhancement]

Where would native plants, such as the endemic palms be relocated to?

39) [Fauna Impact]

The 4<sup>th</sup> sentence in this paragraph contradicts that which was stated in “Flora, Direct Impacts”. This needs to be addressed.

40) [Fauna Mitigation]

What is the proposed method of relocating faunal groups, especially endemic species to a similar habitat? Where is the location of the similar habitat that is being considered?

41) Page 73: Fauna – Mitigation

A plan for the capture and/or relocation of these endemic species should be submitted.

Responses to 37 to 42

- Given the physical and terrestrial (flora/fauna) attributes of the area, habitat conditions in adjacent areas (similar to the project site) are unlikely to be altered, therefore, the area can provide continued habitat conditions. In addition, post implementation strategies will involve the replanting of native and ornamental species, such as, the endemic palms (which will be relocated to the area reserved for open space) and fruit trees.

Also kindly reread the sentence as it refers to enhancing of “*the poor sustainability of the area*”

- # Please refer to revised table below :

Table 5B: Biology: Significant Impacts and Mitigation

INDICATOR	IMPACT & MITIGATION
CONSTRUCTION/IMPLEMENTATION	
<p><b>Biology</b></p> <p><i>Flora</i></p> <p><i>Fauna</i></p>	<p><b>Impact</b></p> <p><u>I. Direct Impacts</u></p> <p>The direct impact of the proposed development will produce extensive and irreversible change in the vegetation composition and structure of the area in the short and medium term with a near complete removal of the remaining natural vegetation of the area.</p> <p><b>Impact</b></p> <p>Removal of the current forest will completely modify the fauna of the area. The dominant faunal group, the birds, will be among those species most significantly affected. Approximately 50% of the property’s birds are forest dependent. As such, the development will produce some change in the avian community from one dominated by forest dependent species, composed of many endemic species and subspecies, to a community comprised of a few species almost totally of non-endemic birds such as the Red-billed Streamertail hummingbird, and the lizard <i>Anolis grahami</i>, that are both highly tolerant of development and human presence</p> <p><b>Mitigation</b></p> <p>No mitigation measures will be necessary</p>

- #37 Correction has been made follows:

“...The other most abundant species were almost all introduced species characteristic of the vegetation of rural residential habitats. These species include Mango trees (*Mangifera indica*) and Ackee (*Blighia sapida*) some of which support a large community of bromeliads (see plate 20).....”

4. There will be no need for capture and/or relocate species. The EIA should have read “no mitigation measures will be necessary”. Please see revised table above.

**42) Page 74: Table 6B**

**Has consideration been given to what type of plants – trees, herbs and shrubs, would be used in landscaping of the proposed site? Non-native plants are not recommended.**

**Response:** Please see page 73 of the EIA (Table 5B III Aesthetic Enhancement – point 3 Relocating native plants with landscaping value where possible. In particular, the endemic palms (*Thrinax spp and Acrocomia spinosa*.)” Other ornamental plants will be introduced.

**43) Page 75: Air Quality – Mitigation**

**Any loose material that is stockpiled should be adequately covered and may also need to be wetted periodically.**

**Response:** This will be adhered to.

**44) Page 76: Table 8B**

**What other means have been identified to remove limestone rock or large boulders from the site? Is blasting the only option? The mitigation presented does not adequately address the issue of damage to property and injury from “flying rocks” which are usually associated with the blast method of excavation. What measures have been identified for staff in relation to noise levels during blasting? Although a schedule is being proposed to lessen the impacts of alleviated noise levels, the impact of the noise on the houses nearby is a major concern and it is recommended that this be addressed.**

**45) -**

**The schedule of activities must be shared with the public. A blast schedule must also be published and communicated with the public before hand.**

**46) -**

**It is recommended that a pre-blast assessment of structures that may be affected be conducted by the proponent in the event that damage occurs and compensation is sought by residents subsequent to blasting activities.**

**Response to Nos 44 to 46**

1. As much as possible rocks will be removed by the use of backhoe.
2. Staff will be equipped with the appropriate personal protection equipment (PPE)
3. The blasting option will no longer be used. A backhoe, bulldozer with a ripper will be used instead.

**47) Page 76: Table 9A**

**The proposed sewage treatment facility of septic tank and reed beds was not discussed in detail especially in terms of possible impacts and mitigation. The only mention of the facility was on page 5, Section 2.2.5 (ii). Has an application for the construction of the facility been submitted to the Agency in addition to a license to discharge? This should also be stated in the document.**

**Response:** Please see engineering report for the sewage treatment facility in Appendices (Appendix XII).

The Permit and License applications are being prepared for submission to the Agency

**48) Page 76: Table 9B**

**Will skips/bins be used onsite to collect solid waste or will there be one large collection area for NSWMA or private trucks to operate from? If there is to be one collection area, what mechanisms have been identified to prevent redistribution to other areas on the site?**

**Response:** Two skips will be used on separate points on the site as the need arises.

**49) Page 78: Table 11B**

**The statement presented in the document with regards to potable water is contradictory. Previously, it was stated that arrangements would have to be made with NWC to provide potable water. In this section however, it is being presented that the NWC has indicated their willingness to supply water to the development. What is the true nature of the situation? A similar contradiction was done for JPSCo. The agencies support to the development has to be substantiated by a letter attached to the EIA in the Appendix.**

**Response:** Please see NWC letter attached in Appendix III

Please see the responses to Page 4: Section 2.2.3 – Electricity/Telephone above.

**50) Page 81: Section 5.5**

**What is the purpose of this section and Table 15?**

**Response:** The purpose of the cumulative impact table was to show the extent of the affected “**resources**” at the local, national, and regional scale. Employment, population and housing for example, will have an effect at the local scale (within the parish and adjacent parishes). This is so because when a new development is proposed for an area, jobs are normally created (some short term, some long term), depends on the nature of the development. Case in point, Ambassador Heights: the development of 120 residential units will undoubtedly provide employment (masons, carpenters etc) to persons within that community and adjacent communities or from other parishes.

In terms of population and housing, that is self explanatory. I will however, proceed to explain. There will be a definite increase in the proposed Ambassador Heights community as the projected population is expected to be six hundred 600 persons. It therefore, means that those persons will be migrating from elsewhere, so as to reside in Ambassador Heights. The effect of this migration whether internal or external will highly correlate to population shifts within the parish and adjacent parishes. This will produce a cumulative effect at the local level.

**51) Page 83: Socio-economic Benefits/Costs**

**Costs which may be incurred due to blasting operations should also be considered.**

**Response:** Costs which may be incurred due to blasting operations are no longer necessary as the use of Backhoes and Bulldozers have been substituted for blasting.

**52) Page 85: Monitoring Guidelines**

**Monitoring guidelines should also be developed for drainage.**

**Response:** Please see additional indicator in the Table below.

Table 5.8 B: Monitoring Guidelines

ITEM	INDICATOR	PARAMETER	FREQUENCY	LOCATION
<b>CONSTRUCTION/IMPLEMENTATION</b>				
4	Drainage	To ensure the drainage paths are not blocked	Monthly	-
<b>OPERATION/MAINTENANCE</b>				
4	Drainage	To ensure the drainage paths are not blocked. Responsibility of the KSAC	-	-

**53) Page 107: Appendix II. Items #1 and #4 as indicated on the National Works Agency (NWA) letter dated July 15<sup>th</sup>, 2008 were not adequately addressed in the EIA.**

**Response:**

1. Identification of routes to be used for waste disposal and delivery to the construction site. An existing entrance at the southeastern corner of the site will be upgraded allowing easier ingress/egress.
2. Measures to limit the impact of the construction on the existing /man made and natural drainage in the area. **Please see No. 7 above.**

**54) Page 122: Appendix VI**

**There are two (2) columns in the table that require completion – “% of points with species by point”. This should be rectified.**

**Response:** The recommended changes were made. However, “Total # of species by point” was changed to “percentage of species by point. Please see revised Table - Appendix. XIII

