

EVALUATION OF THE ADVANTAGES AND DISADVANTAGES TO THE ENVIRONMENT



Environmental Assessment Report (Class 2 Undertaking) Goldboro LNG - Natural Gas Liquefaction Plant and Marine Terminal Pieridae Energy (Canada) Ltd.



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## 11.0 EVALUATION OF THE ADVANTAGES AND DISADVANTAGES TO THE ENVIRONMENT

This section presents an overall Project evaluation of the advantages and disadvantages to the environment, during the construction, operation, and decommissioning phases. As required in the TOR for the EA, a justification is provided for the identified disadvantages.

This overview reflects Pieridae's commitments to regulatory compliance and to sound environmental management principles. The list of advantages and disadvantages assumes the successful implementation of the specific mitigation measures and monitoring programs as described in this EA and are reflective of an undertaking that is in full compliance with all applicable regulatory requirements, contemporary approaches to environmental management, and sustainability assurance.

Tables 11.0-1, 11.0-2, and 11.0-3 summarize the evaluation of the Project by Phase. For the most part, disadvantages of the Project are short-term and localized and associated with environmental effects that were not considered significant. The disadvantages are offset by mostly economic benefits, which are expected to be long-term and far reaching, i.e., relevant to the local community, the region, and the province of NS. Table 11.0-4 discusses advantages and disadvantages with respect to potential malfunctions and accident scenarios.

Table 11.0-1 Construction Phase Project Advantages and Disadvantages

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VEC	Construction Phase		
VEC	Advantages	Disadvantages Including Justification	
Biophysical Environment			
Geological (soil quality)	Project site development work will eliminate concerns and hazards associated with on-site tailings and AMO.	<ul> <li>Potential for minor impairment to surface and groundwater resources from works and activities at contaminated sites; Project will identify extent and degree of site contamination within the Project site boundaries and provide for adequate site management (i.e., isolation, removal, and remediation).</li> </ul>	
Groundwater (quality and quantity)	• NA.	Potential for minor impairment to groundwater quality; possible localized alterations in flow and volume; construction-related effects short-term and to remain within applicable regulatory standards and requirements.	
Surface Water (quality, sediment quality)	• NA.	Potential for minor impairment of surface water quality and flow during construction, however, effects localized short-term and to remain within applicable regulatory standards and requirements.	
Air Quality and Climate Change	• NA.	Increased air emissions; construction- related emissions localized short-term and to remain within applicable regulatory standards; emission sources located in designated industrial park.	



	Construction Phase			
VEC	Advantages	Disadvantages Including Justification		
Noise, Lighting	• NA.	<ul> <li>Increased noise levels; construction- related noise effects localized short-term and to remain within applicable regulatory standards; increased lighting will change rural character of Goldboro; noise and light sources located in designated industrial park.</li> </ul>		
Flora, Fauna and Terrestrial Habitat (including SAR)	Improved inventory of area habitat and species (for SAR).	Permanent loss of terrestrial habitat; no rare habitat involved (site previously disturbed through mining and logging activities); together with other future developments, Project may contribute to cumulative adverse effects on Mainland Moose population and bats; Proponent committed to contrinute to moose and bat recovery programs; avoidance of identified plant SAR; site designated for industrial use; development represents "brownfield site development" and is in line with municipal planning objectives.		
Wetlands	• NA.	Site development will involve removal of several small wetlands; all of which are considered common in the region and do not provide critical habitat for SAR; loss will be permanent; remaining wetlands in region extensive; to be mitigated/compensated through implementation of a wetland compensation program.		
Freshwater Aquatic Species and Habitat (including SAR)	Improved inventory of area habitat and species (for SAR).	Potential for HADD and reduced productivity; mitigated through ecological channel design to extent possible, and maintenance of flow regime; residual effects to be addressed through offset plan/ Fish Habitat Compensation Plan.		
Marine Species and Habitat (including SAR) and Marine Sediment Transport	Improved inventory of area habitat and species (for SAR).	<ul> <li>Some habitat loss at wharf and jetty; offset by marine habitat creation / enhancement of habitat productivity.</li> <li>Potential for some localized, temporary impairment of marine water and sediment quality and potential sediment transport; effects considered not significant.</li> </ul>		
Socio-Economic Environment				
Agriculture	No agriculture within zone of influence of proposed facility.	• NA.		
Forestry	Location has no particular value for forestry.	• NA.		
Fisheries, Aquaculture and Harvesting	• NA.	Marine traffic, water quality impairment, and near-shore construction activity could affect fish harvesting and aquaculture. Considered a trade off against significant economic benefits for the local community.		



