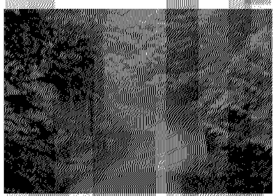

Keltic Petrochemicals Inc.

A Petrochemical Plant and LNG Facilities
Goldboro, Nova Scotia

Submission of Project Description
to
Canadian Environmental Assessment Agency

by

STRAIT ENGINEERING LIMITED

August 2004

KELTIC
PETROCHEMICALS INC
523-5151 George Street, Halifax, NS B3J 1M5
Tel: (902) 422-4557 Fax: (902) 422-5980 Email: questions@kelticpetrochemicals.ca

TABLE OF CONTENTS

List of Tables and Figures:

APPENDICES:

1.0 NAME OF THE UNDERTAKING:

Keltic Petrochemicals Inc. proposes to construct and operate a Petrochemical Complex supported by a Liquefied Natural Gas (LNG) importation and vapourization facility and an electric co-generation plant. The project will also include construction of a 100 series highway. The integrated project will be identified as the Keltic Petrochemical Project (referred to in this document as □the Project□).

2.0 LOCATION OF THE UNDERTAKING:

The proposed site is located in Goldboro, Guysborough County (see Figure 1) and is positioned within the Goldboro Industrial Park along the north shore of Isaacs Harbour. The associated marine facilities will be located on the northeast side of Isaacs Harbour. A 100 series highway will be constructed along a new 58km alignment between the Goldboro site and Antigonish (see Figure 2).

2.1 Land Ownership:

The Goldboro Industrial Park is presently zoned for industrial usage and encompasses approximately 240 hectares. Keltic has a requirement for 125 hectares within the park but the entire Industrial Park will be purchased by Keltic Petrochemicals from the Municipality of the District of Guysborough. The Sable Offshore Energy Project (SOEP) gas plant and metering station are located on the northeast of the Industrial Park.

The portion of land forming the peninsula forms the corridor and the marine berthing facilities. This land is in the process of being acquired by the Municipality of the District of Guysborough from private interests. That land will also then be purchased by Keltic from the municipality.

Figure 1 - Locality Map

Figure 2 - Proposed Highway

3.0 NAME, ADDRESS AND IDENTIFICATION OF THE PROPONENT:

Keltic Petrochemicals Inc.
523-5151 George Street
Halifax NS B3J 1M5
Phone 902-422-4557

Proponent Contact:
Mr. W. Kevin Dunn,
President, Keltic Petrochemicals Inc.
523-5151 George Street
Halifax NS B3J 1M5
Phone: 902-422-4557
Fax 902-422-5980
Email kevin.dunn@kelticpetrochemicals.ca

Consultant Contact:
Mr. Basil Mattie
Project Manager
Strait Engineering Ltd.
Port Hawksbury, NS
Phone: 902-625-3631
Fax: 902-625-3634
Email strait@straiteng.com

Mr Alan V. Bell
EA Coordinator
Alan Bell Environmental Management Services
767 Parkland Drive, Suite 214
Halifax, NS
Phone: 902-832-1526 (Halifax)
902-485-4847 (Pictou)
Fax: 902-445-4682
Email: avbell@ns.sympatico.ca

Mr. D. Lutz
McInnes Cooper
Phone 902-425-6500
Fax 902-425-6350
Email doug.lutz@mcinnescooper.com

Mr. D. Purvis
Head Engineering Design Team
Stone and Webster Canada
Phone: 416-529-3261
Fax: 416 - 482-2865
Email dave.purvis@shawgrp.com

3.1 Company Description:

Keltic Petrochemicals Inc. is a private Canadian company. It is incorporated under the laws of Alberta and registered to do business in Nova Scotia under the Nova Scotia Corporations Registration Act.

4.0 NATURE OF THE UNDERTAKING:

The project as described in Section 7 represents a private capital investment in excess of $3.0US billion, employment of approximately 3000 persons during construction and approximately 500 during the operational phase. It provides the Province the opportunity to embark on the development of a world class petrochemical industry and to enhance its position as a continental energy supplier.

5.0 PURPOSE AND NEED OF THE UNDERTAKING:

It is well recognized that the significantly growing demand for natural gas in Canada and the United States will soon exceed the supplies available from current sources. Increased importation of LNG offers an attractive means of filling the gap for a period of time and could be distributed through the existing Maritimes and Northeast Pipelines (M&NP) pipeline transmission system to both Canadian and Northeast U.S. markets.

Slower than anticipated development of the offshore oil and gas industry in Nova Scotia has delayed the development of downstream value-added industries due to insufficient volumes of natural gas resources from the Scotia offshore. The proposed LNG facility at Goldboro will not only provide liquid gas for revapourization for pipeline feed but will also provide the critical mass of feedstock necessary for development of value-added projects such as the petrochemical and co-generation facilities proposed.

Value-added energy projects have been proposed in the recent past. However, they could not access sufficient volumes of feedstock to allow them to move forward. This project will provide over 220,000 mm cfd of natural gas and natural gas liquids as input to the proposed petrochemical plant and its supporting infrastructure.

The project is in keeping with the Provincial Energy Strategy which supports the convergence of supply at a single location to build the critical mass to enable the development of a world class petrochemical industry.

This project also enhances the economics of offshore Nova Scotian projects because the greater the volumes of gas moving within the pipeline, the greater the downward pressure on the transportation toll price. Projects such as EnCana□s Deep Panuke will benefit from lower transportation tolls. Commitments made to M&NP by current offshore producers will be able to be met or supported by LNG volumes.
The project provides the further additional benefits of ensuring the diversification of the energy supply

and long-term viability of the natural gas industry in Nova Scotia. From an environmental standpoint LNG provides a clean source of energy and presents an opportunity to improve air quality through the potential to re-power coal or oil fired power generation facilities. The construction of a new highway between the project site and Antigonish will reduce the overall transportation cost to the Project and greatly benefit the economic standing of the Goldboro region and the Province as a whole.

Finally this project responds to and supports the view of the joint Federal Provincial Environmental SOEP Panel. They felt that the significant long term impact of that project for Nova Scotia and Canada will be found in the area of other benefits rather than in direct expenditures for labour and material. The obvious sources derive from use of natural gas as an energy source and alone, or together with the liquids, as a raw material for use in other products; the liquids alone could form the base for a Provincial petrochemical industry. If SOEP is truly a seed project for petrochemical industry then all of the available physical and human resources have to be brought together to make the seed grow. The Panel recommended that the Province examine options for an industrial strategy that would include hydrocarbon-based development.

6.0 PROPOSED CONSTRUCTION AND OPERATION SCHEDULES:

Construction to accommodate the facilities described under Section 7 will entail: land clearing, earth works (till and rock), surface water drainage, concrete construction, building construction and parking spaces, process facilities, electrical works, pipe lines, marine works (terminal and marginal wharf), fencing, and wastewater outfall. Other than for the construction of the LNG storage tanks, none of the proposed construction techniques are beyond experience and capacity of the local construction industry.

The construction period to commissioning of the Project is expected to take 33 months. The Project scheduling is broken down into four categories as shown on the Bar Chart, Figure 3 on the following page. It is noted on the bar Chart, that phases of the project have been underway in order to provide a project definition, selecting licensors/technology, and pre-FEED activities.

It will be critical to the construction schedule to have the road in service by the time on-site activities have ramped up to a significant level and to accommodate the arrival of heavy equipment and process units. This is scheduled to occur during early stages of detailed design of the process facilities and procurement.

Nominal design life of the process facilities will be twenty years. It is customary that with maintenance, technical upgrading and replacement, facilities continue to operate indefinitely.

Figure 3 - Project Schedule

Also refer to Section 7.2.1 - Project Phases.

