PELLEW ISLAND PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT
PUBLIC CONSULTATION

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THE Project TEAM

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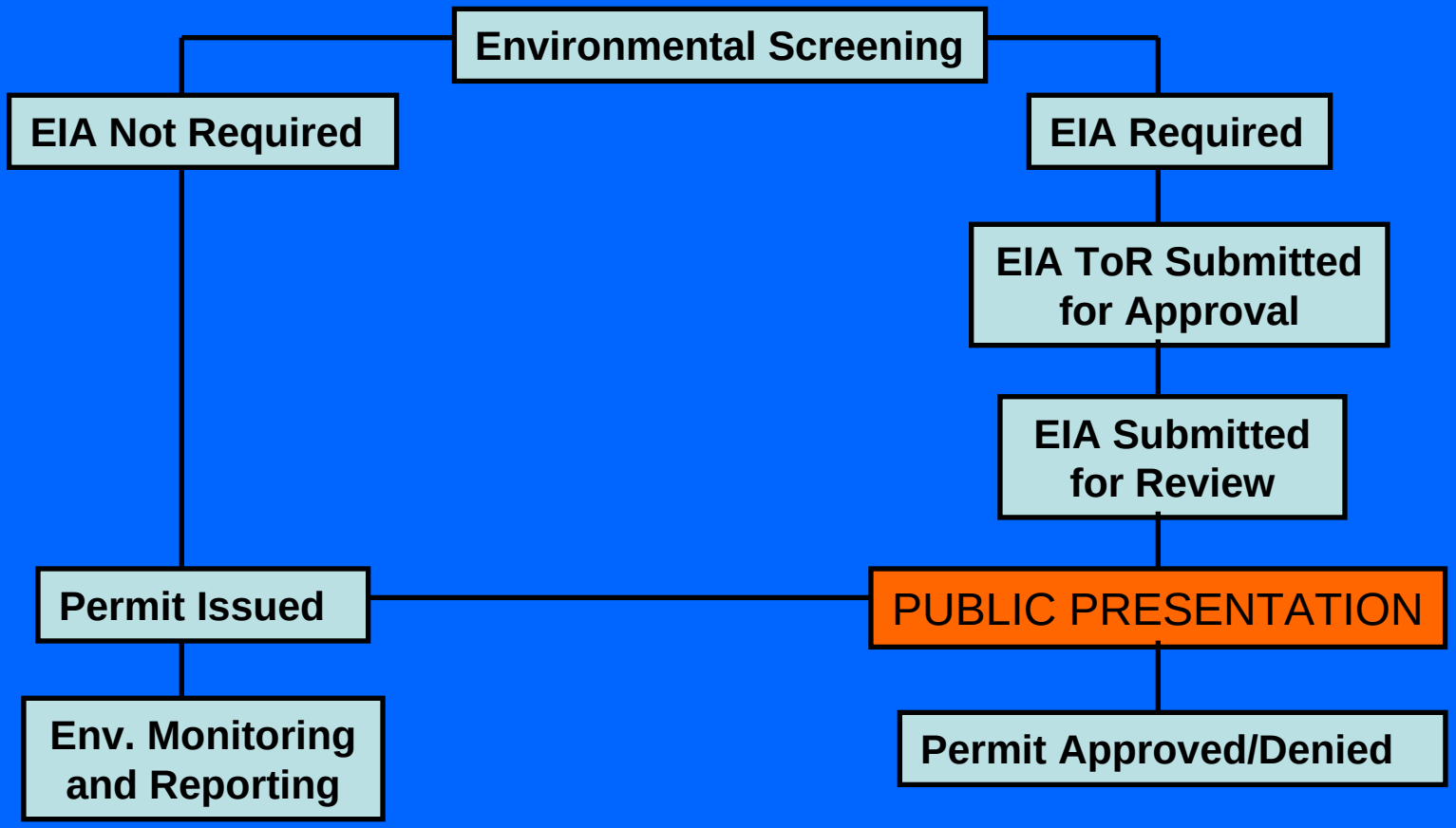
NEPA's EIA PROCESS



