



Keltic Petrochemicals Inc.
Liquid Natural Gas Facilities and
Marginal Wharf
Goldboro, Nova Scotia



Final
Comprehensive Study Report



October 2007



**Proposed Liquefied Natural Gas Facility
and Marginal Wharf
Comprehensive Study Report
Goldboro, Nova Scotia**

FINAL REPORT

Submitted to:

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TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY.....	ES-1
1.0 INTRODUCTION.....	1-1
1.1 PURPOSE OF THE COMPREHENSIVE STUDY REPORT (CSR)	1-4
1.2 THE FEDERAL REVIEW PROCESS	1-5
1.2.1 Comprehensive Study.....	1-5
1.2.2 Screenings.....	1-6
1.2.3 Key Federal Legislation	1-7
1.2.4 Technical Review Process of Marine Terminal Systems in Transshipment Sites (TERMPOL)	1-8
1.3 THE PROVINCIAL REVIEW PROCESS	1-9
1.3.1 Provincial Environmental Assessment Process.....	1-9
1.3.2 Key Provincial Legislation	1-10
1.4 THE FEDERAL/PROVINCIAL COORDINATION.....	1-11
2.0 PROJECT DESCRIPTION AND SCOPE OF ASSESSMENT	2-1
2.1 THE PROPONENT.....	2-1
2.1.1 Keltic Development Project (KDP) Participants.....	2-1
2.1.2 Participants' Roles.....	2-3
2.2 KELTIC DEVELOPMENT PROJECT (KDP) DEVELOPMENT PROPOSAL OVERVIEW.....	2-5
2.2.1 Location.....	2-5
2.2.2 Key Keltic Development Project Components.....	2-9
2.2.2.1 LNG Facility Including Marine Terminal and Marine Transfer Pipelines	2-9
2.2.2.2 Petrochemical Facilities	2-12
2.2.2.3 Marginal Wharf	2-14
2.2.2.4 Co-generation Plant.....	2-17
2.2.2.5 Utilities and Site Support Facilities	2-17
2.2.3 Applicable Project Design Codes, Standards and Guidelines	2-18
2.2.4 Environmental, Health and Safety, and Communications.....	2-20
2.2.4.1 Environmental Management Plan (EMP)	2-20
2.2.4.2 Environmental Protection Plan (EPP)	2-21
2.2.4.3 Monitoring.....	2-22
2.2.4.4 Health and Safety	2-23
2.2.4.5 Training.....	2-23
2.2.4.6 Best Management Practices	2-23
2.2.4.7 Public Information / Community Liaison	2-24
2.2.5 Construction	2-24
2.2.5.1 General.....	2-26
2.2.5.2 LNG Facility Including Marine Terminal.....	2-26
2.2.5.3 Petrochemical Facilities	2-27

TABLE OF CONTENTS (CONTINUED)

	Page
2.2.5.4 Marginal Wharf	2-27
2.2.5.5 Co-generation Facilities	2-29
2.2.5.6 Utilities and Support Facilities	2-29
2.2.6 Operation and Maintenance	2-29
2.2.6.1 LNG Facility Including Marine Terminal.....	2-29
2.2.6.2 Petrochemical Facilities	2-30
2.2.6.3 Marginal Wharf	2-31
2.2.6.4 Co-generation Facilities	2-32
2.2.6.5 Utilities and Support Facilities	2-33
2.2.7 Future Modifications and Decommissioning	2-34
2.3 SCOPE OF PROJECT	2-35
2.3.1 Transport Canada's (TC) Scope of Project	2-35
2.3.2 Fisheries and Ocean Canada's Scope of Project	2-36
2.4 PROJECT NEED / ALTERNATIVES ASSESSMENT	2-36
2.4.1 Project Need / Purpose.....	2-37
2.4.1.1 Conclusion.....	2-38
2.4.2 Alternatives to the Project	2-39
2.4.2.1 Alternatives to LNG and LNG Importation	2-39
2.4.2.2 Alternatives to the Marginal Wharf	2-39
2.4.2.3 Conclusions	2-40
2.4.3 Alternative Means of Carrying Out the Project	2-40
2.4.3.1 LNG Marine Terminal.....	2-41
2.4.3.2 LNG Storage Tanks	2-42
2.4.3.3 LNG Regasification Facilities	2-43
2.4.3.4 Marginal Wharf	2-44
2.5 SCOPE OF ASSESSMENT.....	2-45
2.5.1 Factors to be Considered.....	2-45
2.5.2 Scope of Factors to be Considered.....	2-46
2.5.2.1 Boundaries	2-47
2.5.2.2 Methods.....	2-48
2.5.2.3 VEC Description	2-48
2.5.2.4 Strategy for Determining VEC – Project Interaction.....	2-57
2.5.2.5 Effects Prediction.....	2-58
3.0 INFORMATION DISTRIBUTION AND COORDINATION.....	3-1
3.1 FEDERAL COORDINATION	3-1
3.2 PUBLIC CONSULTATION IN ACCORDANCE WITH THE CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)	3-1

TABLE OF CONTENTS (CONTINUED)

	Page
3.2.1	Section 21 – Public Participation Regarding Proposed Scope of Project 3-2
3.2.2	Section 21.2 – Public Participation in Comprehensive Study 3-3
3.2.2.1	Issues Raised During the Public Review..... 3-4
3.2.3	Section 22 – Public Review of the Comprehensive Study Report (CSR).....3-10
3.3	CONSULTATION MEASURES UNDERTAKEN BY THE PROPONENT3-10
3.3.1	Goals3-10
3.3.2	Approaches to Public Consultation3-11
3.3.2.1	Defining Communities, Stakeholders and the Public.....3-11
3.3.2.2	Project/Scoping Backgrounder.....3-13
3.3.2.3	Public Meetings / Open Houses3-13
3.3.2.4	Continued Consultation.....3-16
3.3.3	Overview Provincial EA Process and Associated Key Consultation Activities 3-16
3.3.4	Consultation Summary.....3-17
3.4	FIRST NATION ENGAGEMENT3-17
3.4.1	RA Engagement with First Nations3-18
3.4.2	Engagement with First Nations by the Proponent and the Provincial Government.....3-18
3.4.2.1	Initial Communication, Engagement, Meetings3-18
3.4.2.2	Mi'kmaq Ecological Knowledge (MEK) Study.....3-18
3.4.2.3	Communication and Engagement with Assembly of Nova Scotia Mi'kmaq Chiefs3-19
3.4.2.4	Continued Communication and Engagement with First Nations by the Proponent3-20
3.5	CONSULTATION WITH EXPERT FEDERAL AND PROVINCIAL DEPARTMENTS...3-20
3.5.1	Consultation with Expert Federal Departments3-20
3.5.2	Comments by Federal and Provincial Authorities on the Provincial EA.....3-21
4.0	DESCRIPTION OF THE EXISTING ENVIRONMENT 4-1
4.1	DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT 4-1
4.1.1	Hydrology 4-1
4.1.1.1	Stream Flow Data 4-3
4.1.1.2	Stream-Flow Amounts Greater than Total Precipitation Catchment 4-7
4.1.1.3	Drought and Flood Frequency Forecasting 4-8
4.1.2	Freshwater Quality..... 4-9
4.1.2.1	Red Head Ponds4-12
4.1.2.2	Betty's Cove Brook and Other Surface Samples.....4-12
4.1.3	Groundwater Quality/Quantity.....4-12
4.1.3.1	General Hydrogeology4-14
4.1.3.2	Groundwater Flow Direction.....4-15
4.1.3.3	Local Well Survey4-16
4.1.3.4	Hydrogeology at the Proposed Keltic Project Site4-18
4.1.4	Marine Water Quality4-26
4.1.5	Soil/Sediment Quality.....4-29

TABLE OF CONTENTS (CONTINUED)

	Page
4.1.5.1	Terrestrial4-29
4.1.5.2	Past Mining4-33
4.1.5.3	Marine.....4-39
4.1.6	Description of Existing Ambient Air Quality4-39
4.1.7	Climatic Conditions4-40
4.1.7.1	Temperatures4-41
4.1.7.2	Winds4-41
4.1.7.3	Precipitation4-42
4.1.7.4	Fog4-42
4.1.7.5	Severe Weather4-42
4.1.7.6	Normals and Extremes4-43
4.1.8	Marine Biophysical Environment.....4-47
4.1.8.1	Wave Climate4-48
4.1.8.2	Currents.....4-48
4.2	DESCRIPTION OF THE BIOLOGICAL ENVIRONMENT.....4-49
4.2.1	Vegetation4-49
4.2.1.1	Terrestrial4-49
4.2.1.2	Aquatic (Vascular)4-52
4.2.1.3	Plankton and Marine Plants4-53
4.2.2	Fish and Fish Habitat.....4-54
4.2.2.1	Marine Fish and Fish Habitat4-54
4.2.2.2	Freshwater Fish and Fish Habitat4-70
4.2.3	Terrestrial Wildlife and Wildlife Habitat.....4-73
4.2.3.1	Amphibians4-73
4.2.3.2	Reptiles.....4-76
4.2.3.3	Birds4-76
4.2.3.4	Mammals4-84
4.2.4	Wetlands.....4-87
4.2.4.1	Wetland No.14-89
4.2.4.2	Wetland No. 124-90
4.2.4.3	Wetland No.134-91
4.2.5	Species at Risk.....4-91
4.2.5.1	Terrestrial Species.....4-92
4.2.5.2	Aquatic.....4-97
4.2.5.3	Vegetation4-99
4.2.5.4	Special Places4-100
4.2.6	Atmospheric Acoustic Environment.....4-100
4.3	DESCRIPTION OF THE SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT ...4-101
4.3.1	Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons4-102
4.3.2	Physical and Cultural Heritage.....4-103
4.3.2.1	Recreational Opportunities and Aesthetics4-104
4.3.2.2	Tourism.....4-104

TABLE OF CONTENTS (CONTINUED)

	Page
4.3.3 Structures/Sites of Archaeological, Paleontological or Architectural Significance	4-105
4.3.3.1 Archaeological Field Survey and Reconnaissance.....	4-105
4.3.4 Shipping and Navigation	4-109
4.3.4.1 Current Shipping Routes.....	4-109
4.3.4.2 Regulatory Environment	4-109
4.3.5 Lighting.....	4-109
4.3.6 Marine Safety and Security	4-109
4.3.7 Human Health and Safety	4-111
4.3.7.1 Seismic Considerations	4-111
4.3.7.2 Tsunamis	4-111
4.3.8 Fisheries.....	4-113
4.3.8.1 Freshwater.....	4-113
4.3.8.2 Marine.....	4-113
4.3.9 Aquaculture	4-121
4.3.9.1 Revenues and Earnings.....	4-121
5.0 ENVIRONMENTAL EFFECTS, MITIGATION, RESIDUAL ENVIRONMENTAL EFFECTS AND FOLLOW UP	5-1
5.1 ENVIRONMENTAL EFFECTS OF THE LNG MARINE TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS AND THE REGASIFICATION FACILITIES.....	5-1
5.1.1 Hydrology	5-1
5.1.1.1 Environmental Effects Prediction	5-1
5.1.1.2 Mitigation Measures and Monitoring	5-2
5.1.1.3 Residual Effects.....	5-3
5.1.1.4 Follow Up.....	5-3
5.1.2 Freshwater Quality/Quantity.....	5-4
5.1.2.1 Environmental Effects Prediction	5-4
5.1.2.2 Mitigation Measures and Monitoring	5-6
5.1.2.3 Residual Effects.....	5-9
5.1.2.4 Follow Up.....	5-10
5.1.3 Groundwater Quality/Quantity.....	5-10
5.1.3.1 Environmental Effects Prediction	5-11
5.1.3.2 Mitigation Measures and Monitoring	5-13
5.1.3.3 Residual Effects.....	5-14
5.1.3.4 Follow Up.....	5-14
5.1.4 Marine Water Quality	5-16
5.1.4.1 Environmental Effects Prediction	5-16
5.1.4.2 Mitigation Measures and Monitoring	5-16
5.1.4.3 Residual Effects.....	5-17
5.1.4.4 Follow-up.....	5-17

TABLE OF CONTENTS (CONTINUED)

	Page
5.1.5 Soil/Sediment Quality (terrestrial and marine).....	5-18
5.1.5.1 Environmental Effects Prediction	5-18
5.1.5.2 Mitigation Measures and Monitoring	5-19
5.1.5.3 Residual Effects.....	5-21
5.1.5.4 Follow Up.....	5-22
5.1.6 Air Quality	5-22
5.1.6.1 Environmental Effects Prediction	5-22
5.1.6.2 Mitigation Measures and Monitoring	5-53
5.1.6.3 Residual Effects.....	5-54
5.1.6.4 Follow Up.....	5-54
5.1.7 Climate Conditions.....	5-55
5.1.8 Vegetation (terrestrial and marine).....	5-55
5.1.8.1 Environmental Effects Prediction	5-55
5.1.8.2 Mitigative Measures and Monitoring.....	5-56
5.1.8.3 Residual Effects.....	5-57
5.1.8.4 Follow Up.....	5-57
5.1.9 Species at Risk.....	5-57
5.1.9.1 Environmental Effects Prediction	5-57
5.1.9.2 Mitigative Measures and Monitoring.....	5-59
5.1.9.3 Residual Effects.....	5-60
5.1.9.4 Follow Up.....	5-60
5.1.10 Fish and Fish Habitat (marine and freshwater)	5-61
5.1.10.1 Environmental Effects Prediction	5-61
5.1.10.2 Mitigative Measures and Monitoring.....	5-62
5.1.10.3 Residual Effects.....	5-63
5.1.10.4 Follow Up.....	5-64
5.1.11 Marine Mammals	5-65
5.1.11.1 Environmental Effects Prediction	5-65
5.1.11.2 Mitigative Measures and Monitoring.....	5-66
5.1.11.3 Residual Effects.....	5-66
5.1.11.4 Follow Up.....	5-67
5.1.12 Wildlife and Wildlife Habitat	5-67
5.1.12.1 Environmental Effects Prediction	5-67
5.1.12.2 Mitigative Measures and Monitoring.....	5-68
5.1.12.3 Residual Effects.....	5-69
5.1.12.4 Follow Up.....	5-69
5.1.13 Migratory Birds and Migratory Bird Habitat.....	5-69
5.1.13.1 Environmental Effects Prediction	5-69
5.1.13.2 Mitigation Measures and Monitoring	5-70
5.1.13.3 Residual Effects.....	5-71
5.1.13.4 Follow Up.....	5-71

TABLE OF CONTENTS (CONTINUED)

	Page
5.1.14 Wetlands.....	5-71
5.1.14.1 Environmental Effects Prediction	5-72
5.1.14.2 Mitigation Measures and Monitoring	5-75
5.1.14.3 Residual Effects.....	5-76
5.1.14.4 Follow Up.....	5-77
5.1.15 Lighting Conditions	5-77
5.1.15.1 Environmental Effects Prediction	5-77
5.1.15.2 Mitigation Measures and Monitoring	5-77
5.1.15.3 Residual Effects.....	5-78
5.1.15.4 Follow Up.....	5-78
5.1.16 Atmospheric and Underwater Acoustic Environment	5-79
5.1.16.1 Environmental Effects Prediction	5-79
5.1.16.2 Mitigation Measures and Monitoring	5-81
5.1.16.3 Residual Effects.....	5-82
5.1.16.4 Follow Up.....	5-82
5.1.17 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	5-83
5.1.17.1 Environmental Effects Prediction	5-83
5.1.17.2 Mitigation Measures and Monitoring	5-83
5.1.17.3 Residual Effects.....	5-84
5.1.17.4 Follow Up.....	5-84
5.1.18 Physical and Cultural Heritage.....	5-84
5.1.18.1 Environmental Effects Prediction	5-84
5.1.18.2 Mitigative Measures and Monitoring.....	5-84
5.1.18.3 Residual Effects.....	5-85
5.1.18.4 Follow Up.....	5-85
5.1.19 Structures/Sites of Archaeological, Paleontological or Architectural Significance	5-85
5.1.19.1 Environmental Effects Prediction	5-85
5.1.19.2 Mitigation Measures and Monitoring	5-86
5.1.19.3 Residual Effects.....	5-86
5.1.19.4 Follow Up.....	5-87
5.1.20 Navigation.....	5-87
5.1.20.1 Environmental Effects Prediction	5-87
5.1.20.2 Mitigation Measures and Monitoring	5-87
5.1.20.3 Residual Effects.....	5-87
5.1.21 Marine Safety and Security	5-87
5.1.21.1 Environmental Effects Prediction	5-87
5.1.21.2 Mitigative Measures and Monitoring.....	5-88
5.1.21.3 Residual Effects.....	5-88
5.1.22 Human Health and Safety	5-88
5.1.22.1 Environmental Effects Prediction	5-88
5.1.22.2 Mitigation Measures and Monitoring	5-92
5.1.22.3 Residual Effects.....	5-93
5.1.22.4 Follow Up.....	5-93