7.0 DESCRIPTION OF THE PROJECT:

7.1 Project Components and Structures:

The essential project components are shown on the Conceptual Plan, Figure 4 and can be broadly defined under the following four headings:

LNG facility
Petrochemical facilities
CoGeneration plant and
100 Series highway

Each are described in the following subsections and summarized in Table 7.1.

Table 7.1
Key Characteristics of Project Components

Component	Description
LNG facility	Consists of marine terminal; transfer, storage and vapourization facilities, a vapour handling system and associated infrastructure/support facilities. Max transfer rate from ship 12,000m^3/hr @ 75 psig -260^{0}F. Storage in 3 double lined insulated tanks of 160,000m^3 (with future expansion to 6).
Petrochemical facilities	Produces primarily ethylene and propylene from of the natural gas process plant using steam cracking. Polyethelene and polypropylene are subsequently produced in the plant fed by 1.0 BCF/day natural gas from the LNG system. Products are the stored in silos at the marginal wharf. Uses power from CoGen plant. Treats raw water for process and boiler feeds.
CoGeneration plant	Involves a gas turbine and heat recovery steam generator with a capacity of 200MW to meet project requirements
100 Series highway	A project constructed 100 series highway on a new corridor between the plant and Antigonish.

Figure 4 -Conceptual Plan

7.1.1 <u>LNG facility</u>:

The LNG facility will import, store and revapourize liquefied natural gas (LNG) for the supply of feed stock and energy requirements for the Petrochemical Complex and Co-Generation plant.

The project capacity will be 1 billion cubic feet (1 BCF) per day of LNG expandable to 2 BCF. Sufficient natural gas pipeline take-away capacity exists in close proximity to the LNG facility if there is residue gas for market.

The project will provide a facility that is safe, efficient, and easily operable and maintainable with minimal effects on the environment. All facilities will be constructed in accordance with governing federal and provincial regulations, Canadian Standards Association (CSA) Z276-01 Liquefied Natural Gas (LNG) - Production, Storage, and Handling, National Fire Protection Association (NFPA) 59A, Standard Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants. TERMPOL regulations will be followed for the marine facilities and a simulation study is currently underway.

The Project facilities will consist of:

- Marine terminal and LNG transfer lines
- LNG storage
- LNG vapourization and send out
- Vapour handling system
- Utilities, infrastructure and support systems (see Section 7.1.4).

7.1.1.1 Marine Terminal and LNG Transfer Lines:

The marine facilities consist of the LNG Terminal and a Marginal Wharf. A Marine Transportation and Feasibility Study conducted for the Goldboro Industrial Park Development Project has allowed for preliminary selection of the construction techniques for these facilities taking into account the physiology of the site and to minimize environmental issues. Detailed site investigation will follow as part of the FEED phase.

The **LNG Terminal** will be designed to accommodate special ships designed for the transportation of LNG in the range of 70,000 DWT with a draft of up to fourteen metres. The terminal will be constructed of pipe pile mooring piers and berthing dolphins. The piers will be capped and connected with a concrete bridge and deck. The LNG transfer line will be routed from the LNG wharf to the LNG storage tanks via a pipe line and maintenance trestle. A preliminary plan and sections of the facilities are shown in Figure 5.

The marine facility will accommodate ships holding up to 250,000 cubic meters (m^3) of LNG with a draft of approximately 14 meters. LNG vessels will arrive approximately every eight days at the initial capacity. Hoteling and unloading of LNG ships will typically require 24 hours including

Figure 5 Wharf Layout

activities such as customs and immigration; servicing provisioning; and unloading. LNG vessels will be brought in fully loaded and reballasted offshore. Ballast water issues are not expected to arise.

Onboard ship pumps will deliver LNG to low pressure LNG storage tanks via stainless steel loading arms and cryogenic piping. A total of four marine unloading arms will be installed, three for liquid delivery and one for vapour return to the ship. One of the liquid unloading arms will be equipped to operate in either liquid or vapour service. The unloading arms will have swivel joints to provide the required range of movement between the ship and the shore connections. The LNG unloading rate will be up to 12,000 m^3/hr from each ship at approximately 75 psig and -260E F. The unloading arms will be free draining and will have nitrogen connections for displacing LNG prior to disconnecting.

7.1.1.2 LNG Storage:

Key components of LNG storage will be:

- Three full containment, top entry LNG storage tanks each with a nominal volume of 160,000 cubic meters (m^3). Three additional tanks are planned for future expansion.
- Three in-tank LNG pumps.
- Instrumentation and safety systems.
- The LNG storage tanks will operate at approximately 1 psig and -254E F. The very low LNG temperature requires special design features. The LNG will be contained by an inner tank constructed of 9% nickel steel. An outer tank of carbon steel will surround the inner tank. The annulus between the inner and outer tank will be filled with perlite insulation. The roof deck of the inner tank will also be covered with perlite insulation. The bottom of the tank will be insulated with foamglass. The LNG tank foundation will be elevated several feet above the ground to prevent frost heave. All connections to the LNG tanks will be from the top. The LNG pumps will be submersible, vertical type that sit inside wells that will be accessed at the top of the tanks. A spare pump-well will be installed in each tank.

7.1.1.3 LNG Vapourization and Send-Out:

Key components of LNG vapourization and send-out will be:

- High pressure multi stage LNG booster pumps which discharge at a pressure sufficient for vapourization and send out to the petrochemical facility.
- High pressure submerged combustion LNG vapourizers.
- On-site natural gas metering facilities.

The submerged combustion LNG vapourizers will be a water bath type. The water basin is stainless steel. Tube bundles are submerged in the bath. LNG enters the tube bundles and product gas exits the bundle. Heat is provided from waste heat energy from the Petrochemical Complex and a back up source using methane as fuel.
Product natural gas will be sent out of the vapourization facilities to the Petrochemical Complex at a rate of up to 1.0 billion cubic feet per day (BCF/day) through a metering station.

7.1.1.4 Vapour Handling System:

Key components of the vapour handling system will include:

- Boil-off gas compressors and a boil-off gas condensing system to handle the boil-off from the LNG tanks and unloading systems.
- Vapour return blowers.

Ambient heat input into the LNG will cause a small amount of LNG to be vapourized. Vapourization of LNG will also be caused by other factors such as barometric pressure changes, pump heat input.

Excess vapour is removed from the LNG storage tanks to control pressure in the tanks. This vapour is compressed in the boil-off gas (BOG) compressors.

During ship unloading, a portion of the vapour from the storage tanks flows to the vapour return blowers. The blowers boost the pressure to overcome the pressure drop in the piping to the ship. The vapour returned to the ship replaces the volume that was occupied by liquid.

7.1.1.5 Utilities, Infrastructure and Support Systems:

Utilities, infrastructure and support systems dedicated for the LNG facility will consist of:

- PLC based control system
- Emergency shutdown system
- Hazard detection system
- Security system and facilities
- Fire response system
- LNG impoundment basins
- Natural gas vent
- Plant air, instrument air and nitrogen systems
- Electric power distribution and control systems
- Storm water system
- Control building
- Access roadways and service buildings
- Fire and emergency access roads
- Other facilities as required to support safe, efficient and reliable operation.

Utilities, infrastructure and support systems provided as common user facilities will consist of:

- Service water and drinking water systems
- Administration and service buildings

- Sanitary wastewater system.

LNG Terminal control and monitoring will be performed by a PLC based control system. An independent safety instrument system will perform emergency shutdowns when unsafe conditions are detected. A hazard detection system will monitor the LNG Terminal for fire, combustible gas, and low temperature.

The fire response system will consist of several independent systems based on water and foam. A firewater system will be provided which consists of fire water pond, firewater pumps, distribution piping, monitors, hydrants and hose reels.