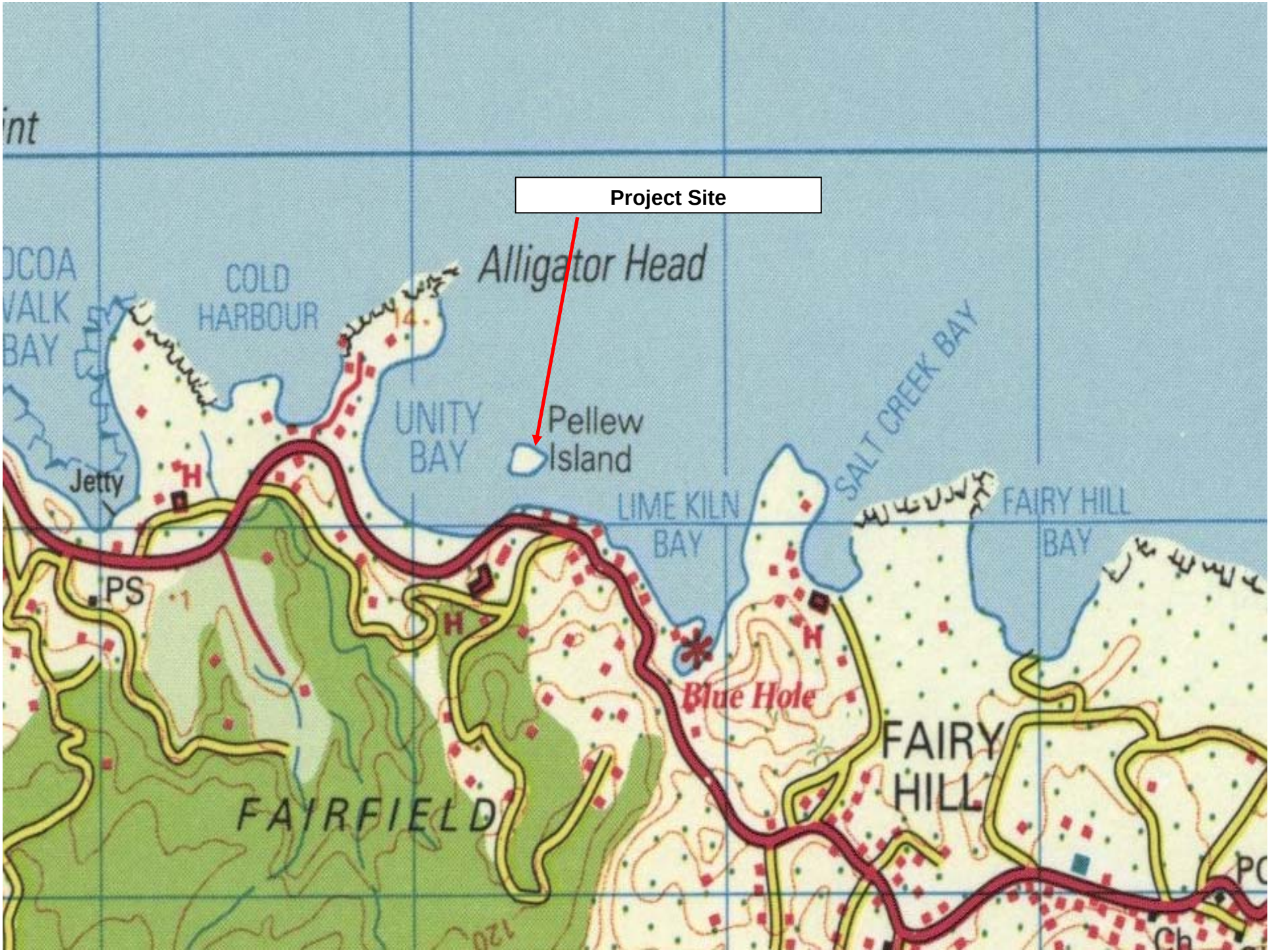
EIA STRUCTURE

Fulfils NEPA requirements

EIA CONTENT

Includes: Project Description
Policy and Legal Framework
Biophysical Baseline Conditions
Socio-economic Baseline Conditions
Analysis of Alternatives
Potential Environmental Impacts
Mitigation Measures
Hazard Analysis

