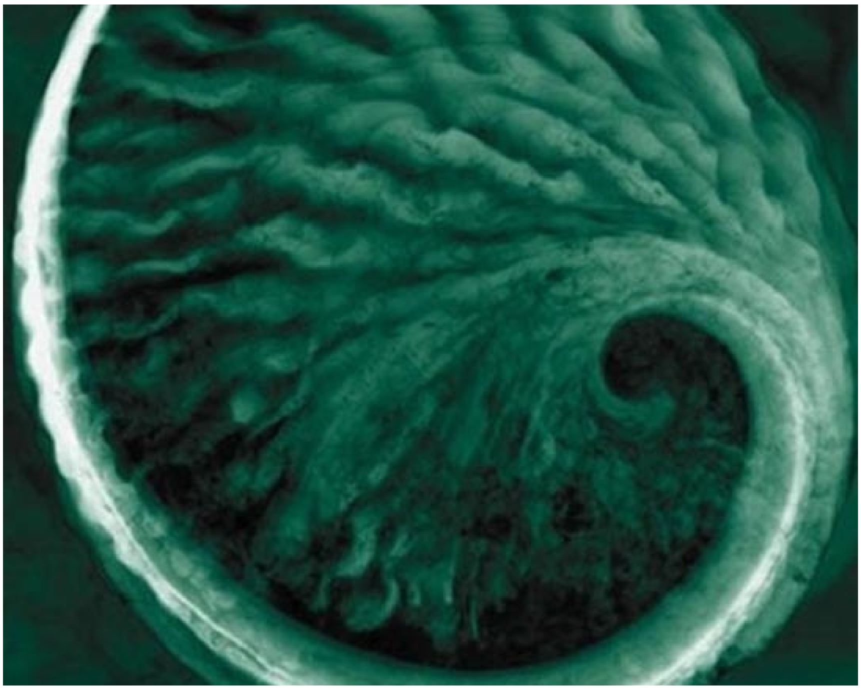

Proposed Power Plant at Great Island, Co. Wexford

Environmental Impact Statement

November 2009

Endesa Ireland Limited

ERM

Mott MacDonald

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Content

Chapter	Title	Page
	Abbreviations and Glossary	i
1.	Introduction	1-1
1.1	Introduction	1-1
1.2	Endesa Ireland Limited	1-1
1.3	Overview of the Proposed Development	1-1
1.4	Key Features of the Proposed Plant	1-1
1.5	Planning Application - Statutory Requirements	1-2
1.6	Structure of the EIS	1-3
2.	Background to the Project	2-1
2.1	Introduction	2-1
2.2	About Endesa	2-1
2.2.1	Presence in Spain and Portugal	2-1
2.2.2	Presence in Latin America	2-2
2.2.3	Presence in Other Countries	2-3
2.2.4	Corporate Social Responsibility	2-3
2.2.5	Endesa Ireland	2-5
2.3	Need for the Development	2-5
2.3.1	General	2-5
2.3.2	Government Policy	2-7
2.3.3	The Need for Competition and Liberalisation of the Electricity Market	2-8
2.3.4	Generation Mix (Wind and Conventional)	2-9
2.3.5	Generation Requirements	2-10
2.4	Site Selection	2-12
2.4.1	Market Entry and Site Selection	2-12
2.4.2	Available Infrastructure	2-13
2.5	Main Alternative Technologies Considered	2-15
2.5.1	Combined Cycle Gas Turbine Plant	2-15
2.5.2	Open Cycle Gas Turbine Peaking Plant	2-16
2.5.3	Conversion of Existing Units	2-16
2.5.4	Large Scale Combined Heat and Power Plant	2-16
2.6	Alternative Fuels Considered	2-16
2.7	Do Nothing Scenario	2-17
3.	Description of the Development	3-1
3.1	Introduction	3-1
3.2	Proposed Development	3-1
3.3	Demolition of the Existing Plant	3-1
3.4	Operational Regime of the Proposed New Plant	3-3
3.5	Site Location	3-3
3.6	Existing Site Layout	3-4
3.7	Requirement for Distillate Fuel Oil	3-4
3.8	Principal Design Objectives	3-5
3.9	Best Available Technology	3-5

3.10 Grid Application 3-5
3.11 Manufacture of the Proposed Power Plant 3-6
3.12 Combined Cycle Gas Process 3-6
3.13 Plant Efficiency 3-7
3.14 Plant Items 3-7
3.15 Connections to the National Grid and Gas Network 3-8
3.15.1 Connection to the National Grid 3-8
3.15.2 Connection to the Gas Network 3-8
3.16 Basis of the Site Layout 3-9
3.17 Main Components of the Combined Cycle Plant 3-9
3.17.1 Above Ground Installation (by Gaslink/BGE Networks) 3-9
3.17.2 Distillate Oil Storage 3-10
3.17.3 Turbine Hall 3-10
3.17.4 Gas Turbine Generator 3-10
3.17.5 Heat Recovery Steam Generator 3-10
3.17.6 Main Exhaust Stack 3-10
3.17.7 Steam Turbine Generator 3-10
3.17.8 Dry Low NO_x Burners for Natural Gas Firing 3-11
3.17.9 NO_X Abatement when Firing On Distillate Fuel Oil 3-11
3.17.10 Auxiliary Boiler 3-11
3.17.11 Water Treatment Plant 3-12
3.17.12 Electrical Transformer 3-12
3.17.13 Emergency Diesel Generator 3-12
3.18 Aqueous Discharges 3-12
3.18.1 Process Waste Flow Rates 3-13
3.18.2 Surface Water Drainage 3-13
3.18.3 Foul Water System 3-14
3.19 Process Water Discharge Pit 3-14
3.20 Seawater Cooling System 3-15
3.21 Plant Structures 3-15
3.22 Raw Materials Used 3-16
3.22.1 Primary Raw Materials 3-16
3.22.2 Secondary Raw Materials 3-17
3.23 Construction Phase 3-18
3.23.1 Construction Phase Activities 3-18
3.23.2 Construction Staff and Facilities 3-18
3.23.3 Site Preparation 3-19
3.23.4 Construction Phase Site Management 3-20
3.24 Operational Phase 3-20
3.24.1 Operational Phase Site Management 3-20
3.24.2 Regulatory Control of the Facility 3-20
3.25 Decommissioning of the Proposed Plant 3-21

4. Legislation 4-1
4.1 Introduction 4-1
4.2 Planning and Development Acts 4-1
4.2.1 Regulatory Overview 4-1
4.3 European Directives and International Agreements 4-2
4.3.1 Environmental Impact Assessment Directive 4-3
4.3.2 IPPC Directive 4-3

4.3.3 Large Combustion Plant Directive 4-4
4.3.4 Proposed Industrial Emissions Directive 4-4
4.3.5 Seveso II Directive 4-5
4.3.6 National Emissions Ceiling (NEC) Directive 4-6
4.3.7 The Kyoto Protocol 4-6
4.3.8 Greenhouse Gas Emissions Trading Directive 4-6
4.4 Electricity Regulation Act 4-6
4.5 Foreshore Act 4-8
4.6 Water Framework Directive 4-8
4.7 Flood Risk Directive 4-9
4.8 Habitats Directive and Birds Directive 4-9

5. Planning and Policy Context 5-1
5.1 Introduction 5-1
5.2 National Context 5-2
5.2.1 National Spatial Strategy 2002 - 2020 5-2
5.2.2 National Development Plan 2007 - 2013 5-2
5.2.3 Energy Policy Framework 2007 - 2020 (Delivering a Sustainable Energy Future for Ireland) 5-3
5.2.4 National Climate Change Strategy 2007 - 2012 5-4
5.2.5 National Heritage Plan 2002 5-4
5.2.6 National Biodiversity Plan 2002 5-5
5.2.7 Sustainable Development – A Strategy for Ireland (1997) 5-5
5.2.8 The Planning System and Flood Risk Management Consultation Draft Guidelines for Planning Authorities 5-5
5.2.9 Towards 2016: Ten Year Framework Social Partnership Agreement 2006 – 2015 5-6
5.3 Regional Context 5-6
5.3.1 South East Regional Planning Guidelines 5-6
5.3.2 Draft Regional Planning Guidelines for the South East Region 2010 - 2022 5-6
5.3.3 Draft River Basin Management Plan for the South Eastern River Basin District 5-7
5.4 Local Context 5-7
5.4.1 Wexford County Development Plan 2007 - 2013 5-7
5.4.2 Waterford County Development Plan 2005 - 2011 5-8
5.4.3 Kilkenny County Development Plan 2008 - 2014 5-8
5.4.4 County Waterford Climate Change Strategy 2008 - 2012 5-8

6. Scoping and Consultation 6-1
6.1 Introduction 6-1
6.2 Preliminary Consultation 6-1
6.3 EIS Scoping Consultation 6-1
6.4 Public Consultation 6-4
6.5 Findings of the Consultation Process 6-5
6.6 Post Application Public Consultation 6-5

7. EIA Methodology 7-1
7.1 Introduction 7-1
7.2 Methodology and Approach 7-1
7.2.1 EIA Methodology 7-1
7.2.2 Difficulties Encountered 7-4

8. Human Beings - Land Use 8-1
8.1 Introduction 8-1
8.2 Methodology 8-1
8.2.1 Guidance Used 8-1
8.2.2 Study Area 8-1
8.2.3 Baseline Assessment Criteria 8-1
8.2.4 Impact Assessment Criteria 8-2
8.3 Baseline Description and Evaluation 8-3
8.3.1 Land Use and Zoning 8-3
8.3.2 Tourism, Amenities and Recreation 8-5
8.3.3 Community Facilities 8-5
8.3.4 Businesses in the Area 8-5
8.3.5 Planning Applications 8-6
8.3.6 Land Use Planning 8-6
8.3.7 Baseline Evaluation 8-7
8.4 Identification of Potential Impacts 8-8
8.4.1 Construction Phase 8-8
8.4.2 Operational Phase 8-8
8.5 Mitigation Measures 8-9
8.5.1 Construction Phase 8-9
8.5.2 Operational Phase 8-9
8.6 Residual Impacts 8-9
8.6.1 Construction Phase 8-9
8.6.2 Operational Phase 8-9
8.7 Summary Conclusion 8-9

9. Human Beings – Socio-economics 9-1
9.1 Introduction 9-1
9.2 Methodology 9-1
9.2.1 Guidance Used 9-1
9.2.2 Study Area 9-1
9.2.3 Baseline Assessment Criteria 9-2
9.2.4 Impact Assessment Criteria 9-2
9.3 Baseline Description and Evaluation 9-3
9.3.1 Demographic Profile 9-3
9.3.2 Economic Activity 9-5
9.3.3 Employment 9-5
9.4 Identification of Potential Impacts 9-7
9.4.1 Construction Phase Impacts 9-7
9.4.2 Operational Phase Impacts 9-8
9.5 Mitigation Measures 9-8
9.5.1 Construction Phase 9-8
9.5.2 Operational Phase 9-9
9.6 Residual Impacts 9-9
9.6.1 Construction Phase 9-9
9.6.2 Operational Phase 9-9
9.7 Summary Conclusion 9-9

10. Traffic 10-1
10.1 Introduction 10-1
10.2 Background 10-1
10.2.1 Scoping Report 10-1
10.2.2 Consultation 10-1
10.3 Traffic Impact Assessment 10-2
10.3.1 Traffic Counts 10-2
10.3.2 Receiving Environment 10-3
10.3.3 Existing Traffic Conditions 10-4
10.3.4 Trip Generation 10-5
10.3.5 Trip Distribution 10-7
10.3.6 Assessment Years 10-8
10.3.7 Highway Capacity Impacts 10-8
10.3.8 Pavement Integrity Impact 10-9
10.3.9 Mitigation Measures for HGV Passage 10-10
10.4 Summary Conclusion 10-11

11. Human Beings – Noise and Vibration 11-1
11.1 Introduction 11-1
11.2 Methodology 11-1
11.2.1 Guidance Used 11-1
11.2.2 Study Area 11-2
11.2.3 Baseline Evaluation Criteria 11-2
11.2.4 Impact Assessment Criteria 11-2
11.3 Baseline Description and Evaluation 11-5
11.3.1 Description 11-5
11.3.2 Evaluation 11-5
11.4 Identification of Potential Impacts 11-6
11.4.1 Construction 11-6
11.4.2 Operation 11-8
11.5 Mitigation Measures 11-9
11.5.1 Construction 11-9
11.5.2 Operation 11-10
11.6 Residual Impact 11-10
11.6.1 Construction Stage 11-10
11.6.2 Operational Phase 11-10
11.7 Summary Conclusion 11-10

12. Flora and Fauna 12-1
12.1 Terrestrial 12-1
12.1.1 Introduction 12-1
12.1.2 Methodology 12-1
12.1.3 Baseline Description and Evaluation 12-7
12.1.4 Ecological Evaluation 12-16
12.1.5 Identification of Potential Impacts 12-19
12.1.6 Mitigation Measures 12-20
12.1.7 Residual Impacts 12-21
12.1.8 Summary Conclusion 12-21

12.2	Marine Ecology	12-22
12.2.1	Introduction	12-22
12.2.2	Methodology	12-22
12.2.3	Baseline Description & Evaluation	12-29
12.2.4	Identification of Potential Impacts	12-39
12.2.5	Mitigation Measures	12-40
12.2.6	Residual Impacts	12-43
12.2.7	Summary Conclusion	12-48
13.	Soils, Geology and Groundwater	13-1
13.1	Introduction	13-1
13.2	Methodology	13-1
13.2.1	Guidance Used	13-1
13.2.2	Study Area	13-1
13.2.3	Baseline Evaluation Criteria	13-1
13.2.4	Impact Assessment Criteria	13-4
13.3	Baseline Description and Evaluation	13-5
13.3.1	Geology	13-5
13.3.2	Site Evaluation	13-5
13.4	Identification of Potential Impacts	13-9
13.5	Mitigation Measures	13-10
13.5.1	Construction	13-10
13.5.2	Operation	13-12
13.6	Residual Impacts	13-13
13.6.1	Construction Phase	13-13
13.6.2	Operational Phase	13-15
13.7	Summary of Residual Impacts	13-16
13.8	Summary Conclusions	13-17
14.	Surface Water	14-1
14.1	Introduction	14-1
14.2	Methodology	14-1
14.2.1	Guidance Used	14-1
14.2.2	Study Area	14-2
14.2.3	Scope of Work	14-2
14.2.4	Baseline Evaluation Criteria	14-2
14.2.5	Impact Assessment Criteria	14-3
14.3	Baseline Description and Evaluation	14-4
14.3.1	Water Body Status	14-4
14.3.2	Existing Operations	14-5
14.4	Proposed Development	14-6
14.4.1	Potable Water	14-6
14.4.2	Process Waste Water Discharges	14-7
14.4.3	Cooling Water	14-8
14.4.4	Foul Water	14-9
14.4.5	Surface Water Run-off	14-9
14.4.6	Flood Risk	14-10
14.4.7	Summary of Effluent Discharges	14-10
14.5	Application of Best Available Techniques	14-11

14.5.1 Potable Water Supply 14-11
14.5.2 Process Waste Water 14-11
14.5.3 Cooling Water 14-12
14.5.4 Foul water 14-13
14.5.5 Surface Water Run-off 14-13
14.5.6 Raw Material Selection and Use 14-14
14.6 Identification of Potential Impacts 14-14
14.6.1 Construction Phase 14-14
14.6.2 Operational Phase 14-14
14.7 Mitigation Measures 14-16
14.7.1 Construction Phase 14-16
14.7.2 Operational Phase 14-17
14.8 Residual Impacts 14-17
14.8.1 Construction Phase 14-17
14.8.2 Operational Phase 14-17
14.9 Summary Conclusion 14-17

15. Air Quality and Climate 15-1
15.1 Introduction 15-1
15.2 Climate 15-1
15.2.1 Overview 15-1
15.2.2 Methodology 15-2
15.2.3 Existing Environment 15-2
15.2.4 Predicted Impacts 15-3
15.2.5 Mitigation Measures 15-3
15.3 Air Quality 15-4
15.3.1 Guidance Used 15-4
15.3.2 Study Area 15-5
15.3.3 Sources of Information 15-5
15.4 Air Quality – Baseline 15-5
15.4.1 Introduction 15-5
15.4.2 Monitoring Data 15-6
15.4.3 Assumed Background Concentrations 15-6
15.4.4 Local Atmospheric Emission Sources and Cumulative Effects 15-7
15.5 Sources of Atmospheric Emissions 15-7
15.5.1 Combined Cycle Gas Turbines 15-7
15.6 Assessment of Construction Phase 15-8
15.6.1 Methodology 15-8
15.6.2 Identification of Construction Phase Impacts 15-10
15.6.3 Summary 15-12
15.7 Assessment of Operational Phase 15-12
15.7.1 Methodology 15-12
15.7.2 Identification of Operational Phase Impacts 15-22
15.7.3 Ecological Assessment 15-26
15.8 Mitigation Measures 15-32
15.8.1 Construction Phase 15-32
15.8.2 Operational Phase 15-33
15.9 Residual Impacts 15-33
15.9.1 Construction Phase 15-33
15.9.2 Operational Phase 15-33

15.10 Summary Conclusion 15-33

16. Landscape and Visual 16-1
16.1 Introduction 16-1
16.2 Methodology 16-1
16.2.1 Guidance Used 16-1
16.2.2 Study Area 16-1
16.2.3 Baseline Evaluation Criteria 16-1
16.2.4 Impact Assessment Criteria 16-3
16.3 Baseline Description and evaluation 16-5
16.3.1 Policy Framework 16-5
16.3.2 Receiving Landscape Character 16-6
16.3.3 Designated Landscapes and Views 16-10
16.3.4 Cultural Assets 16-12
16.3.5 Visual Amenity and Viewers 16-14
16.4 Mitigation Measures 16-17
16.4.1 Construction 16-17
16.4.2 Operation 16-18
16.5 Residual Impacts: Construction Phase 16-18
16.5.1 Impacts on Landscape character 16-19
16.5.2 Visual Impacts 16-19
16.6 Residual Impacts: Operational Phase 16-20
16.6.1 Impacts on Landscape Character 16-20
16.6.2 Impacts on Designated Landscapes and Views 16-23
16.6.3 Impacts on Cultural Assets 16-24
16.6.4 Visual Impacts 16-25
16.7 Summary Conclusion 16-30

17. Material Assets 17-1
17.1 Archaeology Architecture and Cultural Heritage 17-1
17.1.1 Introduction 17-1
17.1.2 Methodology 17-1
17.1.3 Desk Top Study: Study Area Description and Evaluation 17-3
17.1.4 Field Inspection: Description and Evaluation 17-17
17.1.5 Identification of Potential Impacts on the Existing Environment 17-20
17.1.6 Mitigation Measures 17-20
17.1.7 Residual Impacts 17-21
17.1.8 Summary Conclusion 17-21
17.2 Utilities 17-22
17.2.1 Introduction 17-22
17.2.2 Methodology 17-22
17.2.3 Identification of Potential Impacts 17-23
17.2.4 Mitigation Measures 17-24
17.2.5 Residual Impacts 17-24
17.2.6 Summary Conclusion 17-25

18. Interactions of the Foregoing 18-1
18.1 Introduction 18-1
18.2 Cross-media Impacts 18-1

18.3 Cumulative Impacts 18-3

19. References 19-1

Appendices 1

Appendix 1. Introduction 2
1.1. Strategic Infrastructure Notification 3
Appendix 2. Background to the Project 4
2.1. EirGrid Input to ESB Asset Strategy 5
Appendix 3. Description of the Development 6
3.1. Residuals Management Plan 7
3.2. Preliminary Demolition Environmental Assessment 8
3.3. Quantitative Risk Assessment – Land Use Planning Report 9
Appendix 6. Scoping and Consultation 10
6.1. Public Consultation Brochure 11
6.2. Responses Scoping Consultation 12
6.3. Summary of Responses 13
Appendix 10. Traffic 17
10.1. Falling Weight Deflectometer Testing Report 18
Appendix 11. Noise and Vibration 19
11.1. Construction Plant Teams and Associated Sound Power Levels 20
11.2. Operational Plant, Noise Source Levels used in Noise Prediction Model 21
11.3. Noise Contours Normal Operation at 1.8m height 22
Appendix 12. Flora and Fauna 23
12.1. Designated Conservation Sites - Site Synopses 24
12.2. Appropriate Assessment Screening Report 51
Appendix 13. Soils Geology and Groundwater 52
13.1. URS Phase 1 and 2 Environmental Site Assessment 53
Appendix 14. Surface Water 54
14.1. Classification Criteria (Transitional Water Bodies) 55
14.2. Full Report for Waterbody Barrow Suir Nore Estuary 59
14.3. Flood Risk Assessment 60
Appendix 15. Air Quality and Climate 61
15.1. Rosslare Meteorological Station 62
15.2. Stack Height Determination 62
15.2.1. Introduction 62
15.2.2. Dispersion Modelling Methodology 63
15.2.3. Results 63
15.3. Critical Load / Deposition Maps 65
Appendix 16. Landscape and Visual 69
16.1. Baseline Policy 70
16.1.1. County Wexford Review 70
16.1.2. County Waterford Review 70
16.1.3. County Kilkenny Review 72
16.2. Landscape Character Areas 73
16.2.1. County Wexford 73
16.2.2. County Waterford 76
16.2.3. County Kilkenny 77
16.3. Figures 82

16.4. Photomontages 83
Appendix 17. Material Assets 84
17.1. All RMPs in Buildings ZTV 85
17.2. All RMPs in Stacks ZTV 90
17.3. Shipwrecks within the General Vicinity of Great Island (from the shipwreck inventory of Ireland) 96

Tables

Table 1.1: Structure of the EIS 1-3
Table 2.1: Wind Capacity Forecast and Associated Capacity Credit 2-9
Table 2.2: All Island 2025 Portfolio 2-11
Table 3.1: Existing Power Plant Units 3-1
Table 3.2: Operational Regime of Proposed New Plant 3-3
Table 3.3: Dimensions of Main Structures 3-15
Table 6.1: Stakeholder Consultation Meetings 6-4
Table 8.1: Criteria for Baseline Evaluation of Landuse 8-2
Table 8.2: Criteria for Assessment of Impact Magnitude 8-3
Table 8.3: Overseas Tourism to Wexford 8-5
Table 8.4: Revenue Generated by Overseas Tourists to Wexford 8-5
Table 8.5: Planning Applications 8-6
Table 9.1: Criteria for Assessment of Impacts Magnitude 9-2
Table 9.2: Regional Population Trends 2002 - 2006 9-4
Table 9.3: Local Population Trends 1996 - 2006 9-4
Table 9.4: Population Increases 9-5
Table 9.5: Employment by Broad Industrial Group 9-6
Table 10.1: PICADY Results 10-5
Table 10.2: Construction Trip Generation Estimates 10-6
Table 10.3: Operational Phase Trip Generation Estimates 10-7
Table 10.4: Projected Distribution Profile 10-7
Table 10.5: Traffic Growth Factors 10-8
Table 10.6: Ratio of Flow to Capacity at Junction (2012 Do Nothing) 10-8
Table 10.7: Ratio of Flow to Capacity at Junctions (2012 Do Something) 10-9
Table 11.1: Threshold Criteria for Evaluating the Effects of Noise during Construction 11-2
Table 11.2: Threshold Criteria for Evaluating the Effects of Noise during Construction 11-4
Table 11.3: Description of Monitoring Locations and Noise Sensitive Receptors 11-5
Table 11.4: Baseline Noise Level Summary dB Free-field 11-6
Table 11.5: Construction Phases 11-7
Table 11.6: Predicted Unmitigated Construction Noise Levels 11-7
Table 11.7: Night time Operational Noise Levels at Receptors 11-9
Table 12.1: Site Evaluation Criteria 12-6
Table 12.2: Impact Assessment Matrix 12-7
Table 12.3: Distance to Designated Conservation Sites 12-8
Table 12.4: Study Area 12-23
Table 12.5: Habitats Evaluation Criteria 12-25
Table 12.6: Species Evaluation Criteria 12-26
Table 12.7: Magnitude Criteria for Habitats 12-27
Table 12.8: Magnitude Criteria for Species 12-28
Table 12.9: Overall Significance Criteria for EIA 12-29
Table 12.10: Designated Sites in Vicinity of Great Island Power Plant 12-36

Table 12.11: Potential Types and Sources of Impact 12-40
Table 12.12: Summary of Residual Impacts 12-47
Table 13.1: Study Area 13-1
Table 13.2: Criteria for Baseline Assessment of Soils and Geology 13-2
Table 13.3: GSI Guidelines for Aquifer Vulnerability Rating 13-3
Table 13.4: Criteria for Baseline Evaluation of Groundwater 13-3
Table 13.5: Criteria for Assessment of Impact Magnitude 13-4
Table 13.6: Potential Types and Sources of Impacts 13-9
Table 13.7: Summary of Residual Impacts 13-16
Table 14.1: Q-Rating and WFD Status 14-3
Table 14.2: Criteria for Assessment of Impact Magnitude 14-3
Table 14.3: EPA Interim Classification Criteria for the Barrow Suir Nore Estuary 14-4
Table 14.4: Existing Potable Water Demands 14-5
Table 14.5: Permitted Emissions to Water 14-6
Table 14.6: Proposed Effluent Discharges 14-10
Table 14.7: Cooling Water System – BAT Assessment 14-12
Table 14.8: Phased Reduction in Effluent Discharges 14-15
Table 15.1: Air Quality Standard and Target Values 15-5
Table 15.2: Background Pollutant Concentrations (µg/m^3) 15-6
Table 15.3: Summary of Assumed Background Concentrations (µg/m^3) 15-7
Table 15.4: Receptor Sensitivity 15-9
Table 15.5: Construction Phase Significance Criteria – Risk of Dust Effects 15-9
Table 15.6: Proposed Development Activities with Dust Raising Potential 15-11
Table 15.7: Structure Dimensions 15-16
Table 15.8: Air Emissions Data from Great Island CCGT Power Plant 15-17
Table 15.9: Magnitude Descriptor for Process Contributions (PC) 15-19
Table 15.10: Descriptors for Impact Significance 15-19
Table 15.11: Significance of Impacts - Scenario 1 (µg/m^3) 15-23
Table 15.12: Significance of Impacts - Scenario 2 (µg/m^3) 15-26
Table 15.13: NO_X Critical Levels at Designated Sites (µg/m^3) 15-27
Table 15.14: Maximum Predicted Acid Deposition Contribution at Designated Sites (keq/ha/year) 15-28
Table 15.15: Predicted Total Nitrogen Deposition at Ecological Receptors (kg N/ha/yr) 15-30
Table 16.1: Evaluation criteria for baseline landscape 16-2
Table 16.2: Evaluation criteria for baseline visual amenity and viewers 16-2
Table 16.3: Criteria for Assessment of Magnitude of Change in Landscape 16-4
Table 16.4: Criteria for Assessment of Magnitude of Change on Visual Amenity and Viewers 16-4
Table 16.5: Criteria for Assessment of Impact Significance 16-5
Table 16.6: Policies and Objectives 16-6
Table 16.7: Wexford County Landscape Character Assessment (Appendix V of County Development Plan) 16-6
Table 16.8: Kilkenny Landscape Character Assessment 16-7
Table 16.9: Baseline Evaluation of County Landscape Character 16-8
Table 16.10: Baseline evaluation of Local landscape character areas (LLCAs) 16-10
Table 16.11: Baseline Evaluation of Designated Landscapes and Views 16-11
Table 16.12: Baseline Evaluation of Cultural Assets 16-13
Table 16.13: Viewpoint Locations – Baseline Evaluation 16-15
Table 16.14: Potential Types and Sources of Impact 16-17
Table 16.15: Visually prominent structures 16-20
Table 16.16: Operational Visual Impacts at Fixed Viewpoint Locations 16-27
Table 16.17: Summary of Impacts 16-29
Table 17.1: Table of Protected Structures 17-16

Table 17.2 Study Area 17-22
Table 17.3: Criteria for Baseline Evaluation of Utilities 17-22
Table 17.4: Criteria for Assessment of Impact Magnitude 17-23
Table 17.5 Potential Types and Sources of Impact 17-23
Table 18.1: Cross-media Impact Interactions Matrix 18-2
Table 18.2: Key Cross-media Interactions 18-2
Table 14.1: General WFD Status Definitions 55
Table 14.2: General Conditions (ecological) 56
Table 14.3: Specific Pollutants (Ecological) 56
Table 14.4: Priority Substances (Chemical) 57
Table 14.5: Priority Hazardous Substances (Chemical) 58
Table 15.1: Rosslare monthly, annual mean and extreme meteorological values from 1961 - 1990 62
Table 15.2: Stack Height Determination Results 64
Table 16.1: Plans, Policies and Objectives – Wexford County Development Plan 2007-2013 70
Table 16.2: Plans, Policies and Objectives – Waterford County Development Plan 2005-2011 71
Table 16.3: Plans, Policies and Objectives – Clare County Development Plan 2008-2014 72
Table 16.4: Landscape Character Areas - Wexford County Development Plan 2007-2013 74
Table 17.1: All RMPs in Buildings ZTV (Based on Information from the Archaeological Survey of Ireland) 86
Table 17.2: All RMPs in Stacks ZTV (Based on Information from the Archaeological Survey of Ireland) 90
Table 17.3: Shipwrecks within the General Vicinity of Great Island (from the shipwreck inventory of Ireland) 96

Figures

Figure 1.1: Site Location
Figure 2.1: Endesa - Generation Mix 2-1
Figure 2.2: Endesa - Breakdown by Technology (Spain) 2-2
Figure 2.3: Endesa – Breakdown by Technology (Latin America) 2-3
Figure 2.4: Endesa – Corporate Social Responsibility 2-4
Figure 2.5: Typical Profile of Electricity Generating System 2-6
Figure 2.6: Typical Profile of Electricity Generating System with New CCGT Entrant 2-6
Figure 2.7: Wind Generation at Weekly Peak Demand (2009) 2-10
Figure 2.8: Typical Daily Demand Patterns (2007) 2-11
Figure 8.1 Risk Contours for People Outdoors 8-7
Figure 10.1: Traffic Count Locations 10-2
Figure 10.2: Site Location Map 10-3
Figure 15.1: Rosslare Harbour - Wind Roses 15-14
Figure 15.2: Great Island - Proposed CCGT Plant Buildings and Existing Buildings 15-16
Figure 15.3: Designated Sites within 20 km of Proposed Plant 15-22
Figure 15.4: Predicted 99.79th Percentile Hourly Average NO_2 Concentrations – Process Contribution (Scenario 1)15-2
Figure 15.5: Predicted Annual NO_2 Concentrations – Process Contribution (Scenario 1) 15-25
Figure 15.6: Minimum Critical Load Function – Lower River Suir 15-29
Figure 17.1: Site and Proposed Parking Bay Locations 17-3
Figure 17.2: 1st Edition Six-Inch OS map (1840) 17-4
Figure 17.3: 25-Inch OS Map (1902) 17-5
Figure 17.4: Six-inch OS (1919) 17-5
Figure 17.5: 1st Edition Six-Inch OS map (1840) 17-6
Figure 17.6: 25-Inch OS Map (1902) 17-6
Figure 17.7: 25-Inch OS Map (1902) 17-7
Figure 17.8: Site Location and Recorded Archaeological Monuments 17-15

Figure 17.9: Site Plan (supplied by the client) ____ 17-17
Figure 15.1: Nutrient Nitrogen Critical Load (CLnutN) (eq/ha/yr) ____ 65
Figure 15.2: Maximum Sulphur Critical Load (CLmaxS) (eq1/ha/yr) ____ 65
Figure 15.3: Maximum Nitrogen Critical Load (CLmaxN) (eq/ha/yr) ____ 66
Figure 15.4: Minimum Nitrogen Critical Load (CLminN) (eq/ha/yr) ____ 67
Figure 17.1: Map Showing Buildings ZTV with RMP Locations ____ 89
Figure 17.2: Map Showing Stacks ZTV with RMP Locations ____ 95

Abbreviations and Glossary

Abbreviations

$\mu g/m^3$	micrograms per cubic metre
AADT	Annual Average Daily Traffic
AA	Appropriate Assessment (under Article 6 of the Habitats Directive, Council Directive 92/43/EEC)
ADMS	Atmospheric Dispersion Modelling System
AGI	Above Ground Installation
AOD	Above Ordnance Datum
AQS	Air Quality Standards
ARCADY	Assessment of Roundabout Capacity and Delay (Traffic assessment model used to predict traffic impact on roundabouts)
Barg	Bar Gauge
BAT	Best Available Technology
BATNEEC	Best Available Technology Not Entailing Excessive Cost
BIM	Bord Iascaigh Mhara
Bq	Becquerel's
BOD	Biological Oxygen Demand
BOG	Boil-off gas
BGE	Bord Gáis Éireann
BGN	Bord Gáis Network
BRE	Building Research Establishment
Bref	BAT reference document
Bscf	Billion standard cubic feet
Bscfd	Billion standard cubic feet per day

Abbreviations

CCGT	Combined Cycle Gas Turbine
CD	Chart Datum
CEC	Commission of the European Communities
CEMP	Construction Environmental Management Plan
CER	Commission for Energy Regulation
CHS	Cultural Heritage Site
CIF	Construction Industry Federation
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CRTN	Calculation of Road Traffic Noise
CSO	Central Statistics Office
CWS	Cooling Water System
DAFF	Department of Agriculture, Fisheries and Food
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DoEHLG	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
DWF	Dry Weather Flow
DWT	Dead Weight Tonnes
EC	European Community
ED	Electoral Division
EHWS	Extreme High Water Spring Tide
ELWS	Extreme Low Water Spring Tide
EIA	Environmental Impact Assessment

Abbreviations

EIS	Environmental Impact Statement
ELV	Emission Limit Value
EM	Electromagnetic (conductivity)
EN	Euro norm
EPA	Environment Protection Agency
ERM	Environmental Resources Management Ireland Limited
ESB	Electricity Supply Board
ESD	Emergency shutdown
ETS	Emission Trading Scheme
EU	European Union
EWP	Irish Government White Paper 2007 – Delivering a Sustainable Energy Future for Ireland
ESB	Electricity Supply Board
ESD	Emergency shutdown
EC	European Community
ETS	Emissions Trading Scheme
EU	European Union
GBS	Gravity based structure
GHG	Greenhouse gases
GLC	Ground Level Concentrations
GPS	Global positioning system (satellite navigation system)
GSI	Geological Survey of Ireland
Ha	Hectares (10 000 square metres)
HCV/HGV	Heavy Commercial Vehicle / Heavy Goods Vehicle
HFO	Heavy Fuel Oil
HRSG	Heat Recovery Steam Generator

Abbreviations

HSA	Health and Safety Authority
HSE	Health Service Executive
ICSS	Integrated Control and Safety Systems
IPPC	Integrated Pollution Prevention and Control
ISO	International Standards Organisation
km	kilometre
kN	kilo Newton
kV	kilo Volt
LAQM	Local Air Quality Management - Technical Guidance
LCA	Landscape Character Area (sourced from county plan data)
LCP	Large Combustion Plant
LGV/LCV	Light Goods Vehicle / Light Commercial Vehicle
LLCA	Local Landscape Character Area
l/s	Litres per second
m	Metre
mbg	Metres below ground
mm	Millimetre
mOD	Metres above Ordnance Datum
m^3/s	Metres cubed per second
m/s	Metres per second
MW	Mega Watts (Unit of energy)
MWh	Mega Watt hour (measure of energy delivered by power plants)
MWe	Mega Watts Electrical (measure of energy delivered by power plants)
NDP	National Development Plan
NHA	National Heritage Area

Abbreviations

NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NML	Noise Monitoring Locations
NMS	National Monuments Service of the Department of Environment, Heritage and Local Government
NSS	National Spatial Strategy
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NPWS	National Parks and Wildlife Service - Department of Environment, Heritage and Local Government
NRA	National Roads Authority
NSR	Noise Sensitive Receptors
NSS	National Spatial Strategy
NTS	Non-Technical Summary
OPW	Office of Public Works
OS	Ordnance Survey
OSI	Ordnance Survey Ireland
pH	Potential of Hydrogen, measure of acidity or alkalinity
PICADY	Priority Intersection Capacity and Delay (Traffic assessment model used to predict traffic impact on junctions)
pNHA	Proposed Natural Heritage Area
$PM_{2.5}$	Particles that are less than or equal to (≤) 2.5 μm in diameter
PM_{10}	Particles that are less than or equal to (≤) 10 μm in diameter
ppm	Parts per million
QRA	Quantitative Risk Assessment
RMP	Record of Monuments and Places
RPG	Regional Planning Guidelines

Abbreviations

RPS	Record of Protected Structures
SAC	Special Area of Conservation
S.I.	Statutory Instrument
SMR	Sites and Monuments Record
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SUDS	Sustainable Urban Drainage System
TIA	Traffic Impact Assessment
TTA	Traffic and Transport Assessment
TSO	Transmission System Operator
TWh	Terra Watt hour (measure of energy delivered by power plants)
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WFD	Water Framework Directive
WHO	World Health Organisation
ZAP	Zone of Archaeological Potential
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Impact

Glossary

Above Ground Installation (AGI)

Refers to the section of plant where the gas network will connect to the site.

Air Cooled Condenser (ACC)

ACC's condense low pressure exhaust steam from a steam turbine through finned condenser tubes over which air is passed via forced air fans. Heat is transferred from the low-pressure steam to the air by forced convection, condensing the steam to water (condensate). The condensate is then returned to the boiler.

Aquifer

A geological unit that stores and transmits significant quantities of groundwater under normal hydraulic conditions.

Assimilative Capacity

A measure of the contaminant load that can be discharged to a water body without exceeding water quality standards appropriate to that water body.

Base Load

An electric power plant or generating unit within a power plant that is normally operated continuously to meet the base load requirement of the System Operator.

Biotype

Well-defined geographical area, characterised by specific ecological conditions (soil, climate, etc.), which physically supports the organisms that live there.

Bund

A structure surrounding chemical/hydrocarbon storage tanks which is designed to contain spillages or leaks.

Capacity Credit

An estimate of the contribution that wind power, as a variable and intermittent source of electricity generation, makes to generation adequacy, expressed as a percentage of its installed capacity. Generation adequacy is defined below.

Combined Cycle Gas Turbine (CCGT)

A power plant that uses two different thermal cycles for producing electricity. The first cycle burns a fuel inside a gas turbine, and the gas turbine drives an electric generator. The hot air coming out of the gas turbine is used to turn water into steam, and the steam turns a second electric generator.

dB (A) Decibel(s) (A-weighted)

A unit used to measure noise levels that are adjusted by an electronic filter to approximate the response of a human ear.

Distillate

A general classification for one of the petroleum fractions produced in conventional distillation operations.

Diadromous fish

Species of fish that migrate from fresh water to the sea, or vice-versa, to feed or breed.

Distillate

A general classification for one of the petroleum fractions produced in conventional distillation operations.

Elver

Young stage of an eel's lifecycle.

Epifauna

Animals that live on the surface of the seabed.

Façade Noise Level

A noise level measured or predicted at the façade of a building, typically at distance of 1m, containing a contribution made up of reflections from the façade itself.

Fauna

A collective term for animal life of any particular region.

Fill

Material used for raising the level of the ground.

Flora

Plant life occurring in an area.

Free-field

Noise measurements made away from reflecting surfaces (apart from the ground) are termed free-field measurements. Measurements at the façade of the building are typically 3 dB higher, due to reflection from the façade. All data in this report are free-field.

Gas Turbine

A turbine which generates electricity through the process of burning natural gas and using the generated hot gases to turn the turbine blades generating mechanical energy which is converted to electrical energy in an electrical generator.

Generation Adequacy

The ability of all the generation units connected to the electrical power system to meet the total demand imposed on them at all times Greenhouse Gas A gas in Earth's atmosphere that traps heat and can contribute to global warming. Carbon dioxide and nitrous dioxide are two of the most important.

Glass eel

Post larval stage of an eel's lifecycle.

Greenhouse Gas

A gas in Earth's atmosphere that traps heat and can contribute to global warming.

Groundwater

Water located beneath the ground surface.

Habitat

The dwelling place of a species or a community which provides a particular set of environmental conditions.

Hardstanding

A paved or stabilised area where vehicles are parked.

Heat Recovery Steam Generator

The CCGT unit will utilise a heat recovery steam generator (HRSG) to recover heat from the hot gases steam produced by a gas turbine. The heat is used to generate steam which will drive the steam turbine to generate further electricity.

Interconnector

The tie line, facilities and equipment that connect the electricity transmission system of one independently supplied transmission network to that of another.

Infauna

Animals that live within the sediment of the seabed.

LA90

The noise level exceeded for 90% of the time. It is generally taken as being representative of the steady background noise at a location. It tends to exclude short events such as cars passing, dogs barking, aircraft flyovers, etc

LA10

The noise level exceeded for 10% of the time. It is a measure of the higher noise levels present in the ambient noise. The LA10 parameter is generally used to describe traffic noise.

LAE

Sound exposure level. It represents the total integrated energy in a sound event.

LAeq

Equivalent sound pressure level.

LAr,T

Equivalent to LAeq,T below with the addition of a penalty for tonal and impulsive elements in the noise spectrum. Used as a measurement for noise levels during the nightime.

LAeq,T

The equivalent continuous A-weighted sound pressure level having the same energy as a fluctuating sound over a specified time period T. Used as a measurement for noise levels during the nightime.

LAFmax

Maximum sound level.

Landscape Character Area

Area of landscape as defined in the development plans.

Licence to Generate

A licence required of all electricity generators by the Electricity Regulation Act, 1999, issued by the Commission for Energy Regulation (CER).

Limit Value

Highest acceptable concentrations of a substance.

LWA

The total sound power emitted by a source (in dB re 1 pico Watt)

Made Ground

An area of land which has been modified by man.

Methodology

An organised, documented set of procedures.

Mid Merit

A generic term used to describe generators which typically operate during the day and evening, and are off at night, or for longer periods at weekends. A 'Mid Merit' plant will have an annual load factor in the range of 20% - 70%.

Mitigation Measures

To mitigate means to ease or soothe the effect of. Mitigation measures suggest ways to avoid or lessen the negative effects of a project on the environment.

Open Cycle Gas Turbine (OCGT)

A power plant that uses one thermal cycle for producing electricity. The single cycle burns a fuel inside a gas turbine, and the gas turbine drives an electric generator.

Pollution

The direct or indirect alteration of the physical, chemical, thermal, biological, or radioactive properties of any part of the environment in such a way as to create a hazard or potential hazard to the health, safety or welfare of living species.

Renewables

Relating to or being a commodity or resource, such as solar energy, that is inexhaustible or replaceable by new growth.

Renewable Energy

A generic term which describes an energy source which can be deemed to be sustainable and/or replaceable within a timeframe of human lifecycles. The term covers sources such as wind, wave, tidal, biomass, hydroelectric, geo-thermal and solar energy.

Residual Noise Level

The component of the total noise that exists in the absence of the specific noise.

Road Capacity

The ability of a road to accommodate traffic. It is expressed in passenger car units per hour.

Road Network

Description (often in diagrammatic form) of a system of roadways.

Run-off

The gravity-flow of water in open channels.

Secondary Fuel Obligation

A condition of a generator's Licence to Generate, issued by the Commission for Energy Regulation, (CER) which requires certain generators to maintain a minimum quantity of their primary, or an alternative fuel, on their site, to mitigate the effects of a significant interruption of gas supply to the country on the electricity system.

Specific Noise Level

A component of the ambient noise level that can be attributed to a specific source, e.g. industrial source.

Steam Turbine

A turbine which generates electricity by using hot steam to turn the turbine blades generating mechanical energy which is converted to electrical energy in an electrical generator.

Substrate

"Supporting surface" on which an organism grows. The substrate may simply provide structural support, or may provide water and nutrients. A substrate may be inorganic, such as rock or soil, or it may be organic, such as wood.

Thermodynamic Cycle

A thermodynamic cycle is a representation of a continuous process by which thermal energy is converted to mechanical energy. Such a cycle requires the addition of thermal energy to a working fluid at a high temperature and pressure, the generation of mechanical energy through the expansion of the high pressure fluid, and the rejection of heat from the low pressure fluid to a heat sink.

Toponyms

Place names.

Total Noise Level

The total noise level due to all noise sources (also called ambient noise).

Transformer

An item of equipment connecting connection points at different nominal voltages.

Transitional Waters

Bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows.

Transmission Losses

A collective term for the loss of electrical energy through the transmission and distribution electricity networks from the point of generation to the point of consumption. These losses occur due to inherent small levels of resistance in all electrical circuits which convert electrical energy into heat.

Wind Penetration

A term referencing the relative quantity of electricity generated by wind turbine generators.

Zone of Theoretical Visibility

Geographic area from which views of all or a part of the proposals will be gained. The ZTV is calculated based on bare ground and therefore does not take into account the screening afforded by vegetation, buildings and minor cuttings.

1. Introduction

1.1 Introduction

Endesa Ireland Limited commissioned Mott MacDonald (Ireland) Limited and Environmental Resources Management to prepare an Environmental Impact Statement (EIS) and planning application for the proposed construction of a wholly privately owned Combined Cycle Gas Turbine (CCGT) power plant. The proposed development site is located in the townland of Great Island, Co. Wexford, (OS Grid Reference: E268907 N114574). The location of the proposed development is illustrated in Figure 1.1: Site Location.

1.2 Endesa Ireland Limited

Endesa Ireland Limited (Endesa) was registered on 8th January 2009, following Endesa's acquisition of certain generation assets from the Irish state utility, Electricity Supply Board (ESB). The sale, worth €450 million, was signed in Dublin following approval from the appropriate regulatory bodies.

The assets purchased comprised 1,068 MW of capacity divided up between four sites; Great Island in Wexford, Tarbert in Kerry, Rhode in Offaly and Tawnaghmore in Mayo. Endesa proposes to replace the existing plant at Great Island with a more efficient environmentally friendly generator. Detailed background information relating to Endesa and the acquisition of Great Island power plant is provided in Chapter 2 (Background to the Project).

1.3 Overview of the Proposed Development

The Great Island power plant currently operates on Heavy Fuel Oil (HFO) with a maximum electrical output capacity of 240 MW. The existing plant comprises three units, two 60 MW units and one 120 MW unit. All of the existing units are at the end of their useful life span.

Endesa proposes to construct a natural gas fired CCGT power plant with an electrical output capacity of 430 MW. The primary fuel source for the CCGT unit will be natural gas with distillate oil stored onsite as a back up fuel, as required by the Commission for Energy Regulation's (CER) Secondary Fuelling Obligation.

The development site is Brownfield and located within the confines of the existing operational power plant facility, formerly operated by ESB. The Great Island power plant occupies an area of approximately 58 hectares (143 acres). The proposed development site will occupy approximately 8 hectares (19 acres).

It is anticipated, that the new power plant will be commissioned in 2012. Once the CCGT plant becomes operational, the existing HFO fired power plant will be decommissioned.

1.4 Key Features of the Proposed Plant

A CCGT power plant works on the principle of optimising the efficiency of electricity generation. In a CCGT plant, a Gas Turbine (GT) generates electricity and the waste heat from the GT is then used to make superheated steam via a Heat Recovery Steam Generator (HRSG) to generate additional electrical power in a Steam Turbine (ST). Low pressure steam from the steam turbine is condensed back to water and fed back to the HRSG. Any hot gases remaining from the process are emitted to atmosphere via an exhaust gas stack.

Notes

1. ORDNANCE SURVEY IRELAND LICENCE NO. EN0034509

2. ALL CO-ORDINATES SHOWN RELATE TO IRISH NATIONAL GRID CO-ORDINATES.
3. ALL SITE LEVELS REFER TO MEAN SEA LEVEL VERTICAL DATUM AT POOLBEG.
4. GENERAL SITE LEVEL IS +7.00M O.D.

Site Boundary

Property Boundary

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	02/11/09	SK	For Information Only	DH	PK

Mott MacDonald Ireland Ltd.
South Block, Rockfield,
Dundrum, Dublin 16,
Ireland
Tel +353 (1) 291 6700
Fax +353 (1) 291 6747
Web www.mottmac.com

Client

Endesa Ireland Ltd.
5th Floor,
3 Grand Canal Plaza,
Grand Canal Street Upper,
Dublin 4,
Ireland
Tel +353 (1) 552 8300
Fax +353 (1) 552 8301

Title

Combined Cycle Gas Turbine (CCGT)
Great Island, Co. Wexford

Site Location Plan

Designed	-		Eng.Chk.	-	
Drawn	S Kennedy		Coordination	D Hassett	
Dwg.Chk.	D Hassett		Approved	P Kelly	

Scale: 1:10000
Project: 257554
CAD file: Figure 1.1
Status: INF
Drawing No: Figure 1.1
Rev: P1

The proposed plant will utilise the existing cooling water intake and outlet systems to condense steam for use in the HRSG. High purity feed water, for use within the HRSG, will also be required. This water will be sourced from the mains supply operated by Wexford County Council.

The proposed exhaust stack will extend to 60 metres in height, which is significantly less than the existing two stacks, which each measure 137.5 metres.

Electrical power from the new plant will be exported to the existing 220 kV switchyard on site and exported to the regulated electricity market.

Natural gas, supplied from the Bord Gáis Networks (BGN) grid, will be the primary fuel source for the facility. To comply with the requirements of CER, a stock of distillate oil will be stored on site, in sufficient capacity to run the plant for five days in the event of an interruption to the natural gas supply. The volume of distillate oil required will be 11,000 m^3 and its sulphur content will be limited to 0.1% sulphur as per the requirements of *EU Directive 1999/32/EC, (relating to a reduction in the sulphur content of certain liquid fuels).*

Ancillary services will include a water treatment plant, water storage tanks, wastewater discharge tanks, one distillate storage tank, bulk chemical storage tanks (Sulphuric Acid and Sodium Hydroxide), an Aboveground Gas Installation, AGI (comprising gas compressor, gas metering, pressure reducing, heating and filtering skids) and minor ancillary buildings. Existing control and administration buildings, workshops, canteen and stores will be utilised.

In addition, the new CCGT power plant will require the construction of a gas pipeline connection to the AGI. Bord Gáis Network (BGN) and Gaslink (the systems operator with responsibility for operating, maintaining and developing the Irish gas transportation system) will be responsible for the routing and construction of the gas pipeline. The connection to the gas supply will be subject to a separate planning process.

A detailed description of the site and the proposed development is provided in Chapter 3 (Description of the Development).

1.5 Planning Application - Statutory Requirements

The *Planning and Development (Strategic Infrastructure) Act 2006* (the Act) came into effect on 1st January 2007. The Act, which amends the *Planning and Development Act 2000*, requires that planning applications for certain developments considered to be of strategic national and regional importance are made directly to An Bord Pleanála and not to the local planning authority.

Under Section 37B of the Act a prospective applicant must engage in pre-application consultations with An Bord Pleanála (the Board) to determine if the proposed development can be considered a strategic infrastructure development.

Following pre-application consultation meetings with An Bord Pleanála, on 24th June 2009, 1st October 2009 and 28th October 2009, it has been determined that the proposed development satisfies the conditions set out in Section 37A.-(1) and (2) (a) and (b) of the Act i.e. the development is specified under the Seventh Schedule (Section 37A.-(1)):

"A thermal power station or other combustion installation with a total energy output of 300 megawatts or more".

and, under Section 37A.-(2), the Board is satisfied that the proposed development, if carried out, would fall within the following categories:

(a) *"the development would be of strategic economic or social importance to the State or the region in which it would be situate*

(b) *the development would contribute substantially to the fulfilment of any of the objectives of the National Spatial Strategy or any regional planning guidelines in respect of the area or areas in which the development would be situate"*

In accordance with Section 37E.-(1) of the Act an application for permission for development, in respect of which a notice has been served by An Bord Pleanála confirming that it falls within one or more of paragraphs (a) to (c) of Section 37A.-(2), must be accompanied by an Environmental Impact Statement (EIS).

This is also in accordance with the European Directive 85/337/EEC (EIA Directive), as amended by Directive 97/11/EC, which also states that an EIS is required for "*Thermal power stations and other combustion installations with a heat output of 300 megawatts or more*".

In its document entitled *Guidelines on the Information to be Contained in Environmental Impact Statements (March, 2002)* the Environmental Protection Agency (EPA) has defined an Environmental Impact Assessment (EIA) as:

"*the process of examining the environmental effects of development – from consideration of environmental aspects at design stage through to preparation of an Environmental Impact Statement, evaluation of the EIS by a competent authority and the subsequent decision as to whether the development should be permitted to proceed, also encompassing public response to that decision"* .

In the same document, an EIS is defined as:

"A statement of the effects, if any, which the proposed development, if carried out, would have on the environment".

A copy of the notice served by An Bord Pleanála confirming that the development comes under the remit of the Strategic Infrastructure Act is included in Appendix 1.1 (Strategic Infrastructure Notification). Additional regulatory requirements are discussed in Chapter 4 (Legislation). Chapter 6 (Scoping and Consultation) discusses the public consultation process regarding applications made under the Act.

1.6 Structure of the EIS

The structure of this EIS is presented in Table 1.1 below, a description of the methodology followed in the preparation of this EIS is provided in Chapter 7 (EIA Methodology).

Table 1.1: Structure of the EIS

Chapter No.	EIS Section
1	Introduction
2	Background to the Project
3	Description of the Development
4	Legislation
5	Planning and Policy Context
6	Scoping and Consultation
7	EIA Methodology
8	Human Beings – Land Use
9	Human Beings – Socio -economics
10	Traffic
11	Human Beings– Noise & Vibration

Chapter No.	EIS Section
12	Flora and Fauna
13	Soils, Geology and Groundwater
14	Surface Water
15	Air Quality and Climate
16	Landscape and Visual
17	Material Assets (Archaeology, Architectural and Cultural Heritage and Utilities)
18	Interactions of the Foregoing
19	References

This EIS was prepared by Mott MacDonald (Ireland) Limited and Environmental Resources Management (ERM). In addition Aegis Archaeology Limited was engaged to undertake the Archaeology, Architecture and Cultural Heritage assessment.

A Non-Technical Summary (NTS) of this EIS has also been produced as a separate, stand-alone document providing a brief overview of the development and associated impacts and mitigation as described in this EIS.

2. Background to the Project

2.1 Introduction

This chapter of the EIS provides information on Endesa Ireland Limited, the background to the project; including the need for the development, acquisition of the site and the main technologies considered.

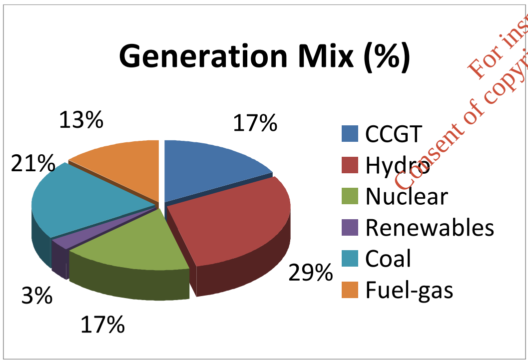
2.2 About Endesa

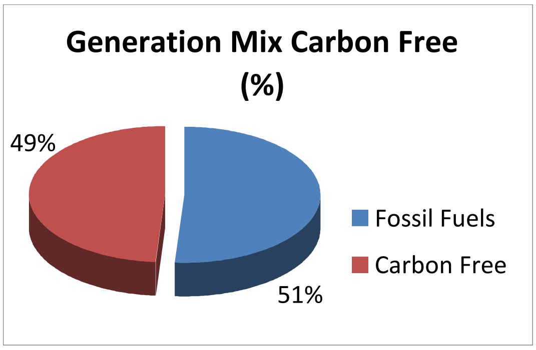
Endesa is the leading utility in the Spanish electricity system and the number one private electricity company in Latin America. It is a significant player in the energy sector of the European Mediterranean region. It also has a growing presence in the Spanish natural gas market and is advancing rapidly in the area of renewable energy.

The electricity companies controlled by Endesa had a total installed capacity of 39,656 MW at the end of 2008, with annual generation of 149,830 TWh and total electricity sales to 24.4 million customers, employing 27,000 people.

Endesa operates a range of generation technologies, from Renewable to Combined Cycle Gas Technology, as presented in Figure 2.1 below.

Figure 2.1: Endesa - Generation Mix





Source: Endesa Proforma Figures (2008)

2.2.1 Presence in Spain and Portugal

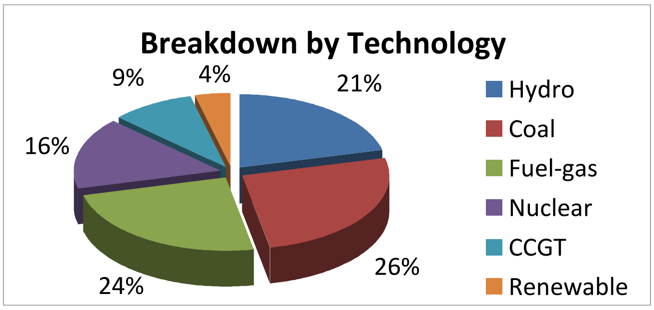
Endesa is one of the largest utilities in Spain and Portugal with an installed capacity of 22 GW in 2008 providing energy to over 12 million customers. Not only does it own actual generation stations / facilities it also maintains and operates a significant portion of the distribution system as described hereunder:

- 21,215 km of High Voltage Lines
- 115,118 km of Medium Voltage Lines
- 1,246 Substations

- 156, 956 Transformation Centres
- 135, 061 MVA

The technology used to generate electricity, and satisfy customer demand in Spain, is presented in Figure 2.2.