Two stacks will be provided for venting high pressure and low pressure natural gas. Normally only a small nitrogen purge flow will be vented. Boil off gas will be temporarily vented to the low pressure vent stack when it exceeds the vapour handling system capacity during upsets such as equipment malfunction or power failure.

Instrument and utility air will be provided from package units. Each package unit will have a lubricated, screw compressor with electric motor drive. Each package unit will have filters and an air dryer. Instrument and utility air distribution piping will run throughout the LNG facility.

Nitrogen will be provided from a package unit. Nitrogen distribution piping will run throughout the LNG facility.

A power substation will be located on site to receive electrical power from the co-generation plant.

Service water and drinking water will be supplied from the common user facilities.

Treatment for sewage will be provided by the common user facilities.

The following buildings will be provided on site:

- Control building
- BOG compressor shelter
- Main electrical substation building
- Jetty electrical substation building
- Firewater pump house

Access roads will be provided for operation, maintenance and fire and emergency vehicles.

7.1.1.6 <u>Air, Noise and Water Emissions</u>:

The following summarizes the emissions that are expected from the facility based on the current design basis.

- Air Emissions

Total NO_X - approximately 150 tons per year
Total CO - approximately 230 tons per year

These are based on continuous emissions and do not consider emissions from emergency sources such as any emergency standby generator and firewater pump engines. They are based on continuous operation for 365 days to a maximum rate of 1.0 BCFD.

The submerged combustion vapourizer NO_X and CO emissions were calculated using the above capacity and emission factors provided by equipment vendors for similar equipment at similar sites.

In addition to the above, there will be periodic testing of engine powered equipment as part of routine emergency equipment maintenance.

- Water Emissions

Storm water pump out of:

- Storage tank dyke area.
- Process Area Impoundment.
- Terminal Area Impoundment Basin.

Based on normal operations and given proper housekeeping and maintenance operations is conducted at the facility, storm water flows may be expected from these areas. There is no planned treatment of the stormwater that is pumped from the impoundment basins into the firewater pond.

Submerged Combustion Vapourization Overflow Water

Sodium carbonate is to be injected into the vapourizer basins for pH control. No additional treatment is anticipated.

Sanitary Wastewater

Normal domestic sanitary wastewater is to be treated in accordance to N.S. Guidelines for Sanitary Wastewater Collection, Treatment and Disposal at a common user facility.

7.1.2 <u>Petrochemical Facilities</u>:

7.1.2.1 <u>General</u>:

Keltic Petrochemicals has contracted Stone & Webster (S&W), a Shaw Group Co., to provide a Pre-FEED study for a grass roots petrochemical complex that is planned for Goldboro. For the study, S&W□s Process Engineering prepared a definition of equipment sufficient to produce an order of magnitude total installed cost (TIC) for all process units, and defined a preliminary recommendation for feedstock and product storage. As part of the effort, S&W also prepared a summary of estimated utility consumption and environmental emissions of the complex.

Also, included in the Process Engineering scope of work requirement for S&W is to make recommendations concerning co-product disposition. Such recommendations on co-product disposition will be accommodated where possible in the schedule for this process flow scheme scoping effort.

7.1.2.2 <u>Definition of Plant Complex</u>:

The petrochemical complex is keyed to the production of olefins, specifically ethylene and propylene, from an ethylene plant. The ethylene plant is based upon S&W□s proprietary Ultra Selective Conversion (USC) technology for the steam cracking of hydrocarbons. The Keltic olefins will be produced from the steam cracking of fresh ethane and propane feedstocks.

A refinery propylene mix will be imported by sea to the Keltic complex. Any facilities required to treat the refinery propylene for contaminants removal will be provided within the ethylene plant. After treating, the refinery propylene stream will be fed to the propane (C3) splitter facilities in the ethylene plant.

The polymer grade ethylene produced from the ethylene plant is the feed to a polyethylene plant with a polymerization train for linear low density (LLDPE) and a train for high density (HDPE) and a low density polyethylene (LDPE) plant. The polymer grade propylene produced from the ethylene plant is the feed to a polypropylene (PP) plant.

The other co-products of the ethylene plant will be exported for sale or consumed as fuel onsite. A stabilized mixed butane (C4's) stream will be produced by a hydrogenation unit in the ethylene plant treating the raw mixed C4's from the debutanizer. The hydrogenated C4 mix containing predominantly butylene will then be shipped by sea. A hydrotreated gasoline will be produced from a gasoline hydrogenation unit (GHU), The GHU will also be contained in the ethylene plant, treating the raw pyrolysis gasoline (RPG) produced by the steam cracking process. A pyrolysis fuel oil product will be used as auxiliary/power boiler fuel. A residue gas will be produced in the ethylene plant, which will flow to the central fuel gas mix drum of the complex. Any high purity hydrogen that may be required for the polyethylene and polypropylene plants will be produced in the ethylene plant. The polyethylene plant and polypropylene plant products will be pelletized and stored until being loaded on ships for export. Vent streams from the polyethylene and polypropylene plants will be recycled to the ethylene plant for recovery.

The Keltic Petrochemical Complex will consist of the following proposed facilities:

Process Units	Capacity KTA
Ethylene	1500
Propylene	200
Polypropylene	200
HDPE	450
LDPE	450
LLDPE	350

- Storage

- Ethylene plant feedstock handling and storage systems
- Ethylene plant product handling and storage systems
- Hexene and Pentane storage for polyethylene plants
- OSBL storage for fresh caustic and raw, demineralized and firewater
- OSBL storage for spent caustic treatment and process waste water

- Power

- Electric power generation (Co-Gen) and distribution systems within the limits of the Project

- Marginal Wharf

- The marginal wharf is required for the shipping out of the products in resin pellet form from the petrochemical plant. The products will be transported to the wharf for storage in silos. The wharf will also be used for receiving propylene and for shipping co-products of the ethylene plant such as hydrogenated C4 mix and refinery grade propane. The side of this facility would be used for berthing tugs and pilot boats.

- Construction of the facility will be pre-cast concrete caissons floated in position on a granular mattress placed on the seabed. This will eliminate the need to dredge and disposed of seabed materials. The area behind the cribs will consist of graded granular material (stone) to above the tidal zone. This material will be placed from land working seaward to the cribs. Till will be used for fill up to the top of subgrade followed with base material before asphalt paving. A section and profile of the wharf construction is shown in Figure 6.

Figure 6 - Typical Profile and Section of Marginal Wharf

- Fuel

- Auxiliary fuel and common fuel supply system

- Water and Steam Systems

- Auxiliary boilers supporting ethylene and derivative plants
- Raw water supply and treatment
- Boiler feed water supply system (VHP and HP levels)
- Steam condensate recovery and polishing
- Cooling water systems
- Firewater systems
- Potable water supply

- Waste Treatment

- Spent caustic handling and treatment
- Waste streams incineration
- Waste water handling and treatment
- Solid waste handling and storage

- Other Facilities

- Cryogenic air separation unit with oxygen and nitrogen supply systems
- Plant air and instrument air supply systems
- Flare systems
- Interconnecting piping and pipe racks
- Maintenance shops
- Receiving and stores
- Firehouse and fire truck
- Plant security and communications
- Administration and laboratory facilities
- Custody metering stations
- Shipping and receiving terminals
- Site roads
- Resin conveyance to wharf

7.1.2.3 Plant Water Supply:

The complex will have a significant industrial water requirement. Water will be drawn from Meadow Lake to provide daily industrial needs. The present estimated demand is 1200m^3/hr. Meadow Lake has been monitored for an 18 month period and has been found adequate to supply water without a need for construction of a dam.
Rather than building impoundments, Goldbrook and/or Ocean Lake will be used as a supplementary supply during prolonged periods of dry weather conditions. During these periods water will be pumped from these lakes to meet the daily demand of the complex. (Ref. Figure 7).