ENVIRONMENTAL MANAGEMENT PLAN (EMP)


Project Site
Alligator Head
COLD HARBOUR
UNITY BAY
Pellew Island
SALT CREEK BAY
LIME KILN BAY
FAIRY HILL BAY
Jetty
PS
Blue Hole
FAIRFIELD
FAIRY HILL

Pellew Island

- Small island
- 8 km west of Port Antonio
- 1.6 acres (0.65 Ha)
- Rocky
- Semi-flat plateau
- Small beach on southern perimeter

BASELINE CONDITIONS

BIOPHYSICAL DATA

Climate
Geology and Soils
Topography and Land Use
Biodiversity
Marine Water Quality
Air Quality and Noise
Landscape and Aesthetics

SOCIO-ECONOMIC DATA

Population
Public Utilities
Education
Employment
Economic Activity
Health and Welfare
Historic and Cultural Heritage
Knowledge of the project

CLIMATE

- Rainfall 30 year mean
  - range 113 – 359 mm per year
  - usual bi-modal peaks in May/June and October/November
- Temperature
  - range 18.9 – 30.7 centigrade
- Wind
  - NE Trades ave. 27kph (15 knots) daytime
  - Southerly ave. 10kph (5 knots) night
  - North coast of Pellew experiences more wind than south
- Air Quality good

Marine Water Quality

- BOD
  - high (7x USEPA standard)
- Coliform
  - compliant with WHO bathing water standards
  - present
- Dissolved Oxygen
  - daytime readings very good
- Nitrate
  - Not in compliance with USEPA standard
  - Encourage algal growth on reefs
- Phosphate
  - In compliance with USEPA standards
  - Encourage algal growth on reefs
- TSS
  - 5 – 10 x above standards

❖ Source from surrounding lands probably nearby villas

Soils & Geology

- Geology
  - Limestone – Coastal group
  - soft chalky limestone interspersed with harder limestone intervals
  - Massively bedded and well jointed
  - Macrofossils not present

- Soils
  - dark brown clay
  - heavily infiltrated with roots
  - variable depths
  - soil supply limited to that created on the island

Noise, Landscape & Aesthetics

- Noise
  - peaceful
  - birds ocean wind
  - not a noise sensitive area
- Landscape & Aesthetics
  - scenic & tranquil
  - aesthetical pleasing
  - good views
  - “icon of Port Antonio”

Terrestrial Biodiversity

- Conservation Status
  - Island falls within proposed Port Antonio Marine Park
- Plants
  - not densely vegetated
  - large trees with minimal under storey (almost entirely limited to ferns)
  - limited to where there is adequate soil – clumped distribution pattern
  - all plants introduced from mainland (Man, birds, sea, wind)
  - No rare threatened or endangered species
  - Ecology similar to mainland
  - Influenced by wind
- Animals
  - island too small for large population of birds
  - 14 species birds recorded – some nesting sites seen
  - No rare threatened or endangered species
  - Ecology similar to mainland

Marine Biodiversity

- Substrate
  - Sediments typical of back reef areas
  - Irregular coral pavement, coral rubble and sand patches

- Plants
  - sea grass meadows
  - algae
  - eutrophication suggested
  - No rare threatened or endangered species

- Animals
  - 500m fringing reef
  - fish, corals, sea urchins,
  - sea turtles, manatees reported but none seen in the survey
  - Coral under stress: most probable source - villas
  - No rare threatened or endangered species

Socio - economics

- Nearest Communities
  - Blue Lagoon, Zion Hill, Pompey and San San
- Population
  - grow 4.8% over last 10 years in Portland
  - approx. 1:1 male:female ratio
  - 60% population in age range 16 - 64
- Employment
  - 15% surveyed gain direct income from island (boatmen and fishermen – transporting visitors)
  - Indirect income from craft vending
  - 2% unemployment
- Utilities
  - Telephone, water, electricity readily available on mainland

