

# THE ENVIRONMENTAL IMPACT ASSESSMENT FOR TANK WELD METAL LAYING OF PIPELINES AND PETROLEUM FACILITY @ RIO BUENO, LOT 3, HOLLAND HILL, TRELAWNY

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CLIENT: Tank Weld Metal

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# **EXECUTIVE SUMMARY**

#### Introduction

This document presents the findings of an Environmental Impact Assessment (EIA) of the proposed *Laying of pipeline and Liquid Petroleum Gas (LPG) storage and loading facility at Lot 3 Holland Hill, Rio Bueno, Trelawny.* The National Environmental and Planning Agency (NEPA), as a part of its permitting process requires that projects of this nature conduct an EIA of the proposed development. EnviroPlanners Limited was contracted to conduct the study in accordance with the terms of reference approved by NEPA.

#### **The Proposed Development**

LPG is an environmentally friendly source of energy with a wide range of applications: domestic (heating, cooking, hot water production), industrial, agricultural, catering and automotive fuel. LPG is used in hundreds of applications by millions of users throughout the world. When LPG is burnt it produces the cleanest emissions of all oil-based products, with a low carbon dioxide output.



This gas is a pure, lead-free product that is virtually devoid of sulfur and particles. LPG does not produce sulfur dioxide (SO<sub>2</sub>), and only generates a limited amount of carbon dioxide (CO<sub>2</sub>) and ozone. It also generates very limited quantities of carbon monoxide (CO), nitrogen oxides (NOx), unburned hydrocarbons and particles. When burned, LPG is odorless and the noise level is very low.



The operations of the proposed facility will include the receipt of LPG from ships, via a underground pipeline from the Rio Bueno port to the storage facility, which will be constructed as a part of the project; the storage of this product in purpose mounded design containers, the loading of product into bulk trucks and trailers and the filling of same into cylinders, using an automated filling system. There will be no processing of the LPG received and no bi-products will be generated. The only adjustment to the product will be the addition of the stenching agent to produce the characteristic smell.

This pipeline to be constructed, will run from the port at Rio Bueno to the storage site, delivering LPG up to a rate of five hundred gallons per minute (500 gpm). It will be constructed with 8-inch diameter Schedule 80 black iron pipe. The line will be buried and joints will be welded or flanged. The ships' pumps will aid transfer through the pipeline. The tank farm will consist of fourteen (14) storage tanks, each of ninety thousand (90,000) gallons capacity, for the storage of liquid propane and butane, collectively know as Liquefied Petroleum Gas (LPG) or cooking gas. Mounded technology will be utilized in the construction; this is the most modern and safest technology available in the industry.

#### Methodology

A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation and analysis of baseline data, determination of potential impacts, recommendation of mitigation measures and possibly alternative. An interactive approach among the environmental team members and other project professionals was adopted. The EIA team worked very closely with the other project team members including the project manager, engineers and surveyors.

The team utilized the Charette-style approach to data gathering, analysis, and presentation whereby team members conducted the reconnaissance investigations together to determine the critical elements for analysis and the issues to be highlighted in the design and planning process. Team meetings were held to discuss the progress of investigations and to analyses and facilitate



integration of data toward an understanding of the systems at work in both the natural and built environment.

Baseline data for the study area was generated using a combination of:

- Field studies
- Analysis of maps, plans, aerial photos
- Review of engineer's reports and drawings
- Review of background project documents
- Structured Interviews
- Social Surveys
- Internet Searches
- Agency requests and document searches

Written environmental searches were undertaken through the WRA, NWC and ODPEM. In addition website searches of the National Environment and Planning Agency (NEPA), Meteorological Service of Jamaica, and NWC was undertaken to obtain relevant information.

Detailed methodologies for the physical, biological and socio-economic aspects of the baseline survey are presented in the report. Additionally, limitations to the study were identified.

# **Regulatory Framework**

An application for an environmental permit for the construction and operation of a LPG storage and loading facility at Holland Hill, Rio Bueno, Trelawny; was submitted to the National Environment and Planning Agency (NEPA). NEPA requested that an environmental impact assessment be done. Terms of Reference were prepared by EnviroPlanners Limited based on the NEPA generic terms of reference and submitted to NEPA for approval. Several pieces of legislation were identified as being relevant to the project and included the Natural Resources Conservation Authority Act, Clean Air Act, the Public Health Act, and the Natural Resources conservation Authority (Air Quality) Regulations among others which are mentioned in section 5 of the report.



#### The Existing Environment

The facility is to be located on four point seven (4.7) acres of land, which forms Section 1 of lot 3 of the property known as Holland Hill (Volume 1295 Folio 707), near Rio Bueno in the parish of Trelawny. The entire property, which is owned by Tank-weld, is divided into two (2) sections. Section 2 is occupied by Tank-Weld's operation.

In addition to the shared border with the existing Tank-weld operation, the site is bordered by: a parochial road, the North Coast Highway and undeveloped land with un-cleared vegetation. The entire property was cleared by Tank-weld when they embarked on their development, so the proposed site is has only shrubbery. The land on the other side of the parochial road, immediately opposite to the proposed site is also un-developed. However further along this road, about 400 metres away there is a housing community adjacent to another parochial road, which separates it from the undeveloped land.

#### The Physical Environment

In the Rio Bueno area the Coastal aquiclude is composed primarily of limestone reef rubble and blocks of chalk deposited down slope of the Montpelier hinterland, in the late Miocene (Mines & Geology, 1974). Exposures in the recent road cuts along the North Coast Highway in the vicinity of Rio Bueno and as Holland Hill is approached, shows relatively thin and discontinuous bauxitic soils on the surface and minor karstification throughout the depth of the limestone exposure. The absence of karstification in the limestone is a clear indication of relatively low permeability and its classification as an aquiclude. The main water resources product from Coastal aquiclude is surface runoff.

#### Hydrology& Drainage

The proposed project will not be a significant impact on water resources in the area. There is no existing water body within the sphere of impact, neither are there any natural drains. The only impact will be the incremental increase (less than 2%) in surface runoff as a result of the construction of structures and paved surfaces which will inhibit percolation. This impact is not considered to be significant.



The drainage system on the site will be designed to accommodate Jamaican climatic conditions, based on data of 100 years average, and will follow the existing natural contours in order not to disrupt the natural drainage system.

#### Natural Hazard:

No incidence of flooding has been recorded for the project site. The recent construction of the new highway will not increase the possibility of such incidence as the highway drainage system on the southern side does not interact with the northern side where the site is located.

The OAS seismic risk maps of Jamaica shows that the project site lies in an area that can expect earthquake with strength measured on the Modified Mercalli Intensity scale of up to 6, with a 10% chance of exceedance in any 50 year period.

#### Air Quality and Noise:

The noise levels recorded at the site of the proposed development are well within the NEPA guideline for perimeter noise. The site is not impacted by the any surrounding activities, except for traffic on the highway; which forms the southern boundary of the site.

Respirable particulates levels were well within the recommended ambient air quality PM10 guidelines established by NEPA.

#### **Biological Environment:**

The project site is highly disturbed and does not exhibit a great deal of biodiversity. The sparse vegetation indicates that the site may have been cleared in the past and is only partially recolonized by a few naturally occurring species. Shallow soil and the storage and stockpiling of material on the site (Fig. 1), seems to have prevented. As con be expected with such limited vegetation the site does not support any significant fauna. The impact of the project on biodiversity is therefore considered to be insignificant.



#### Socio-economic Environment:

To sensitize the community about the project and to poll their views a survey was conducted by the project consultant – EnviroPlanners Limited. A total of 69 persons were interviewed in and around the Rio Bueno community, located in the parish of Trelawny. The communities polled consisted primarily of informal residential settlements, interspersed in parts with small businesses. Participants interviewed were from communities that would be directly impacted by the project.

Many residents do not perceive that construction will hinder commuter travel. However thirty eight percent (38%) of the persons polled believe that in the construction phase, it may be disruptive, especially in terms of dust and noise nuisance.

The majority of the residents is looking forward to the project and sees it as a means for increasing the socio-economic quality of their lives. Some are currently employed but see the project as enhancing current inflows or providing employment for others.

Survey findings revealed that residents of Rio Bueno hold the following views about the project:

#### Public Health and Safety:

There is a police station in Rio Bueno and a clinic. The nearest major hospital is in St. Anns Bay. There is also a fire station in St. Anns Bay and one in Falmouth, which is the major town in the parish of Trelawny. With these amenities and excellent connecting roads the public health and safety needs of the project can be adequately addressed.

#### Potential Impacts and Mitigation Measures:

Project of this nature will have impact of varying degree, both positive and negative, long term and short term. The major impacts expected from this development are:

• The loss of the options for alternative uses of the land represents an irreversible commitment of land resources. This loss of the option may be considered to be a negative



impact. Mitigation is not considered for this impact but is addressed in section 9 under the heading Consideration of Alternative.

- The excavation of trenches to accommodate the pipelines poses the risk of soil erosion during incidences of heavy rainfall, however mitigation measures will minimize this impact.
- The use of heavy equipment during construction works will inevitably generate noise, which may create a nuisance for nearby residents and workers. This is a negative impact but is not considered to be significant, as the duration will be short-term.
- The site grading and excavation activities will produce fugitive dust which may result in increased levels of air borne particulate matter. This situation will be worst during the dry season and during times of prevailing wind. The occurrence of fugitive dust is periodic and short-term, lasting only for the duration of the construction activity, and is therefore not considered a significant impact.

#### Consideration of Alternatives:

The following alternatives were considered:

- The "do nothing" alternative which would mean continuing to transport bulk LPG across the dangerous terrain from Kingston to the north coast.
- Site the facility at or near the port in MontegoBay, Discovery Bay or Ocho Rios

#### **Outline Monitoring Programme:**

Once a permit is granted for the proposed development, and before site preparation and construction activities begin, a detailed Monitoring Programme will be prepared for submission to NEPA, for approval. The Monitoring Programme should include the following components; an inspection protocol; parameters to be monitored; frequency of monitoring and reporting procedures. The duration of the monitoring programme should be for the entire construction period, with monthly reporting. The detailed Monitoring Programme is best prepared after the



permit is received as this would allow for the Terms and Conditions of the permit to be taken into consideration, and included in the monitoring programme as appropriate.

# During the Construction Phase:

- Transportation and storage of construction material to ensure best practice and minimum impact.
- Proper disposal of waste, via a licensed waste disposal contractor to landfill.
- Proper repair of road surfaces that may be damager in the pipe laying process.
- Appropriate warning sign and flagmen are utilized.

#### Post construction:

- Appropriate warning signs are maintained.
- Safety requirements are adhered to.

#### Conclusion:

Based on all the data collected and analysed in relation to the proposed development of the LPG Storage and Filling Facility; at Holland Hill, Rio Bueno, Trelawny; the project will have a positive impact on the surrounding communities and also at the national level.

- Eliminate the risk involved in the transportation of LPG from Kingston to the north coast.
- Ensure a secure supply of LGP for the north coast.
- Provide employment opportunities both during construction and operations.

The project will also have some negative impact such as dust and noise nuisance, but these will be generally short term and can be minimised by application of the appropriate mitigation.



#### **1.0 INTRODUCTION**

This document presents the findings of an Environmental Impact Assessment (EIA) for the proposed construction of a Liquefied Petroleum Gas (LPG) importation and bulk storage terminal, including all the necessary pipelines and infrastructure to facilitate the receipt of LPG from ships and the loading and delivery of LPG in bulk and cylinders. EnviroPlanners Ltd. was contracted to carry out the EIA as part of the permitting requirements as stipulated by the regulatory agency, the National Environment and Planning Agency (NEPA).

#### **1.1 Purpose**

An application was submitted for a development permit to the NEPA. The application was accompanied by Project Information Form (PIF) and supporting documentation. NEPA responded to that application with a request that an Environmental Impact Assessment (EIA) be conducted on the proposed development, based on their review of the permit application. NEPA supplied Generic Terms of Reference and requested modification of these Terms of Reference to be specific to the project. The modified Terms of Reference were submitted to NEPA for their approval and a response obtained.

The TOR is outlined in Section 4.0 and the completed document as approved by NEPA is presented in Appendix III.

#### **1.2 Objectives of the Project**

- i. Reduce the need to transport LPG from Kingston, across the dangerous mountain roads, to the Northern and Western regions of the island, consequently reducing the exposure to the risks associated with the transportation of LPG by road.
- ii. Introduce additional strategic LPG storage to mitigate against the possible adverse consequences of natural disasters that could restrict or limit the movement of product crosscountry.
- iii. Improve customer service and response time by making the product more readily accessible.



### 2.0 PROJECT BACKGROUND

The project involves the construction of a Liquefied Petroleum Gas (LPG) importation and bulk storage terminal, including all the necessary pipelines and infrastructure that will facilitate the receipt of LPG from ships and the loading and delivery of LPG in bulk and cylinders.



Figure 2.1: Location map

The operations will include the receipt of LPG from ships, via pipeline; the storage of this product in mounded design bulk storage containers; the loading of product into bulk trucks and trailers and the filling of same into cylinders, using an automated filling system. There will be no processing of the LPG received and no bi-products will be generated. The only adjustment to the product will be the addition of the stenching agent to produce the characteristic smell.



LPG does not produce harmful effects on the environment but there is the risk of fire associated with its storage and handling. Much consideration will be given to this risk in the design, operation and maintenance of the facility in order to reduce it to as low as is practicable. The facility will however have an impact on water consumption as large quantities of water will be consumed in fire-fighting exercises and in the event there is a fire. Apart from altering of the landscape there are no other significant impacts on the natural environment.

The facility is to be located on four point seven (4.7) acres of land, which forms of Section 1 of lot 3 of the property known as Holland Hill (Volume 1295 Folio 707), near Rio Bueno in the parish of Trelawny. The entire property, which is owned by Tank-weld, is divided into two (2) sections. Section 2 is occupied by Tank-Weld.