7.1.2.4 Wastewater Management:

There are several waste producing streams at a petrochemical facility. These streams can be categorized as stormwater, potentially contaminated stormwater, oily water and domestic wastewater.

Storm water runoff from uncontaminated areas will be segregated from potentially contaminated areas and discharged through a stormwater outfall. These uncontaminated areas generally include roads, building roof drains, undeveloped areas and uncontaminated areas in the utility and offsite units. The non contaminated runoff will generally flow through open site ditches with final disposal in Isaac□s Harbour.

A first flush approach will be utilized in handling potentially contaminated stormwater. Under this approach the initial 25mm of rainfall is diverted to contaminated stormwater ponds. Rainfall in excess of 25mm is considered to be clean and is diverted to the stormwater outfall. Water from the contaminated stormwater pond will be transferred at a controlled rate to the onsite wastewater treatment system.

Oily water will be collected in the oily water system and is pumped to the CPI separator, where initial separation of oil and water takes place.

Water effluent from the CPI separator flows to the induced air flotation unit (IAF) for further removal of any remaining free and/or emulsified oils. In the IAF, oil, suspended solids and grease adhere to bubbles and are floated to the surface. This froth then overflows to a collection point while the water from the IAF is pumped to the equalization basin. In the equalization basin, the IAF water combines with non oily wastes and potentially contaminated stormwater.

Recovered oil from both the CPI separator and the IAF is collected and pumped to the recovered oil tank. This oil will be disposed of offsite. Solids removed by the CPI separator will collect in the bottom of the separator and will be removed periodically via vacuum truck.

A biological treatment unit consisting of extended aeration and activated sludge system will be utilized for further treatment of wastewater. Effluent from the equalization basin is sent to the bioreactor basin and is contacted with activated sludge. This sludge permits natural biological reactions to further treat the wastewater.

The mixed biological slurry overflows to the secondary clarifier where the biological solids are removed and recycled to the bioreactor. The product of the biological treatment unit is of sufficient quality to be discharged to the environment.
Sanitary sewage generated on the site will be treated in a sequential batch reactor (SBR) treatment system with final discharge to Isaac□s Harbour.

All effluent will be treated to the quality standards stipulated by the local, provincial and federal regulatory bodies.

7.1.3 Co-generation Plant:

As part of the overall project, a co-generation plant incorporating a gas turbine and heat recovery steam generator will be constructed. Preliminary design of the co-generation facility has been based on the Pre-FEED study completed by Stone & Webster in March 2004.

The electric power for the Petrochemical complex will be generated in the central utility area using a combined cycle arrangement and will have a nominal rated capacity of 200 MW. The electricity will be generated at 35 KVA, three phase and 60 Hz. This will enable connection to the Nova Scotia Power Inc grid for purchase of incremental power required by the site and to provide some backup.

The preliminary design calls for four 40 MW gas turbine electric generator sets with a heat recovery steam generator (HRSG) fitted to each gas turbine as after the hot, dense combustion gases are expanded through the turbine, they still retain much of their heat. Each HRSG will provide approximately 60 metric tons per hour of steam at 4320 kPa and 400 degrees Celsius. Some 200 metric tons per hour of this steam will be fed to a 40MW steam turbine electric generator set to generate additional electric energy. The excess steam from the hRSG will be exported as process steam to meet some of the demand of the other process in the complex.

As the FEED phase is initiated it is likely that power and process steam efficiency gains will be realized as the overall use in the various plants is integrated. This may result in some modifications to the co-generation design.

7.1.4 100 Series Highway:

7.1.4.1 Current Road Infrastructure:

The roads in Guysborough County were built to link communities and funnel traffic to other areas of the province (i.e. Trunk 7 and Highway 316). These routes are also utilized by increasing volumes of industrial traffic. Additionally, there are numerous access points to these routes including single and multiple-dwelling driveway access, access to businesses and public services, and intersections with less traveled routes. There are 206 points of access to Trunk 7 between the Trans Canada Highway and Route 276 (6.9 points of access/km). There are 490 points of access to the Highway 316 between the Trans Canada Highway 104 and the Sable Road (6.8 points of access/km). A high volume of commercial traffic along well-populated roads is a safety concern for all members of the community. It is also a safety concern for those businesses utilizing the routes as a thoroughfare.
The existing highways, while not at capacity, are cumbersome for industrial traffic. Both Trunk 7 and Trunk 16 are two-lane highways with gravelled shoulders in good operational condition. They do, however, have their shortcomings. Their sharp curves, blind crests, pedestrian/animal crossings, hidden driveways, and school bus stops inhibit traffic and increase the risk of accidents. As a result

truck traffic along these routes must travel well below the posted speeds of 70 and 80 km/hr.

A traffic impact analysis outlining the likely changes in volume on area routes both during construction and once the corridor is complete may have to be done upon project approval. Traffic volumes on existing routes are outlined below:

Traffic Volumes (TPW, 1998):
Trunk 7; Antigonish to Highway 316 - 2370 vpd
Route 276; Trunk 7 to Highway 316 - 800 vpd

7.1.4.2 Proposed Highway:

The proposed 100 Series Highway will extend from the Trans Canada Highway 104/ Beech Hill Road intersection at Antigonish to the Keltic Petrochemical Complex at Goldboro, a distance of 58 km. The proposed alignment was selected to have a minimum impact on wetland, agricultural land and developed woodlands. Less than 5% will fall into these categories. These lands will be further evaluated to minimize their impact. 43% of the lands are provincial Crown Lands; 57% privately owned, with an estimated 55 to 60 owners along the alignment.

The highway right-of-way will have to be approximately 50 meters wide to accommodate a 100-series highway. A preliminary evaluation of the area indicates that four interchanges and approximately 25 structures will be required (a structure is any interchange, grade separation, or river crossing that has to be constructed on-site rather than prefabricated).

Currently identified crossing are listed in Table 7.2

Table 7.2 - Currently Identified Crossings

Road Crossings	River Crossings
West Side South River Road Highway 316 (paved) Springfield Road Campbell Road Antigonish Guysborough Road Upper Springfield Road Glencoe Road Duggan Road South River Lake Road (paved) Goldboro Branch Road	South River West Pomquet River Pomquet River Salmon River Costley River Isaac Harbour River Gold Brook Plus 22 minor brooks and streams

- Physiography and Geology:

The southern half of the road corridor traverses Nova Scotia's Southern Upland and the east part of the St. Marys Graben within Guysborough County. The north half traverses the Antigonish Highlands and the Antigonish Lowland.The Southern Upland physiographic region is characterized by varied topography that is controlled by the underlying Goldenville Formation greywacke, granite and Halifax Formation shale bedrock of the Meguma Group. The corridor crosses two or three sections only of Halifax slate. The St. Marys Graben, which is roughly 15 km wide and extends from Truro to west of Chedabucto Bay, is characterized by a more monotonous and flatter topography. It is underlain by siltstone, sandstone and conglomerates of the undifferentiated Horton Group.The topography within the Antigonish Highlands is similar to that of the St. Marys Graben the section of the Highlands traversed by the road corridor is underlain by the Clam Harbour River Formation (siltstone, sandstone, conglomerate), the Sunnyville Formation (basalt, rhyolite) and the Glenkeen Formation (predominantly conglomerate). The bedrock geology traversed by the road corridor within the Antigonish Lowland include fluvial siltstone and sandstone of the Mabou Group's Hastings and Pomquet Formations, and mud, sandstone, minor gypsum and limestone of the Upper Windsor Group.

- Project Scope and Timing:

The highway will link up at the Project and run north-northwest through Guysborough County to Trans Canada Highway 104. Land acquisition is estimated to take 12 months and the construction of the corridor is expected to be completed in time for construction of any new facilities at Goldboro, barring any unforseen delays, once land acquisition is complete.