Socio - economics

- Solid waste
  - collection once per week
  - disposal site on border with St. Mary
- Sewage
  - absorption pits
  - storage tanks in some villas
- Social Services
  - nearest hospital in Port Antonio
  - nearest fire station in Port Antonio
  - nearest police station Port Antonio
  - bus and taxi service available along main road
  - access to island by boat or raft
- Historical & Cultural Significance
  - Icon
  - Port Antonio, Folly, Navy Island

Public Perception Survey

- 39% surveyed had knowledge of project
- 37% surveyed utilised the property
- 44% thought the project would be good for the economy of the area (new jobs, goods and services)
- 32% thought project bad for community
  - economic opportunity would be limited and not spread to surrounding communities
  - environmental and aesthetic impact
  - fish stock decline
- 17% had no opinion on whether project would be “good” or “bad”
- 7% did not care whether the project were “good” or “bad”

JEAN Petition

- Inaccurate project description
- Claimed significant environmental impact, loss of beach, loss of scenic vistas
- Persons Surveyed
  - 34% surveyed claimed that there were Jamaican
  - 52% from US, Europe and the Caribbean.
  - 14% remained Anonymous
- The major reasons given were:
  - 51% objected without any comment
  - 21% thought the project would spoil the aesthetics
  - 9% thought there would be environmental impact
  - 9% thought there was too much development already
  - 5% thought an icon would be lost
- All reasons put forward by the petitioners are considered by the EIA report

ANALYSIS OF ALTERNATIVES

Alternatives suggested by those surveyed

- Leave in Natural state “Do Nothing”
- Restaurant and Bar
- National Monument
- Natural SPA
- Casino
- Build a private house

ANALYSIS OF ALTERNATIVES

- "Do Nothing"
  - socio-economics may remain the same
  - title allows for development
  - traditional access may change – private property
- Proposed project
  - Impacts can be mitigated
  - Particular attention to be paid to sewage, solid waste, construction impacts
  - some socio-economic benefits
- National Monument
  - Declaration required – not fast
  - Private land needs to be acquired
  - Management required to mitigate impacts

ANALYSIS OF ALTERNATIVES

- **Restaurant & Bar**
  - Construction required – similar impacts to proposed project
  - More visitors – greater intensity of impact
- **Natural SPA**
  - Construction required – similar impacts to proposed project
  - Socio – economic impact may be less than proposed project
- **Casino**
  - Construction required – similar impacts to proposed project
  - More visitors – greater intensity of impact
  - Potentially greater economic benefit
  - not enough land space
- **Build a private house**
  - Similar construction impacts as proposed project
  - Less socio-economic impact

POTENTIAL ENVIRONMENTAL IMPACTS

AND MITIGATION MEASURES

Issue	Impact	Mitigation
Climate	**Construction & Operations Phase** ▪Removal of vegetation affects climate	**Construction Phase** ▪Maintain all mature trees ▪Retain a 2 - 3 m vegetation buffer ▪Remove only vegetation that is absolutely necessary ▪Source raw materials as close as possible to the construction site (reduce emissions from vehicular traffic) ▪Utilise just-in-time construction techniques that will minimise the need for storage of large quantities of building materials. ▪Recruit staff from the surrounding communities to decrease the travelling distance (reduce emissions from vehicles) ▪Ensure that all project vehicles are properly maintained ▪Machines must not be left idling - reduce emissions. **Operations Phase** ▪Plant trees and shrubs

Issue	Impact	Mitigation
Air Quality	**Construction Phase** ▪ Fugitive Dust may be a nuisance to neighbours. **Operations Phase** None	**Construction Phase** o Ensure that all material (sand and aggregate) stockpiled on the site are covered with tarpaulins and regularly wet with water. o Ensure that all trucks and boats carrying construction material are covered by tarpaulin. o Care must be taken to prevent spillage of construction materials during delivery. o All staff provided with dust masks. **Operations Phase** None