In addition to the shared border with the Tank-weld operation, the site is bordered by: a parochial road, the North Coast Highway and undeveloped land with un-cleared vegetation. The entire property was cleared by Tank-weld when they embarked on their development, so the proposed site is has only shrubbery. The land on the other side of the parochial road, immediately opposite to the proposed site is also un-developed. However further along this road, about 400 metres away there is a housing community adjacent to another parochial road, which separates it from the undeveloped land.



# 3.0 PROJECT DESCRIPTION

#### The main components of the facility are:

- 1. A product receipt pipeline to transfer LPG from ship to storage tanks
- 2. A storage and loading facility

#### 1. Product Receipt Pipeline.

This pipeline will run from the port at Rio Bueno to the storage site, delivering LPG up to a rate of five hundred gallons per minute (500 gpm). It will be constructed with 8-inch diameter Schedule 80 black iron pipe. The line will be buried and joints will be welded or flanged. The ships' pumps will aid transfer through the pipeline.



Figure 3.1: Image of Project Area Showing The Proposed Pipe Route



Two alternatives for routing the pipeline are being evaluated. The possible pathways are outlined on surveyors' drawings already submitted.

### The options are as follows:

- Locate the pipeline in an easement on the northern extremity of the soft shoulder of the section of the North Coast Highway connecting the site to the lands owned by Tank-weld Metals, which adjoins the wharf/port.
- 2. Locate the pipeline in an easement on the side of the parochial road, which runs along the eastern boundary of the proposed storage site at Holland Hill and joins the new highway to the old road passing through Rio Bueno.

An easement has been requested form the National Works Agency (NWA) for the laying of this pipeline.

# 2. Storage and Loading Facility

The proposed storage and loading facility will be located on the Holland Hill site. It will comprise the following:

A tank farm consisting of fourteen (14) storage tanks, each of ninety thousand (90,000) gallons capacity for the storage of liquid propane and butane, collectively know as Liquefied Petroleum Gas (LPG) or cooking gas. The mounded technology for the bulk storage of LPG will be the design used in the construction.





Figure 3.2: Design of the LPG Mounded Storage Facility

This new design of Mounded Storage Vessels for L.P.G. represents a dramatic and totally unprecedented advancement in safety, as well as efficiency and economy, Cylindrical tanks are embedded in sand, encased within a masonry structure. Only inlet and outlet controls are exposed. Even in comparison to the Horton Spheres, which till now had been the industry standard, Mounded Storage Vessels represent a radical advancement, and help to ensure that industrial gas fires would be a thing of the past.





Figure 3.3: Example of a Mounded LPG Storage Facility

The mounded storage system provides the following advantages;

LPG stored in the form of mounded storage totally eliminates the possibility of BLEVE. The sand cover of 1 metre, which provides natural insulation from external heating, is adequate to outlast any fire in the surrounding areas. Water cooling systems are not required. In addition, the mounding material provides good protection against most of the external like influences flying objects and pressure waves from explosions. A well-engineered and well-executed mounded storage is the safest and the most economical solution for bulk LPG storage. Other safety features of the aboveground LPG storage vessels viz. hydrant network all around with monitors and hydrants, heat detectors and detectors are provided mounded storage facilities also. gas etc., to

 A facility for the injection of Mercaptan, which gives the characteristic odour to LPG. It will consists of a drum storage for the mercaptan, piping and electrical pumps. Mercaptan is normally injected during product transfer from ship to storage.



ii. A bulk product delivery facility for the loading of tanker trailers and bulk delivery trucks comprising pipelines constructed from Sch. 80 Black iron pipe, liquid meters and electrical pumps and compressors. This facility will be capable of loading four units; two (2) trailers and two (2) bulk trucks, at any one time.



Figure 3.4: Flow Diagram of the Operation on Site

- iii. A Ten thousand litre per hour (10,000 lit/hr) automated cylinder-filling carousel housed in a building of standard prefabricated steel design (Butler building type). The building will have additional space for the handling and storage of filled and empty cylinders
- iv. An office and control room facility of standard prefabricated steel design (Butler building type), for accommodating staff process control equipment for the proper management, supervision and monitoring of the operation
- v. A maximum of staff compliment of ten (10) is intended, along with two (2) contracted security persons.
- vi. A fire fighting system composed of a 240,000gallon firewater storage tank, two electrical pumps and two standby generators, distribution pipeline, fire monitors, extinguishers and hoses, and sprinkler systems.



#### Works

Works to be undertaken involve the grading ad leveling of the site, excavation for underground pipeline, building and water tank foundations and tank supports, the fabrication and erection of steel structure for building, fabrication and erection of the water storage tank, welding of pipelines, concrete works for buildings, pipe and tank supports, bases for pumps and water tank foundations, and the mechanical and electrical installation of pumps compressors and other plant equipment

#### **Sewage Treatment**

Sewage treatment facilities will consist of a Biodigester Septic Tank, Reed Bed and Chlorination chamber of acceptable design. The maintenance of the system will be the responsibility of the facility staff.

Garbage will be stored in standard skips, and removal will be contracted to Northern or Western Parks and Markets, whichever has jurisdiction

#### **Pre-Construction**

The proposed site for development of the facility has previously been cleared, so there will be no major disruption of flora, fauna or habitats prior to construction. Grading and leveling of the site are the only pre-construction activities necessary, outside of the applications for the various permits and applications for services and the easement for the pipeline.

#### **Traffic Impact**

• The movement of heavy-duty vehicles in and out of the facility could affect the free flow of traffic along the section of the North Coast Highway. To reduce the impact, the entrance to the facility will be through a gate leading to the parochial road on the Eastern boundary of the site. The gate will be inset by a minimum of 100 feet from the roadway



so that the vehicle standing area will be within the boundaries of the property, so as to avoid congestion on the parochial road.

• Entry to and exit from the Highway via the parochial road will have some impact on the traffic flow on the Highway. The intersection is on a curved section of the Highway, which creates some risk to motorists; however, the risk is reduced, as it is not a blind curve; there is a clear view up to at least 75 metres on either side. There are heavy-duty vehicles operating there now and there does not seem to be a problem; however the situation can be improved by the erection of signs on the North Coast Highway to warn approaching motorists of the hazard of heavy vehicles entering and leaving the highway. This is to be negotiated with the National Works Agency.

# Manmade Hazards and Control Measures:

#### Pipeline:

Some of the risks associated with the transfer pipelines are as follows

- Un authorized access and tampering, resulting in possible leakage
- Accidental damage during excavation for other services
- Leaks from normal operation.
- Leakage caused from deterioration as a result of corrosion

#### **Control Measures**

- Pipeline will be buried up to 10 feet below ground, where it passes through public thoroughfare to make access and tampering difficult
- A dyed concrete cover will be cast over the top of the back-filled trench in which the pipe is buried so as to clearly identify the location of the said pipeline and alert maintenance crews of the hazard.
- The storage capacity has be sized so that only two deliveries per month will be necessary, reducing the exposure to problems during operation
- The line will be emptied of all liquid after each transfer



- A non-return valve will prevent back flow out of the pipeline at the wharf end and there will be a break-away coupling installed at the end of the pipeline where the transfer hose is connected, which will close both the pipeline and the hose in the event of accidental separation.
- The line will be specially coated to resist corrosion and further protected with cathodic protection. There will be regular inspection, at least annually of the cathodic protection system.
- .There will be written procedures governing the operation and maintenance of the pipeline and the actions to be taken in the event of an incident.

# **Storage and Loading Facility:**

Hazards

- Access to the facility by unauthorized persons
- Leakage on the facility that could result in a fire and possible explosion.
- Ignition sources such as cigarettes and other open flames, spark ignition vehicles

Control Measures.

- The site will be enclosed by chain-link fencing, at least six foot (6ft) high with barbed wire on top, with a gate to limit access. Security personnel will man it 24 hours per day and only legitimate persons will be allowed to enter.
- The tanks will be mounded, i.e. installed above ground in a solid concrete enclosure and the enclosure filled with suitable material to cover the tanks, leaving only the connections exposed. This significantly reduces if not eliminates the possibility of tanks exploding.
- Tanks will be given corrosion protection similar to that described for the pipeline.
- There will be an elaborate fire-fighting system, as described earlier. Water will be taken from a 20-inch main being laid along the North Coast Highway, via a 6" line into the firewater storage tank. An application has been made to the National Water Commission for the provision of a 6-inch tee off.



Fire extinguishers will be provided at strategic locations such as those near pumps and loading racks so that they are readily available for use.

There will be regular inspection and testing of the fire-fighting system during operation.

- Nozzles on the tanks will be protected either by a non-return valve, restricting flow out of the tank or excess flow valves, limiting flow in the event of a breakage of attached pipeline.
- In addition to excess flow and non-return valves there will be a remotely operated Emergency Shut-down system for fast shutdown of the facility in the event of an emergency.
- Aboveground pipelines will be protected from impact damage, where necessary.
- The facility will be designed and constructed in accordance with National Fire Protection Agency, NFPA, code 58 & 59 and American Petroleum Institute, Code 2510, which are international benchmark standards for the LPG industry.
- There will be regular inspection and testing of tanks, pipelines and equipment, as per the requirements of international standards, to minimize the occurrence of leaks and to quickly identify and correct them when they occur.

During operation there will be strict control on the movement of people and spark ignition vehicles entering the facility to eliminate sources of ignition and all electrical installation in hazardous areas will be explosion-proof.



### 4.0 TERMS OF REFERENCE

The Environmental Impact Assessment to be completed by EnviroPlanners limited shall include but not limited to the following:

- 1) Objectives of the project
- A complete description of the existing site proposed for development outlining the main elements of the project. A map will be included to identify the proposed location of the project site.
- 3) Significant environmental issues of concern will be identified through presentation of baseline data which will take into consideration social, cultural and heritage information. An assessment of the public perception of the proposed development will be done through public consultations and the use of social survey instruments such as questionnaires.
- 4) Identification of Policies, Legislation and Regulations relevant to the project.
- 5) Prediction of the likely short, medium and long term impact of the development on the environment, including direct, indirect and cumulative impacts, and their relative importance to the design of the development's facilities.
- 6) Identify any mitigation action to be taken to minimize predicted adverse impacts and provide associated costs where applicable and practical.
- 7) Develop an Environmental monitoring Plan which will ensure that the mitigation measures are adhered to during the implementation phase.
- 8) Describe the alternatives to the project.
- 9) Conclusions

EnviroPlanners Limited will provide full details of the following in fulfillment of an Environmental impact Assessment:



# 1. Task # 1. Description of the Project

- i. A comprehensive description of the project and the surrounding environment specifying any information necessary to identify and assess the environmental and social effects of the project.
- ii. Detailed project objectives and information on the following:
  - a. nature, location/ existing setting, timing, duration, frequency, general layout and size of facility including ancillary buildings
  - b. pre-construction activities, construction methods, works and duration, and post construction plans.
- iii. Detailed description of raw material inputs, technology and processes to be used as well as products and by-products generated.
- iv. Areas to be reserved for construction and areas to be preserved in their existing state as well as activities and features which will introduce risks or generate impact (negative and positive) on the environment will be highlighted.
- v. Outline of Sewage treatment system including treated effluent disposal as well as solid waste disposal option.
- vi. Outline plans for storm water collection and disposal as well as plans for providing utilities and other services. This will involve the use of maps at appropriate scales, site plans, aerial photographs and other graphic aids and images, as appropriate.
- vii. A storm surge analysis to be conducted to inform the construction and alignment of the pipelines and impact mitigation structures/measures.

If any aspects of the projects are to be done on a phased basis all phases will clearly defined the relevant time schedules provided and phased maps, diagrams and appropriate visual aids will be included.



# 2. Task # 2. Description of the Environment/Baseline Studies Data Collection and Interpretation

A detailed description of the study area/geographical boundaries, and methodology to be utilized for baseline and other data as well as the length of the study will be done. This task involves the generation of baseline data which is used to describe the study area as follows:

- i) Physical environment
- ii) Biological environment
- iii) Socio-economic and cultural constraints.

Presentation of baseline data which will be utilized to describe the study areas in respect of the following:

# i. Physical

- a. Detailed description of the existing soil and geology and geomorphology, landscape, aesthetic values and hydrology as it would relate to the stability and integrity of the pipeline and tank farm.
- b. Special emphasis will be placed on storm water run-off, drainage patterns, aquifer characteristics, effect on groundwater and availability of potable water. Any slope stability issues that could arise will be thoroughly explored.
- c. **Coastal and Marine** ecosystem, including but not limited to any wetlands including mangroves, seagrass and coral community with indication of its function and value in the corridor of the pipeline.
- d. **Climatic conditions and air quality** in the area of influence including particulate emissions from stationary or mobile sources, wind speed and direction, precipitation, relative humidity and ambient temperatures.
- e. Noise levels of undeveloped site and the ambient noise in the area of influence.
- f. Availability of **solid waste** management facilities.



# ii. Biological

- a. Detailed description of the flora and fauna (terrestrial and aquatic) of the area, with special emphasis on rare, threatened, endemic, protected and, endangered species.
- b. Species dependence, habitats/niche specificity, community structure and diversity will be considered.

#### iii. Socio-economic & Cultural

- a. Present and projected population;
- b. present and proposed land use;
- c. planned development activities;
- d. issues relating to squatting and relocation (housing demand and supply);
- e. community structure;
- f. economic base/employment;
- g. distribution of income;
- h. goods and services;
- i. utilities; recreation; public health and safety;
- j. Cultural peculiarities, aspirations and attitudes will be explored.
- k. The historical importance (heritage, archaeological sites and feature) and other material assets of the area will also be examined.
- 1. While this analysis is being conducted, an assessment of public perception of the proposed development will be conducted.

This assessment may vary with community structure and may take multiple forms such as public meetings or questionnaires/surveys.