Figure 2.2: Endesa - Breakdown by Technology (Spain)



2.2.1.1 Gas Supply Business

Endesa are not only involved in pure electricity generation but are also key players in the gas market including areas such as: procurement, regasification & transport and distribution & supply. In terms of procurement Endesa is engaged with a number of contracts totalling over 6 Bm^3 (Billion cubic metres) per annum. The supply chain is geographically diversified across many countries in Europe and North Africa (i.e. Maghreb). Adopting and maintaining a similar strategy to electricity generation, Endesa is the owner / operator of various gas transmission assets including:

- 4,213 km of Distribution Network
- 530 km of Network Transmission
- Major Stakes in Regasification Plants

The holding in the regasification plants alone provides enough capacity to meet generation and supply demand. This demand comprises 40 TWh sold to liberalised customers, 7 TWh supplied to 397,000 regulated customers and 26 TWh consumed in generating stations. Endesa controls over 15% of the overall market share in Spain and Portugal.

2.2.2 Presence in Latin America

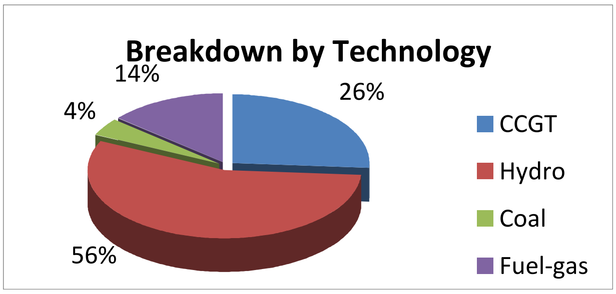
Endesa is the main private utility provider in Latin America. Total installed capacity exceeds 15 GW supplying over 12 million customers with a reliable supply of electricity; Endesa operates in the following countries in Latin America:

- Colombia: 2,895 MW, 2.3 million customers
- Brazil: 987 MW, 5.3 million customers
- Argentina: 4,522 MW, 2.3 million customers
- Chile: 5,283 MW, 1.5 million customers

- Peru: 1,597 MW, 1 million customers

The breakdown of technology used in electricity generation in Latin America is presented in Figure 2.3.

Figure 2.3: Endesa – Breakdown by Technology (Latin America)



Source: Endesa Proforma Figures (2008)

2.2.3 Presence in Other Countries

Endesa is committed to developing the company generation portfolio in a number of countries. Although Endesa is a major organisation in Spain and Latin America it has significant experience in developing other generation portfolios in various countries, currently operating in ten countries.

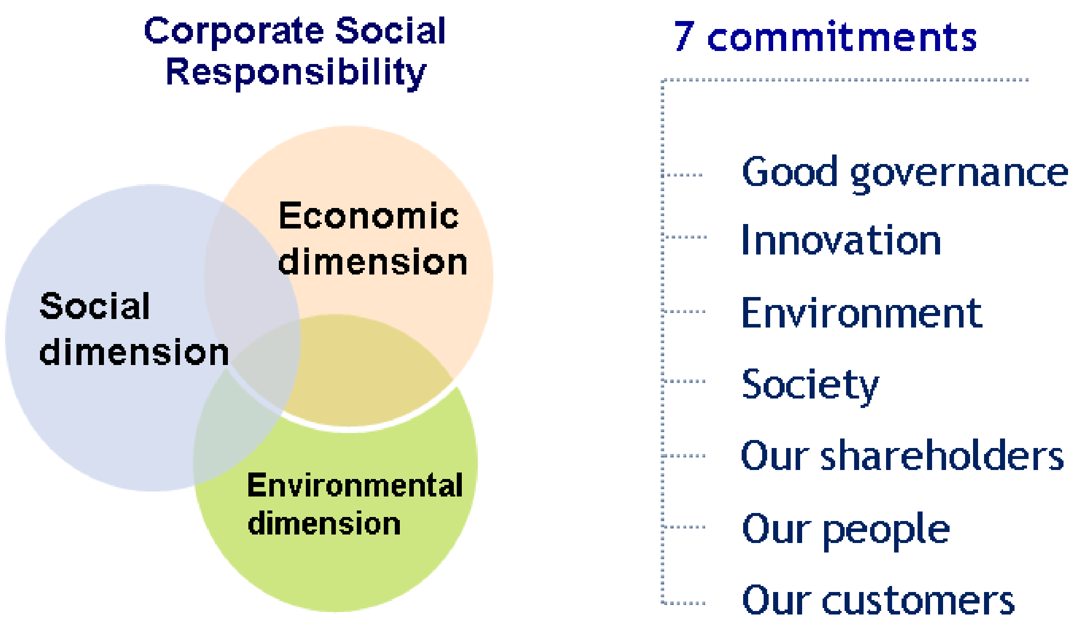
2.2.4 Corporate Social Responsibility

Endesa take a very proactive approach to Corporate Social Responsibility and it is a major element of the Endesa strategic plan.

Endesa recognises the challenges for the future in this area and are committed to endorsing a proactive approach to local government across all locations where Endesa have a presence and a drive for innovation in technology to promote a culture of continuous improvement towards climate change. To facilitate the positive impact on climate change various goals have been developed at corporate level across the organisation to identify innovative methods of integrated water management systems, implement state of the art environmental management systems, conserve and protect the natural environment and use, where appropriate, Best Available Techniques (BAT) technology.

In terms of the approach to Corporate Social Responsibility there are three dimensions ranging across seven separate commitments as presented in Figure 2.4.

Figure 2.4: Endesa – Corporate Social Responsibility



In addition to the specific environmental improvements incorporated in facility technology, as outlined in the previous paragraph, Endesa is also committed to achieving various other goals by 2020. These goals include a 50% reduction in their carbon emission factor, promoting and developing renewable energies, leading Carbon Capture and Storage (CCS) technological developments, promoting electric vehicles and adopting a culture of promotion and continuous adoption of Clean Development Mechanism (CDM) projects.

The specific milestones set for 2009 are:

- 18% reduction in Carbon Dioxide (CO_2) emissions, when compared with 2008 figures
- 41 CDM projects in the portfolio
- 90% of energy produced under environmental certification
- 7 GW of generation in the pipeline
- Participation in various initiatives to reduce CO_2

Endesa, and their approach to corporate social responsibility, were recognised by the Dow Jones Sustainability World Index for the ninth year running in 2009. Endesa has been included, along with other leading utilities in the world, for its commitment to sustainability, in particular the areas of social action investment and occupational health and safety and social reporting. The index, regarded as the most important global benchmark for sustainability issues, selects the leading companies in different industries that stand out for their commitment to making sustainable development one of the corner stones of their business strategy. Specifically, the Dow Jones Sustainability World Index includes just 10% of the 2,500 companies that make up the Dow Jones Global Stock Index and nine of its 74 electric utilities.

2.2.5 Endesa Ireland

Endesa Ireland was established as an operating company on 8th January 2009, following Endesa's acquisition of certain generation assets from the Irish state utility, Electricity Supply Board (ESB). The sale, worth €450 million, was signed in Dublin following approval from the appropriate regulatory bodies.

The assets purchased comprise 1,068 MW divided up between four sites, Tarbert in Kerry, Great Island in Wexford, Rhode in Offaly and Tawnaghmore in Mayo.

This acquisition presents Endesa with the environmental challenge of improving the efficiency of current plants and the construction of new ones with cleaner generation technologies. Endesa are developing an industrial plan for repowering and improving the efficiency of the plants it has acquired.

The project assessed within this environmental impact statement involves constructing a new Combined Cycle Gas Turbine generating station on the existing generation site in Great Island, Co. Wexford, adjacent to the existing heavy fuel oil power station that is currently in operation. The new development will demonstrate significant improvements and a substantial increase in operating efficiency over the existing development. In order to assess the impact of this project Endesa Ireland has brought together a broad-based collaboration of highly skilled and experienced engineers and environmental consultants experienced in the permitting, licensing and engineering of power generation facilities of both in Ireland and abroad.

2.3 Need for the Development

2.3.1 General

The proposed development in Great Island is a CCGT generating station with an electrical output of circa 430 MW. This power plant, when developed, will be one of the most efficient CCGT generating stations on the all-Ireland grid. The development will use best available technology in defining and achieving such high levels of efficiency which will result in reducing environmental impacts and also optimising electricity generation for each unit of fuel used. The modernisation of Great Island power plant, and the introduction of Endesa in general, will promote the strategy of competition in the Irish energy market which will directly promote competitive energy prices. Achieving a reduction in the cost of energy absorbed by business in producing goods and services is critically important as Ireland competes on a global basis for economic survival, in terms of Ireland's domestic entrepreneurs and also in terms of attracting inward investment.

Figure 2.5 and 2.6 below illustrate market operation in the Irish electricity system. Figure 2.5, Typical Profile of Electricity Generation System, demonstrates the typical types of technologies that are used to satisfy the electricity demand. As the technologies move from left to right across the chart it becomes more expensive to produce electricity as the technology is older and / or less efficient, therefore the price of electricity is higher to the end user. This is termed the "merit order" of generation on the system.

Figure 2.6, Typical Profile of Electricity Generation System with New CCGT Entrant, demonstrates that new, more efficient technologies, with cheaper generation cost, push old and expensive technologies out of the primary market. The capacity surplus, i.e. the older technologies, typically remain for security of supply reasons as required in an island system, but competition and lower cost is brought by new technologies.

For example in both graphs the demand is constant and in Figure 2.5 the demand is being satisfied by a mix of generation including renewable, Combined Heat and Power (CHP), CCGT (new and old), coal boiler, gas boiler and fuel oil boiler, with open cycle distillate turbine in reserve for system back-up.

When the new CCGT plant is introduced in Figure 2.6 it is placed immediately after the renewable and CHP generation in the merit order therefore system demand (remaining constant) is now satisfied by renewable, CHP, CCGT (new and old), coal boiler, with gas boiler and fuel oil boiler being forced out of the primary market into reserve with open cycle distillate turbine for system back-up. In this instance the new CCGT is more efficient then older CCGT, gas boiler and fuel oil boiler therefore is dispatched by the market and has an overall positive impact on electricity price. This impact is also positive from an environmental perspective as older, less efficient, technologies are being forced out of the primary market. It should also be noted that a new CCGT will always be placed after renewable generation on the grid.

Figure 2.5: Typical Profile of Electricity Generating System

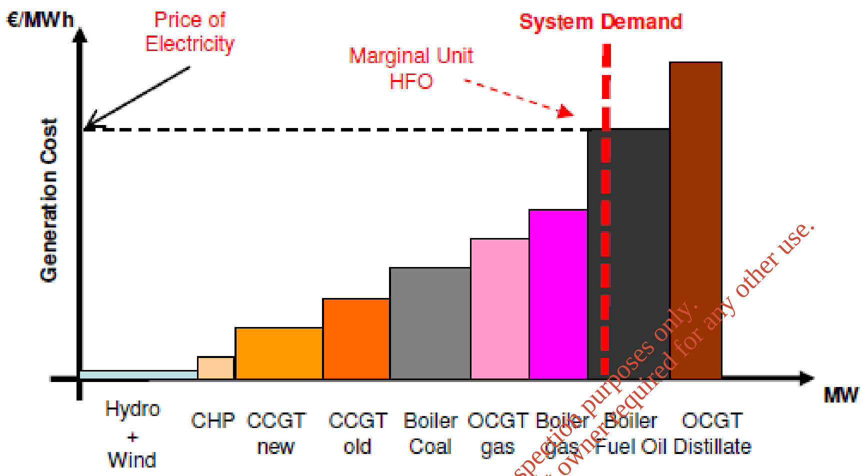
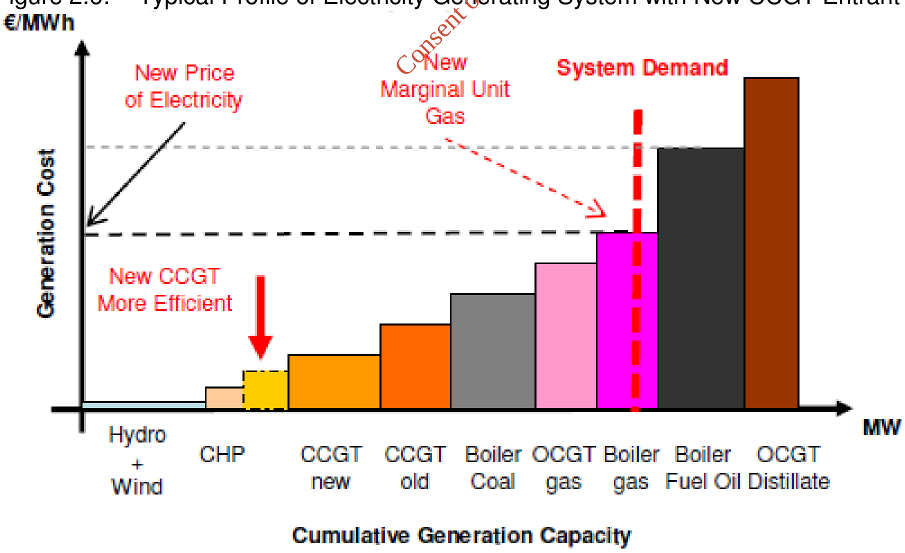


Figure 2.6: Typical Profile of Electricity Generating System with New CCGT Entrant



Maintaining “security of supply” and achieving the appropriate grid balance is critically important, not only to satisfy Ireland’s own requirements but also to attract inward investment. It is essential that Ireland has a stable system with adequate capacity to meet demand when required thereby ensuring grid integrity and reducing / eliminating the possibility of grid outages. When improving the Irish electricity system it is therefore critical to ensure best in class technology is used to promote efficiency and reliability. The technology chosen for the development in Great Island will achieve these objectives

Recognising the importance of the integrity of the grid and maintaining Ireland's security of supply, EirGrid forwarded a letter to CER on October 31st, 2007 detailing the requirements of the grid in general and specifically in relation to the sites in the Asset Strategy Agreement. This letter, referenced *"EirGrid Input to ESB Asset Strategy"*, described the impact of new generation on the grid in the Great Island region as follows:

"In addition to the information contained in the Forecast Statement, EirGrid has previously carried out studies as to the effect upon the network should there be a plant closure, and no replacement, at Great Island. These studies showed that significant problems arise in the South East of the country which would necessitate large scale reinforcement in this area to resolve. Additional generation in the area, although is likely in itself to cause some need for reinforcement, is also likely to alleviate a portion (the scale dependent on size and location) of the aforementioned reinforcement needs in the South ease and reduce the overall needs in the area".

A copy of the letter is provided in Appendix 2.1 (EirGrid Input to ESB Asset Strategy).

2.3.2 Government Policy

As mentioned above security of electricity supply is identified as crucial for the economy and in the Government White Paper, entitled *Delivering a Sustainable Energy Future for Ireland* (*Energy Policy Framework 2007 – 2020)*, the need for robust electricity networks and electricity generating capacity to ensure consistent and competitive supply of energy is highlighted.

The above mentioned paper also highlights the need for additional electricity generating capacity and improved availability of existing generating stations with the following statement:

"*Achieving an adequate safety margin between electricity supply and demand requires additional generating capacity including flexible plant and significantly higher standards of generating plant availability, as well as more interconnection. We will ensure that the strategic network development approach is underpinned by coordinated local, regional and national approaches to issues, which balance local interests with the national imperative to deliver strategic energy infrastructure. This approach will be supported by the new arrangements provided for in the Planning and Development (Strategic Infrastructure) Act 2006*".

The paper further reinforces the need for additional capacity and the need to replace older technology with new more efficient technology, stating:

- *"We will oversee the transformation of the generation portfolio between 2007 and 2013 through the CER-ESB Agreement on planned divestment of 20% of the existing ESB conventional plant portfolio by 2010*
- *We will under the National Energy Efficiency Action Plan, introduce measures to further enhance the energy efficiency of the power generation sector which will contribute to demand management and security of supply*
- *We will need substantial new investment in conventional power generation of the order of at least 1,000 MW to 2013 to meet demand growth and the planned closure of older plants. However, the carbon intensity of electricity production will continue to be progressively reduced with greater penetration of renewable energy, co-firing with biomass, and the planned*

replacement of older generation plant with modern efficient power generation facilities to 2020. Gas fired power stations will continue to play a key role over the period".

CER decision paper "*Proposed Direction on Conventional Offer Issuance Criteria*" (July 2009), a paper that is specifically associated with Gate 3 connection direction, compliments the Government White Paper with the following statement in relation to the requirement for additional conventional generation:

"Consequently, in order to protect electricity security of supply, it is necessary to ensure that a mix of energy sources (other then wind on its own) is connected to the network. This means that conventional generation, which is a predictable form of generation output, is required in order to maintain security of supply, i.e. "keep the lights on". As noted in section 4, one of the Commission's statutory duties is to ensure that security of supply is protected by taking such measures as are necessary to do so. In accordance with this duty and the Commission's objectives for this process, the Commission considers that processing a number of conventional applications alongside renewable generation in Gate 3 is therefore required in order to protect long term security of supply".

2.3.3 The Need for Competition and Liberalisation of the Electricity Market

In order to try and develop a competitive market it is critical that there is competition, particularly in a traditionally monopolistic marketplace such as the Irish energy market. The Government's White Paper on energy, which sets out Ireland's energy policy framework to 2020, provides for the divestment and repowering of certain ESB generating plant. This is in order to aid security of supply, integration of renewable generation, liberalisation of the electricity market and the promotion of competition. The Government endorses the case for a process of structural change in the energy market. A key policy objective is the enabling of competition and delivery of consumer choice through this structural change.

In this vein the Asset Strategy Agreement (ASA) was entered into between CER and ESB in April 2007 for the sale of certain ESB power stations, with the objective to reduce ESB's dominant market share and promote competition for the benefit of the end customer.

The CERs statutory function to promote competition and security of supply is particularly served by enabling third parties to proceed with the grid connections previously allotted to ESB, otherwise acquisition of the sites would not have been commercially attractive and hence there would be no competition gains.

Part of the strategy to promote such competition is evident in the Gate 3 "*Proposed Direction on Conventional Offer Issuance Criteria*". In this paper the Commission states:

"in the Gate 3 direction, it would only "bring forward" projects for connection that were warranted on the grounds of their wide systemic/public benefit and where this could not have disproportionate impact on other applicants. This must be read in the context of the stated determination on the part of the Commission to take account of the overall objective of the Asset Strategy Agreement. This is because delivery in full on that Agreement is entirely consistent with Government Policy and the Commission's obligations under its statute to promote competition in the generation and supply of electricity. The forthcoming energisation of ESB's new Aghada plant was authorised by the Commission only as a quid pro quo for successful delivery of the divestment and repowering of the ESB plant such as was contained in the Asset Strategy Agreement. Therefore, if the Asset Strategy is not successful, the ESB's market share could in fact be increased, which would be contrary to Government policy and the Commission's duty to promote competition".

The market entry strategy of Endesa will increase levels of competition while the efficiency of the technology proposed will reduce environmental emissions and energy cost to the end user.

2.3.4 Generation Mix (Wind and Conventional)

While the increasing levels of wind penetration will make a valuable contribution to fuel diversity, sustainability and emissions reduction, there are issues surrounding the reliability of supply resulting from wind generated electricity and the amount of the actual wind generation i.e. capacity credit into the transmission system. The intermittent nature of wind means that the contribution of wind power to generation adequacy is significantly less than its installed capacity. EirGrid have classified this type of plant as non-fully-dispatchable i.e. they cannot be relied upon to generate electricity as and when required.

Generation adequacy is defined as the ability of all the generation units connected to the electrical power system to meet the total demand imposed on them at all times. The demand includes transmission and distribution losses in addition to customer demand. When considering the generation adequacy of wind as an energy source, wind is given a lower 'capacity credit' than conventional thermal generation, primarily because of its intermittent nature. This capacity credit is used by the system operator, EirGrid, when assessing the adequacy of overall generation capacity to meet the predicted demand. The capacity credit for Wind Power Generation (WPG) is predicted by EirGrid in the *Generation Adequacy Report 2009 – 2015* (GAR 2009 – 2015) to decrease from 19% in 2009 to 12% by 2015 as illustrated in Table 2.1: Wind Capacity Forecast and Associated Capacity Credit.

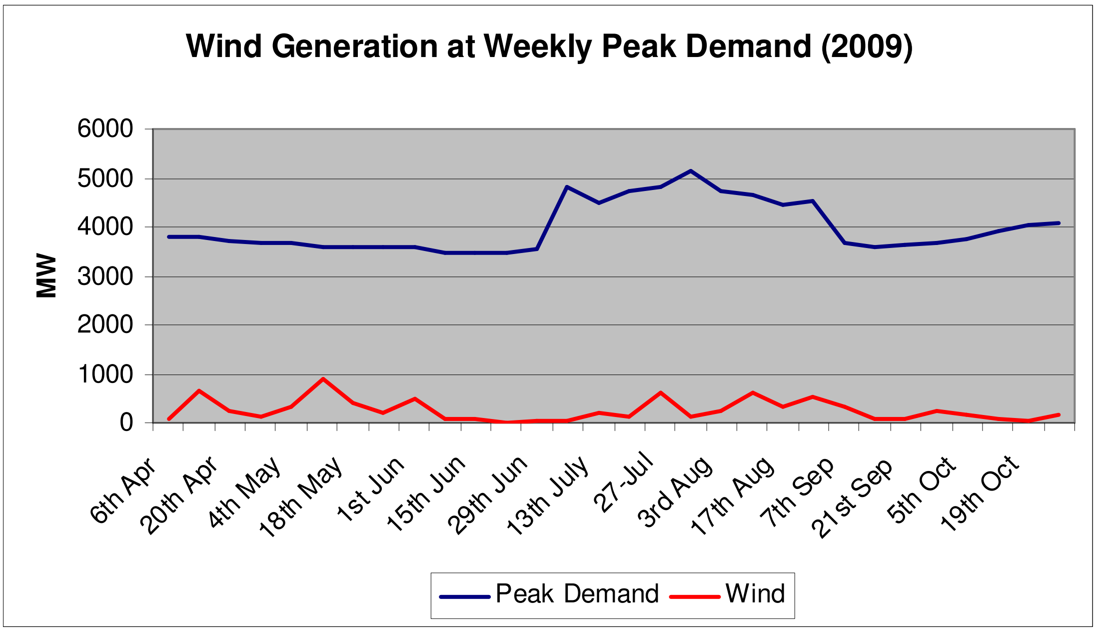
Table 2.1: Wind Capacity Forecast and Associated Capacity Credit

	2009	2010	2011	2012	2013	2014	2015
Installed Wind Capacity (MW)	1248	1429	1723	2017	2231	2606	2900
Capacity Credit (MW)	234	250	274	294	313	329	344
Capacity Credit as % of Installed Capacity	19%	17.5%	16%	14.5%	13.5%	12.5%	12%

Source: EirGrid Generation Adequacy Report 2009 – 2015 (February, 2009)

The following comment in the GAR 2009 – 2015 should also be noted *"Although the expected large growth of installed renewable capacity will increase portfolio diversity, it will only offer a limited contribution to generation adequacy."* This is further illustrated in Figure 2.7 which presents the results of CER weekly generation reports for 2009 to date.

Figure 2.7: Wind Generation at Weekly Peak Demand (2009)



Source: CER Weekly Generation Reports (www.cer.ie)

As a consequence, even though up to approximately 6,000 MW of non-fully-dispatchable wind capacity may be installed on the grid by 2020, a considerable amount of fully-dispatchable conventional thermal generating plant will also be required. This is necessary to provide system reserve and backup capacity for periods of low output from wind generators and for retirement and non-availability of the existing fully-dispatchable plant, in order to maintain an adequate security of supply standard.

In the CER proposed direction on Gate 3 offers *"Proposed Direction on Conventional Offer Issuance Criteria"* CER also assessed the strategy of Endesa in terms of the impact on renewable generation stating:

".. the Endesa re-powering connection applications are not expected to have a material adverse impact on the level of constraints borne by wind farms already connected or contracted to connect or due to receive a connection offer under Gate 3".

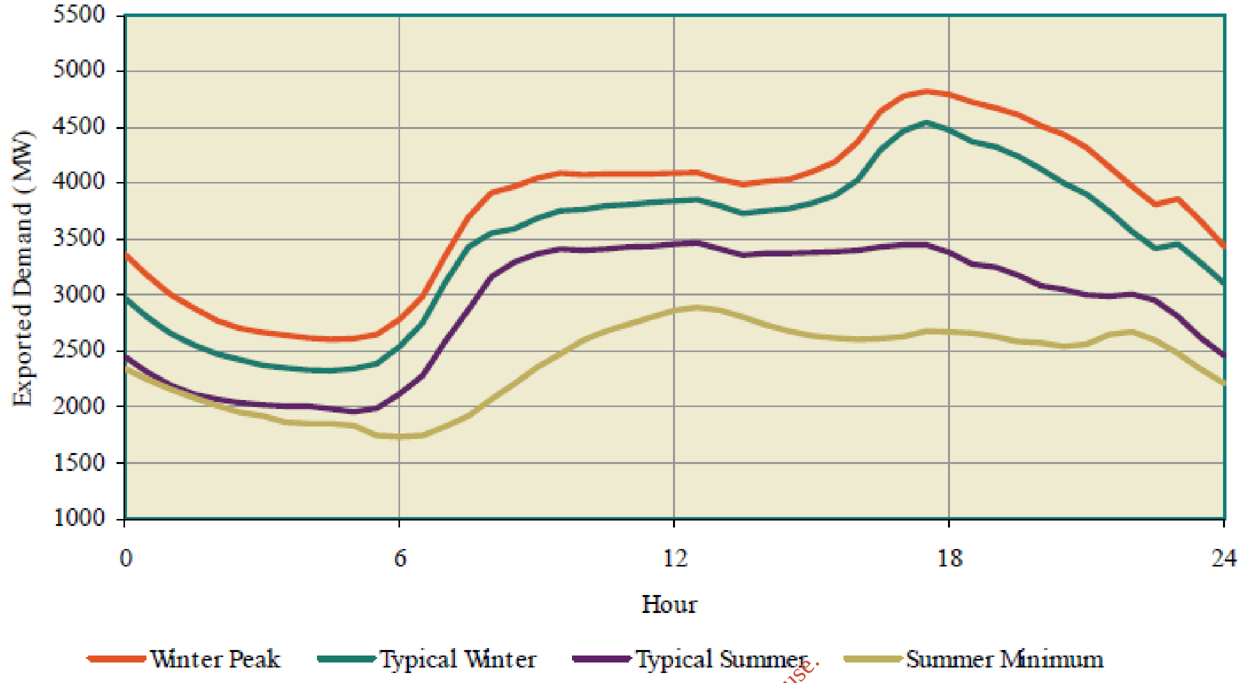
The proposed development at Great Island will satisfy the need for fully-dispatchable conventional thermal plant, will not have an effect on constraints borne by wind farms, will be one of the most efficient and reliable CCGT on the grid and will help reduce national environmental emissions by replacing older technology with new. The proposed CCGT power plant in Great Island will have a nominal capacity of 430 MW, and will therefore provide a significant contribution to the estimated future peak demand in Ireland from 2013.

2.3.5 Generation Requirements

2.3.5.1 Demand Profile

The typical demand profile on the Irish transmission system varies throughout the year. An example of the variation in daily electricity demand is illustrated in Figure 2.8 below.

Figure 2.8: Typical Daily Demand Patterns (2007)



Source: EirGrid Generation Adequacy Report 2009 – 2015 (February, 2009)

It can be seen from Figure 2.8 that the level of demand can vary within a 24 hour period from a low of approximately 1,750 MW to a peak of almost 5,000 MW. The typical base load requirement, of approximately 2,250 MW in winter and approximately 2,000 MW in summer, is generally provided by coal, peat and established CCGT units. Additional demand during daytime periods is met by CCGT, oil, hydro and Open Cycle Gas Turbine (OCGT). This mode of operation is commonly referred to as 'mid-merit' or two-shift operation. Peak demand and replacement reserves are met mainly by OCGT, pumped storage, hydro-electrical and a supply of electricity via the existing 450 MW capacity HV interconnector from Northern Ireland.

CER, in its document entitled *Criteria for Gate 3 Renewable Generator Offers & Related Matters: Direction to the System Operators* (16th December 2008) proposed the type of conventional power generation capacity and interconnection portfolio needed by 2025 to support a high level of wind penetration, as presented in Table 2.2.

Table 2.2: All Island 2025 Portfolio

Generation Type	Size (MW)	Number	Total (MW)
Base	500	8	4,000
Mid Merit	350	8	2,800
Peaking	100	16	1,600
CHP	100	4	400
Interconnectors [1]	450-500	3	1,450

Note: (1) The new North-South and East-West Interconnectors are due to be commissioned in 2012 / 2013.

2.3.5.2 Future Requirements and Generation Mix

GAR 2009 - 2015 outlines the predicted electricity demands for the island as a whole for the years 2013, 2014 and 2015. It was estimated that the electricity demand for 2013 would be in the region of

43 TWh, with a peak demand of approximately 7,571 MW. A slight increase in demand was expected between 2013 and 2015 with the electricity demand for 2015 estimated at 45 TWh and peak demand of approximately 7,946 MW. This was subsequently updated in July 2009 when EirGrid revised their demand forecasts and reassessed their original base case adequacy assessment due to the deteriorating economic situation in Ireland and the reduction in electricity demand since January 2009. EirGrid anticipates that demand is to recover slowly to 2008 levels by 2012 – 2014 with the system above security of supply standard for all years up to 2015.

A comparison of alternative portfolios with different mixes of CCGT units and OCGT units was examined by the Department of Communications, Energy and Natural Resources (DCENR) in the *All Island Grid Study (January 2008)*. Part of this study compared the generation dispatch patterns and associated costs and carbon emissions to meet "all island" demand in 2020 for these alternative portfolios. The study concluded that the portfolio with the larger proportion of OCGT units had higher operating costs and also higher carbon emissions owing to the lower efficiency of the OCGT units. Therefore it is essential that the portfolio of units on the grid has a sufficient number of reliable CCGT units in order to increase efficiency of the overall system, reduce the impact on the environment and also reduce the cost of energy to the end user. With this in mind the proposed development in Great Island will be an important contribution to the Grid.

2.4 Site Selection

2.4.1 Market Entry and Site Selection

Site selection is a critical factor in any large development but is particularly critical in terms of power generation as there are essential ancillary requirements and grid connection that are only present in select locations. It is very important therefore that a robust site selection process is followed by a developer or, in this case, by a market entrant to ensure minimum environmental impact of the actual development and ancillary services (e.g. additional overhead power lines). Such impacts need critical consideration in terms of "Greenfield" sites versus "Brownfield" sites.

According the Department of Environment, Heritage and Local Government document *Guidelines for Planning Authorities on Residential Density, 1999*, a "Greenfield" site, as the name suggests is "*Potential development land on the periphery of urban settlements having no previous building on it*" whereas a "Brownfield" site is defined as "*Any land which has been subjected to building, engineering or other operations, excluding temporary uses or urban green spaces*".

Endesa set key criteria to acquire regulated Brownfield sites, with a history of environmental compliance, that are suited to continued use, consistent with their established use as power generation facilities. This not only reduces the environmental impact of developing a Greenfield site but also ensures the ongoing monitoring and maintenance of the Brownfield site. The possibility of acquiring a Brownfield site is considered beneficial to a market entrant in terms of mitigating against the environmental impact of a development. This is reinforced by the level of interest displayed by potential market entrants as part of the Asset Strategy Agreement, including four global energy organisations (currently not present in Ireland), involved in the public tender / acquisition process of the divested ESB sites.

The environmental and public interest impacts / benefits associated with re-powering an existing "Brownfield" site as opposed to developing a "Greenfield" site is recognised by CER in their Gate 3 proposed offer paper *Proposed Direction on Conventional Offer Issuance Criteria* which states:

"The environmental and public interests benefits from re-powering an existing "brownfield" site as opposed to developing a new "Greenfield" site must be taken into account by the Commission in light of its statutory duties. The transferability of existing capacity at Great Island and Tarbert is also

consistent with the encouragement of the efficient use of production of electricity by the Commission. As Endesa's connections at Great Island and Tarbert are not "Greenfield connections", connection of the proposed new stations current capacity would not result in significant additional network capacity requirements as the necessary infrastructure for the current capacity rights is already in situ".

As mentioned previously Endesa were successful in acquiring a number of Brownfield sites as part of the Asset Strategy Agreement and are now committed to developing clean, efficient and reliable technology on these sites using the existing infrastructure that is currently in place.

Part of the formal legal agreement of the Asset Strategy Agreement (which included the Great Island site), dated 27th April 2007, directed ESB to sell sites with export capacity:

"The Sale Sites shall each have Export Capacity and such capacity shall be subject to the final approval of the Commission", therefore reducing the requirement for additional overhead lines".

Also as part of this agreement the acquired sites could only be purchased for the purpose of energy generation for the future:

"The Conditions of Sale in respect of each of the Sale Sites shall include a condition in the Approved Form that the relevant Sale Site shall only be used for the Use. The Commission shall be entitled to require that the said condition include a direct covenant from the proposed purchaser to the Commission that the Sale Site will be used only for the Use".

The objectives of the Asset Strategy Agreement are further reinforced in the agreement as follows:

"The Parties hereby acknowledge and confirm that one of the Commission's primary objectives of this Agreement is that:

12.2.1 the ESB has ceased and reduced its electricity generating capacity by 1500 MW on a phased basis.

12.2.2 new electricity generation capacity has been created on the market amounting to 1000 MW (or such lesser amount of MW acceptable to the Commission) on a phased basis and is being commercially operated by third parties, independent of ESB.

The proposed plant in Great Island will be a CCGT plant, will replace the existing Heavy Fuel Oil units and will continue the use of power generation on the site. This change in technology will result in significant improvements in efficiencies and environmental impacts. There will be a substantial reduction in greenhouse gas emissions and general water requirements, which is in accordance with the strategic goals outlined in the Government White Paper.

2.4.2 Available Infrastructure

The development of the existing Great Island power plant offers a number of advantages as outlined below.

- The site is located at the Barrow Estuary. The estuary provides a readily available supply of water for the purposes of once through cooling, which is considered to be the most energy efficient cooling system available for this type of plant. The infrastructure and abstraction methods for this cooling water are already in place and being used by the existing facility.

- The plant is currently regulated by the EPA under IPPC Licence Number P0606-02 and has an established record of compliance with the environmental regulatory authorities.

- Much of the existing infrastructure can be utilised, including but not limited to the existing cooling water inlet and outlet systems, process water reservoir, distillate storage, administration building, etc, thereby negating the need to undertake extensive refurbishment works as part of this project.

- The site is Brownfield and the development site of the CCGT plant will not require the acquisition or permanent development of any Greenfield areas.

- Great Island power plant became operational over 40 years ago. As such the site has a long history of power generation and an established infrastructure network, including connection to the 220 kV high voltage systems. As the necessary transmission infrastructure is already in place and available to take the electricity generated, it is not anticipated that there will be any requirement for works to upgrade the transmission infrastructure in the area.

In terms of grid integrity and maintaining a grid that supports the needs and demand of the country, it is important that the proposed power generation is located in an area where the national grid can accommodate such a connection and a location that reinforces areas of the grid that are deemed to require such reinforcement. With this in mind the *EirGrid Transmission Forecast Statement 2008 - 2014* provides the following guidelines for new connections:

"Connection of a large generator at any of the locations analysed is likely to require deep reinforcement of the transmission network to allow it full grid access. The results from the analyses do however indicate that in 2013 between 250MW and 400MW of generation can be accommodated at Arklow in Wicklow, Cashla in Galway and Great Island in Co Wexford".

In order to determine the capability of the grid to accommodate changes in generation and the opportunity for generation at various parts of the network, EirGrid performed an "Incremental Transfer Capability (ITC) analysis as outlined in the aforementioned EirGrid's document (2008). The purpose of the studies is to indicate the level of generation opportunity that exists at a comprehensive range of locations across the gird i.e. the capacity available for greater use of the grid without the need for upgrades beyond those already planned. In terms of connecting large generators, the appropriate stations are in the 220 kV and 400 kV categories. Of the total stations on the grid there are twenty-five 220/110 kV stations and four 400/220 kV stations. Of these twenty-nine stations, fourteen 220 kV stations and one 400 kV station were selected for the ITC analysis. The stations were then classified as follows to identify the level of availability at each station:

- *Very High – more then 400 MW*

- *High – between 250 – 400 MW*

- *Medium – between 100 – 250 MW*

- *Low – less then 100 MW*

The Forecast Statements presented the following transfer capability results from Great Island in 2010:

- *Dublin – "Very High"*

- *Northern Ireland – "Low"*

- *South – "Very High"*

- *West – "Very High"*

The 2013 transfer capability results from Great Island were detailed as follows:

- *Dublin – "High"*
- *Northern Ireland – "High"*
- *South – "high"*
- *West – "High"*

As referenced in Section 2.3 (Need for the Development), a letter between EirGrid and the CER, entitled *EirGrid Input to ESB Asset Strategy* details the requirements of the grid in general and specifically in relation to the sites in the Asset Strategy Agreement. Part of this letter assesses Great Island in terms of its suitability as a site for future development and generation capacity. The letter is favourable towards Great Island stating:

In general terms EirGrid can advise the Commission that Great Island is likely to be a good location on the network to connect a new base load generating station. The recently published Forecast Statement, although prepared upon a basis different to the type of analysis necessary for connection studies, identifies 250-400 MW of available generation capacity for connection at Great Island...."

2.5 Main Alternative Technologies Considered

As discussed, the development of a base load plant was determined to be the optimum choice for Great Island in light of EirGrid's input to the Asset Strategy Agreement.

The potential plant configurations that were considered for this role included:

- Combined Cycle Gas Turbine (CCGT) plant
- Open Cycle Gas Turbine (OCGT) plant
- Conversion of the existing Units
- Large Scale Combined Heat and Power (CHP) plant

2.5.1 Combined Cycle Gas Turbine Plant

CCGT technology has been in operation in Ireland for many years with continual technological improvements in design, efficiency and reliability. Over the past 10 years there has been a significant increase in such technology in Ireland e.g. Huntstown Phases 1 and 2, Tynagh, Poolbeg and Ringsend with two such plants currently under construction at Aghada and Whitegate and further plant planned for a site in Louth, amongst others.

The key benefit of this technology is that it is the most efficient method of generating electricity from a primary fuel source such as natural gas. This means, that it also has the lowest greenhouse gas intensity of any such power plant type. This fact has meant that CCGT plants have traditionally fulfilled a base load running profile in electricity markets as they generate the cheapest electricity.

2.5.1.1 Combined Cycle Gas Turbine Plant with Air Cooled Condenser

The purpose of an Air Cooled Condenser (ACC) in terms of combined cycle technology is to provide plant cooling where there is no source of water cooling. The ACC is a considerable sized structure and is also a large generator of noise emissions. The ACC is also intensive on potable water use thereby resulting in larger requirements from the local regional water system then those required for a water-cooled plant. CCGT plants using ACC rather then once through cooling water (as per existing operations at Great Island) also have lower efficiency ratings. Furthermore, the re-use of the existing cooling water system at Great Island complies with the principles outlined in the *Integrated Pollution Prevention and Control (IPPC) Reference Document on the application of Best Available Techniques to Industrial Cooling Systems, December 2001* as discussed in Chapter 14 (Surface Water).

2.5.2 Open Cycle Gas Turbine Peaking Plant

OCGT technology (which does not utilise waste heat content in the gas turbine exhaust gases for steam generation) can offer great flexibility but with high associated generating costs. As a result OCGT's are generally considered more suited to peaking plant operation. With the projected significant increase in wind power generation in Ireland up to 2020, and beyond, it is expected that there will be a substantial increase in such peaking plant development in areas of high wind penetration to cater for the intermittent nature of wind generated electricity. A detailed description of the open cycle process is provided in Section 3.12 (Combined Cycle Gas Process).

2.5.3 Conversion of Existing Units

The existing units on the Great Island site are all approaching the end of their useful life cycle. Technical and financial assessments on the conversion of the existing units from Heavy Fuel Oil (HFO) operation to operation on natural gas have determined that it is neither technically nor economically feasible.

2.5.4 Large Scale Combined Heat and Power Plant

In such plant, the waste heat content in the gas turbine exhaust gases is used to produce process heat in the form of steam and / or hot water which is then used for another industrial purpose, such as drying or curing. The by-product electrical power is then exported onto the local electrical grid. For example, such a plant exists at the Aughinish Alumina facility whereby approximately 150 MW of electrical power is exported onto the local networks system.

In the much colder climates of Northern and Central Europe, CHP technology is also frequently used to provide heat for municipal district heating schemes in densely populated towns and cities. No such system exists in Ireland although there is one being considered for the Ringsend area of Dublin which will produce waste heat from a planned waste incinerator. Carbon neutral fuels, such as biomass or waste streams, may also be used to fire the boiler and a typical example of this is the BALCAS facility at Enniskillen, County Fermanagh in Northern Ireland.

CHP technology is not suitable for the development at Great Island as there are no complementary industrial or district heating loads in the vicinity of the site that could consume the heat output from the size of gas turbine generator envisaged for the site.

2.6 Alternative Fuels Considered

When considering the optimum fuel type for the operation of a baseload plant a number of factors need to be considered namely;

- Environmental Impacts
- Investment Costs

- Operational Efficiencies and Unit Size
- Site Footprint
- Security of Supply

Solid fuels, such as coal and peat, present significant investment costs in relation to emissions control, environmental monitoring and fuel handling and delivery. The efficiencies of such facilities are inherently low requiring large unit sizes and development footprints in order to meet the baseload requirements for the scale of plant proposed at Great Island. While the proposed CCGT can operate on distillate oil it is not considered economically viable, in addition, such full load operation of the plant would necessitate fuel oil deliveries in the order of 730,000 tonnes per annum.

Natural gas is a clean fuel with negligible sulphur and particulate matter content. The fuel can be piped directly to the site negating the requirement for transportation of a primary fuel source by road. Operation of a 430 MW plant at full load firing on natural gas will also result in significant reductions in Carbon Dioxide (CO_2) emissions. The emissions intensity of the proposed power plant (assuming natural gas as the primary fuel) has been estimated and compared to other types of combustion plant. Based upon normal operating conditions, the emissions intensity of the plant are:

- CCGT at Great Island: 0.3429 tCO_2 / MW;
- Coal fired power station: 0.8505 tCO_2 / MW;
- Modern coal fired power station: 0.7560 tCO_2 / MW; and
- Oil fired power station: 0.6957 tCO_2 / MW.

Modern gas combustion plant in CCGT operation is widely recognised as being the most carbon efficient combustion technology and has been widely deployed throughout Europe.

Gas must be brought from the main Bord Gáis Networks gas main, although the gas line project is not part of this application Endesa are required to provide the financial support for delivery of the gas to site. It is envisaged the length of the line will be approximately 40 kilometres, Gaslink and Bord Gáis Networks are responsible for delivering gas to site and are currently in the process of developing a planning application under the *Planning and Development (Strategic Infrastructure) Act, 2006* in relation to the required connection. As part of the Asset Strategy Agreement the ESB have committed to providing part payment of the gas line to Great Island. It is also considered that the gas connection will encourage much needed critical infrastructure to the south east region.

Endesa therefore considers the optimum choice for the Great Island development to be a base load natural gas fired CCGT plant.

2.7 Do Nothing Scenario

As detailed in Section 2.4.1 (Market Entry and Site Selection) the formal legal agreement regarding the sale of ESB assets stipulated that the acquired sites could only be purchased for the purpose of energy generation for the future.

The existing generation facility at Great Island has been operational for over 40 years and includes an existing 220 kV substation, an established infrastructural network and a readily available supply of water. As such it is not considered probable that electricity generation at the Great Island site would cease, should the proposed development of a CCGT power plant not proceed. In effect, it is planned to develop the site for future power generation. However, as a base load CCGT power plant has been determined to be the optimum choice of plant for the scale proposed at Great Island it is not possible to present probable alternative proposals at this stage, should the proposed development not proceed.

Although the cessation of power generation activities at Great Island is not considered to be reasonably foreseeable, in the unlikely event of cessation of electricity generation activities at Great Island the likely consequences would include loss of full-time permanent employment and the requirement for significant reinforcement works of the transmission network to facilitate full grid access and meet demand in the south east, as described in the letter *"EirGrid Input to ESB Asset Strategy"*:

"EirGrid has previously carried out studies as to the effect upon the network should there be plant closure, and no replacement, at Great Island. These studies showed that significant problems arise in the south east of the county which would necessitate large scale reinforcement in this area to resolve. Additional generation in the area, although is likely in itself to cause some need for reinforcement, is also likely to alleviate a portion (the scale is dependant on size and location) of the aforementioned reinforcement needs in the south east and reduce the overall needs in the area".

3. Description of the Development

3.1 Introduction

This chapter of the EIS provides the background to the proposed development and details the principal elements of the power plant. A description of the development site and surrounding area and the technology of the proposed development are provided. The principal plant components, processes and materials consumed are identified. Construction and operational management of the plant are described The provisions for decommissioning of the existing and proposed plants are also discussed.

3.2 Proposed Development

The existing power generation plant comprises the Units described in Table 3.1 hereunder;

Table 3.1: Existing Power Plant Units

Unit No.	Electrical Rating (MW)	Year Commissioned
1	60	1967 / 1968
2	60	1967 / 1968
3	120	1972

It is proposed to construct a 430 MW natural gas fired Combined Cycle Gas Turbine (CCGT) power plant within the confines of the existing site. Subject to planning permission being granted the proposed development will be commissioned in 2012.

The existing Heavy Fuel Oil (HFO) fired power plant will continue to operate until the new CCGT becomes operational and will then be decommissioned.

The primary fuel to be used will be natural gas, as provided by BGE Networks. The secondary or back-up fuel will be distillate fuel oil. The distillate oil will be limited to 0.1% sulphur as per the requirements of *EU Directive 1999/32/EC, (relating to a reduction in the sulphur content of certain liquid fuels).*

3.3 Demolition of the Existing Plant

Endesa will apply for planning permission to Wexford County Council for the demolition of the existing generation plant within six months of decommissioning of the existing power plant. The application will be accompanied by an environmental assessment, as required by the planning authority and relevant stakeholders.

Under the terms of the approved IPPC licence (Registration Number P0606-02) for the existing facility; following termination or planned cessation for a period greater than twelve months of use or involvement of all or part of the site in the licensed activity, Endesa is obliged to decommission, render safe or remove any soil, subsoil's, buildings, plant or equipment, or any waste materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

A Residuals Management Plan (RMP) for the existing plant has been approved by the Environmental Protection Agency (EPA), outlining the activities to be undertaken during the decommissioning of the existing Units as required under the IPPC licensing regime. Demolition of the existing Units, and their associated stacks, will be subject to further consultation with EPA, and the conditions outlined in the RMP, a copy of which is provided in Appendix 3.1 (Residuals Management Plan).

A validation report will be submitted to the EPA for approval within three months of completion of the RMP. The report will address the following:

- Disposal of materials
- Decontamination of items of plant and equipment
- Decommissioning of plant and equipment
- Results of monitoring and testing
- The need for ongoing monitoring and investigation

Although Endesa is not seeking planning permission for demolition of the existing Units as part of this planning application, following consultation with members of the local community, it is considered that the provision of additional information, in support of the approved RMP, would be of benefit in informing local stakeholders of the potential environmental effects associated with demolition of the existing Units and proposed mitigation measures that are considered appropriate at this stage of the process.

This assessment, which includes cumulative effects where predicted, is provided in Appendix 3.2 (Preliminary Demolition Environmental Assessment) and includes a brief overview of environmental considerations only. It is not possible to undertake a comprehensive assessment of all environmental factors at this stage for the following reasons:

- A detailed programme for demolition of the existing Units will require agreement between the Commission for Energy Regulation (CER), ESB Networks / EirGrid and Endesa
- The existing turbine hall contains certain network assets (i.e. control and protection equipment for the 110 and 220 kV compounds) which are controlled by EirGrid, the national transmission system operator. The scheduling for decommissioning and demolition of this building will therefore require agreement between EirGrid and Endesa
- Demolition of the existing Units will require careful consideration of the environmental and engineering considerations associated with demolition of the existing Units in proximity to the proposed CCGT, which will be fully operational during the demolition phase of the existing Units
- It is not possible to comprehensively identify all the elements of the existing development as this would require destructive testing on the current available and operational equipment and sub-ground level investigation under the existing units

Once definitive timelines can be agreed, after decommissioning of the existing facility, a comprehensive assessment of engineering and environmental considerations will be developed by Endesa and agreed in full and open consultation with members of the local community, Wexford County Council, EirGrid, CER and other appropriate statutory stakeholders, including National Parks and Wildlife Service (NPWS). As detailed previously, Endesa is committed to applying for planning permission for the demolition of the existing Units within six months of decommissioning of the existing power station and is obliged to undertake comprehensive assessments under the conditions of the

IPPC licensing regime. In addition, the appropriate financial provision has been included in the annual financial report for Endesa to cater for the eventual demolition exercise.

3.4 Operational Regime of the Proposed New Plant

The CCGT Plant will operate principally as a base load plant, with a high annual capacity factor, at or near 100% load during weekday daytime hours and reduced load or shut down during the night and at weekends, when necessary, in accordance with the operational criteria outlined in Table 3.2.

Table 3.2: Operational Regime of Proposed New Plant

Operational Mode	Operational Regime
Base load	Full base load Base load - 5 days Base load 8,000 hrs
Shift operation	2 shifting 4000 to 6000 hrs per year 5 days 16 hours 180 stop/starts

The operational requirements of the proposed power plant will be set down by the Transmission System Operator (TSO) i.e. EirGrid. Refer to Chapter 4 (Legislation).

3.5 Site Location

The Great Island site is an existing power generating plant located in the townland of Great Island, Co. Wexford, (OS Grid Reference: E 268907, N 114574). Refer to Figure 3.1: Site Location.

The development site is Brownfield and located within the confines of the existing operational power plant facility, formerly operated by ESB. The Great Island power plant occupies an area of approximately 58 hectares (143 acres). The proposed development site will occupy approximately 8 hectares (19 acres). Refer to Figure 3.2: Proposed Development Site.

The topography of the development site is generally flat, approximately 7.0 metres Above Ordnance Datum (AOD) Poolbeg. The ground profile changes to the north of the development site rising to approximately 36 metres before sloping downwards to approximately 10 metres. It is proposed that the area to the north of the development site will be utilised as a construction laydown area. The area is currently under planted tree cover. It is proposed to clear an area of approximately 2.26 hectares (5.6 acres) and level the area in question. As the area is under cover it is not possible at this stage to obtain accurate topographical data, the references provided above are based on mapping from the 1970's which cannot be verified until the area is cleared.

The surrounding area is predominantly characterised by agricultural lands. The Waterford to Wexford railway line runs under the site access road immediately north of Great Island power plant. Agricultural lands are located further north of the site and to the east. The site is located at the confluence of the River Suir and River Barrow, on the shores of Waterford Harbour. The Barrow River Estuary is a proposed Natural Heritage Area (pNHA – the basic designation for wildlife). The River Barrow, River Nore and Lower River Suir are designated Special Areas of Conservation (SAC – the prime wildlife conservation designation). Refer to Figure 3.3: Designated Conservation Sites and Chapter 12 (Flora and Fauna).

Access to the site is gained via a local road, the L8072, which connects the site to the R733, located approximately 5 kilometres to the east of the development site. The R733 connects with the N25, approximately 11 kilometres to the north east. During the construction phase it is intended to utilise a

Notes

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2. ALL CO-ORDINATES SHOWN RELATE TO IRISH NATIONAL GRID CO-ORDINATES.
3. ALL SITE LEVELS REFER TO MEAN SEA LEVEL VERTICAL DATUM AT POOLBEG.
4. GENERAL SITE LEVEL IS +7.00M O.D.

Site Boundary
Property Boundary

1:10000 0 500m 1000m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P5	05/11/09	AV	Issued with Planning Application	KMc	DMc
P4	27/10/09	AV	Revised as per Endesa Comments	KMc	DMc
P3	23/10/09	AV	Revised as per Endesa Comments	KMc	DMc
P2	30/09/09	AV	Revised as per Endesa Comments	KMc	DMc
P1	30/07/09	VF	Issued for Approval	KMc	DMc

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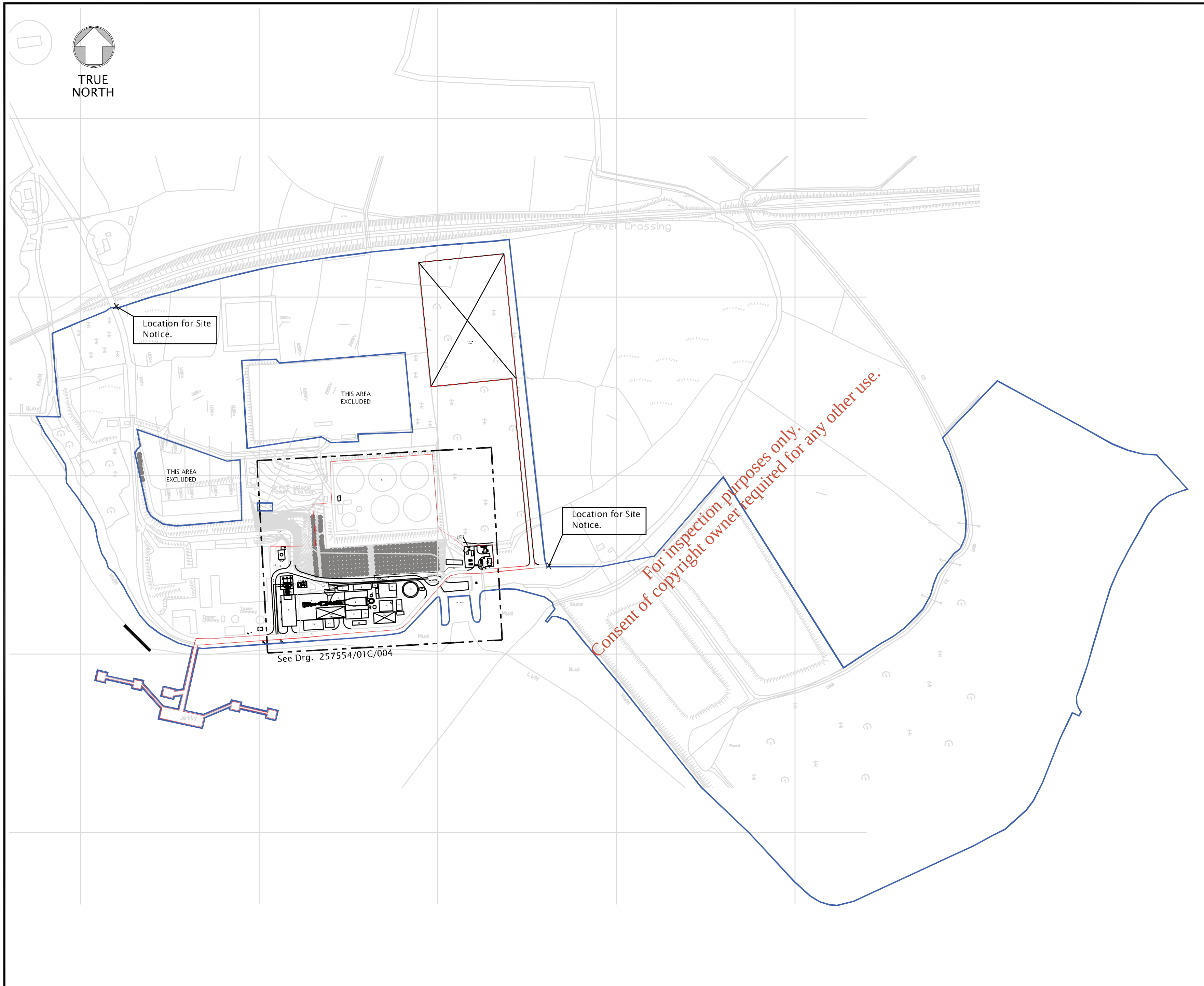
Title
Combined Cycle Gas Turbine (CCGT)
Great Island, Co. Wexford

Site Location

Designed	-	Eng.Chk.	B.Kinsella
Drawn	V.Farrell	Coordination	B.Kinsella
Dwg.Chk.	V.Farrell	Approved	B.Kinsella
Scale 1:10000	Project 257554	CAD file Figure 3.1	Status APR
Drawing No	Figure 3.1		Rev P5



Notes

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3. ALL SITE LEVELS REFER TO MEAN SEA LEVEL VERTICAL DATUM AT POOLBEG.
4. GENERAL SITE LEVEL IS +7.00M O.D.