TABLE OF CONTENTS (CONTINUED)

	Page
5.1.23 Fisheries	5-93
5.1.23.1 Environmental Effects Prediction	5-93
5.1.23.2 Mitigation Measures and Monitoring	5-95
5.1.23.3 Residual Effects	5-95
5.1.23.4 Follow Up	5-95
5.1.24 Aquaculture	5-95
5.1.24.1 Environmental Effects Prediction	5-96
5.1.24.2 Mitigation Measures and Monitoring	5-96
5.1.24.3 Residual Effects	5-96
5.1.24.4 Follow Up	5-96
5.1.25 Tourism	5-96
5.1.25.1 Environmental Effects Prediction	5-96
5.1.25.2 Mitigation Measures and Monitoring	5-97
5.1.25.3 Residual Effects	5-97
5.1.25.4 Follow Up	5-98
5.2 ENVIRONMENTAL EFFECTS OF THE MARGINAL WHARF	5-98
5.2.1 Hydrology	5-98
5.2.2 Freshwater Quality/Quantity	5-98
5.2.2.1 Environmental Effects Prediction	5-98
5.2.2.2 Mitigation Measures and Monitoring	5-98
5.2.2.3 Residual Effects	5-98
5.2.2.4 Follow Up	5-99
5.2.3 Groundwater Quality/Quantity	5-99
5.2.3.1 Environmental Effects Prediction	5-99
5.2.4 Marine Water Quality	5-99
5.2.4.1 Environmental Effects Prediction	5-99
5.2.4.2 Mitigation Measures and Monitoring	5-99
5.2.4.3 Residual Effects	5-101
5.2.4.4 Follow Up	5-101
5.2.5 Soil/Sediment Quality (terrestrial and marine)	5-101
5.2.5.1 Environmental Effects Prediction	5-101
5.2.5.2 Mitigation Measures and Monitoring	5-102
5.2.5.3 Residual Effects	5-102
5.2.5.4 Follow Up	5-103
5.2.6 Air Quality	5-103
5.2.7 Climate Conditions	5-103
5.2.8 Vegetation (terrestrial and marine)	5-103
5.2.8.1 Environmental Effects Prediction	5-103
5.2.8.2 Mitigation Measures and Monitoring	5-104
5.2.8.3 Residual Effects	5-105
5.2.8.4 Follow Up	5-105

TABLE OF CONTENTS (CONTINUED)

	Page
5.2.9 Species at Risk.....	5-105
5.2.9.1 Environmental Effects Prediction	5-105
5.2.9.2 Mitigation Measures and Monitoring	5-106
5.2.9.3 Residual Effects.....	5-107
5.2.9.4 Follow Up.....	5-107
5.2.10 Fish and Fish Habitat (marine and freshwater)	5-107
5.2.10.1 Environmental Effects Prediction	5-107
5.2.10.2 Mitigation Measures and Monitoring	5-110
5.2.10.3 Residual Effects.....	5-111
5.2.10.4 Follow Up.....	5-112
5.2.11 Marine Mammals	5-113
5.2.11.1 Environmental Effects Prediction	5-113
5.2.11.2 Mitigation Measures and Monitoring	5-114
5.2.11.3 Residual Effects.....	5-114
5.2.11.4 Follow Up.....	5-115
5.2.12 Wildlife and Wildlife Habitat	5-115
5.2.12.1 Environmental Effects Prediction	5-115
5.2.12.2 Mitigation Measures and Monitoring	5-116
5.2.12.3 Residual Effects.....	5-117
5.2.12.4 Follow Up.....	5-118
5.2.13 Migratory Birds and Migratory Birds Habitat.....	5-118
5.2.13.1 Environmental Effects Prediction	5-118
5.2.13.2 Mitigation Measures and Monitoring	5-118
5.2.13.3 Residual Effects.....	5-118
5.2.13.4 Follow Up.....	5-119
5.2.14 Wetlands.....	5-119
5.2.14.1 Environmental Effects Prediction	5-119
5.2.14.2 Mitigation Measures and Monitoring	5-119
5.2.14.3 Residual Effects.....	5-120
5.2.14.4 Follow Up.....	5-120
5.2.15 Lighting Conditions	5-120
5.2.15.1 Environmental Effects Prediction	5-120
5.2.15.2 Mitigation Measures and Monitoring	5-120
5.2.15.3 Residual Effects.....	5-121
5.2.15.4 Follow Up.....	5-121
5.2.16 Atmospheric and Underwater Acoustic Environment	5-121
5.2.16.1 Environmental Effects Prediction	5-121
5.2.16.2 Mitigation Measures and Monitoring	5-122
5.2.16.3 Residual Effects.....	5-123
5.2.16.4 Follow Up.....	5-123

TABLE OF CONTENTS (CONTINUED)

	Page
5.2.17 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	5-123
5.2.17.1 Environmental Effects Prediction	5-123
5.2.17.2 Mitigation Measures and Monitoring	5-123
5.2.17.3 Residual Effects.....	5-124
5.2.17.4 Follow Up.....	5-124
5.2.18 Physical and Cultural Heritage.....	5-125
5.2.18.1 Environmental Effects Prediction	5-125
5.2.18.2 Mitigation Measures and Monitoring	5-125
5.2.18.3 Residual Effects.....	5-125
5.2.18.4 Follow Up.....	5-125
5.2.19 Structures/Sites of Archaeological, Paleontological or Architectural Significance	5-125
5.2.19.1 Environmental Effects Prediction	5-125
5.2.19.2 Mitigation Measures and Monitoring	5-127
5.2.19.3 Residual Effects.....	5-129
5.2.19.4 Follow Up.....	5-129
5.2.20 Navigation.....	5-130
5.2.20.1 Environmental Effects Prediction	5-130
5.2.20.2 Mitigation Measures and Monitoring	5-130
5.2.20.3 Residual Effects.....	5-131
5.2.20.4 Follow Up.....	5-131
5.2.21 Marine Safety and Security	5-131
5.2.21.1 Environmental Effects Prediction	5-131
5.2.21.2 Mitigation Measures and Monitoring	5-131
5.2.21.3 Residual Effects.....	5-132
5.2.21.4 Follow Up.....	5-132
5.2.22 Human Health and Safety	5-132
5.2.22.1 Environmental Effects Prediction	5-132
5.2.22.2 Mitigation Measures and Monitoring	5-133
5.2.22.3 Residual Effects.....	5-133
5.2.22.4 Follow Up.....	5-133
5.2.23 Fisheries	5-133
5.2.23.1 Environmental Effects Prediction	5-133
5.2.23.2 Mitigation Measures and Monitoring	5-135
5.2.23.3 Residual Effects.....	5-136
5.2.23.4 Follow Up.....	5-136
5.2.24 Aquaculture	5-137
5.2.24.1 Environmental Effects Prediction	5-137
5.2.24.2 Mitigation Measures and Monitoring	5-137
5.2.24.3 Residual Effects.....	5-138
5.2.24.4 Follow Up.....	5-138

TABLE OF CONTENTS (CONTINUED)

	Page
5.2.25 Tourism	5-138
5.2.25.1 Mitigation Measures and Monitoring	5-138
5.2.25.2 Residual Effects.....	5-138
5.2.25.3 Follow Up.....	5-138
5.3 ENVIRONMENTAL EFFECTS OF THE PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND	5-138
5.3.1 Hydrology	5-139
5.3.2 Freshwater Quality/Quantity.....	5-139
5.3.3 Groundwater Quality/Quantity.....	5-139
5.3.4 Marine Water Quality	5-139
5.3.4.1 Environmental Effects Prediction	5-139
5.3.4.2 Residual Effects.....	5-139
5.3.4.3 Follow Up.....	5-139
5.3.5 Soil/Sediment Quality (terrestrial and marine).....	5-140
5.3.5.1 Mitigation Measures and Monitoring	5-140
5.3.5.2 Residual Effects.....	5-140
5.3.5.3 Follow Up.....	5-140
5.3.6 Air Quality	5-140
5.3.6.1 Environmental Effects Prediction	5-141
5.3.6.2 Mitigation Measures and Monitoring	5-141
5.3.6.3 Residual Effects.....	5-141
5.3.6.4 Follow Up.....	5-142
5.3.7 Climate Conditions.....	5-142
5.3.7.1 Environmental Effects Prediction	5-142
5.3.7.2 Mitigation Measures and Monitoring	5-143
5.3.7.3 Residual Effects.....	5-143
5.3.7.4 Follow Up.....	5-143
5.3.8 Vegetation (terrestrial and marine).....	5-143
5.3.8.1 Environmental Effects Prediction	5-143
5.3.8.2 Residual Effects.....	5-143
5.3.8.3 Follow Up.....	5-144
5.3.9 Species at Risk.....	5-144
5.3.9.1 Environmental Effects Prediction	5-144
5.3.9.2 Mitigation Measures and Monitoring	5-144
5.3.9.3 Residual Effects.....	5-145
5.3.9.4 Follow Up.....	5-145
5.3.10 Fish and Fish Habitat (marine and freshwater)	5-145
5.3.10.1 Environmental Effects Prediction	5-145
5.3.10.2 Residual Effects.....	5-145
5.3.10.3 Follow Up.....	5-145
5.3.11 Marine Mammals	5-145
5.3.11.1 Environmental Effects Prediction	5-146
5.3.11.2 Residual Effects.....	5-146
5.3.11.3 Follow Up.....	5-146

TABLE OF CONTENTS (CONTINUED)

	Page
5.3.12 Wildlife and Wildlife Habitat	5-146
5.3.13 Migratory Birds and Migratory Birds Habitat.....	5-147
5.3.13.1 Environmental Effects Prediction	5-147
5.3.13.2 Mitigation Measures and Monitoring	5-147
5.3.13.3 Residual Effects.....	5-147
5.3.13.4 Follow Up.....	5-147
5.3.14 Wetlands.....	5-147
5.3.15 Lighting Conditions	5-148
5.3.15.1 Environmental Effects Prediction	5-148
5.3.15.2 Residual Effects.....	5-148
5.3.15.3 Follow Up.....	5-148
5.3.16 Atmospheric and Underwater Acoustic Environment	5-148
5.3.16.1 Environmental Effects Prediction	5-148
5.3.16.2 Mitigation Measures and Monitoring	5-148
5.3.17 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	5-149
5.3.18 Physical and Cultural Heritage.....	5-149
5.3.19 Structures/Sites of Archaeological, Paleontological or Architectural Significance	5-149
5.3.20 Navigation.....	5-149
5.3.21 Marine Safety and Security	5-150
5.3.22 Human Health and Safety	5-150
5.3.23 Fisheries	5-150
5.3.23.1 Environmental Effects Prediction	5-150
5.3.23.2 Mitigation Measures and Monitoring	5-151
5.3.24 Aquaculture	5-151
5.3.24.1 Residual Effects.....	5-152
5.3.24.2 Follow Up.....	5-152
5.3.25 Tourism	5-152
6.0 RESIDUAL EFFECTS ASSESSMENT SUMMARY	6-1
6.1 LNG TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS AND THE REGASIFICATION FACILITIES	6-3
6.1.1 Hydrology	6-3
6.1.2 Freshwater Quality/Quantity.....	6-5
6.1.3 Groundwater Quality/Quantity.....	6-8
6.1.4 Marine Water Quality	6-12
6.1.5 Soil/Sediment Quality (terrestrial & marine)	6-14
6.1.6 Air Quality	6-19
6.1.7 Vegetation	6-22
6.1.8 Species at Risk.....	6-24
6.1.9 Fish and Fish Habitat (freshwater and marine)	6-27
6.1.10 Marine Mammals	6-29
6.1.11 Wildlife and Wildlife Habitat	6-31
6.1.12 Migratory Birds and Migratory Birds Habitat.....	6-34
6.1.13 Wetlands.....	6-36

TABLE OF CONTENTS (CONTINUED)

	Page
6.1.14 Lighting Conditions	6-39
6.1.15 Atmospheric and Underwater Acoustics	6-40
6.1.16 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	6-43
6.1.17 Physical and Cultural Heritage.....	6-45
6.1.18 Structures/Sites of Archaeological, Paleontological or Architectural Significance	6-46
6.1.19 Navigation.....	6-47
6.1.20 Marine Safety and Security	6-48
6.1.21 Human Health and Safety	6-48
6.1.22 Fisheries	6-51
6.1.23 Aquaculture	6-54
6.1.24 Tourism	6-55
6.2 MARGINAL WHARF.....	6-57
6.2.1 Freshwater Quality/Quantity.....	6-57
6.2.2 Marine Water Quality	6-59
6.2.3 Soil/Sediment Quality (terrestrial and marine).....	6-61
6.2.4 Air Quality	6-64
6.2.5 Vegetation (terrestrial and marine).....	6-66
6.2.6 Species at Risk.....	6-69
6.2.7 Fish and Fish Habitat (marine and freshwater)	6-72
6.2.8 Marine Mammals	6-76
6.2.9 Wildlife and Wildlife Habitat	6-77
6.2.10 Migratory Birds and Migratory Birds Habitat.....	6-79
6.2.11 Wetlands.....	6-81
6.2.12 Lighting Conditions	6-82
6.2.13 Atmospheric and Underwater Acoustic Environment	6-83
6.2.14 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	6-84
6.2.15 Physical and Cultural Heritage.....	6-86
6.2.16 Structures/Sites of Archaeological, Paleontological or Architectural Significance	6-87
6.2.17 Navigation.....	6-89
6.2.18 Marine Safety and Security	6-91
6.2.19 Human Health and Safety	6-91
6.2.20 Fisheries	6-93
6.2.21 Aquaculture	6-97
6.2.22 Tourism	6-98
6.3 PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND.....	6-99
6.3.1 Marine Water Quality	6-99
6.3.2 Soil/Sediment Quality (terrestrial and marine).....	6-101
6.3.3 Air Quality	6-103
6.3.4 Vegetation	6-104

TABLE OF CONTENTS (CONTINUED)

	Page
6.3.5 Species at Risk.....	6-105
6.3.6 Fish and Fish Habitat (marine and freshwater)	6-109
6.3.7 Marine Mammals	6-111
6.3.8 Migratory Birds and Migratory Birds Habitat.....	6-114
6.3.9 Lighting Conditions	6-115
6.3.10 Atmospheric and Underwater Acoustic Environment	6-116
6.3.11 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	6-118
6.3.12 Navigation.....	6-119
6.3.13 Marine Safety and Security	6-121
6.3.14 Fisheries	6-122
6.3.15 Aquaculture	6-124
6.4 EFFECTS OF THE PROJECT ON RENEWABLE RESOURCES.....	6-125
7.0 PROPOSED ENVIRONMENTAL MONITORING AND FOLLOW-UP PROGRAMS....	7-1
7.1 INTRODUCTION.....	7-1
7.2 LNG TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS AND THE REGASIFICATION FACILITIES	7-1
7.2.1 Air Quality Monitoring.....	7-1
7.2.1.1 Construction	7-1
7.2.1.2 Operations	7-2
7.2.2 Noise and Light Monitoring	7-2
7.2.2.1 Construction	7-2
7.2.2.2 Operations	7-2
7.2.3 Surface Water Monitoring	7-3
7.2.3.1 Construction	7-3
7.2.3.2 Operations	7-4
7.2.4 Water Supply Wells	7-5
7.2.4.1 Plant Site Pre-construction, Construction, and Operation.....	7-5
7.2.4.2 Contingency Monitoring and Resolution.....	7-6
7.2.5 Groundwater at the Plant Site	7-6
7.2.6 Flora, Fauna and Terrestrial Habitat Monitoring.....	7-7
7.2.6.1 Bird Census	7-8
7.2.6.2 Vegetation	7-8
7.2.6.3 Wildlife	7-8
7.2.7 Freshwater Species and Habitat Monitoring.....	7-9
7.2.8 Inshore Fisheries Monitoring.....	7-10
7.2.9 Marine Species and Habitat Monitoring	7-10
7.2.10 Archaeological Resource Monitoring.....	7-11
7.2.11 Pre Blast Survey	7-11
7.2.12 Community Involvement	7-12
7.2.13 Other Monitoring Plans	7-13
7.2.14 Environmental Protection Plans (EPPs).....	7-13
7.2.15 Waste Management Plan.....	7-15
7.2.16 Contingency Plan.....	7-15