# Task # 3. Policy, Legislative & Regulatory Considerations

- i. The pertinent regulations and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, siting and land use control at the national and local levels will be outlined.
- ii. The examination of the legislation will include at minimum, legislation such as the NRCA Act, the Housing Act, the Town and Country Planning Act, Building Codes

and Standards, Development Orders and Plans and the appropriate international convention/protocol/treaty where applicable.

# Task # 4. Identification and Assessment/Analysis of Potential Impacts

**Identification** of the significant environmental and public health/safety issues of concern and indicate their relative importance.

**Identification** of the nature, severity, size and extent of potential direct, indirect and cumulative impacts (for terrestrial and aquatic environments) during the pre-construction, construction and operational phases of the development as they relate to,(but are not restricted by) the following:

- change in drainage patterns
- flooding potential
- landscape impacts of excavation and construction
- loss of and damage to geological and palaeontological features
- loss of species and natural features
- habitat loss and fragmentation species
- biodiversity/ecosystem functions
- pollution of potable, coastal, marine, surface and ground water
- air pollution
- capacity and design parameters of proposed sewage treatment facility
- Socio-economic and cultural impacts.
- Impact of flooding, loss of natural features, excavation and construction on the historic landscape, architecture and archaeology of the site.



- risk assessment
- noise
- solid waste
- soil
- traffic
- carrying capacity of the proposed site

**Identification** of the interaction between different impacts and impacts of other projects will also be considered. In addition, the impacts that have occurred and those impacts which could still occur as a consequence of the clearing works that were conducted on the site prior to the preparation of the TORs will also be identified and analysed

**Distinguish** between significant positive and negative impacts, reversible or irreversible direct and indirect, long term and immediate impacts as well as avoidable and irreversible impacts.

<u>Characterization</u> of the extent and quality of the available data, explaining significant information deficiencies, assumptions and any uncertainties associated with the predictions of impacts. A major environmental issue will be determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It will also be determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should be represented in matrix form with separate matrices for pre and post mitigation scenarios.

#### Task # 5.Drainage Assessment

An assessment of Storm Water Drainage will be conducted. The

EIA Report will cover, but not limited to:

i. Drainage for the site during construction, to include mitigation for sedimentation to the aquatic environment



ii. Drainage for the site during operation, to include mitigation for sedimentation to the aquatic environment

### Task #6 Traffic Impact

A traffic impact assessment to address the impacts of the entering and exiting project site and access to the highway including parking for trucks awaiting loading will be assessed.

#### Task #7 Manmade Hazards

An assessment of fire hazard scenarios and risks as well as responses to each scenario and risk perceived will be done. An assessment will also be carried out of the facilities (eg. fire, hospital etc.) in the surrounding areas to handle any possible mishap should it occur.

#### Task # 8 Mitigation

Guidelines for avoiding or reducing (e.g. restoration and rehabilitation), as far as possible, any adverse impacts due to proposed usage of the site and utilizing of existing environmental attributes for optimum development will be prepared. Mitigating methods will be quantified and financial and economic values assigned.

#### Task #9 - Environmental Management and Monitoring Plan

- A plan for the management of the natural, historical and archaeological environments of the project to monitor implementation of mitigatory or compensatory measures and project impacts during construction and occupation/operation of the units/facility will be designed.
- ii. An Environmental Management Plan and for the long term operations of the site will also be prepared.
- iii. An outline monitoring programme will be included in the EIA, and a detailed version submitted to NEPA for approval after the granting of the permit and prior



to the commencement of the development. At the minimum the monitoring programme and report should include:

- Introduction outlining the need for a monitoring programme and the relevant specific provisions of the permit and/or licence(s) granted.
- The activity being monitored and the parameters chosen to effectively carry out the exercise.
- The methodology to be employed and the frequency of monitoring.
- The sites being monitored. These may in instances, be pre-determined by the local authority and should incorporate a control site where no impact from the development is expected.
- Frequency of reporting to NEPA

The Monitoring report will also include, at minimum:

- Raw data collected. Tables and graphs are to be used where appropriate
- Discussion of results with respect to the development in progress, highlighting any parameter(s) which exceeds the expected standard(s).
- Recommendations
- Appendices of data and photographs if necessary.

# Task # 10 - Project Alternatives

Alternatives to the project will be examined to include the no-action alternatives. This examination of project alternatives will incorporate the use of history of the overall area in which the site is located and previous uses of the site itself. Alternatives to the site location will also be considered and include the reason for the site chosen.

# Task #11 Public Participation/Consultation Programme

A public presentation on the findings of the EIA will be conducted to inform, solicit and discuss comments from the public on the proposed development.

• The public participation programme for the project will be documented.



- Description of the public participation methods, timing, type of information to be provided to the public, and stakeholder target groups will be done
- The issues identified during the public participation process will be summarized
- Public input that has been incorporated into the proposed project design; and environmental management systems will be discussed

All Findings will be presented in the **EIA report** and will reflect the headings in the body of the ToRs, as well as references. Fourteen hard copies and an electronic copy of the report will be submitted to the National Environment and Planning Agency.

The report will include an appendix with items such as maps, site plans, the study team, photographs, ToR and other relevant information.


## 5.0 LEGISLATIVE AND REGULATORY CONSIDERATIONS

This section presents the legislation and regulations pertinent to the proposed Liquefied Petroleum Gas (LPG) plant. Comments are made where they are felt to be helpful in relating the project to the existing regulations, policies and legislation.

#### 5.1 National Legislation – Natural Environment

#### 5.1.1 Natural Resources Conservation Authority Act (1991)

The Natural Resources Conservation Authority Act was passed in the Jamaican Parliament in 1991 and provided the basis for the establishment of the Natural Resources Conservation Authority (NRCA) with primary responsibility for ensuring sustainable development in Jamaica through the protection and management of Jamaica's natural resources and control of pollution. Sections 9 and 10 of the NRCA Act stipulate that an Environmental Impact Assessment (EIA) is required for new projects and existing projects undergoing expansion.

The body is also responsible for investigating the effect on the environment of any activity that may cause pollution or which involves waste management. Sections of the Act that relate specifically to pollution control state that:

- No person shall discharge on or cause or permit the entry into waters, on the ground or into the ground, of any sewage or trade effluent or any poisonous noxious or polluting matter.
- (ii) No person is allowed to construct or reconstruct or alter any works designed for the discharge of any effluent.

The Act also empowers the authority to require of any owner or operator of a pollution control facility information on the performance of the facility, the quantity and condition of effluent discharged and the area affected by the discharge of such effluent. The Authority has the right to consult with any agency or department of Government having functions in relation to water or water resources to carry out operations to:



- (a) Prevent pollutants from reaching water bodies.
- (b) Remove and dispose of any polluting matter or remedy or mitigate any polluted water body in order to restore it.

#### 5.1.2 Environmental Review and Permitting Process (1997)

The Environmental Permit and License System (P&L), introduced in 1997, is a mechanism to ensure that all developments in Jamaica meet required standards in order to minimize negative environmental impacts. The P&L System is administered by NEPA, through the Applications Section (formerly the Permit and License Secretariat). Permits are required by persons undertaking new development which fall within a prescribed category. Under the NRCA Act of 1991, the NRCA is authorized to issue, suspend and revoke permits and licences if facilities are not in compliance with the environmental standards and conditions of approval stipulated. An applicant for a Permit or License must complete an application form as well as a Project Information Form (PIF) for submission to the NRCA.

#### 5.1.3 Wildlife Protection Act (1945)

The Wildlife Protection Act of 1945 prohibits removal, sale or possession of protected animals, use of dynamite, poisons or other noxious material to kill or injure fish, prohibits discharge of trade effluent or industrial waste into harbours, lagoons, estuaries and streams, and authorizes the establishment of Game Sanctuaries and Reserves. Protected under the Wildlife Protection Act are six species of sea turtle, one land mammal, one butterfly, three reptiles and several species of birds including rare and endangered species and game birds.

## 5.1.4 The Endangered Species (Protection, Conservation and Regulation of Trade) Act (2000)

This Act deals with restriction on trade in endangered species, regulation of trade in species specified in the schedule, suspension and revocation of permits or certificates, offences and penalties, and enforcement. Many species of reptile, amphibian and birds that are endemic to



Jamaica but not previously listed under national protective legislation, or under international legislation, are listed in the Appendices of this Act.

## 5.1.5 The Natural Resources (Prescribed Areas)(Prohibition of Categories of Enterprise, Construction and Development) Order (1996)

The island of Jamaica and the Territorial Sea of Jamaica have been declared a Prescribed Area. No person can undertake any enterprise, construction or development of a prescribed description or category except under and in accordance with a permit. The Natural Resources Conservation (Permits and Licenses) Regulations (1996) give effect to the provisions of the Prescribed Areas Order.

## 5.1.6 Water Resources Act (1995)

The Water Resources Act of 1995 established the Water Resources Authority (WRA). This Authority is authorized to regulate, allocate, conserve and manage the water resources of the island. The Authority is also responsible for water quality control and is required under Section 4 of the Act to provide upon request to any department or agency of Government, technical assistance for any projects, programmes or activities relating to development, conservation and the use of water resources.

It is the responsibility of the WRA as outlined in Section 16 to prepare, for the approval of the Minister, a draft National Water Resources Master Plan for Jamaica. Areas to be covered in this Draft Master Plan of 1990 included objectives for the development, conservation and use of water resources in Jamaica with consideration being given to the protection and encouragement of economic activity, and the protection of the environment and the enhancement of environmental values.

Section 25 advises that the proposed user will still have to obtain planning permission, if this is a requirement, under the Town and Country Planning Act. In addition, Section 21 of the Act stipulates that if the water to be used will result in the discharge of effluents, an application for a license to discharge effluents will have to be made to the Natural Resources Conservation Authority or any other relevant body as indicated by the Minister.



With regard to underground water, Section 37 states that it is unlawful to allow this water to go to waste. However, if the underground water "interferes or threatens to interfere with the execution or operation of any underground works", it will not be unlawful to allow the water to go to waste in order to carry out the required works provided that there is no other reasonable method of disposing of the water. The Authority also has the power to determine the safe yield of aquifers (Section 38).

#### 5.1.7 Country Fires Act (1942)

Section 4 of the Country Fires Act of 1942 prohibits the setting of fire to trash without prior notice being given to the nearest police station and the occupiers of all adjoining lands. In addition, a space of at least fifteen feet in width must be cleared around all trash to be burnt and all inflammable material removed from the area. Section 6 of the Act empowers the Minister to prohibit, as may be necessary, the setting of fire to trash without a permit.

Offences against this Act include:

Setting fire to trash between the hours of 6.00 p.m. and 6.00 a.m. (Section 5a);

Leaving open-air fires unattended before they have been completely extinguished (Section 5b);

Setting fires without a permit and contrary to the provisions outlined in Section 6 (Section 8);

Negligent use or management of a fire which could result in damage to property (Section 13a);

Smoking a pipe, cigar or cigarette on the grounds of a plantation which could result in damage to property (Section 13b).

Vegetation clearance will be required but no burning is anticipated to facilitate this; however, the Developer should note the legal requirements for burning of vegetation.

#### 5.1.8 Quarries Control Act (1983)

The Quarries Control Act of 1983 established the Quarries Advisory Committee, which advises the Minister on general policy relating to quarries as well as on applications for licenses. The Act provides for the establishment of quarry zones, and controls licensing and operations of all quarries. The Minister may on the recommendation of the Quarries Advisory Committee declare



as a specified area any area, in which quarry zones are to be established and establish quarry zones within any such specified area.

Section 5 of the Act states that a license is required for establishing or operating a quarry though this requirement may be waived by the Minister if the mineral to be extracted is less than 100 cubic metres. Application procedures are outlined in Section 8. The prescribed form is to be filed with the Minister along with the prescribed fee and relevant particulars. The applicant is also required to place a notice in a prominent place at the proposed site for a period of at least 21 days starting from the date on which it was filed.

#### Any quarries used to provide material for the project should be licensed.

#### 5.1.9 The Pesticides (Amendment) Act (1996)

The Pesticides (Amendment) Act of 1996 amended sections of the principal act, which came into effect in 1975 and established the Pesticides Control Authority. This Act gives the Authority the responsibility of controlling the importation, manufacture, packaging, sale, use and disposal of pesticides. Section 11 states that the Authority is required to keep a register or record of all relevant information such as registered pesticides, restricted pesticides, pest control operators and persons licensed to import or manufacture pesticides. Under Section 16 of the Act, the Authority may also, with the approval of the Minister, make regulations which relate to areas such as:

Aerial application of pesticides;

Supervision required for the use of pesticides, the prescribed protective clothing to be worn and other precautionary measures;

The permissible levels of pesticides to be used;

The periods during which particular pesticides may or may not be used on certain agricultural crops;

The disposal of pesticides and packages.



## 5.1.10 Clean Air Act (1964)

This act refers to premises on which there are industrial works, the operation of which is in the opinion of an inspector likely to result in the discharge of smoke or fumes or gases or dust in the air. An inspector may enter any affected premise to examine, make enquiries, make tests and take samples of any substance, smoke, fumes, gas or dust as he considers necessary or proper for the performance of his duties.

Exhaust and Emissions should meet the National Standards.

# 5.1.11 The Natural Resources Conservation Authority (Air Quality) Regulations, 2002

Part I of this Act stipulates license requirements and states that every owner of a major facility or a significant facility shall apply for an air pollutant discharge license. Part II speaks to the stack emission targets, standards and guidelines.

The Act states that no person shall emit or cause to be emitted from any air pollutant source at a new facility, any visible air pollutants the opacity or pollutant amount of which exceeds the standards.

Every owner of a facility with one or more air pollutant source or activity shall employ such control measures and operating procedures as are necessary to minimize fugitive emissions into the atmosphere, and such owner shall use available practical methods which are technologically feasible and economically reasonable and which reduce, prevent or control fugitive emissions so as to facilitate the achievement of the maximum practical degree of air purity.