- Highway Description:

An Arterial Type C Highway (based upon Nova Scotia Department of Transportation and Public Works Classification scheme) was chosen as appropriate for the highway. Arterial highways are two-lane highways designed to carry significant volumes of traffic at moderate to high speeds with controlled access. A Type C Arterial Highway is designed for volumes in excess of 5000 vehicles per day (VPD). Other features of an Arterial Type C Highway include:

- volumes during peak periods reaching 450 vehicles per hour;
- a design to accommodate speeds of 100 km/hr;
- 3.7m lanes and a 2.7 m shoulders (0.5 m paved, 2.2m useable);
- a maximum gradient of 7%;
- shoulder rounding of 0.8m;
- a width of finished top 12.8m;
- a side slope ratio of 3:1; and
- a back slope ratio of 2:1.

- Land Acquisition:

After the planning stages (functional design, preliminary environmental screening and public consultation) is complete, the land required for the corridor must be obtained. Depending on the route, the corridor will cross from 55 to 60 properties. The Project requests that any Crown Land required will be provided by the Province in compensation for the highway. Fair and reasonable compensation will be paid to private landowners. The cost per acre will increase considerably when the land required has a business value (i.e farmland, wood lot).

- Approach to Project Delivery:

The Goldboro - 104 Highway will be designed to meet the objectives of the users of the highway, the investors in the highway, and the Nova Scotia Department of Transportation and Public Works. The highway will:

- Provide excellent access to the Goldboro Industrial Park from Trans Canada Highway 104;
- Provide users with a high degree of travel efficiency, road quality and safety at a reasonable price through the use of innovative design and construction;
- Provide the Province of Nova Scotia with a completed, soundly designed and constructed Arterial Class □C□ Highway;
- Provide an aesthetically pleasing landscaped, highway optimized for snow control;
- Be routed incorporating the interests of local communities regarding business, personal, and tourism impacts and opportunities; and
- Be developed and constructed under the direction of an expertly prepared and monitored environmental plan.

7.2 Project Activities:

7.2.1 Project Phases:

7.2.1.1 Construction Phase:

As indicated in Figure 6, the construction period of the main plant area, marine terminal and the highway will span a time of approximately 33 months. The plant site area will provide rock suitable for concrete and foundation backfill and will therefore become the principal source of such needs at the site and marine terminal. This will involve some blasting, and heavy excavation equipment and crushing/screening. A concrete batching plant will be established for the construction period. After site preparation the activities will shift to the fabrication and erection of major industrial components and steel-framed buildings. Potential environmental issues to be addressed will include noise, dust suppression, and storm drainage control.

No dredging is anticipated in the construction of the marine facilities. The storage area will be formed by backfilling rock excavated from the project area; the berthing docks will be of piled construction and the dolphins will be based on rock pads consisting of excavated rock from the project area.
The highway construction will follow the normal established procedures applied for Series 100 highways in Nova Scotia, using a range of heavy material to achieve the required cut and fill balance

which will be presented for review prior to implementation. Appropriate dust and drainage control based on the avoidance of environmentally sensitive areas will be applied throughout.

7.2.1.2 Operational Phase:

Activities in this phase and their environmental implications are described later in subsequent sub-sections.

7.2.1.3 Closure/Reclamation Phase:

The project is anticipated to have a multi-decade life-span. A closure/reclamation plan will be presented as an integral part of the Environmental Assessment Report.

7.2.2 Engineering Details:

Details will be presented later to federal and provincial authorities to fully address specific regulatory needs.

7.2.3 Requirements for Off-site Land Use:

The only currently known off-site land use relates to a requirement that Crown Lands required for the construction of the new highway be made available to the project.

7.3 Resource/Material Requirements:

7.3.1 Aggregate and Fill Material:

Any greywacke bedrock needing to be removed during construction of the petrochemical plant and associated facilities can be processed to serve (contingent upon testing for net acid generating potential) as construction aggregate for use in concrete or as fill. During road construction, material removed from cuts will be processed for use as fill and for road bed material. With respect to other construction material needs, kame and esker deposits are known to be present (some local ones with existing gravel pits), along the New Harbour River just downstream of Ocean Lake, at Stormont, at Country Harbour Mines, Ogden, Roman Valley and at Upper South River. Existing gravel pits can be reopened or extended, and/or new ones developed, contingent upon completion of appropriate geological and other terrestrial surveys.

7.3.2 Fresh Water Supply:

The petrochemical plant will have a high demand for process water, possibly as much as 1200 m^3/hr. Four watersheds are currently under review for their potential to supply water for the petrochemical plant. These are:Isaac's Harbour River watershed (1EP-1) as possible primary water supply, with withdrawals made from Meadow Lake.

Gold Brook Lake watershed (1EQ-SD) as possible short-term (seven to ten day) contingency supply, with withdrawals from Gold Brook Lake,
New Harbour River watershed (1EQ-4) as a possible alternative primary water supply, with withdrawals from the river slightly upstream Fox Island. However, this would require the construction of a dam to provide the storage needed for water supply and to maintain downstream flows.

Ocean Lake sub-watershed (part of 1EQ-4) as possible short-term (approximately 21 day) contingency supply, with withdrawals directly from Ocean Lake. The abovementioned watersheds are delineated in Figure 7. The final decision as to which watershed to employ as primary water supply will be contingent upon the ability to reduce/mitigate environmental impacts, and will be made only following appropriate fish, terrestrial and wetland surveys.

7.3.3 Other:

Other materials inputting to or exiting each of the key process facilities are identified in Table 7.3.

Figure 7 - Watershed Mapping

Table 7.3
Process Materials Input/Output Chart

Inputs	Process/Facility	Outputs

- Ship servicing materials - Sea water ballast	**Marine facility** Ship unloading, servicing and ballasting	- LNG pumped to storage tanks - Garbage & other ship wastes
- LNG from ship	**LNG storage, regasification & transfer**	- revapourized nat gas to M&NP pipeline and Petrochem plant
- propane - butane - ethane	**Chemical Storage Tanks**	propane butane ethane
- ethane - propane - steam - fresh water - elect power - nitrogen	**Petrochemical Plant**	- ethylene - propylene - by-products of: hydrogenated C4s and hydrotreated gasoline
- methane - other waste gases	**Cogeneration Plant**	- electrical power (200MW) - steam

7.4 <u>Waste Disposal</u>:

The various waste sources and waste management plans for each are addressed in Section 7.1.

Table 7.4
Summary of Waste Management Plans

Waste Description	Waste Management Plan

Marine facility	A protocol for berthed ships will be developed to define satisfactory management of ship solid wastes, prevention of the discharge of waste water into Isaac□s Harbour, and ship ballasting after unloading, etc.
LNG Storage and Regasification	A fully automated vapour control system will be installed and will monitor fire, combustible gas and low temperatures with control and full shut down capability. There will be some NOx and CO air emissions through several small stacks, storm water management, and domestic sewage collection and treatment. These will be detailed in the EA.
Petrochemical Plant	Most by-product gas will be sold or used elsewhere on site. Any residue gas will be mixed into the fuel gas feed. The waste management plan will fully address spent caustic handling and treatment, waste streams incineration, waste water handling and treatment, and solid waste handling and storage.
Cogeneration Plant	Stack emissions will result from the combustion methane and waste gases. There will be no cooling water discharge associated with the plant and no significant ash.
Wastewater Treatment Plant (WWT)	The basic WWT plant will consist of a biological aerated/activated sludge system with pre-separation of oily water collected in a separate subsystem fitted with CPI separators. Treated water will be discharged into Isaac□s Harbour within provincial standards.
Stormwater	A first flush approach will be applied by which the initial 25mm of rainfall will directed to contaminated stormwater ponds. This water will then be bled into the WWT plant prior to discharge. Other stormwater will be regarded as clean and discharged directly.