**55) Page 125: Appendix VII**

**The scientific names of the shrubs/herbs/grasses are to be presented in italics.**

**The scientific and common names of the plants need to be rechecked in terms of spelling and accuracy.**

**Scientific names should not be interchanged for common names and vice versa.**

**Response:** Please see revised table - Appendix XIII

**56) Please be advised that the citizens of Belgrade Mews submitted there concerns to the Agency regarding the environmental impacts of the proposed development. These are listed below and should also be taken into consideration:**



- I. The Mannings Hill Road between its intersection of Old Gate Drive to Smokey Vale is extremely narrow at several sections, it is winding and is currently incapable of carrying the present level of traffic. In some places it is difficult to carry two trucks abreast. Heavy trucks also utilize this road frequently which holds up the traffic as well, which results in frustration and a loss of man hours. The residents are extremely worried that the proposed development will add to the existing problems. The roads therefore need to be widened at sections before the development is contemplated.
- II. The storm water run-off associated with the existing development at South Ambassador Heights which should have been channeled into the ravine at the eastern side of the development, was redirected to flow into a very narrow drain at Belgrade Mews and as a consequence the residents of Belgrade Mews living near to the drains are in danger of suffering severe damage to the property. Storm water from the rain has flooded out at least three homes in Belgrade Mews and has washed down huge quantities of stones and dirt onto the main thoroughfare at Belgrade Mews.
- III. The existing development has exacerbated additional storm water run-off as the culverts on Mannings Hill Road in the vicinity of Belgrade Mews has been consistently overwhelmed, thus resulting in severe damage to the roadway and the retaining walls along the roadway. At least four sections of the walls have already collapsed. Despite several recommendations to NWA, nothing has been done to date to remedy this situation. Engineers from the NWA and the KSAC have advised that the culverts are inadequate to carry this storm water. They have also indicated that to address the problem the following are required:
  - i. A box culvert
  - ii. Widening the approach and concreting same.
- IV. The citizens feel that the watershed will be comprised, if the construction of the sewage on the proper 23 acre development is not properly supervised by the regulators (i.e. NWC).
- V. The potable water supply in this area is unreliable at times both in terms of the water pressure and the total availability. The citizens know that the additional requirement for water from the proposed development will further exacerbate the existing problem.

**Response:** These comments/concerns have been noted and will be implemented as far as NWA and engineering solutions find it feasible to do so.

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## **Appendix II - Study Rationale & NEPA'S Environmental Permit & Licence Applications Process**

This Draft Environmental Impact Assessment (DEIA) is a requirement of the National Environment and Planning Agency (NEPA) under the Natural Resources Conservation (Permits and Licenses) Regulations, 1996. As shown in the steps in the Figure below. The information provided in the Project Information and the Permit Application Forms, NEPA was able to decide on the need for an Environmental Impact Assessment (EIA) of the proposed project. This decision was communicated to the project proponent. The EIA adequately provides information required to analyze the significant socio-economic and environmental effects of the Proposed Action and determines whether a permit would be granted for the proposed residential subdivision.

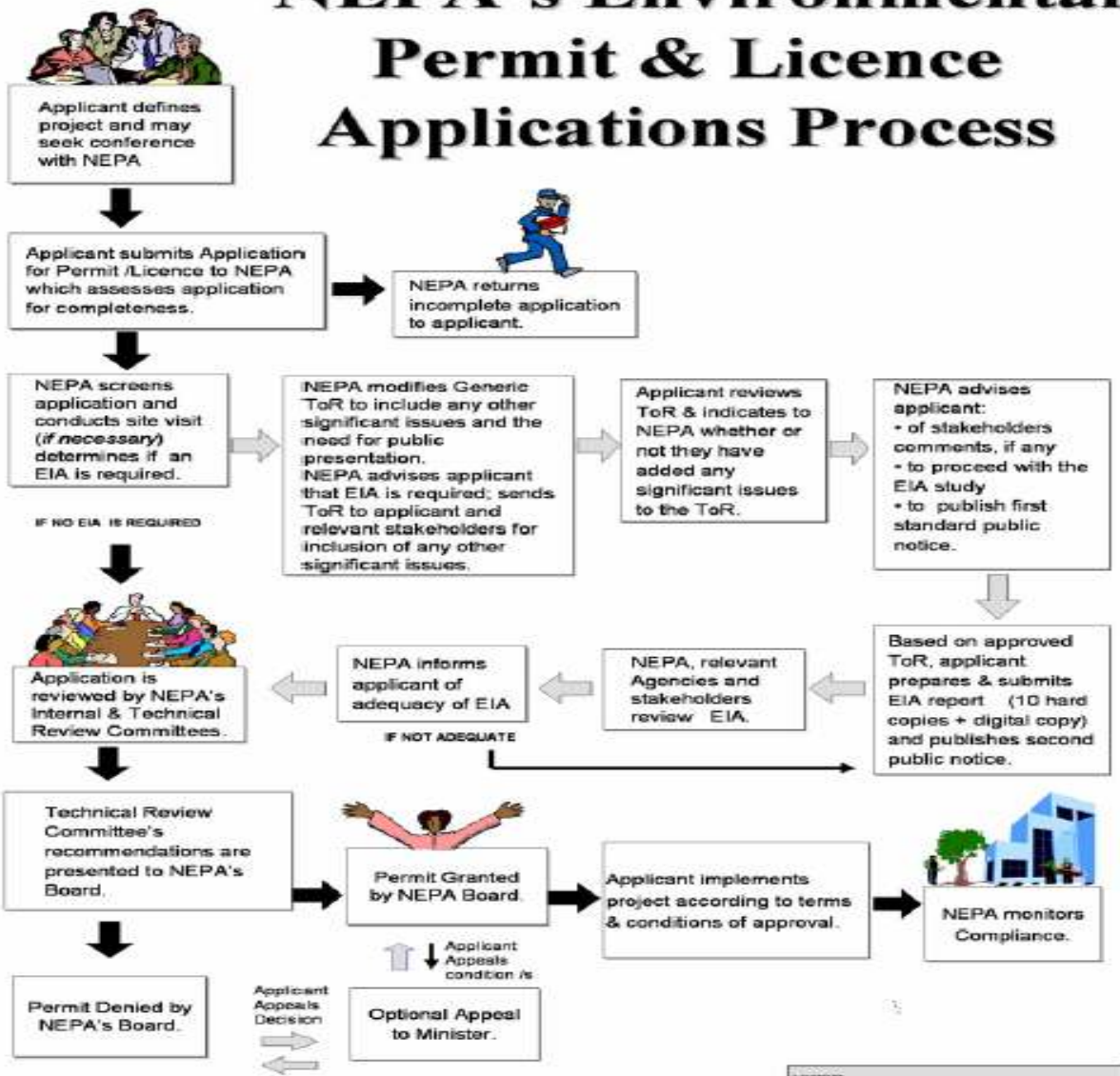
Essentially the purpose of this EIA is to inform the decision makers in all agencies required to approve authorizing actions and the public in general regarding the anticipated significant environmental effects of the Proposed Subdivision and possible ways to mitigate them. However, the information in this study does not control an agency's discretion on a project. Nevertheless, the local agency must adopt feasible mitigation measures or alternatives within its jurisdiction if they are to avoid significant environmental effects identified for the Proposed Action.

This EIA contains the Table of Contents, Executive Summary, and Chapters 1 through 6 which include photographs of the site and Appendices which include the Subdivision Plan, and an approval letter from the National Works Agency (NWA), one of the relevant government agencies directly related to the EIA process. This EIA is available for public review at the office of NEPA, 10 Caledonia Avenue, Kingston 5.