Under this Act a "major facility" is described as any facility having an air pollutant source with the potential to emit:

- (a) one hundred or more tonnes/y of any one of total suspended particulate matter (TSP);
- (b) particulate matter with a diameter less than ten micrometres (PM10);
- (c) sulphur oxides measured as sulphur dioxide (SO2);
- (d) carbon monoxide (CO);
- (e) nitrogen oxides (NOx) measured as equivalent nitrogen dioxide;



(f) five or more tonnes/y lead;

- (g) ten or more tonnes per year of any single priority air pollutant; or
- (h) twenty-five or more tonnes per year of any combination of priority air pollutants;

The stack emission standards specified in the Twelfth Schedule shall apply to all new facilities with air pollutant sources.

Emissions from the LPG Plant will have the potential to influence ambient air quality. The accumulated impact of emissions from the LPG Plant and the other major contributors to the airshed may impact air quality in the airshed. These impacts will be influenced by meteorological conditions (precipitation, wind direction and speed, etc). The regulations define primary and secondary ambient air quality standards. The standards for those pollutants of particular relevance to the operations at the LPG plant are shown in Table 5.1.11.

Parameters	Annual	24 h	1 h	8 h
Total	60	150		
Suspended				
Particulates				
PM10	50 (diameter <10	150		
	micrometer)			
Primary	80	365		
Secondary	60	280		
Sulphur			700	
Dioxide				
Carbon			40,000	10,000
Monoxide				
Nitrogen	100			
Dioxide				

Table 5.1.11: Standard for Air Pollutants

## 5.1.12 Noise Standards

Jamaica has no national legislation for noise, but World Bank guidelines have been adopted by the National Environment and Planning Agency (NEPA), and are used for benchmarking



purposes along with the draft National Noise Standard that is being prepared. The guidelines for daytime perimeter noise are 75 decibels and 70 decibels for nighttime noise.

## 5.1.13 Trade Effluent and Sewage Regulations (1996) (Draft)

Jamaica has draft regulations governing the quality of the effluent discharged from facilities to public sewers and surface water systems. These draft regulations were gazetted sometime in 2006. The draft guidelines require the facility to meet certain basic water quality standards for trade effluent including sewage. The requisite permits and licenses are required to install and operate sewage treatment facilities.

The site contains several streams and is adjacent to a gully. During the construction and operation phases the integrity of the water quality in these systems should not be compromised.

Tank Weld Metal Ltd. will apply for a permit to construct a sewage treatment facility and a licence to discharge sewage effluent. The proposed sewage treatment facility will be designed to meet NEPA standards for effluent discharge.

Table 5.1.13: NRCA Sewage Effluent Standards

Immediate Technology Based Effluent Standards - Existing Plants Parameter Effluent Standard

BOD5 20 mg/l TSS 30 mg/l Nitrates (as Nitrogen) 30 mg/ Phosphates 10 mg/l COD 100 mg/l pH 6-9 Faecal Coliform 1000 MPN/100ml Residual Chlorine 1.5 mg/l



## **Proposed Sewage Effluent Standards – New Plants**

BOD5 20 mg/l TSS 20 mg/l Total Nitrogen 10 mg/l Phosphates 4 mg/l COD 100 mg/l pH 6-9 Faecal Coliform 1000 MPN/100ml Residual Chlorine 1.5 mg/l

## Natural Resources Conservation Authority (NRCA) Interim Sewage Effluent Irrigation Standards Parameter Standard Limit

Oil & Grease 10 mg/L Total Suspended Solids (TSS) 15 mg/L Residual Chlorine 0.5 mg/L

## **Immediate Technology Based Effluent Standards - Existing Plants Parameter Effluent Standard**

Biochemical Oxygen Demand (BOD) 15 mg/L Chemical Oxygen Demand (COD) <100 mg/L Faecal Coliform 12 MPN/100mL

### 5.1.14 Watershed Protection Act (1963)

This Act provides for the protection of watersheds and areas adjoining watersheds and promotes the conservation of water resources. The entire island however is considered to be one watershed, but for management purposes is divided into smaller units. There are 26 watershed management units declared under the Act. The Act makes provision for conservation of watersheds through the implementation of provisional improvement schemes whereby soil conservation practices are carried out on land. No regulations have ever been prepared under this Act and therefore voluntary compliance and training have been the only measures available to ensure appropriate management practices in watersheds in Jamaica.



## 5.2 National Legislation – Social Environment

#### 5.2.1 Town and Country Planning Act (1958)

Section 5 of the Town and Country Planning Act authorizes the Town and Country Planning Authority to prepare, after consultation with any local authority, the provisional development orders required for any land in the urban or rural areas, so as to control the development of land in the prescribed area. In this manner, the Authority will be able to coordinate the development of roads and public services and conserve and develop the resources in the area. Any person may, under Section 6 of the Act, object to any development order on the grounds that it is:

- Impractical and unnecessary;
- Against the interests of the economic welfare of the locality.

However, if the Minister is satisfied that the implementation of the provisional development order is likely to be in the public interest, he may, under Section 7 (2) of the Act, confirm it with or without modification by publishing a notice in the Gazette. Section 8 of the Act also gives the Minister the authority to amend a confirmed development order. Section 10 of the Act states that a development order must include:

- Clearly defined details of the area to be developed;
- Regulations regarding the development of the land in the area specified;
- Formal granting of permission for the development of land in the area.

If the provisions of section 9A of the Natural Resources Conservation Authority (NRCA) Act apply to the development, the application can only be approved by the Planning Authority after the NRCA has granted a permit for the development (Section 11 (1A)). The Authority may impose a "tree preservation order" under Section 25 of the Act if it considers it important to make provision for the preservation of trees and woodlands in the area of the development. This order may:

prohibit the cutting down, topping, lopping or willful destruction of trees;

secure the replanting of any section of the woodland area in which trees were felled during the forestry operations permitted under the order.

The tree preservation order is not applicable to the cutting down of trees which were already



dead, dying or had become dangerous and the order can take effect only after it has been confirmed by the Minister.

The Minister can, under Section 26 of the Act, make regulations to restrict and regulate the display of advertisements in any area to be developed if he considers this to be in the interest of public safety. Section 28 of the Act empowers the local authority to require the owner or occupier of land in the development area to take the steps necessary to ensure its proper maintenance.

#### 5.2.2 Land Development and Utilization Act (1966)

Under Section 3 of the Land Development and Utilization Act (1966), the Land Development and Utilization Commission is authorized to designate as agricultural land, any land which because of its "situation, character and other relevant circumstances" should be brought into use for agriculture. However, this order is not applicable to land, which has been approved under the Town and Country Planning Act for development purposes other than that of agriculture. Among the duties of the Commission outlined in Section 14 of the Act is its responsibility to ensure that agricultural land is "as far as possible, properly developed and utilized".

#### The proposed project site is zoned for industrial development.

#### 5.2.3 Public Health Act (1976)

The Public Health (Air, Soil and Water Pollution) Regulations 1976, aim at controlling, reducing, removing or preventing air, soil and water pollution in all possible forms. Under the regulations given:

- i. No individual or corporation is allowed to emit, deposit, issue or discharge into the environment from any source.
- Whoever is responsible for the accidental presence in the environment of a contaminant must advise the Environmental Control Division of the Ministry of Health and Environmental Control, without delay.
- iii. Any person or organization that conducts activities which release air contaminants such as dust and other particulates is required to institute measures to reduce or eliminate the presence of such contaminants.



iv. No industrial waste should be discharged into any water body which will result in the deterioration of the quality of the water.

#### 5.2.4 The National Solid Waste Management Authority Act (2001)

The National Solid Waste Management Authority Act (2001) is "an act to provide for the regulation and management of solid waste; to establish a body to be called the National Solid Waste Management Authority and for matters connected therewith or incidental thereto". The Solid Waste Management Authority (SWMA) is to take all steps as necessary for the effective management of solid waste in Jamaica in order to safeguard public health, ensure that waste is collected, sorted, transported, recycled, reused or disposed of, in an environmentally sound manner and to promote safety standards in relation to such waste. The SWMA also has responsibility for the promotion of public awareness of the importance of efficient solid waste management, to advise the Minister on matters of general policy and to perform other functions pertaining to solid waste management.

Solid waste management will be generated during both the construction and operation phases of the ethanol plant and will require the removal and proper disposal of vegetative matter, which is cleared for construction, construction rubble and operational wastes.

#### 5.2.5 Jamaica National Heritage Trust Act (1985)

The Jamaica National Heritage Trust Act of 1985 established the Jamaica National Heritage Trust (JNHT). The Trust's functions outlined in Section 4 include the following responsibilities:

To promote the preservation of national monuments and anything designated as protected national heritage for the benefit of the Island;

To carry out such development as it considers necessary for the preservation of any national monument or anything designated as protected national heritage;

To record any precious objects or works of art to be preserved and to identify and record any species of botanical or animal life to be protected.

Section 17 further states that it is an offence for any individual to:



willfully deface, damage or destroy any national monument or protected national heritage or to deface, damage, destroy, conceal or remove any mark affixed to a national monument or protected national heritage;

alter any national monument or mark without the written permission of the Trust;

remove or cause to be removed any national monument or protected national heritage to a place outside of Jamaica.

The JNHT has been contacted officially to advise them of the project and to determine if there are any relevant listings on their Sites and Monuments Records (Appendix XI). No written response has been received. Staff of the JNHT visited the site with members of the EIA Professional Team.

#### 5.2.6 Registration of Titles Act (1989)

The Registration of Titles Act of 1989 is the legal basis for land registration in Jamaica, which is carried out using a modified Torrens System (Centre for Property Studies, 1998). Under this system, land registration is not compulsory, although once a property is entered in the registry system the title is continued through any transfer of ownership.

#### 5.2.7 The Factories Act (1973)

Under Section 4 of the Factories Act, the Minister may make regulations generally for giving effect to the purposes of this Act, and for the purposes of ensuring the safety, health and welfare of persons who are employed in any factory or in connection with machinery, and in particular, and without prejudice to the generality of the foregoing provisions, any such regulations may provide for:

o the safe means of approach or access to, and exit from, any factory, or machinery;

o the fencing and covering of all dangerous places or machines;

o life-saving and first aid appliances;

o securing safety in connection with all operations carried on in a factory;

o securing safety in connection with the use of all engines, machinery, and mechanical

• the proper ventilation of any factory, having regard to the nature of the process carried on therein;



• the sanitation, including the provision of lavatory accommodation (having regard to the number of workers employed) at any factory;

• the provision and maintenance of appropriate facilities for the welfare of persons employed at any factory.

In Section 5 of the Act the Chief Factory Inspector may enter upon the premises and inspect the factory and machinery, at *all* reasonable times by day and night, and take materials used or samples of the products *of* such factory.

Where any accident occurs in a factory which

(a) causes loss of life to a person employed in that factory; or

(*b*) disables any such person for more than two days from earning full wages at the work at which he was employed, the manager of the factory or person having control of the machinery in such factory shall forthwith report the occurrence of such accident to the Chief Factory Inspector and in connection therewith he shall furnish such particulars as the Chief Factory Inspector in any case from time to time may require.

## The provisions as laid out under the Factories Act will be relevant to the Tank Weld Metals Ltd. and the establishment of the LPG Plant.

### 5.2.8 Jamaica's Energy Policy

The Jamaican economy is not well endowed with petroleum based energy resources and therefore, depends heavily on imports. The policy seeks to diversify Jamaica's energy base with the aim of ensuring adequate and secure energy supply for Jamaica. The Energy Policy addresses issues relating to energy sources such as petroleum, renewable and other fuels. In keeping with the Government of Jamaica's commitment to deregulate and liberalize the Jamaican economy, the involvement of the private sector on a competitive basis is chosen as the best way to modernize and expand the energy sector, so as to achieve the required growth in energy supplies and to improve efficiencies in energy production.

There are several objectives of the Energy Policy a few of which are to:

o diversify the energy base



• encourage efficiency in energy production, conversion and use with the overall objectives of reducing the energy intensity of the economy;

• complement the country's Industrial Policy recognizing the importance of energy as a critical input to industrial growth and stability;

• minimize the adverse environmental effects and pollution caused by the production, storage, transport and use of energy, and minimize environmental degradation as a result of the use of fuel wood; and

o establish an appropriate regulatory framework to protect consumers, investors and the environment.

These objectives will be achieved by creating and enabling the environment to:

• encourage private sector participation and investments through a policy of divestment and an appropriate regulatory framework conducive to new investment;

o encourage energy conservation/efficiency on the supply side as well as demand side management;

• fully protect the environment while ensuring that adequate energy supplies are available to the country and to sustain the desired rate of economic growth.

The protection of the environment is a primary objective of this Energy Policy and therefore, the environmental guidelines of the Natural Resources Conservation Authority (NRCA) relating to the energy sector will be strictly enforced.

With the establishment of the LPG Plant, Tank Weld Metal Ltd. will act in keeping with the provisions under the Energy Policy. The objectives under the policy including the encouragement of the private sector to participate in the provision of energy sources, the diversification of Jamaica's energy base and the protection of the environment are all applicable to this proposed project.



## 5.2.9 The Town and Country Planning (St. Catherine Coast) Provisional Development Order, 1964

This order is to make provision for the orderly and progressive development of the southern part of the parish of St. Catherine excluding Spanish Town but including the areas to the east, south and southeast. This will also include the whole parish coast from the Kingston and St. Andrew Corporate Area Boundary on the east to the parish of Clarendon boundary on the west. No development will be permitted which would conflict with the proposals outlined in the Order. Land use proposals are not made for the whole of the area contained within the boundary of the Order. The areas are zoned for: urban development, roads, commercial areas, beaches, seaside parks, roadside parks, areas of natural beauty and historic interest, industrial area, amenity, zoning related to use classes, public services and miscellaneous.

#### 5.2.10 South Coast Sustainable Development Master Plan

The South Coast Development Master Plan (SCSDMP), 1999 was developed to facilitate a planned approach to the expected growth in the tourism industry and to explore environmentally sustainable pathways to economic growth. The plan area runs from the east of Hellshire in St Catherine to Little London in Westmoreland, extending approximately 11km inland and offshore to a depth of 20m.