Issue	Impact	Mitigation
Water Quality	**Construction Phase** ▪Spills from stored hazardous substances on the site such as fuel diesel and motor oil. ▪The clearing of the vegetation within the development area may increase runoff from the site. ▪Inappropriate disposal of sewage	**Construction Phase** o Phased land clearance o No clearance of vegetation during periods of heavy rainfall o Mature trees retained o Retain a 2 - 3 m vegetation buffer o Employ mitigative landscaping to control drainage o Store all raw materials away from the vicinity of the sea and properly bunded. o Contain spills and leaks. o A comprehensive waste management plan for the site o Provide workers at the site with chemical toilets. o Conduct periodic marine water quality monitoring.

Issue	Impact	Mitigation
Water Quality	Operations Phase ▪This phase of the development may possibly have a major irreversible negative long term impact on the water quality in the marine environment especially from the faulty operation of sewage treatment plants, solid waste generated from the facility and run-off.	Operations Phase o Regular maintenance of sewage treatment plant o Regularly monitor sewage plant treated effluent to determine compliance with standards. o Treated effluent from the tertiary sewage treatment plant will be used for irrigation o Install an adequate storage tank for treated effluent (2 days). o Central storage area for solid waste o Solid waste collected, transported and disposed of appropriately o All chemicals must be stored in a bunded area o Drainage plan should contain run-off from the site. o A comprehensive waste management plan should be developed.

Issue	Impact	Mitigation
Soils & Geology	**Construction Phase** ▪ Inappropriate removal of vegetation may cause soil erosion and loss ▪ Inappropriate storage of fuels and chemicals may result in the contamination of soils.	**Construction Phase** o Vegetation should be removed on a phased basis and avoided in heavy periods of rainfall. o Only remove vegetation that is absolutely necessary o Ensure that all open or exposed areas are replanted and landscaped. o Install appropriate drainage systems to direct water away from slopes; o Areas storing hazardous substances must be properly bunded. o Construct board-walks or paths out of permeable paving material to minimise erosion. o Spills should be immediately contained and cleaned up. o Contaminated soil must be removed and disposed of at a parish council approved disposal site. o Ensure that general refuse is collected regularly and is transported and disposed of appropriately at the designated disposal site.

Issue	Impact	Mitigation
Soils & Geology	**Operations Phase** ▪Uncontrolled run-off from the hard areas (roofs walkways etc.) may increase the level of soil erosion on the island	**Operations Phase** o Storm water should be managed (guttering, drains). o Ensure that all chemicals (e.g. chlorine) are properly stored within an impermeable bund. o Ensure that all vegetated areas on the island are maintained.

Issue	Impact	Mitigation
Noise	**Construction Phase** ▪ The activities to be carried out in this phase of the development may likely have the most significant negative short-term impact on the ambient noise in the development area. This will be from the movement of heavy goods vehicles that will be delivering supplies to the area. **Operations Phase** None	**Construction Phase** o Where possible silenced machinery and instruments should be used. o Workers should be provided with hearing protection (ear plugs and ear muffs) to reduce the risk of hearing impairment. o Construction hours including the delivery of raw materials should be limited to the hours between 8:00 a.m. and 6:00 p.m. daily. **Operations Phase** None

Issue	Impact	Mitigation
Landscape & Aesthetics	**Construction Phase** ▪The removal of vegetation from the island may negatively alter the aesthetics. ▪Construction camps and storage sites which will be located on the mainland may also have a major negative short–term impact on aesthetics. **Operations Phase** ▪Once completed the villa with proper landscaping may complement the aesthetics of the area which may have a major long-term positive impact.	**Construction Phase** o Remove as little vegetation as possible; o Clearance of vegetation must be done on a phased basis; o Retain a 2 – 3 m vegetation buffer o Ensure that construction camp and storage site screened o Ensure that local building materials are utilised in the construction process and that muted colours are used to reduce the visual impacts o Landscaping using natural vegetation is encouraged **Operations Phase** o Ensure that the villas and other infrastructure are regularly maintained. o Develop and maintain landscaping