TABLE OF CONTENTS (CONTINUED)

	Page
7.3 MARGINAL WHARF.....	7-16
7.3.1 Air Quality Monitoring.....	7-16
7.3.1.1 Construction	7-16
7.3.1.2 Operations	7-16
7.3.2 Noise and Light Monitoring	7-16
7.3.2.1 Construction	7-16
7.3.2.2 Operations	7-17
7.3.3 Surface Water Monitoring	7-17
7.3.4 Groundwater Monitoring	7-18
7.3.5 Flora, Fauna and Terrestrial Habitat Monitoring	7-18
7.3.5.1 Bird Census	7-18
7.3.5.2 Vegetation	7-19
7.3.5.3 Wildlife	7-20
7.3.6 Freshwater Species and Habitat Monitoring.....	7-20
7.3.7 Inshore Fisheries Monitoring.....	7-20
7.3.8 Marine Species and Habitat Monitoring	7-21
7.3.9 Archaeological Resource Monitoring.....	7-21
7.3.10 Pre Blast Survey	7-21
7.3.11 Community Involvement	7-22
7.3.12 Other Monitoring Plans	7-23
7.3.13 Environmental Protection Plan.....	7-23
7.3.14 Waste Management Plan.....	7-23
7.3.15 Contingency Plan.....	7-23
7.4 PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND.....	7-23
7.4.1 Air Quality Monitoring.....	7-23
7.4.2 Noise and Light Monitoring	7-24
7.4.3 Surface Water Monitoring	7-24
7.4.4 Water Supply Wells	7-24
7.4.5 Groundwater at the Plant Site	7-24
7.4.6 Flora, Fauna and Terrestrial Habitat Monitoring.....	7-24
7.4.6.1 Bird Census	7-24
7.4.6.2 Vegetation	7-24
7.4.6.3 Wildlife	7-24
7.4.7 Freshwater Species and Habitat Monitoring.....	7-24
7.4.8 Inshore Fisheries Monitoring.....	7-25
7.4.9 Archaeological Resource Monitoring.....	7-25
7.4.10 Pre Blast Survey	7-25
7.4.11 Community Involvement	7-25
7.4.12 Other Monitoring Plans	7-26
7.4.13 Environmental Protection Plan.....	7-26
7.4.14 Waste Management Plan.....	7-26
7.4.15 Contingency Plan.....	7-26

TABLE OF CONTENTS (CONTINUED)

	Page
8.0 CUMULATIVE ENVIRONMENTAL EFFECTS ASSESSMENT.....	8-1
8.1 METHODOLOGY	8-1
8.1.1 Scoping	8-1
8.1.1.1 Regional Issue Identification	8-2
8.1.1.2 Regional VEC Identification	8-2
8.1.1.3 Temporal and Spatial Boundaries	8-3
8.1.1.4 Selection of Other Projects and Activities.....	8-4
8.1.1.5 Potential Effects of Other Projects and Activities.....	8-7
8.1.1.6 Summary of VECs Interacting with Other Projects	8-7
8.2 LNG MARINE TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS, AND THE REGASIFICATION FACILITY	8-10
8.2.1 Assessment.....	8-10
8.2.1.1 Hydrology	8-10
8.2.1.2 Freshwater Quality/Quantity.....	8-10
8.2.1.3 Groundwater Quality/Quantity	8-12
8.2.1.4 Marine Water Quality	8-13
8.2.1.5 Soil/Sediment Quality (terrestrial and marine)	8-14
8.2.1.6 Air Quality	8-15
8.2.1.7 Climate Conditions.....	8-17
8.2.1.8 Vegetation (terrestrial and marine).....	8-18
8.2.1.9 Species at Risk	8-19
8.2.1.10 Fish and Fish Habitat (Marine and Freshwater)	8-20
8.2.1.11 Marine Mammals	8-22
8.2.1.12 Wildlife and Wildlife Habitat.....	8-23
8.2.1.13 Migratory Birds and Migratory Birds Habitat.....	8-23
8.2.1.14 Wetlands.....	8-24
8.2.1.15 Lighting Conditions	8-24
8.2.1.16 Atmospheric and Underwater Acoustic Environment.....	8-26
8.2.1.17 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	8-26
8.2.1.18 Physical and Cultural Heritage.....	8-27
8.2.1.19 Structures/Sites of Archaeological, Paleontological or Architectural Significance.....	8-28
8.2.1.20 Navigation.....	8-28
8.2.1.21 Marine Safety and Security	8-28
8.2.1.22 Human Health and Safety	8-29
8.2.1.23 Fisheries	8-29
8.2.1.24 Aquaculture	8-30
8.2.1.25 Tourism.....	8-30
8.2.2 Conclusion.....	8-30
8.3 MARGINAL WHARF.....	8-31
8.3.1 Assessment.....	8-31

TABLE OF CONTENTS (CONTINUED)

	Page
8.3.1.1 Hydrology	8-31
8.3.1.2 Freshwater Quality/Quantity	8-31
8.3.1.3 Groundwater Quality/Quantity	8-31
8.3.1.4 Marine Water Quality	8-31
8.3.1.5 Soil/Sediment Quality (Terrestrial and Marine)	8-32
8.3.1.6 Air Quality	8-32
8.3.1.7 Climate Conditions	8-32
8.3.1.8 Vegetation (Terrestrial and Marine)	8-33
8.3.1.9 Species at Risk	8-33
8.3.1.10 Fish and Fish Habitat (Marine and Freshwater)	8-33
8.3.1.11 Marine Mammals	8-34
8.3.1.12 Wildlife and Wildlife Habitat	8-34
8.3.1.13 Migratory Birds and Migratory Birds Habitat	8-35
8.3.1.14 Wetlands	8-37
8.3.1.15 Lighting Conditions	8-37
8.3.1.16 Atmospheric and Underwater Acoustic Environment	8-37
8.3.1.17 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	8-38
8.3.1.18 Physical and Cultural Heritage	8-38
8.3.1.19 Structures/Sites of Archaeological, Paleontological or Architectural Significance	8-39
8.3.1.20 Navigation	8-39
8.3.1.21 Marine Safety and Security	8-40
8.3.1.22 Human Health and Safety	8-40
8.3.1.23 Fisheries	8-40
8.3.1.24 Aquaculture	8-40
8.3.1.25 Tourism	8-40
8.3.2 Conclusion	8-41
8.4 PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND	8-41
8.4.1 Assessment	8-41
8.4.1.1 Hydrology	8-41
8.4.1.2 Freshwater Quality/Quantity	8-41
8.4.1.3 Groundwater Quality/Quantity	8-41
8.4.1.4 Marine Water Quality	8-41
8.4.1.5 Soil/Sediment Quality (Terrestrial and Marine)	8-42
8.4.1.6 Air Quality	8-42
8.4.1.7 Climate Conditions	8-43
8.4.1.8 Vegetation (Terrestrial and Marine)	8-43
8.4.1.9 Species at Risk	8-43
8.4.1.10 Fish and Fish Habitat (Marine and Freshwater)	8-44
8.4.1.11 Marine Mammals	8-44
8.4.1.12 Wildlife and Wildlife Habitat	8-45
8.4.1.13 Migratory Birds and Migratory Birds Habitat	8-45
8.4.1.14 Wetlands	8-45
8.4.1.15 Lighting Conditions	8-45

TABLE OF CONTENTS (CONTINUED)

	Page
8.4.1.16	Atmospheric and Underwater Acoustic Environment.....8-45
8.4.1.17	Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons8-47
8.4.1.18	Physical and Cultural Heritage8-47
8.4.1.19	Structures/Sites of Archaeological, Paleontological or Architectural Significance.....8-47
8.4.1.20	Navigation.....8-47
8.4.1.21	Marine Safety and Security8-47
8.4.1.22	Human Health and Safety8-47
8.4.1.23	Fisheries8-47
8.4.1.24	Aquaculture8-48
8.4.1.25	Tourism.....8-48
8.4.2	Conclusion.....8-48
8.5	OVERALL CUMULATIVE SUMMARY8-48
9.0	EFFECTS OF THE ENVIRONMENT ON THE PROJECT 9-1
9.1	INTRODUCTION..... 9-1
9.2	LNG TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS AND THE REGASIFICATION FACILITIES 9-2
9.2.1	Erosion 9-2
9.2.2	Seismic Events 9-2
9.2.2.1	Background 9-2
9.2.2.2	Seismic Hazard..... 9-4
9.2.2.3	Tsunami Hazard 9-5
9.2.2.4	Mitigation Measures and Residual Effects 9-6
9.2.3	Precipitation and Fog..... 9-7
9.2.4	Wind 9-8
9.2.5	Waves 9-9
9.2.6	Ice.....9-10
9.2.7	Climate Change.....9-10
9.2.7.1	Background9-11
9.2.7.2	Effects of Climate Change9-12
9.2.7.3	Mitigative Measures and Residual Effects.....9-12
9.2.8	Forest Fires9-13
9.3	MARGINAL WHARF.....9-14
9.3.1	Erosion9-14
9.3.2	Seismic Events9-14
9.3.3	Precipitation and Fog.....9-15
9.3.4	Wind9-16
9.3.5	Waves9-17
9.3.6	Ice.....9-17
9.3.7	Climate Change.....9-18
9.3.7.1	Effects of Climate Change9-18
9.3.8	Forest Fires9-19

TABLE OF CONTENTS (CONTINUED)

	Page
9.4 PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND.....	9-20
9.4.1 Seismic Events	9-20
9.4.2 Precipitation and Fog.....	9-20
9.4.3 Wind.....	9-21
9.4.4 Waves	9-21
9.4.5 Ice.....	9-21
9.4.6 Climate Change.....	9-22
10.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS & MALFUNCTIONS.....	10-1
10.1 LNG TERMINAL, MARINE TRANSFER PIPELINES, LNG STORAGE TANKS AND THE REGASIFICATION FACILITIES	10-1
10.1.1 Hydrocarbon and Hazardous Material Spills	10-4
10.1.1.1 Spills of Hydrocarbons (excluding LNG) and Hazardous Materials.....	10-4
10.1.1.2 LNG Releases	10-4
10.1.1.3 Potential Environmental Concerns of Spills of Hydrocarbons, LNG, and hazardous Materials	10-6
10.1.1.4 Design and Operational Safeguards	10-13
10.1.1.5 Contingency and Emergency Response Procedures	10-23
10.1.1.6 Conclusion.....	10-25
10.1.2 Accidental Forest Fires	10-25
10.1.2.1 Potential Environmental Concerns.....	10-25
10.1.2.2 Design and Operational Safeguards	10-28
10.1.2.3 Contingency and Emergency Response Procedures	10-29
10.1.2.4 Conclusion.....	10-29
10.1.3 Discharge of Sediment to Marine Environment.....	10-29
10.1.3.1 Potential Environmental Concerns.....	10-29
10.1.3.2 Design and Operational Safeguards	10-30
10.1.3.3 Contingency and Emergency Response Procedures	10-30
10.1.3.4 Conclusion.....	10-30
10.1.4 Discharges from Ships.....	10-30
10.1.4.1 Potential Environmental Concerns.....	10-31
10.1.4.2 Design and Operational Safeguards	10-33
10.1.4.3 Contingency and Emergency Response Procedures	10-33
10.1.4.4 Conclusion.....	10-33
10.1.5 Grounding of Ships.....	10-33
10.1.6 Risk of Accidents and Malfunctions during Decommissioning	10-34
10.2 MARGINAL WHARF.....	10-34
10.2.1 Hydrocarbon and Hazardous Material Spills	10-34
10.2.1.1 Potential Environmental Concerns.....	10-34
10.2.1.2 Design and Operational Safeguards	10-35
10.2.1.3 Contingency and Emergency Response Procedures	10-35
10.2.1.4 Conclusion.....	10-35
10.2.2 Discharge of Sediment to Marine Environment	10-35

TABLE OF CONTENTS (CONTINUED)

	Page
10.2.3 Discharges from Ships.....	10-35
10.2.3.1 Potential Environmental Concerns.....	10-36
10.2.3.2 Design and Operational Safeguards.....	10-36
10.2.3.3 Contingency and Emergency Response Procedures.....	10-37
10.2.3.4 Conclusion.....	10-37
10.2.4 Grounding of Ships.....	10-37
10.2.5 Risk of Accidents and Malfunctions during Decommissioning.....	10-37
10.3 PROJECT RELATED SHIPPING WITHIN 25 KM OF COUNTRY ISLAND.....	10-37
10.3.1 Hydrocarbon and Hazardous Material Spills.....	10-38
10.3.1.1 Potential Environmental Concerns.....	10-38
10.3.1.2 Design and Operational Safeguards.....	10-38
10.3.1.3 Contingency and Emergency Response Procedures.....	10-39
10.3.1.4 Conclusion.....	10-39
10.3.2 Discharges from Ships.....	10-39
10.3.2.1 Potential Environmental Concerns.....	10-39
10.3.2.2 Design and Operational Safeguards.....	10-40
10.3.2.3 Contingency and Emergency Response Procedures.....	10-40
10.3.2.4 Conclusion.....	10-40
10.3.3 Grounding of Ships.....	10-40
10.3.3.1 Potential Environmental Concerns.....	10-41
10.3.3.2 Design and Operational Safeguards.....	10-41
10.3.3.3 Contingency and Emergency Response Procedures.....	10-41
10.3.3.4 Conclusion.....	10-41
11.0 CONCLUSION.....	11-1
REFERENCES AND PERSONAL COMMUNICATIONS.....	R-1

LIST OF TABLES

TABLE 1.2-1	List of Relevant Federal Legislation.....	1-7
TABLE 1.3-1	List of Relevant Provincial Legislation	1-10
TABLE 2.2-1	Key Characteristics of Essential KDP Components.....	2-6
TABLE 2.2-2	List of Environmental Permits, Approvals, and Relevant Legislation.....	2-18
TABLE 2.5-1	Basis for Selection of VECs.....	2-49
TABLE 2.5-2	Definitions for Levels of Magnitude.....	2-59
TABLE 3.1-1	Summary of Federal Departments' Responses	3-1
TABLE 3.2-1	Topics Raised Through Nova Scotia EA Board and Public Review	3-5
TABLE 3.3-1	Valued Ecosystem Components Identified during Public Consultation Process.....	3-16
TABLE 3.3-2	Provincial EA Process and Milestone Dates Related to Public Consultation	3-17
TABLE 3.5-1	Input Received from Federal and Provincial Governments on the Provincial EA Report.....	3-22
TABLE 4.1-1	Known, Assumed, and Possible Water Uses of Waterbodies in the Project Area	4-3
TABLE 4.1-2	Statistics of 2002 Flows (m3/hr) for ML1, GB1, and GB2.....	4-3
TABLE 4.1-3	Monthly Summary Statistics of Flow Values for ML1, October 2001 to May 2003 (m3/hr).....	4-6
TABLE 4.1-4	Monthly Summary Statistics of Flow Values (m3/hr) for GB1 (October 2001 to May 2003)	4-6
TABLE 4.1-5	Monthly Summary Statistics of Flow Values (m3/hr) for GB2 (October 2001 to May 2003)	4-7
TABLE 4.1-6	Monthly Summary Statistics of Flow Values (m3/hr) for GB3 (October 2002 to March 2002)	4-7
TABLE 4.1-7	Total Monthly Precipitation (millimetre (mm)) for October 2001 to May 2003.....	4-7
TABLE 4.1-8	Summer (June, July, August) Drought Estimates (mm)	4-8
TABLE 4.1-9	100-year Storm Events (mm)	4-8
TABLE 4.1-10	200- year Storm Events (mm).....	4-9
TABLE 4.1-11	500-year Storm Events (mm)	4-9
TABLE 4.1-12	Typical Event-to-Peak Delay (time in hours) between Precipitation Events and Stream-flow Peak on Hydrographs.....	4-9
TABLE 4.1-13	Lab Analytical Protocol Used for Surface and Groundwater Sample Analyses	4-11
TABLE 4.1-14	Water Chemistry in Red Head Ponds.....	4-11
TABLE 4.1-15	Monitoring Well Construction and Development Details	4-14
TABLE 4.1-16	Average Well Data (NSEL Well Log Database, Goldenville, and Halifax Formations).....	4-15
TABLE 4.1-17	Hydraulic Conductivity Results at Monitoring Wells (cm/sec1).....	4-21
TABLE 4.1-18	Summary of Protocol Used for Sample Collection	4-21
TABLE 4.1-19	Groundwater Elevation at Monitoring Wells (elevations reference mean sea level)	4-21
TABLE 4.1-20	Groundwater Flow Velocity Estimates at the Proposed Keltic Project Site..	4-25