VEC	Construction Phase		
VEC	Advantages	Disadvantages Including Justification	
Socio-economic Environment (Economic Conditions, Population, Employment)	<ul> <li>Will provide short term         (construction) employment through         direct hires and economic benefits         through direct expenditures and         multiplier effects.</li> <li>Will strengthen existing regional and         provincial industrial capability.</li> <li>Will encourage and facilitate local         population growth.</li> </ul>	• NA.	
Residential Property Values	Property values likely to increase.	• NA.	
Human Health	Discovery and safe disposal of potential mine tailings within the Project footprint.	<ul> <li>No air quality issues identified; all emissions and discharges to remain within applicable regulatory standards.</li> <li>Potential for exposure to dust or site runoff contaminated by hazardous materials; addressed by RMP.</li> </ul>	
Land Use – Existing and Planned	Project is compatible with and supports land use designation.	• NA	
Road Transportation	Project related economic benefits provide the public with financial resources for infrastructure improvements and maintenance	Increased traffic volumes effects expected to be localized, temporary; and well within existing road capacity; residual effects considered a trade off against significant economic benefits for the local community and with it the financial resources for infrastructure improvements and maintenance.	
Landscape Aesthetics and Recreational Opportunities	<ul> <li>Project's information centre will provide for local learning and interpretation opportunities.</li> <li>Increased tax revenues and higher population numbers (temporary and permanent) expected to provide for increased demand and business opportunities in local and regional recreation and tourism sector.</li> <li>Increased municipal tax base will allow for improvement and maintenance of recreation / tourism infrastructure.</li> </ul>	<ul> <li>Change of local landscape character from rural to industrial; some impairment of visual quality for some locations (foreground visually dominating by industrial features; visual intrusion by lighting). Site development fits municipal planning objectives in that it will take place in a designated industrial park with other existing and planned industrial uses. Visual aesthetics not raised as a concern during community consultation.</li> <li>Potential for temporary limitations on recreational boating near the jetty; considered a trade off against significant economic benefits for the local community and, with project-generated increased revenues, there is potential to off-set adverse effects through improvements in local and regional recreational infrastructure.</li> </ul>	



VEC	Construction Phase		
VEC	Advantages	Disadvantages Including Justification	
Aboriginal Use of Land and Resources	<ul> <li>First Nations communities engaged in Project development process (signed MOU in place). Proponent committed to collaborate with First Nations communities to ensure realization of Project benefits for Aboriginal communities.</li> <li>No interaction with land claims.</li> <li>No significant adverse effects on natural environment resources (see summaries under Biophysical Environment).</li> </ul>	• NA.	
Archaeological Resources	Improved inventory and knowledge of area resource.	• NA.	

Table 11.0-2	Operations Phase - Project Adv	vantages and Disadvantages	
VEC	Operations Phase		
VEC	Advantages	Disadvantages Including Justification	
<b>Biophysical Environment</b>			
Geological (Soil Quality)	No interaction with Project identified.	• NA.	
Groundwater (Quality and Quantity)	• NA.	• NA.	
Surface Water (Quality, Sediment Quality and Transport)	• NA.	<ul> <li>Discharges of (treated) wastewater; all discharges compliant with applicable water quality standards.</li> <li>Potential for some impairment of marine water and sediment quality and sediment transport; effects considered not significant; trade off through new wharf infrastructure providing opportunities for large scale naval transport to and from the industrial park and associated economic benefits.</li> </ul>	
Air Quality and Climate Change	With the provision of natural gas, the Project is making a fuel source available that generates the least GHG emissions of all fossil fuels.	Increase in emissions from local sources; levels to remain within regulatory standards. GHG emissions not significant in global context but in relation to NS's GHG reduction targets. Emission sources located in designated industrial park. Currently the province has no industry binding GHG standards in place; proponent committed to GHG management and/or GHG offsets within NS.	
Noise, Lighting	• NA.	Potential for increase in noise levels; proponent committed to mitigation so that levels remain within regulatory standards. Increased lighting will change rural character of Goldboro; noise and light sources located in designated industrial park.	