Legend:

Site Boundary
Property Boundary

Scale:

1:2500 0 125m 250m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P7	11/11/09	AV	Issued with Planning Application	KMcC	DMcR
P6	05/11/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P5	13/10/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P4	22/10/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P3	30/09/09	AV	Revised as per Endesa Comments	DC	DMcR
P2	28/08/09	AV	Issued for Approval	DC	DMcR
P1	30/07/09	VF	Issued for Approval	DC	DMcR

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Title

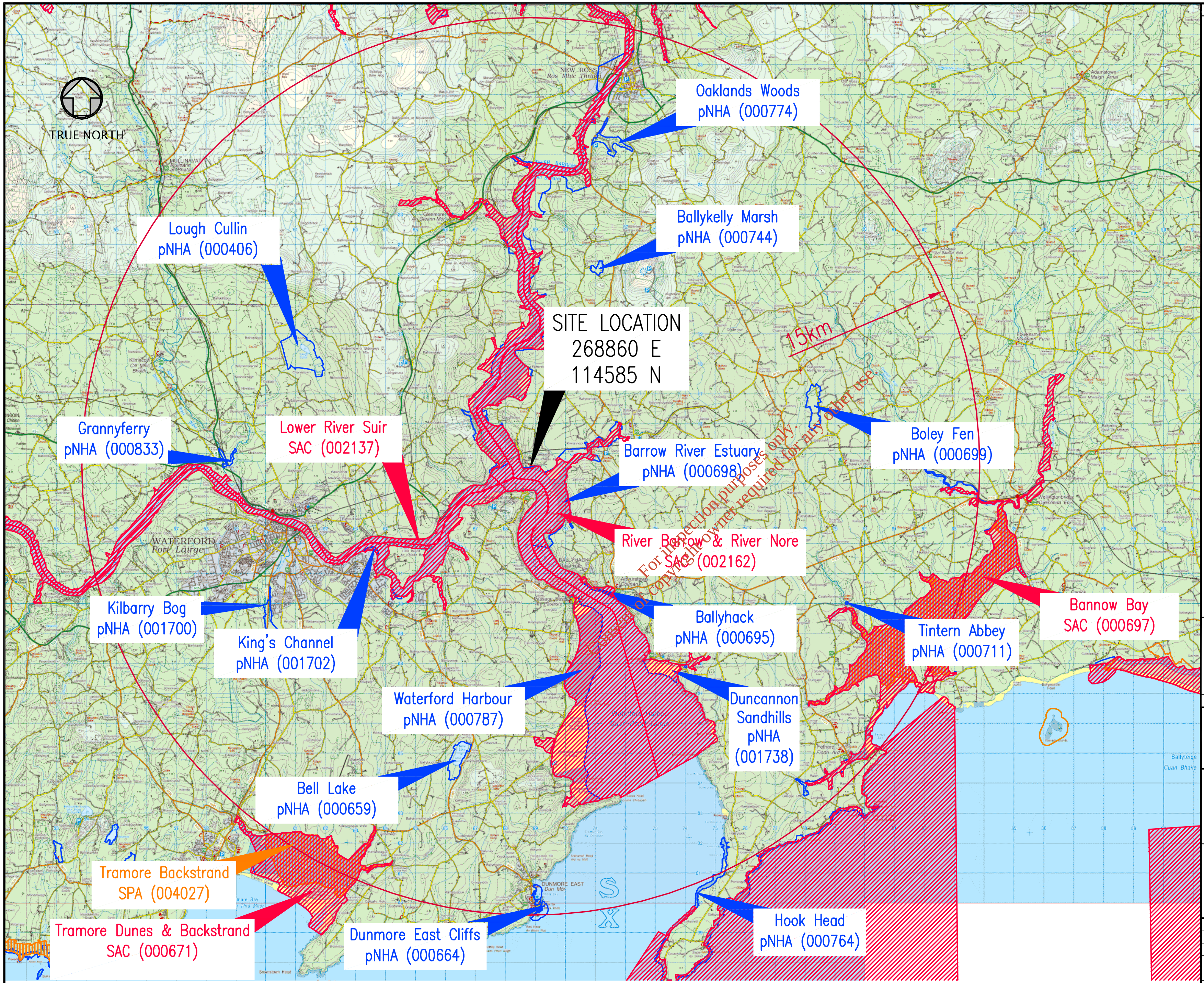
Combined Cycle Gas Turbine
Great Island, Co. Wexford

Proposed Development Site

Designed	D. McRandal		Eng.Chk.	D. Carr	
Drawn	C. Cunningham		Coordination	D. McRandal	
Dwg.Chk.	C. Cunningham		Approved	D. McRandal	

Scale 1:2500	Project 257554 CAD file Figure 3.2	Status APR
Drawing No Figure 3.2		Rev P7

Filename: Figure 3.2.dwg, Plotted by ken49363, on Nov 11, 2009 -12:40pm



Notes

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2. All co-ordinates shown in metres to Irish National Grid

Natural Heritage Area (NHA)
Proposed Natural Heritage Area (pNHA)
Special Area of Conservation (SAC)
Special Protection Area (SPA)

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	02/11/09	SK	For Information Only	BK	PK

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Title

Combined Cycle Gas Turbine (CCGT)
Great Island, Co. Wexford
Designated Conservation Sites

Designed	SK		Eng.Chk.	-	
Drawn	SK		Coordination	BK	
Dwg.Chk.	DH		Approved	PK	

Scale	Project	Status
NTS	257554	INF
	CAD file: Figure 3.3	

Drawing No: Figure 3.3 — Rev: P1

Filename: Figure 3.3.dwg, Plotted by ken49363, on Nov 25, 2009 -1:05pm

temporary parking bay for HGV access adjacent to the L8072, in proximity to the R733 junction, as illustrated in Figure 3.1. Traffic impacts associated with the proposed development are discussed in Chapter 10 (Traffic).

The nearest area of settlement is at Cheekpoint, Co. Waterford, located approximately 700 metres to the south of the site. In County Wexford, the nearest significant area of settlement is Campile, located approximately 3.75 kilometres to the east. A number of one-off houses are located in proximity to the site boundary, the nearest occupied dwelling is located approximately 450 metres to the northwest of the actual development site. There are no schools, hospitals or churches located within a 1 kilometre radius of the development. The nearest school is located approximately 5 kilometres to the north east.

The proposed development site and the existing operating units are wholly owned by Endesa Ireland Limited.

3.6 Existing Site Layout

The existing power plant site includes the main elements as illustrated in Figure 3.4: Existing Site Layout. It is intended to re-use as much of the existing infrastructure as possible, however, the following equipment and facilities will have to be removed to allow the new plant to be constructed.

- Underground HFO Waste Store
- Underground Light Oil Waste Store
- Fuel Pump House
- Sewage Treatment Plant

The removal of the above facilities and equipment will be incorporated into the Construction and Demolition Waste Management Plan and will be undertaken, in agreement with the EPA, in accordance with the conditions outlined in the Residuals Management Plan.

The following elements will require relocation to accommodate the drainage system of the new plant:

- Boiler Wash Effluent Tank
- Demineralisation Water Tank
- Water Treatment Plant Effluent Tank
- Process Waste Water Discharge Point SW13
- Oil Interceptor
- Stripping Tank
- Oil Spill Material Store

3.7 Requirement for Distillate Fuel Oil

Five days continuous operating capacity of distillate oil will be stored on site equating to approximately 11,000m^3 as required by the Secondary Fuelling Obligation, under CERs Decision Paper *CER/09/001*, *Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland*. To comply

Notes

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2. All co-ordinates shown relate to irish national grid co-ordinates.
3. All site levels refer to mean sea level vertical datum at Poolbeg.
4. General site level is +6.60m o.d.

Site Boundary
Property Boundary

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	05/10/09	SK	For Information Only	DH	PK

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Title

Combined Cycle Gas Turbine (CCGT)
Great Island, Co. Wexford

Existing Site Layout

Designed	-	Eng.Chk.	-
Drawn	S Kennedy	Coordination	D Hassett
Dwg.Chk.	D Hassett	Approved	P Kelly

Scale: 1:1000
Project: 257554
CAD file: Figure 3.4
Status: PRE
Drawing No: Figure 3.4
Rev: P1

with this requirement, it is intended to refurbish one of the existing 5 x 17,000 tonne capacity HFO storage tanks for the storage of distillate oil.

The tank will be completely drained and cleaned with all internal traces of HFO removed. A thorough NDT (Non-Destructive Testing) inspection will be undertaken and any necessary repair works will be carried out. The existing earthen bund and concrete lining will be refurbished. This work will be subject to detailed method statements which will be developed and agreed with Wexford County Council and EPA prior to any refurbishment works taking place.

Due to the volume of distillate oil required to be stored on site the proposed development has been accorded a lower-tier Seveso rating under the *European Communities (Control of Major Accident Hazards Involving Dangerous Substances), Regulations, 2006, (S.I. No. 74 of 2006)*. As such an assessment of containment measures for distillate fuel oil has been undertaken, in accordance with the requirements of the Health and Safety Authority (HSA). Based on this assessment it is proposed to increased the height of the existing bund wall by 2 metres and maintain the slope of the embankment at 60 degrees to the south, east and west sides of the storage area. A copy of the full assessment is included in Appendix 3.3 (Quantitative Risk Assessment – Land Use Planning Report*).* The requirements of the Seveso regulations are discussed in detail in Chapter 4 (Legislation).

3.8 Principal Design Objectives

The primary objectives of the proposed development are to:

- Comply with Government Policy in relation to generation requirements
- Meet the projected requirement for new electrical generation plant
- Reduce the proportion of greenhouse gas emissions per MWh of electricity generated by the use of high efficiency plant, thus contributing to Ireland's objectives in complying with its obligations under the Kyoto protocol
- Generate a commercial rate of return for Endesa Ireland Limited
- Enhance competition in the electricity generation market

3.9 Best Available Technology

The proposed plant design has been developed in accordance with *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006), BAT Guidance Note on Best Available Techniques for the Energy Sector (Large Combustion Plants Sector), 2008.* Utilisation of the existing cooling water system also complies with the principles outlined in *Reference Document on the Application of Best Available Techniques to Industrial Cooling Systems, (December 2001)*, as discussed in Chapter 14 (Surface Water).

The development will employ Best Available Technique (BAT) technology recognised as being the most advanced for power production at the scale proposed. The high overall efficiency of the CCGT Unit will lead to lower specific emissions to the environment generally compared to any other form of conventional thermal power plant.

3.10 Grid Application

Endesa has submitted a grid application to EirGrid for a 431MW connection at Great Island 220 kV substation. EirGrid deemed the application to be complete as of 17th September 2009 and has communicated this to Endesa. Endesa's connection application is in the Gate 3 offers awaiting outcomes of the ITC process. As described in Chapter 2 (Background to the Project), EirGrid has previously advised CER of available generation capacity for connection at Great Island.

3.11 Manufacture of the Proposed Power Plant

The tendering process to supply and construct the new CCGT plant will be subject to the requirements of the Utilities Directive (*Directive 2004/17/EC*), requiring Endesa to publish a tender notice in the Official Journal of the European Union (which is published on the e-Tenders website). The exact plant output and layout cannot therefore be specified at this stage without prejudice or favour to a particular supplier but will be within the figures quoted for output and efficiency throughout this EIS. The layout of the proposed plant as shown in the accompanying planning drawings is based upon a typical plant layout for the electrical ratings considered.

The performance of the chosen plant will be required to comply with the environmental objectives as presented in this EIS in order to ensure a minimal negative impact on the receiving environment. Consideration of the environmental impacts as presented in this EIS is on the basis of the largest size (and hence maximum emissions) of plant envisaged for the site.

3.12 Combined Cycle Gas Process

The combined cycle process consists of two thermodynamic cycles, the *Brayton Cycle for the gas turbine* and the *Rankine* Cycle for the steam turbine working simultaneously to produce electricity as efficiently as possible, hence the name Combined Cycle Gas Turbine.

The *Brayton* cycle comprises a gas turbine and an electrical generator which rotate at high speed (3,000RPM). The gas turbine consists of a compressor section, a combustion chamber and a turbine section. Air is drawn in through an intake filter, compressed and fed into the combustion chamber where fuel is injected and ignited. The resulting hot combustion gases (approximately 1,428^{o}C) passing through the turbine section rotate the shaft driving the compressor and the electrical generator to produce the rated electrical power output. The expansion of the hot gases through the turbine, and the extraction of mechanical work from them, via the turbine, reduces the temperature of the gases to approximately 600^{o}C at the exit of the gas turbine.

Operation of a gas turbine alone is referred to as open or simple cycle mode and has an overall cycle efficiency in the region of 38%. It is possible to generate approximately 50% more electricity without the need to use additional fuel by extracting the high degree of heat in the hot exhaust gases by using them to produce steam. The steam is generated by passing the hot gases through a Heat Recovery Steam Generator (HRSG), where the heat is transferred to water flowing in the HRSG wall tubes. This process reduces the temperature of the exhaust gases down to approximately 100^{o}C on exiting the HRSG. The gases are discharged to the atmosphere via an exhaust gas stack.

The high pressure steam produced in the HRSG is supplied through inter-connecting pipework to the steam turbine which is coupled to an electrical generator.

The steam is expanded in the steam turbine down to vacuum conditions to extract as much energy as possible and is then fed to a seawater cooled condenser where it is condensed back to water and fed back to the HRSG to generate more steam thus conserving water in the closed cycle. This is the Rankine thermodynamic cycle.

The electricity generated is fed to a transformer where the voltage is stepped up to the existing 220kV transmission voltage.

The proposed CCGT is a single-shaft arrangement i.e. the gas turbine and steam turbine operate on the same generator. A schematic of the proposed “Single-shaft” arrangement is provided in Figure 3.5: Single-Shaft CCGT Cycle Flow Schematic.

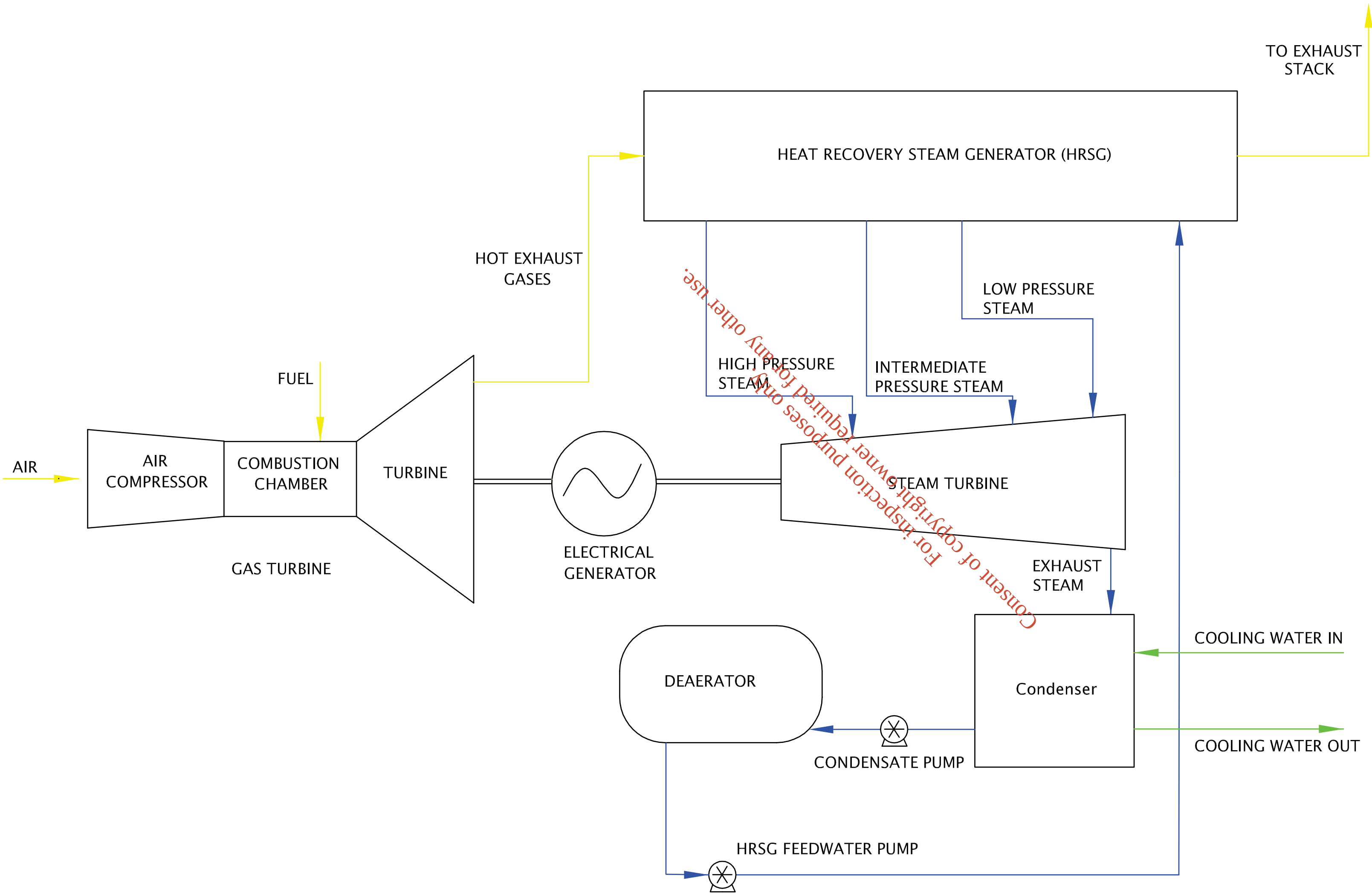
3.13 Plant Efficiency

The efficiency of a power plant is defined as the proportion of primary energy input which is converted to electricity. Total electricity output for the CCGT will be up to approximately 430 MW during optimum conditions. The overall generation efficiency is approximately 58%, this equates to a thermal input of 741 MWth. Most of the low grade heat loss for the CCGT unit will be via the seawater condensing system and from emissions to the exhaust stack. The remainder of the overall cycle losses can be accounted for as both mechanical and electrical losses within the plants.

Energy efficiency is integral to optimising the overall design of a CCGT plant. CCGT technology is the most efficient form of conventional thermal power generation. The plant will operate on an advanced computerised control system which will support optimisation of generation efficiency thereby minimising heat loss due to unburned gases. The steam cycle will be optimised by achieving the highest possible steam pressure and temperature. The supplier’s contract will detail plant specific energy balance data providing guarantees for heat rate and power output thereby guaranteeing an overall plant efficiency.

3.14 Plant Items

The principal components in this project will include the items listed below. The locations of each item are detailed by reference to Figure 3.6: Site Layout.



Notes

Legend:

Scale:

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	30.09.09	AV	Issued with Planning Application	KMc	DMc
P1	27/05/09	AV	Issued for Information	AV	DC

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Title

Combined Cycle Gas Turbine
Great Island, Co. Wexford

Single Shaft CCGT Cycle Flow Schematic

Designed	D. Carr		Eng.Chk.	D. Carr
Drawn	A. Varghese		Coordination	D. Carr
Dwg.Chk.	D. Carr		Approved	D. Carr

Scale	Project	Status
NTS	257554	PRE
	CAD file Figure 3.5	

Drawing No Figure 3.5 | Rev P2

1. Gas Turbine and Steam Turbine Building
2. Gas Turbine
3. Steam Turbine
4. Air Inlet Filter to Gas Turbine
5. Electrical Annex and Control Room
6. Heat Recovery Steam Generator (HRSG)
7. CCW Skid
8. Oil Separator (Relocated)
9. Gas Fuel Treatment Skid
10. Demineralised Water Supply Pumps (NO_x Abatement)
11. Generator Transformer
12. Unit Auxiliary Transformer
13. Natural Gas Compound AGI
14. Distillate Oil Storage Tank
15. Gas Compressor
16. Demin Water Storage Tank (1 x 6,000m^3)
17. Water treatment Plant Building
18. Main Stack
19. Fire Pump House (inside existing building)
20. Distillate Fuel Oil Forwarding Pump skid
21. CW Culvert
22. Over Ground Gas Main
23. Boiler Feed Water Pumps
24. Fin Fan Cooler
25. Rails in road for Transformer Removal
26. Chemical Injection Skid
27. Caustic Storage Tank with Bund
28. Acid Storage Tank with Bund
29. Gas Turbine Oily Water Drain Tank
30. Starting Transformer
31. Excitation Transformer
32. Auxiliary Transformer
33. Sewage Treatment Plant
34. Boiler Waste Water Drain Tank
35. N_2/H_2/CO_2 STORAGE
36. Process Water Discharge Pit
37. Blowdown Vessel
38. Auxiliary Boiler
39. Auxiliary Boiler Flue Stack
40. Continuous Emission Monitoring (CEM) System
41. Condensate Polisher
42. Distillate Oil Supply Pipe to Generator
43. HFO Filling Pipe in Concrete Trench
44. Distillate Oil Filling Pipe in Concrete Trench

3.15 Connections to the National Grid and Gas Network

Connection to the national grid and connection to the gas network will be undertaken by EirGrid and Gaslink / BGE Networks respectively as outlined hereunder.

3.15.1 Connection to the National Grid

The new power plant will be connected to the existing National Grid at the existing 220 kV substation at Great Island.

Reinforcement works, if required, on the existing 220kV system will be undertaken by EirGrid as part of a separate project. The exact technical requirements for these works will be determined by EirGrid after detailed electrical engineering studies have been completed.

3.15.2 Connection to the Gas Network

Endesa is working closely with BGN and Gaslink regarding the development of a gas connection to the site. The gas connection (the routing and construction of which will be undertaken by BGN /

Gaslink) will be subject to a regulated process. The development will require the granting of a licence to construct from CER, which will include an environmental appraisal of the impact of the pipeline development. The projected schedule for the entire process of environmental assessment, receipt of the required permit, acquiring wayleaves along the route and construction is estimated to take 24 months. The associated planning application to construct the new gas supply pipeline and associated Above Ground Installation (AGI) will be made by Gaslink/BGE Networks. The application will be applied for under the *Planning and Development (Strategic Infrastructure) Act, 2006*. At the time of writing this report Gaslink/BGE Networks had engaged in pre-application consultation with An Bord Pleanála regarding the application.

3.16 Basis of the Site Layout

The site layout has been determined to take into consideration the following criteria:

- To allow for the demolition of the existing buildings, equipment and stacks
- To minimise the routing of the 220 kV cables to the existing 220 kV substation
- To minimise the routing of the cooling water intake and discharge pipework
- To minimise the requirement for access roads
- To allow for ease of construction and access to the proposed laydown area
- To minimise the length required for the supply of gas pipework to the AGI station
- To maximise the use of existing services e.g. effluent discharge, surface water drains
- To maximise the use of existing buildings and structures e.g. cooling water pump house and associated culverts
- To provide suitable access for future maintenance and removal of plant and equipment
- To minimise environmental impacts

3.17 Main Components of the Combined Cycle Plant

The main components of the proposed plant, which are designed in accordance with Best Available Technology, are described hereunder.

3.17.1 Above Ground Installation (by Gaslink/BGE Networks)

Under normal operating conditions the plant will be fired on natural gas. It is anticipated that the CCGT plant will utilise approximately 500 x 10^6 Nm^3 per annum of natural gas.

The gas will be supplied to the site from the Bord Gáis Network (BGN) at a minimum guaranteed pressure of 19 barg and 15ºC. The maximum operating pressure of the BGN gas pipeline is 70 barg. Depending on the turbine selected, the pressure required will in the range of 35 to 50 barg.

The gas will be filtered, pre-heated, metered and pressure reduced prior to supply to the gas turbine, as required. The AGI asset will be owned by Bord Gáis and operated and maintained by Gaslink, an independent system operator with responsibility for operating and maintaining gas transportation systems within Ireland. Specifications for gas supply and operation and maintenance of the AGI will be stipulated in the contracts with Bord Gáis and Gaslink.

3.17.2 Distillate Oil Storage

As described in Section 3.7 (Requirement for Distillate Fuel Oil), it is intended to refurbish one of the existing 5 x 17,000 tonne capacity HFO storage tanks for the storage of distillate oil and increase the height of the existing bund wall by 2 metres. In accordance with the requirements of CER approximately 11,000 m^3 of distillate oil will be required to be stored.

The tank will be completely drained and cleaned with all internal traces of HFO removed. A thorough NDT (Non-Destructive Testing) inspection will be undertaken and any necessary repair works will be carried out. This work will be subject to detailed method statements which will be developed and agreed with Wexford County Council and EPA prior to any refurbishment works taking place.

3.17.3 Turbine Hall

The turbine hall building will house the condenser, steam turbine, generators, gas turbine and auxiliaries such as the compressed air system, overhead cranes, condensate pumps, air intake silencer, gas turbine exhaust silencer, gas / steam turbine auxiliary skids and electrical annex.

3.17.4 Gas Turbine Generator

The Gas Turbine Generator (GTG) will comprise a multi-stage axial-flow compressor section with movable inlet guide vanes, a combustion chamber with several burners, and a multi-stage axial-flow turbine section. Fuel will be combusted using air from the air compressor. The hot gases will pass through the turbine blades. Mechanical energy will then be converted to electrical energy in the electrical generator coupled to the gas turbine.

3.17.5 Heat Recovery Steam Generator

The heat content in the hot exhaust gases from the gas turbine will be used to produce the high-pressure steam which will be supplied to the steam turbine. The cooler exhaust gas will then be expelled to the atmosphere via an exhaust stack (main exhaust stack). The Heat Recovery Steam Generator (HRSG) is typically of a multi-pressure type, which allows the maximum mechanical energy to be extracted from the steam in the steam turbine. The HRSG will comprise high pressure (HP), intermediate pressure (IP), low pressure (LP) and reheat (RH) sections. The conceptual design site layout is based on an outdoor triple pressure horizontal type HRSG.

3.17.6 Main Exhaust Stack

The main exhaust stack will measure 60 metres in height and will be fabricated from painted carbon steel.

Continuous local and remote monitoring (CEM) equipment will be provided to allow measurement of Nitrogen Oxides (NO_x), Sulphur Dioxide (SO_2), Carbon Dioxide (CO_2) and Carbon Monoxide (CO) emissions. The impacts of emissions from the exhaust stack, and the stack height determination, are discussed in Chapter 15 (Air Quality and Climate).

3.17.7 Steam Turbine Generator

The Steam Turbine Generator (STG) will be of a multiple cylinder type suitable for direct coupling to the two-pole generator for power generation at 50 Hz. The thermal energy of the steam generated by the HRSG will be converted to mechanical energy in order to drive a generator to produce electrical power. The low-pressure exhaust steam will flow radially out of the steam turbine to the seawater cooled condenser.

3.17.8 Dry Low NO_x Burners for Natural Gas Firing

Combustion in gas turbines has traditionally employed a diffusion flame where fuel is sprayed into the centre of an air stream. Fuel mixes with the air by turbulent diffusion. Hot combustion gases, approximately 1,428°C, are cooled by dilution with excess air to temperatures acceptable to the combustor walls and turbine blading.

Natural gas is a clean fuel resulting in negligible emissions of Particulate Matter (PM) and Sulphur Dioxide (SO_2), the main atmospheric pollutants of concern are therefore Nitrogen Oxides. Nitrogen Oxides (NO_x) are formed at high temperature by the dissociation of the Oxygen (O_2) molecule and the action of the monoxide (O) radical on molecules of Nitrogen. NO_x, referred to as *Thermal NO_x*, are formed during the combustion process at temperatures above 1,400°C, from nitrogen in the air.

Initial attempts to reduce NO_x introduced a heat sink in the flame by injecting water, with the aim of reducing average combustion temperature to below the threshold for thermal NO_x formation. However, the process required large quantities of pure water to avoid corrosion of the turbine blading or deposition and blocking of cooling air holes by impurities.

The high costs of the systems detailed above provided the incentive for equipment suppliers to explore the use of non-stoichiometric mixtures to reduce flame temperature in so-called Dry Low NO_x (DLN) Burners. The combustion temperature, and therefore the NO_x formed, is a function of the Fuel / Air ratio when fuel and air are mixed prior to combustion in a "*pre-mix flame*". As a consequence the rate of NO_x formation can be significantly reduced by using a lean Fuel / Air mix.

Therefore, in order to ensure stable and efficient combustion, a pilot flame and various geometric arrangements are employed to maintain ignition of the main Fuel / Air mix. Dry Low NO_x Burners optimise the Fuel / Air ratio producing a uniform low temperature flame in the combustion chamber to minimise the production of NO_x

This technology will be used for the proposed development.

3.17.9 NO_x Abatement when Firing On Distillate Fuel Oil

The limitation on NO_x emissions from the CCGT plant, when firing on distillate oil, is set out in the Large Combustion Plant Directive (2001/80/EC) and is 120mg/Nm^3 @ 15% O_2 v/v. To comply with this emission level high quality demineralised water injection directly into the combustion chamber is employed. The evaporation of water requires heat which is then not available to heat the flame decreasing the flame temperature and reducing the amount of NO_x produced. A maximum demineralised water flow rate of 94 tonnes per hour (TPH) will be required in the combustion chamber of the gas turbine, as required, for water injection.

3.17.10 Auxiliary Boiler

Certain plant suppliers require the use of an auxiliary boiler, with a rating of approximately 5 MWth, to provide heat to the plant during start up periods from cold conditions. If an auxiliary boiler is required, frequency of use will be limited to 1 or 2 events per month and will last for a short duration, typically 2 to 3 hours. The auxiliary boiler stack will measure approximately 30 metres in height, in order to clear the height of adjacent buildings.

3.17.11 Water Treatment Plant

An on site water treatment plant will be required, where water for use in the HRSG will be demineralised to achieve a high purity. The water treatment process will consist of filtration, and a resin based treatment system. Approximately 0.5m^3 per hour of wastewater, generated by the regeneration process of the resins in the water treatment plant, will be discharged to the Process Water Discharge Pit as discussed in Section 3.19. Wastewater from the demineralisation plant comprises water containing the salts removed from the raw water or neutralised backwash of the resins from the demineralisation process. The pH of the wastewater will be maintained by acid or alkali addition, as required.

The raw feedwater to the water treatment plant, which is of drinking water quality, will continue to be supplied from the existing 9,500m^3 reservoir which in turn is supplied from the Wexford County Council supply.

The feedwater used in the HRSG will be thermally de-aerated to remove oxygen and chemically treated to prevent corrosion of the tubes and components of the water / steam cycle. Chemical dosing for pH control essentially alters the pH of the boiler water to a pH that prevents corrosion reactions. Oxygen scavenging and de-aeration combine to remove the dissolved oxygen from the boiler water which again prohibits corrosion.

A range of specialist chemical treatment options are available for boiler feedwater as follows;

- **Oxygen Scavenging**: Dilute Carbohydrazide ($CO(NHNH_2)_2$) or Hydrazine(N_2H_4)
- **pH Control**: Aqueous ammonia (NH_3)
- **Scale Inhibition**: Tri-sodium Phosphate(Na_3PO_4)

Waste water discharges are discussed in detail in Chapter 14 (Surface Water).

3.17.12 Electrical Transformer

The electrical power produced in the generating plant will be fed to a generator transformer where the voltage will be stepped up to 220 kV before being passed, via a buried underground cable, to the existing EirGrid switchyard. The electrical transformer is an outdoor, three phase unit of the oil immersed design. It is bunded and blast protected with a deluge system for fire protection. Power flows from the transformer to the existing transmission line network and onto the national grid.

The existing 220kV switchyard is currently operated, owned and maintained by EirGrid.

3.17.13 Emergency Diesel Generator

An emergency diesel generator will be provided to supply electricity to essential users in the event of an interruption to power supply. The generator will not operate under normal conditions, other than for short duration testing for a maximum period of 30 minutes per week.

3.18 Aqueous Discharges

The operation of the power plant is anticipated to produce the following waste water streams, all of which will be appropriately treated, as required in accordance with the revised IPPC licence, prior to discharge into the Barrow Estuary via a number of existing outfalls;

- Process Wastewater
- Surface water drainage
- Domestic sewage
- Cooling Water

Waste water discharges are discussed in detail in Chapter 14 (Surface Water).

3.18.1 Process Waste Flow Rates

The arrangement of the proposed water discharge system is provided in Figure 3.7: Site Drainage Plan and it is also outlined below.

3.18.1.1 Blowdown

In order to reduce the build up of salts in the HRSG drum, which remain in the drum once the water has evaporated off, it is necessary to continually “blow-down” approximately 1% of the total 500m^3/hr of circulating water (i.e. 5 m^3/hr).

Boiler blow-down will undergo the following processes:

- Release from the boiler to a flash vessel
- Release to a collection sump
- Collection in the process wastewater discharge pit. Refer to Section 3.19 (Process Water Discharge Pit)

On occasion there may be a requirement to increase the blowdown rate from the HRSG. This is an intermittent operation and last for a very short period of time, a typical flow rate is in the order of 45.5m^3/hr.

3.18.1.2 Water Treatment Plant Effluent Discharge

During the regeneration process approximately 0.5m^3/hr of effluent water is discharged from the water treatment plant which will be collected in the process water discharge tank.

3.18.1.3 Leaks and Sampling

Although not a normal flow rate, on occasion there will be some additional process discharges from the system to account for leaks and for boiler water sampling. A typical flow rate for this will be 1.05m^3/hr.

3.18.2 Surface Water Drainage

Surface water runoff will consist mostly of storm rainwater but with an allowance for spillages and wash water. Since this may become contaminated with oily substances in some areas, oil interceptors will be included at the downstream ends of proposed collection systems. The oil interceptors will also include a silt trap unit which will remove any excess silt or grit which may become entrained in the surface water. Once oils and silts have been removed, surface runoff will be discharged via existing outfalls. At conceptual design stage, it is assumed that the existing drainage system will be re-utilised as much as possible and that the existing invert levels and pipe capacities will allow this. When pipe capacities and levels are confirmed, it may become apparent that some re-design of the current proposal will be required.

3.18.2.1 CCGT Area

The CCGT area will use a new collection system to convey water to the existing system. The surface water will be treated via an oil interceptor and silt trap unit, before discharging to the estuary via an existing outfall.

3.18.2.2 AGI Area

Surface water runoff from the AGI area, and its access road, will also be conveyed by a new collection system and treated via a silt trap unit and bypass oil interceptor prior to discharge to the estuary via an existing outfall.

3.18.2.3 General Spillages and Washings

Cleaning products will be of a water based biodegradable nature, wherever possible, general plant washings will be discharged to the estuary via a hydrocarbon interceptor and silt trap. Compressor cleaning washings, which require the use of hazardous detergents, will be removed from site by an appropriately authorised waste contractor.

3.18.3 Foul Water System

There will be a domestic sewage flow element from the CCGT area but not the AGI site. A new collection system, separate from the surface water system, will be required to connect this to the existing foul collection system. A new sewage treatment system is proposed. As there will be no net increase in the number of persons employed at the Great Island site over the present manpower levels, it is not anticipated that flow rates will increase from those currently generated in the existing facility. Flows will be treated to a quality that will comply with allowable discharge standards prior to discharge to the estuary via an existing outfall.

3.19 Process Water Discharge Pit

The volumetric capacity of the new process water discharge pit will take into consideration the volumes associated with each of the following operational scenarios;

1. Holding the complete volume of water in the HRSG after a full hydro test - **500m^3**

2. Holding the complete volume of water from the HRSG when drained after prolonged operation and required for maintenance - **200m^3**

3. Holding the complete volume of water for normal continuous blowdown (5TPH) and intermittent blowdown (45TPH) and effluent discharge from the WTP (0.5TPH) for a period of 4h - **200m^3**

4. Holding the complete volume of water for normal continuous blowdown (5TPH) and effluent discharge from the WTP (0.5TPH) for a period of 36h -**198m^3**

It is considered that item 1 above would not be a valid basis to determine the volume of this pit as after the HRSG has initially been commissioned it should never again be subject to a full hydro test.

Therefore, from the above analysis it is proposed that the volume of the process discharge pit be a nominal **200m^3**.

The process waste water will be collected and treated in the below ground concrete discharge pit where the discharge will be pumped to outfall SW13. It will be necessary to relocate SW13 approximately 100 metres east of its current location to facilitate the proposed development.

3.20 Seawater Cooling System

A continuous flow of cooling water will be required to absorb heat from the steam turbine condenser and, depending upon the final design of the plant, from other heat exchangers associated with the proposed CCGT plant. Cooling water will be abstracted from the Barrow Estuary, in accordance with existing operations, utilising the existing water intake and outfall systems.

Cooling water will be screened by a mechanical screening system through a series of fixed, coarse screens and travelling fine screens, in order to remove debris from the cooling water prior to entering the pump chambers in the existing cooling water pumphouse.

The screened material will be washed periodically from the screens and collected, the washwater will be returned to the estuary.

The screened cooling water will be routed from the cooling water pumphouse to the steam turbine condenser and to the coolers of the closed cooling water system via a new culvert. The cooling water will then return to the estuary via the existing discharge channel.

Cooling water will be chlorinated by direct injection of Sodium Hypochlorite solution, as required, in order to control biological fouling of, and damage to, the condensers, principally by mussels which thrive in the conditions of fast flow encountered in cooling water systems. Chlorine concentrations in the cooling water discharge will be maintained at a maximum concentration of 0.5 mg/l Chlorine. It should be noted that use of biocides is currently very infrequent and this situation is unlikely to alter with the new CCGT plant.

3.21 Plant Structures

The development will include the new structures listed in Table 3.3 below. The dimensions provided are regarded as the maximum likely dimensions and may be reduced depending on the plant and equipment specification of the successful Tender.

Table 3.3: Dimensions of Main Structures

Name	Length (m)	Width (m)	Height (m)
Turbine Building	69.3	36.5	22.66
Heat Recovery Steam Generator	31.0	26.4	30.88
Electrical / Control Building	43.7	20.1	13.09
Main Stack	-	6.0 (I.D)	60
Auxiliary Boiler Building	18.7	14.7	16
Auxiliary Stack	-	-	30
Demineralised Water Storage Tanks	-	20 (I.D)	20.5
Water Treatment Plant	25.6	20.5	7.35
Acid and Alkali Storage Tanks	16	4	3.5
Gas Fuel Treatment Building	25.6	8.6	4.0

The structural design of the buildings will generally be of a structural steel framed design clad with profiled steel sheet wall and roof cladding. The sheeting will be of double skinned insulated construction. Internal walling of masonry will be adopted except where specific load carrying requirements necessitate the use of reinforced concrete walls. Where applicable the existing buildings will be completely refurbished and modified to suit the new plant.

For the main turbine building the wall cladding will be installed above a masonry dado wall, approximately two metres high.

Areas where spillage of chemicals, oil, or other corrosive material is likely will be provided with protective treatment / finish to prevent damage to the works.

The colour proposed for the principal structures has been selected to minimise visual impact, taking into account the colour of the existing power plant. In addition, a horizontal band detail, applied in a slightly contrasting colour to that used on the main power plant, is proposed to be applied to the larger structures. This will visually enhance the proposal by breaking up the overall mass of the larger structures associated with the power plant.

Hard finishes will be provided for the majority of floor areas throughout the power plant. These will provide durable surfaces that enhance the building environment and are easy to clean. Protective floor finishing will be provided to plant areas, switchrooms and ceramic tiling to toilets, kitchen areas and lockers / changing rooms. Areas where chemical or oil spillage may occur will be finished with chemical / oil-resistant materials. Industrial claddings will be factory finished according to the manufacturer's recommendations and specifications.

Roofs will be constructed of profiled metal decking on purlins spanning between rafters and will be flat or shallow pitched. Buildings will be single or two storeys with access gantries and walkways for access to plant and equipment. These will be constructed of stainless / galvanised steel open grating type flooring supported on steel beams and columns. The stack will be fabricated from painted insulated carbon steel.

External doors and escape doors will generally comprise metal flush doors and mild steel frames. Fire doors will comply with *BS 476-22:1987 - Fire tests on building materials and structures*.

3.22 Raw Materials Used

3.22.1 Primary Raw Materials

Primary raw materials for use in the proposed power plant include natural gas, distillate oil and water.

Natural gas is a clean fuel resulting in negligible emissions of Particulate Matter and Sulphur Dioxide. The main atmospheric pollutants relating to natural gas firing are therefore Nitrogen Oxides (NO_x).

Although the CCGT will normally be fuelled by natural gas, distillate oil storage and pumping facilities will also be provided. Distillate oil will be limited to a Sulphur content of 0.1%. The plant will only operate on distillate in the event of an interruption to gas supply and for short duration testing, estimated at approximately three hours per annum.

Raw untreated water, sourced from the Wexford County Council mains supply, will be stored in the existing 9,500m^3 service reservoir prior to treatment in the water treatment plant. The reservoir also holds capacity for fire fighting purposes, approximately 1,140m^3. An additional 500m^3 will be provided from the existing fire water storage tank. This volume is considered sufficient to meet the requirements of the National Fire Protection Association guidelines - NFPA 850: *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations.*

During normal operations the CCGT plant will require 6.5m^3/hr of raw feedwater when operating on natural gas. Where necessary, supply of water from the mains supply will take place during low demand periods in order to minimise any potential impacts on water supply in the area.

High purity demineralised water, used as feed water for the HRSG / Steam Turbine water-steam cycle, will be produced in the water treatment plant, and stored in a 6,000m^3 capacity on-site demineralised water storage tank prior to use. This capacity is sufficient to provide for 94m^3/hr injection water to the gas turbines for NO_x emissions control purposes while firing on distillate.

Cooling water, for condensing steam, will be abstracted from the Barrow Estuary, in accordance with existing operations, utilising the existing water intake and outfall systems. However the overall demand will be significantly reduced from the current maximum demand of 50,170/hr to approximately 20,000m^3/hr, when the CCGT is fully operation.

Water usage and waste water discharge are discussed in detail in Chapter 14 (Surface Water).

3.22.2 Secondary Raw Materials

Secondary raw materials include conditioning and seawater injection chemicals, coolants, laboratory smalls, cleaning products and oils and greases.

The use of conditioning chemicals will be optimised through controlled dosing. Conditioning and laboratory chemicals will be stored in a chemical store within the water treatment plant. The storage room will be provided with appropriate ventilation and temperature control. Drums and IBC's will be stored on drip trays / spill pallets. The store will be enclosed fully containing any spills within. A spill kit will be located in close proximity to the chemical store.

As required, conditioning chemicals will be transferred from the water treatment plant to replenish the dosing tanks located within the turbine hall. The transfer route will be kept clear of all obstacles to allow the safe transfer of chemicals. Dosing tanks will be fitted with level indicators and located within bunds. The contents of the drums will be transferred to the dosing tanks using dedicated filling pumps.

Sulphuric Acid (H_2SO_4) and Sodium Hydroxide (NaOH), for use in the water treatment plant, will be stored in 33m^3 bunded bulk chemical storage tanks. The Sulphuric Acid tank will be fitted with a vapour trap. Gases will vent through the trap media and exit the tank via a vent.

Oils and greases used for the lubrication of the main mechanical components will be stored in a designated bunded area within the stores building.

The generator will be filled with Hydrogen as a closed circuit cooling medium. The hydrogen will be topped up by small amounts using a bottle storage system, as required. Stocks of Hydrogen will be stored in an enclosed designated storage area in UN approved cylinders. The hydrogen system will be earthed and connections will be carried out by trained personnel only. Carbon Dioxide will be used on site for purging the generator of Hydrogen. The cylinders will be fitted with corrosion resistant leak proof valves. Leaks of gases and the ingress of air into the generator cooling system will be prevented through the use of seal oil at a pressure higher than that of the relevant gases.

A Nitrogen blanketing system will be employed to protect the internal surfaces of the HRSG from corrosion and to allow maintenance works to be carried out.

The use and selection of laboratory chemicals will be determined by the on-site monitoring requirements, however their use will be minimised, wherever possible. Cleaning products will be of a water based biodegradable nature, wherever possible. A hazardous detergent is however required for compressor cleaning. Hazardous compressor cleaning products will be segregated in a locked cabinet with limited access to prevent misuse. Compressor cleaning waste water will be disposed of off-site as hazardous waste.

All chemicals stored on site will be subject to a COSHH (Control of Substances Hazardous to Health) assessment and compliance with the requirements of REACH, i.e. *EC Regulation 1907/2006 for the Regulation, Evaluation, Authorisation and Restriction of Chemicals*. Chemicals will be managed in accordance with the HSA guidance document *Guidance for Downstream Users – Guidance for the Implementation of REACH, January 2008*. Final selection of bulk chemicals will be subject to an assessment of trace elements to ensure that they are within acceptable limits.

3.23 Construction Phase

3.23.1 Construction Phase Activities

Subject to planning permission being granted it is anticipated that construction will commence in the fourth quarter of 2010. Civil, mechanical, electrical works and commissioning of plant are expected to last for approximately 30 months. Construction activities are expected to peak between March 2011 and February 2012.

Construction activities will gradually phase over from predominantly civil activities to predominantly mechanical and electrical installation activities.

Construction phase activities will comprise the following main elements:

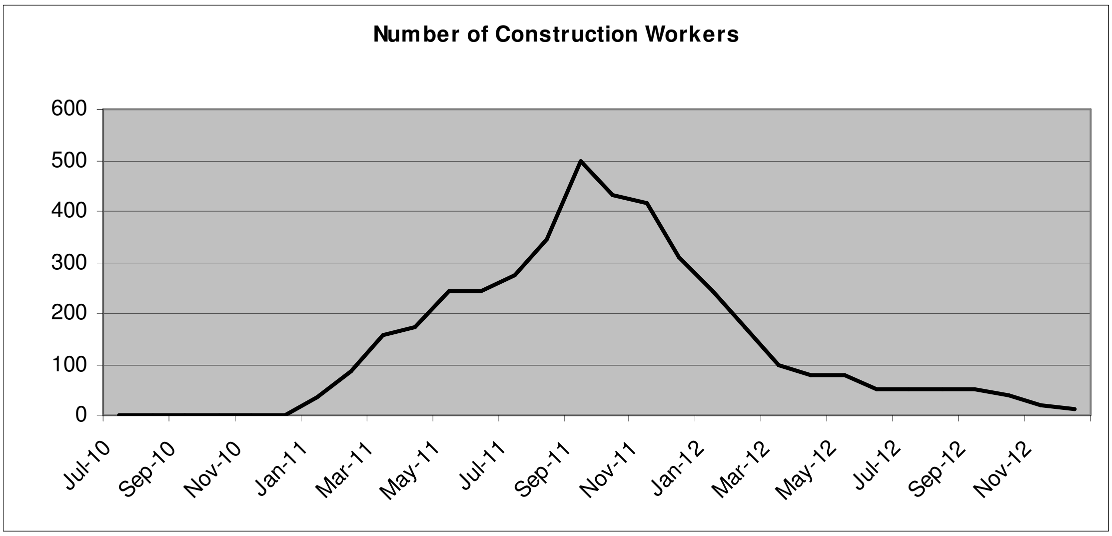
- Security Fencing and Access Control and Signage
- Site Survey and Geotechnical Investigation, as required
- Relocation / Removal of Existing Structures / Installations
- Site Preparation, Grading and Levelling
- Construction of all buildings, structures and equipment

3.23.2 Construction Staff and Facilities

It is anticipated that a maximum of 500 construction workers will be employed during the peak construction period. Temporary facilities will be provided within the proposed construction laydown area, which will measure approximately 2.26 hectares (5.6 acres) and will include portacabins, welfare facilities and laydown areas.

Figure 3.8 below illustrates the estimated peak construction period from March 2011 to February 2012.

Figure 3.8 Peak Construction Period



Normal working hours during the construction period are expected to be Monday to Friday 08:00 to 20:00 and Saturday 08:00 to 17:00. During certain stages of the construction phase it is expected that some work will have to be carried out outside of normal working hours, however this will be kept to a minimum. Construction works with a significant noise impact will be avoided outside of normal working hours.

Endesa proposes to utilise the existing functional jetty at the power plant, which is currently used for the delivery of bulk Heavy Fuel Oil, to deliver selected items of plant and equipment during the construction phase. These deliveries will not require any works on the foreshore. Heavy Goods Vehicles (HGVs) will access the site via the local road network. Due to the restrictive widths on the local road leading to the site it is proposed to implement traffic control measures, including the provision of a parking bay to restrict HGV movements to one-way traffic only. The proposed area is located in proximity to the junction with the R733 and has been leased by Endesa for the duration of the construction phase. The area extends approximately 110 metres in length and 4.5 metres in width. A stacking area for HGVs is also proposed within the boundaries of the existing power plant. The proposed parking bay is discussed in detail in Chapter 10 (Traffic).

3.23.3 Site Preparation

Prior to the commencement of construction activities the area for development will be fenced off. As the site is an existing operational power generation plant, and the topography of the site is relatively level, site clearance works will be minimal.

The topsoil layer will be cleared across the development site, as required. Where possible this material will be reused on site. If the material is considered unsuitable for reuse on site an outlet for off site reuse will be sought. If reuse is not possible the material will be removed to a licensed facility by licensed waste contractors for recycling or disposal, as appropriate.

Bulk soil, sub-soils or other material will be stored in designated areas only. Only uncontaminated material will be used onsite for the purpose of fill and site levelling, if required. During the civil construction works, the site boundary will be clearly marked with high visibility tape and the appointed contractor will not be permitted to use any areas outside the identified site boundary for any activity relating to construction.

In order to mitigate against the contamination of water by soil and sediment run-off it is proposed that a sediment trap will be installed on site during the construction phase. Water from the sediment trap will be discharged to the estuary via the existing drainage network.

A Construction and Demolition Waste Management Plan will be prepared and implemented in accordance with the *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Department of the Environment Heritage and Local Government (2006).* Impacts associated with soils, geology and groundwater during the construction phase of the development are discussed in Chapter 13 (Soils, Geology and Groundwater).

3.23.4 Construction Phase Site Management

Endesa will ultimately be responsible for the management of all commercial, operational and regulatory issues associated with the site during both the construction and operational phases of the development.

Endesa will employ a technically competent Contractor who will have responsibility for all aspects of day to day operations on site during construction. Construction activities have the potential to create a nuisance and cause disruption. In order to minimise the disruption caused, a Construction Environmental Management Plan (CEMP) will be developed and implemented. The CEMP will provide a framework for the management and implementation of construction activities incorporating the mitigation measures identified in the relevant chapters of this EIS, including dust and traffic control measures, a Construction and Demolition Waste Management Plan, a Sediment Management Plan and a Pest Control Programme. The CEMP will be reviewed regularly, and revised as necessary, to ensure that the measures implemented are effective.

3.24 Operational Phase

3.24.1 Operational Phase Site Management

Endesa will operate the proposed plant and will have responsibility for the day to day operation and maintenance of the plant as well as environmental monitoring and reporting. Endesa will have ultimate responsibility for all health, safety and environmental issues relating to the operation of the facility.

Existing staff will be maintained and trained in the operation of a CCGT plant. All major items of power generating plant will be covered by long term service agreements to ensure safe and efficient plant operations

As stated previously in this EIS, Endesa are a major utility in Latin America, Spain and Portugal with a combined output of 39GW. Of this 39GW, 16% is provided by CCGT technology. The company therefore has extensive experience in operating and maintaining this technology and also has experience in working with all of the manufacturers currently in the market. This experience ensures that Endesa have the appropriate knowledge in operation, environmental and safety systems thereby reassuring that the Great Island facility will operate in accordance with best practice.

3.24.2 Regulatory Control of the Facility

The facility will be regulated by the following authorities during the operational phase of the development:

- Environmental Protection Agency (EPA)
- Health and Safety Authority (HSA)

- Commission for Electricity Regulation (CER)

The facility will also have to operate within the provisions of a number of codes applicable to the electricity sector, such as the Transmission System Grid Code and Single Electricity Market Trading and Settlement Code. Legislative requirements are discussed in detail in Chapter 4 (Legislation).

3.25 Decommissioning of the Proposed Plant

Subject to the granting of planning permission it is anticipated that operations at the facility will commence in 2012, the plant is expected to be operational for 25 years. Upon cessation of activities the plant will either be redeveloped as a power generation facility or be redeveloped in an alternative form. Given the fact that the site includes an existing 220 kV substation and a water supply, and will be connected to a national gas supply, it is envisaged that the site will remain a power generating facility.

The following detail provides an indicative programme of works that will be implemented in the event of plant decommissioning to prevent environmental pollution:

- All plant equipment and machinery will be emptied, dismantled and stored under appropriate conditions until it can be sold. If a buyer cannot be found the material will be recovered or disposed of through appropriately authorised waste contractors and hauliers

- Plant services, including pipelines and cabling, will be decommissioned and disconnected to the boundary of the installation

- If plant, machinery and services are required to be cleaned on site prior to removal all necessary measures will be implemented to prevent the release of polluting substances

- All chemicals, fuel and waste will be removed from the facility. Unused chemicals will be returned to the supplier, where possible

- Waste will be recycled wherever possible. All waste movements, recycling and disposal operations will be controlled by appropriately authorised waste contractors

- The site and all associated buildings will be secured. All structures and plant will be removed and the site returned to a condition as close as possible to a Greenfield site. If buildings are to be retained, a maintenance programme will be implemented to ensure they do not decay or present an unacceptable health and safety risk

- All associated licences and permits will be surrendered

- An Aftercare Management Plan will be developed and implemented in agreement with the EPA and Wexford County Council

A revised detailed Residuals Management Plan will be developed and submitted to the EPA within six months of commencement of operations of the proposed development, or as otherwise agreed with the EPA, in accordance with *Guidance on Environmental Liability, Risk Assessment, Residuals Management Plans and Financial Provision, EPA (2006).* The plan will be reviewed annually as part of the Annual Environmental Report (AER). The Residuals Management Plan will include details of costings for the plan and a description of how these costs will be underwritten.

4. Legislation

4.1 Introduction

This chapter of the EIS describes the key legislative requirements relevant to the project during the planning application, construction and operational phases.

4.2 Planning and Development Acts

4.2.1 Regulatory Overview

The *Planning and Development Acts, 2000 to 2007* provide the primary statutory basis for obtaining planning permission. A series of secondary legislation is set out in the *Planning and Development Regulations 2001 to 2009* associated with the primary statutory requirements.

The *Planning and Development (Strategic Infrastructure) Act, 2006* (the Act) amends the *Planning and Infrastructure Development Act, 2000* to provide for the introduction of a more efficient planning consent procedure for certain strategic infrastructure developments allowing the application to be made to An Bord Pleanála (the Board) and not to a local planning authority.

The *Planning and Development Regulations, 2006 (S.I. No. 685 of 2006)*, which make provisions for strategic consent procedures associated with the Act, became effective in January 2007.

The types of infrastructure subject to the revised strategic development consent procedure are listed in Section 5 of the Act which generally relates to major energy, transport and environmental infrastructure projects.

Seventh Schedule (Section 5) developments include:

"*A thermal power station or other combustion installation with a total energy output of 300 megawatts or more*".

In order for a Seventh Schedule development to be considered strategic it must exceed the thresholds specified in Section 5 and satisfy one or more of the paragraphs outlined in Section 37A-(2) of the Act; namely - :

(a) The development would be of strategic economic or social importance to the state or to the region in which it would be situate

(b) The development would contribute substantially to the fulfilment of the objectives of the National Spatial Strategy or in any regional planning guidelines in force in respect of the area in which it would be situate

(c) The development would have a significant effect on the area of more than one planning authority

Under Section 37B of the Act, a prospective applicant is required to engage in pre-application consultation with the Board to determine whether or not planning permission can be applied for under the Act. Following consultation, the Board notifies the applicant in writing that, in the opinion of the Board, the project does or does not satisfy the provisions laid out in Section 37A-(2).

In accordance with Section 37E.-(1) of the Act, all Seventh Schedule strategic infrastructure development planning applications must be accompanied by an EIS.

Under the Act a prescribed number of copies of the planning application and EIS must be submitted to the relevant planning authority or authorities in whose area the proposed development would be situated. The planning authority then has 10 weeks to prepare a written submission to the Board on the environmental effects of the proposed development and the appropriateness of the development in relation to the planning and sustainable development objectives of the planning authority.

A prescribed number of copies of the planning application and EIS must also be submitted to the prescribed authorities. Submissions must be made within a specified timeframe, of not less than six weeks.

The application and EIS can also be inspected by the public within a specified timeframe of not less than six weeks, submissions and observations can be made within the same period. The Board will aim to make a decision eighteen weeks from the last day of receipt of submissions from the public. The Board may, at its discretion, choose to hold an oral hearing.

Following pre-application consultation meetings with An Bord Pleanála, on 24th June 2009, 1st October 2009 and 28th October 2009, it has been determined that the proposed development satisfies the conditions set out in Section 37A.-(1) and (2)(a) and (b) of the *Planning and Development (Strategic Infrastructure) Act*, 2006 for a Seventh Schedule development. A copy of the notice served by the Board confirming that the development comes under the remit of the Strategic Infrastructure Act is included in Appendix 1.1 (Strategic Infrastructure Notification).

As the Board has provided written notice to Endesa, subsequent to mandatory pre-application consultations, that the proposed development is a Strategic Infrastructure development, the planning application is being made directly to An Bord Pleanála.

4.3 European Directives and International Agreements

The following lists the key European Directives, Regulations and Agreements which apply to the proposed development. Specific regulations are listed under each relevant environmental topic in Chapter 8 – 17, as appropriate.

- EC Directive 85/337/EEC, as amended by Directives 97/11 and Article 3 of 2003/35/EC (commonly known as the Environmental Impact Assessment Directive);
- Integrated Pollution Prevention and Control Directive 96/61/EC, as amended by 2008/1/EC;
- Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants (the "Large Combustion Plant Directive", LCPD);
- Proposed Industrial Emissions Directive;
- Council Directive 96/82/EC on the control of major accident hazards involving dangerous substances as amended by Directive 2003/105/EC (Seveso II Directive);
- The National Emissions Ceiling (NEC) Directive 2001/81/EC;The Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) – Emissions Trading Scheme; and

- Greenhouse Gas Emissions Trading Directive 2003/87/EC.

4.3.1 Environmental Impact Assessment Directive

Under Directive 85/337/EEC (the EIA Directive), as amended, certain developments are subject to the requirements of an Environmental Impact Assessment (EIA). Article 3 of the EIA Directive outlines the requirements of an EIA:

"*The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case and in accordance with Articles 4 and 11, the direct and indirect effects of a project on the following factors:*

- *human beings, fauna and flora,*
- *soil, water, air, climate and the landscape,*
- *the interaction between the factors mentioned in the first and second indents,*
- *material assets and the cultural heritage"*

Article 5 of the EIA Directive concerns the information that is to be furnished to the competent authority by the developer. Member States are required to adopt measures to ensure that the developer supplies the information required under the Directive. "Developer" is defined in Article 1(2) as:

"*the applicant for authorization for a private project or the public authority which initiates a project*".