The primary team members for the EIA were:

- Beverline Brown Smith, MURP, B.A (Hons), Dip - Mgmt. of the Environment
- Leo Douglas, PhD (Candidate), M.Phil (Distinction)
- Norman Harris MSc. Engineering Geology, BSc

# NEPA's Environmental Permit & Licence Applications Process



LEGEND  
 - EIA - Environmental Impact Assessment  
 - ToR- Terms of Reference  
 National Environment and Planning Agency (NEPA)  
 August 2005

Appendix III - National Water Commission's approval letter



- |   |   |  |   |
|---|---|--|---|
| <input type="checkbox"/> 28-48 Barbados Avenue<br>P.O. Box 65, Kingston 5<br>Tel: (876) 929-5430-5<br>Fax: (876) 926-1329 | <input type="checkbox"/> 18 Oxford Road<br>Kingston 5<br>Tel: (876) 926-5825-7<br>Fax: (876) 926-7121               | <input type="checkbox"/> 4 Marescaux Road<br>Kingston 5<br>Tel: (876) 929-3540-5<br>Fax: (876) 960-0582  | <input type="checkbox"/> 2n Mathan Road<br>Kingston 5<br>Tel: (876) 929-3540-5<br>Fax: (876) 968-8247 |
|   | <input type="checkbox"/> 231A Old Hope Road<br>Kingston 6<br>Tel: (876) 977-4998<br>977-5600<br>Fax: (876) 927-1870 | <input type="checkbox"/> 28-30 Church Street<br>Kingston<br>Tel: (876) 922-8110-8<br>Fax: (876) 967-1499 |   |

May 8, 2006

Mr. G. A. (Bobby) Dixon  
20 Blythwood Drive  
Kingston 6

Dear Mr. Dixon

**Re: Proposed Subdivision  
Part of Comfort Castle, Belle View & Mannings Hill  
(Ambassador Heights Phase II) – St. Andrew  
NWC Ref#. 668/05**

The National Water Commission approved, on April 21, 2006, the captioned application with respect to the availability of domestic water supply.

The Certificate and Conditions of Approval and a copy of the approved plan can be collected at the Commission's Engineering Division (Subdivision Unit), 4 Marescaux Road, Kingston 5.

Please note that you are required to pay the processing fee of Eighteen Thousand Eight Hundred & Seventy Dollars (\$18,870.00) plus any outstanding water rates before the documents can be delivered to you. Note also that all fees are payable by Cash or Certified Cheque.

Sincerely,  
**NATIONAL WATER COMMISSION**

L. Kirk Mitchell  
Systems Investigator

Board of Directors: Richard Byles (Chairman), Winston Watson, James Morrison, Keith Goodison, Basil Fernandez,  
Dr. John Brown, Jean Bickelock, Bevyn Harrison, Conita Herbert, E.G. Hunter (President)

## Appendix IV – National Solid Waste Management Authority Letter



# National Solid Waste Management Authority

(An Agency of Local Government - Office of the Prime Minister)

81 Half Way Tree Road, Kingston 10 Telephone: (876) 960-4511 \* 968-6160 \* 926-3988 \* 926-8559 \* 926-5170 Fax: (876) 920-  
E-mail: [nswma@nswma.gov.jm](mailto:nswma@nswma.gov.jm)

### Board of Directors

**Dennis Morgan**  
Chairman

**Carlton Cole**  
Deputy Chairman

Dave Barnaby

Laurel deMercado

Alston Douglas

Frederic Espout

Herbert Fletcher

Daphne Hurge

Neil Lewis

Patrick Smette

Douglas Thompson

### Executive Director

Joan Gordon-Webbly

### Legal Director/ Company Secretary

Graceann Cameron-Small

### Regional Offices/ Subsidiaries

**NPM WASTE MANAGEMENT Ltd.**  
81 Half Way Tree Road  
Kingston 10  
Tel: 754-5941  
E-mail: [npm@nswma.gov.jm](mailto:npm@nswma.gov.jm)

**NEPM WASTE MANAGEMENT Ltd.**  
2 Stormount Road  
New Buckfield  
Ocho Rios P.O.  
St. Ann  
Tel: 974-5465  
E-mail: [neph@nswma.gov.jm](mailto:neph@nswma.gov.jm)

**SPM WASTE MANAGEMENT Ltd.**  
4A Mandeville Plaza,  
Mandeville  
Manchester  
Tel: 963-1804  
E-mail: [spm@nswma.gov.jm](mailto:spm@nswma.gov.jm)

**WPM WASTE MANAGEMENT Ltd.**  
A1, LCU Freeport Commercial  
Complex  
Freeport, Montego Bay  
St. James  
Tel: 953-8281-3  
E-mail: [wpm@nswma.gov.jm](mailto:wpm@nswma.gov.jm)

Ref: # PLNG/197

March 26, 2009

Mrs. Beverline Brown Smith  
President  
EPN Consultants Limited  
Suite #7 Main Plaza  
83 ½ Red Hills Road  
Kingston 10.

Dear Mrs. Smith:

**Re: Collection of Solid Waste from the Proposed Development Ambassador, St. Andrew**

The National Solid Waste Management Authority (NSWMA) acknowledges receipt of your correspondence requesting approval for the collection of solid waste from the proposed residential development, Ambassador Heights in St. Andrew.

Based on the fact that the proposed site location is in an area which currently receives collection service from the National Solid Waste Management Authority it would be within the capability of the NSWMA to extend collection service provided the following:

1. The development has met the requirements for collection (see attached criteria).
2. The requisite cost for collection service is paid until the development is registered on the property tax roll; and
3. The availability of trucks to service this development.

Regarding the collection of solid waste from the proposed development prior to and during the construction phase, please note that the developer is responsible to organise for the commercial collection and removal of the waste if they are unable to undertake it themselves. In addition, please note that all solid waste generated is required to be disposed of at an approved disposal site, which in this case would be the Riverton Disposal Site. The NSWMA authorised disposal sites are able to accommodate waste for general disposal, provided the waste is not characterised as hazardous waste. Tipping of waste at the disposal sites attract an administrative fee which is currently \$500.00 for each truckload.

Please indicate should there be need for clarification.

**"Jamaica's Beauty is Our Duty"**



Yours Sincerely,  
**NATIONAL SOLID WASTE MANAGEMENT AUTHORITY**



Bethune Morgan  
**Planning and Research Manager**

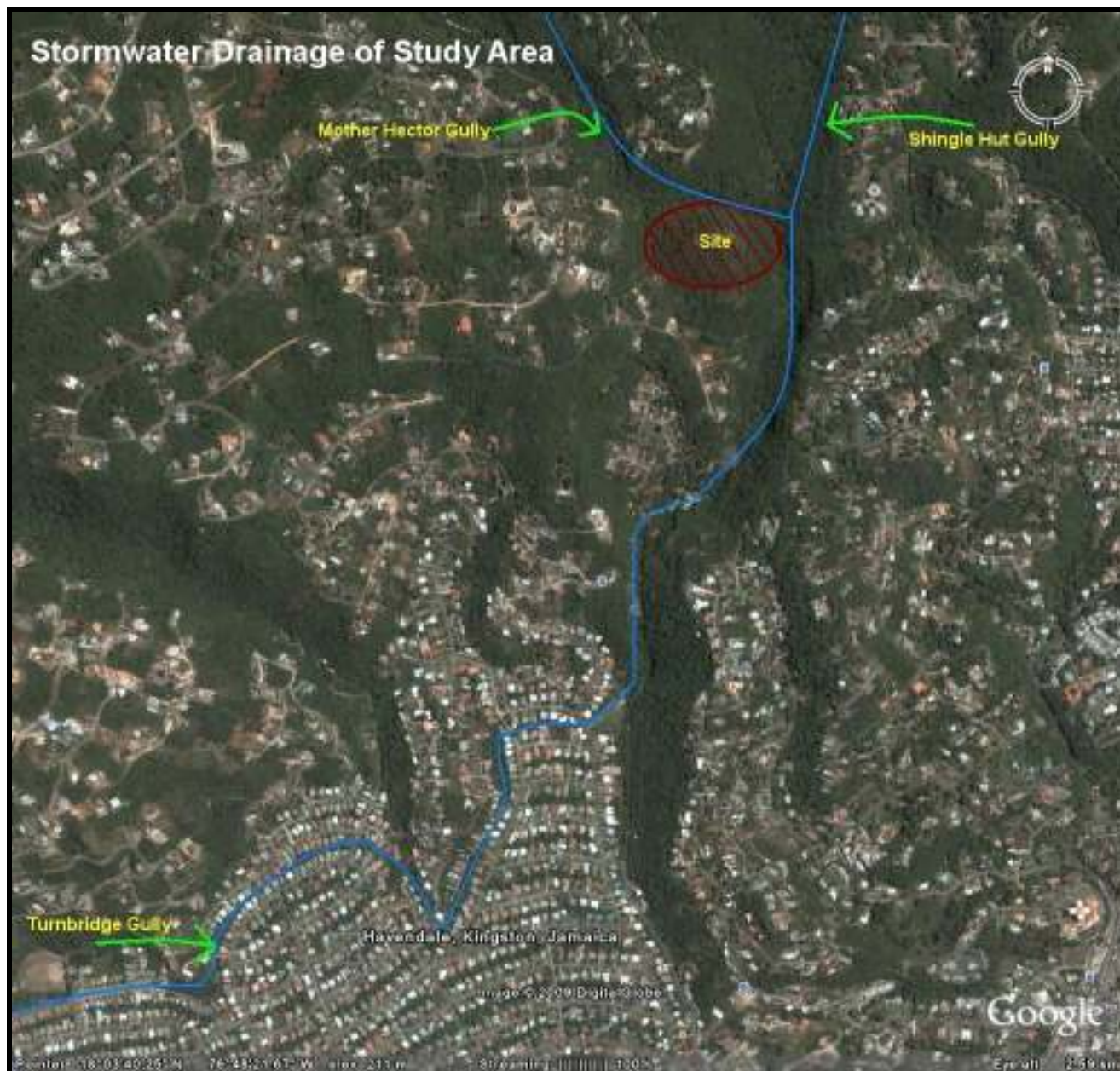
Cc: Audley McLean – Director of Operations  
David Bloomfield – Regional Operations Manager, MPM  
Andre Wiltshire – Director of Enforcement & Compliance