	Operations Phase		
VEC	Advantages	Disadvantages Including Justification	
Flora, Fauna and Terrestrial Habitat (including SAR)	• NA.	<ul> <li>Migrating bird species movement pattern could be disrupted as a consequence of the presence of the new development.</li> <li>Effect not considered significant.</li> </ul>	
Wetlands	No interaction with Project identified.	• NA.	
Freshwater Aquatic Species and Habitat (including SAR)	No interaction with Project identified.	• NA.	
Marine Species and Habitat (including SAR)	• NA.	Potential for change in sedimentation patterns around marginal wharf; significance unknown; but not expected to be significant trade off through new wharf infrastructure providing opportunities for large scale naval transport to and from the industrial park and associated economic benefits.	
Socio-Economic Environme	nt		
Agriculture	No agricultural activity within zone of influence of proposed facility.	• NA.	
Forestry	No interaction with Project identified.	• NA.	
Fisheries, Aquaculture and Harvesting	• NA.	Marine traffic and water quality impairment, could affect fish harvesting and aquaculture; effects expected to be not significant and considered a trade off against significant economic benefits for the local community.	
Socio-economic Environment (Economic Conditions, Population, Employment)	<ul> <li>Will provide long term (operation phase) employment opportunities.</li> <li>Contribute to local and regional economy (direct expenditures and benefits through multiplier effect).</li> <li>Increased municipal tax base.</li> <li>Strengthening of existing industrial capability of region and Province.</li> </ul>	• NA.	
Residential Property Values	Stability in property values.	• NA.	
Human Health	• NA.	<ul> <li>None identified; all emissions and discharges to remain within applicable regulatory standards; working environments in compliance with regulatory requirements.</li> <li>All potentially contaminated material managed and safely disposed of.</li> </ul>	
Land Use – Existing and Planned	Project is compatible with land use designation and supports municipal planning objectives for the Project location.	• NA.	
Transportation	Project related economic benefits provide the public with financial resources for infrastructure improvements and maintenance.	None identified; operation related traffic volumes are well within road capacity. Increased traffic volumes; effects expected to be localized.	



VEO.	Operations Phase		
VEC	Advantages	Disadvantages Including Justification	
Recreational Opportunities and Aesthetics	Information Centre will provide interpretive and learning opportunities     Increased tax revenues and higher population numbers (permanent workforce) expected to provide for increased demand and business opportunities in local and regional recreation and tourism sector.     Increased municipal tax base will allow for improvement and maintenance of recreation/tourism infrastructure.	Change of landscape character from rural to industrial; some impairment of visual quality for some locations (foreground visually dominating by industrial features; visual intrusion by lighting). Site development fits municipal planning objectives (designated industrial park with other existing and planned industrial uses). Visual aesthetics not raised as a concern during community consultation.  Potential for temporary limitations on recreational boating near the jetty and not considered; considered a trade off against significant economic benefits for the local community. Project-related increased revenues provide potential to off-set adverse effects through improvements in local and regional recreational infrastructure.	
Aboriginal Use of Land and Resources	<ul> <li>First Nations communities engaged in Project development process (signed MOU in place). Proponent is committed to collaborate with First Nations communities to ensure realization of Project benefits for Aboriginal communities.</li> <li>No interaction with land claims.</li> <li>No significant adverse effects on natural environment resources (see summaries under Biophysical Environment).</li> </ul>	• NA.	
Archaeological Resources	No interaction with Project identified.	• NA.	

Table 11.0-3 Decommissioning Phase - Project Advantages and Disadvantages

VEC	Decommissioning Phase		
VEC	Advantages	Disadvantages Including Justification	
Biophysical Environment			
Geological (Soil Quality)	Full site decommissioning to applicable standards.	• NA.	
Groundwater (Quality and Quantity)	No interaction identified.	• NA.	
Surface Water (Quality, Sediment Quality and Transport)	Upon completion, elimination of operations-related discharges; potential for rehabilitation of natural shoreline and processes.	Potential for impairment of marine water and sediment quality from dismantling of infrastructure; short-term and localized.	
Air Quality and Climate	Upon completion, elimination of operations-related emissions.	Dust emissions from decommissioning work; short-term and localized.	