Pursuant to Article 5(2), the following information is mandatory:

- A description of the project comprising information on the site, design, and size of the project
- A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects
- The data required to identify and assess the main effects which the project is likely to have on the environment
- A non– technical summary

The proposed development is listed in Annex I of the EIA Directive and is therefore subject to an EIA i.e.

"*Thermal power station and other combustion installations with a heat output of 300 megawatts or more*".

In Ireland, the *European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006* and the *Planning and Development Regulations, 2000 to 2009* bring the EIA Directive into effect.

4.3.2 IPPC Directive

The IPPC Directive aims to prevent or minimise pollution from new and existing installations which come under the regime through an integrated licensing system. The IPPC Directive (96/61/EC) was transposed into Irish law under the Protection of the Environment Act, 2003. Directive 2008/1/EC codifies the original IPPC Directive 1996/61/EC.

The First Schedule of the Act describes the activities that require an IPPC licence including:

"Energy: The operation of combustion installations with a rated thermal input equal to or greater than 50 MW."

The competent authority for IPPC licensing is the Environmental Protection Agency (EPA). Prior to issuing a licence the EPA must be satisfied that the installation does not cause adverse effects on the environment.

An IPPC licence sets conditions and requirements in order to prevent or reduce emissions to air, water and land and limit waste and noise generated. Conditions on the prevention of accidents, efficient use of energy / resources and decommissioning of plant are also set. Under the regime the operator is obliged to employ Best Available Technique (BAT) technology and follow BAT guidance.

BAT guidance appropriate to the proposed development includes *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006), BAT Guidance Note on Best Available Techniques for the Energy Sector (Large Combustion Plants Sector), 2008* and *Reference Document on the Application of Best Available Techniques to Industrial Cooling Systems, (December 2001).*

Any significant changes to a licensed facility must be notified to the EPA in advance of any change taking place.

The existing power plant at Great Island currently operates under IPPC Licence Registration Number P0606-02. The existing licence will be required to be revised to include the proposed development. Endesa is in ongoing consultation with the EPA regarding the required IPPC licence amendments.

4.3.3 Large Combustion Plant Directive

The Large Combustion Plants Directive (LCPD) was adopted in 1988 and subsequently revised in 2001. The Directive applies to thermal plants with a thermal output of greater than 50 MW applying limits for emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x) and Particulate Matter (PM). The *Large Combustion Plants Regulations, 2003 (S.I. No. 644 of 2003)* transpose the LCPD into Irish law.

4.3.4 Proposed Industrial Emissions Directive

The European Commission (EC) recently undertook a review of the Integrated Pollution, Prevention and Control Directive (96/61/EC) and its implementation throughout the EU. The review determined that the key principles of the Directive provide a sound basis for the control of industrial emissions in the EU. However, the EC identified a number of shortcomings which have reduced the effectiveness of the Directive and resulted in lower than expected reductions in emissions across the EU. As a result the EC has proposed a Directive on Industrial Emissions which would replace and amalgamate the following Directives:

- Titanium Dioxide Directives (78/176/EEC, 82/883/EEC and 92/112/EEC on waste from the titanium dioxide industry);
- Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC);
- Volatile Organic Compounds (VOC) Solvents Directive (99/13/EC);

- Waste Incineration Directive (2000/76/EC); and
- Large Combustion Plants (LCP) Directive (2001/80/EC).

The proposed Directive on Industrial Emissions is likely to apply to combustion plants of a rated thermal input equal to or greater than 50 MW. Originally it was proposed that the Directive would apply to combustion plants with a rated thermal input of greater than 20MW, however, this is currently under review by the EC following significant political objections to the proposal.

In general, the proposed Directive will require that emission limits do not exceed the emission levels outlined in relevant BAT reference documents.

However, the Directive and associated legislation are currently under review by the EC and the provisions of the legislation are therefore subject to change.

4.3.5 Seveso II Directive

Council Directives 96/82/EC and 2003/105/EC (Seveso Directives) have been transposed into Irish law through the *European Communities (Control of Major Accident Hazards Involving Dangerous Substances), Regulations, 2006, (S.I. No. 74 of 2006)*. The regulations, commonly referred to as the Seveso Regulations, apply to facilities where dangerous substances are held in quantities above specified threshold limits as specified in Annex I, Parts 1 and 2, of the regulations. The Health and Safety Authority (HSA) is the competent authority under the Seveso Regulations.

A "major accident" is defined in the Regulations as "*an occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of the operation of any establishment, leading to a serious danger either to human health or to the environment, whether immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances".*

Operators of facilities which come under the regime are required to take all necessary measures to prevent and mitigate the effects of major accidents to human beings and the environment. The regulations impose certain planning restrictions both within and adjacent to a regulated facility thereby controlling development that is incompatible with operations.

The Seveso Directive applies at two levels: top-tier and lower tier. The levels are defined by threshold quantities of hazardous substances that are present. The power plant at Great Island is governed by the lower tier Seveso requirements dues to the quantity of distillate that will be stored on site. The distillate will be stored as a back-up fuel to be used in the event of the gas supply not being available. The distillate which will be stored at the power plant is classified as a Gas Oil Petroleum Product in the Seveso II Directive, which has lower and top tier thresholds of 2,500 and 25,000 tonnes respectively.

The proposed plant will store approximately 10,000 Tonnes of low sulphur distillate oil on site, in accordance with the requirements of Commission for Energy Regulation (CER) Decision Paper *CER/09/001, Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland*. Therefore the proposed development is considered to be a lower tier Seveso site.

In order to meet their general duties, operators of lower tier establishments are required to:

- Identify all major accident hazards and assess the consequences in terms of extent and severity of any such accident that may occur
- Provide and maintain:

- Safe plant
- Safe systems of work
- Safe means of access to / exit from all parts of the establishment

- Make arrangements for the safe handling of dangerous substances
- Provide the necessary information, instruction, equipment, training and supervision to ensure the occupational health and safety of people working at the establishment
- Use best practicable means to both prevent a major emission into the environment from uncontrolled developments and to render harmless and inoffensive any substances that might be released

The specific requirements are to:

- Notify the HSA at least six months prior to commencement of construction activities providing clearly defined details in relation to the operator, relevant dangerous substances, inventories, description of the activity and details of the immediate environment of the activity. Any significant changes to the facility must also be notified in advance
- Prepare and implement a Major Accident Prevention Policy (MAPP)
- Undertake specified actions in the event of a major accident event
- Maintain a register of notifiable incidents to be kept for minimum of 10 years

4.3.6 National Emissions Ceiling (NEC) Directive

The NEC Directive imposes limits on member states on emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOC's) and Ammonia (NH_3) to the levels specified in the Directive by 2010.

4.3.7 The Kyoto Protocol

The Kyoto Protocol sets mandatory emission limits for the reduction of Greenhouse Gas Emissions (GGE). Ireland is committed to limiting GGE to 13% above its 1990 levels during the period 2008-2012. The European Union Council of Ministers has recently committed to achieving a 20% reduction in emissions of 1990 levels by 2020. The Greenhouse Gas Emissions Trading Agreement facilitates the aims of the Kyoto Protocol.

4.3.8 Greenhouse Gas Emissions Trading Directive

Under Directive 2003/87/EC listed operators are allocated greenhouse gas emission allowances at the beginning of each year. If the operator does not meet their target they can buy or sell allowances within the EU. Combustion installations with a rated thermal input exceeding 20 MW are included in the scheme.

4.4 Electricity Regulation Act

Under Section 16 of the *Electricity Regulation Act, 1999 (S.I. No. 29 of 1999)*, an authorisation to construct is required from CER prior to commencing construction on a new generating station or reconstruction of an existing generation station. The criteria used to assess an application for an authorisation are specified in the *Electricity Regulation Act, 1999 (Criteria for Determination of Authorisations) Order, 1999 (S.I. No. 309 of 1999)*.

Under Section 14 of the Electricity Regulation Act all generators must obtain a generation licence from CER. Factors which may be considered in the evaluation of a licence application include the availability of sufficient appropriate financial, managerial or technical resources to ensure that the generator is able to comply with the terms and conditions that govern the electricity generation licence.

CER also has responsibilities regarding security of supply. In this regard secondary fuel supply requirements are imposed, as described in CER Decision Paper *CER/09/001, Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland*. Generating units that expect to operate in excess of 2,630 hours per annum are required to hold stocks equivalent to five days continuous running based on the unit's rated capacity on its primary fuel. Generating units that expect to operate less than 2,630 hours per annum are required to hold stocks equivalent to three days continuous running based on the unit's rated capacity on its primary fuel. A stock of approximately 10,000 Tonnes of distillate oil is determined to be sufficient to meet the necessary capacity requirements of the proposed development.

Endesa will participate in the Single Electricity Market, (SEM), in accordance with the *Electricity Regulation Act 1999 (Single Electricity Market) Regulations 2007*, the new wholesale electricity market for the island of Ireland. The rules of the market require that the output from plant is traded through the market pool. The market rules also encapsulate the structures by which generators bid their cost of operation and get paid for producing electricity and providing reserve capacity to the system.

The market is administered by the Single Electricity Market Operator, (SEMO) and regulated by the Single Electricity Market Committee, (SEMC). This committee includes representatives of the energy Regulatory Authorities in both jurisdictions, namely CER in the Republic of Ireland and the Northern Ireland Authority for Utility Regulation (NIAUR) in Northern Ireland, as well as independent members.

The market rules require that each unit bids its cost of production into the market on a daily basis. Bids must be based on the short run marginal cost of production, and include the costs of performing a start, which may vary depending on the warmth state of the unit, and the cost associated with operation that is independent of the unit output, termed no load cost. Each unit must also declare technical data such as the length of time it takes to start or change load, its minimum stable generation and maximum available output. The bids must be submitted by 10:00 on the day proceeding the trading day to which they apply, and apply across the duration of the trading day. The trading day runs from 06:00 on the first day to 06:00 on the following day.

The market price paid to generators varies on a half hourly basis, and is based on the marginal cost of production in a half hour period to meet demand for that trading period, such that the total cost of production across the trading day is minimised. The price is based on the commercial bids submitted by generators, the out-turn wind generation, unit availability profiles and the technical capabilities of all the generating units in the portfolio. A forecast production schedule is prepared by the central market computer system on the day prior to the trading day, to guide the dispatch of plant in real time. However, the out-turn data in terms of actual demand, unit availability and wind generation is used after the production day to set the market price

Under the new market structure generators are centrally dispatched, such that individual plant operators do not decide when to operate their plants, but must be instructed, or dispatched, by the Transmission System Operator (TSO). The TSO will dispatch units that are scheduled to produce electricity according to the forecast market schedule produced by the central market system. The TSO must also make provision for reserve, which provides the capability of rapidly increasing output to the electricity system, if required. The TSO will also adjust the dispatch schedule to meet variations in the real time demand, wind generation and unit availability profile, compared to those values used in the forecast. It should be noted therefore, that whilst the expected running profile of a generator unit can be projected one day in advance, a power plant operator has to be prepared to start a unit at any time.

4.5 Foreshore Act

Under the Foreshore Acts, 1933 to 2005, a foreshore licence must be obtained prior to the undertaking of any works or placing of structures or material on or for the occupation of or removal of material from State-owned foreshore.

The "foreshore", is defined in the 1933 Act as *the bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek and bay or any such river or estuary*. Subsequent amendments to the Act state that the foreshore *has the meaning as assigned to it by the Foreshore Act, 1933, but includes land between the line of high water of ordinary or medium tides and land within the functional area of the planning authority concerned that adjoins the first-mentioned land.*

In May 2009 the Government passed legislation which will transfer responsibility for granting Foreshore Licences from the Department of Agriculture, Fisheries and Food (DAFF) to the Department of the Environment, Heritage and Local Government.

Where a development is subject to the requirements of the *European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006* a copy of the environmental impact statement must be submitted with the Foreshore License application.

A foreshore lease was granted for Great Island generating station in 1968. Part of this area, which is currently in use as part of the existing activity on site, is proposed to be used for the development. Endesa has engaged in consultation with the Coastal Zone Management Division and have served a copy of this planning application to the Minister of the Environment Heritage and Local Government.

4.6 Water Framework Directive

The Water Framework Directive (2000/60/EC) was transposed into Irish law by the *European Communities (Water Policy) Regulations, 2003* as amended in 2005 and 2008. The Directive commits Member States to achieve Good Status in river, lakes, estuaries, transitional waters, coastal waters and groundwater by the year 2015.

The *European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009)* were adopted on 30th July 2009. The regulations:

- Give legal status to the standards and criteria being used by the EPA for classifying surface water quality in accordance with the ecological status of the Water Framework Directive requirements
- Give effect to the requirements of the Water Framework Directive to progressively reduce pollution to receiving waters for a list of 41 priority hazardous substances
- Prohibit discharges liable to cause water pollution, except where such discharges are subject to prior authorisation or general binding rules
- Establish environmental quality standards in surface water for a range of substances covered by the Dangerous Substances Directive (2006/11/EC)

4.7 Flood Risk Directive

The Flood Risk Directive (*Directive 2007/60/EC on the assessment and management of flood risks*) requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. A preliminary assessment to identify river basins and associated coastal areas at risk is required to be complete by 2011 with a requirement for flood risk maps to be drawn up by 2013. Flood risk management plans are required by 2015. The competent authority for the implementation of the requirements of the Floods Directive in Ireland is the Office of Public Works (OPW). The Directive is expected to be transposed into Irish law by December 2009.

4.8 Habitats Directive and Birds Directive

An Appropriate Assessment (AA) is required under Article 6 of the Habitats Directive (*Council Directive 92/43/EEC*) where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are sites designated as ecologically important areas (Special Areas for Conservation - SAC) under the Habitats Directive or Special Protected Areas (SPA) under Council Directive 79/409/EEC on the conservation of wild birds, commonly referred to as the Birds Directive.

Under Article 6(3) of the Habitats Directive all plans and projects which either by themselves or in combination with other plans or projects, are likely to have a significant effect on a Natura 2000 site (SACs or SPAs protected under the Habitats Directive or the Birds Directive) shall be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives.

This means that such plans and projects are subject to a screening process, where existing documentation is used to assess whether they are likely to have significant adverse effects on a Natura 2000 site. If such effects can be ruled out, a detailed appropriate assessment is no longer required. The reasoning for the decision must however be adequately documented. In all cases, it is immaterial whether the plan or project in question has a direct effect on components of a Natura 2000 site or affects them indirectly from elsewhere. If uncertainties remain to as whether significant adverse effects can be completely ruled out, an appropriate assessment must be performed to provide clarity. Strict adherence to the precautionary principle is required when conducting the assessments so that the mere likelihood of significant adverse effects gives rise to an obligation to conduct a full appropriate assessment.

5. Planning and Policy Context

5.1 Introduction

This chapter of the EIS presents the Planning and Policy context of the proposed development. The information presented in this chapter has been sourced from the following documents:

- Department of Environment, Heritage and Local Government, *National Spatial Strategy for Ireland 2002 – 2020 People, Places and Potential,* November 2002
- Department of the Taoiseach*, National Development Plan 2007 – 2013, Transforming Ireland, A Better Quality of Life for All,* January 2007
- Department of Communication, Marine and Natural Resources, *Energy Policy Framework 2007 - 2020 (Delivering a Sustainable Energy Future for Ireland)*, March 2007
- Department of Environment, Heritage and Local Government, *National Climate Change Strategy 2007 – 2012,* April 2007
- Department of Arts, Heritage, Gaeltacht and the Islands, *National Heritage Plan*, April 2002
- Department of Arts, Heritage, Gaeltacht and the Islands, *National Biodiversity Plan*, April 2002
- Department of Environment, Heritage and Local Government, *Sustainable Development – A Strategy for Ireland)*, 1997
- Department of Environment, Heritage and Local Government, *The Planning System and Flood Risk Management Consultation Draft Guidelines for Planning Authorities*, September 2008
- Department of the Taoiseach, *Towards 2016; Ten Year Framework Social Partnership Agreement 2006-2015*, June 2006
- South East Regional Authority*, South East Regional Planning Guidelines 2004,* May 2004;
- South Eastern River Basin District, *Draft River Basin Management Plan for the South Eastern River Basin District,* December 2008
- Wexford County Council, *Wexford County Development Plan 2007 – 2013*, April 2007
- Kilkenny County Council, *Kilkenny County Development Plan 2008 – 2014*, June 2008
- Waterford County Council, *Waterford County Development Plan 2005 – 2011*, July 2005
- Waterford County Council, *County Waterford Climate Change Strategy 2008 – 2012*, 2008

National Context is discussed in Section 5.2, Regional Context is discussed in Section 5.3 and Local Context is discussed in Section 5.4.

5.2 National Context

5.2.1 National Spatial Strategy 2002 - 2020

The National Spatial Strategy (NSS) for Ireland is *"a twenty year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions"*.

To facilitate balanced regional development the NSS proposes that areas of sufficient scale and critical mass will be built up through a series of gateways and hubs.

Waterford City has been designated as a gateway by the NSS, and will be supported by the 'hub' settlements of Kilkenny and Wexford. Together, these three settlements will form a nationally strategic "growth triangle". It is anticipated that the gateways and supporting hubs will strengthen smaller towns and rural areas within their sphere of influence.

The populations of Kilkenny and Wexford town were 20,735 and 17,235 respectively in 2002, rising to 22,179 and 18,163 respectively in 2006. The population of Waterford city increased from 44,594 to 45,748 between 2002 and 2006.

The need for additional generating capacity to augment the grid due to accelerated growth in Ireland is highlighted in the NSS. The NSS emphasises that linkages in terms of transport, communications and energy networks are critically important to allow places and areas to reach their potential and promote balanced regional development.

The NSS outlines that physical networks of infrastructure such as roads, public transport, energy and communications are of particular relevance, because they have a spatial impact and can also influence the location, timing and extent of development. It is also highlighted in the NSS that reliable and effective energy systems, such as gas and electricity, are key prerequisites for effective regional development.

Prime considerations outlined in the NSS in terms of spatial policies relating to energy include;

- Developing energy infrastructure on an all-island basis to the practical and mutual benefit of both the Republic and Northern Ireland
- Enhancing both the robustness and choice of energy supplies across the regions, through improvements to the national grids for electricity and gas

5.2.2 National Development Plan 2007 - 2013

The *National Development Plan 2007 - 2013* is a blueprint for the economic and social development of Ireland until 2013. A key objective of the plan is to promote balanced regional development. The NDP builds on the previous plan which identified the need for a National Spatial Strategy to promote regional development in Ireland through the designation of a number of development corridors as Gateways and Hubs in individual regions. Gateways and hubs have been designated to act as development growth areas that will be promoted in terms of infrastructure and investment to act as economic drivers for their region.

The NDP's Energy Programme will encompass approximately €8.5 Billion in investment in energy over the plan period. In relation to energy infrastructure, the overall strategic objective of the NDP is to ensure security of energy supply nationally and regionally, which is competitively priced, in the long term while meeting a high level of environmental standards. Security of supply is considered of vital importance to ensuring the continued economic development of the country. The NDP states that efficiency in the use of energy must also be improved. The management of energy demand is discussed in the plan and it is estimated that energy demand is projected to increase by 1.6% per annum up to 2013 while annual electricity demand is expected to grow by 3.1%, (it should be noted however that EirGrid, the national independent electricity Transmission System Operator (TSO), has recently revised their forecasts figures due to the deteriorating economic situation in Ireland. The latest estimates from EirGrid suggest a 4-5% decrease in Total Electricity Requirement in 2009 with a further fall of 0.9% in 2010. EirGrid anticipates that demand is to recover slowly to 2008 levels by 2012 - 2014).

The NDP states that the infrastructure investments required in the energy sector are of critical national strategic importance and they will help the sector's ability to ensure security of energy supply and overall economic sustainability. The following infrastructure developments are envisaged to be implemented over the period of the plan:

- Interconnection
- Market integration
- Network extension
- Storage for greater security of supply

5.2.3 Energy Policy Framework 2007 - 2020 (Delivering a Sustainable Energy Future for Ireland)

Security of supply is identified as being vitally important for the Irish economy in the Government White Paper entitled *Energy Policy Framework 2007 - 2020*. The paper emphasises the necessity for robust electricity networks and electricity generating capacity to ensure consistent and competitive supply of energy.

The Government supports the case for a process of structural change in the energy market and a key policy objective is the enabling of competition and delivery of consumer choice through structural change. In light of this objective the Asset Strategy Agreement (ASA) was entered into between Commission for Energy Regulation (CER) and ESB in April 2007 for the sale of certain ESB power stations (including Great Island power plant), with the objective to reduce ESB's dominant market share and promote competition for the benefit of the end customer. The CER-ESB ASA is discussed in detail in Chapter 2 (Background to the Project).

The paper also highlights the need for additional electricity generating capacity and improved availability of existing generating stations stating:

"Achieving an adequate safety margin between electricity supply and demand requires additional generating capacity including flexible plant and significantly higher standards of generating plant availability, as well as more interconnection….We will ensure that the strategic network development approach is underpinned by coordinated local, regional and national approaches to issues, which balance local interests with the national imperative to deliver strategic energy infrastructure. This approach will be supported by the new arrangements provided for in the Planning and Development (Strategic Infrastructure) Act 2006".

In order to ensure security of energy supply, the Governments objective is to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption.

Strategic Goals outlined in the *Energy Policy Framework 2007 - 2020* in relation to security of energy supply include:

- Ensuring that electricity supply consistently meets demand
- Ensuring the physical security and reliability of gas supplies to Ireland
- Enhancing the diversity of fuels used for power generation
- Being prepared for energy supply disruptions

The Government White Paper highlights that Ireland has a well developed framework to ensure the adequacy of gas supplies and transportation infrastructure into the country with substantial investment in the transmission network and the new pipelines in recent years. The Paper states that natural gas will continue to play a vital role in the Irish fuel mix and the future use of oil in electricity generation could feature in terms of dual firing capability of gas fired plants.

5.2.4 National Climate Change Strategy 2007 - 2012

The predicted impacts of climate change in Ireland are outlined in the *National Climate Change Strategy 2007 - 2012*. It is recognised in the Strategy that Ireland cannot, on its own, prevent or ameliorate the impacts of climate change. However, the National Climate Change Strategy states that Ireland must meet its responsibilities with regard to reducing Carbon Dioxide (CO_2) emissions in partnership with the EU and the global community.

In relation to energy supply the climate change strategy identifies the following objectives:

- 15% of electricity will be generated from renewable sources by 2010 and 33% by 2020
- Biomass will contribute up to 30% of energy input at peat burning power plants by 2015
- Support for Combined Heat and Power projects
- Development of a National Ocean Energy Strategy

The Strategy highlights that the efficiency of electricity generation will continue to be improved in line with recent trends to commission additional high-efficiency gas fired power plants to displace less efficient generating capacity. In relation to gas transmission and distribution, it is stated in the Strategy that the natural gas network will continue to be extended over the 2008 - 2012 period, where it is cost-effective and economic to do so.

5.2.5 National Heritage Plan 2002

The National Heritage Plan sets out a strategy for the protection and enhancement of Ireland's national heritage. The key objective of the Plan is to protect the national heritage as well as promoting it as a resource to be enjoyed by all.

The National Heritage Plan recognises that the pace of economic activity and development in Ireland has accelerated dramatically over recent years and it is recognised that the achievement of balanced economic growth, in accordance with the principles of sustainable development, is of vital importance in the protection of our heritage. The plan highlights that the challenge to heritage posed by economic activity is significant and will continue to increase. However, the plan also highlights that development can proceed in a manner that is sensitive to the demands of both our heritage and of economic investment.

The National Heritage Plan states that the impact on heritage of prescribed projects in all sites of national heritage importance should be assessed.

5.2.6 National Biodiversity Plan 2002

The overall objective of the National Biodiversity Plan is to secure the conservation, (including where possible) the enhancement, and sustainable use of biological diversity in Ireland and to contribute to conservation and sustainable use of biodiversity globally.

The National Biodiversity Plan recognises that conservation and enhancement of biological diversity is essential for sustainable development, and for maintaining the quality of human life. All sectors and actors are responsible for advancing the conservation of biological diversity in their respective areas. A key target of the Plan is to halt biodiversity loss by 2010.

The Planning and Development Act 2000 (as amended) provides that Development Plans must have mandatory objectives for the conservation of European and nationally important sites and for the conservation of biodiversity in general.

5.2.7 Sustainable Development – A Strategy for Ireland (1997)

Sustainable Development is defined by the Brundtland Commission as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

Sustainable development relates to the balance between economic growth and preserving the natural environment. It aims to improve the quality of life through sustained economic growth, while supporting social progress and protecting the environment.

The aim outlined for Ireland in *Sustainable Development – A Strategy for Ireland (1997),* was "*to ensure that economy and society in Ireland can develop to their full potential within a well protected environment, without compromising the quality of that environment and with responsibility towards present and future generations and the wider international community".*

The principal goals and polices defined in the Strategy aim to inform the development and delivery of policies and programmes in the area of environmental protection and sustainable development. The integration of environmental considerations into other policy areas is considered a key means of securing balanced development.

The Strategy states that action will be continued to reduce emissions of Sulphur Dioxide (SO_2) and Nitrogen Oxides (NO_x) from power generation. These actions include fuel substitution, energy conservation and installation of low-NO_x burners.

5.2.8 The Planning System and Flood Risk Management Consultation Draft Guidelines for Planning Authorities

In accordance with the above mentioned guidelines, issued by the Department of Environment Heritage and Local Government, developers are required, at site-specific level to examine their development proposals to determine whether there have been instances of flooding or potential for flooding on specific sites. The Guidelines state that the relevant planning authority should be consulted at an early stage regarding any flood risk assessment issues that may arise. It is also specified in the Guidelines that a site-specific flood risk assessment, should be carried out, as appropriate, with regard to the minimisation of flood risk.

5.2.9 Towards 2016: Ten Year Framework Social Partnership Agreement 2006 – 2015

"Towards 2016" outlines a number of key objectives for economic and social development in Ireland during the next ten years.

In relation to energy, "Towards 2016" recognises that *"it is imperative for a modern competitive economy to have reliable, secure and competitively priced energy available to it. Long-term actions and decisions regarding the energy sector must also be sustainable from an environmental perspective in order to provide safeguards for future generations."*

Energy policy aims outlined in the paper include security of energy supply, environmental sustainability and economic competitiveness. Key priorities for energy policy identified in "Towards 2016" include:

- The delivery of critical energy infrastructure
- The expansion of the contribution of renewable energy
- The progression of structural changes in the energy sector
- An improvement in energy efficiency and demand management across all sectors to address fuel poverty

5.3 Regional Context

5.3.1 South East Regional Planning Guidelines

The South East Regional Planning Guidelines 2004 (RPG's) have been prepared in accordance with the NSS. It is intended that RPG's will strengthen local authority development plans, addressing issues such as settlement, transportation, industrial development, community facilities and environmental protection.

To support sustainable development and efficient energy utilisation, the RPG'S state that local authorities in the south east region will recognise and support all energy source providers in the development of a suitable network in the south east region capable of sustaining the scale of development proposed for the region.

It is an objective (B10) of the RPG's to support the development and improvement of key economic infrastructure such as energy generation and transmission networks and telecommunications, which are considered essential for the continued development of the region.

The RPG's note that "*the region has significant capacity to provide much of its own energy through expansion of the existing Great Island power station and comprehensive provision of alternative energy sources such as wind".*

5.3.2 Draft Regional Planning Guidelines for the South East Region 2010 - 2022

The South East Regional Authority is currently preparing new Regional Planning Guidelines for the south east region for the period 2010 to 2022. These Guidelines are expected to be published in draft form in October 2009. It is anticipated that the final version of the Guidelines will be adopted in early 2010.

5.3.3 Draft River Basin Management Plan for the South Eastern River Basin District

The Water Framework Directive (WFD) establishes a legal framework for the protection, improvement and sustainable management of inland surface waters, transitional waters, coastal waters and groundwater. The aim of the WFD is to prevent deterioration in the existing status of waters, including the maintenance of "High Status" where it exists, and to ensure that all waters, with some limited exceptions, achieve at least "Good Status" by 2015. In accordance with the objectives of the WFD eight River Basin Districts (RBDs) have been established on the island of Ireland for the co-ordinated management of water resources through the development and implementation of River Basin Management Plans (RBMPs). The proposed development site is located in the South Eastern River Basin District (SEBD).

The Draft River Basin Management Plan for the SEBD highlights that regional planning guidelines, county development plans and local area land-use and spatial plans should take account of the objectives established for waters in river basin management plans; thereby ensuring that new projects consider the objectives of the WFD.

Chapter 14 (Surface Water) assesses discharges from the proposed development with due regard to the objectives of the WFD and the Draft River Basin Management Plan for the SERBD.

5.4 Local Context

5.4.1 Wexford County Development Plan 2007 - 2013

Wexford County Development Plan 2007 - 2013 sets out Wexford County Council's strategy for the future development of the county over the period of the plan and includes measures for the conservation and improvement of the natural and physical environment and the provision of infrastructure. The Plan aims to accommodate the need to protect the environment with the demand for necessary development to meet the needs and aspirations of the people of *County Wexford. Wexford County Development Plan 2007 - 2013* was prepared in accordance with national and regional policy and takes cognisance of development plans of adjoining Local Authorities.

The NSS designates Wexford town as a hub and the County Development Plan, in its settlement strategy, designates Wexford town as a "Primary Growth Area". The settlement strategy designates Campile, the nearest settlement to Great Island in County Wexford, as a Strategic Growth Area. The plan also highlights that future development in Strategic Growth Areas will utilise and underpin the existing road and rail network.

The County Development Plan makes no specific reference to power generation or power generation sites. However, in terms of economic development, the plan recognises the importance to County Wexford of connecting to the national gas network. It is the intention of Wexford County Council to pursue this as an objective with Bord Gáis and other agencies. Additionally, it is the policy of the development plan to encourage economic development in a sustainable manner in order to create employment opportunities for all sectors of the community.

According to the Landscape Character Assessment for Co. Wexford, the proposed development site at Great Island is located within Policy Area 3 – Coastal – East Coast. Polices for this area include:

- Encourage development that will not have a disproportionate effect on the existing character of the coastal environment in terms of location, design, and visual prominence

- Encourage development that will not interrupt or penetrate distinct linear sections of primary ridge lines and coastlines when viewed from areas of the public realm

- Preserve any areas that have not been subject to recent or prior development and have retained a dominantly undisturbed coastal character

5.4.2 Waterford County Development Plan 2005 - 2011

The proposed development site is located at the confluence of the River Suir and the River Barrow on the shores of Waterford Harbour. The nearest area of settlement is at Cheekpoint, which is located to the south of the confluence in County Waterford. Due to the proximity of the proposed development site to County Waterford, the policies and objectives of *Waterford County Development Plan 2005* were considered.

Waterford County Development Plan is a six-year development Plan for the County that sets out Waterford County Council's planning policy for the county for that period. It is an objective of the development plan to facilitate the provision of infrastructure within the County including transport, energy and communication facilities, water supplies, waste recovery and disposal facilities, waste water services, and ancillary facilities.

5.4.3 Kilkenny County Development Plan 2008 - 2014

The County Kilkenny border is located to the west of the site across the River Barrow. As the proposed development site is located in proximity to County Kilkenny, the policies and objectives of *Kilkenny County Development Plan 2005* were considered.

The *Kilkenny County Development Plan 2008 - 2014* sets out Kilkenny County Council's policies and objectives for the proper planning and sustainable development of the County from 2008 to 2014.

It is the aim of the development plan, through the efficient management of a wide range of engineering services and infrastructure, to provide for the sustainable social and economic development of the county.

In support of sustainable development and efficient energy utilisation, Kilkenny County Council supports the infrastructural renewal and development of electricity networks in the region.

5.4.4 County Waterford Climate Change Strategy 2008 - 2012

The County Waterford Climate Change Strategy emphasises that Local Authorities have significant influence over emissions in their local areas, in relation to reducing emissions through their own energy use and procurement activities, and in raising awareness and stimulating action in local communities.

In terms of energy use, the Strategy states that Waterford County Council will *set targets to reduce energy consumption in buildings and through operation of plants and equipments*. It is also an objective of the Strategy to maximize opportunities for the generation of heat and electricity from renewable energy sources.

6. Scoping and Consultation

6.1 Introduction

Consultation is an important element of the Environmental Impact Assessment (EIA) process. This chapter of the EIS has been prepared in order to record the consultation carried out in respect of the proposed development.

Endesa has carried out extensive consultation in relation to the proposed development with various stakeholders, including members of the public, local residents, businesses, institutions, representative organisations, statutory bodies and bodies with environmental responsibility and interest. A scoping exercise was undertaken in order to encourage stakeholder input to the EIA process. The objective of consultation is to ensure that the views and concerns of all stakeholders are taken into account in the EIA process.

This chapter outlines the consultation initiatives undertaken by Endesa and the design team prior to the application to An Bord Pleanála and the main issues identified during this process. Public participation will continue right through the planning process and for the life of the project.

6.2 Preliminary Consultation

The EIS scoping exercise represented the beginning of the environmental assessment for the conceptual design. The purpose of the scoping exercise was to establish the scope and methodology for the EIS and to provide the public, relevant bodies with environmental responsibility and other interested parties with information on the proposed development and to invite their input to the EIA process.

Where the potential for significant effects was identified, detailed consultation with key stakeholders was undertaken. Consultations progressed in line with the developing project design and iterative environmental impact assessment process.

Consultation with a number of key stakeholders took place in 2009 under the direction of Endesa and the project team in order to ensure that the concerns of stakeholders were considered and addressed during the design process. Consultations were carried out by means of written correspondences, meetings, open days and telephone conversations.

6.3 EIS Scoping Consultation

In July 2009, a scoping report outlining the proposed approach to the EIA was prepared to facilitate consultation with statutory consultees regarding the scope of the EIS. The following parties were sent copies of the scoping reports, invite letters (inviting parties to request copies of the scoping report and to comment on the proposal) or information letters (notifying parties of the proposal and inviting them to request further information and to submit comments):

Local Authorities

- Waterford City Council
- Waterford County Council
- Wexford County Council
- Kilkenny County Council

Government Departments

- Department of Communications, Energy and Natural Resources
- Department of Justice, Equality and Law Reform
- Department of Environment, Heritage and Local Government
- Department of Enterprise, Trade and Employment
- Department of Transport
- Department of Agriculture, Fisheries and Food
- Department of Community, Rural and Gaeltacht Affairs
- Department of Arts, Sport and Tourism

Regional Authorities

- Health Service Executive - South (Kilkenny, Waterford, Wexford)
- South East Regional Authority
- Eastern Regional Fisheries Board
- Southern Regional Fisheries Board

State / Semi-State Organisations

- An Bord Pleanála
- Health Services Executive Headquarters
- Environmental Protection Agency
- Commission for Energy Regulation
- National Roads Authority
- Office of Public Works
- National Parks and Wildlife Service

- Geological Survey of Ireland
- Fáilte Ireland
- Health and Safety Authority
- Heritage Council
- Irish Aviation Authority
- Sea Fisheries Protection Authority Head Quarters
- Sea Fisheries Protection Authority Waterford Office
- An Garda Síochána
- Bord Iascaigh Mhara
- Central Fisheries Board
- Marine Institute
- Teagasc
- Sustainable Energy Ireland
- Iarnród Éireann
- Comhar Sustainable Development Council

National Special Interest Groups

- An Taisce
- ENFO
- Badgerwatch Ireland
- Birdwatch Ireland
- Bat Conservation Ireland
- Irish Farmers Association
- National Museum of Ireland
- Radiological Protection Institute of Ireland
- Irish Whale and Dolphin Group
- Irish Wildlife Trust

Companies

- Bord Gáis Éireann
- Eircom
- Electricity Supply Board (ESB)
- Waterford Airport
- Port of Waterford

Endesa and / or the project team met with the following stakeholders prior to submission of the planning application.

Table 6.1: Stakeholder Consultation Meetings

Stakeholder
Cheekpoint Community Alliance
Waterford County Council
Wexford County Council
Kilkenny County Council
Health Service Executive
Southern Regional Fisheries Board
An Bord Pleanála
Environmental Protection Agency
Commission for Energy Regulation
National Parks and Wildlife Service
Health and Safety Authority
Iarnród Éireann
An Taisce
Irish Farmers Association
Bord Gáis Éireann
Electricity Supply Board (ESB)
Port of Waterford

6.4 Public Consultation

Two public open days were held in order to inform the local population of the proposed development and invite comments. The open days were held on 7th September 2009 in the Reading Room at Cheekpoint and on the 8th September 2009 in Horeswood GAA Club.

Invitations to the open days were issued to members of the public by means of newspaper advertisements as detailed below:

- Munster Express, advertised on 4th September 2009
- Waterford News and Star, advertised on 3rd September 2009
- New Ross Echo, advertised on 2nd September 2009

- New Ross Standard, advertised on 2nd September 2009

Preliminary site layout drawings and photomontages of the proposed development were on display during the open days with members of Endesa, ERM and Mott MacDonald Ireland project management teams on hand to answer queries. The open days were well attended by local residents and representatives. While the majority of attendees expressed support for the proposal there were some concerns with regards to visual impacts, noise and vibration, air emissions and traffic. Attendees also expressed interest in the details regarding the route of the gas pipeline and the number of jobs that the project would create. A copy of the brochure presented at the public consultation is presented in Appendix 6.1 (Public Consultation Brochure).

6.5 Findings of the Consultation Process

Written responses to the scoping exercise are provided in Appendix 6.2 (Responses to Scoping Consultation). A summary of the concerns raised to date during stakeholder consultation is provided in Appendix 6.3 (Summary of Responses).

6.6 Post Application Public Consultation

This EIS accompanies a Strategic Infrastructure planning application for the proposed development.

The planning application and the EIS for the proposed development may be inspected free of charge or purchased on payment of a specified fee by the public at the following locations:

- The Offices of An Bord Pleanála, 64 Marlborough Street, Dublin 1

- The Offices of Wexford County Council, County Hall. Spawell Road, Wexford

The full application may also be viewed / downloaded on the following website:

www.greatislandpowerproject.com

Submissions or observations may be made only to An Bord Pleanála at 64 Marlborough Street, Dublin 1 within a specified timeframe, of not less than six weeks.

A prescribed number of copies of the planning application and EIS must also be submitted to the prescribed authorities.

An Bord Pleanála may, at its discretion, hold a public oral hearing in relation to this planning application. As well as writing to An Bord Pleanála as outlined above, members of the public can attend the oral hearing and those who have made a submission may express their views to the An Bord Pleanála inspector.

7. EIA Methodology

7.1 Introduction

This EIS sets out the findings of an Environmental Impact Assessment (EIA) of the likely significant effects associated with the construction and operation of the proposed power plant at Great Island.

7.2 Methodology and Approach

7.2.1 EIA Methodology

7.2.1.1 Overview

This section sets out the framework principles of the methodology that has been applied during the EIA process. The framework methodology that is used is broadly consistent across all chapters and has been adopted and adhered to as much as possible, in order to ensure that the assessment methodology is transparent and can be effectively communicated to, and understood by all stakeholders including the general public.

The general principles set out in this section have been developed to a greater level of detail by each of the environmental specialists. For this reason, more detailed, topic-specific methodologies are outlined in relevant chapters of this EIS.

The framework methodology used in this EIS comprises the following steps:

- Definition of the study area
- Date collection, baseline description and evaluation
- Identification of potential environmental impacts
- Definition of mitigation measures to minimise potential impacts
- Description and evaluation of the residual impacts once the mitigation measures have been implemented

This EIS has been prepared in accordance with the following EPA documents:

- *Guidelines on the Information to be contained in Environmental Impact Statements*, EPA (2002)
- *Advice Notes on Current Practice in the preparation of Environmental Impact Statements*, EPA (2003)

7.2.1.2 Scoping

The scoping stage of any EIA process is carried out on an ongoing basis to identify significant environmental issues to be examined as part of the EIA. The scope of the EIA is determined in consideration of any legal requirements and the findings of any consultation undertaken. The consultation that has been carried out for this project and key findings in this regard are described in detail in Chapter 6 (Scoping and Consultation). Key legislative requirements relevant to the proposed development are described in Chapter 4 (Legislation).

With respect to the temporal scope of the EIA, the construction phase of the project is anticipated to commence in late 2010 and last for approximately 30 months. Construction impacts, including mechanical and electrical works and commissioning, are therefore assumed to occur during this period. It is anticipated that the CCGT plant will be commissioned in late 2012. Therefore, for the purpose of this EIS, the potential for impacts to occur during the operation of the development is assessed from 2012.

7.2.1.3 Defining the Study Area

A 'study area' has been defined, as appropriate, for each environmental topic. The defined study area encompasses all locations that may potentially be impacted upon by the proposed development. Impacts may occur during the construction phase or the operational phase and may be temporary or permanent, positive or negative.

For a development such as that proposed at Great Island the study area typically encompasses an area of between 100 and 500 metres around the proposed development. Depending on the local situation these dimensions may be increased (e.g. for long range impacts such as traffic, which may spread along a transport network and / or impacts on landscape views or atmospheric emissions). The extent of the study area may also be restricted to the immediate development area for example archaeological features will typically only be affected if they are in direct proximity to the proposed development.

7.2.1.4 Data Collection, Baseline Description and Evaluation

The data collection requirements for each environmental topic have been determined by the technical specialists and are driven by relevant legislation, guidelines and policy requirements.

Desktop reviews of existing information have been undertaken for each discipline, these desktop reviews have been supplemented by specialised field studies and consultation with interested parties, statutory bodies and local authorities, as deemed necessary.

Where appropriate, the baseline is evaluated to identify features of specific importance or sensitivity. This evaluation is undertaken by means of qualitative and / or quantitative criteria relating to the importance and sensitivity of the environment. A feature of the environment is deemed to be of importance if it performs a function that supports a specific environmental objective of the area. These objectives may be derived from legislation, policy documents or, in cases where legislation and policy are insufficient, guidelines or professional judgements.

The means by which this evaluation is carried out is explained for each environmental topic.

7.2.1.5 Identification of Potential Environmental Impacts

Each individual expert has identified potential impacts based on an assessment of the proposed development and their technical experience and expertise. Consultation with stakeholders, interested parties and the public has also been carried out on an ongoing basis to help identify potential issues. A summary of the activities carried out is provided in Chapter 6 (Scoping and Consultation). The source and type of potential impacts is clearly identified for each individual environmental topic in the relevant chapters of the EIS.

The proposed development has the potential to impact on the environment during both the construction and operational phases and the assessment of impacts has been differentiated accordingly. Construction impacts can be temporary or permanent nature while operational impacts are likely to be permanent.

The EIA must identify, describe and assess potential direct and indirect impacts on all environmental topics as outlined under Article 3 of the EIA Directive (Directive 85/337/EEC, as amended). Furthermore, an EIA must identify, describe and assess the potential for impacts on any one environmental topic to have an effect on other environmental topics due to interaction between the two topics. The potential for many small impacts (from one or more projects) to have a cumulative impact on the environment must also be considered. These types of impacts are known as interactions and cumulative impacts, additional detail in this regard is provided in Chapter 18 (Interactions of the Foregoing).

In accordance with best EIA practice, the assessment of impacts is conservative, considering "a reasonable worst case where there is any degree of uncertainty." The EIA therefore constitutes a robust and transparent assessment of the "*likely significant environmental effects"* associated with the "*reasonable worst case scenario*"'.

7.2.1.6 Mitigation Measures

Certain potential negative environmental impacts associated with a power plant development have been mitigated against during the design process, which has been undertaken in accordance with *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006).*

In a number of cases, impacts of the proposed development could not be completely mitigated during the project design. Where impacts cannot be avoided mitigation measures are provided in the individual chapters of the EIS, as appropriate.

The mitigation measures provided will be incorporated into management plans which will be developed in consultation with the local authority and appropriate stakeholders. The plans will be implemented during the detailed design and construction phases of the development and will include a Construction Environmental Management Plan (CEMP), a Traffic Management Plan and a Construction and Demolition Waste Management Plan (C&D WMP). The plans will be subject to regular reviews and amendments as required with due regard to changing legislation and guidance.

7.2.1.7 Residual Impacts

Any likely significant impacts that continue to exist when the mitigation measures have been put in place are assessed for each individual environmental topic. These residual impacts are identified and the relevant ones are described in detail and assessed (where appropriate) in terms of a combination of Magnitude and Significance (as defined hereunder). For certain quantifiable impacts, such as noise and air quality, predicting magnitude at a receptor and comparing it with accepted standards is sufficient to determine significance.

Magnitude

The magnitude of the impact takes into account the quality, type and range of impact that will occur as well as the duration over which the impact will occur. Criteria are defined for each individual environmental topic and are used to evaluate the magnitude of impacts as set out in the relevant chapters of this EIS. These criteria take into account Irish legislation, international standards, accepted technical and / or good practice guidelines and the results of the scoping process.

Quantitative criteria are used in cases where this is possible. Qualitative criteria are assessed where non-quantifiable impacts are identified.

Significance

The significance of the impacts is defined by evaluating the magnitude of the impact relative to the importance and sensitivity of the affected area. The assessment of significance is carried out by the environmental specialist in light of their specialist experience and expertise.

7.2.2 Difficulties Encountered

No significant difficulties have been encountered in the course of this EIA that could not be addressed by taking a precautionary approach.

8. Human Beings - Land Use

8.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS has been prepared in order to help fulfil this requirement with respect to Human Beings - Land Use.

The proposed development has the potential to impact on human beings in many ways. The impacts of the proposed development on human beings from traffic, noise and vibration, air quality and visual impacts are discussed in detail in Chapter 10 (Traffic), Chapter 11 (Human Beings - Noise and Vibration), Chapter 15 (Air Quality and Climate) and Chapter 16 (Landscape and Visual) respectively. Socio-economic impacts are considered in Chapter 9 (Human Beings - Socio-economics).

8.2 Methodology

8.2.1 Guidance Used

In order to provide the background for the assessment of the impacts of the proposed development on land use, a desk based study was undertaken to assess information regarding zoning, tourism, amenities and recreation and community facilities within the vicinity of the proposed development site. The aim of the study was to assess the positive and negative impacts of the proposed development on land use. Publications and other data sources that guided the preparation of this chapter are listed hereunder:

- Wexford County Council; Wexford County Development Plan 2007 – 2013; April 2007
- Waterford County Council; Waterford County Development Plan 2005-2011, July 2005
- Kilkenny County Council; Kilkenny County Development Plan 2008 – 2014; June 2008
- Fáilte Ireland Tourism Facts; Regions South East 2007, September 2008
- Fáilte Ireland Tourism Facts; Regions South East 2006, July 2007
- Fáilte Ireland Tourism Facts; Regions South East 2005, August 2006

8.2.2 Study Area

The study area for this assessment encompasses a 1 kilometre radius around the proposed development site.

8.2.3 Baseline Assessment Criteria

The baseline evaluation included:

- A desktop study of existing available information

- A review of planning applications in proximity to the site

- A field survey to identify current land use and sensitive receptors

The functional value of the study area is determined with reference to the importance and sensitivity of the area. Tourist facilities and sites are important because they define and add value to the character of an area. Recreational land uses are also important and include areas zoned as 'open space' and / or 'recreational amenity' areas. Community facilities such as schools, hospitals and churches contribute to the community, educational, health and social quality of life. The quality of the residential environment is perhaps the most important determinant to people's overall quality of life. Business and commercial activities are also important aspects of the local economy as they provide goods, services, and jobs to the local population.

Land use sensitivity can be described as the degree to which a land use can accept change of a particular type and scale without adversely impacting on its functionality. Residential properties in proximity to the site would be considered to be highly sensitive to change. In addition, tourist and recreational facilities and community facilities (schools, churches and hospitals) are also considered to be very sensitive to change.

Table 8.1 hereunder outlines the criteria used for evaluating the baseline land use, within the study area.

Table 8.1: Criteria for Baseline Evaluation of Landuse

Criteria	Importance/ Sensitivity
Tourist, amenity and / or recreational sites within 1 km of the proposed development site Community facilities such as schools, hospitals and / or churches within 1 km of the proposed development site Businesses / commercial premises / enterprises within 1 km of the proposed development site Planning permission granted for developments within 1 km of the proposed development site	High
Tourist, amenity and / or recreational sites within 2 km of the proposed development site Community facilities such as schools, hospitals and / or churches within 2 km of the proposed development site Residential properties within 1 km of the proposed development site Businesses / commercial premises / enterprises within 2 km of the proposed development site	Medium
Tourist, amenity and / or recreational sites are located further than 2 km from the proposed development Community facilities such as schools, hospitals and / or churches are located further than 2 km from the proposed development site No residential properties within 2 km of the proposed development site No businesses / commercial premises / enterprises within 2 km of the proposed development site	Low

8.2.4 Impact Assessment Criteria

The source and type of all impacts is set out in Section 8.4 (Identification of Potential Impacts). The mitigation measures that are defined for any potentially significant impacts are set out in Section 8.5 (Mitigation Measures). Any likely residual impacts are evaluated in terms of magnitude and significance in Section 8.6 (Residual Impacts).

Magnitude

The magnitude of an impact is assessed in consideration of its intensity, and its extent in space and time. The criteria used to assess the magnitude of the developments impacts on land use are presented in Table 8.2.

Table 8.2: Criteria for Assessment of Impact Magnitude

Criteria	Impact Magnitude
Irreversible and significant impacts on tourist, amenity and / or recreational sites in the area Severance / separation of communities and / or residents in the area from services and facilities Long-term loss of income and livelihood in the area due to changes in land use (>5 years) Long-term road closures (>5 years)	High
Short-term impacts on tourist, amenity and / or recreational sites in the area (1 - 5 years) Short-term severance / separation of communities and / or residents in the area from services and facilities (1 - 5 years) Short-term loss of income and livelihood in the area due to changes in land use (1 - 5 years) Short-term closure of roads during construction and long-term severance of access to local and regional roads (1- 5 years)	Medium
Limited impacts on tourist, amenity and / or recreational sites in the area No severance / separation of communities and / or residents in the area from services and facilities Minimal loss of productivity due to changes in land use Temporary and short-term disruption to traffic on some roads during construction (1 - 5 years)	Low

Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the importance / sensitivity of the affected area.

Impact significance is described as being *Not significant,* of *Low* significance, of *Medium* significance, or of *High* significance.

8.3 Baseline Description and Evaluation

8.3.1 Land Use and Zoning

8.3.1.1 Land Use

The proposed development site is an existing power generating plant located in the townland of Great Island, Co. Wexford. The development site is 'Brownfield' in nature i.e. has been subjected to development previously and is not undisturbed natural environment. Great Island power plant occupies an area of approximately 58 hectares (143 acres). The proposed development site will occupy approximately 8 hectares (19 acres) of the existing site, i.e. 14%.

The site is located at the confluence of the River Suir and River Barrow, on the shores of Waterford Harbour. The nearest area of settlement is Cheekpoint on the opposite side of the estuary, in Co. Waterford, approximately 700 metres from the proposed development site. In Co. Wexford, the nearest significant area of settlement is Campile, located approximately 3.75 kilometres to the east. A number of one-off houses are located in proximity to the site boundary, the nearest occupied dwelling is located approximately 450 metres to the northwest of the actual development site.

Access to the site is gained via a local road, the L8072, which connects the site to the R733, a regional road located approximately 5 kilometres to the east of the development site. The R733 connects with the national N25 road, approximately 11 kilometres to the north east.

Agricultural lands are located to the north and to the east of the site. The Waterford to Wexford railway line runs under the site access road immediately north of Great Island power plant. The site is located at the confluence of the River Suir and River Barrow, on the shores of Waterford Harbour. The Barrow River Estuary is a proposed Natural Heritage Area. The River Barrow, River Nore and Lower River Suir are designated Special Areas of Conservation. Refer to Chapter 12 (Flora and Fauna).

8.3.1.2 Zoning

Wexford County Development Plan 2007 - 2013 states that there will be a presumption in favour of industrial and commercial development located in or adjacent to settlements where infrastructure has been provided and in line with the principle of sustainable development.

In addition, Policy L1 of the development plan states that *"in assessing developments the Council will have regard to the guidance contained in the Landscape Character Assessment. Proposed developments should reflect the guidance contained in the Landscape Character Assessment and seek to minimise the visual impact, particularly in areas designated as Sensitive and Vulnerable Landscapes."*

According to the Landscape Character Assessment for Co. Wexford, the proposed development site at Great Island is located within Policy Area 3 – Coastal – East Coast. Polices for this area include:

- Encourage development that will not have a disproportionate effect on the existing character of the coastal environment in terms of location, design, and visual prominence

- Encourage development that will not interrupt or penetrate distinct linear sections of primary ridge lines and coastlines when viewed from areas of the public realm

- Preserve any areas that have not been subject to recent or prior development and have retained a dominantly undisturbed coastal character

The proposed development site is also located in proximity to Policy Area 2 – Lowlands – Barrow River Corridor. In this policy area, Wexford County Council will continue to permit development that can utilise existing infrastructure, while taking account of absorption opportunities provided by the landscape and prevailing vegetation. However, the Council will only encourage development that will not have a disproportionate effect on the existing character of the landscape in terms of location, design, and visual prominence.

Waterford County Development Plan 2005 - 2011 designates the banks of the River Barrow as visually vulnerable. Waterford County Council specifies that development in the environs of these vulnerable areas must be shown not to impinge in any significant way upon its character, integrity or uniformity when viewed from the surroundings.

The proposed development site is located in proximity to an "Area of High Amenity" designated by *Kilkenny County Development Plan 2008 - 2014*. A high standard of design and siting is expected for all development in Areas of High Amenity. The development plan states that in conserving views, development, where permitted, should not seriously hinder or obstruct these views and should be designed and located to minimise their impact. The proposed development site has views onto the Suir Valley Landscape Character Area, as designated by the Landscape Character Appraisal for County Kilkenny. The landscape appraisal highlights the importance of avoiding visual intrusion by development in this area, which could interrupt and reduce the integrity of the river valley.

The proposed development is consistent with the established use of the Great Island site.

8.3.2 Tourism, Amenities and Recreation

The tourism industry is one of the primary sectors within the economy of County Wexford. The County is known for its considerable unspoilt coast line, countryside, natural and built environment and its reputation as the 'Sunny South East'. Tourist attractions in County Wexford include its beaches, its many walking routes, the coastal path and numerous heritage sites and historical monuments. Recreation and tourist activities which take place in Wexford include golf, walking, swimming, sailing, nature watching, horse riding, boating and fishing. The River Suir, River Barrow and Waterford Harbour also provide opportunities for additional recreational usage.

Table 8.3 illustrates that the number of tourists visiting the county increased significantly in 2007, following a decline in tourist numbers in 2006. However, there was a decrease in revenue generated from the tourist industry in 2007, despite the increase in tourist numbers, as illustrated in Table 8.4.

Tourism facts were not available for County Wexford for 2008 or 2009.

Table 8.3: Overseas Tourism to Wexford

Overseas Tourists	Total	Britain	M. Europe	N. America	Other Areas
2007	243,000	143,000	59,000	27,000	14,000
2006	215,000	116,000	53,000	30,000	16,000
2005	217,000	127,000	53,000	24,000	13,000

Table 8.4: Revenue Generated by Overseas Tourists to Wexford

Revenue Generated (millions)	Total	Britain	M. Europe	N. America	Other Areas
2007	64	40	16	6	2
2006	67	39	19	7	2
2005	63	37	17	5	4

There are no tourist attractions in the immediate vicinity of the proposed development site. However, there are numerous attractions in the surrounding area including Duncannon Fort located approximately 14 kilometres from the development site, Ballyhack Castle located approximately 10 kilometres from the site, Dunbrody Abbey, the JFK Dunbrody Famine Ship and the JFK Arboretum located approximately 5.2 kilometres from the site and Tintern Abbey located approximately 18 kilometres from the site.

The proposed development site is also located in proximity to a number of larger settlements, including Waterford City and New Ross, located approximately 23 kilometres and 16 kilometres from the development site respectively. These settlements have an important role within a tourism context by supporting and sustaining tourism services.

8.3.3 Community Facilities

There are no schools, hospitals or churches located within a 1 kilometre radius of the development site. However, a school and GAA club are located approximately 5 kilometres to the north east of the site. A health centre is located in Campile.

8.3.4 Businesses in the Area

As the area is generally rural in character, the predominant businesses in the area relate to agriculture. The area immediately surrounding the proposed site is pasture land. The closest settlements to the proposed development site are Cheekpoint and Campile which provide services to the local population.

8.3.5 Planning Applications

A planning search was undertaken of all planning applications in County Wexford, County Kilkenny and County Waterford within 1 kilometre of the proposed development site between 2004 and 2009 and these are presented in Table 8.5.