Appendix V- Active Faults within Jamaica



— Fault Lines

Appendix VI - Iknos image showing Stormwater drains in the area



Appendix VII - National Works Agency letters



140 Maxfield Avenue, Kingston 10, Jamaica Tel: (876) 926-3210-9 - Fax: (876) 926-2572

ANY REPLY OR SUBSEQUENT REFERENCE SHOULD BE ADDRESSED TO THE CHIEF EXECUTIVE OFFICER AND THE FOLLOWING REFERENCE NUMBER QUOTED:-

Ref. No.:

KMR Regional Office  
15 Hagley Park Road  
Kingston 10  
Tel: 926-8499  
929-7328, 968-1578  
Fax: 929-7327

Central Regional Office  
33 Caledonia Road  
Mandeville, Manchester  
Tel: 960-2258  
Fax: 961-6172

Western Regional Office  
Bankers Main Road  
Bankers, St. James  
Tel: 960-7337  
940-4468, 979-3186  
Fax: 940-7973

North Eastern  
Regional Office  
West Street  
Port Antonio  
Portland  
Tel: 993-2531  
Fax: 993-9685

15<sup>th</sup> July 2008

The Government Town Planner  
National Environment and Planning Agency  
10 Caledonia Avenue  
KINGSTON 5

Dear Sir:

**Re: Terms of Reference for an Environmental Impact Assessment for Proposed Residential Development at Ambassador Heights, St. Andrew by Greshford Dixon – Ref. No 2008-02017-EP00005**

With reference to your letter dated 16<sup>th</sup> May 2008, received 26<sup>th</sup> May 2008, regarding the caption; we are to advise that after careful review, the National Works Agency is satisfied with the content of the Terms of Reference, however the following additional information should be embodied in the Environment Impact Assessment:

1. Identification of routes to be used for waste disposal and delivery to the construction site.
2. Mitigation measures to protect the road from damage during the transportation of construction material.
3. Traffic management at site entrance during construction.
4. Measures to limit the impact of the construction on the existing / man made and natural drainage in the area.

**Advisory:**

All maps and plans should be legible and prepared at a reasonable scale.

Yours truly,

  
WINSTON HARTLEY  
Physical Planner

  
PATRICK ROSE  
Director, Planning and Research  
for Chief Executive Officer

Copied to: The Town Clerk - KSAC  
The Parish Manager – National Works Agency, KMR  
EPN Consultants Ltd Suite No. 7, Main Plaza – 83 ½ Red Hills Rd, Kgn 20

*'Developing Safe, Reliable and Quality Roads'*



140 Maxfield Avenue, Kingston 10, Jamaica Tel: (876) 926-3210-9 • Fax: (876) 926-2572

ANY REPLY OR SUBSEQUENT REFERENCE SHOULD BE ADDRESSED TO THE CHIEF EXECUTIVE OFFICER AND THE FOLLOWING REFERENCE NUMBER GUARDED.

Ref. No.:

16<sup>th</sup> April 2008

The Government Town Planner  
National Environment & Planning Agency  
10 Caledonia Avenue  
KINGSTON 5

EMR Regional Office  
15 Hagley Park Road  
Kingston 10  
Tel: 926-6499  
926-7328, 926-1078  
Fax: 926-7327

Central Regional Office  
33 Caledonia Road  
Mandeville, Manchester  
Tel: 962-2255  
Fax: 961-8172

Western Regional Office  
Flaxbarn Main Road  
Flaxbarn, St. James  
Tel: 940-7337  
940-4456, 879-2166  
Fax: 940-7373

North Eastern  
Regional Office  
West Street  
Port Antonio  
Portland  
Tel: 993-2531  
Fax: 993-9665

Dear Sir:

**Re: Proposed 120 Lots Residential Subdivision Part of Ambassador Heights,  
St. Andrew by Greshford Dixon - Reference No. 2007-02001-SB00054**

With reference to your letter dated 4<sup>th</sup> January 2008, received 14<sup>th</sup> January 2008 and hydraulic report received 6<sup>th</sup> March 2008 regarding the above, we are to advise that after examination, this Agency offers no objection to approval being granted subject to the following conditions:

1. No building or permanent structure should be erected less than 12.19m and 10.66m from the centre line of the parochial and reserved roads respectively.
2. No building or permanent structure should be erected less than 3.66m from any side road property boundary.
3. No new building or permanent structure should be erected less than 6.1m and 3.05m from the bank of the gully and drains respectively.
4. There should be no vehicular ingress/egress from lot #123 onto the parochial road.
5. The vehicular ingress/egress from lots #1 and 123 should be taken at the common boundary with lots #2 and 122 respectively.
6. The vehicular ingress/egress from lot #3 should be taken along Ambassador Way a minimum of 15.24m from the intersection with Reserved Road No.1.
7. The turning radius at the intersection of Reserved Road No.1 with the parochial road should be a minimum of 11m.
8. The guard house should be relocated to Ambassador Way as indicated in red on plan returned herewith.
9. The vehicular ingress/egress gate from lot #2 should be setback a minimum of 6.1m from the road property boundary.
10. The reserved roads should be held as private roads to be maintained by the lot owners.
11. The turning circle at the end of the cul-de-sac should conform to the National Works Agency standard attached.
12. Stop signs should be erected at all road intersections conforming to the National

15. The existing culvert which crosses Mannings Hill Road should be upgraded to a 600mm minimum diameter culvert pipe.
16. A drainage plan should be submitted with detailed building plans for each lot #2 illustrating the interception of surface drainage/storm water runoff and disposal on-site or into any existing drainage system for approval by the relevant authority.
17. Surface drainage/storm water runoff should be effectively intercepted and disposed of by means conforming to the approved detailed surface drainage infrastructure plan.
18. There shall be no deviation from the approved detailed surface drainage infrastructure plan without the consent of the Chief Executive Officer, National Works Agency.
19. The Parish Manager, NWA and City Engineer, KSAC should be consulted to inspect and monitor construction of the surface drainage/ storm water runoff infrastructure works 25%, 50% and 75% intervals until completion and confirm approval in writing to the Chief Executive Officer, NWA and Town Clerk, KSAC respectively.
20. Road closure shall be applied for (at least 2 weeks prior to the commencement of any works within the Mannings Hill Road reservation) from the National Works Agency for this vicinity.

**Reason for Condition 15:**

To inform the public of the expected traffic delays due to the civil works to be carried out.