7.5 Site Description:

The land for the Project is mostly situated in the Goldboro Industrial Park plus private land being negotiated for purchase. A description of these tracts of land is included as Appendix □B□.

7.6 Environmental:

7.6.1 Preliminary Environmental Screening:

A Preliminary Environmental Screening was undertaken in 2002; the results of which are shown in

Table 7.5.

Table 7.5
Preliminary Environmental Screening

Category	Constraint	Organization/ Department Contacted	Constraint Present (Yes/No)	Comments
Geology	Mineral Resources	Nova Scotia Department of Natural Resources (DNR)	Yes	mineral resources include gold.
	Sand and Gravel Deposits	DNR	Yes	
	Mineralized Slates	DNR	No	
	Shallow Bedrock	DNR	No	
	Karst Terrain	DNR	Yes	
	Highly Erodible Soils	DNR	Yes	sandy and silty tills
Terrestrial Environment	Wildlife Management Ares	DNR, Environment Canada (EC)	No	
	Ecological Reserves	DNR, Nova Scotia Museum (NSM)	No	
	Rare and Endangered Species	DNR, NSM	Yes	several species of rare plants and animals exist in the study area; survey recommended.
	Managed Wetlands	Ducks Unlimited	No	
	Important Habitat	DNR, EC	Yes	
	Important Wetlands (Golet Score >60)	DNR, EC	Yes	
	Protected Beaches	in house	No	
	Old Growth Hardwood Stands	DNR	No	
	Trees of Distinction	in house	Yes	
Aquatic	Rivers/lakes	in house	Yes	

Environment	Significant Fish Habitat	Fisheries and Oceans Canada (FOC)	Yes	
	Floodplain	in house	No	
Marine Environment	Marine Habitat	FOC	No	
	Salt Marsh	FOC	Yes	
Crown Lands	Provincial Parks	DNR	No	
	National Parks	in house	No	
	Federal Lands	in house	No	
	Park Reserves	DNR	No	
Native Lands	Indian Reserves	Indian and Northern Affairs (INA)	No	
	Native Land Claims	INA	No	no active claims
Agriculture	Agricultural Land	in house	No	area
	Fur Farms	Nova Scotia Department of Agriculture and Marketing (NSDAM)	Yes	
Forestry	Intensive Forestry Management	DNR	No	
	Woodlot Management	DNR	Yes	private wood lots located throughout the study area
	Sugar Bush	DNR	No	
Land/Water Use	Urban/Rural, Proposed Development	Municipality of Guysborough	Yes	
	Airports and Navigational Aids	Transport Canada	Yes	Heli-Pad
	Landfills/Waste Disposal Sites	Nova Scotia Department of the Environment (DOE)	No	
	Strip Mines	DNR	No	
	Underground Mines and Surface Facilities	DNR		Inactive gold mines

	Pits and Quarries	DNR	No	
	Advanced Mineral Exploration	DNR	No	
	Navigable Waters	FOC (Coast Guard)	Yes	Isaac□s Harbour
	Aquaculture	NS Dept. of Fisheries	No	
	Recognized Views	in house	No	
Recreation	Canoe Route	Sport Nova Scotia	Unknown (no reply)	
	Cross Country Ski Trails	Sport Nova Scotia	Unknown (no reply)	
	Hiking Trails	Sport Nova Scotia	Unknown (no reply)	
	Misc. Recreation	Municipality of Guysborough	Yes	Snowmobile trails
Water Supply	Surface Water Supply	DOE	Yes	Potential sources under review
	Groundwater Supply	DOE, Municipality of Guysborough	Yes	SOEI well, individual wells
	Developed Springs	Municipality of Guysborough	No	none identified
Utilities	Power Transmission Lines	Nova Scotia Power	Yes	transmission and distribution lines
	Municipal Services (water and sewer infrastructure)	Municipality of Guysborough	No	Municipality considering water and sewer lines, sewage treatment plant, Goldboro Industrial Park
	Telecommunications Towers	Industry Canada	No	
	Telephone Fibre Optic Cable	MT&T	Yes	buried/aerial copper and fibre optics lines
	Cable TV Fibre Optic Cable	No Contact	to be determined	

	Miscellaneous Pipelines	Municipality of Guysborough, SOEI, M&NP	Yes	Underground Natural gas and Natural gas liquid lines.
	Active Railway Lines	in house	No	
Archaeology/ Heritage	National Historic Sites	Canada Parks Service	No	
	Heritage Properties	Nova Scotia Department of Housing and Municipal Affairs	No	
	Archaeological Sites	NSM	No	no reported archaeological sites
	Old Burial Grounds/Cemeteries	NSM, local residents	Yes	two identified cemeteries
	Heritage Rivers	DNR	No	
	Fossil Sites	NSM	No	none indicated by

7.6.2 Possible Valued Environmental Components (VECs):

The following elements are currently being regarded as possibleVECs or of other specific concern:

- Fish habitat
- Fisheries including aquaculture
- Marine mammals
- Sea and coastal birds
- Species at risk
- Wildlife
- Wetlands
- Aboriginal interests
- Air quality including noise
- Water resources/management
- Highway corridor - traffic, land use, other impacted components
- Cumulative effects
- Climate change implications
- Safety and health concerns
- Impacts to lifestyle

These items are briefly introduced in the following sub-sections. Any others items specified in the Terms of Reference, will also be fully addressed in the EA.

7.6.2.1 Fish Habitat:

Shoreline fish habitat supports valued commercial fisheries for lobster, sea urchin and crab. Lobster habitat is generally restricted to the coarse substrate within about a kilometre from shore; the central part of the bay is deeper and has a predominately mud bottom. Herring spawning areas are known to exist in outer parts of the bay. Streams in the area support brook trout, gaspereau and smelt. Some freshwater fish habitat in the area has been contaminated by past heavy metal mining activities. Currently available information on the fresh water bodies in the project area are as follows:

Meadow Lake:

Meadow Lake is also known locally as Isaacs Harbour Lake. The headwaters of the Meadow Lake watershed originate in Garry Lake and Garry River situated approximately 10 km north of Meadow Lake. The Garry River discharges to Big Stillwater Lake along with several other smaller tributaries; and from that lake, the discharge becomes the Isaacs Harbour River which flows to Meadow Lake. The only other major tributary to Meadow Lake is that from Little Beach Hill and Beach Hill lakes located about 1 km north of Meadow Lake.

Meadow Lake is quite shallow, with a maximum water depth of about 2 m at the lake elevations at the time of the 2001 and 2004 surveys. Shoreline vegetation is dominated by black and white spruce, birch, tamarack, and speckled alder, with some rock maple and sweet vibernum. Labrador tea was also common, as were a variety of sedges and grasses. In-water vegetation includes Glyceria and the algae Chara, as well as emergents such as horsetail and cattail. Substrates along the shoreline are dominated by boulder and cobble, with occasional patches of gravel. Small sand beaches were also noted along several stretches of shoreline. Lakebottom substrates in deeper waters are almost exclusively silt. Dissolved-oxygen concentrations and pH levels are within normal ranges.

The fish community in Meadow Lake includes yellow perch (Perca flavescens), brook trout (Salvelinus fontinalis), golden shiner (Notemigonus crysoleucas), white sucker (Catostomus commersoni), and Atlantic Salmon (Salmo salar). Yellow perch and white sucker were the most frequently collected species during the surveys, with golden shiners and brook trout found in relatively low abundance. The most notable result of the fish surveys in this Meadow Lake is the confirmed presence of Atlantic salmon. Local residents report that this species migrates up the Isaacs Harbour River from the Atlantic Ocean; and although Meadow Lake is not typical of Atlantic Salmon habitat, it appears likely that the salmon use Isaacs Harbour River upstream and perhaps downstream of Meadow Lake for spawning.