Table 8.5: Planning Applications

Application Number	Name	Description	Decision
Wexford			
20070736	Patrick O'Connor	Erection of 2 dwelling houses and garages at Great Island, Kilmokea	Granted April 2007
20060590	Michael Murphy	Agricultural Entrance	Granted November 2006
20053873	ESB	Erect a new tower under the existing Great Island Waterford 110 KV line	Granted March 2006
20043664	Margaret Fitzpatrick	Dwelling house	Granted January 2005
Waterford			
08/505	William & Nancy Doherty	First floor bedroom extension	Granted August 2008
07/541	Michael O' Brien	Retention of existing granny flat and existing sewage treatment system	Granted May 2007
07/1155	Bernard & Kathleen Cunningham	Construction of a single storey extension	Granted October 2007
06/1151	Ben & Marie Power	Construction of two storey extension	Granted October 2006
06/1622	Bridget & Alan Clifford	Retain and to complete a split level extension	Granted January 2007
05/470	Patrick Murphy	Extension to existing dwelling	Granted May 2005
04/349	Andrew Doherty	Extension to existing dwelling	Granted May 2004
04/922	Edward Quann	To construct a dormer extension	Granted September 2004
04/1366	Aidan McAlpin	Erection of a single storey store	Granted November 2004
04/1501	Joseph P. Power	Erect a dormer dwelling	Granted May 2005

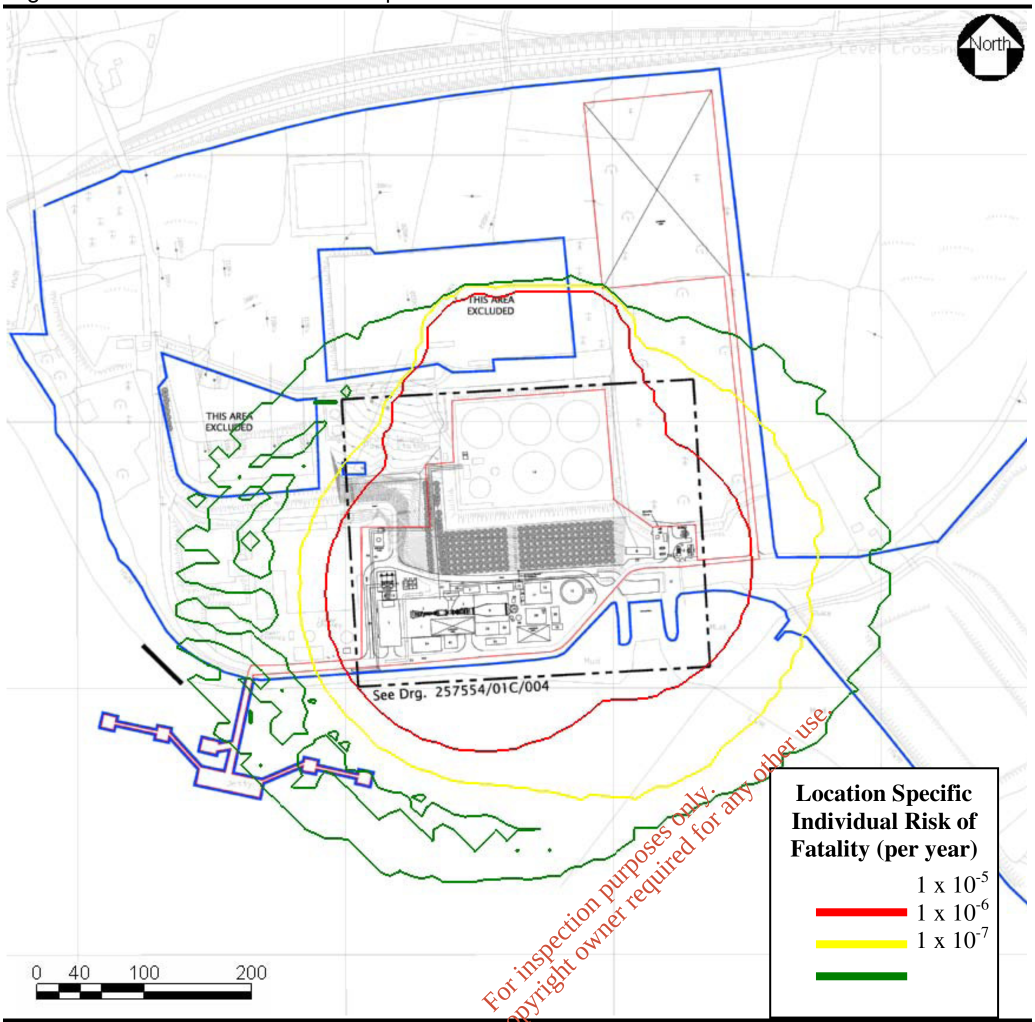
Source: Wexford County Council (www.wexford.ie), Waterford County Council (www.waterfordcoco.ie)

In addition, it is understood that Port of Waterford was granted an extension to planning permission for the construction of a new 6 Hectare quayside extension of the port (reference P.683/94, An Bord Pleanála reference 10/096935).

8.3.6 Land Use Planning

In accordance with HSA document *Policy and Approach of the Health and Safety Authority to COMAH Risk-based Land Use Planning, 2009* a Quantitative Risk Assessment and Land Use Planning assessment has been undertaken, Refer to Appendix 3.3. The results of that assessment show that there will be no impacts that will give rise to any need for restrictions or rezoning of the adjacent and local lands outside the ownership boundary of Endesa. The risk contours associated with the proposed development are presented in Figure 8.1.

Figure 8.1 Risk Contours for People Outdoors



8.3.7 Baseline Evaluation

The land uses within the study area have been evaluated in consideration of the factors detailed above and the criteria detailed in Table 8.1: Criteria for Baseline Evaluation of Landuse.

There are no schools, hospitals or churches located within 1 kilometre of the site. However, a school and a GAA pitch are located approximately 5 kilometres from the proposed development site. A number of residential houses are located in Cheekpoint which is located less than 1 kilometre from the proposed development site, on the opposite side of the estuary. A number of one-off houses and the Waterford to Wexford railway line are also located in proximity to the site boundary.

The development of the proposed power plant is located entirely within the confines of a Brownfield site and is consistent with current activities on the site. Therefore, the activities associated with the operation of the new power plant will not change significantly from those associated with existing operations.

Considering that there are a number of residential properties and a railway line located within 1 kilometre of the site and a number of planning applications have been granted within the same area, the baseline evaluation of land uses in the surrounding area has been classified as medium. The baseline evaluation of the proposed development site has been classified as low with due regard to the existing land use within the site boundary.

8.4 Identification of Potential Impacts

8.4.1 Construction Phase

It is proposed to construct the power plant within the confines of the existing site. It is anticipated that the construction phase will extend for 30 months and will commence in late 2010.

Construction activities can cause a nuisance to the local community and result in disruption. However, the impacts, outlined below, will be temporary in nature and will cease on completion of works:

- Increased traffic and HGV movements during the construction phase will have a negative short-term impact on the local community, primarily due to potential traffic disruption on local roads. Impacts on local landowners in the area, such as impacts on cattle movements, may result in some temporary and short-term negative impacts on these operations. A temporary parking bay will be provided, limiting Heavy Goods Vehicle (HGV) movements, adjacent to the local access road. However, it is not considered that the development will impact on the existing land uses of the surrounding areas in general. No impacts on the railway line, which runs under the site access road, are predicted. A new road surface is also proposed which will result in an improvement to the structural strength of the existing access road.

- A construction compound, including portacabins, welfare facilities and construction plant laydown areas, will be provided within the confines of the existing power plant facility. Abnormal loads will access the site via a jetty located within the confines of the existing facility. It is not anticipated that there will be any impacts on land-use in the surrounding area, outside the confines of the existing power plant.

8.4.2 Operational Phase

The area of land proposed for the development has been selected to take into consideration the following criteria:

- To minimise the routing of the 220 kV cables to the existing 220 kV substation
- To minimise the routing of the cooling water intake and discharge pipework
- To minimise the requirement for access roads
- To allow for ease of construction and access to the proposed laydown area
- To minimise the length required for the supply of gas pipework to the AGI station
- To mitigate against overhead lines and development of Greenfield sites
- To maximise the use of existing services e.g. effluent discharge, surface water drains
- To maximise the use of existing buildings and structures e.g. cooling water pump house and associated culverts
- To provide suitable access for future maintenance and removal of plant and equipment

As such, the land take requirement has been optimised as far as is practicable for a facility of the scale proposed. The construction of the proposed power plant is located entirely within the confines of a Brownfield site and is consistent with current activities on the site i.e. the activities associated with the operation of the new power plant will not change significantly from those associated with existing land use.

8.5 Mitigation Measures

8.5.1 Construction Phase

It is proposed to utilise an area of land along the local access road, in proximity to the Regional R733 road, as a parking bay for HGV access during the construction phase of the proposed development. HGV traffic will be controlled thereby limiting disruption to traffic accessing the local road. Refer to Chapter 10 (Traffic).

The land take requirement for the parking bay and the construction laydown area has been minimised, as far as is reasonably practicable, and the land will be returned as close as possible to its original condition on cessation of construction phase activities.

A Traffic Management Plan will be developed as part of the Construction Environmental Management Plan (CEMP), in consultation with local landowners to ensure disruption to landowners is minimised as far as practicable.

8.5.2 Operational Phase

No mitigation measures are considered necessary during the operational phase as the development of the facility is located entirely within a Brownfield site and is consistent with current activities on the site.

8.6 Residual Impacts

Residual impacts are those that could arise as a result of the construction and operation of the development once the proposed mitigation measures are in place.

8.6.1 Construction Phase

The residual impact on land use associated with temporary land take and traffic movements associated with the construction phase of the proposed development, once mitigation measures are implemented, are considered to be of overall low significance.

8.6.2 Operational Phase

The proposal will result in a permanent noticeable development within the confines of the existing generating plant. However, as the development is consistent with current land use activities the impact is not considered to be significant for the purposes of assessing land use. There will be no permanent impact on land use on lands outside the ownership of Endesa during the operational phase. The impact on these lands is therefore not considered to be significant.

8.7 Summary Conclusion

A desk-based assessment of the impacts on land use was undertaken to assess information relating to zoning, tourism, amenities and recreation and community facilities within the vicinity of the proposed development site.

There are no schools, hospitals or churches located within 1 kilometre of the site. However, a school and a GAA pitch are located approximately 5 kilometres from the proposed development site. A number of residential houses are located in Cheekpoint which is located less than 1 kilometre from the site, on the opposite side of the estuary. A number of one-off houses and a railway line are located in proximity to the site boundary. Also, a number of planning applications have been granted permission in proximity to the site. The construction of the proposed power plant is located entirely within the confines of a Brownfield site and is consistent with current activities on the site i.e. the activities associated with the operation of the proposed power plant will not change significantly from those associated with existing land use.

Increased traffic and HGV movements during the construction phase will have a negative short-term impact on the local community, primarily due to potential traffic disruption on local roads. Impacts on local landowners in the area, such as impacts on cattle movements, may result in some temporary and short-term negative impacts on these operations. A temporary parking bay will be provided, limiting Heavy Goods Vehicle (HGV) movements, adjacent to the local access road. A detailed Traffic Management Plan will be developed as part of the Construction Environmental Management Plan (CEMP), in consultation with local landowners to ensure disruption to landowners is minimised as far as practicable.

9. Human Beings – Socio-economics

9.1 Introduction

An Environmental Impact Statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS has been prepared in order to help fulfil this requirement with respect to Human Beings - Socio-economics. The potential impacts on the socio-economic environment during the construction phase and operational phase have been assessed.

The proposed development has the potential to impact on human beings in many ways. The impacts of the proposed development on human beings from traffic, noise and vibration, air quality and visual impacts are discussed in detail in Chapter 10 (Traffic), Chapter 11 (Human Beings – Noise and Vibration), Chapter 15 (Air Quality and Climate) and Chapter 16 (Landscape and Visual) respectively. Impacts associated with land use are considered in Chapter 8 (Human Beings – Land Use).

9.2 Methodology

9.2.1 Guidance Used

In order to provide the background for the assessment of the impact of the proposed development on human beings, the socio-economic context was reviewed. A desk based study was undertaken to assess information relating to population, age structure, economic activity, employment and unemployment within the vicinity of the proposed development site. The aim of the study was to assess the positive and negative impacts of the proposed development on the socio-economic environment. Publications and other data sources that guided the preparation of this chapter are listed hereunder:

- Wexford County Council; *Wexford County Development Plan 2007 – 2013*; April 2007;
- Central Statistics Office (www.cso.ie); *Census 2006, Volume 1 Population Classified by Area,* April 2007;
- Central Statistics Office (www.cso.ie); *Census 2002, Volume 1 Population Classified by Area,* July 2003;
- Central Statistics Office (www.cso.ie); *Census 2006, Volume 4 Usual Residence, Migration, Birthplaces and Nationalities*, July 2007; and
- Central Statistics Office (www.cso.ie); *Census 2006, Volume 3, Household Composition, Family Units and Fertility,* May 2007.

9.2.2 Study Area

The study area is defined by the Electoral Division(s), EDs, in which the proposed development site is located. An ED is the smallest administrative area for which population statistics are published by the Central Statistics Office (CSO). Census data for the wider area, including counties Wexford, Kilkenny and Waterford were also considered.

9.2.3 Baseline Assessment Criteria

The EPA's *Guidelines on the Information to be contained in Environmental Impact Statements* (2002), states that economic activity, social patterns and employment should be assessed in the Environmental Impact Assessment (EIA) under the heading of "Human Beings".

The baseline data used to compile this chapter is taken from the most recent Census in 2006. This census includes the following data:

- Demographic data
- Age profile data
- Economic and employment data

Baseline socio-economic data is assessed in this chapter so as to describe the socio-economic context of the study area.

In the context of socio-economics, it is considered appropriate to assign an overall "functional value" of high to the study area for the purposes of categorising the baseline evaluation.

9.2.4 Impact Assessment Criteria

The source and type of all impacts is set out in Section 9.4 (Identification of Potential Impacts). The mitigation measures that are defined for any potentially significant impacts are set out in Section 9.5 (Mitigation Measures). Any likely residual impacts are evaluated in terms of magnitude and significance in Section 9.6 (Residual Impacts).

Magnitude

The magnitude of an impact is assessed in consideration of its intensity and its extent in space and time. The criteria used to assess the magnitude of the developments impacts on socio-economics are presented in Table 9.1.

Table 9.1: Criteria for Assessment of Impacts Magnitude

Criteria	Impact Magnitude
Impact is of long-term or permanent duration (>5 years) Impact on socio-economics has a clearly noticeable and significant impact on environmental functionality The affected area has limited or no potential to recover	High
Impact is of medium-term duration (1-5 years) Impact on socio-economics has a moderate and noticeable impact on environmental functionality The affected area has the potential to recover Socio-economics are moderately affected and alternative resources performing similar functions are not available in the area	Medium
Impact is of temporary (weeks) or short-term (months) duration Impact has only slight or no noticeable consequences for the environmental functionality Socio-economics in the area have the potential to recover A small or insignificant effect on socio-economics or alternative resources performing similar functions are available in the area	Low

Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the importance / sensitivity of the affected area.

Impact significance is described as being *Not significant,* of *Low* significance, of *Medium* significance, or of *High* significance.

9.3 Baseline Description and Evaluation

9.3.1 Demographic Profile

As the proposed development site is located in proximity to the borders of counties Waterford and Kilkenny, this section will outline the population statistics in County Wexford, County Waterford and County Kilkenny on a county and local area basis.

9.3.1.1 National

Nationally, the 2006 Census recorded that the population of Ireland increased by 8.2% from 3,917,203 in 2002 to 4,239,848 in 2006, representing an actual increase of 322,645 persons.

9.3.1.2 Regional

According to Census 2006, the population of the South East region, which includes counties Wexford, Kilkenny and Waterford, has grown from 423,616 in 2002 to 460,474 in 2006, accounting for approximately 10.9% of the national population. The South East region is predominantly rural in character with the main urban centres being Waterford City, Kilkenny City and the towns of Carlow, Wexford and Clonmel. The region also consists of various smaller towns and villages evenly distributed across the region as well as a strong rural settlement pattern.

The *National Spatial Strategy for Ireland 2002 - 2020* (NSS) aims to achieve balanced regional development throughout Ireland. To achieve this, the NSS identified a number of “Gateways”, and “hubs” which are primarily existing large urban centres, to promote economic and social development in their region. Waterford City has been designated as a Gateway, being supported by Wexford and Kilkenny as Hubs. These three together will form a nationally strategic “growth triangle” in the South East region. The NSS highlights the importance of reliable and effective energy systems, such as gas and electricity to power industry and services, as key prerequisites for effective regional development.

According to Census 2006, the recorded population of County Wexford was 131,749 persons, having increased from 116,596 in 2002 and 104,371 in 1996. The population of surrounding counties Waterford and Kilkenny also increased between 2002 and 2006, growing by 6.3% and 9% to 107,961 and 87,558 persons respectively. The population of Waterford City has increased by 2.6% between 2002 and 2006 growing from 44,594 persons in 2002 to 45,748 persons in 2006.

The *South East Regional Planning Guidelines 2004* estimated that the population of the South East region could reach 463,740 by 2020. The Issues Paper (dated February 2009) for the *South East Regional Planning Guidelines 2010 - 2022* states that the target population for the South East region for 2022 is in the range 580,500 to 596,500. *Wexford County Development Plan 2007 – 2013* estimates that if migration into County Wexford continues, at its current rate, the population of the county will increase to 177,110 by 2016, a further increase of approximately 45,000 in population.

Population figures for Ireland, County Wexford, County Waterford and County Kilkenny are presented in Table 9.2.

Table 9.2: Regional Population Trends 2002 - 2006

District	Census 2002	Census 2006	% Change 2002 – 2006
County Wexford	116,596	131,749	13%
County Waterford (including Waterford City)	101,546	107,961	6.3%
Waterford City	44,594	45,748	2.6%
Kilkenny	80,339	87,558	9%
Ireland	3,917,203	4,239,848	8.2%

Source: Central Statistics Office (www.cso.ie)

9.3.1.3 Local

The proposed development site is located in Great Island, County Wexford, at the confluence of the River Suir and River Barrow, on the shores of Waterford Harbour. The nearest area of settlement to the proposed development site is at Cheekpoint, County Waterford, located west of the estuary. In County Wexford, the nearest area of settlement is Campile, located east of the proposed development site. Great Island is also located near the County Kilkenny border. The assessment of local population trends therefore included surrounding areas in County Wexford and adjacent counties.

The smallest geographical units distinguished in the Census are Electoral Divisions (ED). The proposed site location at Great Island is located in Kilmokea ED, which is located within the New Ross Electoral Area. The nearest settlement to the proposed development site, Cheekpoint, County Waterford is located in Faithlegg ED. Campile is located in the Ballyhack ED. The closest Electoral Division in County Kilkenny to the proposed development site is Rathpatrick ED. Table 9.3 below presents the changes in population trends within these areas between 1996 and 2006.

Table 9.3: Local Population Trends 1996 - 2006

Location	1996	2002	2006	% change 1996 – 2002	% change 2002 – 2006
Co. Wexford					
Kilmokea ED	745	686	728	-7.9%	6.1%
Ballyhack ED	1,180	1,258	1,232	6.6%	-2.1%
Campile Village	396	335	347	-15.4	3.6%
Co. Waterford					
Faithlegg ED	1,513	1,809	1,905	19.6%	5.3%
Cheekpoint Village	320	325	313	1.6%	-3.7%
Co. Kilkenny					
Rathpatrick ED	1,622	1,204	1,173	-25.8	-2.6%

Source: Central Statistics Office (www.cso.ie)

As illustrated in Table 9.3, the population of the study area has been fluctuating over the past 10 years. In County Wexford, Kilmokea ED, which includes Great Island, experienced a population decline of 7.9% between 1996 and 2002 but the population increased again by 6.1% between 2002 and 2006 to 728 persons. Ballyhack ED experienced a fall in population numbers during the last inter-censal period, from 1,258 persons to 1,232 persons, a decrease of 2.1%. The population of Campile increased by 3.6% between 2002 and 2006, following a decline in population growth of 15.4% between 1996 and 2002.

A review of census data indicates that the population of Faithlegg ED, Co. Waterford has been increasing since 1996. Census 2006 shows that the rate of growth has slowed in Faithlegg, down to 5.3% in 2006 compared with 19.6% in 2002. Cheekpoint experienced an increase in population between the years 1996 and 2002, growing by 1.6%. The population of Cheekpoint decreased by 3.7% between the years 2002 and 2006.

Table 9.3 also shows that the population of Rathpatrick ED in County Kilkenny has been experiencing a decline in population since 2006.

A key factor of County Wexford's population growth is the extent of migration into the county. As illustrated in Table 9.4, the average estimated net migration per 1,000 of population was 21.8 in County Wexford, which is considered high compared with 11.7 nationally. Census 2006 recorded average estimated net migration per 1,000 of population of 6.9 in County Waterford and 14.8 in County Kilkenny. This implies that migration is a contributing factor in population growth, particularly in County Wexford.

Table 9.4: Population Increases

Location	Natural Increase	Change in Population 2002- 2006	Net Migration	Annual Average Rates per 1000 of Population		
				Birth	Death	Estimated Net Migration
Ireland	131,314	322,645	191, 331	15.0	7.0	11.7
Wexford	4,319	15,153	10,834	15.9	7.3	21.8
Waterford	3,516	6,415	2,899	15.4	7.0	6.9
Kilkenny	2,233	7,219	4,986	13.4	6.8	14.8

9.3.1.4 Age Structure

According to Census 2006, the age structure of County Wexford is similar to that of County Waterford, County Kilkenny and the State. The age structure of County Wexford exhibits a high proportion of persons in the 25 - 44 year age group, representing 30.3% of the population, compared with 31.7% nationally, 29.9% in County Waterford and 30.2% in Kilkenny. There is also a high proportion of persons within the 45-64 year age group; 22.5% in Wexford compared with 22% in the State, 22.6% in County Waterford and 23.1% in Kilkenny. The 0-14 year age group represents 22.2% of the population in County Wexford, which is higher than the national average of 20.4%, and figures recorded in counties Waterford and Kilkenny, 20.7% and 21.5% respectively. County Wexford has a generally young population structure and it is likely that the high rate of in-migration to the county contributes to this.

9.3.1.5 Household Size

By comparing the absolute population figures divided by the number of private households recorded in County Wexford, it appears that the average household size in County Wexford, at 2.84 is slightly higher than the state average of 2.81. The average household in County Waterford is 2.71 persons and 2.88 persons in County Kilkenny. According to the National Spatial Strategy 2002 - 2020, in the long term, the average household size in Ireland will continue to fall towards the EU average of 2.63 persons per household.

9.3.2 Economic Activity

9.3.3 Employment

Information on economic activity was obtained primarily from the *Wexford County Development Plan 2007 – 2013* and the CSO document, *Principal Economic Status and Industries (2006)*.

The *Wexford County Development Plan 2007 – 2013* considers that the enhancement of Waterford as a gateway, supported by Kilkenny and Wexford as hubs, is vital for the future economic development of the county. Waterford, Kilkenny and Wexford form a nationally strategic "growth triangle". The development plan states that a critical mass of population will help support greater economic activity and quality of life. It is the policy of *Wexford County Development Plan 2007 – 2013* to "*build on the strengths and opportunities of County Wexford so that economic growth can be encouraged in a sustainable manner in order to create employment opportunities for all sectors of the community*".

The development plan specifies that in order to enhance economic development in the county, the plan will:

- Build upon the county's strengths including its strategic location and good road network
- Promote economic development in co-operation with other agencies where appropriate
- Promote the continuous upgrading of the infrastructural network to encourage and facilitate economic development

Traditionally County Wexford has had a strong agricultural base and primary and secondary agriculture still plays an important role in the County's economy. Although the numbers engaged in farming has declined in recent years, the sector remains an important contributor to the economic and social viability of rural areas in County Wexford and continues to play a defining role in the rural landscape.

Census 2006 recorded that County Wexford experienced a steady population growth between 2002 and 2006, increasing to 131,749 persons, an increase of 13%. The population of counties Kilkenny and Waterford increased by 9% and 6.3% respectively during the same time period. Consequently, the total number of persons at work increased up to 2006, with 54.6% of the population of Wexford at work, which is lower than the State average of 57.2%. In County Kilkenny, 57.9% of the population was at work, compared with 54% in Waterford and 52.4% in Waterford City.

According to Census 2006, the construction trade is the largest sector of the economy in County Wexford, with 16.7% of the population at work employed in the sector, as illustrated in Table 9.5: Employment by Broad Industrial Group. The Wholesale and Retail sector is the second largest sector accounting for 14.9% of the working population. These are higher than the State proportions for the same sectors, 11.10% and 13.3% respectively. Agriculture remains more important in Wexford than the State; 7.5% compared to 4.6% for the State.

Regionally, the construction industry, the wholesale and retail sector and manufacturing industries, are the largest sectors of the economy in Counties Wexford, Kilkenny and Waterford. Mining, quarrying and turf production, along with electricity, gas and water supply, are the lowest employment sectors in Wexford, Kilkenny and Waterford, according to 2006 figures.

Table 9.5: Employment by Broad Industrial Group

Broad Industrial Group	State	Wexford	Kilkenny	Waterford	Waterford City
Agriculture, Forestry & Fishing	4.60%	7.50%	8.10%	5.80%	0.70%
Mining, Quarrying	0.40%	0.30%	0.75%	0.14%	0.03%
Manufacturing	12.60%	12.30%	12.50%	19.45%	21.70%
Electricity, water & gas	0.60%	0.49%	0.46%	0.45%	0.41%
Construction	11.10%	16.70%	12.60%	10.80%	7.80%
Wholesale and retail	13.30%	14.90%	13.60%	12.70%	13.90%
Hotels & Restaurants	5.20%	6.30%	5.80%	5.80%	6.80%

Broad Industrial Group	State	Wexford	Kilkenny	Waterford	Waterford City
Transport, Storage and Communications	5.50%	5%	3.90%	3.80%	4.10%
Banking	4.40%	3.10%	3.50%	2.50%	2.50%
Real Estate	9.40%	5.90%	6%	7.50%	8.80%
Public Administration	5.20%	4.4%	4.90%	3.90%	3.30%
Education	6.60%	5.90%	6.70%	7.10%	6.70%
Health and Social Work	9.90%	9%	11.60%	9.80%	10%
Other community, social and personal service activities	4.20%	4.40%	3.90%	3.80%	3.50%
Other	6.80%	3.90%	5.50%	6.20%	9.50%

9.3.3.1 Unemployment

According to Census 2006, the percentage of persons unemployed in County Wexford in 2006, at 4.6% was slightly higher than the state average of 4.4%. The percentage of persons unemployed in Kilkenny was 4.1%. In County Waterford, the percentage of persons unemployed was 5.2% and 6.5% in Waterford City, according to Census 2006.

According to the Live Register 17,431 people were claiming unemployment benefit in October 2009 in County Wexford. This represented a profound increase on the same period in 2008, when 10,567 people were in receipt of benefits. In County Kilkenny, 6,834 people were claiming unemployment benefit in October 2009 (compared with the October 2008 figure of 4,250) while in County Waterford 14,158 were in receipt of benefits during the same period (compared with the October 2008 figure of 9,409). In the South East 52,869 people were in receipt of benefits in October 2008, an increase of 64% on the October 2008 figure of 33,616.

It is of importance to note that the live register is not the official measure of unemployment, as it includes persons in receipt of benefits who are in part time or casual employment. However, the live register is the most up to date information available and is indicative of the current unemployment situation in Ireland.

The *Quarterly National Household Survey* is a national survey of households in the Republic of Ireland that produces quarterly labour force estimates that include the official measure of unemployment in the State. The results for the second quarter (April - June 2009) indicate that the employment rate in the South East region was 14.7% (an increase of 3.6% on the first quarter) which is higher than the State average results for the second quarter, 12.0%.

9.4 Identification of Potential Impacts

9.4.1 Construction Phase Impacts

During the peak construction period it is anticipated that up to 500 construction workers will be employed.

As far as practicable local labour will be employed, this is a significant positive medium term impact for the local economy of the area.

It is likely that the proposed development will increase the population of the area in the short term during the construction phase, as it is probable that there will be an influx of construction workers. Construction workers will positively impact on businesses in surrounding settlements that will provide workers with services including accommodation, food, and entertainment creating employment opportunities in the local service industry. This will be a significant positive medium term impact on the local economy addressing the need for employment opportunities in the region in light of recent increases in unemployment rates.

Construction activities have the potential to cause a nuisance to the local environment and result in disruption. However, it is important to note that these impacts, outlined below, will be medium term in duration and will cease upon completion of construction.

- Negative landscape and visual impacts will occur due to construction plant and activities on site including; site compounds, temporary fencing, material storage, plant and machinery, vegetation stripping, generation of dust and vehicle movements. However, these impacts will be medium term and will be restricted to the construction period. Construction phase landscape and visual impacts are discussed in detail in Chapter 16 (Landscape and Visual)

- Increased traffic and Heavy Goods Vehicle (HGV) movements during the construction phase will have a negative medium term impact on the local community, primarily due to potential traffic disruption on local roads. However, it is proposed to utilise a parking bay to control the movement of HGVs accessing the site. Traffic impacts are discussed in detail in Chapter 10 (Traffic)

- The construction phase will potentially have a medium term negative impact on the local population as a result of noise and dust during working hours. Normal working hours during the construction period are expected to be Monday to Friday 08:00 to 20:00 and Saturday 08:00 to 17:00. During certain stages of the construction phase it is expected that some work will have to be carried out outside of normal working hours, however this will be kept to a minimum. Construction works with a significant noise impact will be avoided outside of normal working hours. Construction phase noise and dust impacts are discussed in Chapter 11 (Human Beings - Noise and Vibration) and Chapter 15 (Air Quality and Climate) respectively

9.4.2 Operational Phase Impacts

The proposed development will offer many positive benefits to the local area and economy. The most significant positive impacts are the permanent employment opportunities that will be maintained by operating the power plant and supplying goods and services.

The proposed development will maintain long term employment for the area and the impact of this is anticipated to be positive.

The power plant will provide a significant positive impact on the national economy during the operational phase of the development, by improving the public utilities infrastructure and generating additional electricity. In addition, the provision of a gas supply to the area supports the development of a nationally strategic “growth triangle” in the South East incorporating Waterford City, Wexford and Kilkenny, as specified in the NSS.

9.5 Mitigation Measures

The mitigation measures proposed for the construction and operational phases of the development are described hereunder.

9.5.1 Construction Phase

In order to control potential negative impacts during construction, a Construction Environmental Management Plan (CEMP) will be developed and implemented by the nominated Contractor during the construction phase of the project.

Specific mitigation measures include:

- Connection to services will be carried out during low demand periods in order to minimise any potential disruption to services in the area
- Use of artificial lighting will be restricted to the minimum required for safety and security
- Large plant will be located as far away as possible from local residences to minimise the visual impact of construction activities
- Implementation of a Traffic Management Plant, including the utilisation of parking bay to control HGV movements. Refer to Chapter 10 (Traffic)
- Mitigation measures relating to noise, visual impacts and dust are discussed in Chapter 11 (Human Beings Noise and Vibration), Chapter 15 (Air Quality and Climate) and Chapter 16 (Landscape and Visual)

9.5.2 Operational Phase

It is not anticipated that any specific mitigation is required regarding the socio-economic context discussed in this chapter.

Other relevant mitigation measures proposed for the operational phase of the development are discussed in Chapter 15 (Air Quality and Climate), Chapter 11 (Human Beings Noise and Vibration), and Chapter 16 (Landscape and Visual).

9.6 Residual Impacts

The residual impacts are the final or intended impacts which occur after the proposed mitigation measures have been implemented. Residual impacts in relation to the proposed development are those that could arise as a result of the operation of the electricity generating plant once the proposed mitigation measures are in place.

9.6.1 Construction Phase

Following the implementation of mitigation measures as detailed for the construction phase, the residual impact of the proposed development on the socio-economic environment of the area is considered to be positive.

9.6.2 Operational Phase

The residual impact of the proposed development during the operational phase is considered to be significant, positive and long term due to the provision of long term employment opportunities and improved infrastructure.

9.7 Summary Conclusion

A desk-based assessment of the impacts on socio-economics was undertaken to assess information relating to recent trends in population, employment and economic activity in the vicinity of the proposed development.

It is likely that the proposed development will increase the population of the area in the short term during the construction phase, as it is probable that there will be an influx of construction workers.

Construction workers will positively impact on businesses in surrounding settlements that will provide workers with services including accommodation, food, and entertainment creating employment opportunities in the local service industry. This will be a significant positive medium term impact on the local economy.

There is a potential for negative impacts during construction due to visual impacts, increased noise, traffic and dust. However, these will cease following completion of construction. During the construction period a Construction Environmental Management Plan (CEMP), incorporating mitigation measures for reducing traffic, dust, noise and visual impacts will be implemented in order to minimise any negative impacts on the receiving environment. During the operation of the proposed power plant, it is considered that there will be a significant positive impact on the local and national economy.

Overall, impacts on the socio-economic environment of the area are considered to be positive.

10. Traffic

10.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS assesses the impact of the proposed development on roads and traffic. A detailed description of the proposed development is provided in Chapter 3 (Description of the Development).

10.2 Background

This report has been prepared in accordance with *Traffic and Transport Assessment Guidelines, National Roads Authority, (September 2007)* and was carried out to assess the existing traffic and transport conditions in the area and to assess the impact that traffic generated by the proposed development would likely have on the road network local to the development.

10.2.1 Scoping Report

Prior to the preparation of this chapter a scoping report was issued to Wexford County Council for approval. The scoping report briefly summarised the existing situation and outlined the proposed development. It noted the issues to be addressed and summarised how these could be dealt with in the compilation of a comprehensive Traffic and Transport Assessment (TTA) for the development. It also outlined the proposed methodology and the analyses envisaged to be undertaken to demonstrate the impact that the proposed development will likely have on traffic flows in the local area. Wexford County Council were invited to provide comment on the scoping report and detail what, if any, further information would be required in the compilation of the TTA.

10.2.2 Consultation

Prior to the compilation of this TTA a pre-planning meeting was held with Wexford County Council on 21st August 2009. The purpose of this meeting was to discuss traffic and transportation issues likely to arise due to the construction of the proposed development. The meeting was attended by representatives from Endesa, Mott MacDonald Ireland and representatives from Wexford County Councils Roads Department. The following issues were discussed and agreed at the meeting:

- The contents of the scoping report were discussed. Wexford County Council stated that they were generally in agreement with the process and methodology outlined in the scoping report. Wexford County Council did however request that the undertaking of traffic counts be delayed until September so traffic generated by the national school at Ballinamona would be accounted for

- The condition of the pavement surface on the section of local road between the junction with the R733 at Ballinamona and the site entrance was discussed. It was agreed that that investigation works would be undertaken since the construction phase of the proposed development was likely to generate an increase in traffic volumes on this section of pavement. The pavement investigation was required to assess the impact of development generated traffic on the local road and to establish its residual life

- The width and alignment of the section of local road mentioned above was also discussed. It was noted that the width of this section of carriageway is generally between 4.0 to 5.0 metres and that there would not be sufficient road width to allow two HGVs to pass safely at a number of locations along this section of road

These issues have been taken into account in the preparation of this assessment and are discussed in later sections.

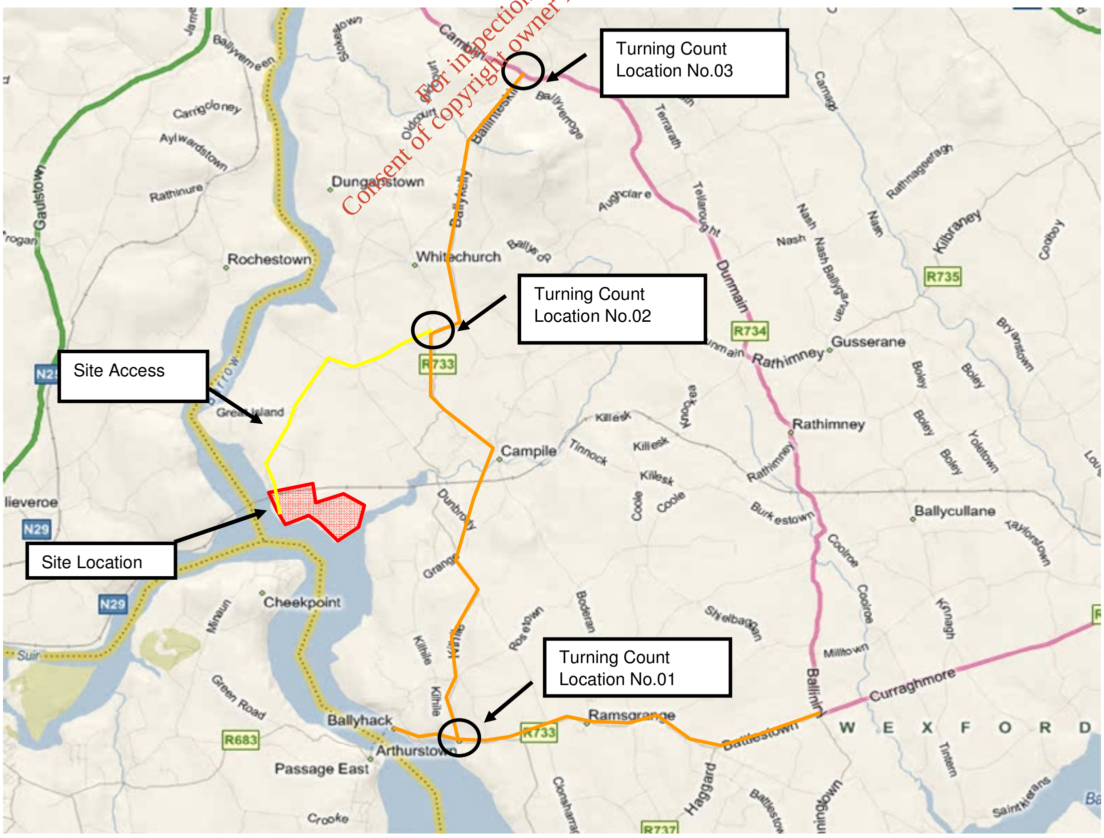
10.3 Traffic Impact Assessment

10.3.1 Traffic Counts

To obtain traffic volumes representative of those generally experienced in the vicinity of the proposed development turning movement counts were conducted at a number of key junctions in the vicinity of the development. The junctions at which turning movement counts were to be undertaken were agreed with Wexford County Council. The counts were conducted between the hours of 07:00 and 10:00 and 16:00 and 19:00 on Tuesday the 8th of September 2009. This date was chosen as the national school at Ballinamona was open, following summer holidays, from late August onwards. The locations at which counts were undertaken are detailed below and illustrated in Figure 10.1.

- Junction 1 - R733/R683 at Arthurstown
- Junction 2 – R733/Site Access Road
- Junction 3 – R733/R734 at Balinteskin

Figure 10.1: Traffic Count Locations

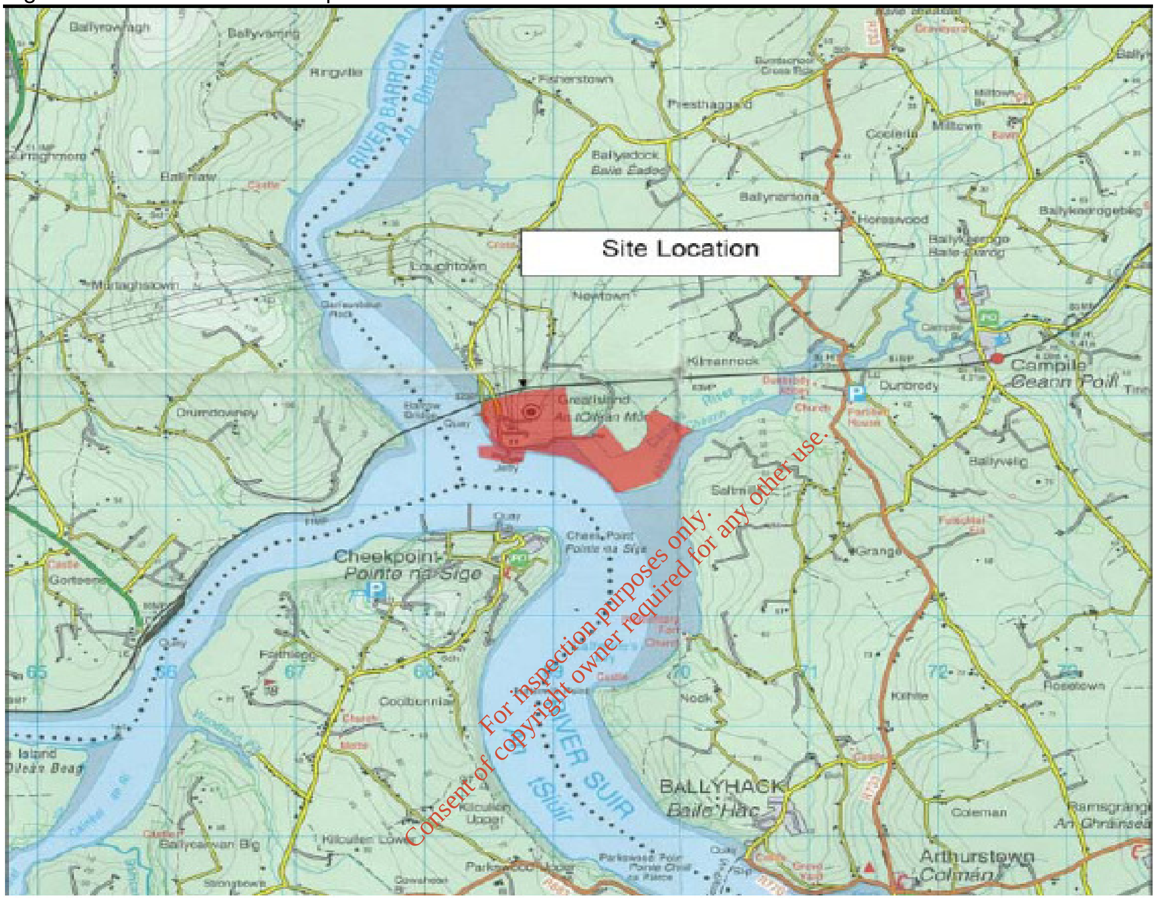


10.3.2 Receiving Environment

10.3.2.1 Site Location

The Great Island site is an existing power generating plant located on a 58 hectare site at the confluence of the River Suir and the River Barrow, on the shores of Waterford Harbour, as illustrated in Figure 10.2.

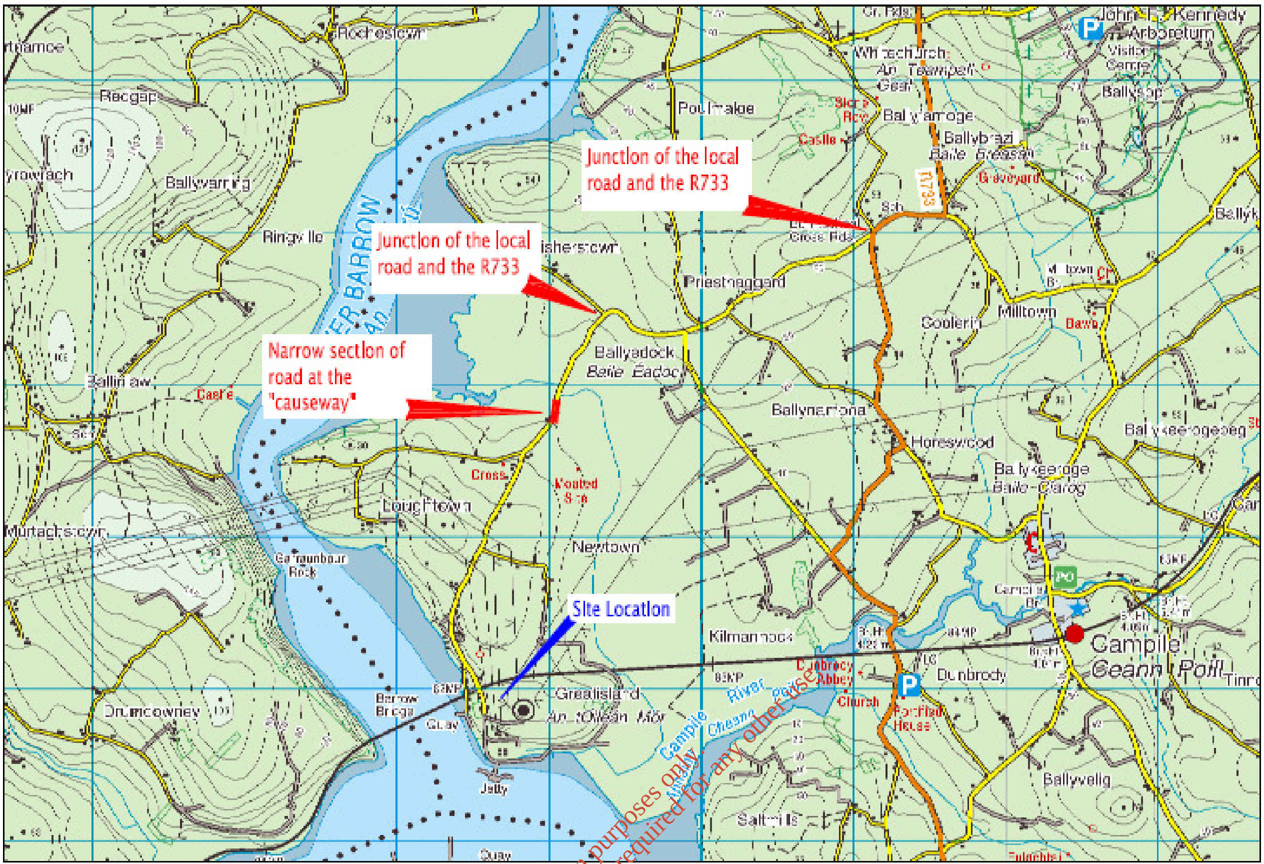
Figure 10.2: Site Location Map



10.3.2.2 Local Road Network

The site is accessed via a 5 kilometre section of local road. This section of local road forms a priority junction with the R733 at Ballinamona. The section of local road accessing the site is generally rural in character with road widths varying between 4.0 to 5.0 meters along the majority of this 5 kilometre section. This section of local road exhibits a number of acute changes in horizontal alignment with a particularly “tight” bend at Fisherstown. The road also narrows to approximately 3.5 meters in width for a section of approximately 400 metres along the “causeway”. The “causeway” is essentially a viaduct which historically formed a linkage between Great Island and the mainland prior to the silting over of the Barrow River basin, Figure 10.3 below refers.

Figure 10.3 Local Road Network Accessing the Site



10.3.2.3 Public Transport Facilities

There are currently no public transport facilities in operation to the site. However, Endesa does operate a subsidised bus service to the site.

10.3.3 Existing Traffic Conditions

The capacity and operation of a road network is dependant on the junctions within that network and it is the capacity and operation of these junctions that generally determines the capacity and vehicle delay on the network. In order to assess the current traffic conditions on the road network appropriate to the development site, traffic surveys were carried out at the junctions that traffic generated by the proposed development would likely affect, namely:

- Junction 1 - R733/R683 at Arthurstown
- Junction 2 – R733/Site Access Road
- Junction 3 – R733/R734 at Balinteskin

10.3.3.1 Interpretation of Traffic Surveys

Classified junction turning movement counts were carried out between the hours of 07:00 and 10:00 and 16:00 and 19:00 on Tuesday the 8th of September 2009.

Analysis of the traffic counts revealed the AM system peak hour to be between 08:00 and 09:00 and the PM system peak to be between 17:00 and 18:00.

10.3.3.2 Analysis of the Existing Operation and Capacity of the Junctions

Having established the link flows and turning movements on the local road network in the vicinity of the development site, an analysis of the operation and capacity of the junctions surveyed was undertaken. The analysis was undertaken using the computer modelling programme PICADY as produced by the Transport Research Laboratory (TRL) in the UK. This programme is used to predict capacities, queue lengths and delays at priority junctions.

PICADY output files contain tables consisting of demand flows, capacities, queues and delays for each time segment of the peak hour analysis. These tables contain start and finish times, and for each arm of the junction, traffic demand, capacity, Ratio of Flow to Capacity (RFC), start queue length, end queue length and queuing delay. The RFC provides the basis for judging the acceptability of junction designs and the capacity of existing junctions. An RFC of 85% or less is considered to be acceptable. An RFC of this value would indicate that at peak times the junction operates at 85% of its capacity and thus has a reserve capacity of 15%. This level of reserve capacity is considered by traffic engineers to be the level of reserve capacity generally required at a junction to cater for periods of unusually high traffic flows, such as bank holiday weekends etc.

A summary of the PICADY results for the existing surveyed junctions is provided in Table 10.1 hereunder.

Table 10.1: PICADY Results

Assessment Year	Time Period	Junction 01	Junction 02	Junction 03
			RFC Max	
2009	AM Peak	5.8%	9.4%	26.8%
	PM Peak	8.7%	10.1%	24.9%

As can be seen from the above table the junctions are currently operating well within capacity.

10.3.4 Trip Generation

10.3.4.1 Construction Phase Trip Generation

It is proposed to construct a new 430 MW Combined Cycle Gas Turbine (CCGT) power plant which, subject to planning permission being granted, will be commissioned in late 2012.

An assessment of the construction traffic generation has been conducted based on the current construction plan, experience drawn from similar schemes and first engineering principles. For this study, worst case traffic conditions have been based on the following assumptions:

- Maximum of 500 construction workers on site at any one time
- 20 heavy vehicles deliveries to the site during the day
- 28 abnormal loads over the course of the construction programme

For construction workers, trip generation estimates have been based on the assumption that all construction workers arrive by passenger vehicle to the site during the morning peak hour and depart during the evening peak hour. Further it was assumed that the occupancy of these passenger vehicles is 1.25 persons per vehicle. Estimates for peak hour arrivals for heavy vehicles have been based on first engineering principles and experience drawn from similar developments.

Based on these assumptions, morning peak hour, evening peak hour and daily trip generations have been estimated. A summary of these estimates are shown in Table 10.2.

Table 10.2: Construction Trip Generation Estimates

Traffic Type	Am Peak Hour		Pm Peak Hour		Weekday Daily Total	
	In	Out	In	Out	In	Out
Construction Workforce	400	0	0	400	400	400
Heavy Vehicles	2	2	2	2	20	20
Total	**402**	**2**	**2**	**402**	**420**	**420**

As shown in the table above, the proposed site is expected to generate approximately 404 trips (402 in / 2 out) during the morning peak hour, 402 trips (2 in / 402 out) during the during the evening peak, and 840 weekday daily trips (420 in / 420 out).

10.3.4.2 Abnormal Loads

Due to the complexity of the local road network it is the intention of Endesa to use the existing functional jetty at the power station to deliver selected items of plant and equipment (abnormal loads), to the development site; this will help mitigate the impact on the local roads. Arising from this it is planned to deliver such loads using a combination of shipping and barging due to the coastal location of the proposed development site. Great Island jetty is currently, and has historically, been used for the delivery of bulk Heavy Fuel Oil, and is being maintained as a functional asset.

Consultations have been on-going with shipping companies (Abnormal Load Engineering, Burke Shipping and Allelys Heavy Haulage) and they have confirmed that they are in a position to make such deliveries by use of shipping / barging and a combination of crane and ro/ro pontoon with specialist ramping. These deliveries will not require any works on the foreshore and can be programmed to accommodate tidal and construction programme limitations without affecting the length of the construction programme. It is anticipated that 15 such deliveries would be required. Any deliveries will be planned and programmed in consultation with the relevant port authorities to ensure that the appropriate safety precautions are adhered to.

10.3.4.3 Operational Phase Trip Generation

During the operational phase it is expected that very little traffic will be generated by the site. It is estimated that twenty three full time day employees will work at the site, and 6 deliveries will be made per day. Additional to the twenty three day workers there will be a team of 15 shift workers i.e. 38 permanent employees in total. The shift workers will operate on a three shift basis as follows: Shift 1 from 00:00 to 09:00, Shift 2 from 09:00 to 15:30 and Shift 3 from 15:30 to 24:00. This distribution of shifts over the 24 hour day will result in five shift workers arriving at the site and five departing during the AM peak hour with no arrivals or departures expected during the PM peak hour. For the workers, a conservative occupancy rate of one passenger per vehicle has been estimated. Peak hour trip generation estimates have been formulated from first engineering principles. The morning peak hour, evening peak hour, and weekday daily trip generation estimates are summarised in Table 10.3.

Table 10.3: Operational Phase Trip Generation Estimates

Traffic Type	AM Peak Hour		PM Peak Hour		Weekday Daily Total	
	In	Out	In	Out	In	Out
Full Time Work Force	23	0	0	23	23	23
Shift Workers	5	5	0	0	15	15
Deliveries	2	2	2	2	6	6
Total	**30**	**7**	**2**	**25**	**44**	**44**

10.3.5 Trip Distribution

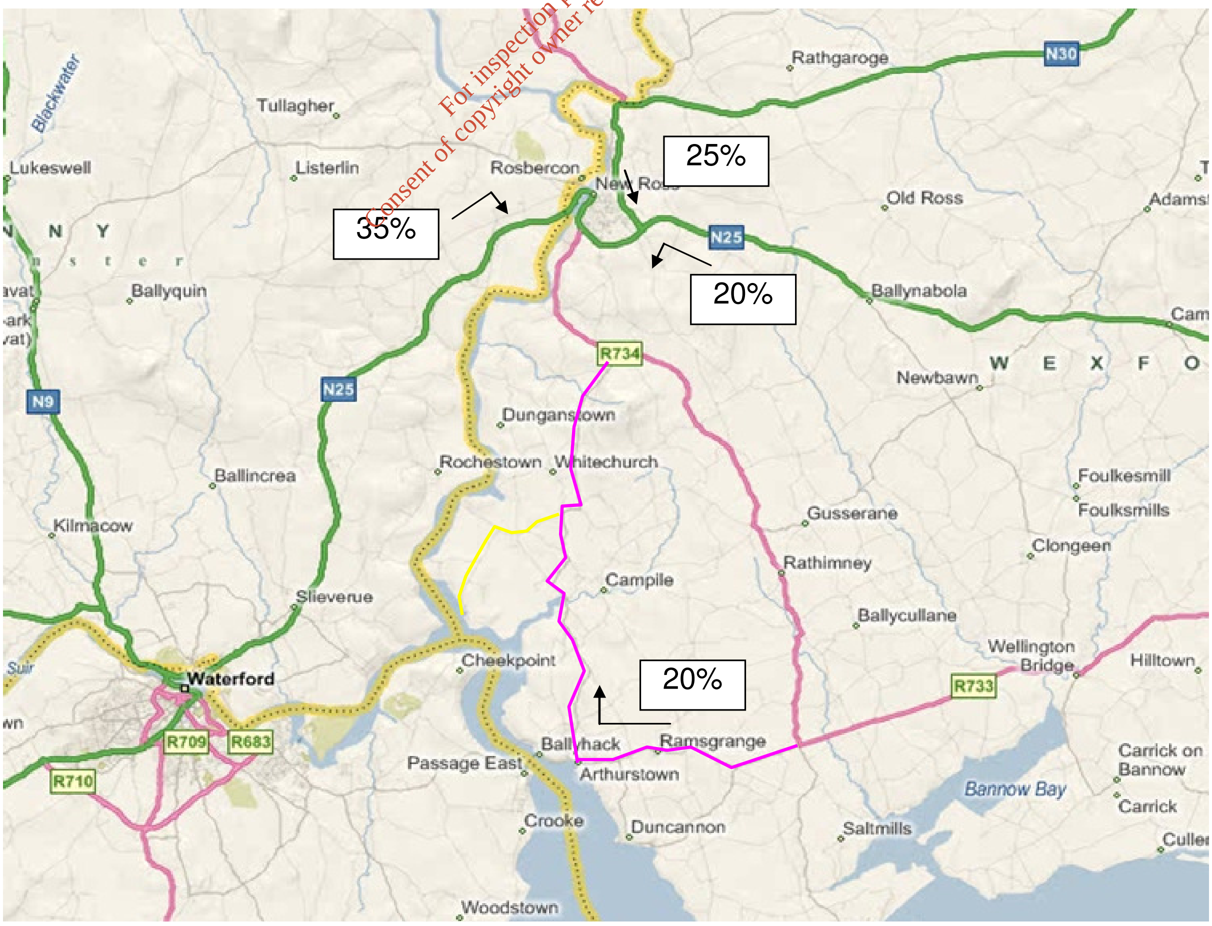
The distribution of trips generated by the development is based on available routing towards the strategic road network and the location of the major urban areas in the vicinity of the development site. The trip distribution profile is detailed in Table 10.4 below.

Table 10.4: Projected Distribution Profile

Roadway	Distribution
N30 & N25 East	45%
N25 West	35%
R733	20%

This distribution of trips to the site is shown graphically in Figure 10.4 below:

Figure 10.4 Trip Distribution



10.3.6 Assessment Years

The peak volumes of construction traffic are expected to occur during the civil works phase, between March 2011 and February 2012. Due to the low volumes of operational traffic it was agreed with Wexford County Council that an operational phase analysis was not required. It was also agreed that junction capacity forecasts, during both the AM and PM peak hours, would be undertaken for the following scenarios:

- Existing Conditions
- Year 2012 Baseline Conditions
- Year 2012 Baseline Conditions plus Construction Traffic

The National Roads Authority (NRA) 2003 publication *Future Traffic Forecasts 2002 to 2040* was used to calculate growth factors for the road network traffic. The following table outlines the calculated growth factors to convert from 2009 to 2012.

Table 10.5: Traffic Growth Factors

	Non-National Roads HGV	Non-National Roads Cars & LGVs
2009	112	115
2012	117	119
Growth Factor	1.045	1.035
Overall Growth Factor Applied	**1.040**	

10.3.7 Highway Capacity Impacts

Developments add traffic to the existing road networks in their immediate vicinity and to a lesser extent further afield from the development location. As mentioned previously the proposed development will impact on the following three junctions:-

- Junction 1 - R733/R683 at Arthurstown
- Junction 2 - R733/Site Access Road
- Junction 3 - R733/R734 at Balinteskin

A junction capacity analysis was therefore undertaken on the above mentioned junctions. Capacity analysis was undertaken for the future years 2012 with and without the proposed development in place. The RFC values obtained for the junctions during the AM and PM peak periods are outlined in the Table 10.6 and Table 10.7 below.