**Note:** One set of the plans submitted is retained for our files, the other is returned to the KSAC herewith.

Yours truly,

  
**WINSTON HARTLEY**  
Physical Planner

  
**PATRICK ROSE**  
Director, Planning and Research  
for Chief Executive Officer

Copied to: The Town Clerk - KSAC  
The Parish Manager – National Works Agency

## Appendix VIII - Revised Tables

**Table 1:** Jamaican endemic sub-species recorded from Ambassador Heights the development area.

COMMON NAME	LOCAL NAME	SCIENTIFIC NAME
Bananaquit	Beeny Bird, Sugar Bird	<i>Coereba flaveola</i>
Jamaican Parakeet	Parakeet	<i>Aratinga nana</i>
Jamaican Oriole	Banana Katie, Aunt Katie	<i>Icterus leucopteryx</i>
Greater Antillean Grackle	Cling-Cling	<i>Quiscalus niger</i>

Source: Field visit

**Table 2:** Neotropical migratory birds recorded from the Ambassador Heights development area.

COMMON NAME	LOCAL NAME	SCIENTIFIC NAME
Common Yellowthroat	-	<i>Geothlypis trichas</i>
American Redstart	Butterfly Bird	<i>Setophaga ruticilla</i>
Ovenbird	Betsy Kick-up	<i>Seiurus aurocapillus</i>
Black-throated Warbler	-	<i>Dendroica caerulescens</i>
Prairie Warbler	-	<i>Dendroic discolor</i>

Source: Field visit





## Appendix X – Building footprints

# STORM WATER DRAINAGE SUMMARY

Proposed Residential Subdivision of Part of Ambassador Heights  
now called Ambassador ~~Manor~~, St. Andrew  
Estates

Prepared by: SPK Engineers Ltd  
Consulting Engineers

Client: G. A Dixon et. Al.  
Russell Heights  
St. Andrew

Date: March 2008



*Estates*  
**Ambassador Manor Development**  
Part of Ambassador Heights Subdivision, St. Andrew  
Summary on Storm Water Drainage

**1. PREAMBLE**

It is proposed to undertake the residential development of part of Ambassador Heights subdivision now called Ambassador Manor in the parish of St. Andrew. It is proposed to provide one hundred and twenty (120) residential lots averaging ~~420~~ <sup>(420)</sup> SM.

The proposed development area is located approximately 1.50 Km along the Manning's Hill main road just north of the Havendale area. The property is bounded to the west by the Manning's Hill main road which serves as the main access road to the development and to the north and east by a major dry gully which drains most of the development area. The total subdivision area comprises approximately ~~15.0~~ <sup>(22.6)</sup> acres of land.

The topography of the project area is generally hilly with slopes exceeding thirty percent (30%) in some areas. The project site is predominantly underlain by White Limestone Formation with shallow overburden of sandy loam soils which allows for quick drainage of run-off.

**2. CALCULATION OF PEAK RUN-OFF**

The run-off impact assessment entails a determination of pre-development and post development run-off from the main drainage abvbvreas for different return periods (5yr, 10yr and 25yr). Given the relatively small catchment areas, the Rational Formula was used for the calculation of run-off or peak discharge, where;

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2

Peak Discharge  $Q_p = 0.0028CIA$

- C - run-off coefficient
- I - average rainfall intensity, mm/hr
- A - total drainage area in hectares

### 3. METHODOLOGY

The entire subdivision area was divided into seven sub-catchment areas (A – G) and three (3) main drainage areas for computational purposes. All sub-catchments drain directly into the main gully running along the northern and eastern boundaries except for sub-catchments D and G (total area 9610.0 SM) that drain unto the main road.

#### Design Criteria:

The primary culvert drain provides for storm events exceeding 25 yr return period while secondary drainage features (local) systems consider adequate drainage for more frequent storm events (T= 5yrs return period). The meteorological data for the total catchment was obtained from the National Meteorological Service. The Forest Hill rainfall station was chosen as representative for the average 24 hour rainfall in the area of the subdivision. 24 - hr maximum rainfalls for different return period are as follows:

Return period, T	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Maximum 24-hr rainfall	145 mm	203 mm	256 mm	323 mm	373 mm	422 mm

Comparing Kirpich's and Manning's formulae an average concentration time  $T_c = 7$  minutes was used to calculate rainfall intensity.

Kirpich's equation:  $T_c = 0.0078 \frac{L^{0.77}}{S^{0.385}}$



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Short duration Frequencies (rainfall intensities) are calculated as follows:

$$I = \frac{4.73 (I_{24hr})^{0.65}}{(T_c + 12.25)} \quad \text{where}$$

$T_c$  = concentration time (in minutes)  
 $I_{24hr}$  = 24hr maximum rainfall depth



### Proposed Drainage System

The following summarizes the proposed surface water drainage system:

- The surface run-off generated within the project site is channeled along road side drains (kerb channels) and then via a system of storm inlets and culverts.
- Culverts will accommodate storm flows of 1:10 years return period. Specially designed drop inlets will serve to dissipate energy given anticipated high velocities due to the steep topography.
- Final disposal of site run-off will be into the existing main gully. This main gully can accommodate major storm events (exceeding 50-yr return period), however, the capacity of the down gradient culverts which crosses the Manning's Hill main road needs upgrading.

**TABLE 1: STORM FLOW DESIGN SHEET (T = 5 YRS)**

PRE-DEVELOPMENT				POST-DEVELOPMENT			
A, hectare	C	I, mm/hr	Q, CMS	A, hectare	C	I, mm/hr	Q, CMS
A = 2.06	0.35	145	0.290	A = 2.06	0.70	145	0.580
B = 1.67	0.35	145	0.235	B = 1.67	0.70	145	0.470
C = 0.93	0.35	145	0.132	C = 0.93	0.70	145	0.264
D = 0.064	0.35	145	0.009	D = 0.064	0.70	145	0.018
E = 1.307	0.35	145	0.185	E = 1.307	0.70	145	0.370
F = 0.055	0.35	145	0.0053	F = 0.055	0.70	145	0.015
G = 0.033	0.35	145	0.0045	G = 0.033	0.70	145	0.009



TABLE No. 2: STORM FLOW DESIGN SHEET (T = 10 YEARS)

PRE-DEVELOPMENT				POST-DEVELOPMENT			
Area	C	I, mm/hr	Q, CMS	Area	C	I, mm/hr	Q, CMS
A = 2.06	0.35	152.7	0.3055	A = 2.06	0.70	152.7	0.611
B = 1.67	0.35	152.7	0.248	B = 1.67	0.70	152.7	0.495
C = 0.93	0.35	152.7	0.139	C = 0.93	0.70	152.7	0.278
D = 0.064	0.35	152.7	0.0055	D = 0.064	0.70	152.7	0.019
E = 1.307	0.35	152.7	0.195	E = 1.307	0.70	152.7	0.389
F = 0.055	0.35	152.7	0.008	F = 0.055	0.70	152.7	0.016
G = 0.033	0.35	152.7	0.005	G = 0.033	0.70	152.7	0.010

TABLE No. 3 STORM FLOW DESIGN SHEET (T = 25 YEARS)

PRE-DEVELOPMENT				POST-DEVELOPMENT			
Area	C	I, mm/hr	Q, CMS	A, hectare	C	I, mm/hr	Q, CMS
A = 2.06	0.35	214	0.429	A = 2.06	0.70	214	0.858
B = 1.67	0.35	214	0.347	B = 1.67	0.70	214	0.694
C = 0.93	0.35	214	0.193	C = 0.93	0.70	214	0.386
D = 0.064	0.35	214	0.0133	D = 0.064	0.70	214	0.0266
E = 1.307	0.35	214	0.285	E = 1.307	0.70	214	0.570
F = 0.055	0.35	214	0.011	F = 0.055	0.70	214	0.022
G = 0.033	0.35	214	0.0069	G = 0.033	0.70	214	0.0138

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#### 4. HYDRAULIC ANALYSIS

- Sizing of outlet drains (culverts) for main drainage areas.

Manning's Formula is used in our computation to determine the hydraulic capacity of the catchment outlet drains.