LIST OF TABLES (CONTINUED)

	Page
TABLE 4.1-21	Tailings Sample Results from Giffin Mine and Dung Cove Areas4-38
TABLE 4.1-22	Stillwater-Sherbrooke Climate Normals (1971-2000) and Extremes (1967-2001)4-44
TABLE 4.1-23	Halifax-Shearwater Climate Normals (1971-2000) and Extremes (1944- 2001).....4-45
TABLE 4.2-1	Number of Vascular Plant Species4-52
TABLE 4.2-2	Aquatic Vascular Plant Species at the Keltic Project Site4-52
TABLE 4.2-3	Marine Shoreline Plant Species Identified in the Peninsular Area.....4-53
TABLE 4.2-4	Marine Plant and Benthic Invertebrate Habitat4-61
TABLE 4.2-5	Fish Habitat.....4-61
TABLE 4.2-6	Number of Bird Species Observed4-77
TABLE 4.2-7	Warblers and Related Birds.....4-78
TABLE 4.2-8	Comparison of Habitat Use by Woodland/Shrubland Birds at the Keltic Site4-79
TABLE 4.2-9	Shorebirds Observed in Dike/Beach Areas at Betty’s Cove4-79
TABLE 4.2-10	Raptors Observed in the Study Area at the Keltic Site.....4-80
TABLE 4.2-11	Mammals Observed in the Study Area at the Keltic Site.....4-84
TABLE 4.2-12	Furbearer Harvest in Guysborough County in 1994.....4-86
TABLE 4.2-13	Wetland Types and Area (ha) for the Project Site.....4-88
TABLE 4.2-14	Summary of Species of Special Status for the Project Site.....4-93
TABLE 4.2.15	Hourly Leq Range (dBA) SOE Gas Plant, Sept. 15-16, 20044-101
TABLE 4.2.16	Typical Noise Values (dBA)4-101
TABLE 4.3-1	Number of Inshore Fishers, Guysborough County.....4-117
TABLE 4.3-2	Numbers of Fishers by Port (1999).....4-117
TABLE 4.3-3	2000-2003 Value of Landings by Statistical District (SD) in Thousands of Dollars.....4-118
TABLE 4.3-4	Sea Urchin Landings (t) for Eastern Nova Scotia from 1994 to 2000.....4-119
TABLE 4.3-5	Inshore Fish Landings (kilograms) by Community in the Study Area (1999 and 2000).....4-121
TABLE 4.3-6	2000 County and Provincial Production Statistics for Aquaculture Tourism.....4-122
TABLE 5.1-1	Air Emissions Inventory5-25
TABLE 5.1-2	Air Emission Inventory – Additional Information on Parameters.....5-29
TABLE 5.1-3	Nova Scotia Air Quality Regulations (Environment Act) and Canadian Environmental Protection Act (CEPA) Ambient Air Quality Objectives.....5-35
TABLE 5.1-4	Odour Thresholds.....5-39

LIST OF TABLES (CONTINUED)

	Page
TABLE 5.1-5	Maximum Predicted Overall Facility Impacts vs. Nova Scotia Air Quality Regulations and National Ambient Air Quality Objectives.....5-40
TABLE 5.1-6	Maximum Predicted Sensitive Receptor Impacts vs. Nova Scotia Air Quality Regulations and National Ambient Air Quality Objectives.....5-41
TABLE 5.1-7	Typical Construction Equipment Noise Levels at 50 Feet (15 m).....5-79
TABLE 5.1-8	Relative Significance of Archaeological Sites within the LNG Plant Study Area5-85
TABLE 5.1-9	Residual Environmental Effects Criteria - Health and Safety5-90
TABLE 5.2-2	Relative Significance of Archaeological Sites within the Marginal Wharf Study Area5-126
TABLE 6.1-1	Residual Environmental Effects Summary for Hydrology 6-3
TABLE 6.1-2	Residual Environmental Effects Summary for Freshwater Quality/Quantity 6-5
TABLE 6.1-3	Residual Environmental Effects Summary for Groundwater 6-8
TABLE 6.1-4	Residual Environmental Effects Summary for Marine Water Quality6-12
TABLE 6.1-5	Residual Environmental Effects Summary for Soil/Sediment Quality (terrestrial)6-14
TABLE 6.1-6	Residual Environmental Effects Summary for Air Quality*6-19
TABLE 6.1-7	Residual Environmental Effects Summary for Vegetation.....6-22
TABLE 6.1-8	Residual Environmental Effects Summary for Species at Risk6-24
TABLE 6.1-9	Residual Environmental Effects Summary for Fish and Fish Habitat6-27
TABLE 6.1-10	Residual Environmental Effects Summary for Marine Mammals.....6-29
TABLE 6.1-11	Residual Environmental Effects Summary for Wildlife and Wildlife Habitat6-31
TABLE 6.1-12	Residual Environmental Effects Summary for Migratory Birds and Migratory Bird Habitat6-34
TABLE 6.1-13	Residual Environmental Effects Summary for Wetlands6-36
TABLE 6.1-14	Residual Environmental Effects Summary for Lighting Conditions.....6-39
TABLE 6.1-15	Atmospheric and Underwater Acoustics6-40
TABLE 6.1-16	Residual Environmental Effects Summary for Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons6-43
TABLE 6.1-17	Residual Environmental Effects Summary for Physical and Cultural Heritage6-45
TABLE 6.1-18	Residual Environmental Effects Summary for Structures/ Sites of Archaeological, Paleontological or Architectural Significance6-46
TABLE 6.1-19	Residual Environmental Effects Summary for Navigation6-47
TABLE 6.1-21	Residual Environmental Effects Evaluation Assessment Matrix - Health and Safety.....6-48
TABLE 6.1-22	Residual Environmental Effects Evaluation Assessment Matrix - Fisheries6-51
TABLE 6.1-23	Residual Environmental Effects Summary for Aquaculture6-54
TABLE 6.1-24	Residual Environmental Effects Summary for Tourism6-55
TABLE 6.2-1	Residual Environmental Effects Summary for Freshwater Quality/Quantity6-57
TABLE 6.2-2	Residual Environmental Effects Summary for Marine Water Quality6-59

LIST OF TABLES (CONTINUED)

	Page
TABLE 6.2-3	Residual Environmental Effects Summary for Soil/Sediment Quality (terrestrial and marine).....6-61
TABLE 6.2-4	Residual Environmental Effects Summary for Air Quality6-64
TABLE 6.2-5	Residual Environmental Effects Summary for Vegetation (terrestrial and marine).....6-66
TABLE 6.2-6	Residual Environmental Effects Summary for Species at Risk6-69
TABLE 6.2-7	Residual Environmental Effects Summary for Fish and Fish Habitat (marine and freshwater)6-72
TABLE 6.2-8	Residual Environmental Effects Summary for Marine Mammals.....6-76
TABLE 6.2-9	Residual Environmental Effects Summary for Wildlife and Wildlife Habitat6-77
TABLE 6.2-10	Residual Environmental Effects Summary for Migratory Birds and Migratory Birds Habitat.....6-79
TABLE 6.2-11	Residual Environmental Effects Summary for Wetlands.....6-81
TABLE 6.2-12	Residual Environmental Effects Summary for Lighting Conditions.....6-82
TABLE 6.2-13	Residual Environmental Effects Summary for Atmospheric and Underwater Acoustic Environment6-83
TABLE 6.2-14	Residual Environmental Effects Summary for Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons6-84
TABLE 6.2-15	Residual Environmental Effects Summary for Physical and Cultural Heritage6-86
TABLE 6.2-16	Residual Environmental Effects Summary for Structures/ Sites of Archaeological, Paleontological, or Architectural Significance.....6-87
TABLE 6.2-17	Residual Environmental Effects Summary for Navigation.....6-89
TABLE 6.2-19	Residual Environmental Effects Summary for Human Health and Safety ...6-91
TABLE 6.2-20	Residual Environmental Effects Summary for Fisheries6-93
TABLE 6.2-21	Residual Environmental Effects Summary for Aquaculture.....6-97
TABLE 6.2-22	Residual Environmental Effects Summary for Tourism.....6-98
TABLE 6.3-1	Residual Environmental Effects Summary for Marine Water Quality6-99
TABLE 6.3-2	Residual Environmental Effects Summary for Soil/Sediment Quality (terrestrial and marine).....6-101
TABLE 6.3-3	Residual Environmental Effects Summary for Air Quality6-103
TABLE 6.3-4	Residual Environmental Effects Summary for Vegetation (terrestrial and marine).....6-104
TABLE 6.3-5	Residual Environmental Effects Summary for Species at Risk6-105
TABLE 6.3-6	Residual Environmental Effects Summary for Fish and Fish Habitat (marine and freshwater)6-109
TABLE 6.3-7	Residual Environmental Effects Summary for Marine Mammals.....6-111
TABLE 6.3-8	Residual Environmental Effects Summary for Migratory Birds and Migratory Birds Habitat.....6-114
TABLE 6.3-9	Residual Environmental Effects Summary for Lighting Conditions.....6-115
TABLE 6.3-10	Residual Environmental Effects Summary for Atmospheric and Underwater Acoustic Environment6-116
TABLE 6.3-11	Residual Environmental Effects Summary for Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons6-118

LIST OF TABLES (CONTINUED)

	Page
TABLE 6.3-12	Residual Environmental Effects Summary for Navigation6-119
TABLE 6.3-13	Residual Environmental Effects Summary for Marine Safety and Security6-121
TABLE 6.3-14	Residual Environmental Effects Summary for Fisheries6-122
TABLE 6.3-15	Residual Environmental Effects Summary for Aquaculture.....6-124
TABLE 7.2-1	Proposed Surface Water Monitoring Program Elements..... 7-4
TABLE 7.2-2	Proposed Survey Times for Wildlife Monitoring Program..... 7-8
TABLE 7.2-3	Proposed Fish and Fish Habitat Monitoring 7-9
TABLE 7.2-4	Proposed Archaeological Compliance and Monitoring Programs7-11
TABLE 7.3-1	Proposed Surface Water Monitoring Program Elements.....7-19
TABLE 7.3-2	Proposed Survey Times for Wildlife Monitoring Program.....7-20
TABLE 7.3-3	Proposed Archaeological Compliance and Monitoring Programs7-22
TABLE 8.1-1	Regional VEC Summary..... 8-2
TABLE 8.1-2	Number of Environmental Assessments (EAs) Considered by the Canada Nova Scotia Offshore Petroleum Board, 2001-2005 8-6
TABLE 8.1-3	VEC Pathway Interaction Matrix 8-8
TABLE 8.1-4	Proposed Schedules for Keltic and Other Project Construction* 8-9
TABLE 8.2-1	Cumulative Summary – Freshwater8-12
TABLE 8.2-2	Cumulative Summary – Groundwater.....8-13
TABLE 8.2-3	Cumulative Summary – Marine Water Quality8-15
TABLE 8.2-4	Cumulative Summary – Soil/Sediment Quality8-16
TABLE 8.2-5	Cumulative Summary – Air Quality8-17
TABLE 8.2-6	Cumulative Summary – GHG8-18
TABLE 8.2-7	Cumulative Summary – Species at Risk.....8-20
TABLE 8.2-8	Cumulative Summary – Fish/Habitat8-21
TABLE 8.2-9	Cumulative Summary – Marine Mammals8-23
TABLE 8.2-10	Cumulative Summary – Migratory Birds8-25
TABLE 8.2-11	Cumulative Summary – Lighting.....8-25
TABLE 8.2-12	Cumulative Summary – Health and Safety8-29
TABLE 8.2-13	Cumulative Summary – Tourism8-30
TABLE 8.3-1	Cumulative Summary – Marine Water Quality8-32
TABLE 8.3-2	Cumulative Summary – Fish/Habitat8-34
TABLE 8.3-3	Cumulative Summary – Marine Mammals8-35
TABLE 8.3-4	Cumulative Summary – Migratory Birds8-36
TABLE 8.3-5	Cumulative Summary – Lighting.....8-37
TABLE 8.4-1	Cumulative Summary – Marine Water Quality8-42
TABLE 8.4-2	Cumulative Summary – Migratory Birds8-46
TABLE 8.4-3	Cumulative Summary – Underwater Acoustic.....8-46
TABLE 8.5-1	Summary of Impact Assessment Significance for Cumulative Projects.....8-49
TABLE 9.2-1	Seismic Hazard 9-5
TABLE 9.2-2	CICS Scenario Projection Model Results for Nova Scotia through to the 2080s9-11
TABLE 10.0-1	Interactions Between Accidents & Malfunctions and ECCs10-2

LIST OF FIGURES

FIGURE 1.0-1	Keltic Development Project Location and Regional Setting	1-2
FIGURE 1.0-2	Keltic Development Project Project Location and Basic Layout	1-3
FIGURE 2.1-1	Keltic's Corporation Structure	2-2
FIGURE 2.1-2	Relationships and Roles of Project Participants	2-4
FIGURE 2.2-1	Overview of the Essential Components of the Keltic Project.....	2-7
FIGURE 2.2-2	Plan of Essential Components of Keltic Development Project	2-8
FIGURE 2.2-3	Preliminary Plan of LNG Marine Terminal	2-10
FIGURE 2.2-4	Typical LNG Tank Design.....	2-11
FIGURE 2.2-5	Schematic of Pellet Transfer to the Wharf and Storage	2-15
FIGURE 2.2-6	Typical Arrangement of Product Storage Silos	2-16
FIGURE 2.2-7	Construction Schedule	2-25
FIGURE 2.2-8	A Section and Profile of the Marginal Wharf Construction	2-28
FIGURE 2.4-1	US and Canadian Natural Gas Demand.....	2-39
FIGURE 2.4-2	US and Canadian Natural Gas Supply	2-40
FIGURE 2.4-3	Global Polyethylene Demand (Nexant Chem Systems).....	2-43
FIGURE 2.4-4	Global Polypropylene Demand.....	2-44
FIGURE 4.1-1	Keltic Study Area in Relation to the Deep Panuke Study Area	4-2
FIGURE 4.1-2	Keltic Study Area Watersheds.....	4-4
FIGURE 4.1-3	Location of the Study Rain Gauges and Environment Canada Climate Stations.....	4-5
FIGURE 4.1-4	Watersheds Studied	4-10
FIGURE 4.1-5	Red Head Peninsula Study Area	4-13
FIGURE 4.1-6	Dug and Drilled Domestic Wells within 1 km Site Boundaries.....	4-17
FIGURE 4.1-7	Monitoring Well Locations and Piezometric Contours.....	4-19
FIGURE 4.1-8	Piezometric Contour Map Showing Probable Gravitational Flow Direction.....	4-24
FIGURE 4.1-9	Piper Diagram for the Water Samples in this Study	4-27
FIGURE 4.1-10	Soil Type Distribution (A and B Horizons).....	4-30
FIGURE 4.1-11	Surficial Geology	4-32
FIGURE 4.1-12	Location of the McMillan, Mulgrave, and Giffin Mines.....	4-34
FIGURE 4.1-13	Location of Former Mine Works in the Project Site.....	4-35
FIGURE 4.1-14	Location of Tailings Disposal Areas within the Project Area	4-37
FIGURE 4.2-1	Keltic Plant Site and Terminal.....	4-50
FIGURE 4.2-2	Vegetation Types	4-51
FIGURE 4.2-3	Remote Operated Vehicle Transect Locations	4-56
FIGURE 4.2-4	Fish Habitat in the Vicinity of Keltic Facilities	4-59
FIGURE 4.2-5	Fish Habitat in Stormont Bay and Adjacent Areas	4-60
FIGURE 4.2-6	Bird Observation Sites.....	4-74
FIGURE 4.2-7	Bird Observation Sites.....	4-75
FIGURE 4.2-8	Roseate Tern Foraging Sites and Foraging Survey	4-82
FIGURE 4.3-1	Location of Heritage Resources	4-107
FIGURE 4.3-2	Shipping and Navigation.....	4-110
FIGURE 4.3-3	Fisheries off Nova Scotia from 2001 – 2003 with 25 km and 50 km Radii from Country Island.....	4-116