The Plan aims to provide a framework for the management of the natural and man-made environment and to achieve orderly and sustainable development of the South Coast. It includes land use designation to promote: best use and sustainable development of natural resources; protection and conservation of the terrestrial and marine environment; conservation of the cultural heritage; community development and improved health conditions; and diversification of economic activities.

The SCSDMP identified projects and programs in each of the key development sectors for the South Coast. The projects aim to address critical infrastructure and human resources constraints, as well as to secure the environmental assets of the region and promote economic growth. The projects were evaluated taking into consideration economic, social and environmental criteria, as well as consistency with the concept of sustainable development and stakeholder support.



Appropriate development of infrastructure is a prerequisite for economic growth and diversification.

The Plan envisages sustained development based on adding value to the natural and human resources of the region through the growth of community-based services. The high quality of coastal and upland landscapes; the rivers and groundwater resources; the prime agricultural land; extensive forests and wetlands; the beaches, reefs and fish nursery areas; and the distinctive cultural heritage of the region are the key environmental assets which will support sustainable growth. Building on these resources, strong protection and management of critical natural resources is at the core of the Plan's vision.

The project is consistent with the aims and objectives of bringing development to the Western Region.

#### 5.3 International Legislative and Regulatory Considerations

## **5.3.1** Cartagena Convention (Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region) (1983)

Adopted in March 1983 in Cartagena, Colombia, the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, also known as the Cartagena Convention, is the only legally binding environmental treaty for the Wider Caribbean. The Convention came into force in October 1996 as a legal instrument for the implementation of the Caribbean Action Plan and represents a commitment by the participating governments to protect, develop and manage their common waters individually and jointly.

Ratified by twenty countries, the Cartagena Convention is a framework agreement which sets out the political and legal foundations for actions to be developed. The operational Protocols, which direct these actions, are designed to address special issues and to initiate concrete actions. The Convention is currently supported by three Protocols.



These are:

• *The Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region* (The Oil Spills Protocol), which was adopted and entered into force at the same time as the Cartagena Convention;

• *The Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region* (The SPAW Protocol), which was adopted in two stages, the text in January, 1990 and its Annexes in June, 1991. The Protocol entered into force in 2000:

• *The Protocol Concerning Pollution from Land-based Sources and Activities in the Wider Caribbean Region* (LBS Protocol), which was adopted in October, 1999.

## 5.3.2 Convention on Biological Diversity

The objectives of the Convention on Biological Diversity are "the conservation of biological diversity, sustainable use of its components and the fair equitable sharing of the benefits arising out of the utilization of genetic resources". This is the first global, comprehensive agreement which has as its focus all aspects of biological diversity: genetic resources, species and ecosystems. The Convention acknowledges that the "conservation of biological diversity is a common concern of humankind and an integral part of the development process". In order to achieve its goals, the signatories are required to:

- Develop plans for protecting habitat and species.
- Provide funds and technology to help developing countries provide protection.
- Ensure commercial access to biological resources for development.
- Share revenues fairly among source countries and developers.
- Establish safe regulations and liability for risks associated with biotechnology development.

Jamaica's Green Paper Number 3/01, entitled *Towards a National Strategy and Action Plan on Biological Diversity in Jamaica*, speaks to Jamaica's continuing commitment to its obligations as a signatory to the Convention.



## 6.0 METHODOLOGY AND APPROACH

### 6.1 General Approach

A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation and analysis of baseline data, determination of potential impacts and recommendation of mitigation measures. The members of the EIA Professional Team are given in Appendix VI. An interactive approach among the environmental team members and other project professionals was adopted and was facilitated by team meetings as required.

The team utilized the Charette-style approach to data gathering, analysis, and presentation whereby team members conducted the reconnaissance investigations together to determine the critical elements for analysis. Team meetings were held to discuss the progress of investigations and analyses and facilitate integration of data toward an understanding of the systems at work in both the natural and built environment.

Baseline data for the study area was generated using a combination of:

- Field studies
- Analysis of maps, plans, aerial photos
- Review of engineer's reports and drawings
- Review of background project documents
- Structured Interviews
- Social Surveys
- Internet Searches
- Agency requests and document searches

Written environmental searches were undertaken through the WRA, NWC and ODPEM. In addition website searches of the National Environment and Planning Agency (NEPA), Meteorological Service of Jamaica, and NWC was undertaken to obtain any further relevant information.



## 6.2 Physical Environment

### 6.2.1 Site and Situation

A definition of the study area was determined based on the drainage pattern into and out of the site, the area to be traversed by the pipeline and reconnaissance of the communities within a sphere of influence (two Kilometer radius). Baseline data collection on the study area was conducted and included climate, hydrology, geology, noise, air quality, traffic, topography, socioeconomic, flora and fauna.

All issues material to the site, such as rainfall, groundwater pollution incidents, flooding incidents, and other critical facilities were reviewed within a 3 km radius of the site.

The available data that was referenced for this study is listed below:.

- Satellite Photographs taken from Google Earth's website.
- . The 1:12,500 topographic sheet published by the Jamaica Survey Department.
- Water Resources Authority (WRA) Data Request Rio Bueno
- Hydro-stratigraphic Map of Rio Boueno
- Office of the Disaster Preparedness and Emergency Management (ODPEM).
- National Works Agency
- Jamaica Meteorological Office
- Industrial Gases Limited
- Internet searches of NEPA and other websites.

Data was garnered from field, aerial photographs other relevant reports held within various governmental and non-governmental organizations.

Implementation of the terms of reference of this study involved execution of the following tasks:

 Review of the Project Description to understand the nature and components of the structures and activities of the proposed development, as well as examination of the Terms of Reference with a view to identifying those aspects of the Terms of Reference that were to be addressed by the Hydrology Component of the EIA;



 (ii) Collation of available maps, plans, reports and data of relevance to the project and their review by desk study to understand the hydrological framework and to guide field investigation of the development site and its environs;

(iii) Field reconnaissance of the development site and its environs to confirm the desk study interpretation and collect such additional data as was possible, including on-site discussions with the Project Engineer

#### 6.2.2 Climate

The climate information such as rainfall was obtained from the National Meteorological Services.

#### 6.2.3 Hydrology

The hydrological assessment was made using a combination of data source and calculation models such as the WinTR-55; which is a single-event, rainfall-runoff small watershed hydrologic model. The model generates hydrographs from both urban and agricultural areas and at selected points along the stream system. Rainfall Intensity values were obtained from the Jamaica Meteorological Office.

## 6.2.4 Geology, Topography

Data was generated from published geological information as well as assessment of the site through field visits, previous site reports and intrusive site reports done and current public domain reports held within various governmental and non-governmental organizations

#### 6.2.5 Drainage

Data was collected, reviewed and analyzed to provide analysis of the change in drainage patterns, issues related to potential for ponding, and any history of flooding on the site. This included:

a) Drainage for the site during construction to include mitigation for sedimentation to the aquatic environment,

b) Drainage for the site during operation, to include mitigation for sedimentation to the aquatic environment and flooding incidences.



#### 6.2.6 Storm water runoff

Data was collected, reviewed and analyzed to effect discussion of the proposed development's impact on runoff and the consequential flooding potential.

Comment on the potential for increased changes to flows and channel shifting and to the coastal environment as the available data provides. Other effects of storm water, such as soil erosion especially during the pipe laying activities will be discussed and mitigation measures to reduce same.

### 6.2.7 Coastal and Marine Ecosystem

Assessment of the pipeline construction activities and any influence on the existing marine environment. Also based on prediction of increased runoff, examine effect on sedimentation of marine environment.

#### 6.2.8 Noise & Air Quality

The approach taken in determining existing condition on the site as it relates noise and air was to conduct a search for available historic data. The search came up with no available data for that site. Measurements were made on site using standard calibrated instruments

#### 6.2.9 Solid waste

The availability of appropriate and approved solid waste facility was examined.

## 6.3 Biological Environment

The approach taken for the study was to do a detailed walk through of the project site to ensure a proper coverage of all possible Fauna, even though the site is very disturbed and would not likely support any significant fauna. Detailed notes and photographs were taken during the survey..



## 6.3.1 Terrestrial Flora

The project site is highly disturbed and does not exhibit a great deal of biodiversity. The sparse vegetation indicates that the site may have been cleared in the past and is only partially recolonized by a few naturally occurring species. A detailed walk through the site was done to determine the presence of any flora of significance.

## 6.3.2 Terrestrial Fauna

A detailed walk through the site was done to determine the presence of any fauna of significance. The non-existence of any significant fauna on the site is to be expected as the absence of any significant vegetation and frequent movement of heavy equipment for the storage of construction material makes the site undesirable as an habitat for fauna.

### 6.4 Socio-economic & Cultural Environment

To determine the cultural and social factors associated with the construction of the proposed LPG Facility, members of the communities impacted by it were interviewed and a review of economic and social literature was conducted. These were undertaken to ascertain information to satisfy the following factors as outlined in the approved terms of reference provided by NEPA.

- Present and projected population
- Present and proposed land use
- Planned developmental activities
- Identification of private land acquisition
- Local economic benefits and cost to communities
- Implication of the project during the construction phase for resident commuter travel and travel times
- Accommodation for construction workers
- Access to, and delivery of health, education and social services
- Recreation
- Public health and safety
- Historical importance of the area
- Public Perception



• Project awareness and acceptance

## 6.5 Manmade & Other Hazards

Review of all historical data available relating to hazards associated with projects of this nature, both locally and abroad. Incidences that may be peculiar to the project site was also researched. Consideration was given to possible occurrences both during the construction and the operation phases.

### 6.6 Traffic Assessment

The physical situation associated with the movement of traffic in the vicinity of the project site was observed and noted, along with the road conditions in the area. The volume and type of vehicular traffic traversing the roads adjacent to the site was measured. The data gathered was used to estimate impact along with the peculiar situation associated with the location.



## 7.0 THE EXISTING ENVIRONMENT

#### 7.1 The Physical Environment

#### 7.1.1 Site and Situation

Tank-Weld proposes to construct a Liquid Petroleum Gas (LPG) Facility on a 1.07 hectare (2.64 acre) site at Holland Hill above the town of Rio Bueno, in the parish of Trelawny. The approximate location of the site is shown in **Figure 7-1**.

#### Figure 7-1: LOCATION OF PROPOSED LPG FACILITIES IN RIO BUENO



The main components of the proposed LPG facilities are as follows: -

• Port facilities in the Rio Bueno Harbour to receive the LPG from marine tankers, which is already being constructed and is outside the Terms of Reference of this assignment;



- A Product Storage and Loading Terminal at Holland Hill;
- A buried, 204mm (8inch) ID Product Receipt Pipeline linking the Port to the Product Storage and Loading Terminal;
- Water Storage Tank with a holding capacity of 200,000 imperial gallons, for purposes of fire-fighting, and
- A Sewage Treatment Facility incorporating a Bio-digester Septic Tank, Reed Beds, Chlorination chamber and disposal by re-use of the treated effluent for on-site irrigation.

The location of the port facilities, the Storage/Loading Terminal and the alignment of the transmission pipeline are also shown on **Figure 1-1**. The Water Storage Tank and Sewage Treatment Plant are to be sited within the boundary of the Storage/Loading Terminal.

The respective data sources are referenced and the analytical methodologies used described in the relevant sections of the report.

## 7.1.2 Climate/Rainfall

Rainfall depth for storms of 24-hour duration with return periods form 2 to 100 years obtained from the Jamaica Meteorological Office for rain gauges located in the parish of Trelawny are given in **Table 7-1**.

The rain gauge at Braco was the closest to Holland Hill and adjudged to be representative of that area.

Table 3-1:	24-HOUR AT BRAC	FOR VARIO	DUS RETU VNY	RN PERIOI	)\$	
 Rainfall			Return Pe	riod (year)		
Depth	2	5	10	25	50	100
mm	101	146	186	237	274	312
 inch	3.46	5.00	6.37	8.12	9.39	10.69



The Meteorological Office has also developed a series of 6 No. typical time distributions of the 24 hour rainfall. These are shown in **Table 7-2**. Distribution C which was recommended by the Flood Plain Mapping Project was adopted for these investigations. The highest rainfall intensity indicated by this distribution occurs between hours 6 to 7, was used in the computations.

Table 3-2:	TYPICAL TI	ME DISTRIB	UTION FOR:	24-HOUR RA	INFALL	
	IN JAMAICA	1				
Hour	Distribution	Distribution	Distribution	Distribution	Distribution	Distribution
	A	В	С	D	E	F
0	0.000	0.000	0.000	0.000	0.000	0.000
1	0.066	0.040	0.023	0.006	0.000	0.000
2	0.130	0.080	0.060	0.042	0.010	0.003
3	0.203	0.110	0.100	0.078	0.033	0.010
4	0.233	0.180	0.143	0.113	0.086	0.032
5	0.353	0.263	0.230	0.186	0.123	0.053
6	0.700	0.263	0.230	0.186	0.123	0.070
7	0.803	0.553	0.376	0.333	0.273	0.180
8	0.843	0.576	0.406	0.350	0.310	0.233
9	0.850	0.603	0.466	0.410	0.366	0.240
10	0.850	0.640	0.546	0.500	0.456	0.280
11	0.870	0.673	0.603	0.630	0.486	0.320
12	0.976	0.796	0.630	0.630	0.500	0.368
13	0.996	0.836	0.696	0.633	0.516	0.398
14	1.000	0.890	0.766	0.663	0.516	0.416
15	1.000	0.923	0.813	0.706	0.583	0.478
16	1.000	0.946	0.830	0.733	0.643	0.513
17	1.000	0.973	0.850	0.773	0.680	0.543
18	1.000	0.986	0.910	0.836	0.733	0.560
19	1.000	0.986	0.946	0.876	0.796	0.603
20	1.000	0.993	0.973	0.900	0.830	0.663
21	1.000	0.996	0.983	0.950	0.916	0.860
22	1.000	1.000	0.993	0.980	0.970	0.880
23	1.000	1.000	1.000	0.993	0.990	0.913
24	1.000	1.000	1.000	1.000	1.000	1.000



## 7.1.3 Hydrology

### 7.1.3.1 Hydro-stratigraphy

Two hydro-stratigraphic units are of direct relevance to the project – the Rio Bueno alluvium aquiclude and the Coastal aquiclude mapped by the Mines & Geology Division (1974) as Quaternary Alluvium and Coastal Group, respectively. The Product Receipt Pipeline is to be constructed within reclaimed coastal wetland developed on the alluvium aquifer as it traverses the Rio Bueno port and through Coastal aquiclude up to Holland Hill. The LPG Storage/Loading Terminal is to be constructed on Coastal aquiclude at Holland Hill. A hydro-stratigraphic map showing outcrops of these aquicludes, the alignment of the pipeline and the location of the LPG Storage/Loading Facility is set out in **Figure 7.2**. E-W and N-S aligned hydrogeological cross sections given as **Figure 7-3**, illustrate the stratigraphical and structural relations between the hydro-stratigraphic units.