Manning's Formula:  $V = 1.49 \frac{R^{2/3} S^{1/2}}{n}$  (Qp = V. Aw = ) where,

Aw – Wetted area of culvert

R – Hydraulic radius

S – Hydraulic slope (assume 3.50%)

Roughness coefficient n = 0.015



#### 5. CONCLUSION

The largest drainage (sub-catchments) area was used to calculate the peak discharge value giving a more conservative result. The combined peak flows for sub-catchments A, B and C were computed as 1.310 CMS, 1.43 CMS and 1.936 CMS for return periods T = 5yr, T = 10yr and T = 25yr respectively. The hydraulic capacity (1.50 CMS and 2.88 CMS) of the proposed 750 mm and 900 diameter culverts (catchment outlet drains) are therefore adequate to convey flows for design return periods T = 5yrs, T = 10yrs and T = 25yr.

The concerns about scouring at drain outfalls and in the main gully cannot be ignored given the high storm velocities anticipated as a result of steep drainage profiles (topography). The recommended mitigative measures to address this potential problem are as follows:

- Construct drop inlets (energy dissipaters) as per design to reduce run-off velocities hence minimizing scouring.
- Provide adequate scour protection (gabion mattresses and rip rap works) at all storm outfalls as per design.
- Stepping of open paved drains running thru proposed recreational areas to reduce critical velocities.

Recommendation: The existing waterway(s) crossing the Manning's Hill main road down gradient of the project site needs to be upgraded by the relevant authorities. Successive storm events have proven that the existing culverts are inadequate resulting in overtopping of storm waters and serious damage to the road infrastructure.

**Prepared by:** SPK Engineers Ltd.

**Date:** March 3, 2008



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**The culvert along Mannings Hill Road will be upgraded by the Project Proponent as mentioned previously.**



**ENGINEERING REPORT**

**AMBASSADOR ESTATE HOUSING DEVELOPMENT**

**PREAMBLE**

This development is proposed to consist of 120 housing solutions, located in the Mannings Hill Area of the Greater Kingston Metropole. This development will be on a phased basis with 60 solutions in Phase 1 and the remaining 60 in Phase 11. The sewage treatment solution will also be developed along the same line, Phases 1 & 11

The need to meet the stipulated effluent discharge standards will necessitate the construction of a tertiary sewage treatment facility. It is proposed that this facility will have trains consisting of the following components:

1. Septic Tanks -
2. Reed Beds -
3. Sand Filter -
4. Chlorination Chamber -
5. Discharge into earthen Gully -

ENV. HEALTH DIV. M.O.H.		
Received by: _____		
Date: 12/2/08		
Action By:	Director's in-charge	File

These components were chosen because of the following reasons:

- Ease and convenience of operation and maintenance.
- Space availability
- Ability of system to meet the required standards

At the end of the treatment process, all the relevant standards for effluent discharge will be met on a consistent basis.

**ENGINEERING CALCULATIONS**

**1. Number of Properties**

Proposed Scheme 120  
 Consisting of 120- 2 bedrooms

2. **Residents/Property** - 4 for 2 bedrooms

3. **Total # of Residents** - 120 x 4 = 480  
 Total # of Residents per phase - 480/2 = 240

4. **Per Capita Sewage Contribution** - 50 IGPD or 225 l/d

5. **Total Daily Sewage Discharge "Q"**  
 Per phase - 50 x 240

$$\text{"Q"} = 12\ 000\ \text{IGPD}$$

$$\approx 54\ 000\ \text{l/d}$$

6. **Population Growth Factor (20 Years) –**

$$P_f = 0.1$$

$$= 5\ 400\ \text{l/d}$$

7. **Infiltration I** = 0.05Q  
 $\approx 2\ 700\ \text{l/d}$

The infiltration factor is only 5% because the conveyance system is short.

6. **Total Daily Sewage Discharge** = **Q + I + P<sub>f</sub>**

$$= 54\ 000 + 5\ 400 + 2\ 700$$

$$= 62\ 100$$

$Q_t$	=	62 100 l/d
	=	63 m <sup>3</sup> /d
	=	0.73 l/s
	=	0.16 IGPS

### TREATMENT MODULES

The treatment process will consist of the following modules in the order in which they will be used:

1. **Septic Tank** – There shall be a total of six (6) tanks with each serving approximately fifty four (54) housing solutions.
2. **Reed Bed (Vegetated sand Filter)** – This will be constructed in two sections
3. **Sand Filter** - This is the last module in the process.

The important design parameters are:

- |    |                                      |   |                      |   |                            |
|----|--------------------------------------|---|----------------------|---|----------------------------|
| 1. | Temperature                          | - | <b>T</b>             | = | 26 <sup>0</sup> C          |
|    | Ambient temperature                  |   |                      | = | 26 <sup>0</sup> C          |
| 2. | Flows                                |   | <b>Q<sub>t</sub></b> | = | 332 m <sup>3</sup> /d      |
| 3. | BOD Concentration                    |   | <b>Y<sub>0</sub></b> | = | 250 mg/l                   |
| 4. | <b>Faecal Coliform Concentration</b> |   |                      | = | 1 x 10 <sup>8</sup> /100ml |
| 5. | Suspended Solids                     |   |                      | = | 250 mg/l                   |
| 8. | Retention Time                       |   | <b>t<sub>R</sub></b> |   |                            |
|    | To be calculated                     |   |                      |   |                            |

$$\begin{aligned} \text{Total BOD Loading} &= 250 \times 332000 \times 10^{-6} \\ &= 830 \text{ kg/day} \end{aligned}$$

### SEPTIC TANK

Used instead of the conventional sedimentation unit in cases where:

- There is a deficiency in available space.

There will be a total of four (4) septic tanks, two per phase.

#### **Daily flow to tanks**

$$\begin{aligned} Q &= 63/2 \\ &= 31.5 \text{ m}^3 \end{aligned}$$

#### **Capacity**

Capacity of septic tank is equal to one and one half times the daily flow.  
For Tank A:

$$\begin{aligned} \text{Capacity "V"} &= 31.5 \times 1.5 \\ &\approx 48 \text{ m}^3 \end{aligned}$$

#### **Dimensions**

Depth "h" = 1.5 m

Width "w" = 4 m

Length "l" = 8 m

The length will be divided into two sections of lengths 5.5 and 2.5 metres.

#### **Removal**

The expected rate of removal of pollutants is as follows:

BOD        30%

TSS        50%

PO4 & NO3 10%

**BOD concentration in discharge from septic tank**

$$\begin{aligned} \text{BOD}_{\text{out}} &= 250 - [250 \times 30/100] \\ &= 175 \text{ mg/l} \end{aligned}$$

**TSS concentration in discharge from septic tank**

$$\begin{aligned} \text{TSS}_{\text{out}} &= 250 - [250 \times 50/100] \\ &= 125 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{PO}_4\text{out} &= 8.3 - [8.3 \times 10/100] \\ &= 7.47 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{NO}_3\text{out} &= 39.7 - [39.7 \times 10/100] \\ &= 35.73 \text{ mg/l} \end{aligned}$$

**REED BEDS**

Flows from the septic tanks will be directed to two (2) trains of treatment modules.

This is to facilitate the norm of flows < 50 m<sup>3</sup>/day per bed. This will provide optimum treatment of the sewage passing through the beds and provide a buffer for possible shock loads.

Treatment will be effected with not only the reduction of BOD and TSS, but also the reduction of nitrates and phosphates can be achieved.

This method of treatment uses the root zone effect and has demonstrated comparable success in the applications worldwide.

There is a preference for the use of Reed Beds for the following reasons:

1. Difficult in reaping water hyacinth as opposed to reaping Reed Beds.
2. Frequency in the need for reaping hyacinth ponds as oppose to Reed Beds.

3. Difficulty in disposing of the reaped hyacinth without additional environmental degradation.
4. The ability to plant economically viable crops on the Reed Beds.

The **Reed Beds** were chosen to be used as the treatment modules.