Extensive areas of marsh and bog are associated with Meadow Lake, particularly at the north end. Ring-necked duck and common loon appear to nest in these areas, and common merganser with recently fledged have been observed in this part of the study area. The marsh /bog system has an notable diversity of plants, including arethusa orchid and, in one area, narrow-leaved sundew. Osprey and bald eagle were observed on several occasions, and the eagle, at least, may nest nearby.

New Harbour River / Ocean Lake:

The headwaters of New Harbour River originate in the vicinity of Ephraims Lake. The Northeast Branch New Harbour River and the outlet of Ocean Lake both discharge into New Harbour River which flows generally southeastward into Upper New Harbour on the Atlantic coast.

Riparian vegetation along New Harbour River downstream of Ocean Lake is dominated by black spruce (Picea mariana), red maple (Acer rubrum), balsam fir (Abies balsamea), speckled alder (Alnus incana), rhodora (Rhododendron canadense), sheep laurel (Kalmia angustifolia), peat moss (Sphagnum spp.) and a variety of grasses and sedges. Substrates in New Harbour River include boulder, cobble, gravel, and sand sorted in general correspondence with the riffle-pool-run sequences which are typical throughout much of this watercourse. Overhanging vegetation, undercut banks, deep pools, riffle-runs, and woody debris all contribute to the high-quality fish habitat associated with this feature.

The fish community in New Harbour River includes brook trout, Atlantic Salmon, killifish, and American eel. As with Meadow Lake, the most noteworthy result of the surveys in New Harbour River is the confirmed presence of Atlantic salmon which are obviously using the watershed for spawning and rearing purposes.

Ocean Lake is a relatively large deep lake with a maximum water depth of about 20 meters below surface elevation at the time of the surveys. Riparian vegetation is dense, uniform and dominated by black spruce (Picea mariana), balsam fir (Abies balsamea), tamarack (Larix laricina), sheep laurel (Kalmia angustifolia) and leatherleaf (Chamaedaphne calyculata). Substrates along the lake margins is dominated by boulders and sand, with some areas of cobble, gravel and sand in several beach-like formations.

The fish community in Ocean Lake is dominated by brook trout, white sucker and American eel, along with forage fish such as killifish and ninespine stickleback.

The terrestrial habitat associated with the New Harbour River system is almost entirely coniferous forest. While most of this system may be described as such, there are some small meadow and sphagnous areas near the lower end. Osprey was noted on two occasions in this part of the study area as well as red-breasted merganser and spotted sandpiper.

Gold Brook Lake:

The headwaters of Gold Brook Lake originate at Oak Hill Lake, a small lake situated almost midway between Ocean Lake and Meadow Lake. Gold Brook Lake has two main tributaries, both of which discharge to the lake along the north shore and one of which is the watercourse from Oak Hill Lake. Gold Brook Lake discharges to Gold Brook at Gold Brook Road, the location of several former gold mines. Gold Brook flows generally southeasterly to Seal Harbour Lake, and from there through East Brook and West Brook to the Atlantic Ocean at Warringtons Cove.

Gold Brook Lake is relatively shallow, with the deepest location having only 3 m of water at the time of the survey. Shoreline vegetation is dominated by white spruce (Picea glauca), black spruce (P. mariana), birch (Betula spp.), speckled alder (Alnus incana), Labrador tea (Ledum groenlandicum), and horse tail (Equisetum spp.). Other species included sheep laurel (Kalmia angustifolia), tamarack (Larix laricina), sweet viburnum (Viburnum lentago), and various mosses and lichens. Aquatic macrophytes are quite sparse, with only grasses (Glyceria spp) noted. Stonewart (Chara sp) is also found at several locations.

Shallow-water substrates are dominated by boulder and cobble, with occasional small gravel beaches. Substrates in the vicinity of the discharge from Gold Brook Lake outlet, particularly those on the east side, consist of fine sandy materials which appear to be tailings from the former mining and milling operations located at that site. These suspected tailings deposits, some of which were larger than a hectare, are also located along Gold Brook banks for more than a kilometre downstream. Dissolved oxygen levels noted during the surveys of this lake are well within a normal range, with pH slightly less than neutral and conductivity at a low level as expected.

The fish community in Gold Brook Lake is dominated by yellow perch. Brook trout are also present in the lake, and have been reported in Gold Brook. Brook trout are a relatively sensitive species which requires ground-water discharge as part of suitable spawning habitat. The presence of this species in Gold Brook Lake indicates that this is almost certainly a spring-fed systems and that the water quality is likely relatively high. American eels were not collected during the survey but have been reported as present by local residents and by previous studies. The presence of this species in Gold Brook lake confirms that there is un-obstructed passage for the eels between this lake and the Atlantic Ocean.

Gold Brook flows from Gold Brook Lake to Seal Harbour Lake in a southeasterly direction. Observations noted during a survey in 2000 and further supplemented by inspections during 2001 indicated that the physical habitat associated with the watercourse is relatively diverse. Riffles, pools, and side channels, are common, and a range of riparian vegetation was observed including willow, grasses, spruce, and Sphagnum. In-stream substrates were dominated by boulder and cobble with some gravel and sand in the upper reaches. In some downstream sections where the channel is wider and water velocities considerably lower, substrates are characterized by silt.

The terrestrial habitat associated with Gold Brook Lake is mostly coniferous forest, with the exception of an extensive marsh/bog area at the northeast corner. Ring-necked duck appears to nest here and common loon is confirmed as breeding on this lake.

7.6.2.2 Marine Fisheries including Aquaculture:

Lobster, crab and sea urchin form the most important commercial fisheries. Herring and mackerel are also caught during seasonal migrations through the bay. Only about eight fishermen fish in the local area, assisted by divers harvesting sea urchin. Large offshore shrimp vessels offload shrimp at a wharf in Country Harbour. A number of aquaculture leases are active in Country Harbour, but not near the proposed facilities.

7.6.2.3 Marine Mammals:

The area is not particularly important for marine mammals, but small whales, such as belugas, are known to come into the local bays to feed.

7.6.2.4 Sea and Coastal Birds:

Offshore islands, particularly Country Island, and some coastal areas support breeding colonies of sea and coastal birds. Roseate terns and storm petrels are two particularly important species found in the area.

7.6.2.5 Species at Risk:

The Species at Risk Act (SARA) establishes Schedule 1 as the official list of wildlife species at risk. It classifies those species as being either extirpated, endangered, threatened, or a special concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assigns national status to species at risk in Canada. Species that were designated at risk by COSEWIC prior to October 1999 must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the list of wildlife species at risk.

7.6.2.6 Wildlife:

Deer, moose and raptors are potential species of interest in the study area. The area near the proposed facility is a mix of forest, wetlands and developed land, not wilderness per se. Most of the forest growth is relatively young and does not tend to provide critical breeding or over-wintering habitat for valued commercial or recreational species.

7.6.2.7 Wetlands:

Wetlands are relatively abundant throughout the rocky terrain where drainage is interrupted. None of the wetlands near the proposed facilities are classified as particularly important wildlife areas, but wetlands are generally considered sensitive and valued habitats.

7.6.2.8 Aboriginal Interests:

Aboriginal use is uncommon in the area, but a pre-contact archaeological site was identified on the edge of Dung Cove in the Deep Panuke, SEIS.

7.6.2.9 Air Quality Including Noise:

During the construction phase activities on both the plant area and the highway corridor will generate noise and dust which will likely need to be mitigated to avoid nuisance levels. During operations there will be a number of both regular and periodic air emissions requiring appropriate management measures to meet regulatory requirements.