Issue	Impact	Mitigation
Terrestrial Biodiversity	**Construction Phase** ▪Some vegetation removed mainly in area dominated by bamboo (an invasive alien species). ▪Possible increase in soil erosion may also significantly affect the water quality in the marine environment surrounding the island through the increase in sediment loading to this area via run-off. ▪Birds might migrate off island if habitat lost. ▪Minimal and temporary habitat disturbance to other fauna	**Construction Phase** o Vegetation cleared in phases o Retain all mature trees o Retain a 2 - 3 m fully vegetated buffer area o Incorporate existing vegetation into the landscaping activities oRemoved trees or shrubs can be kept in nurseries and transplanted during the landscaping exercise. o Construction activities must be limited to the hours between 8:00 a.m. and 6:00 p.m. to minimise disturbance to birds.

Issue	Impact	Mitigation
Terrestrial Biodiversity	**Operations Phase** ▪ Landscaping may introduce alien species.	**Operations Phase** o The developer may encourage birds to the island by installing nest boxes, feeders and birdhouses o Plant trees that are used by bird species for foraging to attract bird species to the island. o Ensure that native species are incorporated in the landscape design and that plants used are not listed as Invasive Alien Species. o Rat and other pest control employed

Issue	Impact	Mitigation
Marine Bio-diversity	**Construction Phase** ▪ Direct disturbance of benthic marine community during the placing of wooden posts for jetty. ▪ Utilities supplied from mainland via an underwater pipe will disturb benthic communities ▪ Run-off from the island to the marine environment may increase (sediment, freshwater, pollutants). ▪ The transportation and delivery of building supplies and materials may cause a negative impact due to dust, spillage, and emissions. ▪ The improper storage of building materials could lead to fugitive dust ▪ Frequent operation of small boats may cause physical damage to the benthic communities and possible pollution from spills ▪ Sewage generated by construction workers may impact the marine environment.	**Construction Phase** o The construction zone for each dock should be clearly marked (<1m) to limit area of damage. o Dock construction will be done by a special craft made for working in shallow water with least impact. o In disturbed areas Sea Grass should be monitored and replanted if not recovered within one month of disturbance. o The construction of the dock that will serve as receiving point for supplies should be priority. o The waters adjacent to Pellew Island should be designated a no-anchoring zone. o All stipulations and restrictions regarding the operation of vessels should be included in the terms of reference of the contractor and the vessel operators.

Issue	Impact	Mitigation
Marine Bio-diversity	**Operations Phase** ▪ Major negative impact on the marine flora and fauna may result from: - improper sewage treatment and disposal - improper solid waste management - run-off from the development.	**Operations Phase** o Develop and implement an environmental management plan. o Anchoring in the shallow areas around Pellew Island should be prohibited. o The removal of sea grass to enhance or enlarge swimming areas should be prohibited. o Install a storage tank to confine treated effluent from the sewage plant. o In the event that there is the release of partially treated or untreated sewage empty the contents of the storage tank into a portable holding tank and transport to the municipal sewage treatment plant. o If it becomes necessary to empty swimming pools or plunge pools the water should be used for irrigation purposes.

Issue	Impact	Mitigation
Demo graphy	**Construction & Operations Phase** ▪ Persons migrating into local communities in search of work	**Construction & Operations Phase** o As far as possible hire only persons from local community.
Economic Structure	**Construction & Operations Phase** ▪Increase in jobs ▪Increase in income ▪Increase in income opportunities	**Construction Phase** o As far as possible hire only persons from local community. o As far as possible, supplies to be used in the construction of the villas should be purchased from local suppliers.
Infra structure	**Construction Phase** ▪Increase in traffic ▪Increase in heavy vehicles traffic **Operations Phase** ▪No significant impact	**Construction Phase** o A traffic management system that involves appropriate signals and signs to ensure the smooth flow of traffic must be implemented.