LIST OF FIGURES (CONTINUED)

	Page
FIGURE 5.1-1 Halifax-Shearwater Wind Rose (2000-2004)	5-38
FIGURE 5.1-2 Maximum 1-Hour NO ₂ Impacts	5-43
FIGURE 5.1-3 Maximum 24-Hour NO ₂ Impacts	5-44
FIGURE 5.1-4 Annual Average NO ₂ Impacts	5-45
FIGURE 5.1-5 Maximum 1-Hour SO ₂ Impacts	5-46
FIGURE 5.1-6 Maximum 24-Hour SO ₂ Impacts	5-47
FIGURE 5.1-7 Annual Average SO ₂ Impacts	5-48
FIGURE 5.1-8 Maximum 24-Hour TSP Impacts.....	5-49
FIGURE 5.1-9 Annual Average TSP Impacts.....	5-50
FIGURE 5.1-10 Maximum 1-Hour CO Impacts	5-51
FIGURE 5.1-11 Maximum 8-Hour CO Impacts	5-52
FIGURE 8.1-1 Location Other Projects in Relation to the Keltic Development Project and the CSR Project	8-5
FIGURE 9.2-1 Seismic Sub Regions	9-3
FIGURE 10.1-1 Major Accidents in Europe and North America (Factory Mutual Research Corporation, June 1999)	10-21

LIST OF APPENDICES

APPENDIX 1	CEAA Scoping Document for the Petrochemical and Liquefied Natural Gas Facilities at Goldboro, NS and Addendum to Scoping Document
APPENDIX 2	Nova Scotia Terms and Conditions for Environmental Assessment Approval
APPENDIX 3	Environmental Management Plan Draft Scoping Document
APPENDIX 4	Issues and Concerns Raised During Public Consultation Program
APPENDIX 5	Fish Habitat Compensation Plan

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
AERMOD	American Meteorological Society Regulatory Model
AMEC	AMEC Earth & Environmental, a division of AMEC Americas Limited
ASU	Air Separation Unit
ATV	All-Terrain Vehicle
BLEVE	Boiling Liquid Expanding Vapour Explosion
BOG	Boil-Off Gas
CCME	Canadian Council of Ministers of Environment
CEA	Cumulative Effects Assessment
CEAA	<i>Canadian Environmental Assessment Act</i>
CEPA	<i>Canadian Environmental Protection Act</i>
CICS	Canadian Institute for Climate Studies
CL	Carapace Length
CLC	Community Liaison Committee
CMHC	Canadian Mortgage and Housing Corporation
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPI	Coalescing Plate Interceptor
CSA	Canadian Standards Association
CSR	Comprehensive Study Report
CTA	Chain Transfer Agent
CWS	Canadian Wildlife Service
DDT	Dichlorodiphenyltrichloroethane
DFO	Fisheries and Oceans Canada
DIANA	Department of Indian and Northern Affairs
DNL	Day-Night Average Sound Level
DNV	Det Norske Veritas
DO	Dissolved Oxygen
EA	Environmental Assessment
EC	Environment Canada
ECC	Environmental Components Of Concern
ECM	Environmental Compliance Monitoring
EEM	Environmental effects monitoring
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPC	Engineering Procurement and Construction
EPP	Environmental Protection Plan
ESC	Erosion and Sediment Control
ESD	Emergency Shut Down

FEED	Front End Engineering Design
FHCP	Fish Habitat Compensation Plan
GBEP	St. Georges Bay Ecosystem Project
GCIFA	Guysborough County Inshore Fisherman's Association
GCRDA	Guysborough County Regional Development Authority
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GPS	Global Positioning System
HADD	Harmful Alteration, Disruption or Destruction
HAZOP	Hazard and Operability Analysis
HDPE	High Density Polyethylene
IAFU	Induced Air Flotation Unit
IBA	Important Bird Area
IMO	International Maritime Organization
INAC	Indian and Northern Affairs Canada
IPCC	Intergovernmental Panel on Climate Change
ISAR	Interdisciplinary Studies in Aquatic Resources
ISFA	Inverness South Fishermen's Association
ISQC	Interim Sediment Quality Guidelines
KDP	Keltic Development Project
Keltic	Keltic Petrochemicals Inc.
KO	Knock Out
LDPE	Low Density Polyethylene
LLDPE	Linear Low Density Polyethylene
LNG	Liquefied Natural Gas
M&NP	Maritimes and Northeast Pipeline
MARPOL	International Convention for the Prevention of Pollution from Ships
MDO	Maine Diesel Oil
MEK	Mi'kmaq Ecological Knowledge
MFU	Maritime Fishermen's Union
MFWC	Mi'kmaq Fish and Wildlife Commission
MIACC	Major Industrial Accident Council of Canada
MSX	Multinucleate Sphere
Municipality	The Municipality of the District of Guysborough
NAEE	No Adverse Environmental Effect
NBCC	National Building Code of Canada
NFPA	National Fire Protection Association
NO ₂	Nitrogen Dioxide
NO _x	Nitrous Oxides
NPRI	National Pollutant Release Inventory
NRCan	Natural Resources Canada
NSDAF	Nova Scotia Department of Agriculture, Fisheries and Aquaculture

Keltic Petrochemicals Inc.
Liquid Natural Gas Facilities and Marginal Wharf
Comprehensive Study Report Final Report
Goldboro, Nova Scotia
October 2007

NSDE	Nova Scotia Department of Energy
NSDNR	Nova Scotia Department of Natural Resources
NSEL	Nova Scotia Department of Environment and Labour
NSMNH	Nova Scotia Museum of Natural History
NSPI	Nova Scotia Power Inc.
NSRBA	Nova Scotia Road Builders Association
NSUARB	Nova Scotia Utility and Review Board
NWPA	<i>Navigable Waters Protection Act</i>
OCIMF	Oil Companies International Marine Forum
OCSG	Offshore Chemical Selection Guidelines
ORV	Open Rack Vaporization
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEL	Probable Effect Level
PIRI	Partnership in RBCA Implementation
PLC	Programmable Logic Control
PM	Particulate Matter
PM ₁₀	Particulate Matter with aerodynamic diameter less than a nominal 10 micrometres
PM _{2.5}	Particulate Matter with aerodynamic diameter less than a nominal 2.5 micrometres
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QRA	Quantitative Risk Assessment
RA	Responsible Authorities
RBCA	Risk-Based Corrective Action
RCMP	Royal Canadian Mounted Police
RMS	Root Mean Square
ROV	Remote Operated Vehicle
S&W	Stone & Webster
SARA	<i>Species At Risk Act</i>
SCV	Submerged Combustion Vaporization
SD	Statistical District
SIGTTO	Society of International Gas Tanker and Terminal Operators
SIRE	Ship Inspection Report Programme
SO ₂	Sulphur Dioxide
SOEI	Sable Offshore Energy Inc.
SOEP	Sable Offshore Energy Project
SPM	Suspended Particulate Matter
SSP	Steel Sheet Piling
SWMP	Storm-water Management Plan
TC	Transport Canada
TCH	Trans-Canada Highway
TDG	Transportation of Dangerous Goods

TERMPOL	Technical Review Process of Marine Terminal Systems in Transshipment Sites
the Agency	Canadian Environmental Assessment Agency
the Board	Nova Scotia Environmental Assessment Board
the Project	Petrochemical and Liquefied Natural Gas Facility in Goldboro, Nova Scotia
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UK	United Kingdom
USA	United States of America
UTM	Universal Transverse Mercator
VEC	Valued Environmental Component
VHP	Very High Pressure
VLCC	Very Large Crude Carriers
VOC	Volatile Organic compound
WHMIS	Workplace Hazardous Materials Information System

LIST OF UNITS

%	percent
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
μm	micrometer
μS	microseimens
$\mu\text{S}/\text{cm}$	microseimens per centimetre
BCM	billion cubic metres
bcm/a	billion cubic metres per annum
BF/P	base flow to precipitation
BTU	British Thermal Unit
BTU/hr	British Thermal Units per hour
cm	centimetre
cm/sec	centimeters per second
dB	decibels
dBA	Decibel measurement using an A weighting filter
dB re1 μPa	decibals referenced to 1 microPascal
DWT	dead weight tonnes
g/t	grams per tonne
gal/hr	gallons per hour
gal/yr	gallons per year
ha	hectare
hPa	hectopascal
Hz	hertz
ka	kiloannum
kg	kilogram
kg/hr	kilograms per hour
kg/m^3	kilograms per metres cubed
kHz	kilohertz
km	kilometre
km/h	kilometres per hour
km^2	square kilometre
kTA	kilotonnes per ampere
kV	kilovolts
KVA	kilovolts per annum
kW	kilowatt
L	litre
L/min	litres per minute
lb/hr	pounds per hour
lb/mmBTU	pounds per million British Thermal Units
Leq	equivalent sound level
m	metre
m/s	metres per second
m^2	square metres

Keltic Petrochemicals Inc.
Liquid Natural Gas Facilities and Marginal Wharf
Comprehensive Study Report Final Report
Goldboro, Nova Scotia
October 2007

m ³	cubic metres
m ³ /day	cubic metres per day
m ³ /hr	cubic metres per hour
m ³ /year	metres cubed per year
mg	milligrams
mg/kg	milligrams per kilogram
mg/L	milligram per litre
mg/m ³	milligrams per cubic metre
ml	millilitre
mm	millimetre
mm/d	millimetres per day
mmcf/hr	million cubic feet per hour
mmcf/yr	million cubic feet per year
mmcfd	million cubic feet per day
mmt	million metric tonnes
MW	megawatt
MWe	megawatts of electricity
Nm ³	normal cubic metres
Nm ³ /hr	normal cubic metres per hour
°C	degrees celsius
°F	degrees fahrenheit
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
psig	pound per square inch gauge
QF/P	quick flow to precipitation
t	metric tonne
t/year	metric tonnes per year
tcf	trillion cubic feet
TF-P	total flow to precipitation
W/m ²	watts per square metre

EXECUTIVE SUMMARY

Overview

Keltic Petrochemicals Inc. (Keltic) proposes to construct and operate a Petrochemical and Liquefied Natural Gas (LNG) Facility in Goldboro, Nova Scotia (the Keltic Development Project). The Keltic Development Project components include a LNG regasification facility, a petrochemical complex, a marginal wharf, a marine LNG Terminal, LNG storage and an electric co-generation facility. The Keltic Development Project will be located adjacent to the existing Sable Island natural gas plant and the Maritimes and Northeast Pipeline (M&NP) in the Goldboro Industrial Park. The processing facilities in Goldboro will require approximately 300 hectares (ha) of land zoned for industrial use.

The marine terminal will allow the delivery of LNG and export of product. The co-generation plant will be fuelled by spent LNG with any remaining spent LNG injected into the existing M&NP pipeline in Goldboro. The Keltic Development Project will also require a wastewater collection and treatment system as well as other site infrastructure and maintenance facilities. The dam and impoundment of Meadow Lake required for water supply likely require approvals from Transport Canada (TC) and Fisheries and Oceans Canada (DFO); however, necessary detail for a screening level environmental assessment (EA) and authorizations will be provided in forthcoming applications.

The petrochemical complex will convert liquids extracted from the Sable Offshore Energy Project (SOEP) at Goldboro combined with the liquids extracted from imported LNG to produce ethylene and propylene in order to manufacture polyethylene and polypropylene pellets. These pellets will be used to manufacture plastic products elsewhere in Canada and the United States of America (USA).

The purpose of the Keltic Development Project is to increase petrochemical production in North America. This will help to meet rising demand for polyethylene and polypropylene pellets and provide additional sources of natural gas to the Canadian and Northeastern USA markets in an effort to meet the growing demands for natural gas. The Keltic Development Project will require an investment of approximately \$5 billion which will be raised through private-sector investors.

The Proponent, Keltic is a Canadian registered corporation, committed to establishing a petrochemical complex, LNG importing facilities, and a co-generation plant at Goldboro, Guysborough County, Nova Scotia. The head office of Keltic is located in Halifax, Nova Scotia. By assignment and absolute conveyance made as at August 30, 2006, MapleLNG Limited ("MapleLNG") acquired from Keltic the entire LNG portion of the Project including any rights with respect to thereto subsequently acquired by Keltic. Keltic has also entered into an agreement with Shaw Stone & Webster for them to act as the Integrating Contractor from the pre- front end engineering design (FEED) through to the operation phase of the Keltic Development Project.

It is Keltic's corporate commitment to provide an economical and sustainable complex in accordance to the highest level of environmental goals and principles. As the agreements between Keltic and the financial, licensors and petroleum firms are finalized a detailed environmental management system (EMS) will be developed for each component of the Keltic Development Project.

This Keltic Development Project is expected to create several thousand direct jobs at the peak of the Project construction and several hundred direct jobs at the various facilities during operation. Keltic expects that many other economic spin-off opportunities will be created in the area as a result of a world-scale LNG and petrochemical facility being built in Goldboro, Guysborough County. These direct jobs and economic spin-off opportunities will be created in a region of Nova Scotia that has an unemployment rate well above the provincial and national average. Furthermore, the population of Guysborough County has been in steady decline as a result of the employment situation; this trend is expected to be reversed with the establishment of this industry. This Keltic Development Project will improve the overall employment rate from both a local and provincial perspective.

Both TC and DFO declared themselves as responsible authorities (RAs) for this Keltic Development Project. A draft scoping document was prepared by the RAs on May 24, 2005, (Appendix 1) to allow the public to comment upon the proposed scope and factors to be considered in the federal EA. Comments were also invited from the public on the ability of a comprehensive study to address the issues related to the Keltic Development Project as opposed to referral to a mediator or a review panel.

Pursuant to Subsection 21(1) of the *Canadian Environmental Assessment Act* (CEAA), TC and DFO invited the public to comment on this draft scoping document on June 1, 2005 and June 3, 2005. Comments were requested to be provided to the RAs by July 3, 2005.

An EA Track Report was prepared by TC and DFO on October 14, 2005. This report, along with the recommendation to the Minister of the Environment, is intended to assist the Minister of the Environment in making a determination under subsection 21.1(1). On January 5, 2006, the Federal Minister of Environment determined that a comprehensive study is the required level of EA for the proposed Keltic Development Project.

On March 14, 2007, the Provincial Minister of Environment and Labour approved Keltic Petrochemicals' Liquefied Natural Gas and Petrochemicals Facility Project at Goldboro subject to certain terms and conditions (Appendix 2). Since receiving the Environmental Approval Conditions from the Nova Scotia Minister of the Environment, Keltic has been working with the provincial regulators on a practical approach to satisfying the Ministerial Conditions.

A finalized scope for the comprehensive study report (CSR) was provided to Keltic on January 6, 2006. Each of the RAs has scoped different elements of the overall Keltic Development Project; however, both elements as scoped are subject to a comprehensive study EA process. Since the Project, as scoped by DFO, falls within the Project as scoped by TC and both projects require a comprehensive study level EA, it was determined that one CSR would be prepared to meet the requirements under CEAA.

Pursuant to Section 17 of CEAA, the RAs have delegated the conduct of the comprehensive study and preparation of the CSR to the Proponent, Keltic. The departments providing specialist advice have worked together with the Agency and the RAs to provide direction on the federal CSR.

Guidance on the content of the CSR has been provided to Keltic, including provision of a table of contents and comments on draft documents. In addition, TC and DFO have reviewed the

provincial EA provided by the Proponent which allowed both RAs to provide additional input regarding their respective content expectations. It was understood that the contents of the provincial EA document were to be used by the Proponent in the preparation of the CSR and subsequent environmental screenings.