(a) Rio Bueno Alluvium Aquiclude

The Rio Bueno alluvium aquiclude was deposited by the Rio Bueno River, forming a N-S aligned coastal flood plain occupying an area of about  $0.8 \text{km}^2$  (1.25 x 0.63 km) at the mouth of the river.

The Rio Bueno alluvium is composed primarily of limestone sand and gravel in a matrix of terrestrial clays, with inter-bedded layers of peat. Its thickness has not been established, but coastal alluviums in St. Mary exceed 30m (100 ft) in thickness. The Rio Bueno alluvium is underlain by Coastal aquiclude at depth.

Although there is expected to be a perennial water table within the alluvium with elevations approximating the river stage, the Bengal Farm has not developed wells within the Rio Bueno alluvium to water their livestock (dairy and beef cattle), implying that it is a low permeability alluvium – hence its classification as an aquiclude i.e. a geological strata that does not support economic yield from springs and/or wells.



#### (b) Coastal Aquiclude

In the Rio Bueno area the Coastal aquiclude is composed primarily of limestone reef rubble and blocks of chalk deposited down slope of the Montpelier hinterland, in the late Miocene (Mines & Geology, 1974). Exposures in the recent road cuts along the North Coast Highway in the vicinity of Rio Bueno and as Holland Hill is approached, shows relatively thin and discontinuous bauxitic soils on the surface and minor karstification throughout the depth of the limestone exposure. The absence of karstification in the limestone is a clear indication of relatively low permeability and its classification as an aquiclude. The main water resources product from Coastal aquiclude is surface runoff.

There is no known spring or well located within Rio Bueno area to indicate the presence of a water table. If present, fresh groundwater would most likely occur as a thin lens floating on seawater at depth, with little if any potential to serve as a source for water supply.

#### 7.1.3.2 Surface water Hydrology

The Rio Bueno (river) is a perennial stream which is the main surface drain of the Dry Harbour Mountains limestone aquifer. It rises as a large karstic resurgence known as the Dornock bluehole at a geological contact between limestone aquiclude and limestone aquifer, some 8kms inland, just north of Stewart Town. Its flow regime is characterised by relatively high dry season flows and low broad wet season peaks. The river has a reliable yield of 246,240m<sup>3</sup>/d (54.2 migd) sustained entirely by groundwater discharge from the limestone aquifer. Contribution from the slopes of the Rio Bueno (river) is very small.

The raised reef terraces are drained by shallow, dry, limestone gullies that carry flow for a few hours after significant rainfall events.

#### 7.1.3.3 Groundwater Hydrology

There are no significant fresh groundwater resources within the Rio Bueno area. A conclusion which is consistent with the hydraulic characterization of the relevant geological formations as aquicludes, the absence of surface springs, submarine springs and/or wells.



#### 7.1.4 Geology, Topography

The Rio Bueno project area consists of the swampy, coastal flood plain of the Rio Bueno and the adjoining limestone upland to the NW, including the Rio Bueno town and the area of Holland Hill, as shown in **Figure 7.4** 



Figure 7.4: GEOMORPHOLOGICAL SUB-DIVISIONS OF THE RIO BUENO PROJECT AREA

The valley occupied by the Rio Bueno flood plain forms a depression in coastal uplands that extends almost to the coastline. The 1:12,500 topographic sheet published by the Jamaica Survey Department indicated ground surface elevations generally less than 8m (25 ft) amsl. The very steep valley walls suggest the influence of faulting, but this is not supported by the geological map of the area. The Rio Bueno port development is located at the north-western corner of the flood plain, on the left bank of the river.



To the west of the Rio Bueno flood plain, the ground surface rises steeply to an elevation of about 122m (400 ft) amsl in the Holland Hill area. This upland area is made up of two distinct terraces, which roughly parallels the coastline to the north, believed to be formed by raised reefs. The inland limit of the lower terrace is marked by a 15m (50 ft) high cliff line at an elevation of 38m (125 ft) and the upper terrace by a similar 15m (50 ft) high cliff line at 76m (250 ft). The upper terrace has a N-S width of about 0.6 km, gradually sloping north through that distance down to the cliff line at 38m (125 ft), whereas that of the lower terrace slopes through 0.3 km distance down to the coastline.

The proposed alignment of the Product Receipt Pipeline leads from the port, south along the western edge of the Rio Bueno flood plain to a juncture with the North Coast Highway and then sharply to the NW up-slope to Holland Hill paralleling the northern edge of the North Coast Highway. The LPG Storage/Loading Terminal is to be located on the upper terrace.

### 7.1.5 Drainage

### 7.1.5.1 Catchment Area

The proposed LPG Storage/Loading Terminal is situated at Holland Hill within a 63.9ha (157.7ac) surface catchment shown in **Figure 7.5**. The boundaries of the catchment area were delineated using the topographic map of the area and its environs at a scale of 1:12,500 published by the Jamaica Survey Department.



#### Figure 7-5: LOCATION OF THE HOLLAND HILL CATCHMENT TRELAWNY



The catchment boundaries and flow paths determined from the review of the topography, were confirmed during field reconnaissance of the area carried out on 2008 March 14. The flow directions are indicated by arrows which point in the direction of flow and the approximate location of the LPG Storage/Loading Terminal shown as a hatched box also on **Figure 7.5**.

## 7.1.5.2 Drainage Patterns

Natural surface runoff generated on the catchment is conveyed by a seasonal gully which becomes active only in response to rainfall of sufficient magnitude to generate runoff. Flow is in a southwest to northeast direction and is discharged into the sea about 300m (1,000 ft) north of the town of Rio Bueno.



The natural drainage pattern of the catchment has been significantly (and permanently) altered by the recent construction of the Rio Bueno by-pass section of the North Coast Highway. The approximate alignment of the highway within the catchment is also shown in **Figure 7.5**. This elevated roadway has divided the catchment into two sub-areas. The area to the south of the highway is designated Area A and that located to its north - Area B.

The North Coast Highway functions as a barrier to flow from Area A. Runoff is now discharged via an earthen road-side drain along the southern side of the highway. There is a topographic high within this drain near to the parochial road leading south, such that discharge via the road-side drain is to the southeast on the one hand and to the northwest on the other.

A similar drain is located on the northern side of the highway and disposes of flow generated on the highway pavement itself.

Note that peak runoff generated within Area A would affect the site of the LPG Storage/Loading Terminal only in the event that its magnitude exceeded the capacity of the southern road-side drain, over-topped the elevated pavement of the highway and also exceeded the carrying capacity of the northern road-side drain.

The drainage pattern within the site of the LPG Storage/Loading Terminal itself was determined using the spot elevation data generated by a survey plan of the site. The contours developed from these measurements together with the flow directions are shown in **Figure 7.6**. Note that flow from the site is to the northeast toward Lot #1 currently occupied by Tankweld Ltd. and not toward the northern road-side drain, located at the property's southern boundary. The topography suggested that surface runoff on the site will occur primarily as sheet flow given the absence of a defined surface channel.



## Figure 7.6: PATTERN OF SURFACE DRAINAGE FROM THE SITE OF THE LPG TERMINAL, HOLLAND HILL



## 7.1.5.3 Adequacy of Southern Road-side Drain

The flow patterns described in Section 3.2 indicated that surface runoff generated within the Area A was likely to impact on the plant site in the event that the highway drain did not have sufficient capacity and the highway was overtopped. The capacity of the drain to convey the peak flows was determined using Manning's equation for uniform flow. It is given as: -

$$Q = (1.49 A R^{2/3} S^{1/2})/n$$
 (1)

where: Q is discharge in cfs,

A is flow area of the channel section in square feet,

R is the hydraulic radius,

S is the channel slope, and,

n is a roughness coefficient dependent on the channel properties.



Equation may be rearranged as

AR 
$$^{2/3} = nQ/1.49S^{1/2}$$
 (2)

The expression  $AR^{2/3}$  is known as the section factor for uniform flow computation. If the parameters on the right hand side of Equation 2 are known then the section factor can be determined. The relationship between the station factor and the depth of flow in a channel with a specified geometry is given in the nomogram presented as **Figure 7.7**.





Determination of each of the parameters used to compute the station factor is discussed in turn below. A roughness coefficient (n) of 0.033 was adopted for this drain. It is the value assigned to straight excavated earth channels containing grass/weeds. The channel slope was estimated from survey measurements of the ground surface along the highway alignment, shown in **Figure 7.8** for ease of reference. A channel slope of 0.0209 was determined. Field measurement of the dimensions of the drain indicated that it is approximately trapezoidal in geometry with a bottom width of 3 feet and side slope of 1:1.5. The maximum allowable depth of flow within the drain i.e. without breaching the road surface is about 3.3 feet.






The flow depths calculated from the foregoing data for the peak discharges determined for the 25, 50 and 100 year storms are as set out in **Table 7.3** below. These data indicated that the roadside drain was of sufficient capacity to dispose of the peak flows generated in Area A.

Table 3-4:	FLOW DEPTHS IN THE SOUTHERN				
	ROAD-SIDE DRAIN OF THE NORTH				
	COAST HIGHWAY AT HOLLAND HILL				
	Re	eturn Period (ye	ar)		
Parameter					
	25	50	100		
Dischage (cfs)	14.40	16.80	18.90		
 Station Factor	2.20	2.57	2.89		
Flow depth (ft)	0.78	0.82	1.05		

## 7.1.5.4 Flooding Potential

The potential for flooding of the site of the LPG Terminal was virtually eliminated by the construction of the North Coast Highway. Surface Runoff generated on the site is readily disposed of by sheet flow down slope over relatively even surface with no significant surface depressions to facilitate ponding and/or flooding.

However, there is anecdotal evidence that surface runoff from the site of the LPG Terminal could contribute to flooding of Lot #1, presently used as a works yard by Tankweld Ltd. The capacity of the shallow depression at Lot #1 is readily exceeded and sheet flow continues down slope along the parochial road into and through the town of Rio Bueno to the sea. There was no evidence of major scouring or gullying resulting from pre-construction runoff.



The post-construction increase in surface runoff is expected to be less than 5%, an insignificant increase and one that could not justify mitigation measures, particularly in the context of there having been a major reduction in storm flows occasioned by the construction of the North Coast Highway.

## 7.1.6 Storm water runoff

#### 7.1.6.1 Determination of Peak Discharges.

#### (a) Computational Method

Peak runoff was estimated using the Rational Method. It is an empirical method applicable to small catchments with simple drainage patterns in which the time of concentration is less than the duration of the storm, causing the runoff. Peak runoff  $(Q_p)$  is given by the model given below: -

 $Q_p = CIA$ ,

Where:

Q<sub>p</sub> is peak discharge in cfs,

C is a dimensionless runoff coefficient between 0 and 1.0, dependent on the catchment characteristics;

I is rainfall intensity in inches/hour, and

A is the catchment area in acres.

#### (b) Data Requirements

The basic data requirements for input into the model and their determination are described below: -

## (i) Runoff Coefficient

The values of C used in the computations were obtained from published literature (Chow 1964). Area A was adjudged to be most akin to woodland, with above average infiltration rate, and a



coefficient of 0.1 assigned accordingly. Area B most closely approximated residential area having coefficients ranging from 0.30 to 0.50. The most conservative value of 0.50 was adopted for this area. A "C value" of 0.30 was adopted for the site of the LPG Terminal in its natural state. This is the maximum value assigned to unimproved areas. It was conservatively assumed that the entire site of the LPG Terminal would be covered with buildings or pavement when constructed, and a "C value" of 1.0 assigned for the computation of the post-project flows.

#### (ii) Catchment Area

The areal extent of Area A, Area B and the project site were determined to be 105.5, 52.2 and 2.6 acres, respectively. Determinations were made using a planometer.

#### (c) Peak Discharge

The estimates of peak flows from using the data presented in Section 3.3(b) above produced the peak discharge values set out in **Table 7.4**. Note that the impact of the constructed project on runoff from Area B was of the order of 5% increase in peak discharge rate. This result is consistent with the relatively small size of the project site in relation to that of Area B.