### REED BED CALCULATION & CONSTRUCTION

The type of Reed Bed to be used is a **Vegetated Sand Filter**

The rate of removal of the intended pollutants is dependent on the following parameters:

1. **BOD<sub>5</sub>, TSS, Phosphate and Nitrate** concentration of inflows.
2. **The Surface Load Rate**  $\lambda_R \text{ m}^2/\text{m}^3$

The suggested loading rate is  $10 \text{ m}^2/\text{m}^3/\text{day}$  Appendix 1 (1)

This loading rate can also be calculated using the formula:

$$\lambda_R = \frac{Q (L_p^{0.35} + L_n^{0.27})^n}{K} + \frac{Q (L_{\text{BOD}} + L_{\text{TSS}})^m}{K_{\text{BOD}}} \quad (2)$$

#### **Where**

Q	=	Total Daily inflow – 31 500 l/d
L <sub>p</sub>	=	Phosphate concentration of inflows -
L <sub>n</sub>	=	Nitrate concentration of inflows
L <sub>BOD</sub>	=	BOD concentration of inflows
L <sub>TSS</sub>	=	Suspended Solids concentration of inflows
K	=	Rate Constant for salt removal m/d
	=	0.13
K <sub>BOD</sub>	=	Rate Constant for BOD removal m/d

6

$$\begin{aligned}
 &= 0.1 \\
 n \ \& \ m &= \text{Reaction coefficient for attaining standards} \\
 &\text{of } 4\text{mg/l} \ \& \ 10\text{mg/l} \ \text{for } \text{PO}_4 \text{ and } \text{NO}_3 \text{ removal} \\
 &\text{respectively} \\
 n &= 0.274 \text{ m}^2 \cdot \text{mg/l}^{-1} \\
 m &= 0.293 \text{ m}^2 \cdot \text{mg/l}^{-1}
 \end{aligned}$$

For train

$$\begin{aligned}
 \lambda_R &= 31.5 \frac{(7.47^{0.35} + 35.73^{0.27})^{0.274}}{0.13 \times 1000} + 31.5 \frac{(175 + 125)^{0.293}}{0.1 \times 1000} \\
 &= 1.238 + 0.593 \\
 &= \mathbf{1.83 \text{ m}^2 / \text{m}^3}
 \end{aligned}$$

Whereas the calculated loading rate is 1.83 m<sup>2</sup> /m<sup>3</sup>, the loading rate of 20 m<sup>2</sup> /m<sup>3</sup> will be applied. This is to compensate for a lack of maintenance and deficiencies in operational activities which might take place.

**Area occupied by reed bed**

$$\begin{aligned}
 a &= 31.5 \times 20 \\
 &= \mathbf{630 \text{ m}^2}
 \end{aligned}$$

Total Recommended surface area required 650 m<sup>2</sup>

Total number of beds = 2

**Dimensions:**

$$\mathbf{L \times W = 20 \times 33 \text{ m}}$$

For the ease and convenience of Operation and Maintenance, two (2) Reed Beds will be constructed of dimensions **20 000 X 33 000 mm**

The Reed Beds shall be of a depth of 800 mm with sand at 550 mm depth, 150 mm of gravel at the base and 50 mm of pea stone directly above it. At the top there is 50 mm of sand, 50 mm of pea stone and 150 mm of gravel from top downwards.

The reeds to be used are Phragmites Rhizomes which portrays the characteristics of upward and outward growth, penetrating each layer of sludge as it is added to the bed.

Each reed will be allowed a space of 1000 mm.

The bottom shall have a slope of < 0.1 %, to account for Hydraulic Conductivity. A slope of 0.4% will be used to achieve the needed conductivity and to ensure sufficient time for the passage of the effluent and the proper level of treatment.

Inlet distributor will be a concrete trough with the overflow weir being at the same height throughout its length the back wall of the trough shall have a free board of 100 mm above the weir.

The Collector will be a concrete trough with evenly spaced holes along its inner wall and a freeboard of 100 mm. The freeboard will provide the possibility of flooding the beds as a mean of weed control.

### **Pollution Removal**

The expected rate of removal of pollutants is as follows:

BOD        80%

TSS        80%

PO<sub>4</sub> & NO<sub>3</sub> 70%

BOD concentration in discharge from reed beds



$$\begin{aligned} \text{BOD}_{\text{out}} &= 175 - [175 \times 80/100] \\ &= 35 \text{ mg/l} \end{aligned}$$

TSS concentration in discharge from septic tank

$$\begin{aligned} \text{TSS}_{\text{out}} &= 150 - [150 \times 80/100] \\ &= 5 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{PO}_4_{\text{out}} &= 7.47 - [7.47 \times 10/100] \\ &= 6.73 \text{ mg/l} \end{aligned}$$

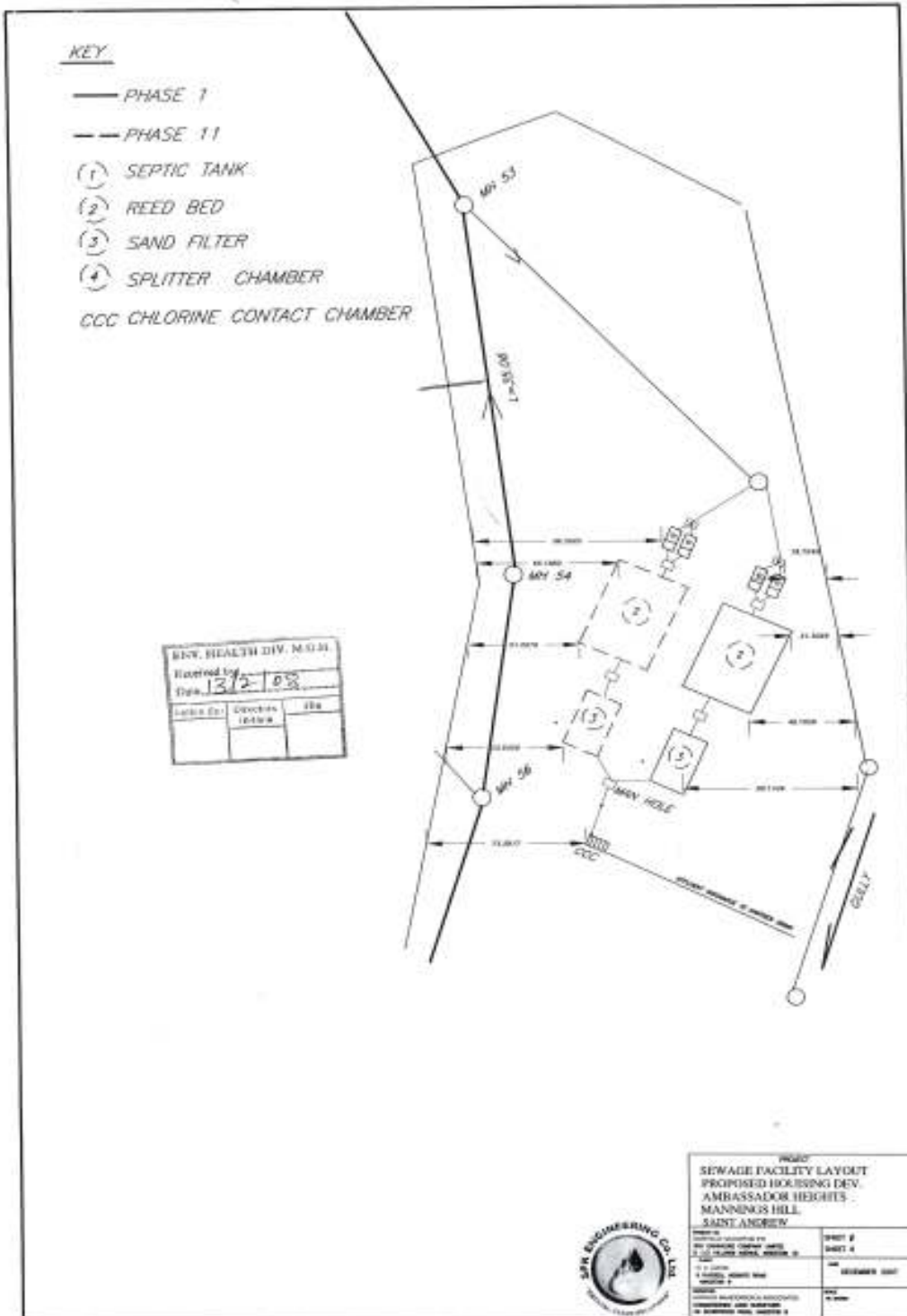
$$\begin{aligned} \text{NO}_3_{\text{out}} &= 37.73 - [37.73 \times 10/100] \\ &= 33.957 \text{ mg/l} \end{aligned}$$

### **Nitrate and Phosphate Removal**

The concentration of Total Phosphates  $\text{TPO}_4^-$  and Nitrates as  $\text{NO}_3^-$  in influent sewage, is assumed at 7.47 mg/l and 35.37 mg/l respectively. These concentrations were assumed from information obtained from the samples of influent sewage from areas within the same proximity as the proposed development and with the same demographic characteristics.