VEC	Decommissioning Phase			
VEC	Advantages	Disadvantages Including Justification		
Noise, Lighting	Upon completion, elimination of noise and lighting sources.	Noise-effects associated with decommissioning work; site lighting likely reduced during decommission but may continue at some level above current rural light levels until completion for decommissioning; noise effects short- term and localized.		
Flora, Fauna and Terrestrial Habitat (including SAR)	Potential for rehabilitation of terrestrial habitat.	• NA.		
Wetlands	Potential for rehabilitation of wetland habitat.	• NA.		
Freshwater Species and Habitat (including SAR)	Potential for rehabilitation of natural shoreline and processes.	<ul> <li>Potential for impairment of aquatic habitat (through water and sediment quality) from ground disturbing activities; short-term and localized.</li> </ul>		
Marine Species and Habitat (including SAR)	Potential for rehabilitation of marine habitat.	<ul> <li>Potential for impairment of marine habitat (through water and sediment quality) from dismantling of wharf and terminal; short- term and localized.</li> </ul>		
Socio-Economic Environme	nt			
Agriculture	No agricultural within zone of influence of proposed facility.	• NA.		
Forestry	Potential for site re-vegetation/ forestry.	• NA.		
Fisheries, Aquaculture and Harvesting	Upon completion, access regained to marine areas to the degree that jetty and marginal wharf will be removed (municipality may decide to maintain some of the marine facilities for other uses).	• NA.		
Socio-economic Environment (Economic Conditions, Population, Employment)	Will provide short term (decommissioning) employment; will provide opportunity for other commercial/industrial use of property.	• NA.		
Residential Property Values	Cannot be determined at this point as dependent on after use scenario.	Potential for reduced demand for residential property following completion of the decommissioning; dependent on subsequent use of property and economic development in the region.		
Human Health	Site rehabilitation; removal of infrastructure and materials with potential for contamination.	<ul> <li>All potentially contaminated material managed and safely disposed of.</li> <li>Condition of site soil and groundwater demonstrated to be free of residual contamination by Project activities.</li> </ul>		
Land Use – Existing and Planned	Decommissioning to be in close consultation with municipality to consider opportunities for after uses (commercial, industrial, resources related).	• NA		



VEC	Decommissioning Phase		
VEC	Advantages	Disadvantages Including Justification	
Road Transportation	No interaction identified.	Increased traffic volumes; effects expected to be localized, temporary, and well within existing road capacity; residual effects considered a trade off against economic benefits for the local community.	
Recreational Opportunities and Aesthetics	<ul> <li>Upon completion, capability for recreational use of some areas may be re-established.</li> <li>Potential for rehabilitating rural landscape characteristics.</li> <li>Elimination of temporary navigational restrictions for recreational boating.</li> </ul>	• NA.	
Aboriginal Use of Land and Resources	No interaction with land claims; opportunities for cooperation between proponent and Aboriginal communities regarding decommissioning activities (employment) as well as after use scenarios.	• NA.	
Archaeological Resources	No interaction identified.	NA.	

Table 11.0-4 Malfunctions and Accidents - Project Advantages and Disadvantages

Table 11.0 4 Mana	ilictions and Accidents - i roject	Advantages and Disadvantages	
VEC	Malfunctions and Accidents		
VEC	Advantages	Disadvantages Including Justification	
Effects on Natural Environment VECs, in particular terrestrial, freshwater and marine species and habitat, as well as water resources and air quality as a result of: • spill of fuels, lubricants, or release of hazardous material to air or water; • fire; • LNG leaks and fire; • vessel collision; and • failure to properly exchange ballast water.	<ul> <li>Coordination with local and regional emergency response units including sharing of resources, training and preparedness.</li> <li>Location in designated industrial park, by design separates the Project from potentially sensitive land uses and most residences.</li> <li>No rare or unique habitat features at or near the site.</li> </ul>	<ul> <li>Consequences ranging from small incidences and localized contamination to fires or large spills.</li> <li>Failure to properly discharge ballast water can lead to introduction of organisms with potential to adversely affect marine life.</li> <li>Project provides major, long-lasting and far reaching economic benefits and employment contributing to economic well being of the area.</li> <li>Integration of specific accident prevention / mitigation measures (e.g., ESD system, leak and fire detection systems, constructed berms for containment areas; appropriate spacing of equipment; double shell tanks; emergency release couplers at loading jetty.</li> <li>Project design, construction and operation in compliance with all applicable LNG specific codes and standards most importantly CSA Z2786. LNG liquefaction, storage and transport represents proven technology with excellent safety record. Development of comprehensive Health, Safety and Environmental Management System.</li> <li>Likelihood of accident/malfunction</li> </ul>	



VEC	Malfunctions and Accidents	
	Advantages	Disadvantages Including Justification
		scenario with significant consequences for natural environment VECs very remote.
Effects on Socio-Economic VECs, in particular human health as a result of direct exposure or exposure via pathways resulting from: • Spill of fuels, lubricants, or release of hazardous material to air or water.	<ul> <li>Coordination with local and regional emergency response units including sharing of resources, training and preparedness.</li> <li>No residences at or immediately adjacent to site.</li> </ul>	<ul> <li>Consequences ranging from human exposure to localized contamination to injuries and loss of life as a result of from fire asphyxiation, freeze burns.</li> <li>For justification – see above listing for Natural Environment VEC; plus:</li> <li>Likelihood of accident/ malfunction scenario with significant consequences for socio-economic VECs very remote.</li> </ul>