Table 3-3:	COMPUTAT	ION OF PEA HILL) CATC	AK DISCHARG HMENT	SES FOR TH	E PROJEC	:т	
				Return Period (year)			
Catchment Area	Scenario	Parameter	Unit	25	50	100	
		P <sub>24</sub>	in	9.33	10.88	12.2	
		i	in/hr	1.36	1.59	1.7	
A	Pre-project	А	acre	105.5	105.5	105.9	
		С		0.1	0.1	0.1	
		Qp	cfs	14.4	16.8	18.9	
		P <sub>24</sub>	in	9.33	10.88	12.20	
		i	in/hr	1.36	1.59	1.7	
В	Pre-project	Å	acre	52.2	52.2	52.3	
		С		0.5	0.5	0.9	
		Qp	cfs	35.6	41.5	46.0	
		Pad	in	9 33	10.88	12.2	
		· 24	in/hr	1 36	1.59	1.7	
В	Post-project	Å	acre	52.2	52.2	52 1	
		C*		0.52	0.52	0.5	
		Q <sub>p</sub>	cfs	37.3	43.5	49.	
	C* =	0.52	area weighted	l runoff coeffi	cient		



## 7.1.7 Coastal and Marine Ecosystem

The proposed project will not be a significant charge on coastal and marine ecosystem. In the construction phase, the pipeline will be laid on the existing pier infrastructure and therefore will not interfere with the marine environment. During operations the berthing of the ships could have an impact, but the number of visit for delivery of LPG is not anticipated to be more than once per month, which should not have a significant impact.

As mentioned in in section (7.1.5.4) the development should not result in increased runoff to the marine environment and will therefore have no significant impact.

#### 7.1.8 Air Quality

Respirable particulate matter (PM<sub>10</sub>) as measured at the site was low (56 -  $153\mu g/m_3$ ). This compares favorable to the NRCA 24hr standard of  $150\mu g/m_3$ . The higher readings were associated with windy gust that generated high levels of particulate air pollution from the material stockpiled on site.

During construction there is the potential for substantial amount of fugitive dust formation, due to the earth movements involved in the grading of the site and the digging of trench for laying the pipeline. Although temporary, it may be a significant nuisance and will warrant appropriate mitigation measures to minimize the impact.

#### 7.1.9 Noise

No noise data were available for the site. Measurement of noise level was taken at approximately 50 meters from the highway (the centre of the site). Average noise levels were between 46dBA and 67dBA, which is generally within the National Environmental Planning Agency daytime guidelines of 65 dBA for residential areas and the World Health Organization guidelines of 55 dBA (serious annoyance). The higher values all coincided with the passage of heavy vehicles on the highway.



# 7.1.10 Solid Waste

During construction any solid waste generated will be disposed of at an approved solid waste disposal site. The operations will not routinely produce solid waste, except for the regular domestic waste generated by the (10 - 14) worker and visitors. Such garbage will be stored in standard skips, and removal will be contracted to Northern or Western Parks and Markets, whichever has jurisdiction

# 7.2 Biological Environment

The project site is highly disturbed and does not exhibit a great deal of biodiversity. The sparse vegetation indicates that the site may have been cleared in the past and is only partially recolonized by a few naturally occurring species. Shallow soil and the storage and stockpiling of material on the site (Fig. 7.9), seems to have prevented many other invasive species from occupying the site after it had initially been cleared.



Plate 7.1: Site being used to stockpile construction material



# 7.2.1 Terrestrial Flora

The southwestern section of the site had sparsely regenerated vegetation of grass and a few shrub (Figure 7.10). No species of conservation significance was present on the site.



Plate 7.2: Grass and a few shrubs at southwestern section of site

There was only one tree observed on the site, and that was a mango tree (*Mangifera Indica*) (Figure 3).



Plate 7.3: Mango Tree (Mangifera Indica)



The field assessment indicated that there was no significant flora associated with

the site and therefore clearing of the site for this development will not significantly affect the flora biodiversity.

# 7.2.2 Terrestrial Fauna

# 7.2.2.1 Butterflies

Three species of butterflies were observed. These are listed below and the number of each specie indicated.

- Little Sulphur (*Eurema elthea*) 5
- (Catopsila Argante Phoebis) 2
- (Anortia jatrophre jamaicensis) 1



Plate 7.4(*Catopsila Argante Phoebis*)



Plate 7.5(Anortia jatrophre jamaicensis)

# 7.2.2.2 Avialfauna

No birds were observed on the site; however two species were seen flying in the vicinity of the site. These were:

- Cattle Egret (*Bubulcus ibis*) 2
- John Crow (*Cathartes aura*) 1



No mammals, reptiles or other form of fauna was observed except for a few grasshoppers. The non-existence of any significant fauna on the site is to be expected as the absence of any significant vegetation and frequent movement of heavy equipment for the storage of construction material makes the site undesirable as an habitat for fauna.

# 7.3 Socio Economic and Cultural Environment

# 7.3.1 Survey Findings

Sample size: 69

Gender Composition: 50% female; 50% male

Age Distribution of Respondents:

- 13.2% 25 years and under
- ◆ 42.6% between ages of 26-39 years
- ◆ 11.8% between 40 65 years
- ◆ 32.4% over 65 years

Employment Status:

- Employed 39.1%
- Unemployed 26.1%
- Self employed 34.8%

No. Persons in Household:

- ◆ 1 3 persons 53.6%
- ◆ 4 8 persons 44.9%
- ◆ 9 and over 1.4%

Head of Household:

• Male - 65.6%



• Female – 34.4%

Age Distribution of Household:

Of the 68 persons interviewed the majority of the households were male headed with the average age of family members distributed as follows:

- ◆ 0 17 yrs. 34%
- ◆ 18 35 yrs. 33%
- ◆ 36 65 yrs. 30%
- ◆ 66+ yrs. 2%

Main Occupation:

- Farming & agro- processing 6%
- Small business (employs 1-10 persons) 15%
- Large (employs over 10 persons) 3%
- Clerical, Admin, teacher, nurse, security personnel 10%
- Self employed, Housewife 8%
- Domestic helper, Tradesman, labourer, fisherman, 38%

## Major Animals:

- ◆ Goat 31.3%
- Pigs 31.3%
- ◆ Chicken 37.5%

Major Crops:

- ◆ Vegetable 50%
- Tubers 18.2%
- Fruits 27.3%
- Others 4.5%

Idle and under-utilized Land in Community:

◆ Too much – 30.6%



- Not much 38.7
- ◆ No 19.4%
- Don't know 11.3%

Awareness of Petroleum Facility:

- ◆ Yes 65.7%
- ◆ No 34.3%

Awareness of Planned Development:

- ◆ Yes 48.4%
- ◆ No 51.6%

Project's disruptiveness during construction phase:

- Disruptive 32.3%
- Not disruptive 38.5%
- ◆ Don't know 29.2%

Project's Effect on Community:

- Provide jobs 95.5% 'yes'
- Attract others to live/work in community 87.3% 'yes'
- Destroy natural environment 74.5% said 'no'; 25.4% 'yes'
- Damage farmland 85.5% 'no'
- Cause flooding 88.9% 'no'; 11.1% 'no'
- Have no significant impact 35.5% 'yes'; 64.5% 'no'
- Create dust nuisance during construction phase 78.5% 'yes'; 21.5% 'no'

Sanitary Convenience (sewage):

- ◆ Pit latrine 25.8%
- Sewage system 46.8%
- ◆ Soak-away pit 25.8%
- ◆ None 1.5%



Garbage Disposal:

# Some who burn also burry?

- Burn 31.8%
- Burry 4.5%
- ◆ Collected 56.1%
- Stockpile on land 7.6%

Awareness of historical place(s) in community:

- Yes 50.9% Fort near to Rio Bueno Primary School; Baptist Church near the square; the Davis Building in the square; first hotel in Jamaica, along the main road Level Bottom community; Rio Bueno River, discovered by Columbus;
- ◆ No 49.1%

Participant being member of an organization:

- Yes 59.7% Church ctc. Pastor Campbell 569-2899; Mr. George Campbell 504-3902; Father Alvin Hall Anglican Church; Debbian 471-4192; Coach Rio Bueno Football team Wesley Clarke;
- ◆ No 40.3%

Level Bottom community has no running water.

# 7.3.2 Analysis of Findings

To sensitize the community about the project and to poll their views a survey was conducted by the project consultant – EnviroPlanners Limited. A total of 69 persons were interviewed in and around the Rio Bueno community, located in the parish of Trelawny. The communities polled consisted primarily of informal residential settlements, interspersed in parts with small businesses. Participants interviewed were from communities that would be directly impacted by the project.



# 7.3.2.1 Gender Distribution:

The gender distribution was equal between the sexes -50% male and 50% female. 66% of the households had males as their head, with 54% consisting of 1-3 persons per household and 45% comprising of 4 - 8 persons.

# 7.3.2.2 Age Distribution:

The ages of persons who participated in the survey are as follows:

- 13.2% 25 years and under
- 42.6% between ages of 26-39 years
- ◆ 11.8% between 40 65 years
- 32.4% over 65 years

It should be noted that 42.6% of the persons polled were within the ages of 26 to 39 years of age and 32.4% over 65 years. This is indicative that the vast majority of those polled were of working age.

The communities polled have a young population with 34% being 17 years or under and only 2% in the 66 and over age group. Of the 69 persons interviewed the majority of the households were male headed with the average age of their family members distributed as follows:

- ◆ 0 17 yrs. 34%
- ◆ 18 35 yrs. 33%
- ◆ 36 65 yrs. 30%
- ◆ 66+ yrs. 2%

# 7.3.2.3 Employment

Employment levels in the area is high with a total of 74% of the persons interviewed employed by another party or self employed. The percentage distribution follows:

- Employed 39.1%
- Unemployed 26.1%



# • Self employed – 34.8%

The survey revealed that the main occupations for the Rio Bueno community were distributed as follows:

- 6% Farming & agro- processing
- 15% Small business operators (employs 1-10 persons)
- 3% Large business operator (employs over 10 persons)
- 10% Clerical, Admin, teacher, nurse, security personnel
- 8% Self employed, housewife
- 38% Domestic helper, tradesman, labourer, fisherman.

Residents were primarily small farmers who engaged in the rearing of domestic animals and the growing of vegetables. The major animals reared are goats -31.3%, pigs -31.3% and chickens -37.5%. The major crops grown are vegetables -50%, tubers -18.2% and fruits -27.3%.

#### 7.3.2.4 Waste Disposal:

There was a mixture of soak-away pits, water based sewage system and pit latrines. In instances where soak away pits were constructed after the pit latrines, householders still maintained their pit latrines. The most used form was that of water based sewage system (flush toilets) which accounted for46.8%. The percentage distribution was as follows:

#### Sewage:

- ◆ Pit latrine 25.8%
- Sewage system 46.8%
- ◆ Soak-away pit 25.8%
- ◆ None 1.5%



## **Garbage Disposal:**

Some Rio Bueno residents who disposed of their garbage through burning also buried it. The most used form of garbage disposal was 56.1% followed by 31.8%. Percentage distribution follows:

- Burn 31.8%
- ◆ Burry 4.5%
- ◆ Collected 56.1%
- Stockpile on land 7.6%

# 7.3.2.5 Land Utilization

39% felt that not much of the land in the area was idle or under-utilized while 31% felt that too much was under-utilized. 19.4% felt that there were no idle lands while 11% was unaware of the status of land utilization.

Awareness of Planned Developments and Historical Sites in the area:

48.4% of the persons polled were aware of planned developments for the area while 51.6% were unaware. Some of these persons included the proposed Petroleum Facility as part of the planned development for the area. Others who did not state conclusively what the planned developments for the area were, alluded to tourism development and spin-offs resulting from the newly constructed highway.

50.9% were aware of places of historical importance within the Rio Bueno area and 49.1% were unaware. Some places of significance from the residents perspective were the Fort near to Rio Bueno Primary School; the Baptist Church near the square; the Davis Building in the square; and other historical information that were not directly tied to any particular places but contributed to the significance of the area from a tourism perspective e.g. proximity to Discovery Bay – place discovered by Christopher Columbus and Look Out – a secluded beach with a scenic view of the Rio Bueno coastline.



Awareness of Petroleum Facility: 65.7% of the persons polled were aware of this project – the Petroleum Facility while 34.3% were not. As such EnviroPlanners will embark on a public sensitization campaign to sensitize residents of the communities to be impacted by the project, ensuring that there concerns are adequately addressed and to minimize or remove any adverse impact it could have on the environment.

Project's disruptiveness during construction phase:

32.3% felt that the project would be disruptive during the construction phase; 38.5% felt that it would not be disruptive and 29.2% said that they did not know and as such could not comment. The disruption was tied to dust nuisance during the construction phase.

# 7.3.2.6 Project's Effect on Community

The majority of the residents are looking forward to the project and see it as a means for increasing the socio-economic quality of their lives. Some are currently employed but see the project as enhancing current inflows or providing employment for others.

Survey findings revealed that residents of Rio Bueno hold the following views about the project:

- 95.5% project will provide jobs
- 87.3% project will attract others to live/work in community
- 74.5% project will not destroy natural environment
- 25.4% project will destroy natural environment
- 85.5% project will not damage farmland
- 11.1% will cause flooding
- 88.9% project will not cause or contribute to flooding
- 35,5% project will have significant impact on environment
- 64.5% project will have no significant impact on the environment.
- 78.5% project will create/contribute dust nuisance during construction phase
- 21.5% project will not create/contribute to dust nuisance during the construction phase.

Factors with percentages above 50% are highlighted for quick reference. Generally the project was viewed as favourable from the stakeholders (persons interviewed).



### 7.4 Traffic Impact Assessment

The proposed site for the development of the LPG Storage and Filling Plant is located adjacent to the southern border of the North Coast Highway at the intersection with the parochial road that links the old road through Rio Bueno to the new highway. It is approximately 50 kilometers for Ocho in a westerly direction and 60 kilometers from Montego Bay in an easterly direction. This section of the North Coast Highway was completed in 2006, and was built to international standard, comprising of four traffic lanes, two in either direction with soft shoulders on both sides. The surface of the road is in excellent condition and has clear markings of an unbroken line in the centre and broken lines to divide the two lanes in both directions.

Access to the proposed site will be via an entrance to be located along the eastern boundary of the property which will lead onto the parochial road, from the parochial road traffic will then enter the highway and may turn left (heading east) or right (heading west) An alternative route would be to travel along the old Rio Bueno road then turn onto the parochial road to the entrance to the site which is close to the intersection with the new highway. The preferred route to access the site would be from the highway as the parochial road is very windy and hilly. The road surface is also in very poor condition.