DFO and TC will work together to conduct a single federal EA process that will allow both RAs to fulfill their respective responsibilities under CEAA, in a unified non-duplicative manner.

The specific scope of each RA is defined below.

Transport Canada's (TC) Scope of Project

The Project has been scoped by TC to include the construction, operation, maintenance, modification and decommissioning of the following components:

- LNG Terminal;
- marine transfer pipelines;
- LNG storage tanks;
- marginal wharf;
- any temporary marine facilities and structures and equipment that are connected with the movement of goods between ship and shore;
- regasification plant; and
- shipping within 25 kilometres (km) of Country Island.

As outlined in the Scoping Document (May 24, 2005), TC scoped the Project based on the anticipated *Navigable Waters Protection Act* (NWPA) section 5(1)(a) trigger under the Law List Regulations pursuant to CEAA. This initial scope included all of the above components but shipping within 25 km of Country Island. Based on subsequent consultation with the public in accordance with section 21(1) of CEAA and consultation with expert federal authorities, TC amended its original scope to include shipping within 25 km of Country Island.

Fisheries and Ocean Canada's (DFO) Scope of Project

DFO scoped the Project to include:

- Construction and operation of the marginal wharf.

The scope of the marginal wharf operation does not include shipping, but does include docking and deberthing of vessels. This scoping is based on the anticipated *Fisheries Act*, section 35(2) trigger under the Law List Regulations pursuant to CEAA.

Based on consultation with the public in accordance with section 21(1) of CEAA and consultation with expert federal authorities, DFO decided that their scope of Project will remain the same.

Public Consultation by the Proponent

To date, several consultations have occurred. These consultations were designed to provide information about the proposed Keltic Development Project, respond to questions and concerns the public might have, and gather technical information and input into impacts, mitigation, and monitoring that could be incorporated into the EA.

As part of the public consultation process, Keltic Petrochemicals established a Community Liaison Committee (CLC) in August of 2004. The committee was set up voluntarily by Keltic to involve and inform local communities in the Keltic Development Project Area and will be the primary vehicle used for future consultations. The CLC has a two-fold mandate:

- to provide a forum for the representatives of the residents of Guysborough and surrounding communities to offer their input on the Keltic Development Project; and
- to provide a forum for representatives from Keltic to update the community, through the committee, on the various aspects of the Keltic Development Project.

Keltic will liaise with the Guysborough County Regional Development Authority (GCRDA) and the Guysborough Journal as a means of communicating any information. Keltic will also liaise actively with local emergency service providers, such as the Royal Canadian Mounted Police (RCMP), fire, and emergency health response.

In addition, as part of the Provincial EA process, public and regulatory consultation was conducted as part of the review of the Environmental Impact Assessment. Input was gathered through written submission as well as 6 days of public hearings held in Goldboro, St. Mary's, and Antigonish from November 20 – 25, 2006. This input was included in the preparation of the CSR.

CSR Methodology

The CSR is written to reflect a Project description that describes the components described in the federal Scoping Report as well as all associated infrastructure requirements. Consideration has been given to all phases of the Project, including activities associated with construction, operation, maintenance, decommissioning/reclamation, and unplanned events.

The methodology for the preparation of the CSR was focused to provide:

- identification of the environmental and socio-economic components of greatest concern;
- consideration of the issues raised by stakeholders;
- incorporation of environmental management planning into the engineering design process;
- inclusion of cumulative effects in the overall EA process; and
- consideration of all regulatory requirements.

In order to attain the above the assessment approach entailed:

- identification of temporal and spatial boundaries;
- selection and organization of Valued Environmental Component (VECs);
- evaluation of VEC interactions with the Project;
- the methods for prediction and evaluation of environmental effects; and
- the rationale for development of mitigation measures.

VECs “are interpreted as environmental; socio-economic; human health; reasonable enjoyment of life and property; and cultural, historical, archaeological, paleontological, and architectural features that may be impacted, whether positive or negative, by the proposed Project.”

For the Project, the VEC selection process involved the following steps and considerations:

- review of requirements of the Terms of Reference and scoping document;
- review of the baseline studies;
- review of Project works and activities;
- consideration of potential Project-environment interactions; and
- identification of public, stakeholder, and government concerns.

The following is a summary of the VECs selected for the Project:

- Hydrology;
- Freshwater Quality/Quantity;
- Groundwater Quality/Quantity;
- Marine Water Quality;
- Soil/sediment Quality (terrestrial and marine);
- Air Quality;
- Climate Conditions;
- Vegetation (terrestrial and marine);
- Species at Risk;
- Fish and Fish Habitat (marine and freshwater);
- Marine Mammals;
- Wildlife and Wildlife Habitat;
- Migratory Birds and Migratory Bird Habitat;
- Wetlands;
- Lighting Conditions;

- Atmospheric and Underwater Acoustic Environment;
- Physical and Cultural Heritage;
- Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons;
- Structures/Sites of Archaeological, Paleontological or Architectural Significance;
- Navigation;
- Marine Safety and Security;
- Human Health and Safety;
- Fisheries;
- Aquaculture; and
- Tourism.

Potential effects were identified when a pathway or interaction between the Project and a VEC was established. Individual studies were then undertaken to focus on these potential effects. Based on collective knowledge and experience of the EA team and the individual studies and consultations, the following were determined for each predicted effect on a VEC:

- Nature (positive or negative);
- Magnitude;
- geographic extent;
- timing, duration and frequency;
- reversibility;
- ecological and socio/cultural context; and
- probability of occurrence (likelihood).

Positive environmental effects are also identified and explained.

Where an adverse environmental effect has been identified, mitigation has been proposed. Many adverse effects can be avoided through sound engineering design, and timing of Project activities and implementation to the proposed environmental management plans. The general approach taken is to reduce or eliminate the potential negative Project-VEC interactions, if feasible. Where not possible, mitigation measures were incorporated into the design and planned implementation of the Project activities in order to eliminate or reduce potential adverse effects. In some instances, remediation and/or compensation may be required where an adverse effect would jeopardize the implementation of the Project.

Furthermore, the terms and conditions to the Provincial Environmental Assessment Approval that relate to the CSR scoped VECs are identified and will be implemented by the Proponent.

The above approach results in the identification of Residual Effects – those environmental effects predicted to remain after the application of mitigation outlined in this CSR. The CSR considers the predicted residual effects for each Project phase (construction, operation, and decommissioning). In addition, residual environmental effects are also described for potential accidental events.

For adverse residual effects, the evaluation for the individual criteria was combined into an overall rating of significance:

- major;
- medium;
- minor; and
- minimal.

An adverse impact was considered “significant” where its residual effects were classified as major; while they were considered “not significant” where residual effects were classified as medium, minor, or minimal.

Conclusion

In accordance with the requirements of Section 16 (1) and (2) of CEAA and the Terms of Reference, this environmental impact assessment includes:

- A discussion of the alternatives to the Project and the alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means.
- A description of the proposed Project including the purpose, and need, the proposed facilities and activities, and the potential malfunctions or accidental events that may occur in connection with the Project.
- A summary of consultation mechanisms and issues raised during consultation (i.e., issues scoping) as well as a description of the methodological approach to the environmental impact assessment.
- An assessment of the environmental effects of the proposed Project for each of the VECs, including cumulative environmental effects and the significance of the effects.
- An assessment of the effects of the environment on the Project.
- Identification of measures to mitigate adverse environmental effects.
- Recommendations for monitoring and follow-up.

The results of the assessment have been developed and summarized in Section 6.0 of the CSR. This section describes the predicted effect and the identified mitigation or avoidance measures which could reduce or eliminate the predicted effects.

Environmental management practice involving prevention and preparedness training is proposed to reduce the likelihood of unplanned (accidental) events. As well, effective emergency response programs will be developed should an event occur. The Emergency Preparedness planning will include the purchase of required equipment, the careful maintenance of equipment and infrastructure, and the frequent scheduling of training exercises and emergency response simulations. Emergency Preparedness Planning will be integrated into all phases of the Project design, planning, and execution. The objective is to achieve a safety and emergency preparedness level higher than the industry average, and continuously to improve upon this standard.

Through careful design and planning, combined with prudent application of proven mitigation measures, Keltic has identified and addressed all potential adverse environmental effects, and reduced the predicted impacts to their lowest level of significance.

1.0 INTRODUCTION

Keltic Petrochemicals Inc. (Keltic) proposes to construct and operate a Petrochemical and Liquefied Natural Gas (LNG) Facility in Goldboro, Nova Scotia, hereafter referred to as the Keltic Development Project (KDP). The primary facilities proposed by the KDP include an LNG regasification facility, a petrochemical complex, a marginal wharf, a marine LNG Terminal, LNG storage, and an electric co-generation facility.

The KDP will be located adjacent to the existing ExxonMobil natural gas plant and the Maritimes and Northeast Pipeline (M&NP) in the Goldboro Industrial Park. The KDP processing facilities in Goldboro will require approximately 460 hectares (ha) of land zoned for industrial use. The KDP location and basic layout are shown in Figures 1.0-1 and 1.0-2.

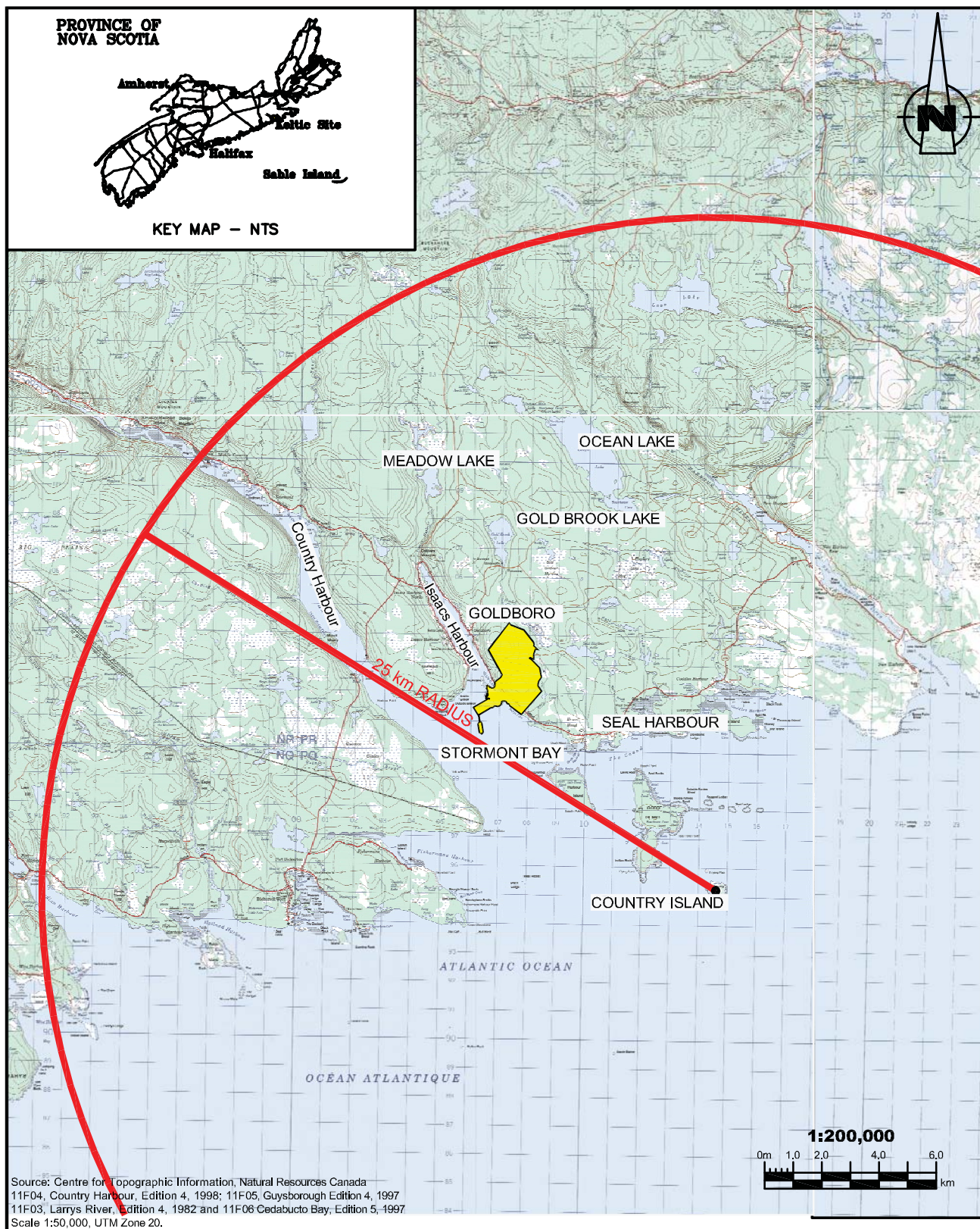
The LNG Marine Terminal will allow for the delivery of LNG and the Marginal Wharf for the import of other feedstock materials and the export of products. The co-generation plant will be fuelled by the natural gas remaining following the extraction of liquids for petrochemical feedstock. The remaining natural gas will be injected into the existing M&NP pipeline in Goldboro. A freshwater supply system is required. This includes the construction of a reservoir at Meadow Lake. A wastewater collection and treatment system, as well as other site infrastructure and maintenance facilities are required for KDP.

The petrochemical complex will convert liquids extracted from the Sable Offshore Energy Project (SOEP) at Goldboro combined with the liquids extracted from imported LNG to produce ethylene and propylene in order to manufacture polyethylene and polypropylene pellets. These pellets will be used to manufacture plastic products elsewhere in Canada and the United States of America (USA).

The purpose of the KDP is to increase petrochemical production in North America and to supply natural gas to markets in Eastern Canada and the Northeastern USA. This will help to meet rising demand for polyethylene and polypropylene pellets as well as that of natural gas to the Canadian and Northeastern USA markets. Development of a petrochemical industry in Nova Scotia is in line with the Nova Scotia Energy Strategy (Nova Scotia Department of Energy (NSDE), 2001) and creates added value to the natural gas found offshore Nova Scotia.

The KDP will require an investment of approximately \$5 billion which will be raised through private-sector investors.

This document forms the Comprehensive Study Report (CSR) as required for this Project under the *Canadian Environmental Assessment Act (CEAA)*. Under CEAA, a comprehensive study must take place where a project is described in the *Comprehensive Study List Regulations*. A comprehensive study is therefore required for the LNG Terminal and marginal wharf portions of the KDP, hereafter referred to as “the Project,” as they will be designed to accommodate vessels larger than 25,000 dead weight tonnes (DWT).