Table 10.6: Ratio of Flow to Capacity at Junction (2012 Do Nothing)

		Junction 01	Junction 02	Junction 03
			RFC Max	
2012 Do Nothing	AM	5.9%	10.1%	28.2%
	PM	8.9%	10.6%	26.1%

Table 10.7: Ratio of Flow to Capacity at Junctions (2012 Do Something)

		Junction 01	Junction 02	Junction 03
			RFC Max	
2012 Do Something	AM	26.8%	71.3%	66.5%
	PM	24.9%	66.0%	68.9%

As can be seen from the above tables both junctions operate well within capacity in 2012 in the Do Nothing scenario (without development in place).

When the peak construction traffic for the Great Island power plant was added to the network it was noted that whilst there were increases in the Ratio of Flow to Capacity (RFC) at all three junctions, all three junctions still operated well within their theoretical capacity of 85%.

10.3.8 Pavement Integrity Impact

Arising from the consultation with Wexford County Council it was decided that given the level of traffic likely to be generated by the development during its construction stage it would be prudent to assess the structural strength of the existing local road accessing the site.

In order to assess the existing structural condition and the residual life of the section of local road accessing the site the services of Pavements Management Services Ltd. (PMS) were engaged to carry out Falling Weight Deflectometer (FWD) testing on behalf of Endesa.

The FWD works on the same principle as all deflection devices; a load of known magnitude is imparted to the pavement, and the resulting deflections of the pavement are measured. For this project, interest centred on deflections under typical HGV wheel loads of 40 kN (kilonewtons). Additionally a coring and dynamic cone pentrometer (DCP) testing programme was carried out by PMS to determine the as-constructed thicknesses of the existing pavement layers.

In order to facilitate PMS in the preparation of their report Mott MacDonald Ireland (MM) provided PMS with the existing Annual Average Daily Traffic (ADDT) and HGV content on the local road and outlined estimated levels of traffic likely to be generated by the proposed development during both the construction and operational phases. The figures developed by MM and outlined to PMS are summarised in the following tables.

Table 10.8: Existing AADT and HGV Content

Existing AADT and Percentage HGV Content on the Local Road	
AADT	%age HGV
831	3.4%

Table 10.9: Construction and Operational Traffic Requirements

Construction Traffic Requirements	
400 Car Trips / Day	20 HGV Deliveries / Day
Operational Traffic Requirements	
30 Car Trips / Day	6 HGV Deliveries / Day

Testing on the local road was carried out by PMS on the 14th October 2009 and a report on the test results and future maintenance requirements was prepared, the full text of this report is contained in Appendix 10.1 of this EIS.

Using the above estimates of HGV movements and the existing AADT and percentage HGV content on the local road PMS have estimated the required maintenance / upgrading on the local road to maintain its structural integrity over a twenty year design period. Their report states that:

"DEHLG guidelines specify that where Surface Curvature Indexes (SCI's) are greater than 250 microns, a hot-mix only overlay is not suitable. Taking into account the design traffic requirement and the fact that the SCI's along the length of each carriageway are generally well in excess of 250 microns, a Clause 804/wet-mix macadam overlay was deemed to be more appropriate than a hot-mix overlay.

A minimum thickness of 150 mm of wet-mix macadam is specified in the DEHLG guidelines for strengthening of Non-National roads. The wet mix/Clause 804 overlay layer should be double surface dressed to seal the unbound material. The thicknesses shown may be superseded by construction requirements.

It should be noted that…..if significantly higher HGV traffic volumes than those shown are anticipated, an overlay consisting hot-mix surface layer over a wet-mix/Clause 804 layer would be more appropriate."

Table 10.10 below shows the Clause 804/Wet-mix macadam overlay requirements, estimated by PMS, by segment for the section of local road based on Non-National Road models (50th% failure curve).

Table 10.10: Overlay Requirements

Lane	Chainage	Overlay Requirements (Wet-mix / Clause 804)
WBCW	0 to 700	200mm
WBCW	700 to 950	150mm
WBCW	950 to 1450	175mm
WBCW	1450 to 1850	150mm
WBCW	1850 to 2400	200mm
WBCW	2400 to 3150	150mm
WBCW	3150 to 4250	150mm
WBCW	4250 to 5000	150mm
EBCW	0 to 625	200mm
EBCW	625 to 1125	150mm
EBCW	1125 to 2325	175mm
EBCW	2325 to 3125	150mm
EBCW	3125 to 4175	200mm
EBCW	4175 to 5000	150mm

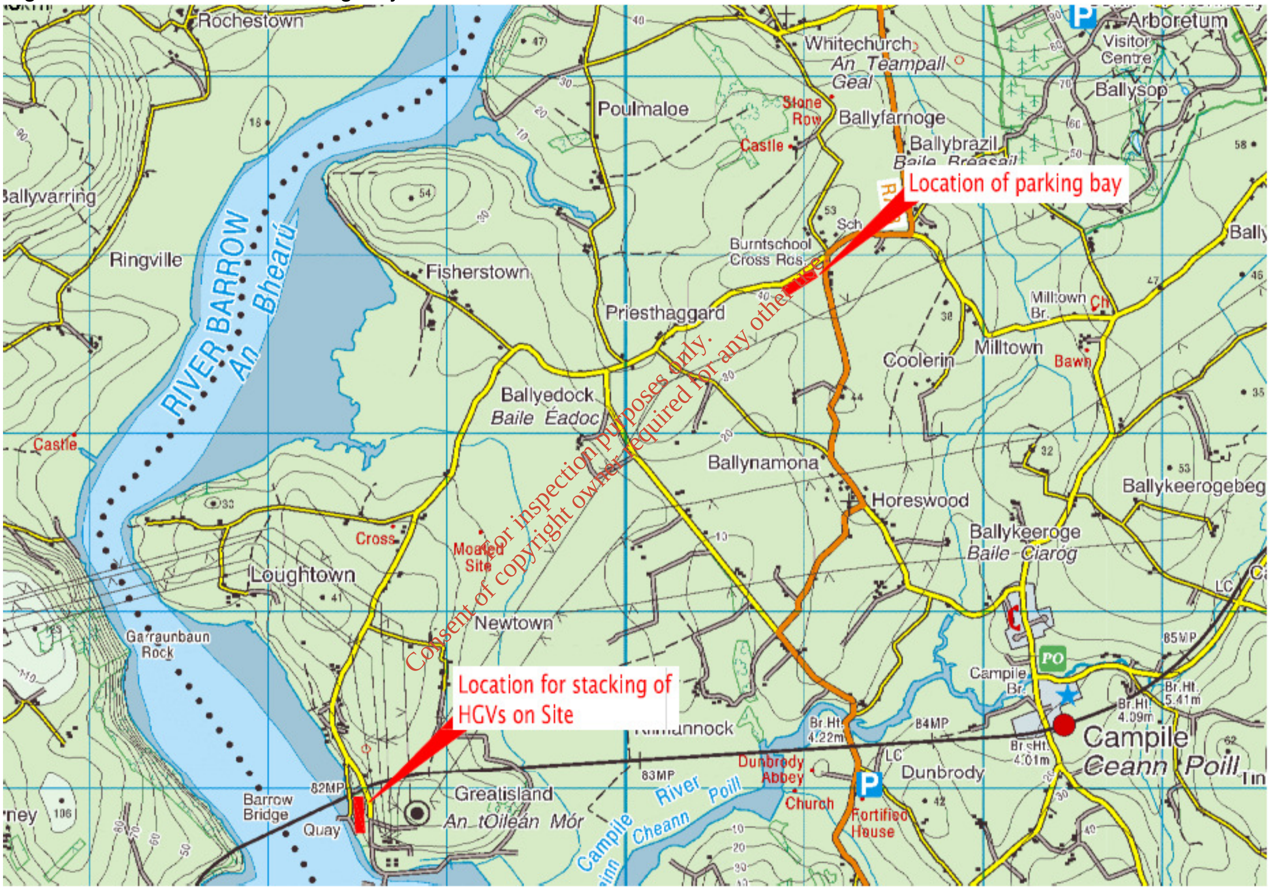
10.3.9 Mitigation Measures for HGV Passage

Given that the width and alignment of the majority of the local road accessing the site is not sufficient to allow for two HGVs travelling in opposite directions to pass each other safely a traffic management plan has been developed. The traffic management plan suggests that two parking bays for HGVs should be constructed at appropriate locations at either end of the local road. The parking bays would be of a sufficient size to allow for the "stacking" of a minimum of four HGVs at a time. Each parking bay would be manned by a traffic controller. The traffic controllers on each bay would be in radio contact with each other, when a stream of HGVs had safely passed along the length of the local road the traffic controller at the end of the road which the stream had just passed would release HGVs from the bay under his control. Whilst this stream passed along the road the controller at the opposing end would "stack" HGV traffic into the bay under his control and vice versa.

A site visit was conducted by MM on 14th October 2009 to assess suitable locations for the proposed parking bays. It was noted that there was sufficient space within the confines of the existing site to cater for the "stacking" of HGVs on site. A potential location for the construction of a temporary parking bay immediately after the junction of the local road and the R733 was identified on agricultural lands located adjacent to the north-east of the affected section of local road.

A portion of land has been acquired and the construction of a parking bay at this location for the duration of the construction phase is anticipated. Figure 10.5 below outlines the proposed locations of the parking bays.

Figure 10.5: Location of Parking Bays



10.4 Summary Conclusion

This assessment identifies the existing, 2009, base traffic conditions at three critical junctions in the vicinity of the proposed development site at Great Island, Co. Wexford. The traffic conditions at these critical junctions have been assessed for the future year 2012 for two scenarios, the Do Nothing Scenario and the Do Something Scenario. The Do Something Scenario assigns the peak construction traffic associated with the development to the traffic carrying network. The analysis indicates that the junctions will operate within capacity in 2012 in the Do Nothing Scenario and also in the 2012 Do Something Scenario.

Pavement integrity testing has been carried out along the entirety of the 5 kilometre section of local road accessing the development site. The current AADT and percentage HGV content along with the estimated construction and operational phase traffic volumes have been used to determine the quantum of remedial works required along the section of local road to achieve a twenty year residual life. A wet mix / clause 804 overlay varying between 150 to 200 mm has been suggested along the entire length of the local road which will result in an improvement to the structural strength of the existing access road.

Given that the width and alignment of the 5 kilometre section of local road accessing the development site is not sufficient to allow for two HGVs travelling in opposing directions to safely pass each other a traffic management plan has been developed. The traffic management plan proposed the installation of a parking bay at either end of the local road. Sufficient space has been allocated on the Great Island site for the operation of one of the said parking bays. A location for the construction of a temporary parking bay immediately after the junction of the local road and the R733 has been identified on agricultural lands located adjacent to the north-east of the affected section of local road. The acquisition of this portion of land has been negotiated with the affected land owner and the construction of a parking bay at this location for the duration of the construction programme is anticipated.

11. Human Beings – Noise and Vibration

11.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS has been prepared in order to help fulfil this requirement with respect to noise and vibration in the area of the proposed development.

Local, regional and national policies and plans, best practice guidance and reports of relevance to the noise environment within, and in the vicinity of, the site of the proposed plant have been reviewed and appropriate information has been fed into Chapter 5 (Policy and Planning Context) and this assessment process.

Power plants are not considered to be a likely source of operational vibration which could give rise to nuisance or damage to properties. Construction of the facility is considered to be the only period where there could be any potential vibration impacts. Given the distance from the proposed location to the closest sensitive receptor (approximately 300 metres from the main gate or approximately 450 metres from the construction area) it is considered unlikely that any construction activity could cause a vibration impact at the sensitive receptors. Imperical studies indicate that vibration impacts from pile driving are typically not detected at distances greater than 100 metres (Hiller DM, Crabb GI, 2000). Therefore, vibration has been scoped out of the impact assessment.

11.2 Methodology

11.2.1 Guidance Used

The section presents the methodology used in assessing the potential noise impacts. As well as considering the relevant EPA guidance with respect to EISs (EPA 2002 and EPA 2003) the scope and methodology for the baseline assessment has been devised with reference to the following guidelines:

- Guidance Note for Noise In Relation To Scheduled Activities, 2nd Edition, 2006, EPA
- BS 4142 – Rating Industrial Noise Affecting Mixed Residential and Industrial Areas
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004, The National Roads Authority
- British Standard BS 5228-1:2009 A Code of Practice for noise and vibration on construction and open sites – Part 1: Noise
- Advisory Leaflet 72 (1976) Noise control on building sites, UK Department of Environment
- Planning Policy Guidance Note PPG 24 Planning and Noise, UK DoE 1994

Currently noise monitoring is carried out on an annual basis as per Condition 8 of the sites IPPC licence (Reg. No. P0606-02) issued by the EPA. Noise Monitoring Locations (NML) chosen as part of the licence condition have previously been agreed with the EPA as being representative of the receiving environment.

11.2.2 Study Area

Three NML have been identified as being representative of the surrounding environment and those Noise Sensitive Receptors (NSR) which could be impacted upon by the operation of the existing power plant. The locations are the nearest NSR to the north of the site and two locations in Cheekpoint on the opposite river bank to the south of the site. The NMLs are identified in Figure 11.1: Noise Contours Normal Contours at 1.8m height (refer to Appendix 11.3).

Descriptions of the NMLs are provided in Table 11.3, Description of Monitoring Locations and Noise Sensitive Receptors, and a summary of the results of the monitoring is presented in Table 11.4: Baseline Noise Level Summary dB Free-field. Details of this noise survey can be found in Section 11.3. Additional NSR to those identified in the current IPPC licence were included within the study area (five in total) to give a greater geographical spread. As noise impacts mitigate with distance, the noise sensitive receptors closest to the site were selected as the most appropriate locations to predict future noise levels.

11.2.3 Baseline Evaluation Criteria

The Environmental Protection Agency (EPA) has issued a licence to Endesa Ireland Limited for the "*production of combustion installations with a rated thermal input equal to or greater than 50MW*" – IPPC Licence P0606-02. The licence stipulates noise emission limit values, which state that daytime (08:00 – 22:00) and night-time (22:00 – 08:00) noise levels should not exceed the levels below at noise sensitive locations as a result of the activities on site:

Daytime	$L_{Aeq,30min}$	55dB(A) free-field
Night-time	$L_{Aeq,30min}$	45dB(A) free-field

Annual monitoring is carried out by the applicant / current operator to ensure compliance with these criteria

11.2.4 Impact Assessment Criteria

The source and type of all identified potential impacts is set out in Section 11.4. The mitigation measures that are defined for any potentially significant impacts are set out in Section 11.5. Any likely residual impacts are evaluated in terms of magnitude and significance in Section 11.6.

Magnitude

The magnitude of an impact is assessed in consideration of its intensity, and its extent in space and time. The criteria used to assess the magnitude of impacts from noise are shown in Table 11.1.

Table 11.1: Threshold Criteria for Evaluating the Effects of Noise during Construction

Criteria	Impact Magnitude
The permanent change is greater than or equal to 10dB	High
The permanent change is greater than or equal to 5dB	Medium
The permanent change is greater than 3dB	Low

Significance

The significance of all impacts is considered in consideration of the magnitude of the impact and the importance / sensitivity of the affected area. As the noise assessment is focused on human receptors and in particular those sensitive at night time, which are the most sensitive receptors, the significance of the impact is determined by the magnitude as any change in operational noise will be permanent. Construction noise impacts are anticipated to only impact upon the day time period and will only be experienced over a short period of time (mainly during the civil works phase and when construction traffic is high – anticipated to be approximately 12 months).

Construction

The construction phase of a development is often the period over which any potential for noise impact is greatest. There are difficulties in applying the same noise control measures to temporary construction activities (different phases and activities over the course of the construction project) as are applied to fixed and permanent installations or operations. The reasons for this are as follows:

- For construction work, noise control measures can be restrictive and could unreasonably prolong the site works and construction programme
- Works areas are not fixed and change according to the demands of the construction work
- Work, in the initial stages at least, is conducted outdoors without the benefits of fixed plant housing
- Mobile plant is used which limits the scope for noise control measures

The National Roads Authority's Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004 is the only nationally issued Irish guidance available in relation to acceptable noise levels during construction. Advice and guidelines to local planning authorities and developers in the UK can be found in Planning Policy Guidance Note PPG 24 (DoE UK 1994), British Standard BS 5228 and Advisory Leaflet (AL) 72 (DoE UK). AL 72 is out of print, but is referred to in the discussion on the significance of construction noise in Annex E of BS5228-1: 2009 and remains as a paper giving guidance on acceptable levels of noise. PPG24 refers to the guidance in BS 5228 in respect of construction noise. These guidelines are considered as transferable and appropriate for construction projects in the Republic of Ireland and have been applied in several similar assessments.

DoE Advisory Leaflet (AL) 72 gives advice as to maximum levels of construction site noise to prevent conversation being difficult inside occupied buildings with windows closed, during daytime hours (07:00-19:00). The leaflet states that the noise level outside the nearest occupied room should not exceed:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise.

These levels are generally taken as being facade L_{Aeq} AL 72 also suggests that in the evening period a level of 10 dB(A) below daytime levels may be appropriate. BS 5228 Part 1 also reinforces the use of the levels described above as significant noise level thresholds.

The NRA guidance suggest that noise levels of 70 dB(A) L_{Aeq} between daytime hours (07:00-19:00) and 60 dB(A) L_{Aeq} between evening (19:00-22:00 hours) would be acceptable. The NRA guidance also put forward levels for weekend and holiday periods as set out in Table 11.2 Threshold Criteria for Evaluating the Effects of Noise during Construction.

A summary of the relevant criteria for the assessment of the effects of construction noise is set out in Table 11.2. The noise levels set out are not aimed at providing noise limits for construction activities, but are the threshold criteria used for the assessment of construction noise effects. A night-time noise criterion level has been included. However, no night-time construction work is anticipated to be carried out, except in exceptional circumstances.

The criteria are based on the project team's experience of standard practice on a wide range of relevant projects. The approach that has been adopted in the assessment to determine the potential noise effect from construction activities compares predicted noise levels for each construction phase with the noise criteria in Table 11.2. In cases where predictions show that these criteria will be exceeded for more than very brief periods, a significant potential effect has been reported.

Table 11.2: Threshold Criteria for Evaluating the Effects of Noise during Construction

Period	Building/Location	Criteria for Assessment LAeq, 1 hour	Purpose
Daytime (0700 – 1900)	Dwellings/Offices (façade)	70 dB	To maintain speech intelligibility
	Schools	65 dB	To maintain speech intelligibility in classrooms
Evening (1900 – 2200)	Dwellings (façade)	60 dB	To avoid disturbance
Night-time (2200 – 0700)	Dwellings (façade)	45 dB	To avoid sleep disturbance
Saturday (08:00 - 16:30)	Dwellings (façade)	65 dB	To avoid disturbance
Sundays and Bank Holidays (08:00 - 16:30)	Dwellings (façade)	60 dB	To avoid disturbance

Increases in road traffic noise of 3 dB(A) or more have been considered potentially significant for construction traffic. Changes, that are only above the criterion by a small amount and which are likely to apply for a short period, have not been considered significant.

Operation

The power plant currently in operation on site is licensed by the Environmental Protection Agency (EPA) – IPPC Licence P0606-02. Noise emission limit values as outlined below have been stipulated in Condition 8 of the licence and are in line with the guidance issued by the EPA, Guidance Note for Noise In Relation To Scheduled Activities, 2nd Edition, 2006, which suggests that daytime (08:00 – 22:00) and night-time (22:00 – 08:00) noise levels should not exceed the levels below at noise sensitive locations:

Daytime	$L_{Aeq,30\ min}$	55dB(A) free-field
Night-time	$L_{Aeq,30min}$	45dB(A) free-field

The proposed Combined Cycle Gas Turbine (CCGT) power plant will have a capacity of approximately 430 MW for export to the national grid. The plant will operate principally as a base load plant, with a high annual factor, at or near 100% load during the weekday daytime hours and reduced load or shut down during the night and at weekends, when necessary.

As the plant is likely to operate during the night-time hours, the plant will have to be able to achieve the night-time criteria at full load. Therefore the primary assessment criteria will be:

$L_{Aeq,30min}$ 45dB(A) free-field

11.3 Baseline Description and Evaluation

11.3.1 Description

The Great Island power plant is located on the Co. Wexford coastline at the confluence of the River Suir and Barrow. The townland of Great Island is made up predominately of agricultural land with a number of scattered residential properties. Cheekpoint, to the south of the site on the opposite side of the river, is the closest town (C. 700M). Cheekpoint is a quiet tourist location with little traffic passing through it and surrounded by agricultural land.

In such rural settings the predominant noise sources are typically traffic, agricultural vehicles and associated activities. In this case the Great Island power plant is currently in operation and there are a number of industrial activities located at Waterford Harbour, 2 kilometres to the west of the site, so industrial noise currently forms a part of the environmental noise character of the wider area.

As required under Condition 8 of the IPPC licence the site carries out an annual noise survey. The monitoring locations are described in Table 11.3 below.

Table 11.3: Description of Monitoring Locations and Noise Sensitive Receptors

Ref.	Ref.	Location	Description
NML1	NSR 1	Last Bungalow on Approach Road to Station and in line of sight of the Station. Approx 300M from Main gate.	Station clearly audible. Occasional passing traffic and wildlife.
	NSR 2	Next bungalow north of NSR 1 on Approach Road to Station and in line of sight of the Station. Approx 400M from Main gate.	No baseline monitoring carried out at this point. The noise environment would be similar or the same as NML 1.
NML2		"Cheekpoint" on Coast Road 1/3 distance from Main Pier to old pier	Station clearly audible. Occasional passing traffic and wildlife.
	NSR 3 & 4	Residential properties to the west of this location were selected to be representative of NSR in the area.	No baseline monitoring carried out at these points. The noise environment would be similar or the same as NML 2.
NML3		"Cheekpoint" on "Board of Works" ground in line with Unit 3 Chimney	Station clearly audible. Occasional passing traffic and wildlife.
	NSR 5	Residential property to the east of NML 3 was selected to be representative of NSR in the area.	No baseline monitoring carried out at these points. The noise environment would be similar or the same as NML 3.

The information provided in the table above has been extracted from IPPC noise monitoring reports submitted to the EPA

11.3.2 Evaluation

The noise environment within the study area has been evaluated in consideration of the factors detailed above and the criteria detailed in Table 11.2. The results of this evaluation are shown in Table 11.4.

Table 11.4: Baseline Noise Level Summary dB Free-field

	Daytime Noise Levels 0800 – 2200 (dB)		Night-time Noise Levels 2200 – 0800 (dB)	
NML	**LAeq**	**LA90**	**LAeq**	**LA90**
2008				
1	50	42	41	36
2	44	37	41	35
3	42	38	45	37
2007				
1	44	41	47	43
2	41	36	41	36
3	41	38	45	39
2006				
1	45	38	39	36
2	39	35	38	35
3	43	38	38	36
2005				
1	39	-	36	33
2	45	43	44	41
3	48	46	47	45

The information provided in the table above has been extracted from IPPC noise monitoring reports submitted to the EPA

The plant was off load during the night time monitoring in 2007 and 2008, only Unit 3 was on load in 2006 (35 MW) and Unit 1 (27 MW), Unit 2 (27 MW) and Unit 3 (35 MW) were on load in 2005. The results and observations indicate that the plant is compliant with their licence conditions. Noise levels in the area, during both the day and night, are low due to the rural nature of the area. The station is clearly audible during all the day time samples and it is noted that all but one sample was at or below the night-time criteria of 45dB(A). The reason for the higher night-time levels measures at NML1 in 2007 are not known.

11.4 Identification of Potential Impacts

11.4.1 Construction

11.4.1.1 Construction Noise Prediction Methodology

Noise levels are predicted using the methods set out in British Standard 5228. Predictions are made based on indicative plant teams representing what are considered to be the noisiest phases of the works.

For specific construction activities the exact plant details will not be known prior to the detailed design and construction phase programming of the project. However, an indicative assessment has been undertaken by assuming a general plant team based upon experience of the activities required and discussions with the design engineers. Construction noise has been predicted for the 'worst-case' situation in each of the three phases of construction, as outlined in Table 11.5: Construction Phases, and is considered to be a snap-shot of concurrent construction activities where numerous construction plant items for multiple activities are operating simultaneously. Information on the expected construction schedule can be found in Chapter 3 (Description of the Development). Construction plant teams associated with relevant activities are summarised in Appendix 11.1 (Construction Plant Teams and Associated Sound Power Levels).

Predictions have been undertaken using the proprietary modelling software SoundPlan. Together with associated sound power levels for construction plant equipment, equivalent noise levels at receptors will also depend upon the expected percentage of usage or on-time, distance from the source, air and ground absorption, and any potential screening from buildings or topography. Location of construction equipment within the site for the noise assessment is based upon assumption of a typical case, where plants items are located arbitrarily, unless associated with a location-specific activity.

11.4.1.2 Predicted Noise Levels during Construction Phase and Impacts

Three phases, each considering concurrent construction activities, have been modelled and assessed. A summary of these three phases is shown below in Table 11.5. Construction Plant Teams and Associated Sound Power Levels are presented in Appendix 11.1.

Table 11.5: Construction Phases

Construction Phase	Concurrent Activities
1 – Site Clearance	Site Clearance Grading
2 – Civil Works	Excavation Piling Pouring Foundations
3 – Plant Installation	Backfilling Excavation Structural Steelwork

Noise levels for 'worst-case' scenarios in each of the three phases of construction have been predicted at the nearest NSR and are shown below in Table 11.6. Normal working hours during the construction period are expected to be Monday to Friday 0800 – 2000 and Saturday 0800 – 1700. Most of this work thus falls into the daytime noise assessment category. An hour of the daily duration of construction activities falls into the evening assessment period, and as such predicted noise levels have also been compared with this criterion. The evening criterion is a three hour averaged noise level, between 19:00 – 22:00. No night-time works are scheduled for the construction phase. Construction traffic will also exit the site during the evening period and will be assessed against this criterion.

Table 11.6: Predicted Unmitigated Construction Noise Levels

NSR	Location	Predicted Noise Level for Construction Scenario (LAeq, T dB, facade)			Exceedance of Daytime Construction Noise Criterion (dB)	Exceedance of Evening Construction Noise Criterion (dB)
		1	2	3		
NSR 1	**NML 1**	37	41	36	0	0
NSR 2	**Residential property just north of NSR 1**	37	40	37	0	0
NSR 3	**Residential Properties in Cheekpoint represented by NML 2 and 3**	50	50	48	0	0
NSR 4		47	48	46	0	0
NSR 5		50	50	49	0	0

Table 11.6 above indicates that no exceedance of the day-time or evening-time construction noise assessment criterion ($L_{Aeq,T}$ 70 dB and 60 dB) is predicted at the closest NSRs and consequently no impacts are expected at these or any other location.

Construction Traffic

During the 30 month construction period employees are anticipated to travel to and from the site by personal means. At its peak it is anticipated that there will be 500 people working on the site (month 15 of the construction period) which would equate to 400 light vehicle movements, assuming 1.25 persons per vehicle. Traffic movements associated with the construction personnel will occur primarily in the hour prior to construction starting and after construction ceases each day. In a worst case scenario 500 construction workers equating to 400 light vehicles would travel to the site. This would result in an increase in traffic volumes on the local road system and the larger local road, the R733, during the hours of 07:00 – 08:00 and 20:00 – 21:00. The magnitude of change in noise levels due to construction traffic would be greater than 5 dB(A).

The worst case scenario was modelled (400 vehicles) for the evening period of 20:00 – 21:00. The CRTN guidelines were followed and the results are predicted in terms of an L_{A10} noise level, whereas the evening noise criterion is in L_{Aeq}. Assumptions for the modelling were that vehicles travel at 50kph, on a bituminus road, with 0% gradient and there is soft ground between the road and receptor. It does not allow for any additional mitigation which may be obtained from road side ditches or walls which could reduce noise levels at particular receptors. To convert from L_{A10} to L_{Aeq} a generally accepted correction of -2dB was applied to the predicted noise levels.

Using the approach outlined above, the predicted noise level was calculated for each of the 30 months of construction. Indicative modelling demonstrates that the evening noise criteria of 60 dB(A) $L_{Aeq,\ 1\text{-hour}}$ would be exceeded from month 13 to month 18 (six months) of the construction phase due to the predicted increase in traffic volumes during one hour of the three hour evening period. The predicted levels, during the hour the construction traffic exit the site (20:00 – 21:00), were 61, 62, 63 62, 62, and 61dB L_{Aeq} respectively. As the magnitude of change from 60dB L_{Aeq} to 63dB L_{Aeq} is considered low and the period of six months is considered to be short term, the significance of this impact would be considered low.

If the noise levels are averaged over the three hour evening period, the average hourly L_{Aeq} would be below the criterion of 60dB(A) $L_{Aeq,\ 1\text{-hour}}$.

11.4.2 Operation

11.4.2.1 Noise Propagation Model

Propagation of noise from operation of the proposed CCGT plant was predicted using the proprietary modelling software SoundPlan. Noise predictions were made using this software according to guidelines specified in *ISO 9613-2: Attenuation of Sound Propagation Outdoors: General Method of Calculation, International Organisation for Standardisation, 1996*. This methodology considers the strength and size of the noise sources, screening effects due to local topography and intervening buildings, dispersion of sound energy over distance, and attenuation due to ground and air absorption.

Topographical data for the area of the proposed development has been supplied digitally, in the form of elevation contours and spot-heights. Buildings in the area are included in the model and have been identified through site visits, consultation with plant personnel and review of mapping information. Information on the site layout for the proposed power plant and auxiliary buildings is detailed in Chapter 3 (Description of the Development).

Noise source strengths for the proposed power plant items for the steady-state operation of the facility are summarised in Appendix 11.2 (Operational Plant, Noise Source Levels Used in Noise Prediction Model). Sound power levels for individual equipment were provided by a number of potential suppliers. These levels provide an accurate representation of the noise levels likely to be associated with each plant item. As the area to the north of the development site consists primarily of agricultural land and to the south is water, appropriate soft and hard ground attenuation has been included for all predictions of noise at noise sensitive receptors.

11.4.2.2 Noise Impacts during the Operational Phase

Incorporation of the above information into the noise model has enabled predictions of operational noise levels at receptors to be made. Additionally, predicted operational noise contours have been produced to give an indication of the contribution of the proposed power plant to environmental levels. Table 11.7 summarises the predicted noise levels at the closest NSRs. Appendix 11.3 (Operational Plant Noise Contours) presents the predicted noise contours at 1.8 metres above ground level.

Table 11.7: Night time Operational Noise Levels at Receptors

NSR	Impact Assessment Criterion	Existing background night time levels	Predicted Level (LAr, T dB) arising from plant	Combined noise levels	Exceedance of Noise Criterion (dB)	Magnitude of change
1	45	43	39	45	0	+2
2	45	43	39	45	0	+2
3	45	43	40	45	0	+2
4	45	43	37	44	0	+1
5	45	43	38	44	0	+1

As can be seen from Table 11.7 the predicted noise levels from the operation of the plant are lower than the 45 dB(A) criterion. The predicted noise from the plant was added to the average existing background noise levels. The results indicate that the noise criterion will not be exceeded at any of the noise sensitive receptors and the predicted magnitude of change is low.

Operational Traffic

Traffic levels associated with the operation of the power plant are predicted to decrease marginally. Therefore, a positive but imperceptible impact will be experienced.

11.5 Mitigation Measures

11.5.1 Construction

As indicated by the noise modelling it is predicted that there will be no significant impact on the noise environment during the construction phase of the project as the impact assessment criteria is not normally exceeded. However, it is noted that the noise environment will change during this period as a result of increased traffic volumes. The implementation of a Construction Environmental Management Plan (CEMP) will ensure that good practice for construction will be used on site and is predicted to reduce noise levels even further. These practices include ensuring that:

- Plant will be used in an appropriate manner with respect to minimising noise emissions
- Inherently quiet plant will be selected where appropriate
- Local screening is used wherever practical and / or considered necessary to achieve the construction noise target
- Noisy plant will be located as far as possible from sensitive receptors

- Construction contractors will be required to adhere to the codes of practice for construction working given in British Standard BS 5228, and the guidance given therein, for minimising noise emissions from the site

- Construction contractors will be required to comply with the requirements of the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 as amended in 1990 and 1996 (S.I. No. 320 of 1988, S.I. No. 297 of 1990 and S.I. No. 359 of 1996), and the Safety, Health and Welfare at Work (Control of Noise at Work) Regulations, 2006 (S.I. No. 371 of 2006)

- Notification procedure to notify residents of particularly noisy activities

- The Traffic Management Plan will look at ways of minimising the potential impacts from construction traffic which could include reduced speed limits, car pooling, bus transfers or commitment to agreed driving behaviours on local roads

11.5.2 Operation

The operation of the power plant will be licensed by the EPA. Noise limits as described in Section 11.2.3 will be applicable to the site. As demonstrated in Section 11.4, predicted noise levels are not expected to exceed the noise assessment criteria at any of the noise sensitive receptors. Modelling of noise from the proposed power plant is based upon a conceptual layout and plant type. It is noted that screening has been incorporated around the HRSG to minimise potential noise impacts from the plant. During detailed design the noise model can be refined and detailed mitigation, if necessary, will be identified and incorporated into the design to ensure compliance with the required IPPC licence conditions.

11.6 Residual Impact

11.6.1 Construction Stage

Construction is likely to be audible in the vicinity of the development, although due to the temporary and transient nature of works, this will not result in any significant long term impacts. Construction traffic will result in a significant change in the noise environment but will not exceed the assessment criteria. No significant residual impacts are predicted to occur at the noise sensitive receptors.

11.6.2 Operational Phase

Predicted noise levels at the noise sensitive receptors during operation do not exceed the assessment criteria. As part of the detailed design process detailed modelling of the plant layout and operation will be carried out and will incorporate mitigation measures as necessary to ensure the criteria are met. No significant residual impacts are predicted to occur at the noise sensitive receptors.

11.7 Summary Conclusion

Power plants are not considered to be a likely source of operational vibration which could give rise to nuisance or damage to properties. Construction of the facility is considered to be the only period where there could be any potential vibration impacts. Given the distance from the proposed location to the closest sensitive receptor (approximately 300 metres from the main gate or approximately 450 metres from the construction area) it is considered unlikely that any construction activity could cause a vibration impact at the sensitive receptors. Imperical studies indicate that vibration impacts from pile driving are typically not detected at distances greater than 100 metres (Hiller DM, Crabb GI, 2000). Therefore, vibration has been scoped out of the impact assessment.

A noise impact assessment of the construction phase and operational phase of the project was completed. This assessment took into consideration the existing baseline noise environment and assessed the potential impacts against nationally and internationally accepted criteria and noise limits likely to be enforced by the EPA as part of the operational plants revised IPPC licence.

Construction is likely to be audible in the vicinity of the development, although due to the temporary and transient nature of works, this will not result in any significant long term impacts. Construction traffic will result in a significant change in the noise environment but will not exceed the assessment criteria. No significant residual impacts are predicted to occur at the noise sensitive receptors.

Predicted noise levels at the noise sensitive receptors during operation do not exceed the assessment criteria. As part of the detailed design process detailed modelling of the plant layout and operation will be carried out and will incorporate mitigation measures as necessary to ensure the criteria are met. No significant residual impacts are predicted to occur at the noise sensitive receptors.

12. Flora and Fauna

12.1 Terrestrial

12.1.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This section of the EIS presents a terrestrial Ecological Impact Assessment (EcIA) of the proposed development.

The principal objectives of assessment are to identify the habitats and species present in the study area, determine their nature conservation value and assess and mitigate any impacts associated with the development. The terrestrial ecology surveys, conducted by Mott MacDonald Ireland Ltd. and Wildlife Surveys Ireland, were undertaken to identify habitats and species present within the development site and assess the potential impacts of the construction and operational phases of the proposed development on terrestrial flora and fauna.

An ecological assessment of the marine environment is provided in Section 12.2.

12.1.2 Methodology

12.1.2.1 Guidance Used

The ecological assessment was prepared in accordance with legislative requirements including *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora,* commonly referred to as the Habitats Directive and *Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment* and amended by *Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment*. These directives were transposed into Irish law by the Statutory Instruments (S.I.) No. 94/1997 - *European (Natural Habitats) Regulations 1997* and subsequent amendments, No. 349 of 1989 - *European Communities (Environmental Impact Assessment) Regulations, 1989*; S.I. No. 92 of 1999 - Local *Government (Planning and Development) Regulations, 1999*; S.I. No. 93 of 1999 - *European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999*.

This assessment was also conducted in accordance with the *Guidelines on the Information to be contained in Environmental Impact Statements* (Environmental Protection Agency, 2002), *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements* (Environmental Protection Agency, 2003), *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2006, 2009) and the Institute of Ecology and Environmental Management (IEEM) *Guidelines for Ecological Impact Assessment.*

The methodology for the assessment was based on the following:

- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009)

- Guidelines for the treatment of otters prior to the construction of national roads schemes; (National Roads Authority, 2006)
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes; (NRA, 2006)
- Guidelines for the Treatment of Bats during the Construction of National Roads Schemes (NRA, 2006)
- Guidelines for Ecological Impact Assessment (National Roads Authority, 2006 and 2009)
- Guidelines for Ecological Impact Assessment (Institute of Ecology and Environmental Management (IEEM), 2008)
- A Guide to Habitats in Ireland (Fossit, 2000)
- Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland; (The Heritage Council, 2005)

12.1.2.2 Study Area

The proposed development is located at Great Island, County Wexford, on the eastern shore of the River Barrow and just north of the confluence of the River Barrow and River Suir. The extent of the survey area includes the development site and laydown area and a section of hedgerow along the access road to the site. The desktop study area encompassed a wider area up to 15 kilometres from the development site boundary. Figure 12.1: Designated Conservation Sites illustrates the extent of the desk-top study area identifying the location of designated conservation sites within a 15 kilometres radius of the proposed development site.

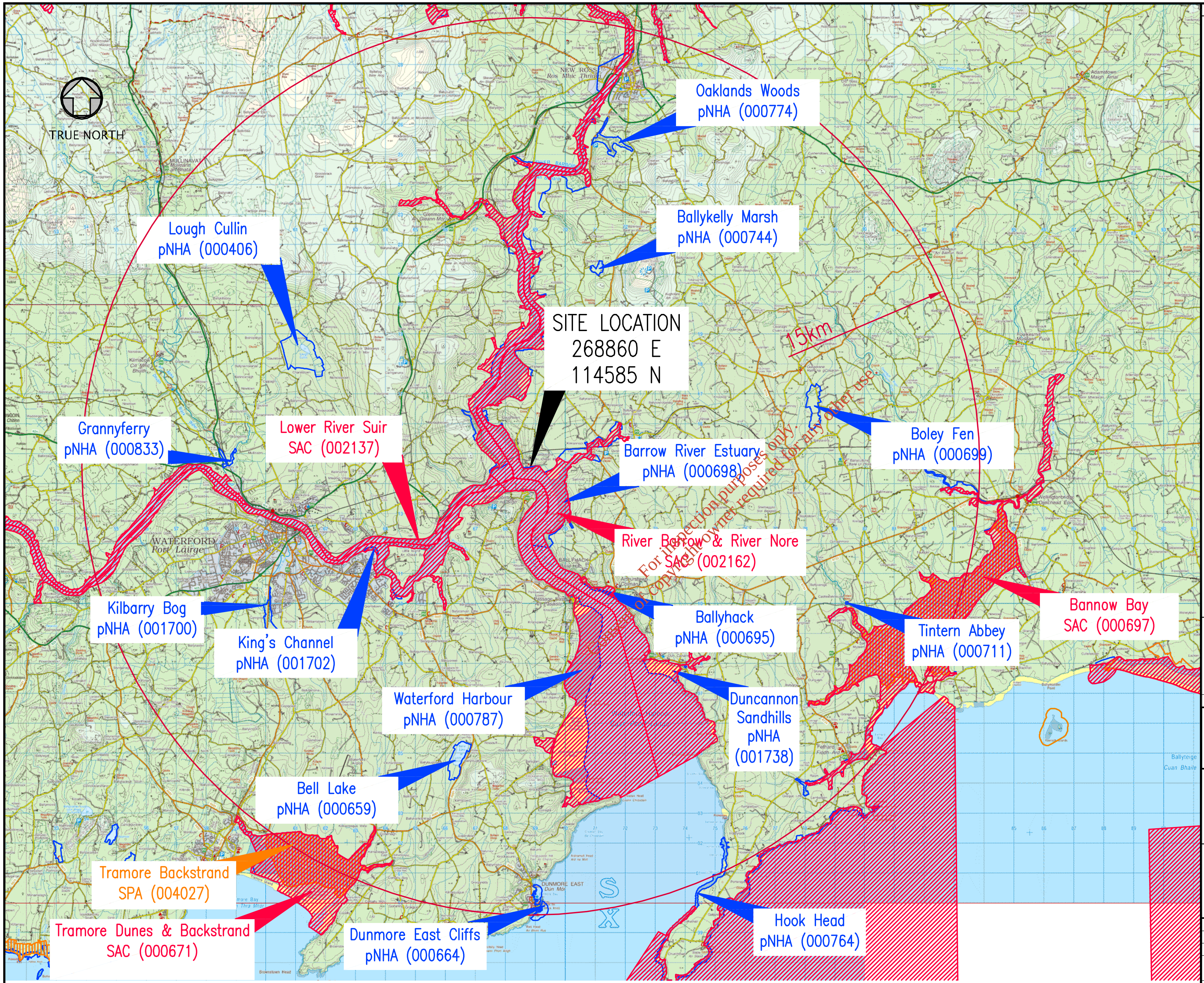
The generating station was constructed in the 1960s and the proposed development site for the new CCGT power station is located within the existing site, Grid Reference E 268907, N 114574. The study area comprises an area of recolonising bare ground, sewage treatment unit and storage buildings to the south of the site. In addition, a laydown area is proposed in the densely planted wooded area to the northeast of the site. A parking bay is also to be provided within private lands adjacent to the access road to the site (Refer to Figure 3.1) to facilitate movements of Heavy Goods Vehicles (HGVs) during the construction phase. It is intended to use the existing gates for entry and exit, however, for the purposes of this assessment it was assumed that hedgerows may be removed in part. In addition, a stacking area for HGVs has been identified within the site boundary of the power plant facility.

12.1.2.3 Desktop Study and Consultation

The desk study comprised consultation with relevant authorities. The National Parks and Wildlife Service (NPWS) database was researched to determine if any protected species occur on or in the vicinity of the site. Following a meeting between Endesa, ERM and NPWS on 25th June 2009, the NPWS requested that a bat and badger survey be conducted at the site.

The principal sources of information that were referred to include:

- The Wildlife Act 1976
- The Wildlife (Amendment) Act 2000



Notes

1. Ordnance Survey Ireland Licence No. EN0034509 ©Ordnance Survey Ireland/Government of Ireland
2. All co-ordinates shown in metres to Irish National Grid

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	02/11/09	SK	For Information Only	BK	PK

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Title

Combined Cycle Gas Turbine (CCGT)
Great Island, Co. Wexford
Designated Conservation Sites

Designed	SK		Eng.Chk.	-	
Drawn	SK		Coordination	BK	
Dwg.Chk.	DH		Approved	PK	

Scale	Project	Status
NTS	257554	INF
	CAD file: Figure 12.1	

Drawing No	Rev
Figure 12.1	P1

Filename: Figure 12.1.dwg, Plotted by ken49363, on Nov 25, 2009 -1:04pm

- S.I. No. 94/1997, European (Natural Habitats) Regulations 1997 and subsequent amendments
- Curtis, T.G.F., McGough, H.N., *The Irish Red Data Book*, Wildlife Service Ireland, 1988
- S.I. 94 of 1999 Flora Protection Order 1999
- NPWS database and map viewer – www.npws.ie

12.1.2.4 Terrestrial Ecological Surveys

Field surveys, carried out to inform the ecological baseline assessment, are set out below. These surveys were undertaken in order to verify the information gathered during the desktop exercise and to identify, map and evaluate the habitats located within and adjacent to the proposed site. A terrestrial and botanical survey of the site was conducted on 22nd July 2009 and the area for the proposed parking bay was surveyed on 9th November 2009. A mammal survey was conducted on 4th and 5th August 2009.

Habitat and Flora Survey

The terrestrial habitat survey was conducted on 22nd July 2009. The survey was conducted during the flowering season which is the optimum period for botanical surveying. Weather conditions on the day of survey were generally good, with the occasional shower.

Habitats present were classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000) and in accordance with *Draft Habitat Survey Guidelines: a Standard Methodology for Habitat Survey and Mapping in Ireland* (Heritage Council, 2005). Habitats within the survey area were mapped and the extent of each habitat was determined. The habitats or species of ecological interest are indicated on the habitat map (Figure 12.2: Habitat Map) by target notes, denoted by T (e.g. T1 – Target Note 1).

The flora present within the different habitats encountered is listed under the habitat category and Latin names are used at first mention. Flora listed in the Flora Protection Order (1999) and by Curtis and McGough (1988) in the *Irish Red Data Book* are of high conservation importance and when encountered the following records are made:

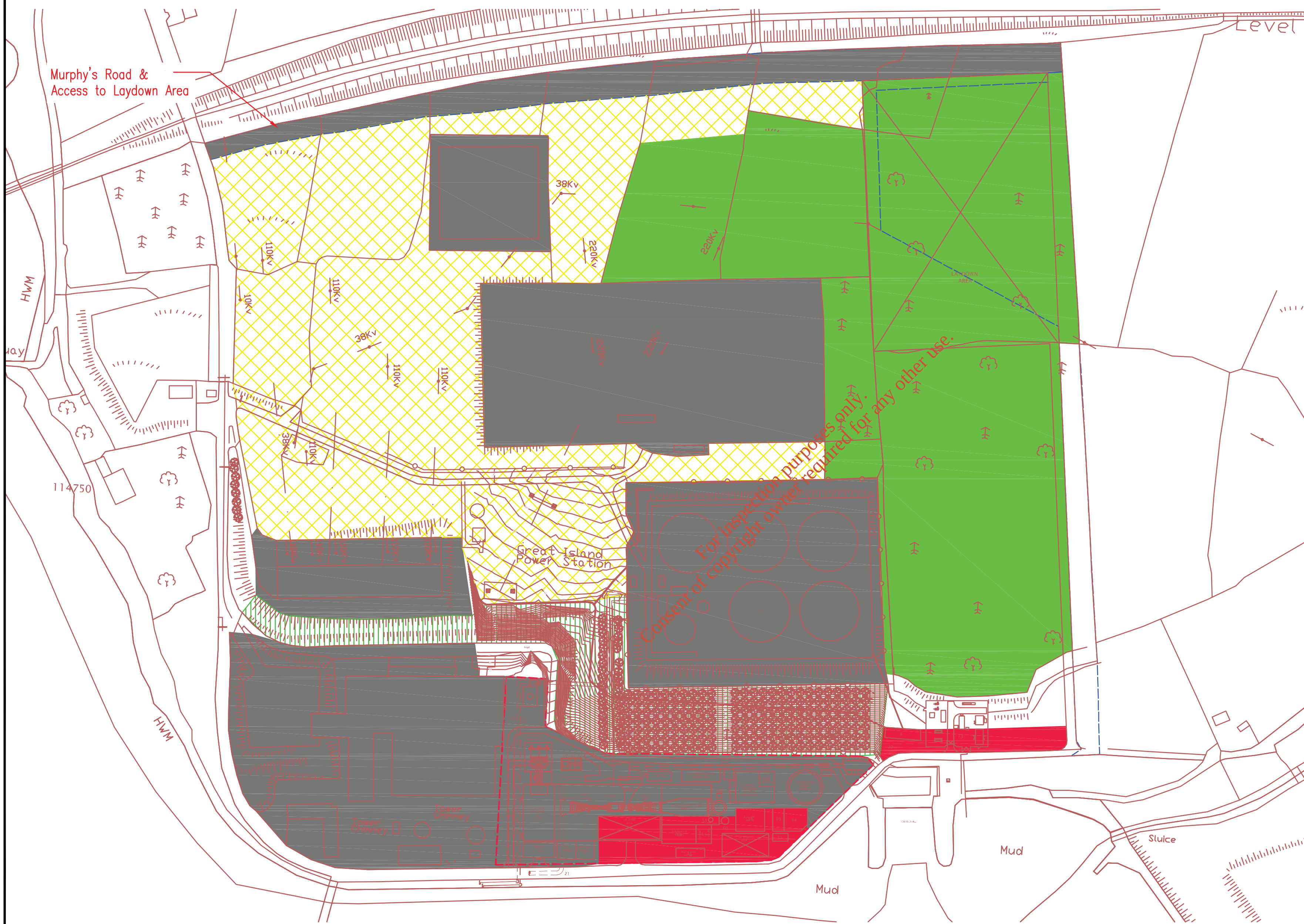
- Sketches illustrating the location of the species are drawn
- GPS co-ordinates recorded where possible
- Description of the population including an estimate of population size
- Habitat description qualifying the habitat extent, management regime and threats

Fauna Survey

Badger Survey

A walkover survey of the proposed construction site, laydown area and the R733 access road was conducted on 4th and 5th of August, 2009. Signs of badger activity were searched for.

Badger presence was determined by:



Notes

1. Ordnance Survey Ireland Licence No. EN0034509
ÓOrdnance Survey Ireland/Government of Ireland
2. All co-ordinates shown in metres to Irish National Grid
3. All site levels refer to mean sea level vertical datum at Malin Head
4. General site level is +6.60m OD

GS1 Dry Calcareous & Neutral Grassland
ED3 Recolonising Bare Ground
BL3 Building & Artificial Surfaces
WS2 Immature Woodland
WD2 Mixed Broadleaved/Conifer Woodland
Site Boundary
Laydown Area

Scale:

Rev	Date	Drawn	Description	Ch'k'd	App'd

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Title

Combined Cycle Gas Turbine
Great Island, Co. Wexford

Habitat Map

Designed	SK		Eng.Chk.	-	
Drawn	SK		Coordination	DH	
Dwg.Chk.	DH		Approved	PK	

Scale	Project	Status
1:1250	257554	INF
	CAD file Figure 12.2	

Drawing No	Rev
Figure 12.2	P1

Filename: Figure 12.2.dwg, Plotted by ken40363, on Nov 20, 2009 -9:40am

1. The discovery of setts or structures likely to be setts (some animal burrows may require further checking to rule out (or confirm) as badger setts)

2. Badger tracks (and paw prints)

3. Badger digging

4. Badger dung

5. Discussions with staff encountered at the power plant

All hedgerow, drains, plantations of broadleaf and conifer and also built land within the Great Island site were examined for the presence of badger setts or other animal burrows. The hedgerows adjacent to the proposed parking bay were surveyed on the 9th November 2009.

Identified setts are normally considered in terms of the number of entrances, signs of activity, location relative to the construction area and laydown area and the likelihood of alternative setts in the vicinity.

Discussions with staff at the power plant included a question on the presence of badgers and other mammals and the most recent observations and sightings.

Bat Survey

All buildings on site were examined externally and, where possible, internally for evidence of bats. This included the rooftop area of the main generator building, a toilet block adjacent to the proposed construction area and a number of buildings in close proximity to the toilet block. Staff members were questioned regarding any incidents of bats entering buildings, being heard within buildings or being found within buildings.

A bat detector assessment commenced at 21:15 on August 4th 2009 and continued until 00.00 and re-commenced at 04.00 until 06.00 on August 5th 2009. The two surveyors chose two separate sites at which to commence the assessment. One surveyor was based at and around the buildings adjacent to the proposed power plant site. The second surveyor was positioned to the south east of the site, approximately 80 metres from the access road and proposed laydown area.

In addition bat activity was assessed from the perimeter of the trees to the east of the existing storage tanks and proposed laydown area (south-western corner), the roads leading to the power plant and along an access track to the north of the site, on the right of way made available to the neighbouring land owner and also along the woodland / plantation that will be partially cleared to make way for the laydown area.

Prior to dawn, all efforts were concentrated upon the structures that will be removed to make land available for the proposed power plant.

A QMC Mini 3 heterodyne bat detector and a Pettersson D240X bat detector were employed for the bat survey on August 4th and 5th, 2009. A 1 million candela light and an Olympus SP550UZ digital camera were also employed as well as Petzl headlamps.

Other Fauna

Otter

Signs of otters were sought in a similar fashion to badgers with most emphasis being placed on sites wherein paw prints might be preserved and along the estuarine shoreline. The study area was surveyed and otter prints and spraints were searched for.

The presence of other mammal species was determined both by examining for signs as for badgers and by visual scanning for the presence of mammals likely to be active by day and again at night. Fox and rabbit may be seen by day in addition to their signs being in evidence. They were also searched for at night using a 1 million candela lamp.

Species such as squirrel may be located occasionally by sight but more often by feeding signs such as stripped cones, hazelnuts, bark-stripping and by the presence of dreys.

Deer may be determined by hoof prints and less commonly by direct sighting. Generally evidence of deer is anecdotal and based on evidence from locals. However, the presence of deer was not of concern at the Great Island site.

Signs of fauna were recorded with an Olympus SP550UZ digital camera and images were edited with Microsoft Picture It 7.0 or Microsoft Office Picture Manager.

Survey Constraints

The habitat survey was undertaken during the flowering plant season, which is the optimum time for habitat and flora surveys and therefore no seasonal constraints were encountered.

The mammal survey was undertaken at a period of the year when bats are at their most active and when badger young are fully active and moving from the sett independently. It is not typically a period when setts are easily located given the density of vegetation cover. However, the nature of much of the site allows a more thorough examination than in most wooded sites.

The plantation (of broadleaved trees) is especially dense and has not been properly thinned to date. This ensures that undergrowth is particularly and atypically scarce. Passage through the wood was easy and it was possible to examine large tracts at any one transect through the wood.

There is one area within the proposed laydown area where a high tension cable cuts through the wood and where trees have consequently been cleared. This contains the densest undergrowth with almost unbroken bramble for the entire width of the wood. This is the only area within the proposed development area where it is impossible to be categorical on the presence or absence of badgers.

There are also areas along the existing track (along the edge of the right of way) that cannot be easily or thoroughly examined but these lie outside of the proposed construction area.

12.1.2.5 Baseline Ecological Evaluation Criteria

The existing ecological conditions are described and evaluated according to the NRA (2006) and in accordance with standard guidelines (EPA, 2002; IEEM, 2006). Table 12.1 below details the NRA evaluation scheme (NRA, 2009).

Table 12.1: Site Evaluation Criteria

Ecological Valuation	
Internationally Important	Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives; Undesignated sites that fulfil criteria for designation as a European Site; Features essential to maintaining the coherence of the Natura 2000 network; Sites containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive; Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive; Ramsar Site; World Heritage Site; Biosphere Reserve; Site hosting significant species populations under the Bonn Convention; Site hosting significant populations under the Berne Convention; Biogenetic Reserve; European Diploma Site; Salmonid water.
Nationally Important	Sites or waters designated or proposed as an NHA*; Statutory Nature Reserve; Refuge for fauna and flora protected under the Wildlife Acts; National Park; Undesignated sites fulfilling criteria for designation as a NHA; Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park; Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list; Site containing viable areas of the habitat types listed in Annex I of the Habitats Directive.
County Importance	Areas of Special Amenity; Area subject to a Tree Preservation Order; Area of High Amenity, or equivalent, designated under the County Development Plan; Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list; Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance; County important populations of species, or viable area of semi-natural habitats or natural heritage features identified in the National of local BAP; Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county; Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP; Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list; Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites of features containing non-native species that are of some importance in maintaining habitat links.

Source: *Guidelines for Assessment of Ecological Impacts in National Road Schemes* (NRA, 2009)
*SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

12.1.2.6 Impact Assessment Criteria

The significance of the potential impacts on the receiving environment are discussed in Section 12.1.4 according to the *Criteria for assessing significance of impacts,* NRA (2006) as detailed in Table 12.2. Mitigation measures are proposed in Section 12.1.5 to avoid, reduce or compensate for the impacts identified and any residual impacts are discussed in Section 12.1.6.

Table 12.2: Impact Assessment Matrix

Impact Level	A Sites Internationally Important	B Sites Nationally Important	C Sites High Value, Locally Important	Sites Moderate value, Locally Important	E Sites Low Value, Locally Important
Severe Negative	Any permanent impacts	Permanent impacts on a large part of a site.	-	-	-
Major Negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-	-
Moderate Negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-
Minor Negative	-	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Neutral	No Impacts	No Impacts	No Impacts	No Impacts	Permanent impacts on a small part of a site
Minor Positive	-	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site
Moderate Positive	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	-
Major Positive	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	-	-

Source: *Guidelines for Assessment of Ecological Impacts in National Road Schemes* (NRA, 2006)

12.1.3 Baseline Description and Evaluation

The NPWS database was accessed for information on rare species and designated conservation sites. The proposed development site is partially contained within the Barrow River Estuary proposed Natural Heritage Area (pNHA) and to the south is the River Barrow and River Nore Special Area of Conservation (SAC). Figure 12.1: Designated Conservation Sites illustrates the location of conservation sites within a 15 kilometre radius of the site. A brief description of each of the sites within this radius is presented below and full site synopses are provided in Appendix 12.1 (Designated Conservation Sites – Site Synopses). The distance from the proposed development site to the designated conservation sites are detailed in Table 12.3. There are no records of protected species from within the proposed development site.