Public transportation to the site is provided by the many buses, minivans and taxis which operate between Oho Rios, Montego Bay and the other towns and communities in between.

Monitoring of traffic movement passing the site was done for a nine hour period 8:00 am to 5:00 pm on Tuesday March 11, 2007. This represent the typical working hours in Jamaica for operations of this nature. For observation purposes vehicles were divided into two categories;

- 1. Buses and Trucks
- 2. Others (Cars, Pckup, SUV Etc)

The number of vehicles going in both directions along the Highway, as well as the number passing in both directions along the Parochial road was recorded. The results are presented in the table below:



VEHICLE	HIGH	HIGHWAY					PAROCHIAL ROAD					
	Easterly		Westerly		Northerly		Southerly					
	8-11	11-2	2-5	8-11	11-2	2-5	8-11	11-2	2-5	8-11	11-2	2-5
Bus/Truck	147	122	127	98	87	138	7	8	3	4	5	11
Others	522	377	391	486	381	502	12	4	5	5	6	9
Total	669	499	518	584	468	640	19	12	8	9	11	20

Total number of Bus/Truck passing site on highway easterly	-	396
Total number of Other vehicles passing site on highway easterly	-	1290
Total number of vehicles passing site on highway easterly	-	1686
Total number of Bus/Truck passing site on highway westerly	-	323
Total number of Other vehicles passing site on highway westerly	-	1396
Total number of vehicles passing site on highway westerly	-	<u>1692</u>
Total number of vehicles passing site on highway in both directions		3378

Total number of Bus/Truck passing site on parochial road northerly	-	18
Total number of Other vehicles passing site on parochial road northerly	-	21
Total number of vehicles passing site on parochial road northerly	-	39
Total number of Bus/Truck passing site on parochial road southerly	-	20
Total number of Other vehicles passing site on parochial road southerly	-	20
Total number of vehicles passing site on parochial road southerly	-	<u>40</u>
Total number of vehicles passing site on parochial road in both directions	-	7





Intersection of Parochial Road and Highway

Approaching vehicles from the right (west) of the parochial road has sight range of about 100 metres



Intersection of Parochial Road and Highway

Approaching vehicles from the left (east) of the parochial road has sight range of about 75 metres



# 7.5 Manmade and other Hazards

The associated risk with the transfer pipeline, the storage and loading facility are;

#### Pipeline;

- Damage/rupture caused by collision of ships during berthing operations
- Rupture of transfer hose from ship to shore
- Leakage from transfer and normal operation
- Unauthorized access and sabotage at the port
- Leakage caused from deterioration as a result of corrosion
- Accidental rupture during excavation for other services
- Rupture/leaks from natural disaster Earthquakes
- Industrial and Terrorist activities
- Breakdown of written procedures governing the operation and maintenance of the pipeline and the actions to be taken in the event of an incident

#### Storage and Loading Facility:

- Unauthorized access and sabotage at the storage and loading facilities
- Industrial unrest and Terrorist activities
- Rupture/leaks of storage tanks from Earthquakes
- Rupture/leakage resulting in a fire and possible explosion.
- Ignition sources cigarettes, open flames, lightening, spark ignition vehicles

#### 7.5.1 Assumptions

In the event of a natural or man-made disaster, and given enough warning, it is expected that the necessary arrangements will be in place for coordinating a successful emergency response or evacuation.

#### 7.5.2 Scope

This plan applies to all emergency preparedness and response activities at the port reception facility, the transfer pipeline to storage tanks and the automated filling system into bulk trucks, trailers and cylinders, as well as during delivery of products.



# 7.5.3 Aim

The primary aim of this general plan is to carry out timely and coordinated response to reduce loss of life and property in the event of a disaster or incident.

# 7.5.4 Execution

# 7.5.4.1 Concept of Operations.

This plan is effective for all types of emergencies and will come into force whenever there is an actual disaster or imminent threat of a disaster. It establishes basic guidelines that will assist the management of the LPG Facility in Rio Bueno to carry out the necessary preparedness and response functions in the event of a threat or disaster

# 7.5.4.2 Assignments and Tasking Details/ Responsibilities

The Management team headed by the Managing Director is the overall coordinating body for all emergencies at the LPG Facility and is responsible for ensuring:

- the implementation of awareness programmes on all aspects of disasters for staff and visitors at the Facility.
- that an identified Emergency Operational Centre (EOC) is established and activated once a warning is given.
- that a member of the team is appointed as the Emergency Coordinator.
- that operational plans are put into effect by activating warning systems and response agencies
- coordinating the relay/dissemination of information pertaining to the disaster/emergency and its impact.
- the coordination of rescue, relief and/or evacuation operations



- co-opting other personnel as may be required during emergencies
- that a Register is kept at the site and all necessary information is made available to the response agencies on request in the event of a disaster.
- that all response agencies to which specific responsibilities have been assigned are truly prepared to carry out these responsibilities.

## 7.5.4.3 Coordinating Instructions

Warning of impending or actual emergency/disaster situations may be disseminated in a number of ways (Radio & Television Stations, Written Notices, etc). These will of course depend on the type of situation.

## Hurricanes

The following AMBER warnings will be issued prior to a hurricane:

•	AMBER	-	Hurricane Advisory 48 hours before ETA
•	AMBER PHASE 1	-	Issue Hurricane 'Watch' 36 hours before ETA
•	AMBER PHASE 2	-	Issue Hurricane 'Warning' 24 hours before ETA
•	AMBER PHASE 3	-	12 hours before ETA
•	AMBER PHASE 4	-	The Blow
•	AMBER PHASE 5	_	The Recovery

## Earthquake:

Jamaica is located in a geologically active zone; and is therefore, subject to earthquakes. They are unpredictable and may strike suddenly and unexpectedly. Depending on the



magnitude of the earthquake, it may result in casualties, deaths, landslides and damage to structures thereby causing disruption of activities.

## Fire:

A fire alarm must be raised by the person(s) who sees the fire by shouting "FIRE, FIRE!"

NOTE: All reports of major emergencies must be directed to the Managing Director and/or the designated Member of the management team who is appointed as the Emergency Coordinator.

#### 7.5.4.4 Administration and Logistics

#### Shelter location/Safe areas:

Emergency assembly areas and shelter locations to be identified and signs posted.

## 7.5.4.5 Command and Control

## **EOC Location**:

In the event of an emergency, the EOC will be established as directed by the management team.

- The EOC will remain operational throughout all phases of an incident.
- Ensure that the EOC is properly equipped with radios, status boards, maps, weather charts, etc.



# **Communications:**

Establish communication links (with back ups) with all the relevant agencies and be prepared to maintain these links and disseminate information as necessary

# 7.5.4.6 Agency roles/responsibilities

# Office of Disaster Preparedness and Emergency Management (ODPEM)

Ensure maximum disaster awareness and preparedness of efficient coordination of emergency response to any threat. (Education and Awareness).

# Jamaica Fire Brigade (JFB):

Ensure that fire escape routes are appropriately marked, and that adequate fire fighting equipment is in place. (Trained Fire-fighters/equipment to respond)

## Jamaica Defence Force (JDF):

Provide emergency support for medical service, evacuation, search & rescue and fire fighting.

## Jamaica Constabulary Force (JCF):

Provide security services and the on-scene coordination of crowd control in the event of a emergency response, disaster or the threat of a disaster.

# Red Cross Society of Jamaica (RCSJ):

Provide emergency first aid and services in the area of rescue and relief.



# 8.0 POTENTIAL IMPACT AND MITIGATION MEASURES

An impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts therefore may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term or short-term, and extensive or local in effect. Impacts are termed cumulative when they add incrementally to existing impacts. Both positive and adverse environmental impacts could arise during the site preparation, construction and the operations phases of the LPG Storage and Loading facility.

#### 8.1 Loss of terrestrial habitat and biodiversity

#### **Impact**

The site has already been cleared of most of its vegetation, the clearing and grading of the site will therefore not have significant impact on biodiversity. Removal of the sparsely vegetated grass will result in a minor loss of vegetation in the short term and in the longer term the development will prevent the possibility of re-colonization by invasive species.

## **Mitigation**

The overall objective of this mitigation is to establish as much as is possible, green areas around the facility.

• Site clearance and setting out of the facility must avoid the removal of the only tree on the property. The establishment of green areas on the site should include the planting of bird feeding trees.

# 8.2 Loss of land use options

#### **Impact**

Construction of the facility will result in a loss of the options for alternative use of the land and thus represents an irreversible commitment of land resources. Loss of the option to utilize the land for any other purpose can be considered to be a negative impact.



# **Mitigation**

Mitigation is not considered for this impact but is addressed in section 9 under the heading Consideration of Alternative.

## 8.3 Soil erosion

# **Impact**

Excavation works for construction of the pipeline will expose soils in the affected areas leaving them vulnerable to erosion by surface run-off during heavy rainfall. The hilly topography of the area exacerbates this potential of this negative impact.

# **Mitigation:**

- As much as possible, minimize the area of exposed soil at any given time.
- Compact and resurface disturbed areas as soon as possible.
- During construction of the pipeline direct flows from heavy runoff away from areas that are threaten by erosion.

## 8.4 Noise

## **Impact**

The use of heavy equipment during site clearance and construction works will inevitably generate noise, which may create a nuisance for persons in the vicinity. This is a negative impact but is not considered to be significant, as the duration will be short-term.

# **Mitigation:**

- Persons within the vicinity of the impact should be given notice of intended noisy activities so as to allow then to make any necessary preparation.
- Workers operating equipment that generates noise should be equipped with the appropriate noise protection gear.



• Construction activities that will generate disturbing sounds should be restricted to normal working hours.

## 8.5 **Dust**

#### **Impact**

The site clearing and excavation works for the laying of the pipeline will produce fugitive dust which may result in increased levels of air borne particulate matter. This situation will be worst during the dry periods and prevailing wind. The occurrence of dusting is periodic and short-term, lasting only for the duration of the construction activity.

## **Mitigation:**

- Exposed surfaces should be regularly wetted in a manner that effectively keeps down the dust.
- Stockpiles of fine materials (e.g. marl) should be wetted or covered with tarpaulin during windy conditions.
- Workers on the site should be issued with dust masks for use during dry and windy conditions.
- Persons within a distance of impact should be given notice of intended noisy activities so as to allow then to make any necessary preparation.

#### 8.6 Traffic

## **Impact on Traffic**

Based on the nature and size of the operation it is anticipated that about 20 vehicles per day will enter and leave the site during construction and about 30 vehicles per day during operation. This will have an impact on the traffic, however although the intersection is located on a curve, there is clear vision for at least 75 metres to the left and 100 metres to the right, this should allow merging into the highway traffic with minimum impact. The existing volume of vehicles (approximately 3400 for the operating hours 8 am - 5 pm), is moderate and the highway accommodates two lanes of traffic in both direction, this should not result in any major negative impact.



The project also includes the laying of pipeline along the roadside, which may reduce the number of access lane and thereby result in a negative impact. This would not be considered significant as it would be short term.

## Mitigation

- Set back the gate to the property by at least 30 metres to allow for vehicles entering the property to clear the roadway.
- Provide adequate parking for customer and visitors.
- Erect heavy vehicle warning signs at appropriate place on highway.

## 8.7 Socio-Economic

#### **Impact**

During both the construction and the operation phases the development will provide direct and indirect opportunity for employment of both skilled and unskilled personnel. An estimate of fifty (50) persons will be directly employed during construction and about fifteen (15) during operations. In addition the small businesses in the area such as grocers wholesalers, restaurant operators and transportation operators will experience positive spin-off as the development of the project will boast economic activities, resulting in greater disposable income among residence of the area.

This is considered to be a positive significant impact as the effect will be long term and directly or indirectly will impact in excess of one thousands persons.

## **Mitigation**

No mitigation will be considered for this impact.



# 9.0 CONSIDERATION OF ALTERNATIVES

Two main alternatives to the project was considered. These are:

- 1. "No Action Alternative"
- Sourcing bulk LPG supplies from Gas Products Limited through their facility located at Freeport in Montego Bay, Saint James.

## 9.1 No Action Alternative

The "do nothing" alternative, would mean continuing to transport bulk LPG across the dangerous terrain from Kingston to the north coast. This would allow a perpetuation of the risk of serious fire and possible loss of life and property in the event of an accident.

In the event of the roads from Kingston to the North Coast become inaccessible for an extended period persons and businesses on the North Coast could be starved of supplies of LPG.

## 9.2 Sourcing Bulk LPG Supplies From Gas Product Limited

Gas Products Limited operates a LPG Terminal at Freeport in Montego Bay. The possibility of sourcing bulk supplies of LPG was examined, and the following issues raised.

• The Freeport Terminal is already very congested and an increased call of ships bringing LPG as a result of the increased demand that would have been created would exacerbate this problem.



# **10.0 OUTLINE MONITORING PROGRAMME**

Once a permit is granted for the proposed development, and before site preparation and construction activities begin, a Monitoring Plan will be prepared for submission to NEPA, for approval. The aim of the Monitoring Plan will be to ensure the following:

- compliance with relevant legislation
- implementation of the mitigation measures provided
- conformance with any General or Specific Conditions as outlined in the permit
- minimize the impact of negative environmental impacts.

The Monitoring Plan should include the following components:

• Inspection protocol

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- Parameters to be monitored, which should include
  - Ambient air quality
  - Noise
- Construction monitoring
  - Worker health and safety
  - Disposal of waste
  - Handling and disposal of hazardous material if applicable
- Materials handling and storage
- Covering of haulage vehicles
- Transportation of construction materials
- Deployment of flaggers and signposting
- Storage of fines and earth materials

The duration of the monitoring programme should be for the entire construction period,

with monthly reporting. The Monitoring Plan is best prepared after the permit is received from NEPA as Terms and Conditions of the permit must be taken into consideration, and included in the monitoring programme as appropriate.



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