LEGEND


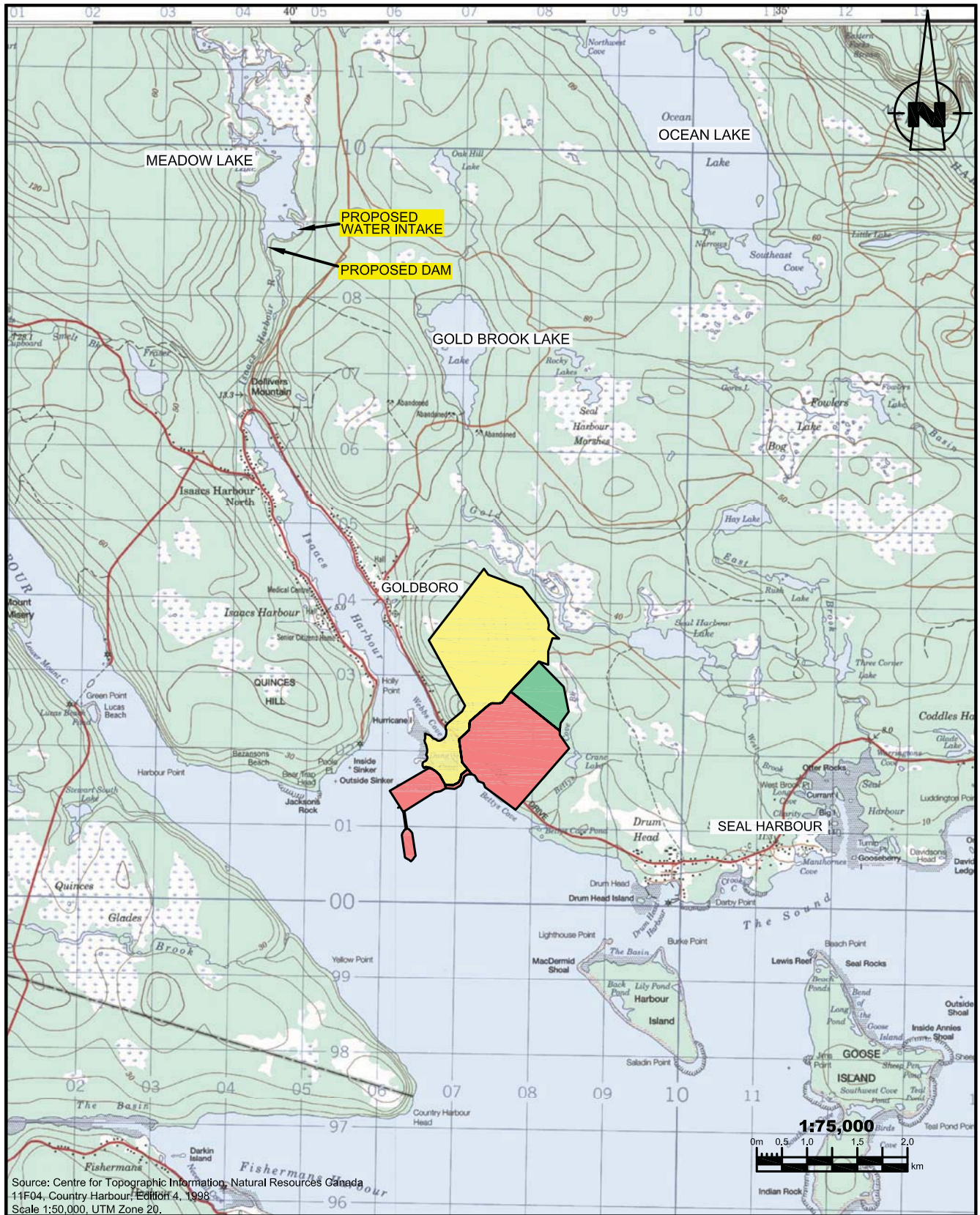
 Keltic Development Project

FIGURE No. 1.0-1
KELTIC PETROCHEMICALS INC.
KELTIC DEVELOPMENT PROJECT
LOCATION AND REGIONAL SETTING

JUNE 2007



LEGEND

- Co-Generation Power Plant
- Petrochemical Plant
- LNG Plant and Marine Facilities

FIGURE No. 1.0-2
 KELTIC PETROCHEMICALS INC.
KELTIC DEVELOPMENT PROJECT
LOCATION AND BASIC LAYOUT
 JUNE 2007

This CSR report has been coordinated by AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), with input from the technical specialists listed below.

- 4Gas;
- Atlantic Road & Traffic Management;
- CEF Consultants Limited;
- Davis Archaeological Consultants Ltd;
- D. Besner & Associates Inc;
- Dillon Consulting;
- Duncan Cameron;
- Earth-water Concepts Inc;
- MacDonnell Group;
- McInnes Cooper;
- Membertou Geomatics;
- Royal Haskoning, Netherlands;
- Shaw Environmental;
- Strait Engineering;
- Stone & Webster (S&W); and
- Tarandus Associates Limited.

1.1 PURPOSE OF THE COMPREHENSIVE STUDY REPORT (CSR)

Under Section 5 (1) of CEAA, an environmental assessment (EA) of a project is required if a federal authority exercises or performs one or more of the following powers, duties, or functions in relation to a project:

- proposes the project;
- grants money or any other form of financial assistance to the project;
- grants an interest in land to enable a project to be carried out; or
- exercises a regulatory duty in relation to a project, such as issuing a permit or license, which is included in the Law List Regulations (Canadian Environmental Assessment Agency (the Agency), 1994).

Transport Canada (TC) and Fisheries and Oceans Canada (DFO), have triggered a requirement to conduct an EA, and as such, will be responsible authorities (RAs) under CEAA as each department will need to issue a regulatory approval for components of the Project, in order for them to proceed. In addition to the RAs, Environment Canada (EC), Natural Resources Canada (NRCan), and Health Canada have provided specialist or expert information and knowledge to support the comprehensive study process.

The purpose of a federal CSR is to:

- Identify the potential environmental effects of a project whether positive or negative, including the environmental effects of any accidents or malfunctions that may occur in connection with the project and any cumulative effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out.
- Describe measures that are technically and economically feasible to mitigate any adverse environmental effects of the project.
- Report on all public concerns raised in relation to the Project and how they have been addressed.
- Based on the CSR and public comments, provide conclusions with respect to whether the project is likely to result in significant adverse environmental effects.

The scope of the Project to be assessed, as separately determined by DFO and TC in accordance with Section 15(1) of CEAA, is provided in Section 2.3 of this document.

1.2 THE FEDERAL REVIEW PROCESS

1.2.1 Comprehensive Study

A draft scoping document was prepared by the RAs on May 24, 2005, (Appendix 1) to allow the public to comment upon the proposed scope and factors to be considered in the federal EA. Comments were also invited from the public on the ability of a comprehensive study to address the issues related to the Project as opposed to referral of the Project to a mediator or a review panel.

Pursuant to Subsection 21(1) of CEAA, TC and DFO invited the public to comment on this draft scoping document on June 1, 2005 and June 3, 2005. Comments were requested to be provided to the RAs by July 3, 2005.

An environmental assessment Track Report was prepared by TC and DFO on October 14, 2005. This report, along with the recommendation to the Minister of the Environment, is intended to assist the Minister of Environment in making a determination under subsection 21.1(1).

On January 5, 2006, the Minister of Environment determined that a comprehensive study is the required level of EA for the proposed Project. Under CEAA, a comprehensive study must take place where the proposal represents a prescribed project or class of project included in the Comprehensive Study List. A comprehensive study is required for marine terminals designed to handle vessels larger than 25,000 DWT (CEAA Comprehensive Study List Regulation, Sept 2006, Part IX Transportation, 28c). This applies to both, the proposed LNG and the proposed terminal wharf.

A finalized scope for the comprehensive study was provided to Keltic on January 6, 2006. As defined in Section 2.3 of this document, each of the RAs has scoped a different project; however, both Projects are subject to a comprehensive study EA process. Since the Project, as scoped by DFO, falls within the Project as scoped by TC and both Projects require a

comprehensive study level EA, it was determined that one CSR would be prepared to meet the requirements under CEAA.

Pursuant to Section 17 of CEAA, the RAs have delegated the conduct of the comprehensive study and preparation of the CSR to the Proponent, Keltic. The departments providing specialist advice have worked together with the Agency and the RAs to provide direction on the federal CSR.

Guidance on the content of the CSR has been provided to Keltic, including provision of a table of contents and comments on draft documents. In addition, TC and DFO have reviewed a provincial EA provided by the Proponent which allowed both RAs to provide additional input regarding their respective content expectations. It was understood that the contents of the provincial EA document were to be used by the Proponent in the preparation of the CSR and subsequent environmental screenings.

The Agency is required to release the CSR for a 30 day public comment period. Following the public review period, the Agency will provide the comments to the RAs for response. The CSR together with public comments and RAs' responses will be provided to the Minister of Environment for review of all the information and subsequent issuance of the EA decision statement in accordance with Section 23 of the Act.

1.2.2 Screenings

The Proponent has been advised that the construction of a dam and impoundment of Meadow Lake for the process water supply for the KDP will likely require approvals from TC under the *Navigable Waters Protection Act* (NWP), Section 5(1) (a), and DFO under the *Fisheries Act*, Section 35(2).

As the dam and impoundment were not envisaged by the Proponent at the time of the federal Scoping Document (May 24, 2005 with revision January 6, 2006), this component of the KDP was not included in the scope of the Project requiring comprehensive study. As the construction and operation of the dam and impoundment are subject to an EA under CEAA, TC, and DFO will address this component of the KDP as a separate screening level assessment.

The screening for the dam and impoundment will be triggered when applications are made by the Proponent to:

- TC for authorization of the dam under the NWP; and
- DFO for authorization of the harmful alteration, disruption, or destruction (HADD) of fish habitat under the *Fisheries Act*.

Any watercourse crossings, storm water, sanitary water, process water, cooling water, wastewater outlets and/or infrastructure within the marine environment will be assessed for compliance with applicable federal legislation, which may result in the requirement for additional EAs.

These applications will be made by Keltic separate from this CSR.

1.2.3 Key Federal Legislation

Table 1.2-1 sets out a list of the key legislation relevant to the Project components. The specific requirement and schedule for application of the legislation are also noted.

TABLE 1.2-1 List of Relevant Federal Legislation

Statute/ Regulation	Section Reference	Requirement	Schedule
NWPA	S. 5 (1)	Approval and responsibility of the NWPA program rests with the Minister of TC to construct "work" in navigable waters	Prior to any construction activities below the high watermark.
<i>Fisheries Act</i>	S. 35	Approval required for HADD of fish habitat, specifically the marginal wharf.	Prior to any construction activities below the high watermark.
	S. 22 (1), (2), (3)	Minimum flows must be maintained for fish and fish eggs.	Prior to any construction activities.
	S. 32	Prohibits destroying fish by any means other than fishing. Most relevant if blasting is required in or near waters containing fish or fish habitat.	Should blasting be required, the Proponent will follow DFOs Guidelines for the Use of Explosives In or Near Canadian Fisheries prior to construction activities.
	S. 36	Prohibits deposit of deleterious substance in waters frequented by fish.	Throughout construction, operation, and decommissioning phases
Petroleum Refinery Liquid Effluent Regulation	General	Sets minimum standards for effluent quality from "petroleum refinery" as therein defined.	Throughout construction, operation, and decommissioning phases
CEAA	S. 5(1)	EA required before federal authority may render a decision identified under CEAA.	Prior to any construction activities.
Law List Regulation	S. 6 and 11	S.5 of the NWPA and s. 22 (2), and s.35 of the <i>Fisheries Act</i> are "triggers" for application of CEAA.	
Comprehensive Study Regulation		Specifies whether or not a comprehensive study is required.	
<i>Species at Risk Act</i> (SARA).	General	Provides protection to listed species and their habitat.	Throughout construction, operation, and decommissioning phases
<i>Canadian Environmental Protection Act</i> (CEPA)	Part 5	Regulates the manufacturing and handling of "toxic substance."	Notification to EC within 90 days of acquiring a scheduled substance.
Environmental Emergency Regulations	General	Requires notification to EC that Proponent has control of a scheduled substance. Also requires an environmental emergency plan for the facility that stores or uses the substance.	
National Pollutant Release Inventory (NPRI)	General	Keltic will likely be required to report under the NPRI.	

Statute/ Regulation	Section Reference	Requirement	Schedule
<i>Canada Marine Act</i>	General	Regulation of marine transportation.	Throughout construction, operation, and decommissioning phases
<i>Transportation of Dangerous Goods Act</i>	General	Documenting handling and placard requirements for transport of dangerous goods.	see above
<i>Pilotage Act - Atlantic Pilotage Authority Regulations</i>	General	Establishes pilotage authorities and requirements outside areas where pilots are compulsory.	see above
<i>Canada Shipping Act</i>	General	Detailed code for all aspects of shipping in Canada.	see above
Ballast Water Control and Management Regulations	General	Came into force on June 8, 2006.	see above
<i>Canada Transportation Act</i>	General	Applies to transportation matters under federal jurisdiction.	see above
<i>Migratory Birds Convention Act</i>	General	Provides protection for migratory birds and their habitat	see above
<i>Marine Transportation Security Act and Regulations</i>	General	Regulatory measures for marine and port security.	see above

1.2.4 Technical Review Process of Marine Terminal Systems in Transshipment Sites (TERMPOL)

The Technical Review Process of Marine Terminal Systems in Transshipment Sites (TERMPOL) is a voluntary review process of marine terminal systems for transshipment sites and is initiated by the Proponent. The purpose of this review process is to objectively appraise operational ship safety, route safety, management, and environmental concerns associated with the location, construction, and operation of a marine terminal.

The review is coordinated by TC in conjunction with requirements of the *Canada Shipping Act*. The process is not necessarily limited to the scope of the CEAA review and may involve a more detailed assessment of shipping and navigation issues. The *NWPA* review process is not exclusive of the components of the TERMPOL review process.

It is the policy of TC to initiate the TERMPOL upon request of the Proponent and upon initiation of the federal environmental assessment process for the Project. Keltic initiated TERMPOL with a written request on September 12, 2006. This correspondence was followed up on October 11, 2006; with a letter amending the initial request as the Project subsequently involved two Proponents, Keltic and MapleLNG. As explained in this letter, Keltic finalized the sale of assets related to the LNG facility to MapleLNG subsequent to the initial correspondence. A kick-off meeting was held on December 18, 2006, with TC and others to establish communications, initiate sharing of pertinent information, define the scope of the review, and agree on a schedule. Keltic is in the process of assembling information and undertaking studies outlined in the TERMPOL guidance document. In addition, Keltic is preparing a scoping document for TC's review which will outline its approach to the shipping simulation study.

Once TC is in receipt of the findings of these studies and simulations, it will prepare a summary report providing recommendations on navigation, pilotage, communications, and emergency response. Provisions of the review are not mandatory, but criteria are used by TC to determine the need for making or revising specific regulations or for implementing special precautionary measures.

1.3 THE PROVINCIAL REVIEW PROCESS

1.3.1 Provincial Environmental Assessment Process

Under the Environmental Assessment Regulations passed under Nova Scotia's *Environment Act*, the proponent of the undertaking is required to register with the Nova Scotia Department of Environment and Labour (NSEL) before proceeding with the final design of an undertaking or commencing work on an undertaking.

A petrochemical plant is designated as a Class II undertaking under the Environmental Assessment Regulations. As a result, an extensive EA, that included consideration by the Nova Scotia Environmental Assessment Board (NSEAB), was required. The generic steps in the Class II provincial environmental assessment process are described below:

- Before proceeding with the final design of the undertaking or commencing work, the proponent must register the undertaking with the NSEL.
- Within 7 days following the registration, the proponent must publish a notice in the newspaper giving certain prescribed information about the Project.
- Within 12 days of the registration of the undertaking, the administrator is required to publish a notice inviting the public to submit written comments for consideration in preparation of the terms of reference for an EA Report. Comments must be received within 40 days of publication of the notice. The proponent is then given 21 days to respond to any public comments and following the final day for comments from the proponent, the administrator is required, within 14 days, to provide final terms of reference for the EA Report.
- The proponent then must produce an EA Report which addresses all of the issues raised in the terms of reference.
- The EA Report is submitted to the NSEL and the Department either accepts the report or requires additional work following acceptance of a final report, there is a 48 day public review period.
- Within 10 days following receipt of the final report, the Nova Scotia Minister of Environment and Labour is obliged to refer the report to NSEAB for consideration. NSEAB then holds public hearings to receive public comments on the EA Report.
- Following the hearings, NSEAB produces a report and recommendations to the Minister of Environment and Labour. This report is to be generated within 110 days of the referral of the EA to NSEAB.
- Within 21 days after the receipt by the Minister of NSEAB's report and recommendation, the Minister advises the proponent in writing whether the undertaking is approved or rejected.

Keltic registered the KDP Development Proposal with NSEL on January 12, 2005, at which point NSEL released a draft terms of reference for public comment. The terms of reference were finalized by NSEL in April 2005.

Keltic submitted the EA Report to NSEL and it was released on August 22, 2006, for public review. The public had until October 30, 2006, to submit comments to NSEAB, following which hearings were held in November 2006.

Following the hearings, NSEAB requested a 60 day extension to the 110 day period they are provided for the preparation of the report and recommendations. This was granted by the Minister and the report and recommendation was submitted on February 21, 2007. The Minister then approved the KDP Development Proposal, subject to terms and conditions, on March 14, 2007.

Public documents related to the provincial EA review can be found at www.gov.ns.ca/enla/ea/kelticpetro.asp.

1.3.2 Key Provincial Legislation

Table 1.3-1 sets out a list of the key legislation relevant to the Project components. The specific requirement and schedule for application of the legislation are also noted.