Table 12.3: Distance to Designated Conservation Sites

Designated Conservation Site	Distance (km)	Designated Conservation Site	Distance (km)
Barrow River Estuary pNHA	0.0	Boley Fen pNHA	9.5
River Barrow and River Nore SAC	0.04	Tramore Dunes and Backstrand SAC	13.0
Lower River Suir SAC	1.1	Tramore Backstrand SPA	13.0
Ballykelly Marsh pNHA	6.7	Tintern Abbey pNHA	11.4
Lough Cullin pNHA	7.6	Oaklands Woods pNHA	10.8
King's Channel pNHA	6.1	Dunmore East Cliffs pNHA	14.0
Ballyhack pNHA	4.1	Hook Head pNHA	14
Duncannon Sandhills pNHA	7.6	Kilbarry Bog pNHA	9.5
Belle Lake pNHA	9.4	Grannyferry pNHA	9.9
Waterford Harbour pNHA	4.6	Bannow Bay SAC Bannow Bay pNHA Bannow Bay SPA	11.1 13.2 11.5

Barrow River Estuary pNHA (Site Code: 000698)

The tidal river and estuary supports populations of the protected (EU Habitats Directive 92/43/EEC) Twaite Shad (*Alosa fallax fallax*) which spawn in selected areas. Along the mid and southern side of the estuary, saltmarshes and saltmeadows have developed on the sediment which has accumulated at the mouths of incoming streams and inlets. The Rare plant species Divided Sedge (*Carex divisa*) was considered extinct in Ireland until 1990 when it was recorded from several sites along the Barrow estuary.

Borer's Salt-marsh Grass (*Puccinellia fasciculata*), a species legally protected under the Flora Protection Order is found within the site. Meadow Barley (*Hordeum secalinum*), occurs at several locations on this site. At the northern end of the site the legally protected Nettle-leaved bellflower (*Campanula trachelium*) is found in two locations.

The Lower River Barrow is a regionally important site for wintering wildfowl and waders. Peregrine falcon (*Falco peregrinus*), a species listed in Annex 1 of the EU Birds Directive and in the Red Data Book as being threatened in Ireland, breeds within the site (West side).

River Barrow and River Nore SAC (Site Code: 002162)

The site is a candidate SAC selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, Desmoulin's Whorl Snail *Vertigo moulinsiana* and the Killarney Fern.

Lower River Suir SAC (Site Code: 002137)

The site is a candidate SAC selected for the presence of the priority habitats on Annex I of the E.U. Habitats Directive - alluvial wet woodlands and Yew Wood. The site is also selected as a candidate SAC for floating river vegetation, Atlantic salt meadows, Mediterranean salt meadows, old oak woodlands and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon and Otter.

Ballykelly Marsh pNHA (Site Code: 000744)

This site combines an arable field with a high quality wetland site. The arable field contains a rare arable weed community including the protected flora species *Fuckria elatine*. Adjacent to this field is a small species rich lake and fen area. Such small wetlands are characteristic of the South-East of Ireland but are decreasing rapidly due to drainage and land reclamation.

Lough Cullin pNHA (Site Code: 000406)

Lough Cullin is the only natural lake in south Kilkenny and occupies a low-lying depression 6 kilometres north of Waterford. Generally the area consists of wet grassland. The main interest of the site lies in its flowering plants some of which are rare in the Kilkenny and Waterford region. There is also a high population of snipe in winter as well as smaller numbers of curlew, lapwing and mallard. In summer, sedge warbler and reed bunting breed.

King's Channel pNHA (Site Code: 001702)

King's Channel is an offshoot of the Suir Estuary below Waterford which surrounds the triangular Little Island. It is relatively deep and at low water retains a broad channel between mudbanks. The channel itself is not of significant interest except to a few cormorant and other seabirds but the southern shore is lined in places by a flat saltmarsh. The saltmarsh is best developed in Grantstown north east of St. Thomas's Church where there is a nice sequence of communities up from the channel.

Ballyhack pNHA (Site Code: 000695)

Ballyhack encompasses, in a small area, a variety of habitats which are not frequent in south-east Ireland. The site is also rich in species and contains one of only two stations known for the Clustered Clover in the country.

Duncannon Sandhills pNHA (Site Code: 001738)

This site is one of a series of sites on the estuary of the River Barrow which demonstrates a variety of coastal types. The Duncannon Sandhills site comprises Duncannon Strand and the freshwater marsh in the valley to the east in Shanacloon Townland. Wild Sage (*Salvia verbenaca*), a rare species listed in the Irish Red Data Book is found in the dunes.

Belle Lake pNHA (Site Code: 000695)

The south east of Ireland has comparatively few lakes; Belle Lake is one of the larger of them. It is an attractive lake which lies at about 50 metres above sea level, 7 kilometres south east of Waterford city. The water of the lake is clear and quite rich in calcium, which makes the occurrence of two rare aquatic plant species; Quillwort, (*Isoetes lacustris*) and Waterwort (*Elatine hexandra*) all the more notable. The lake is used by regionally important numbers of Whooper swan. This is one of the few extensive water bodies in south east Ireland and as such is of great importance within the region. It has a varied aquatic and wetland flora that is of scenic as well as scientific interest.

Waterford Harbour pNHA (Site Code: 000787)

This site is of conservation importance for the extensive and good quality intertidal sand and mudflats, a habitat listed under Annex I of the EU Habitats Directive.

The shore itself is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it, a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here into which willows (*Salix* spp.) are slowly spreading. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail. The intertidal habitats are used by important numbers of wading birds during winter, as well as by small numbers of wildfowl. The populations of Oystercatcher (939), Lapwing (2,141) and Bar-tailed Godwit (216) are of national importance (figures are for winter 1994/95 to 1996/97). Other species which occur include Golden Plover, Sanderling, Dunlin, Black-tailed Godwit, Curlew and Redshank.

Boley Fen pNHA (Site Code: 000699)

Boley Fen is located at Rathumney, approximately 5 kilometres east of Campile. It comprises intermediate fen with wet grassland and tall sedge (*Carex* spp.) communities with encroaching scrub, mainly willows (*Salix* spp.). Areas of the site have been afforested.

The site is of interest due to its location; fens are uncommon in south east Ireland. More importantly, it is noted as nationally important for the following rare species of Diptera (flies): *Anasimyia lunulata, Psacadina zernyi, Parhelophilus consimilis, Pteromicra angustipennis* and *Tetanocera punctifrons*.

Tramore Dunes and Backstrand SAC (Site Code: 000671)

Tramore is of major ecological importance for the range of good quality coastal habitats which occur, including fixed dunes, which are listed as a priority habitat on Annex I of the European Habitats Directive. Salt marsh, another habitat on Annex I of the EU Habitats Directive, is well developed and fairly extensive in the sheltered inner part of the site. It is the lagoon type of salt marsh, which is the rarest type in Ireland. The intertidal mud flats and sand flats are another important habitat listed on Annex I of the EU Habitats Directive. Several rare plants have been recorded from Tramore. It is the only site in the country where the Red Data Book plant Sea Knotgrass (Polygonum maritimum) has grown, though it is sporadic in appearance. Other Red Data Book species which have been reported include Lesser Centaury (Centaurium pulchellum) and Cottonweed (Otanthus maritimus), both of which are listed on the Flora (Protection) Order, 1999. The site has a remarkably rich flora, featuring a number of rare and protected species, and the intertidal area is important for wintering waterfowl.

Tramore Backstrand SPA (Site Code: 004027)

The Back Strand is an important site for wintering waterfowl, providing both feeding and roosting areas. Of particular importance is that the site supports an Internationally Important population of Brent Geese (393). A further seven species occur in Nationally Important numbers: Golden Plover (2,924), Grey Plover (299), Lapwing (3,308), Dunlin (1,723), Sanderling (46), Black-tailed Godwit (289) and Bar-tailed Godwit (367). The regular occurrence of Little Egret, Golden Plover and Bar-tailed Godwit is of particular note as these are listed on Annex I of the E.U. Birds Directive.

Bannow Bay SAC, SPA and pNHA (Site Code: 000697)

Bannow Bay is a relatively large estuarine site, approximately 14 kilometres long, on the south coast of Co. Wexford. Eleven coastal habitats listed on Annex I of the E.U. Habitats Directive occur within the site. The estuary, including the saltmarshes, makes up approximately 83% of the site. Salt marshes of exceptional species diversity and rarity are found above the sand and mudflats, particularly at the south of the site. Halophilous scrub, another Annex I habitat, occurs in four of the larger saltmarsh areas. It is characterised by the presence of the legally protected plant Perennial Glasswort (*Arthrocnemun perenne*) which occurs in only a few sites in the country.

A mosaic of sand dune habitats which are listed on Annex I of the E.U. Habitats Directive occur in three areas at the edge of the estuary. Embryonic shifting dunes and White dunes are present and the priority habitat fixed grey dune is also present. Most of the estuary has been designated a Special Protection Area (SPA) under the E.U. Birds Directive, because of its significant bird interest, particularly during the winter. Parts of this area have also been designated a Wildfowl Sanctuary. There are large numbers of wintering wildfowl and waders who feed on the mudflats and sandflats and use the fringing vegetation of reedbed and saltmarsh for roosting and feeding. The site is of considerable conservation significance for the large number of E.U. Habitats Directive Annex I habitats that it contains, including the priority habitat fixed grey dune. The legally protected Red Data Book plant species Perennial Glasswort also occurs. The site is also an SPA because of the important numbers of wintering wildfowl it supports, including an internationally important population of Light-bellied Brent Goose.

Oaklands Woods pNHA (Site Code: 000774)

The site is a mixed coniferous and deciduous wood located approximately 2 kilometres south of New Ross.

Oak (Quercus spp.) is the dominant species in parts of these woods, although coniferous species have been widely planted. Beech (Fagus sylvatica) also occurs and is regenerating. The trees reach about 15 m and create a closed canopy above abundant Holly (Ilex aquifolium). The site is of interest as it is a representative area of broadleaved woodland and associated flora.

Dunmore East Cliffs pNHA (Site Code: 000664)

Sandstone cliffs surround Dunmore East harbour rising to 20 - 30 metres in places. All these cliffs are listed because they are nesting colonies of a large population of Kittiwake. There are between 1000 - 2000 nests grouped closely on vertical parts of the cliffs.

Hook Head pNHA (Site Code: 000764)

The site of conservation interest at Hook Head comprises an area of marine subtidal reefs to the south and east of the Hook Head Peninsula and includes the sea cliffs from Hook Head to Baginbun and Ingard Point. Hook Head itself is composed of Carboniferous limestone overlain by Devonian Old Red Sandstone and is palaeontologically of international importance. The site contains three habitats listed under the EU Habitats Directive, i.e. large shallow inlets and bays, reefs and sea cliffs. In summary, this site is of conservation importance for its subtidal reef and shallow bay communities, and their diversity of species, as well as for the vegetated sea cliffs. These habitats are listed under the EU Habitats Directive. The rocky coastline is also important for breeding Ravens, Choughs and Peregrines. The latter two are listed on Annex I of the EU Birds Directive.

Kilbarry Bog pNHA (Site Code: 001700)

Kilbarry Bog is the only remaining wetland of its type of significance in the vicinity of Waterford City; it supports a variety of wetland vegetation types and plant species; it is the site of records for the scarce Summer Snowflake; it supports a good diversity of birds, including an important breeding population of Reed Warbler; a range scarce invertebrate species has been recorded from the site.

Grannyferry pNHA (Site Code: 000833)

This site consists of reedswamp, marshes and wet fields with a salt influence which declines from south to north. At the southern end there are saltmarsh communities. There is also a little Meadow Barley (*Hordeum secalinum*) which is now a protected species because of its marked decline this century, caused by drainage and grassland improvement. Small numbers of Mallard and Water Rail occur within the area and in summer there are, most probably, Sedge Warbler and Reed Bunting nesting.

Tintern Abbey pNHA (Site Code: 000711)

A nursery colony of whiskered bats (Myotis mystacinus) were recorded in the roof of a building in the grounds of Tintern Abbey in 1987. As the national population of this species is only several hundred, all nursery colonies are of national importance.

NPWS Records of Protected Species:

Records of protected flora were identified from the NPWS map viewer. In the 10 kilometres grid in which the proposed development site is located, S61, there are ten records for Meadow Barley (*Hordeum secalinum*), one record for Opposite Leaved Pondweed (*Groenlandia densa*), one record for Tufted Salt-marsh Grass (*Puccinellia faciculata*) and two records for Betony (*Stachys officinalis*). The closest record for a protected species is for Meadow Barley at Fisherstown.

12.1.3.1 Habitat Survey

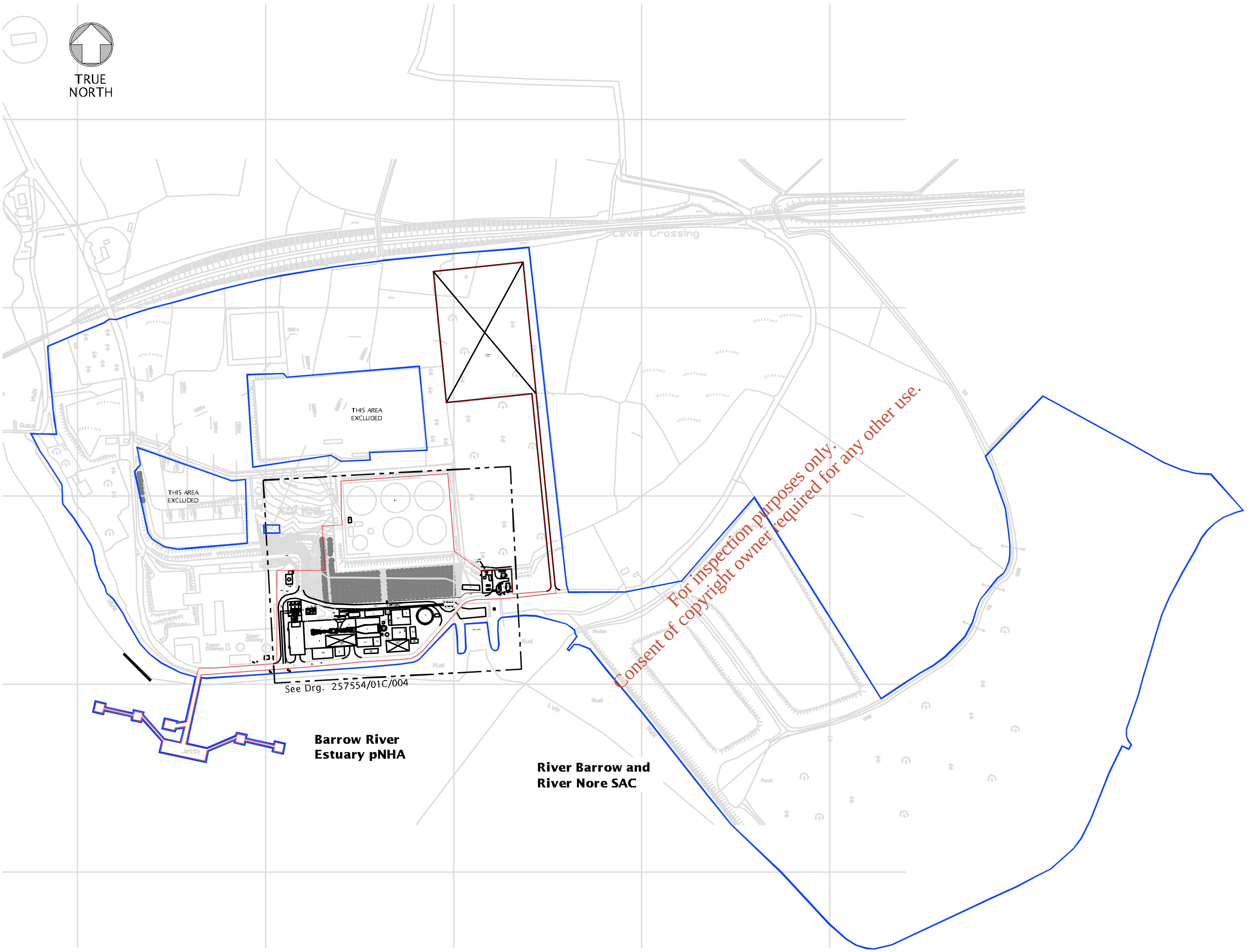
Figure 12.2, Habitat Map, illustrates the habitats present within the site. No protected or rare species were identified within the site during the survey.

An area of ground on the southern section of the Great Island site is contained within the Barrow River Estuary pNHA. This section of the site consists of reclaimed land from the estuary, which was reclaimed circa 1966 when the original plant was constructed. The site of the proposed CCGT consists of a number of existing built structures and paved areas and an area of recolonising bare ground. This area is not of any conservation value and no terrestrial habitats of ecological value are present.

Following discussions with NPWS it is understood that the proposed designation relates to a historical mapping issue whereby the old shoreline boundary, prior to the area being reclaimed, was incorporated into current maps. NPWS has therefore advised that they have no reason to secure designation of this area of land. Figure 12.3, Proposed Development Site, illustrates the location of the proposed development site (red line boundary) and ownership boundary (blue line boundary). Figure 3.4, Existing Site layout (Chapter 3 - Description of the Development), illustrates the existing structures and paved areas within the proposed development site.

Recolonising Bare Ground (ED3)

Plate 1 illustrates the area of recolonising bare ground. Species present in this area include small patches of willow herb (*Epilobium montanum*), scarlet pimpernel (*Anagallis arvensis*), yellow wort (*Blackstonia perfoliata*), hawkbit (*Leontodon autumnalis*) and thistles (*Cirsium* spp.). This area is evaluated as *Low Value, Locally Important* (refer to Table 12.1: Site Evaluation Criteria).



Notes

1. ORDNANCE SURVEY IRELAND LICENCE NO. EN0034509
© ORDNANCE SURVEY IRELAND/GOVERNMENT OF IRELAND
2. ALL CO-ORDINATES SHOWN RELATE TO IRISH NATIONAL GRID CO-ORDINATES.
3. ALL SITE LEVELS REFER TO MEAN SEA LEVEL VERTICAL DATUM AT POOLBEG.
4. GENERAL SITE LEVEL IS +7.00M O.D.

Legend:

Development Site Boundary
Site Ownership Boundary

Scale:

1:2500 0 125m 250m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P7	11/11/09	AV	Issued with Planning Application	KMcC	DMcR
P6	05/11/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P5	13/10/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P4	22/10/09	AV	Revised as per Endesa Comments	KMcC	DMcR
P3	30/09/09	AV	Revised as per Endesa Comments	DC	DMcR
P2	28/08/09	AV	Issued for Approval	DC	DMcR
P1	30/07/09	VF	Issued for Approval	DC	DMcR

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Title

Combined Cycle Gas Turbine
Great Island, Co. Wexford

Development Site Boundary

Designed	D. McRandal		Eng.Chk.	D. Carr	
Drawn	C. Cunningham		Coordination	D. McRandal	
Dwg.Chk.	C. Cunningham		Approved	D. McRandal	

Scale 1:2500
Project 257554
CAD file Figure 12.3
Status APR
Drawing No Figure 12.3
Rev P7

Filename: Figure 12.3.dwg, Plotted by ken45363, on Nov 25, 2009 1:55pm

Plate 1 Recolonising Bare Ground

Buildings and Artificial Surfaces (BL3)

To the south of the area of recolonising bare ground is a road and located to the west are a number of buildings and paved areas (see Plate 2). Buildings and artificial surfaces are not of ecological importance.

Plate 2 Buildings and Artificial Surfaces

Immature Woodland (WS2)

To the north east of the site, the proposed laydown area consists of mixed beech and sycamore woodland (see Plate 3). This area was planted heavily at 2 metre intervals. The canopy is dense and the ground layer generally consists of leaf litter.

Occasional openings in the canopy give rise to an understorey of ground ivy (*Glechoma hederacea*), lesser celandine (*Ranunculus ficaria*), and bracken (*Pteridium aquilinum*) and nettle (*Urtica dioica*).

The biodiversity of this planted woodland area is quite low, due to the reduced ground flora present in the woodland and is therefore evaluated as *Lower Value, Locally Important*.

Plate 3 Beech and Sycamore Woodland

Adjacent Habitats

The surrounding land use is agricultural. To the north and east of the site, improved grassland and arable lands predominate. To the south of the site is the River Barrow estuary. To the north of the site there are fields of neutral grassland and improved agricultural grassland.

As part of the works, a parking bay will be required along the access road to the site. The location of this parking bay is illustrated on Figure 3.1. The habitats present along this section of the road include hedgerows and grassy verges.

The hedgerow is composed of bramble (*Rubus fruticosus* agg.), bracken (*Pteridium aquilinum*) and blackthorn (*Prunus spinosa*).

The grasses present along the verge include false oat grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*), bents (*Agrostis* spp.), cocksfoot (*Dactylis glomerata*) and sweet vernal grass (*Anthoxanthum odoratum*). Broadleaved species include hogweed (*Heracleum sphondylium*), nettle (*Urtica dioica*), dock (*Rumex* spp.), sorrel (*Rumex acetosa*), creeping buttercup (*Ranunculus repens*), kidney vetch (*Anthyllis vulneraria*), bloody cranesbill (*Geranium sanguineum*), clover (*Trifolium* spp.), hawkbit (*Leontodon autumnalis*), hedge woundwort (*Stachys sylvatica*), herb robert (*Geranium robertianum*), thistles (*Cirsium* spp.), knapweed (*Centaurea nigra)*, cleavers (*Galium aparine*), hedge bindweed (*Calystegia sepium*).

Hedgerows and grassy verges are important wildlife corridors and provide food and shelter for a variety of small mammals and bird species and are evaluated as being of local importance.

12.1.3.2 Mammal Surveys

Mammal surveys were conducted at the proposed construction site, laydown area and the R733 access road on 4th and 5th of August, 2009.

Badger Survey

Badger signs were not identified anywhere in or around the power plant and proposed development site. No badger signs were identified within the proposed laydown area, however, one area of scrub within the laydown area was not accessible. This area of scrub was examined on either side and was devoid of any evidence of badgers.

No evidence of badgers was identified in the road leading from the R733 to the power plant. One track that was examined was noted to contain dog paw prints, shoe prints and livestock prints (a cow hoof print).

Otter Survey

There was no evidence of otters within the proposed development site or in the adjacent lands examined. The river to the south is a feeding site but this is outside the construction area.

Bat Survey

Roosting Bats

No bat roosts were identified within the proposed development site during the survey.

A single common pipistrelle record was noted prior to dawn at 04:15 commuting through the proposed construction area. The destination of this bat was unclear but was outside of the site of the proposed development.

Bat Feeding Activity

The most commonly encountered bat species feeding in and around the site was the common pipistrelle. This bat was noted feeding to the southeast of the site at the gate leading to the capped landfill area, along the woodland edge within and outside of the proposed laydown area footprint as well as along this entire track and along the R733 leading to the main gate (refer to Figure 12.4: Mammal Activity and Signs*)*.

Less abundant within and around the site was the soprano pipistrelle. There were two encounters with this species; once in the south-western corner of the power plant lands and once along the woodland edge along the perimeter of the laydown area.

Equally infrequent were records of the third and final species; Leisler's bat. This bat was first heard at 22:10 above the point where the internal road through the power plant site crosses the cooling water output channel. It was heard at 22:15, 150 metres to the east of this point towards the south east of the site. Finally, a Leisler's bat was heard at 22:58 feeding towards the north-eastern corner of the storage tanks.

Leisler's bats entered into the site relatively late as this species would have emerged in most circumstances prior to 21:30. As this is a rapid flier, it is possible that this bat arrived from several hundred metres to several kilometres from the site.

Overall, there was low bat activity around the power plant with higher levels of activity along the woodland edge and the roadways, including close to the main entrance.

There were no bats roosting within the site and no evidence of roosts in recent days or weeks.

Other Fauna

Fox scats were noted within the laydown area. Fox scent marking was detectable in several places within the wood and a fox was seen at 22:45 on August 4th within the wood.

A fox track leading under a fence into the power plant was identified and a fox hair was retrieved from the fence. Digging in the woodland was also attributable to foxes.

There are a number of rabbit warrens within the wood and rabbits were abundant in the area adjoining the right of way and the main road through the power plant (refer to Plate 4).

A young hedgehog was noted to the east of the proposed construction site at 04:30 on August 5th 2009. This is a widespread and common species. The individual was repeatedly in close proximity to the Condenser Cooling Water pond and was at risk of falling into this.

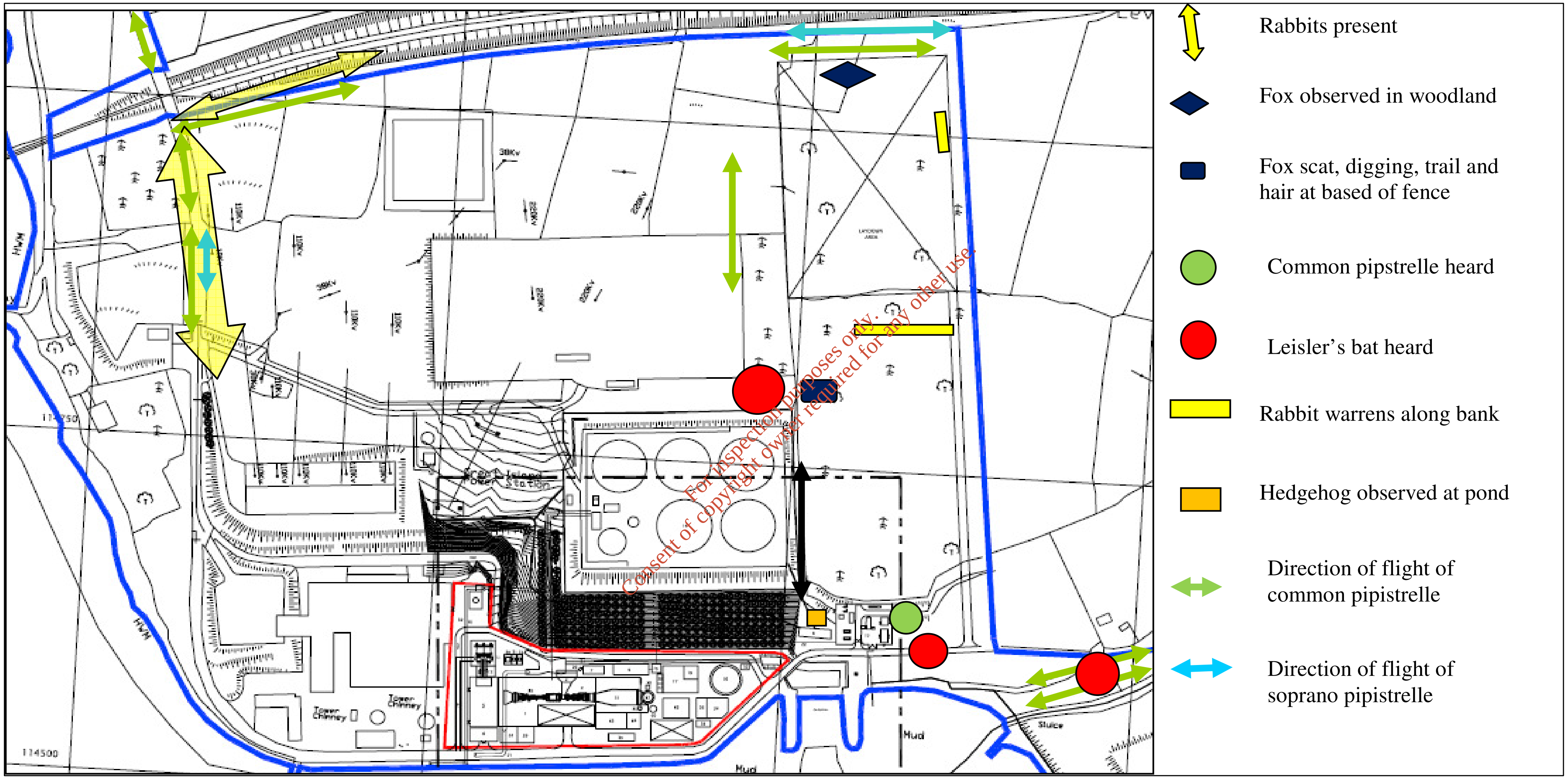
Rodent species likely to be present within the site include the wood mouse, house mouse and brown rat.

12.1.4 Ecological Evaluation

Overall, the proposed development site and proposed parking bay are evaluated as being of local importance (lower value). The proposed turbine site consists of made ground and is not of any ecological value. However, the proposed laydown area has some ecological value in terms of feeding areas for bats and as a refuge for foxes, bats and other small mammals and is evaluated as *Lower Value, Locally Important.*

Plate 4: Buildings with roost potential but no bats and sites in the woods with rabbit warrens

Figure 12.4: Mammal Activity and Signs



12.1.5 Identification of Potential Impacts

12.1.5.1 Construction Phase

The southern section of the site is within the boundary of the Barrow River Estuary pNHA. However, the habitats present within this section of the site are not of conservation interest. This section of the site consists of made ground that was reclaimed during the construction of the existing generating station in the 1960s. There will be no impacts on the integrity of the Barrow River Estuary pNHA or any other designated conservation site as a result of the proposed development.

The majority of the site consists of made ground. To the north east of the site, the proposed laydown area will result in the removal of immature beech and sycamore woodland and along the access road to the site a small section of hedgerow and grassy verge may be removed for the provision of a parking bay. This removal of vegetation will have a minor negative impact on ecology. No habitats protected under the Habitats Directive are present within the site and no protected flora were identified within the site. Therefore there will be no impact on protected habitats or flora species as a result of the development.

Arising from construction of the new CCGT, noise from machinery and vehicles is likely to cause temporary minor negative impacts to bird species and mammals in the area and in the designated conservation sites adjacent to the site.

There will be impacts on the rabbit warrens within the wood that will be cleared for the laydown area. Rabbits are not of any conservation significance and the impact is a welfare issue rather than a conservation issue as rabbits may be present in the warrens when clearance commences.

The removal of immature woodland in the laydown area will result in the loss of feeding areas for mammal species within the site and in surrounding areas. The immature woodland provides shelter and foraging habitat for rabbits and other animals and the presence of invertebrates provides food for bats (flies, moths, beetles). The replacement of woodland with exposed soil or concrete will reduce the availability of foodstuffs or prey items and is considered to be a minor negative impact on fauna, however, a seven metre boundary of trees will be retained around the laydown area

There may be a risk to hedgehogs from any newly introduced trenches (such as ponds, drains, pipe channels). Hedgehogs are susceptible to being trapped in pits and drowning. Hedgehogs will often fall into trenches (cattle grids, roadside drains, swimming pools, ponds etc.) as they do not appear to fear falling possibly due to their protection from damage due to the spines. There should be no significant impacts on hedgehogs following the implementation of mitigation measures.

Most of the buildings within the proposed site are of little use to bats but there are a small number of buildings with roost potential (the toilets have a felt covered roof that has a number of obvious holes whereby bats might enter the roof). The impact of roost loss is therefore only a potential for this site as there are no confirmed roosts that will be demolished. Roost loss is a long-term negative impact of a severe degree in local terms in some circumstances. In the current situation, there is no roost loss and hence there will be no impact from roost loss.

During construction there is the potential for fuel leakages from heavy plant machinery on site which may impact on the soils, groundwater and the adjacent River Barrow estuary. This would result in a minor negative impact on ecology, refer to Chapter 13 (Soils, Geology and Groundwater).

Dust emissions during construction have the potential to impact on flora in the surrounding area. These impacts would be temporary / short-term in nature, refer to Chapter 15 (Air Quality and Climate).

Overall, the impacts on flora and fauna will be minor.

12.1.5.2 Operational Phase

The operation of the CCGT power plant will have permanent minor negative impacts on ecology due to the permanent removal of planted deciduous woodland from the site.

The storage of fuel and oils on site has the potential to impact on soils, groundwater and the adjacent River Barrow estuary if a leakage occurs which may impact on adjacent habitats. These impacts would be minor in nature, refer to Chapter 13 (Soils, Geology and Groundwater).

Air quality dispersion modelling was conducted to assess the potential impacts from air borne emissions on designated sites within a 20 kilometre radius of the proposed development, refer to Chapter 15 (Air Quality and Climate). As all process contributions are well below 1% of the AQS with the exception of the Lower River Suir, and the predicted environmental concentrations are well below the relevant AQS, effects on designated sites are concluded to be negligible. The relevant air quality standard is 30 $\mu g/m^3$, which is the limit value for the protection of ecosystems set by *Council Directive 1999/30/EC (relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air)*. The predicted environmental concentration at the Lower River Suir is 12.88 $\mu g/m^3$.

12.1.6 Mitigation Measures

12.1.6.1 Construction Phase

There is an area of scrub in the laydown area which could not be assessed adequately due to the density of the vegetation and this area will be examined for badger setts prior to tree felling and clearance operations. This survey will be carried out in a period of the year when scrub is reduced (December - March). Any setts encountered will be humanely and legally excluded and excavated and will be subject to a licence from NPWS. The presence of a sett is unlikely but cannot be ruled out.

The removal of hedgerows, trees and scrub will take place outside of the bird nesting season (1st March to 31st August) to prevent impacts on nesting birds. Due to the presence of active rabbit warrens within the immature woodland, care should be taken when clearing vegetation and the banks should be gently disturbed at first and adequate time should be allowed for rabbits to escape from the area prior to the removal of trees or scrub in the area.

Bats principally feed close to mature vegetation, hedgerow and woodland. The maturing trees of the site will be removed and this loss will be compensated by the planting of hedgerow and trees once all construction has ceased. The proposed landscaping mitigation specified in Chapter 16 (Landscape and Visual) will use native species of local provenance where possible. The planting of native species which are present in the general area will enhance the biodiversity around the perimeter of the site. Species composition should reflect the native species present in the general area, including oak (*Quercus petraea* and *Q. robur)* and ash (*Fraxinus excelsior*) and shrubs such as hawthorn (*Crataegus monogyna*), blackthorn *(Prunus spinsoa)* and bramble (*Rubus fruticosus* agg.).

Any soils excavated from the site during construction will be re-used on site where possible for landscaping. The soils shall be stored in low mounds (maximum height of 2 metres) and will be reinstated as soon as possible to minimise adverse impacts on soil structure.

Areas of long grass will be retained where possible to provide shelter for moths and other invertebrates and feeding for bats and other animals (in addition to the biodiversity created by the moths and other invertebrates).

Ramps will be placed within any trenches constructed on site to allow the exit of hedgehogs. A mesh ramp would allow any trapped hedgehogs to climb out of such accidental traps. This may be the equivalent of expanded mesh as used in construction or an inflexible "chicken wire" with diamonds of no greater than 4 centimetres in width to allow hedgehogs to climb out. The ramp shall be at an angle of 45^{o} for easy escape.

During the excavation and removal of soil for construction works, oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off. The Contractor will establish a maintenance schedule and operational procedure for silt and pollution control measures during the construction period and will be incorporated into the Construction Environmental Management Plan (CEMP) for the proposed development.

Oil, petrol and other potentially polluting substances will be stored in bunded containers. Bund specification shall conform to the current best practice for oil storage such as Enterprise Ireland's *Best Practice Guide BPGCS005 Oil Storage Guidelines*. All waste oil, empty oil containers and other hazardous wastes shall be disposed of in conjunction with the requirements of the *Waste Management Act 1996-2008.*

Pouring of concrete will take place in designated areas, washings will not be discharged to surface water and poured concrete will be allowed to cure for 48 hours in the dry.

A Dust Minimisation Plan will be implemented during construction works in order to prevent dust emissions impacting on the flora and habitats of the surrounding area.

12.1.6.2 Operational Phase

The operation of the power plant will adhere to air quality limits set by *Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air*, in order to protect ecosystems and vegetation from excessive nitrogen oxides or sulphur oxides.

12.1.7 Residual Impacts

Residual impacts on flora and fauna will be the permanent removal of habitats and flora from the site and is deemed to be of minor significance due to the low ecological value of the site. No protected habitats or flora were identified within the proposed development site and therefore there will be no residual impacts on protected habitats or flora species.

Minor impacts on fauna are anticipated and are principally related to disturbance during construction. There will be no residual impacts for protected bat species and there will be no impact on the status of other mammal species.

Following the correct implementation of all mitigation measures, no significant residual impacts with respect to flora and fauna are anticipated as a result of the proposed development.

12.1.8 Summary Conclusion

A habitat survey and protected mammal surveys were conducted at Great Island. An area of ground on the southern section of the Great Island site is contained within the Barrow River Estuary pNHA. This section of the site consists of reclaimed land from the estuary, which was reclaimed circa 1966 when the original plant was constructed. The site of the proposed CCGT consists of a number of existing built structures and paved areas and an area of recolonising bare ground. This area is not of any conservation value and no terrestrial habitats of ecological value are present. Following discussions with NPWS it is understood that the proposed designation relates to a historical mapping issue whereby the old shoreline boundary, prior to the area being reclaimed, was incorporated into current maps. NPWS has therefore advised that they have no reason to secure designation of this area of land.

On the northern boundary of the site an area of immature planted woodland will be partially impacted by the works as it will be used as a laydown area during construction. A small section of hedgerow and grassy verge along the access road to the site may be removed for the provision of a parking bay.

Overall, the proposed development site and proposed parking bay are evaluated as being of local importance (lower value). The proposed turbine site consists of made ground and is not of any ecological value. However, the proposed laydown area has some ecological value in terms of feeding areas for bats and as a refuge for foxes, bats and other small mammals and is evaluated as *Lower Value, Locally Important.*

No rare or protected habitats or flora were identified during the survey. No bat roosts, badger setts or otter holts were identified within the site. Mitigation measures are proposed to prevent impacts on breeding birds, hedgehogs and water quality.

12.2 Marine Ecology

12.2.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This section of the EIS has been prepared in order to establish the marine ecology baseline of the study area and assess the impacts of the proposed development on the marine ecology. In addition, an Appropriate Assessment Screening Report has been prepared and is included in Appendix 12.2.

Local, regional and national policies and plans, best practice guidance and reports of relevance to the marine environment within, and in the vicinity of, the site of the proposed plant have been reviewed and appropriate information has been fed into Chapter 5 (Policy and Planning Context) and this assessment process. Where more specific legislation and guidance is appropriate this has been highlighted in the text of this chapter.

Water Quality (with regards to the Water Framework Directive) is assessed in Chapter 14 (Surface Water), although reference is also made in this section to impacts on water quality and the marine environment, where appropriate.

12.2.2 Methodology

12.2.2.1 Guidance Used

As there is no statutory guidance on the evaluation of significance it is necessarily subjective, although existing industry or national standards will inform this judgement. It is recognised that judgements may vary between parties in the assessment and decision making process. The evaluation of impacts presented in this EIA is based on the judgement of the EIA team, informed by reference to the baseline studies, legal standards and current good industry practice. In addition the following recognised publications and guidelines have been used:

- Environmental protection Agency (EPA), 2002. Guidelines on the information to be contained in Environmental Impact Statements. EPA, Ireland;

- Tyler-Walters, H. & Jackson, A (1999) *Marine Life Information Network for Britain and Ireland (MarLIN) – Assessing seabed species and ecosystems sensitivities. Rational and user guide.* Plymouth: Marine Biological Association of the UK; and

- Tyler-Walters, H., Hiscock, K., Lear, D.B. and Jackson, A. (2001) *Identifying species and ecosystem sensitivities. Report to the Department for Environment, Food and Rural Affairs from the*

Marine Life Information Network (MarLIN).Marine Biological Association of the United Kingdom. Plymouth: marine Biological Association of the UK.

12.2.2.2 Study Area

The Great Island Power Plant is located at the confluence of the River Suir and River Barrow, on the shores of the Barrow in Co. Wexford. The estuary flows into the Celtic Sea and its fauna and flora are typical of an estuary in Ireland. For the purposes of this study, the dimensions of the study area for examining the impacts to marine ecology are set out in Table 12.4.

Table 12.4: Study Area

Aspect Under Study	Dimensions of the Study Area
Marine ecology	1 km radius around the development site
Designated conservation areas	15 km radius around the development site

The 1 kilometre radius for the marine ecology study area was chosen based on the expected extent of the existing plume and the relatively rapid mixing known to occur after release into the estuary. In addition the plume from the new development will be greatly reduced due to decreases in the volume of the discharge (see Chapter 3, Description of the Development). However, in the case of some receptors, such as habitats of conservation concern, the desk study encompassed a wider area up to 15 kilometres from the existing power plant site boundary.

Designated sites

There are a number of designated sites in the area. These are further detailed in Section 12.2.3. In addition to the relevant ecology in the area, the designated sites which are 'relevant' to the marine scope of the EIA, in general those within 15 kilometres of the proposed development were considered in the assessment. Designated sites that were too distant to be affected were not considered and any designated sites in the terrestrial environment are considered in Section 12.2.3.5.

12.2.2.3 Sources of Information

The data used to compile this chapter was obtained by means of the following activities:

- Desktop review of relevant databases and documentation. The main sources include:
  - Marine Institute Harmful Algal Blooms database. Website: http://www.marine.ie/home/publicationsdata/data/Habs+Search+Database/
  - Central Fisheries Board 2006. Investigation of Salmon Smolt Impingement at six ESB Thermal Generating Stations
  - Bird Watch Ireland Wetland Bird Surveys (I-WeBS) publications Website http//www.birdwatchireland.ie/Default.aspx?tabid=281
- Consultation with interested parties and relevant authorities at scoping stage (full details of consultation included in Chapter 6, Scoping and Consultation).

The National Parks and Wildlife Service (NPWS) database was researched to determine the location of designated sites within the study area and to establish if any protected species occur within or in close proximity to the development site. Designated sites are defined as sites of ecological importance which are designated under the EU Habitats Directive (92/43/EEC) or the EU Habitats Directive (92/43/EEC). In addition, on June 25th 2009, a meeting was held with the NPWS on site to introduce the scheme and obtain baseline data and any feedback from the NPWS regarding possible concerns and their professional judgement.

12.2.2.4 Baseline Evaluation Criteria

According to the EPA Guidelines (2002), the description of the baseline environment should include a description of the context and character of the existing environment and an evaluation of that environment in terms of importance and sensitivity. Important and sensitive aspects of the marine environment are deemed to include the following:

- Designated sites protected under the EU Habitats Directive (92/43/EEC);
- Species and habitats protected under Annex I and II of the EU Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC);
- Wild fauna protected under the Wildlife Act, 1976 and the Wildlife (Amendment) Act, 2000;
- Species protected under the Flora (Protection) Order, 1999;
- European Communities (Natural Habitats) Regulations, 1997 as amended, and
- Birds and habitats protected under the Ramsar Convention on Wetlands are considered to be very important and sensitive.

For this assessment, the importance / sensitivity of the marine ecology will be defined according to habitats and species. Based on professional knowledge and experience of the sensitivity of habitats and the guidance detailed above, the criteria evaluation for habitats is determined as being 'low', 'medium' or 'high' extent.

Habitats

Criteria have been developed to determine the overall values of different habitats in the study area are listed below. Not all are necessarily applicable to all habitats but those that are will apply to a 'low', 'medium' or 'high' extent from which an overall evaluation can be made as shown in Table 12.5.

Table 12.5: Habitats Evaluation Criteria

Criteria	Low value	Medium value	High value
1. Protection Status- the extent to which the habitat is protected: internationally, nationally or locally. **2. Naturalness**- the 'naturalness' of the habitat must be assessed. Modified environments are environments in which human activity has modified the area's primary ecological functions, for example, through fishing or the introduction of alien species. **3. Fragility** - the fragility and sensitivity of the habitat and its ability to recover (either naturally or with assistance) from disturbance, including invasion by alien species must be assessed. **4. Representativeness** - the extent to which the habitat is considered to be an excellent example of valued natural or semi-natural vegetation types in terms of the flora communities (and their associated fauna) that it contains. **5. Ecosystem Function** - the extent to which the habitat serves an important ecosystem function. This includes: comprising an ecological corridor between other isolated habitats of ecological importance; importance in the context of faunal migrations; or importance in the context of lifecycles (breeding, nursery or feeding grounds). **6. Regulating Services** - the extent to which the habitat is important to and/or provides regulating services (i.e. functions and regulatory processes) such as coastal protection, regulation of floods. **7. Species Association or Reliance** - the extent to which the habitat contains and is relied upon by concentrations of species that are: endemic or restricted range; nationally or locally rare (particularly Red Book species or those protected under national or international legislation or listed by IUCN); keystone species, upon which other species may be reliant for their survival; suffering serious reduction nationally or locally; at the edge of their ranges; present in notably large populations; or uncommon or threatened in a wider context. **8. Diversity** - the diversity of the habitats and their individual species richness and diversity (including genetic diversity) are important. In general, the greater the total number of species recorded, the greater the conservation interest of the area. **9. Research and Education** - the research value and education potential of the site or the recorded history of the site (e.g. surveys, scientific studies, published papers). The loss of an irreplaceable biological record would be particularly significant. **10. Active Management** - the extent to which the habitat is being actively managed with nature conservation in mind.	The evaluation for each criterion will present descriptions of what would constitute low, medium and high values. For each criterion the habitat value will be evaluated based on factual baseline data, scientific knowledge, professional judgement and stakeholder perspective. Based on this evaluation a value will be allocated for that criterion and highlighted accordingly with additional information and brief rationale for the decision. In the absence of data, insufficient data or where there is significant uncertainty, the precautionary principle will be applied.		
Overall Habitats Evaluation	The overall habitat evaluation will be based on an aggregate of the individual ratings for each criterion. This process will involve an application of professional judgement in terms of weighting some criteria higher than others where appropriate.		

Species

Species value is assessed according to accepted criteria such as rarity and the extent to which they are under threat. The importance of species to wider ecological communities and the ecosystem (e.g. predator/prey relationships) is also considered and the degree of protection of species under Irish and EU legislation is also taken into account. Table 12.6 presents some criteria for deciding on the value of individual species.

Table 12.6: Species Evaluation Criteria

Criteria	Importance/ Sensitivity
Protected specifically under Irish legislation Listed as Rare, Threatened or Endangered by International Union for Conservation of Nature (IUCN) Listed under Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Critical ('keystone species') to ecosystem function Culturally iconic species for local and/or indigenous people	High
Not protected or listed but: A species common globally but rare in this part of Ireland Rare or population in decline Endemic or locally distinct sub-populations At the limits of its range Has a commercial value and is being exploited Provides an important subsistence resource Species subject to an active management programme Groups that have been or are under active scientific study	Medium
Not protected or listed and: Common/ abundant Not critical to other ecosystem functions	Low

12.2.2.5 Impact Assessment Criteria

The source and type of all impacts is set out in Section 12.3.4. The mitigation measures that are defined for any potentially significant impacts are set out in Section 12.3.5. Any likely residual impacts are evaluated in terms of magnitude and significance in Section 12.3.6.

Magnitude

The impact assessment will describe what will happen by predicting the magnitude of impacts and quantifying these to the extent practicable. The term 'magnitude' is used as shorthand to encompass all the dimensions of the predicted impact. The magnitude of impacts for the marine ecology is described according to habitats and species.

Habitats

Magnitude of impact to habitats is a combination of several factors, including:

- The spatial extent over which the impact is experienced;
- The duration of the impact and/or the extent to which it is repeated;
- Whether it is total loss to Project footprint or temporary occupation that can be remedied;

- For other physical changes (e.g. to the hydrological cycle, water quality or noise), the extent of the change; and
- The size of the footprint in the context of the wider area of habitat that exists.

Table 12.7: Magnitude Criteria for Habitats

Criteria	Impact Magnitude
The Project (either on its own or together with other projects) may adversely affect the integrity of a habitat, by substantially changing in the long term its ecological features, structures and functions, across its whole area, that enable it to sustain the habitat, complex of habitats and/or population levels of species that makes it important.	High
The habitat's integrity will not be adversely affected in the long term, but the effect is likely to be significant in the short or medium term to some, if not all, of its ecological features, structures and functions. The habitat may be able to recover, through natural regeneration and restoration, to its state at the time of the baseline study.	Medium
Neither of the above applies, but some Low impact of limited extent, or to some elements of the habitat, are predicted to be evident but readily recover through natural regeneration.	Low

Species

The magnitude of impact to species is a combination of several factors, including:

- The spatial extent over which the impact is experienced;
- The extent to which the habitat relied upon by the species is impacted (as evaluated under 'Habitats' above);
- The population or proportion thereof affected;
- The duration of the impact and / or the extent to which it is repeated;
- The magnitude of the aspect (noise, light, volume of vessel movements);
- The size of the footprint in the context of the wider range over which a species lives;
- The scale of change induced e.g. to water quality; and
- The extent to which a new physical or chemical feature is introduced to the environment e.g. the size of a barrier or the toxicity of a chemical.

Determining magnitude is typically a combination of quantifying the change and applying professional judgement / past experience.

However, seasonal variations and species lifecycle stage also need to be considered. For example some waterbirds are more sensitive when they are confined to the sea surface during the late summer moult of their primary flight feathers. Fish species might be deemed more sensitive during their spawning period than at other times of year. Species' sensitivities to different effects of the Project, and how for some they may change seasonally, are therefore important considerations in deriving impact magnitude.

Criteria that have been used to assess the magnitude of ecological impacts (based on Duinker and Beanlands, 1986) are presented in Table 12.8.

Table 12.8: Magnitude Criteria for Species

Criteria	Impact Magnitude
Affects an entire population or species in sufficient magnitude to cause a decline in abundance and /or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations*. A high magnitude impact to a species may also adversely affect the integrity of a site, habitat or ecosystem. A high magnitude secondary impact may also affect a subsistence or commercial resource use (e.g. fisheries) to the degree that the well being of the user is affected over the long term.	High
Affects a portion of a population and may bring about a change in abundance and / or distribution over one or more generations*, but does not threaten the integrity of that population or any population dependent on it. A Medium magnitude impact may also affect the ecological functioning of a site, habitat or ecosystem but without adversely affecting its overall integrity. The size of the consequence is also important. A Medium magnitude impact multiplied over a wide area would be regarded as major. A short term effect upon the well being of resource users may also constitute a secondary Medium impact.	Medium
Affects a specific group of localised individuals within a population over a short time period (one generation* or less), but does not affect other trophic levels or the population itself.	Low

*These are generations of the animal/plant species under consideration not human generations.

Significance

The significance of the potential impacts to habitats and species will be assessed according to the value of the habitat and species involved and the magnitude of the impacts it is predicted to experience. Criteria for assessing the significance of impacts stem from the following key elements.

- Status of compliance with relevant government legislation, policies and plans and any relevant company or industry policies, environmental standards or guidelines.
- The magnitude (including duration, scale and intensity) of the change to the natural environment (e.g. loss of, or damage to habitats, an increase in noise, an increase in employment opportunities), expressed, wherever practicable, in quantitative terms.
- The nature of the impact receptor (physical, biological or human). Where the receptor is physical (e.g. the seabed) its quality, sensitivity to change and importance are considered. Where the receptor is biological, its importance (e.g. its local, regional, national or international importance) and its sensitivity to the impact are considered.
- The likelihood (probability) that the predicted impact will occur. Particularly for accidental events or receptors that have a transitory presence in the study area, this is estimated based upon experience and/or past evidence that such an event has previously occurred.

For this assessment, significance has been defined based on four levels described below and the latter three shown in Table 12.9.

- ***Not significant***: An impact occurs but is indistinguishable from the background / natural level of environmental and socio-economic change.

- ***Low significance***: Impacts of low magnitude, within standards, and / or associated with low or medium value / sensitivity receptors / areas, or impacts of medium magnitude affecting low value / sensitivity receptors / areas.

- ***Medium significance***: Broad category within standards, but impact of a low magnitude affecting high value / sensitive receptors / areas, or Medium magnitude affecting medium value / sensitive receptors, or of high magnitude affecting Medium sensitive receptors / areas.

- ***High significance***: Exceeds acceptable limits and standards, is of high magnitude affecting high or Medium value / sensitive receptors / areas or of medium magnitude affecting high value / sensitive receptors / areas.

Table 12.9: Overall Significance Criteria for EIA

	Low Magnitude Impact	Medium Magnitude Impact	High Magnitude Impact
Low value / low sensitivity receptor or site, within standards	Low	Low	Medium
Medium value / sensitivity receptor or site, within standards	Low	Medium	High
High value / sensitivity receptor or site, exceeding standards	Medium	High	High

12.2.3 Baseline Description & Evaluation

12.2.3.1 Plankton

Plankton includes all organisms that are carried by water movements rather than their own ability to swim, and includes plants and plant-like unicellular organisms (phytoplankton) and animals (zooplankton).

Phytoplankton monitoring is carried out on a regular basis by the Marine Institute of Ireland. The closest sampling point is located approximately 2-3 kilometres south of the Great Island Power Plant at Arthurstown, Co. Wexford. The phytoplankton standing stock is highest in the summer from May to September, however transient phytoplankton blooms also occur in this estuary during the spring when phytoplankton concentrations can exceed 1 million cells / litre (observed in Arthurstown in February 2009 and reported by the Marine Institute on their website, accessed 3rd August 2009). The phytoplankton assemblage is dominated by dinoflagellates and diatoms. Greatest species diversity is observed in summer blooms, for example in May 2009, 13 species were recorded. Summer blooms are typically comprised of the *Scrippsiella* sp, *Skeletonema* sp., and *Thalassiosira* sp. The prevalence of *Skeletonema* spp. is typical of estuaries. The dinoflagellates *Pseudo-nitzschia* spp. and *Alexandrium* sp. are associated with producing toxins that can cause paralitic shellfish poisoning (PSP) and amnesic shellfish poisoning (ASP) in consumers of shellfish. Both of these species have been recorded in the Barrow Estuary in June 2009 (observed in Arthurstown in February 2009 and reported by the Marine Institute on their website, accessed 3rd August 2009).

The centric diatom, *Chaetoceros* sp. and the diatom *Odontella rhombus* are generally present in Arthurstown throughout the winter period. Other species often observed, include *Gymnodinium* sp, *Heterocapsa* sp, Naked Dinoflagellate sp., *Paralia sulcata*, *Prorocentrum micans*, and *Torodinium robustum* (observed in Arthurstown in February 2009 and reported by the Marine Institute on their website, accessed 3rd August 2009).

The zooplankton assemblage consists of holoplankton, which spend their entire lives in the water column and meroplankton, which are the seasonally abundant planktonic larvae of larger animals. In the general region, the dominant holoplankton species are copepods, dominated by calanoids. Meroplankton include the larvae of benthic organisms (e.g. crabs and molluscs), as well as fish eggs and fish larvae.

12.2.3.2 Benthic Communities

Overview

The composition of the intertidal and subtidal nearshore communities are to a large extent determined by the environmental conditions of the area. The intertidal zone along the shorelines of the Barrow Estuary largely consists of fine sediments.

Intertidal Ecology

The shoreline in the immediate vicinity of Great Island Power Plant consists of boulders, rocks, stones, pebbles and gravel, with some mud or sand near low tide mark. The vegetation of the shoreline is typical of rocky shores and consists of washed up *F. vesiculosus, A. nodosum, F. serratus, L. digitata* and sea lettuce (*Ulva lactuca).*

Good quality intertidal sand and mudflats have developed north of Passage East to Creadaun Head on a linear shelf on the western side of Waterford Harbour. Mudflats are not found along the shores in the immediate vicinity of Great Island Power Plant. The sediments of the mudflats adjacent to the power plant mostly comprise firm sands, though grade into muddy sands towards the upper shore (NPWS. 2006. Site Synopsis. River Barrow and River Nore SAC). They have a macro-invertebrate fauna typical of estuarine mudflats, characterised by polychaetes (*Arenicola marina, Nephtys hombergii, Lanice conchilega, Scoloplos armiger* and *Cerastoderma edule)* and bivalves (NPWS. 2006. Site Synopsis. River Barrow and River Nore SAC).

Figure 12.5: Intertidal to the West of Great Island Power Plant

The vegetation of salt marshes varies considerably depending on the degree of submersion of the waterbody and on the salinity of the substratum or of the water (estuarine or lagoonal salt marshes). Common glasswort, *Salicornia* is found in the Barrow Estuary which is common in saltmarshes around the Irish coastline.

In the vicinity of Great Island, Atlantic and Mediterranean salt meadow sub types are generally present. The legally protected species borrer's saltmarsh-grass (*Puccinellia fasciculata*) and meadow barley (*Hordeum secalinum*) (Flora Protection Order, 1987) are found in the upper extent of the saltmarsh along with the rare divided sedge (*Carex divisa*) and sea rush (*Juncus maritimus*) is also present. Other plants associated with salt meadows within the Barrow and Nore SAC include sea aster (*Aster tripolium*), sea thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*)*,* Spear-leaved Orache (*Atriplex prostrata*)*,* lesser sea-spurrey (*Spergularia marina*)*,* sea arrowgrass (*Triglochin maritima*) and sea plantain (*Plantago maritima*).

Salicornia and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

Subtidal Infauna and Sessile Epifauna

Infauna are animals that live within the sediment, while epifauna are animals that live on the surface of the seabed. There has been no recent work on the benthic fauna of the River Suir and Waterford Harbour area directly adjacent to the Great Island power plant site and therefore little information is available on the species that are present. However, the Mapping European Seabed Habitats (MESH) project indicates what benthic habitats and communities are likely to be present in a particular locality throughout the seas and coastal areas of Europe. According to MESH (www.searchmesh.net, accessed 1st August, 2009) the habitat in the vicinity of Great Island are formed of infralittoral mixed sediments, particularly sand and mud. According to the classifications of marine habitats provided by Connor *et al*. (2004) and due to the variable nature of the sediment type, a widely variable array of communities may be found, including those characterised by bivalves (e.g. *Ostrea edulis*, *Tellimya ferruginosa* and *Cerastoderma edule*) and polychaetes (e.g. *Anaitides mucosa*, *Syllidia armata*, *Aphelochaeta marioni*, *Mediomastus fragilis*, *Notomastus latericeus*, *Melinna palmata*). Other groups that may be found in this biotope are hydroids (e.g. *Hydrallmania falcata*), sponges (*Alcyonium digitatum*), oligochaete worms (e.g. *Tubificoides benedii*), ribbon worms, nematodes and sea squirts (Ascideans).