Issue	Impact	Mitigation
Utilities	**Construction & Operations Phase** ▪No significant impact	**Construction & Operations Phase** o Install energy saving lights o Utilise solar panels for water heaters and lighting o Lights that are not operated by solar power should be fixed with light sensors o Train employees in the benefits of energy conservation. o Install water conservation fixtures in bathrooms and kitchens o Treated effluent and storm water can be used for irrigation of the landscaped areas.

Issue	Impact	Mitigation
Waste Management	**Construction Phase** ▪ Solid waste generated ▪ Increase in demand on municipal collection ▪ Sewage generated by construction workers	**Construction Phase** o Hire a private licensed solid waste collection company for removal of construction wastes o All refuse generated should be properly transported and disposed of at the nearest parish council approved solid waste facility. o Ensure that vending is localised and limited to the mainland. o Provide adequate garbage receptacles. o Develop and implement a comprehensive waste management plan for the development. o Use chemical toilets (1 for every 8 construction workers). o Remove sewage regularly in portable tank to municipal plant.

Issue	Impact	Mitigation
Waste Management	**Operations Phase** ▪ Minimal increase in solid waste generated from the area ▪ Minimal increase in demand on municipal collection ▪ Pests may increase ▪Sewage generated by guests and staff	**Operations Phase** o Develop and implement a comprehensive waste management plan for the development. o Hire a private licensed solid waste collection company for twice weekly removal of solid wastes to parish council approved facility. o Implement pest control activities o Tertiary sewage treatment plant to be installed with storage capacity and treated effluent used for irrigation.

Issue	Impact	Mitigation
Social Services	**Construction Phase** ▪ No significant impact on community health services expected ▪ Possible increased crime and violence at site. ▪ No significant impact expected on community transportation services **Operations Phase** ▪ No significant impact on community health services expected ▪ There is a risk of crime and violence at the villas due to the remote nature of the site. ▪ No significant impact expected on community transportation services	**Construction Phase** o Provide First Aid Kit for minor injuries. o Provide Personal Protective Equipment for workers on site including, hard hats, reflective vests, dust masks, and safety shoes. o Inform and make arrangements with the nearest Health Clinic for any major injuries that may occur. o As much as is possible employ persons from the nearby communities o Adequate security present at the construction site at all times. **Operations Phase** o Provide First Aid Kit for minor injuries o A boat that is always available to transport guests or workers to and from the island o Arrange with local medical professionals to be on call for staff and guests. o A permanent security post will be established on the island

HAZARD ANALYSIS

Issue	Impact	Mitigation
Technological Hazards	**Construction Phase** ▪Flammable substances may cause fires or explosions	**Construction Phase** o Provide all employees with safety and protective gear to be worn at all times on the project site. o Adequate numbers and types of fire extinguishers. o Designate the roles and responsibilities of employees to handle emergencies. o Ensure that all machinery is properly maintained and inspected before use. o Fully equipped first aid kit o Warning signs where hazardous or flammable substances stored. o Flammable substances stored in a properly bunded area. o Information signs listing emergency numbers. o Keep an emergency log.

Issue	Impact	Mitigation
Technological Hazards	**Operations Phase** ▪Flammable substances and malfunctioning electrical equipment may cause fires or explosions	**Operations Phase** o Fully equipped first aid kit o Designate the roles and responsibilities of employees to handle emergencies. o Adequate numbers and types of fire extinguishers and fire blankets in kitchens. o Warning signs where hazardous or flammable substances stored. o A pump will be used on a pressurised line which will use water from the sea will be installed and used to combat large fires. o Flammable substances stored in a properly bunded area. o Information signs listing emergency numbers. o Keep an emergency log.

Issue	Impact	Mitigation
Natural Disasters Hurricanes	**Construction Activities** ▪ Very susceptible to the effects of hurricane, tropical storms and storm surges.	**Construction Activities** o Avoid construction activities during the peak hurricane season o Maintain a fully vegetated buffer zone 2 – 3 m o Relocate all mobile machinery and equipment to suitable storage facilities on the mainland on approach of a tropical storm or hurricane. o Keep a logbook and record all damage from the hurricane. o Inspect electrical or mechanical machinery after the hurricane. o Remove all stockpiled material and move to proper storage facilities on the mainland within 48 hours of an approaching hurricane or tropical storm. o Evacuate all project personnel 24 hours prior to the projected arrival of the hurricane or tropical storm.