TABLE 1.3-1 List of Relevant Provincial Legislation

Statute/ Regulation	Section Reference	Requirement	Schedule
<i>Environment Act</i>	S. 50	Prohibits designated activities without holding appropriate approval.	
Environmental Assessment Regulation	Schedule A	Storage facility for liquid or gaseous substances including hydrocarbons with total capacity greater than 5000 m ³ designed as a Class I undertaking requiring registration for Environmental Assessment.	Prior to construction
Activities Designation Regulations	S.(1)(d)(e) and (o)	The installation of certain culverts, a bridge, or other watercourse alteration requires an approval.	Prior to construction of culvert crossings associated with Highway 316 realignment; send-out gas pipeline crossing of Betty's Cove Brook.
	S. 5(1)(g)	The construction of a wharf requires approval.	Prior to construction.
	S. 10(1)(f)	The construction or operation of a site with a chemical storage tank in excess of 2000 litres (L) or 2000 kilograms (kg) requires approval (anticipated to be combined with industrial approvals for the petrochemical facility and LNG facility).	Prior to construction. Can be staged if required.
	S. 12(f)	The construction or operation of a natural gas processing facility.	

Statute/ Regulation	Section Reference	Requirement	Schedule
Activities Designation Regulations (<i>Cont'd</i>)	S. 21	The treatment or processing of wastewater or wastewater sludge is designated as an activity (anticipated to be combined with industrial approvals for the petrochemical facility and LNG facility).	
Air Quality Regulations	General	Establishes maximum permissible ground level concentrations of contaminants.	During all Project phases
Petroleum Management Regulation	S. 11	Storage tank systems must be registered.	Notify NSEL at least 3 days prior to construction of storage tanks. Within 30 days following installation file a report on the installation with NSEL.
Dangerous Goods Management Regulation	S. 6	Written approval required to store waste dangerous goods.	Prior to any construction activities.
<i>Energy Resources Conservation Act</i> – Gas Plant Facility Regulations	S. 6 (1), (2), 7 (1), (2)	Requires a permit to construct and licence to operate to be obtained from the Nova Scotia Utility and Review Board (NSUARB)	Prior to any construction activities.
<i>Pipeline Act</i> – Pipeline Regulations	S. 4 (1), (2)	Requires permit or licence to construct or operate a pipeline. Establishes standards for design and construction.	Prior to any construction activities.
<i>Crown Lands Act</i>	S 5, 13, 16 (1)	Governs the use and activities on lands owned by the province. Through the Act the province can make crown lands available for the Project through the use of easements, conveyances, leases, or licenses.	Prior to any activities on Crown Lands
<i>Forests Act</i> – Forest Protection Regulations	S 6 (1), (2)	Requires fire suppression equipment as per the regulation when operating within 305 metre (m) of the woods.	During construction.

1.4 THE FEDERAL/PROVINCIAL COORDINATION

As the Project is subject to both provincial and federal EAs, the province and the federal government have agreed to coordinate the processes to the extent possible by their respective legislations and processes.

Some components of the KDP reviewed by the provincial environmental assessment process are not within the scope of federal EA, such as the petrochemical facility, co-generation facility and the dam and impoundment. As the scope of the federal EA is a subset of the provincial EA, a separate document was required for the CSR.

Given the differences in federal and provincial scoping, opportunities for coordination were limited to a shared public review period. The Proponent submitted the EA Report in July 2006 which was commented upon by the public. Public hearings were conducted on the Project in November 2006. The 48 day public review period of the provincial EA Report fulfilled the requirements under CEAA Section 21.2.

The Proponent will receive an independent decision from the federal Minister of Environment as the provincial Minister of Environment and Labour issued his decision on March 14, 2007. Since receiving the Environmental Approval Conditions (Appendix 2) from the Nova Scotia Minister of Environment and Labour, Keltic has been working with the provincial regulators on a practical approach to satisfying the Ministerial Conditions. Keltic is currently developing a phased approach to the permits required to ensure that all conditions have been met to satisfy particular permits at the appropriate time.

Keltic recognizes that there will be additional conditions from a federal government perspective and has begun work on only the conditions that will not be impacted by any federal decisions. Keltic will continue to work closely with the provincial regulators to ensure that the scope of work adequately addresses the Ministerial Conditions.

It is of note that the proposed construction and operation of a dam at Meadow Lake (Meadow Lake Dam and Impoundment Project), which represents a component of the KDP, is being evaluated through another, separate EA process. The Meadow Lake Dam and Impoundment Project has been included in the scope of the provincial EA Report but is not within the scope of the federal CSR. Instead, this Project component is subject to a federal screening pursuant to Section 18 of CEAA. The requirement for the screening is triggered by the federal DFO determination that fish habitat may be altered, disrupted, or destroyed as a consequence of the dam construction and operation. It is anticipated that the screening may also be triggered if TC is required to issue an approval for the dam under the NWPA. The RAs for the Meadow Lake Dam and Impoundment Project are DFO and TC. The Meadow Lake Dam and Impoundment Project has also been subject the above mentioned public review and hearings.

2.0 PROJECT DESCRIPTION AND SCOPE OF ASSESSMENT

2.1 THE PROPONENT

The Proponent, Keltic, is a Canadian registered corporation with a head office is located in Halifax, Nova Scotia. The Proponent's coordinates are as follows:

Address: Keltic Petrochemicals Inc.
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B3J 1M5

Contact: Mr. W. Kevin Dunn, President
Tel: (902) 422 4557
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As the agreements between Keltic and the financial, licensors and petroleum firms are finalized, a detailed Environmental Management Plan (EMP) will be developed for each component of the Project. Keltic will provide detailed EMPs for the respective Project components in compliance with the environmental impact statement and approvals granted.

Keltic's corporate structure is depicted in Figure 2.1-1 and the Project participants and their roles in major stages of the Project are described in following subsections.

2.1.1 Keltic Development Project (KDP) Participants

MapleLNG

By assignment and absolute conveyance made as at August 30, 2006, MapleLNG Limited ("MapleLNG") acquired from Keltic the entire LNG portion of the Project including any rights with respect to thereto subsequently acquired by Keltic. MapleLNG is owned by 4Gas North America Ltd. and Suntera Canada Ltd. 4Gas operates on a stand-alone basis with a management team dedicated entirely to LNG. 4Gas focuses on developing and operating LNG Terminals around the world, including the Dragon LNG project in Milford Haven, Wales and the LionGas project in Rotterdam, The Netherlands. Both of these projects are currently under development; Dragon LNG is expected to be operational in 2007 and LionGas in 2009.

KELTIC CORPORATION

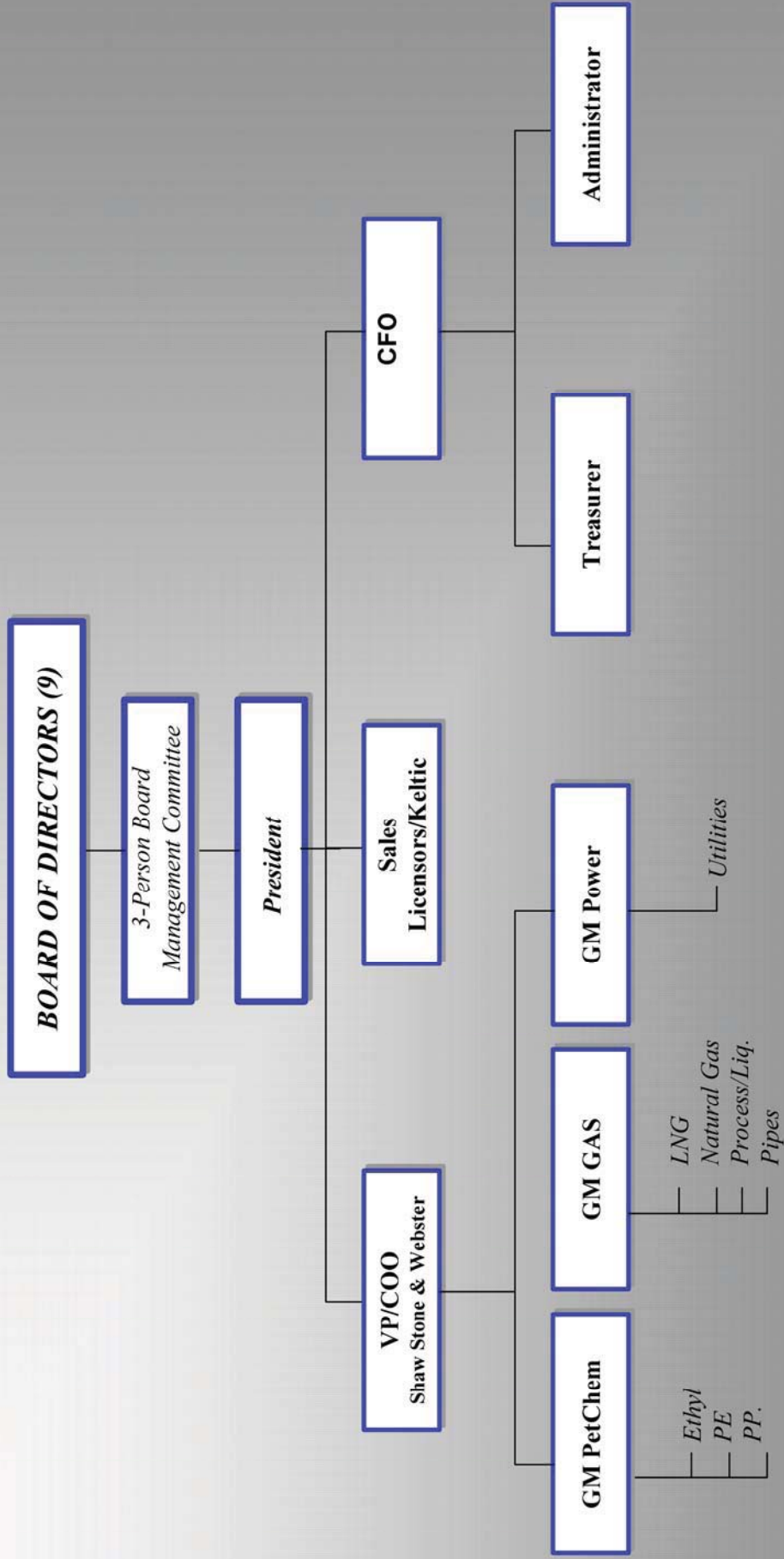


FIGURE No. 2.1-1
 KELTIC PETROCHEMICALS INC.
KELTIC'S CORPORATE STRUCTURE
 JUNE 2007

Stone & Webster (S&W) Inc.

Stone & Webster Inc. (S&W), a subsidiary of The Shaw Group Inc., is an engineering construction company that was founded in Boston in 1889. S&W is a multinational corporation and has been responsible for the development, consulting, engineering, and construction of nuclear, fossil-fuelled, geothermal, and hydroelectric power generation projects. The company has supplied the process technology for over 35% of the world's ethylene capacity constructed since 1995.

The Shaw Group Inc.

The Shaw Group Inc. is a provider of consulting, engineering, construction, remediation, and facilities management services to government and private sector clients in the environmental, infrastructure, and emergency response markets, including services to the power and process industries worldwide. Shaw is headquartered in Baton Rouge, Louisiana, USA. Keltic has entered into an agreement with Shaw S&W for them to act as the Integrating Contractor from the Pre Front End Engineering Design (FEED) through to the operation phase of the Project.

2.1.2 Participants' Roles

During the engineering, procurement, and construction phases, S&W will act as overall Project management contractor for the petrochemical component but with specific engineering procurement and construction (EPC) responsibilities for the ethylene unit and power generation plant. S&W EPC activity will be done upon a lump sum basis with schedule compliance. MapleLNG will have overall Project management responsibility for the LNG component of the Project.

During operations and maintenance, S&W will take the responsibility for developing the Keltic organization and for long-term maintenance at the site. The envisaged Keltic organization will be located at the Goldboro site and also in Halifax. MapleLNG will take the overall responsibility for the operation of the LNG facility and the associated marine terminal.

It should be noted that the polyolefin licensors have agreed to participate in operations and maintenance support. Measures to sustain the asset will be incorporated into the licensing agreements with polyolefin licensors and managed by the Keltic organization.

In the event of significant modification or decommissioning, S&W or, for the LNG component, MapleLNG will take the responsibility for integrating these activities into Keltic's organization.

These relationships and roles are laid out in Figure 2.1-2.

Shaw Stone & Webster Scope

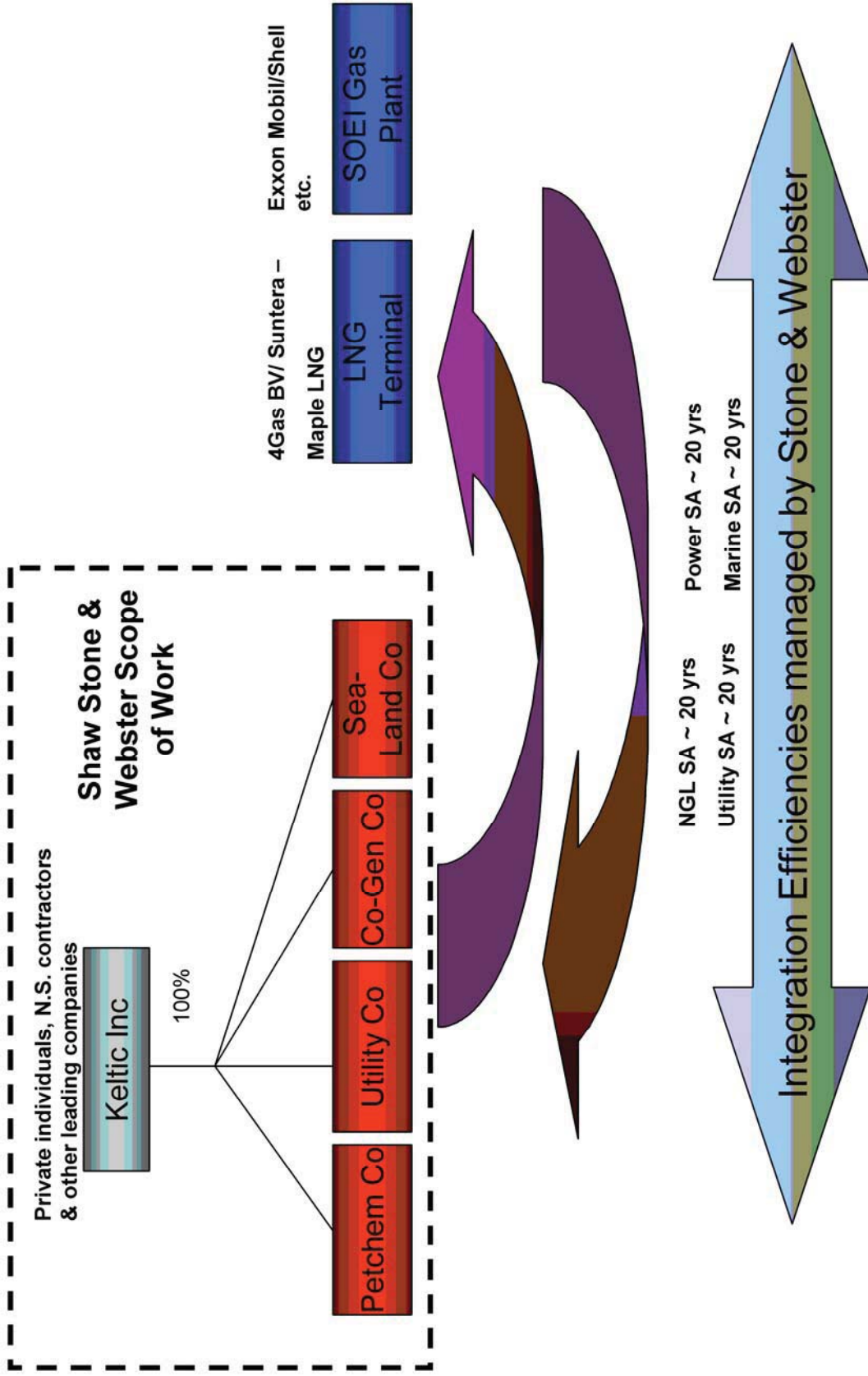


FIGURE No. 2.1-2
 KELTIC PETROCHEMICALS INC.
RELATIONSHIPS AND ROLES OF
PROJECT PARTICIPANTS
 JUNE 2007