The rate of removal of Nitrate as  $\text{NO}_3^-$  and Phosphate as  $\text{TPO}_4^-$  in Reed Beds ranges between a high of 100% to a low of 35% depending on the integrity of the operation of the system. In this case a rate of removal of 70% will be used.

$$\begin{aligned} \text{PO}_4_{\text{out}} &= 6.73 - [6.73 \times 70/100] \\ &= 2.019 \text{ mg/l} \\ \text{NO}_3_{\text{out}} &= 33.957 - [33.957 \times 10/100] \\ &= 10.187 \text{ mg/l} \end{aligned}$$



ANY REPLY OR SUBSEQUENT REFERENCE TO THIS COMMUNICATION  
SHOULD BE ADDRESSED TO THE PARLIAMENT SECRETARY AND THE  
FOLLOWING REFERENCE QUOTED  
EHU NUMBER EMU-01/1108-1  
Tele: 974-967-1100 Fax: 9671280



**MINISTRY OF HEALTH  
AND ENVIRONMENT**  
Oceana Complex  
2-4 King Street  
Kingston Jamaica

Ref No: 2007-02001-SB00054

February 20, 2008

National Environment & Planning Agency  
10-11 Caledonia Avenue  
Kingston 5

**RE: Part of Ambassador Heights, St Andrew by Greshford and Marjorie Dixon**

The Environmental Health Unit (EHU) reviewed the resubmission dated December 2007 supporting the abovementioned subdivision whereby the Developer has proposed two phases consisting of 60 lots each. The overall sewage treatment and disposal facility will include:

- i. Four 48m<sup>3</sup> septic tanks
- ii. Two 660m<sup>2</sup> reed beds
- iii. Two 166m<sup>2</sup> sand filters
- iv. 2m<sup>2</sup> chlorine contact chamber
- v. An earthen drain for final effluent disposal.

The EHU recommend approval on the condition that the earth drain shall be protected against erosion, ponding, blockage and excessive plant growth.

The EHU and Local Health Authority should be contacted in writing at 50% and at 90% completion to allow inspection of the sewage treatment system.

If you have questions or require more information please contact the undersigned.

  
Mr. Peter Knight  
DIRECTOR Environmental Health Unit

C.c. Medical Officer (Health)  
Kingston & St. Andrew Health Department  
Attention: Chief Public Health Inspector

Appendix XIII – Revised Tables

(Avifauna Survey Point Count)

	Common Names	Points At Which Surveys Were Conducted										# of individual of this species	Percentage of points with species
		1	2	3	4	5	6	7	8	9	10		
1	American Kestrel				1		1			1		3	2.78
2	White-crowned Pigeon	1						1	3	1		6	5.56
3	Common Ground Dove		1	3		1	2		1	2	1	11	10.19
4	Zenaida Dove	1		1		1						3	2.78
5	White-winged Dove					1	1	1				3	2.78
6	<b>Jamaican Parakeet</b>	2						3		1	1	7	6.49
7	Antillean Palm Swift		5					4	1			10	9.26
8	Red Billed Streamertail	1				2			1	1		5	4.63
9	<b>Jamaican Tody</b>				1		1					2	1.85
10	<b>Jamaican Woodpecker</b>		1				1					2	1.85
11	<b>Sad Flycatcher</b>		1									1	0.92
12	Loggerhead Kingbird			1				1	1		1	4	3.70
13	<b>White-chinned thrush</b>		1	1	1				1			4	3.70
14	Northern Mockingbird			1		2		1				4	3.70
15	Common Yellowthroat			1		1		1	2			5	4.63
16	Ovenbird										1	1	0.92
17	Black-throated Blue Warbler									1	1	2	1.85
18	Prairie Warbler			1				1				2	1.85
19	American Redstart		1			1		1				3	2.78
20	Bananaquit	1			1		2		2	1		7	6.48
21	Orangequit			2							1	3	2.78
22	<b>Yellow-shouldered Grassquit</b>	1									1	2	1.85
23	Black-faced Grassquit			1	1			1	3	1	1	8	7.40
24	Jamaican Euphonia		1				1					2	1.85
25	Jamaican Oriole	1		1							1	3	2.78
26	Greater Antillean Grackle		3		1			1				5	4.63
	<b>Total # of Individuals by point</b>	8	14	13	6	9	9	16	15	9	9	108	
	<b>Percentage # of species by point</b>	7.40	12.97	12.04	5.56	8.33	8.33	14.81	13.89	8.33	8.33		
	<b>Forest dependent species, shown in bold.</b>												

	<u>Common Name</u>	<u>Scientific Name</u>	<u>Local Name</u>	<u>National Status</u>
1	American Kestrel	<i>Falco sparverius</i>	Lizard Hawk or Killy-Killy	R1
2	White-crowned Pigeon	<i>Columba leucocephala</i>	Ball Plate	R1
3	Common Ground Dove	<i>Columbina passerina</i>	Ground Dove	R1
4	Zenaida Dove	<i>Zenaida aurita</i>	Pea-dove	R1
5	White-winged Dove	<i>Zenaida asiatica</i>	White-wing	R1
6	Jamaican Parakeet	<i>Aratinga nana</i>	Parakeet	R1
7	Antillean Palm Swift	<i>Tachornis phoenicobia</i>	Swallow	R1
8	<b>Red-billed Streamertail</b>	<i>Trochilus polytmus</i>	Doctorbird	E1
9	<b>Jamaican Tody</b>	<i>Todus todus</i>	Robin Redbreast	E1
10	<b>Jamaican Woodpecker</b>	<i>Melanerpes radiolatus</i>	Woodpecker	E1
11	<b>Sad Flycatcher</b>	<i>Myiarchus barbirostris</i>	Little Tom Fool	E1
12	Loggerhead Kingbird	<i>Tyrannus caudifasciatus</i>	Loggerhead	R1
13	<b>White-Chinned Thrush</b>	<i>Turdus aurantius</i>	Hopping Dick	E1
14	Northern Mockingbird	<i>Mimus polyglottos</i>	Nightingale	R1
15	Common Yellowthroat	<i>Geothlypis trichas</i>		W1
16	Ovenbird	<i>Seiurus aurocapillus</i>		W1
17	Black-throated Blue Warbler	<i>Dendroica caerulescens</i>		W1
18	Prarie Warbler	<i>Dendroica discolor</i>		W1
19	American Redstart	<i>Setophaga ruticilla</i>		W1
20	Bananaquit	<i>Coereba flaveola</i>	Yellow-belly	R1
21	Orangequit	<i>Euneornis campestris</i>	Bluequit	R1
22	<b>Yellow-shouldered Grassquit</b>	<i>Loxipasser anoxanthus</i>	Squit or Yellow-back Grassquit	E2
23	Black-faced Grassquit	<i>Triaris bicolor</i>	Squit	R1
24	<b>Jamaican Euphonia</b>	<i>Euphonia Jamaica</i>	Cho-cho Quit	E1
25	Jamaican Oriole	<i>Jamaican Oriole</i>	Banana Katie	R1
26	Greater Antillean Grackle	<i>Quiscalus niger</i>	Cling-cling	R1
	<b>Key:</b>			
	<b>R</b> - Resident		1 - Common in suitable habitat	
	<b>E</b> - Endemic Species		2 - Uncommon	
	<b>W</b> - Winter Migrant			
	N.B. Endemic species, shown in bold. Migratory species in italics.			