7.6.2.10 Water Resources Management:

Water resources management will be an important project VEC both with respect to the plant area and the highway corridor. At the former, large water withdrawals will be required leading to a need for the generation of storage through the construction of a low dam on Meadow Lake, or similar alternatives; stormwater at the plant will require proper management, and the implications of existing impacted streams and lakes from previous mining operations in the Goldboro area pose some concerns. As indicated inTable 7.2, the highway is expected to cross some 29 rivers and streams over its 58 km length, all of which will require appropriate water management measures.

7.6.2.11 Highway Corridor:

The highway will generate a number of environmental issues requiring management and mitigation including the previously mentioned noise and dust suppression, and water management issues. The improved access the highway will provide to the currently isolated Goldboro region may be regarded either positively from the economic standpoint or negatively in the mind of some from a lifestyle standpoint.

7.6.2.12 Cumulative Effects:

A number of cumulative effects will be assessed within the EA including those with the existing pipeline, the existing power-line corridor (which the new highway follows for some of its length), areas impacted from previous mining operations, and the existing fisheries activities. Consideration of climate change implications is, in itself, a cumulative effect issue.

7.6.2.13 Climate Change Implications:

Climate changes over the life-span of the project may likely involve increased mean sea levels and even more importantly, increased frequency and intensity of extreme weather events. Both will be considered in the EA.

7.6.2.14 Safety and Health:

The effects of the projecton on the health and safety of both project personnel and others in the area will be important in all its phases. The shipment, storage, and revapourization of LNG, as well as petrochemical facilities have excellent safety records but any perceived concerns with local residents will be respected and addressed as part of the EA.

7.6.2.15 Impacts on Lifestyle:

The construction and operation of the plant complex and its associated marine terminal and highway will without doubt cause major changes to the Goldboro region. These effects will be positive from the standpoint of economic and employment opportunities, both directly and from its secondary opportunities. However, these changes may alter the lifestyle to the existing residents of the region and will be addressed in the social component of the EA.

7.6.3 Backgound Information on the Safety of LNG Transhipment:

Natural gas liquefaction dates back to the 1940s when the first commercial liquefaction plant, built in Ohio (1941), raised the possibility of its transportation to distant destinations. The first LNG tanker was put in service in 1959. Large quantities of natural gas were discovered in Libya and Algeria in 1964, with the latter becoming a major world supplier of natural gas as LNG. LNG imports reached a peak in 1979 then declined because of gas surplus in North America and price disputes with Algeria. An increase in demand for natural gas in the US, particularly for power generation and an increase in U.S. natural gas prices, resulted in a renewed interest in the U.S. market for LNG in 1999.

World wide, the LNG industry presently operates 17 export and production terminals, 40 receiving and regasification terminals and 145 + LNG carriers.

Throughout the LNG industry□s history less than ten serious accidents have been recorded on a global basis. The operating and safety record of LNG ships has been outstanding. To date, LNG vessels have made about 38,000 voyages and have safely transported over 1.5 billion m^3 of LNG without releases of any LNG cargo.

7.6.4 Other Environmental Information:

Currently available background information on the physiography and geology of the terrain along the proposed new highway is provided in Section 7.1.4.2.

7.7 Land Use:

7.7.1 Proposed Highway:

The Province of Nova Scotia will be asked to provide any crown land that is required for the proposed highway. The Province will also be asked to assist with any issues of expropriation should they occur. Ownership of the highway on completion has yet to be finalized.

No other off-site land uses have been identified to date.

8.0 PUBLIC CONSULTATION:

Over the past four years, Keltic Petrochemicals Inc. has been proactive in their communication effort with stakeholders. In advance of any public announcement, Keltic has met with all levels of government to brief them on the progress of the project. Keltic has established an excellent working relationship with both the elected representatives from the Guysborough area and the municipal staff.

In June 2004, Keltic held a public meeting for local residents. Invitations to the meeting were hand-delivered to over 250 households. As well, an open invitation was posted on several community bulletin boards. The meeting was held at the Goldboro Community Centre.

Eight poster boards depicting and describing the various components of the project were displayed. Keltic staff and associates were available to discuss the project in more detail with attendees. Guests were asked to sign in but due to the high volume of attendees it was not possible to do this effectively. It was estimated that approximately 300 people attended this function. Pamphlets and comment forms were distributed. Ninety-one forms were filled out, 77 (85%) responses were in favour of the project moving forward at Goldboro based on the information provided, 10 (11%) respondents wanted more information before committing to a decision and 4 (4%) were not supportive.

During the week of July 5, Keltic Petrochemicals Inc. held open houses for the communities of Country Harbour, Drum Head, Lincolnville, Guysborough and Antigonish Town and County. Approximately 100 people attended these open houses. 38 attendees completed the comment form and all were in favor of the project moving forward. Twenty-five attendees expressed an interest in sitting on a Community Liaison Committee.

Keltic staff and associates also held a meeting with the executive staff of the Guysborough County Inshore Fishermans Association.

After 6 open houses, the general feeling is that Keltic has an extremely supportive community that is eager to have sustainable economic development in their area. Sixty respondents have expressed an interest in sitting on a community liaison group. Keltic is in the process of structuring the Community Liaison Committee and evaluating all applicants for suitability.

Next steps for Keltic Petrochemicals Inc. include creating the mandate and structure of the

Community Liaison Committee, assessing the need for other committees, developing a quarterly Community Bulletin to keep local residents apprised of new developments regular, launching our website, and arranging community consultations as required.

The First Nation Community has expressed a desire to participate in the Project.

An open house was held in one of the Black communities and their on going participation will be addressed, a member of their communities will be on the Community Liaison Committee.

Attached as Appendix □A□ is the results of Industrial Planning Questionaire completed by residents of Godboro as a result of public consultation carried out by the Municipality of the District of Guysborough.

9.0 LIST OF APPROVALS AND RELEVANT EAs:

It is currently foreseen that approvals may need to be sought in accordance with the requirements of the following federal and provincial legislation and the regulations made pursuant to them:

Federal:

Environmental Assessment Act

Environmental Protection Act

Fisheries Act

Migratory Birds Conservation Act

Navigable Waters Protection Act

Nova Scotia:

Environment Act

9.1 Existing Relevant Environmental Assessments:

The following existing Environmental Assessment reports relevant to this project are:

- ADI Limited. 1997. Alternate Onshore Sites (Preliminary Geotechnical and Environmental Survey, 1996)Country Harbour, NS. for Mobil Oil Canada Properties. Halifax, NS.

- Nolan Davis & Associates. 1990. Environmental Assessment report for a Proposed Gold Mine project at Goldboro, Guysborough County, Nova Scotia. for Exploration Orex Inc.

Halifax, NS.

- Tarandus Associates Limited. 2002. Environmental Assessment - Proposed Petrochemical Facility at Goldboro, Guysborough County, Nova Scotia. Interim Report. Keltic Petrochemicals Inc., Halifax. NS.

- Strait Engineering Ltd., 2001. Environmental Assessment of Lands at Goldboro. Municipality of the District of Guysborough. Guysborough, NS.

- Sable Offshore Energy Project (SOEP).1997. Environmental Assessment of Sable Offshore Energy Project. Halifax, NS.

- Maritime and Northeast Pipelines. 1997. Environmental Assessment of M&NEP Pipeline Project. Halifax, NS.

- O□Halloran Campbell Consultants Limited.. 2003. Goldboro Industrial Park Development Project - Marine Transportation Feasibility Study. Halifax, NS.

10.0 SOURCES OF PUBLIC FUNDING:

The project will be privately funded.

APPENDIX □A□

RECORDS OF PUBLIC MEETINGS

APPENDIX B

SITE DESCRIPTION