Issue	Impact	Mitigation
Natural Disasters Hurricanes	**Operations Phase** ▪ Very susceptible to the effects of hurricane, tropical storms and storm surges.	**Operations Phase** o Prepare a disaster preparedness plan for the resort that includes hurricanes, earthquakes, and fires. o Evacuate all guests and workers from the island 24 hours prior to the arrival of a hurricane or tropical storm o Relocate all mobile machinery and equipment to suitable storage facilities o Ensure that any loose roofing material, all windows and doors are securely fastened prior to a hurricane o Keep a logbook and record all damage that may have occurred after the hurricane.

Issue	Impact	Mitigation
Natural Disasters **Earthquakes**	**Construction & Operations Activities** ▪ The site, like the rest of Jamaica, lies in an active earthquake zone.	**Construction & Operations Activities** o Ensure that employees and construction workers are aware of the precautions to take during an earthquake. o Designate the roles and responsibilities of employees to respond to emergencies. o Place a fully equipped first aid kit on the project site o Place information signs around the project site, which list emergency numbers

Issue	Impact	Mitigation
Natural Disasters **Landslides**	**Construction & Operations Activities** ▪ Landslide potential is relatively low because of hard bedrock and shallow soil profile.	**Construction & Operations Activities** o Maintain a fully vegetated buffer zone 2 - 3 m in width around the edge of Pellew Island this will assist in maintaining the current slope stability, and lessen the potential for erosion at the project site.

All the major social and environmental impacts have been identified and described along with mitigative measures for negative impacts.

All identified negative impacts can be mitigated.

ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN

The EMMP is the prime means by which environmental issues are managed and comprises:

- **The Impact Mitigation Plan;**
- **The Environmental Monitoring Plan;**

Once adopted the EMP becomes legally binding on:

- **The Project Proponent;**
- **The Consultants and Contractors;**
- **Their Sub-Contractors and Suppliers**

EMP implementation is supervised by the Construction Manager with Compliance Monitoring by NEPA

CONSTRUCTION MONITORING

Category	Indicators	Method	Frequency	Responsibility
Site Inspections	Site Clearance	Visual and Descriptive, against a check list	Daily	Construction Manager
	Erosion, Turbidity and Sediment Load	Visual and Descriptive	Daily	
	Disruption to traffic, access and utility services; Materials storage; Disposal of solid wastes Health and Safety.	Visual and Descriptive, against a check list	Daily when sites active	
	Traffic management; Wastewater disposal; Solid waste disposal; Materials storage; Health and Safety.	Visual and Descriptive, against a check list	Monthly	
	Traffic management; Wastewater disposal; Solid waste disposal; Materials storage; Health and Safety.	Visual and Descriptive, against a check list	Quarterly	Contractor and Construction Manager

CONSTRUCTION MONITORING

Category	Indicators	Method	Frequency	Responsibility
Air and Dust	PM_{10}, Ambient Noise	Portable air quality monitoring equipment Portable noise monitoring equipment	As deemed necessary by the Project Manager	Contractor and Construction Manager
Complaint Investigation	Any of the parameters listed above, depending upon the nature of the complaint	As appropriate for the parameter being monitored	As necessary	Project Manager
EMP Compliance	Contractor's compliance with Standards and EMP requirements. Low numbers of injuries to workers. Minimal public disturbance.	Site inspection and interrogation of site records	Every 6 months	Project Manager

OPERATIONAL MONITORING

Category	Indicators	Method	Frequency	Responsibility
Health and Safety	The number of reportable incidents and injuries	Accident & Incident Files	Monthly	Manager of Villas and Supplier of Treatment Plant
Treatment Plant Operation	Monthly Logs	Collation of information	Monthly	
Treated Effluent Quality	Monthly Logs Quarterly reports to NEPA	approved methods of analyses	Monthly Quarterly	

Thank You