Estuarine environments along the south and south-west coast of Ireland are likely to show great similarities as are the species assemblages that are found in them. The species of Cork Harbour have been characterised previously and a number of biotopes have been found there which may also be in the vicinity of the Great Island development site. Species found there include polychaetes (e.g. *Capitella capitata*, *Chaetozone* sp., *Nephtys hombergii*, *Aphelochaeta marioni*), bivalves (e.g. *Abra alba*, *Mysella bidentata* and *Thyasira* spp.), crustaceans (e.g. *Ampelisca* spp.) and oligochaetes (e.g. *Tubificoides* spp.). Communities similar to those described above are likely to be present in the vicinity of Great Island and in the absence of recent survey data from these areas this data provides the best source of information on the species likely to be present in the study area.

Mobile Subtidal Epifauna

A number of epifauna, particularly crustacean species were identified in the vicinity of Great Island in a study carried out by the Central Fisheries Board in 2006 (Central Fisheries Board, 2006). These include prawn (*Palaemon serratus*), shrimp (*Crangon crangon*) and shore crab (*Carcinus maenas*). Chinese mitten crab (*Eriocheir sinensis*) was also identified at Great Island during the 2006 study. This invasive species was first recorded in Ireland in Waterford Estuary in 2005 and has subsequently been recorded from the lower reaches of the River Suir (Central Fisheries Board, 2007).

Commercially Exploited Shellfish

Bottom mussels (*Edulis edulis*) and Pacific oyster (*Crassostrea gigas*) are cultivated in the Barrow Estuary as shown in Figure 12.6. A large area of the River Suir and Waterford Harbour, approximately 200 metres to the west and south of the Great Island Power Plant has recently been designated as a New Shellfish Area under the *Shellfish Waters Directive, 2006/113/EC*. The Directive requires waters to be designated in order to support shellfish life and growth. In Ireland, the Directive is implemented by the *European*

Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268 of 2006). In 2009, this was amended by the *European Communities (Quality of Shellfish Waters) (Amendment) Regulation 2009*, SI 55 of 2009 and allowed for the provision of an additional number of important shellfish growing areas of which Waterford Harbour is one (Figure 12.7). Pollution Reduction Programmes (PRP's) have not yet been established for the designated shellfish waters in Waterford Harbour. There is currently a bottom mussel farm at Arthurstown, less than one kilometre south of the Great Island Power Plant.

Figure 12.6: Location of Shellfish Farms in Waterford Harbour

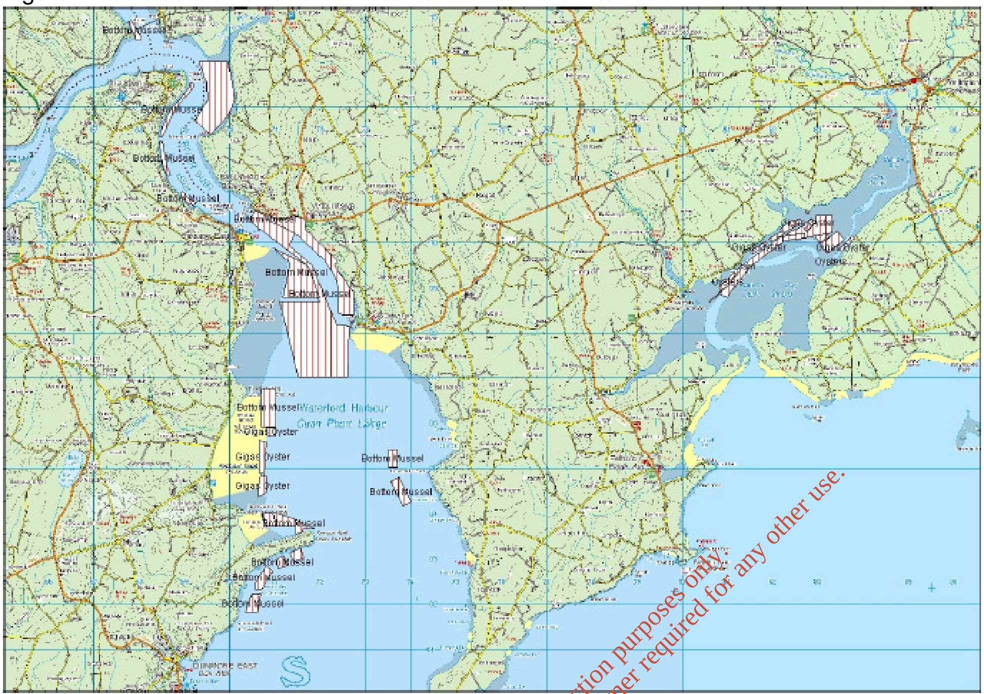


Figure 12.7: Designated Shellfish Waters

12.2.3.3 Fish

Sublittoral sediment, intertidal mud flats and saltmarshes associated with estuaries provide a rich source of benthic food for fish and act as nursery grounds for juvenile fish.

A number of diadromous species pass through the Great Island study area on their way to or from fresh water spawning grounds. Diadromous fish are species that migrate from fresh water to the sea, or vice versa, to feed or breed. These include Atlantic salmon (Salmo salar), sea trout (Salmo trutta), European eel (Anguilla anguilla), twaite shad (Alosa fallax fallax), allis shad (Alosa alsoa L.), river lamprey (Lampetra fluviatilis), and sea lamprey (Petromyzon marinus).

Adult Atlantic salmon spawn upstream in freshwaters between November and December. The freshwater upper stretches of the Rivers Barrow and Nore are very important for spawning. Atlantic salmon smolt have been observed in the waters adjacent to Great Island Power Plant (Central Fisheries Board, 2006). Parr spend up to three years in the river before migrating to the sea.

Sea lamprey are found in the Barrow catchment area. There is evidence of substantial accumulation of gravels and larger alluvial material in the downstream areas of the Suir and Nore weirs further north of the study area, where spawning of sea lamprey is known to take place (King, 2006). Such gravelled areas are not present to the same extent in the Barrow and it is considered that this may reduce areas available for spawning (King, 2006).

Waterford Harbour and the Barrow Estuary provides an important habitat for the European eel (Anguilla anguilla) and it has been regarded as one of the most important eel habitats in the country (Moriarty, 1999). In spring glass eels and elvers enter the estuary. Some migrate upstream, whilst others remain in the estuary to feed prior to their upward migration. Eels use eddies for passive transport and active swimming during upstream migration. Eels rest in sediments during ebb tides and the extensive tidal flats along Waterford Harbour and the Barrow Estuary are important resting points for this species. Adult eels begin their migration downstream in late autumn (Moriarty, 1999).

Shad spend most of their lives at sea but move into the estuaries of large rivers to breed. There are very few spawning areas of shad in Ireland. Twaite shad (Alosa fallax fallax) have been observed in the Barrow and typically spawn near the tidal limits. Spawning grounds comprise deep pool areas and backwaters for adults to rest and gravelled areas where eggs are laid. In 2005, fish of a 0+ age group were found in the Barrow (Allis shad (Alosa alosa) (1102) & Twaite shad (Alosa fallax) (1103) Conservation Status Assessment Report. Website http://www.npws.ie/en/media/Media,6272,en.pdf Date accessed 3rd August 2009) suggesting that in some years successful spawning may occur in the waters of the study area. The waters downstream of each of these sites are considered to constitute good habitat for nursery function for a 0+ and a 1+ shad (Allis shad (Alosa alosa) (1102) & Twaite shad (Alosa fallax) (1103) Conservation Status Assessment Report. Website http://www.npws.ie/en/media/Media,6272,en.pdf, Date accessed 3rd August 2009). It has not yet been established, if allis shad breed in Ireland but if it is occurring it is possible that they are spawning in the Barrow and / or Nore rivers.

In addition to diadromous species, the rivers Nore and Barrow host a number of resident species, comprising rich species diversity. Marine species largely make up the fish community. A survey carried out by the Central Fisheries Board 2006 'Investigation of Salmon Smolt Impingement at six ESB Thermal Generating Stations' included surveys at Great Island Power Plant, formerly owned by the ESB. Twenty fish species were observed during the surveys of the Great Island Power Plant. The most common fish species observed in this survey was flounder (Platichthys flesus). Other species which accounted for a large proportion of the biomass include Atlantic herring (Clupea harengus), cod (Gadus morhua), whiting (Merlangius merlangius), pogge (Agonus cataphractus) and seabass (Dicentrarchus labrax).

Substantial numbers of spawning smelt (Atherina presbyter) have been recorded in the Suir, Nore and Barrow rivers (Doherty & McCarthy, 2004). It has been suggested that the most likely spawning site of the Barrow Estuary smelt was in the upper reaches of the River Suir (Quigley, 1996), however young smelt are present in the study area (Doherty & McCarthy, 2004) . Smelt in the Barrow Estuary feed almost exclusively upon the marine mysid Praunus neglectus (Doherty & McCarthy, 2004).

Species of Nature Conservation Importance

There are several species of nature conservation interest known to occur in the study area. Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), twaite shad (*Alosa fallax fallax L.*), allis shad (*Alosa alosa*) and smelt (*Atherina presbyter*) are all listed on Annex II of the *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora* (EU Habitats Directive). Smelt (*Osmerus eperlanus*) are one of the rarest fish in Ireland and are listed in the Irish Red Data Book.

All three species of lamprey found in Ireland, the sea lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*) and river lamprey (*Lampetra fluviatilis*) are found in the river Barrow. They are listed on

Annex II of the EU Habitats Directive and are identified as qualifying species of interest for the River Barrow and River Nore Special Area of Conservation, site number 002162 (SAC).

Fisheries

The River Nore is important for salmonid fish and is a designated Salmonid River under is designated under the Salmonid Water Regulations, transposing the EU Freshwater Fish Directive. Populations of salmonoids in the rivers feeding the Barrow Estuary have decreased in recent years (David Mc Inerney (The Southern Regional Fisheries Board) pers comm) and the River Barrow is 80 % below its conservation limit for salmon and sea trout, and the Rivers Nore and Suir are both 20 % below their conservation limit (David McInerney (The Southern Regional Fisheries Board) pers comm.). The reasons for the decline are complex and due to a combination of factors - degradation of the fish habitat, pollution, obstruction to the passage of fish including dams, over exploitation at sea and inland and the survival at sea (Eamon Cusack, The Shannon Regional Fisheries Board, 2005, *Submission to the Joint Committee on Communications, Marine & Natural Resources, Re: Commercial Salmon fishing and Salmon Angling*).

The Waterford Harbour / Barrow Estuary is regarded as an important commercial fishery for the European eel. There are two significant eel fisheries in the Barrow / Nore / Suir catchment, the River Barrow silver eel fishery and the baited eel pot fishery in Waterford Harbour. The brown eel catch is predominantly taken in tidal estuarine waters. Glass eels (post larval stage of an eel) and elvers (a young eel) are currently not exploited in these rivers (Southern Regional Fisheries Board and Eastern Regional Fisheries Board, 2009). The eel population of the three rivers that enter the Barrow Estuary, Nore, Barrow and Suir and the Estuary itself is considered to be highly at risk from depleting numbers (David Mc Inerney (The Southern Regional Fisheries Board) pers comm.).

12.2.3.4 Birds

Overview

The River Barrow (Cheekpoint to New Ross) and Waterford Harbour support a wide variety of birds including more than 1,000 waterbirds. As a consequence both areas are recognised as nationally important sites (Bolan & Crowe, 2007). Saltmarsh and mud flats in close proximity (within 1 kilometre) to the Great Island Power Plant are important feeding areas for wading birds such as golden plover (*Pluvialis apricaria*). There are no Special Protection Areas (SPAs) or Important Bird Areas (IBAs) designated for the protection of birds in the study area.

Wintering Birds

Wintering flocks of migratory birds are seen along the Barrow Estuary utilising the suitable feeding and roosting habitats. The study area falls adjacent to the River Barrow and River Nore SAC (see Section 12.2.3.5). This designated site is of ornithological importance for a number of wintering birds. Species listed in Annex I of the Council Directive of 2 April 1979 on the conservation of wild birds (79/409/EEC), the Birds Directive include white-fronted goose (*Anser albifrons*), whooper swan *(Cygnus Cygnus)*, bewick's swan (*Cygnus columbianus*), bar-tailed godwit (*Limosa lapponica*). Nationally important numbers of golden plover (*Pluvialis apricaria*) and bar-tailed godwit (*Limosa lapponica*) are found in the SAC feeding on the rich benthic community during the winter.

Wigeon (*Anas penelope*) occur along the Wexford shore and up to several hundred black-tailed godwits (*Limosa limosa*) are found wading in shallow water on the tidal mudflats, outside of the existing power plant site boundary in winter (Waterford Birds. Website accessed 31 July 2009. http://www.waterfordbirds.com/index.html). Concentrations of grey herons (*Ardea cinerea*) are known to occur within the site boundary of Great Island Power Plant (Waterford Birds. Website accessed 31 July 2009. http://www.waterfordbirds.com/index.html). These are regularly found feeding within the study area.

Salt marsh vegetation, such as the annual *Salicornia europaea agg*., frequently fringe the mudflats and this provides important high tide roost areas for the wintering birds.

Breeding Birds

The estuarine habitats around Great Island Power Plant provide breeding habitat for a range of both, seabirds and terrestrial birds. Peregrine falcon (*Falco peregrinus*) and kingfisher (*Alcedo atthis*) occur along some of the many tributaries throughout the River Barrow and River Nore SAC. Kingfisher is a species that is listed on Annex I of the EU Birds Directive.

During summer months sites around the Power Plant also support a range of both breeding seabirds and passerine species. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by swallows before they leave the country (NPWS. Site Synopsis. River Barrow and River Nore SAC), however reedbeds are not found in close proximity to the Power Plant.

Mute swans (*Cygnus olor*) and moorhen (*Gallinula chloropus*) are permanent residents along the Barrow and most likely breed in the wider study area.

12.2.3.5 Nature Conservation Designations

There are a number of designated Natura 2000 sites found in the immediate vicinity of the Great Island Plant. However, apart from the jetty, the power plant does not fall within any of the designated Special Areas of Conservation (SAC) which are protected under the European Habitats Directive. An area of ground on the southern section of the Great Island site is contained within the Barrow River Estuary pNHA. This section of the site consists of reclaimed land from the estuary, which was reclaimed circa 1966 when the original plant was constructed.

Designated sites within 15 kilometres of the Power Plant are shown in Figure 12.2. The important marine species and habitats for which the sites were designated are detailed in Table 12.10: Designated Sites in vicinity of Great Island Power Plant. This is provided only for the sites in close proximity (15 kilometres) to the study area.

Table 12.10: Designated Sites in Vicinity of Great Island Power Plant

Name of site	Site Code	Key Features for designation
River Barrow and River Nore SAC	002162	The River Nore and River Barrow comprise of the upstream freshwater, tidal and estuarine systems of the Nore and Barrow rivers. The site comprises numerous Annex I habitats- the marine habitats include estuary, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows. The site is also selected for the following marine Annex II species-Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Twaite Shad, Atlantic Salmon.
Lower River Suir SAC	002137	The Lower River Suir SAC consists of the freshwater stretches of the River Suir south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford. The site is of major importance for the two habitats listed on the EU Habitats Directive that it contains (Mediterranean salt meadows and Atlantic salt meadows), as well as for its important numbers of wintering waders and wildfowl, including Annex I (EU Birds Directive) Greenland White-fronted Goose, Golden Plover, Whooper Swan and Kingfisher. The site provides habitats for the following Annex II species, Sea Lamprey, River Lamprey, Brook Lamprey, Twaite Shad, and Atlantic Salmon.

Name of site	Site Code	Key Features for designation
Barrow River Estuary pNHA	000698	The tidal river and estuary supports populations of the protected (EU Habitats Directive 92/43/EEC) Twaite Shad which spawn in selected areas. Along the mid and southern side of the estuary, saltmarshes and saltmeadows have developed on the sediment which has accumulated at the mouths of incoming streams and inlets. Borerr's Salt-marsh Grass (Puccinellia fasciculata), a species legally protected under the Flora Protection Order is found within the site. Meadow Barley (Hordeum secalinum), occurs at several locations on this site. The Lower River Barrow is a regionally important site for wintering wildfowl and waders. Peregrine falcon a species listed in Annex I of the EU Birds Directive and in the Red Data Book as being threatened in Ireland, breeds within the site (West side).
Ballyhack pNHA	000695	Ballyhack encompasses, in a small area, a variety of habitats which are not frequent in south-east Ireland.
Waterford Harbour pNHA	000787	This site is of conservation importance for the extensive and good quality intertidal sand and mudflats, a habitat listed under Annex I of the EU Habitats Directive. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail. The intertidal habitats are used by important numbers of wading birds during winter, as well as by small numbers of wildfowl. The populations of Oystercatcher (939), Lapwing (2,141) and Bar-tailed Godwit (216) are of national importance (figures are for winter 1994/95 to 1996/97). Other species which occur include Golden Plover, Sanderling, Dunlin, Black-tailed Godwit, Curlew and Redshank.

12.2.3.6 Baseline Evaluation

The habitats and species that comprise the marine ecology within the study area have been evaluated in consideration of the criteria detailed in Section 0 and the factors detailed in the baseline description.

Baseline Value of Habitats

- **Nature conservation designations**

  Habitats within designated SACs and pNHAs under the European Habitats Directives and the Irish Wildlife (Amendment) Acts 1976 and 2000 respectively are regarded as habitats of **high** value.

- **Subtidal and intertidal habitats**

  Much of the species that make up the intertidal and subtidal habitats are considered opportunistic species that readily recover following disturbance in an area. The diversity of the intertidal benthic habitat is high within the mudflats surrounding the Power Plant, containing many species which are dependent upon the habitat for survival and is therefore regarded as being of **medium** value. The rocky intertidal area surrounding the Power Plant and the subtidal benthic community are regarded as being a habitat of **low** value.

- **Manmade foreshore**

  The manmade foreshore habitat is regarded as being of low value. This habitat is not representative of the natural habitats surrounding it and provides little importance in the functioning of the surrounding ecosystem.

Baseline Value of Species

- **Plankton**

  Plankton populations are highly dynamic. They vary spatially, in response to nutrient concentrations, climatic conditions and currents and also exhibit significant cyclical changes in response to seasonal variations in sunlight and temperature.

  Phytoplankton, as primary producers is important to other ecosystem functions as they provide the basis of the productivity of higher trophic levels (zooplankton, fish, etc) including commercially important fish species. This could result in plankton having a high species value, however due to the tidal dynamics of the estuary, and the large scale dispersal characteristics and abundance of plankton throughout the estuary the value of plankton is regarded as **low** to **medium**.

- **Benthic Communities**

  The benthic community present is typical of estuaries in Ireland. The populations of representative species of this community are not declining. Many of the species present are considered opportunistic species that readily recover in an area following disturbance. In addition, to the criteria set out in Section 0 the sensitivity of the benthic communities present depends on the type of impact being considered. Species present are not particularly mobile and necessarily move away to avoid the impact, their natural ability to recover is high. Overall, the species value of the benthic community is considered to be **low**.

- **Shellfish**

  Mussels and pacific oysters are regarded as commercially valuable and are exploited in the Barrow Estuary. Shellfish are therefore regarded to be of **low** to **medium** value.

- **Fish**

  There are many species of nature conservation interest found within the study area. Sea lamprey, river lamprey, smelt, twaite shad and Atlantic salmon are all listed on Annex II of the EU Habitats Directive. Smelt (*Osmerus eperlanus*) are one of the rarest fish in Ireland and are listed in the Irish Red Data Book. These species of conservation interest are regarded as **medium** to **high** value species. Twaite shad are regarded as a hearing specialist, and are particularly sensitive to noise.

  The hearing of salmon is poor, with narrow frequency span, a poor ability to discriminate signals from noise and low overall sensitivity. This species is sensitive to increased turbidity and heat change. Salmon smolts are particularly sensitive to fish impingement at outfalls. Salmon is considered as a keystone species. Based on this and its conservation status and declining population in the Ireland, (see Section 12.2.3.3) salmon are regarded as a **medium** to **high** value species.

  Common species such as Atlantic herring, cod and whiting are found within the study area. Based on the baseline evaluation criteria in Section 12.2.2.4 these species are regarded as having a **low** species value on account of their widespread distribution and abundance in the Barrow Estuary, and throughout rivers and estuaries in Ireland and their ability to avoid areas of increased turbidity and noise.

- **Birds**

  Birds are highly mobile and will be able to avoid the areas of disturbance. Breeding birds and wintering birds, present in the study area include a number of species that are protected under EU legislation and are regarded of national importance (e.g. Greenland white-fronted goose, peregrine falcon and kingfisher). Consequently, the populations of these species are considered particularly vulnerable, or highly sensitive, during the seasons that they pass through or breed in the area. These are considered as species of **medium** to **high** value.

Resident species commonly found in the area include mute swan and moorhen. These species are not particularly critical to other ecosystem functions and are classified as having **low** species value.

Several passerine species are found adjacent to the study area (e.g. swallow), are listed on the Amber List as threatened and are considered as species of **medium** to **high** value. However in general, the community of passerine species present in the study area are not protected and common species and therefore considered as of **low** value.

- **Nature Conservation Designations**

  Species selected for designation of SACs and pNHAs, under the European Habitats and Bird Directives and the Irish Wildlife (Amendment) Acts 1976 and 2000 respectively are regarded as species of **high** value.

12.2.4 Identification of Potential Impacts

The proposed development is anticipated to have impacts on various aspects of the marine environment, including habitats, flora, fauna and birds. Potential types and sources of impact associated with the proposed scheme are set out in Table 12.11: Potential Types and Sources of Impact. The mitigation measures that will be required to manage impacts are discussed in Section 12.2.5.

Table 12.11: Potential Types and Sources of Impact

Project phase	Potential Impact Type	Potential Impact Source
Construction	Loss of feeding / nesting areas for birds	Removal of vegetation
	Habitat and community disturbance in designated conservation areas e.g. SAC adjacent to development site boundary	Noise, vibration and visual impact from machinery, vehicles and construction related activities such as pile driving. Removal of vegetation
	Direct and secondary contamination of habitats and species particularly birds	Accidental spillage of vehicle fluids during construction onshore
	Direct and secondary contamination of habitats and species particularly birds	Accidental spillage of fuel-oil onshore and into water environment from transport of fuel or storage facilities
Operation	Changes in marine water quality, with secondary effects on habitats, flora and fauna	Atmospheric pollutants
	Contamination of habitats and species in intertidal and subtidal	Accidental spillage of fuel-oil onshore and into water environment from transport of fuel or storage facilities
	Damage and disturbance to fauna and planktonic fauna such as fish and their larvae	Potential effects of water abstraction from Barrow Estuary
	Habitat or community alteration	Potential effects of a thermal plume from outfall
	Effects on subtidal fauna and flora	Potential effects of chlorine and other chemicals contained in cooling water discharged to surrounding environment Potential effects of effluent discharge and run-off

12.2.5 Mitigation Measures

This section focuses on the mitigation measures that will be implemented specifically for the protection of marine habitats and associated community and the conservation areas designated for these species and habitats.

12.2.5.1 Construction

- The footprint of the development is confined to the southern terrestrial area of the existing power plant's site boundary. No construction activity will take place below high water ensuring that the effects on the estuarine environment are minimised and avoided to a large extent.
- Unnecessary clearing and grading on site will be avoided.
- Soils will be stabilised as soon as practicable to prevent elevated levels of suspended solids in surface water run-off during the construction phase.
- A Construction Environmental Management Plan (CEMP) will be prepared to incorporate mitigation measures identified to minimise the impacts of the proposed development on the marine ecology. This CEMP will focus on detailed measures to protect the Barrow River Estuary pNHA and the River Barrow and River Nore SAC.

- Construction activities known to produce higher levels of noise such as pile driving will be avoided where possible during the winter, between October and March to minimise disturbance to birds feeding on the intertidal mudflats surrounding the development site.

- Construction activities will be phased to minimise soil exposure. Large areas of grading will be avoided in order to minimise erosion potential. Airborne dust arising from construction activities will be minimised by employing the mitigation measures described in Chapter 15 (Air Quality and Climate).

- Clearing adjacent to the estuary will be minimised. Silt control measures will be installed along the perimeter of trench excavations, where considered necessary. Particular care will be taken inside of the development site boundary in accordance with NPWS to ensure that disturbance to habitats and species of particular importance in the River Barrow and River Nore SAC and Barrow River Estuary pNHA can be avoided. Method statements for each construction activity will be developed in consultation with NPWS and included in the CEMP.

- All run off from areas of exposed soil will be diverted to a sediment trap on site during the construction phase. Water from the sediment trap will be discharged to the estuary via the drainage channel network, where practicable. Details of these measures will be developed in the CEMP.

- Potentially polluting substances and chemicals including oils, fuels, residues and wastes shall be stored at least 15 metres distance from watercourses or areas at risk of flooding and site ponding. Potentially polluting substances shall be located in a bunded area. Bund specification will conform to the current best practice for oil storage such as Enterprise Ireland's Best Practice Guide BPGCS005 Oil Storage Guidelines. The bunded areas will have a capacity that is the larger of either:

  - 25% of the total volume of materials in the bund; or
  - 110% of the volume of largest container in the bund

- Draw-off points and pipework associated with potentially polluting substances will be located entirely within bunded areas on site. Drainage from the bunded areas will be diverted for collection and safe disposal. Liquid contained within the bund will be tested once significant volumes have been retained. Once the results have been assessed the liquid will be pumped to the surface water drainage network or removed from the bund for off-site recovery or disposal by an appropriately permitted contactor in accordance with the requirements of the Waste Management Act, 1996 as amended.

- On-site refuelling will be avoided where possible. Where this is unavoidable refuelling will be carried out in designated bunded areas.

- Adequate stocks of hydrocarbon absorbent materials (e.g. spill-kits and / or booms) will be held on-site in close proximity to the chemical store in order to facilitate response to accidental spills and thus the possibility of contaminants entering estuarine environment, impacting the intertidal community. Spill response materials will also be stored on all construction vehicles. Competent personnel will be available to use the spill-kits in the case of a spill.

- Equipment will be regularly maintained and leaks repaired as soon as possible. If the equipment cannot be repaired it will be removed from the development site. Accidental spillages will be contained and cleaned up immediately. Spill-kits will be provided on-site during the construction phase, as required.

- Contained chemical portaloo toilets will be used on site during the construction phase. All sewage will be removed from the site to an authorised treatment plant.

- In addition, an intrusive 'contaminated land assessment' will be undertaken prior to any construction works being undertaken. Any contaminated land encountered, which is considered to be at risk of mobilisation during the construction phase, will be removed to an appropriately authorised facility prior to construction activities commencing with prior agreement from the EPA.

12.2.5.2 Operation

- Atmospheric emissions, during the operational phase of the project will comply with air quality limits and standards as described in Chapter 15 (Air Quality and Climate). In addition, Continuous Emission Monitoring (CEM) will be carried out for emissions of substances as specified by the Environmental Protection Agency in the IPPC licence for the facility. The proposed height of the stack, 60 metres will ensure good dispersion of atmospheric emissions and modelling suggests emissions will be below their relevant AQS and nitrogen critical load values. Ecological impacts, associated with operational phase atmospheric emissions, on the Lower River Suir SAC are predicted to be negligible as the maximum total nitrogen deposition is well below the critical load and the predicted NO_x concentration is well below the relevant AQS standard, this is discussed in detail in Section 12.1.5. Distillate oil will be used for standby fuel for the gas turbine in addition to fuel for the emergency generator set: use of this oil will therefore be very limited (see Chapter 3, Description of the Development).

- Cooling water will be dosed at the cooling water inlet by direct injection of Sodium Hypochlorite (NaOCl) solution as required in order to control biological fouling, of and damage to the condensers. Chlorine concentrations in the cooling water discharge will be maintained at a maximum concentration of 0.5 mg/l as per the current IPPC licence. Due to the high dispersal capacity of the receiving water body and the low concentrations of chlorine present no further mitigation measures are required as the proposed concentrations will not exceed current discharge concentrations. However, a water quality monitoring programme will be developed for process waste water and surface water run-off. Appropriate limits for waste water discharges will be determined by the EPA under the IPPC licence which will be revised with due regard to the WFD. Refer to Chapter 14 (Surface Water).

- A water conservation plan will also be implemented for the proposed power plant during the operational phase in order to reduce the amount of water used.

- In compliance with Best Available Technology (BAT), a mechanical screening system will be used to screen cooling water abstracted from the estuary. A series of fixed, coarse screens and travelling fine screens will be used. Endesa Ireland will use BAT. Endesa Ireland is committed to working closely with the Southern Regional Fisheries Board (SRFB) to determine the most appropriate and effective technology to mitigate against entrainment of fish species into the cooling water system, to ensure that impacts to smolts and other fish are minimised to an acceptable level. In particular this is expected to take place after commissioning of the new plant, circa 2013.

- The thermal load of the water discharged from the outfall will be reduced below the levels currently experienced under the current IPPC licence. Under the current licence thermal load is a maximum of 352 MWth and will be reduced to a maximum of 291 MWth under the proposed application.

- As for the construction phase, oil, petrol and other potentially polluting substances will be stored in UN approved containers. Bund specification will conform to the current best practice. Hydrocarbon interceptors and silt traps will be included at the downstream ends of proposed collection systems to remove oil and silt / grit from general plant washings and surface water runoff during the operational phase. This will then be discharged via existing outfalls where possible. It is assumed that the existing drainage system would be re-utilised as much as possible and that the existing invert levels and pipe capacities would allow this. Refer to Chapter 14 (Surface Water).

- Potentially polluting substances and chemicals including oils, fuels, residues and wastes will be stored according to IPPC licensing conditions.
- All bunds and chemical containers will comply with the appropriate standards and will be leak tested prior to commencement of operations and every five years thereafter, or as otherwise agreed with the EPA.

12.2.6 Residual Impacts

12.2.6.1 Construction Phase

Loss of feeding / nesting areas for birds

To the north east of the development site, the proposed laydown area will require the removal of immature beech and sycamore woodland. In addition, the proposed parking bay may require the removal of some sections of hedgerow along the existing local road leading to the development site. The removal of this vegetation will result in reduced feeding and possibly nesting areas for passerine bird species. With the implementation of the mitigation measures mentioned above these impacts will be of short term duration and will return to pre-impact state once the introduced vegetation establishes. The planting of new vegetation on site will provide new breeding and nesting areas for passerine species affected. Without mitigation the disturbance will be of low magnitude to a low value receptor, resulting in an impact of *Low* significance. However, with mitigation the disturbance to birds is expected to be minimal. Therefore, with mitigation, the impact is likely to be Low.

Habitat and community disturbance in designated conservation areas e.g. SAC adjacent to development site boundary

Noise and vibration and visual disturbance from the presence of increased machinery, vehicles and construction related activities will have temporary impacts on birds using the site and the surrounding areas, in particular the salt marshes, near to the development site. Waterfowl and waders of international importance and others birds particularly those sensitive to noise such as the white-fronted goose (*Anser albifrons*) and peregrine falcon (*Falco peregrinus*) are likely to be displaced from these areas during construction. Monitoring studies undertaken during piling activity on the Humber Estuary in England have shown that disturbance from piling activity was effectively reduced by visual screening from birds, with bird numbers and distribution similar during periods with or without piling. Construction activities which were not screened caused disturbance comparable to recreational activities with birds maintaining a stand off distance of around 200 metres (ERM, 1996).

Effort will be taken to minimise noise emitted during construction (see Chapter 11, Noise and Vibration) during sensitive periods for birds, the disturbance to birds is expected to be minimal. Without mitigation the disturbance will be of low magnitude to a high value receptor, resulting in an impact of Medium significance. However, with mitigation the disturbance to birds is expected to be minimal. Therefore, with mitigation, the impact is likely to be reduced to Low.

Direct and secondary contamination of habitats and species particularly birds

Spillage of vehicle fluids onshore during construction is expected to be unlikely and volumes of fuel oil possibly involved are expected to be relatively low and machinery will be contained within the development site boundaries. In the unlikely event that some vehicle fluids accidentally spill and enter the intertidal area, they will dissipate relatively quickly and not have a lasting impact on the intertidal flora and fauna. During the excavation and removal of soil for construction works, fuel / oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off. This will also reduce the possibility of such contaminants entering the marine environment. Without mitigation the disturbance will be of low magnitude to a high value receptor (both birds and habitats), resulting in an impact of Medium significance. With mitigation the impact is likely to be reduced to Low.

12.2.6.2 Operational Phase

Changes in marine water quality, with secondary effects on habitats, flora and fauna

The River Barrow and River Nore SAC support numerous bird species of national and international importance / concern. As described in Section Birds in addition to seabirds, passerine species including swallow (*Hirundo rustica)* are observed within the power plant site boundary. Air emissions from the proposed development are expected to improve from the current situation (see Chapter 15, Air Quality and Climate). Results from dispersion modelling carried out show concentrations of all relevant pollutants are predicted to remain well below the relevant air quality standards when the plant is firing on either natural gas or distillate fuel oil. Consequently, ecological impacts, associated with operational phase atmospheric emissions, on the Lower River Suir SAC are predicted to be negligible.

Contamination of habitats and species in intertidal and subtidal

Accidental spillage of fuel-oil onshore and into the water environment from transport of fuel or storage facilities may occur during the operational phase. Impacts expected are similar to those from the construction phase (see Section 12.2.6.1). Therefore, with mitigation the impact is likely to be reduced to Low.

Damage and disturbance to fauna and planktonic fauna such as fish and their larvae

Abstraction of cooling water from the Barrow Estuary has the potential to impact on marine plankton and other fauna such as fish and their larvae.

The cooling water will be extracted via the existing cooling water intake culverts. A study carried out by the Central Fisheries Board at Great Island power plant in 2006 concluded that the existing system on the intake culverts have not had a significant impact on migrating salmon smolts (Central Fisheries Board, 2006). However, the existing system does cause large numbers of fish to be impinged in the cooling water intake culverts. In accordance with the recommendations of the study, Endesa will develop a technical solution in consultation with the relevant authorities and in line with current best practice to ensure that migrating salmon smolts are not impacted and that impacts to smolts and other fish are minimised and the impingement of fish is reduced to an acceptable level.

It is anticipated that mortalities of plankton will result from the passage of planktonic species through the cooling water system. This biomass will however be returned into the estuary through the discharge of cooling water at the outfall. The regenerative capacity of the species concerned will ensure that the overall proportion of the population affected in the Barrow Estuary will be minimal.

The impacts expected from the refurbished cooling water intake system are expected to be lower than that of the current system. Without the mitigation measures listed above the plankton community, a low to Medium value receptor, will be subjected to a low magnitude impact, resulting in an impact of *Low* significance. The low magnitude impact to common fish species, a low value receptor, will also result in an impact of *Low* significance. However, fish species of conservation interest (egg Atlantic salmon) are medium to high value receptors and the low magnitude impact is likely to result in an impact of *Low* to *Medium* significance. With mitigation the overall impact is likely to be reduced to *Low*.

Habitat or community alteration

The effects of discharged water from the outfall will result in a thermal plume. Such a plume can affect estuarine flora and fauna including diadromous fish in the following ways:

- Thermal influence caused by a short term or long term exposure to higher than ambient temperatures in the discharge area

- Mechanical damage caused by the screens at the intake (impingement), and by the flow through the cooling system (entrainment)

- Hindrance of river passage of diadromous fish by 'blocking' the water way through the creation of a barrier of water with a temperature sufficiently above ambient to cause behaviour change or discomfort in the fish

- Toxic damage caused by a detrimental water quality of cooling water

- To understand the impacts the discharged elevated temperatures may potentially have on the local environment, it is important to understand the plume characteristics at the outfall

Under the new proposals, the allowable temperature rise through the cooling water system i.e. the difference between outlet and inlet) will remain unchanged at 12.0°C above estuarine water temperature. However, as the volume of discharge is anticipated to decrease from 50,170m^3/hr to 20,000m^3/hr the maximum thermal load is anticipated to decrease from the existing 352 MWth to 291 MWth.

The impact of this 'new' plume in the Barrow Estuary is not considered to have any negative effects on the estuarine flora and fauna and diadromous fish populations above and beyond the effects that may be currently occurring. If it would, it would only be at a small area and with a temperature difference that is similar to current temperatures discharged from the existing power plant. The main considerations for this conclusion are as follows:

1. Subtidal and intertidal benthic communities will not be affected. Owing to its elevated temperature above the estuarine conditions, the plume will be buoyant. Temperatures rapidly drop with increasing depth. As currently is the case, temperatures will be higher in surface waters at the outfall. At the seabed therefore the temperatures should be near ambient and thus are not a reason for concern.

2. Intertidal communities will not be affected. The intertidal substrate in the Barrow Estuary Bay is largely soft sediment inhabited by marine benthos. Any plume that under adverse wind conditions would be directed onshore will have lost much of its heat at the land interface. Temperature increases on these intertidal substrates are not considered harmful in view of the fact that the species in such habitat are physiologically adapted to natural fluctuations in seawater temperature that are characteristic of these exposed environments.

3. Diadromous fish species, including Atlantic salmon (*Salmo Salar*), are not physically blocked from migrating up the river.

4. Reproduction capacity of the fauna in the Barrow Estuary will not be affected. The volume of water where temperature is elevated and the number of eggs and larvae that become trapped and suffer as a result are but a fraction of the total volume and number present in the estuary. Intake of water from the Barrow Estuary would result in the entrainment of fish larvae and other plankton. Because of the reduction of the intake rate, it can be expected that fewer larval fish and eggs will become entrained than during the former operation.

5. Estuarine productivity is not affected. Warmer temperatures are thought to result in lower phytoplankton biomass during the winter-spring bloom period as a result of increased grazing related to greater metabolic activity of both zooplankton and the benthos. The fact that phytoplankton and zooplankton are continuously redistributed in the estuary by currents and a limited extent of the plume renders it unlikely that productivity will be noticeably affected.

6. Water quality will not deteriorate. Higher temperatures often exacerbate low dissolved oxygen level problems in water bodies through the microbial breakdown of organic matter. Thus, persistent warm conditions may in principle lead to a depletion of dissolved oxygen in the water body. However, the

Barrow Estuary is simply too dynamic and the plume is expected to be too small for such conditions to prevail.

7. No evidence of negative effects arising from current discharge exist.

Effects on subtidal fauna and flora

Potential environmental consequences may result from high levels of chlorine contained in discharges from marine and estuarine power plants however, chlorine concentrations in the cooling water discharge will be maintained at a maximum concentration of 0.5 mg/l as per the current IPPC licence. Chlorine decay in seawater depends on the environmental factors including salinity and pH. The current concentration of chlorine discharge appears not to be adversely impacting on any of the species in the study area. Mobile species such as fish are known to avoid areas where elevated chlorine is present so that as a group they are unlikely to suffer any significant adverse impacts.

The volume of cooling water that will be abstracted is relatively small in comparison to the expected volume of each tidal exchange in this part of the estuary and will be significantly reduced as part of the proposed development. Therefore it is anticipated that the concentrations discharged from the outfall will not be significant in terms of toxicity effects on subtidal marine organisms. Impacts to the benthic communities, a low value receptor, will be of low magnitude before mitigation resulting in an impact of *Low* significance. Common fish species in the area are also of low value and the low magnitude impact will again result in an impact of *Low* significance before mitigation. However, fish species of conservation interest (e.g. Atlantic salmon) are medium to high value receptors and the low magnitude impact is likely to result in an impact of *Low* to *Medium* significance. Therefore, with mitigation (i.e. the lower volumes of water extracted and discharged) the impact is likely to be reduced to *Low*.

12.2.6.3 In-combination Impacts

There are no other known plans or projects in the vicinity of Great Island Power Plant which may act in-combination with the proposed development to impact on intertidal and benthic communities. Waterford Container Terminal lies approximately 2 kilometres upstream of the Power Plant on the River Suir at Belview Port. However it is not anticipated that potential impacts from the proposed development will act in-combination with the Belview Port development.

12.2.6.4 Summary of Residual Impacts

Increased noise emitted from construction activities is likely to cause disturbance to breeding and wintering birds. There is a potential that birds may temporarily avoid their normal breeding / wintering areas during periods of loud noise activities. With the exception of birds, intertidal and subtidal marine flora and fauna are not likely to be adversely affected from construction activities.

During the operational phase, it is expected that impacts on marine ecology and birds are likely to be improved from current conditions, with the installation of the Combined Cycle Gas Turbine (CCGT). The decrease in the volumes of water abstracted for cooling purposes will result in a reduction in the impingement of planktonic fauna and fish, and will ensure current impacts are improved.

Under the new proposals, the thermal load and extent of the thermal plume created form the discharge at the existing outfall will be reduced. Associated impacts on the existing water quality and marine ecology is not expected to deteriorate or be further disturbed from the effects of the current plume.

A summary of the residual impacts associated with the proposed development is detailed in Table 12.12.

Table 12.12: Summary of Residual Impacts

Impact Type	Impact Source	Value / Sensitivity of the Receptor	Impact Significance	Residual Impact Significance
Construction				
Loss of feeding/ nesting areas for birds	Removal of vegetation	Passerine bird species- Low	Low	Low
Habitat and community disturbance in designated conservation areas e.g. SAC adjacent to development site boundary. Disturbance of local fauna including marine mammals and birds	Noise and vibration from machinery, vehicles and construction related activities	Birds - High	Medium	Low
Direct and secondary contamination of habitats and species particularly birds	Spillage of vehicle fluids during construction onshore	Habitats – High Birds - High	Medium	Low
Operation				
Changes in marine water quality, with secondary effects on habitats, flora and fauna	Atmospheric pollutants	Bird - High	Medium	Low
Contamination of habitats and species in intertidal and subtidal	Spillage of fuel-oil onshore and into water environment from transport of fuel or storage facilities	Benthic habitats – Low- High Benthic communities - Low Common fish species - Low Conservation interest fish species Medium to High	Benthic habitats – Low to Medium Benthic communities - Low Common fish species - Low Conservation interest fish species Low to Medium	Low
Damage and disturbance to fauna and planktonic fauna such as fish and their larvae	Potential effects of water abstraction from Shannon Estuary	Plankton communities - low to Medium Common fish species - Low Conservation interest fish species Medium to High	Plankton communities - Low Common fish species - Low Conservation interest fish species Low to Medium	Low
Habitat or community alteration	Potential effects of a thermal plume from outfall	Benthic habitats – Low Benthic communities - Low Common fish species - Low Conservation interest fish species Medium to High	Benthic habitats – Low Benthic communities - Low Common fish species - Low Conservation interest fish species Low to Medium	Low
Effects on subtidal fauna and flora	Potential effects of chlorine contained in cooled water discharged to surrounding environment	Benthic communities - Low Common fish species - Low Conservation interest fish species Medium to High	Benthic communities - Low Common fish species - Low Conservation interest fish species Low to Medium	Low

12.2.7 Summary Conclusion

Great Island power plant is located in close proximity to several designated areas of conservation:

- River Barrow and River Nore Special Area of Conservation (SAC);
- Lower River Suir SAC;
- Barrow River Estuary proposed Natural Heritage Areas (pNHA);
- Ballyhack pNHA; and
- Waterford Harbour pNHA.

These designated areas of conservation are regarded as high value as they have been designated to protect and conserve species and habitats of concern or importance. There are no Special Protection Areas (SPAs) or Important Bird Areas (IBAs) designated for the protection of birds in the project area. It is not expected that project activities will impact the marine flora and fauna of the Barrow River Estuary proposed Natural Heritage Areas (pNHA). Much of the benthic species known to exist in the intertidal and subtidal area surrounding the power plant are common in Irish estuaries. However, the mudflats surrounding the power plant contain many species which are dependent upon such a habitat for survival and are therefore regarded as being of medium value. The rocky intertidal area surrounding the power plant and the subtidal benthic community are regarded as being a habitat of low conservational value. Impacts to these communities from the construction phase are expected to be minor as works will be restricted to within the power plant site boundary.

Cooling water will be extracted via the existing cooling water intake culverts. The potential for fish to be impinged (damaged by the screens at the intake) by the fine screens employed by the proposed system will remain, however, Endesa will develop a technical solution in consultation with the Southern Regional Fisheries Board (SRFB) to determine the most appropriate and effective technology to mitigate against entrainment of fish species into the cooling water system, to ensure that impacts to smolts and other fish are minimised to an acceptable level. In particular this is expected to take place after commissioning of the new plant, circa 2013. The temperature of the cooling water discharged from the power plant will remain unchanged during operation, however as the volume of water discharged will decrease substantially, the maximum thermal load is anticipated to also decrease from current conditions. Associated impacts on the existing water quality and marine ecology are not expected to deteriorate or be further disturbed from the effects of the current plume.

Due to combinations of the proposed mitigation measures, the magnitude of impacts and the positive changes from the current situation, the proposed activities will not have an adverse effect on the integrity of the sites or the qualifying features of the conservation objectives of the Natura 2000 sites. Therefore significant impacts are not likely to occur.

13. Soils, Geology and Groundwater

13.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS has been prepared in order to help fulfil this requirement with respect to soils, geology and groundwater as well as any contaminated land, if present, in the area of the proposed development.

The methodology and the following assessment sections are set out for soil, geology and groundwater.

13.2 Methodology

13.2.1 Guidance Used

The section presents the methodology used in assessing the baseline soils, geology and groundwater environment. As well as considering the relevant Environmental Protection Authority (EPA) guidance with respect to EISs (EPA, 2002, 2003). The scope and methodology for the baseline assessment has been devised with reference to the following guidelines and previously undertaken investigations.

- Geology in Environmental Impact Statements - A Guide (Institute of Geologists of Ireland, 2002)
- Greater Dublin Strategic Drainage Study (Dublin Drainage Consultancy, 2005)
- Phase 1 and 2 Environmental Site Assessment, ESB Great Island Power Generating Station, URS, November 2009. Refer to Appendix 13.1.

Historical mapping and other existing data sources were also reviewed.

13.2.2 Study Area

The dimensions of the study areas for this topic are set out in Table 13.1.

Table 13.1: Study Area

Aspect Under Study	Dimensions of the Study Area
Soils and Geology	All soils and geology within the direct footprint of the scheme and adjacent areas
Groundwater	Development area and its immediate environs including the estuary area in the vicinity of the development

13.2.3 Baseline Evaluation Criteria

13.2.3.1 Soils and Geology

Soils and sediments, including the bedrock from which it is sourced and by which it is supported, are important natural resources that perform many functions. These functions include:

- Biomass production: support of vegetation

- Filtering, buffering and transforming action: cycling of major elements required by biological systems, regulation and partition of water flow, provision of nutrients and minerals to groundwater, sorption reactions and microbial and biochemical transformations

- Biological habitat and gene reserve: soil biomass, supporting biological habitat and gene reserve, retention of water for use by vegetation

- Physical medium: support for built structures, waste disposal and recreation activities

- Protecting and preserving cultural heritage: protects archaeological and paleontological sites and contributes to the appearance of the landscape

All soils have different characteristics and play a role in supporting varying environments and chemical processes. Soils and sediment with a high clay and organic matter content provide nutrients and minerals to groundwater and habitats and therefore play an important role in nutrient cycles and vegetation support. These soils and sediments are recognised to be important. Soils and sediment that support areas of natural vegetation are also recognised to be important because the importance of natural habitats and biomass is recognised.

In some cases, the potential for soils and sediment to perform environmental functions (e.g. support of ecological communities) is reduced due to existing pollution resulting from anthropogenic activities, leaching or physical degradation, such as erosion. This is also therefore taken into consideration when defining the importance and sensitivity of soils and sediments.

Table 13.2: Criteria for Baseline Assessment of Soils and Geology

Criteria	Importance/ Sensitivity
Soils / Geology that support areas of natural or semi-natural vegetation and habitats Undisturbed and uncontaminated soils / sediment	High
Soils / Geology that support non-natural vegetation or habitats Soils / Geology that contains minor contamination but does not represent a significant risk	Medium
Areas where soils or sediment are absent (i.e. exposed bedrock) or paved areas Soils or Geology that is highly contaminated and / or represents a significant risk	Low

13.2.3.2 Groundwater

Groundwater performs a number of important functions including:

- Assimilation and transportation of nutrients and minerals required by biological systems

- Transport of water as part of the water cycle

- Support of habitats and species (springs, marshes)

- Baseflow provision to rivers and streams

- Potential supply of potable water

Geological Survey of Ireland (GSI) has defined Source Protection Zones (SPZs) in Ireland and these areas are recognised to be particularly important in terms of protection of potable water use and pollutant control. If groundwater resources support designated ecological sites or protected species they are also recognised to be particularly important and sensitive.

The importance of any groundwater resource is also dependent on the presence and productivity of aquifers. GSI has identified bedrock aquifers in Ireland and classified them in terms of productivity (groundwater yield, based upon porosity and permeability characteristics). The following classification system is used by GSI:

- Regionally important aquifers: good (100 to 400 m^3/day) to excellent (>400m^3/day) productivity
- Locally important aquifers: moderate (40 to 100 m^3/day) productivity
- Poor aquifers: poor (<40 m^3/day) productivity

GSI have produced guidelines as to how aquifer vulnerability can be calculated (GSI, 1999). These guidelines are summarised in Table 13.3 below

Table 13.3: GSI Guidelines for Aquifer Vulnerability Rating

Groundwater Depth	Soil Permeability High (sand/gravel)	Moderate (e.g. sandy soil)	Low (e.g. clayey subsoil, clay, peat)
0.0 – 3.0	Extreme	Extreme	Extreme
3.0 – 5.0	High	High	High
5.0 – 10.0	High	High	Moderate
>10.0	High	Moderate	Low

Note: Release point of contaminants is assumed to be 1-2m below the ground surface

In addition to these parameters, existing groundwater quality also needs to be taken into account when evaluating the importance and sensitivity of groundwater resources. Clean groundwater resources are recognised to be important and their quality shall be preserved and protected. Groundwater resources that are significantly contaminated are considered to be sensitive to further contamination and degradation. However, they are generally considered to be of lower sensitivity than groundwater bodies of pristine or near pristine quality. Exceptions may exist in cases where, for example, habitats and / or users are dependent on groundwater resources.

The criteria set out in Table 13.4 have been devised to evaluate baseline conditions in light of the considerations set out in this section.

Table 13.4: Criteria for Baseline Evaluation of Groundwater

Criteria	Importance/ Sensitivity
Source Protection Zones are present Groundwater resources that support ecological designated sites, proposed designated sites or protected species Some wells in the area are used, or are proposed to be used, for potable water supply Regionally important aquifer with good (100 to 400m3/day) to excellent (>400m3/day) groundwater yields Aquifer of high to extreme vulnerability Groundwater quality is likely to be good	High
Potable water supply abstraction wells are not present Aquifer of moderate vulnerability Locally Important Aquifer with moderate groundwater yields (40 to 100m3/day) Groundwater quality is likely to be moderate – some limited existing sources of current or historic pollution have been identified	Medium

Criteria	Importance/ Sensitivity
Potable water supply abstraction wells are not present Aquifer of low vulnerability. Poor aquifer with poor groundwater yields (<40m3/day) Groundwater quality is likely to be poor – extensive existing sources of current and/or historic pollution have been identified	Low

13.2.4 Impact Assessment Criteria

The source and type of all potential impacts is set out in Section 13.4. The measures developed to avoid, mitigate, or where no other option exists, compensate for adverse impacts are reported in Section 13.5. Potential residual impacts that are identified are described in terms of magnitude and significance in Section 13.6.

Magnitude

The magnitude of an impact is assessed in consideration of its intensity, and its extent in space and time. The criteria used to assess the magnitude of development impacts on soils, geology and groundwater are shown in Table 13.5.

Table 13.5: Criteria for Assessment of Impact Magnitude

Criteria	Impact Magnitude
Impact is of long-term or permanent duration (>5 years) Impact on the soil/sediment has a clearly noticeable and substantial impact on soil/sediment function e.g. biomass production or potential to support ecological systems The soil/sediment/affected area has limited or no potential to recover A large volume of soil/sediment/groundwater is affected and alternative resources performing similar functions are not available in the area Impact on the groundwater has a clearly noticeable and significant impact on environmental functionality	High
Impact is of medium-term duration (1-5 years) Impact on the soil/sediment has a moderate and noticeable impact on soil/sediment function e.g. biomass production or potential to support ecological systems The soil/sediment/affected area has the potential to recover A moderate volume of soil/sediment/groundwater is affected and alternative resources performing similar functions are not available in the area Impact on the groundwater has a moderate and noticeable impact on environmental functionality	Medium
Impact is of temporary (weeks) or short-term (months) duration Impact has only slight or no noticeable consequences for the functionality of the soil/sediment/groundwater A small or insignificant volume of soil/sediment/groundwater is affected or alternative resources performing similar functions are available in the area Impact has only slight or no noticeable consequences for the environmental functionality The affected area has the potential to recover	Low

Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the importance / sensitivity of the affected area. Impact significance is described as being Not significant, of Low significance, of Medium significance or of High significance.

13.3 Baseline Description and Evaluation

13.3.1 Geology

13.3.1.1 Regional Geology

According to the Geological Survey of Ireland (GSI, 2009) and Sleeman (1994), the geology underlying the site comprises Ordovician Volcanics consisting of the Campile Formation with undifferentiated felsic volcanics. The Campile Formation is described as pale coloured rhyolites in grey and brown slaty mudstones with occasional andesites.

13.3.1.2 Encountered Geology

A Phase 1 and Phase 2 assessment undertaken by URS in 2009 (Phase 1 and Phase 2 Environmental Site Assessment, ESB Great Island Power Generating Station, URS, 2009) identified the following geology at the site:

The overburden of the upper tier of the Station Grounds comprised a thin (less than 0.5 m thickness) layer of fine-grained sandy and silty topsoil overlying weathered bedrock. The geology of the parking bay areas is likely to be similar to that encountered in the upper tier.

Near the 220 kV switching yard 1.75 m thickness of loose brown clay was encountered overlying bedrock.

On the lower tier (see section 13.3.3.2 for further details specific to the proposed development area), up to 6.5 metres of fill material was encountered along the southern margin, comprising a lower layer of clays with occasional boulders, underlying an upper layer of boulders. Near the northern margins of this lower tier, up to 3 metres of natural clays overlying bedrock were encountered.

13.3.2 Site Evaluation

13.3.2.1 Site History

The following section describes the entire site of the existing power plant including the proposed area for development based on information provided by the site.

The existing power station was constructed in two stages, over agricultural lands. The first stage involved the commissioning of two 60 MW Units, in 1967 and 1968. Stage 2 involved the commissioning of a 120 MW Unit, in 1972.

Two areas of the site were subject to waste disposal operations. These were developed during the two main phases of construction of the Great Island Generating Station in the mid-1960s and early 1970s and were developed for the deposition of excess rock fill, building materials and spoil.

The northern segment of cell 1 ("station dump") was additionally used for general waste disposal during operation of the generating station between mid-1960s and mid-1990s. The wastes deposited in this area included fuel oil, boiler washings, laboratory waste, building rubble, canteen waste and asbestos removed during turbine overhauls and other maintenance activities. In 2005, with the agreement of the EPA, the landfill was capped.

13.3.2.2 Potential Current Contamination Sources

Primary sources of contamination are man-made activities that have the potential to introduce contamination into the ground. The potential primary sources of potential impact at the site have been identified based on the information provided by the site (current site activities, history of the site, surrounding area, etc).

Current on-site sources of contamination include: power generating units, water treatment plant, cooling water pumping house, oil stripping tank, underground storage tanks with heavy and light fuel wastes, HFO Tank Farm, 220 and 110 kV switching yards.

Historical on-site sources of contamination include the former waste disposal areas, particularly the northern half of the eastern cell (Cell 1) which received a variety of operation related wastes until the mid-1990s.

Current and historic off-site sources of contamination are considered to be limited to agricultural activities.

13.3.2.3 Contamination Site Assessment

This section refers to the Phase 1 and Phase 2 Environmental Site Assessment undertaken by URS and finalised in November 2009. This assessment addressed the entire site. The following works were completed as part of this assessment:

- Drilling of seven boreholes (BH201 to BH207) using air rotary drilling technique including overburden sampling. Monitoring wells were installed into each borehole
- Groundwater samples were obtained from the newly installed and ten previously installed groundwater wells: BH201 to BH206 (BH207 was not sampled as it was dry), BH2, BH3, MW101, MW102, MW107, MW104, MW106, MW200, MW201 and MW202
- Seventeen shallow trial pits (TP101 to TP117) with soil sampling
- Hand augered samples (three samples) from the bund walls around the HFO Tank Farm
- Sediment sampling (seven samples - SS01 to SS04 and SS10 to SS12) from the foreshore areas to the west of the former landfill cells and to the west of the Station Grounds
- Hand augered samples (eight samples) from across the 220 kV compound
- One additional trial pit from the 110 kV compound
- 'Bracketing' sampling (four samples) around hand augered sample HA04

Samples were analysed for a range of inorganic and organic parameters, however, not all samples were analysed for the complete suite of analytical parameters. Further investigation will be undertaken prior to construction.

The URS report drew the following conclusions based on the site works undertaken:

- Overall the site is considered suitable for the continued industrial use from the perspective of human health implications to site users.
- Risks to surface water and groundwater from a number of metals, fluoride, polycyclic aromatic hydrocarbons (PAH) and hydrocarbon indicator compounds were identified. However, URS concluded that the potential risks were not significant across the majority of the site.
- Samples collected from within the 220 kV compound located in the northern section of the site identified exceedances for hydrocarbons (mineral oil), arsenic, copper and zinc which may represent a risk to human health receptors. This area is upgradient of the proposed development area.

- Arsenic exceedances which may represent a risk to human health receptors were identified in two soil samples. One of these locations is upgradient of the proposed development area.
- PAH exceedances were identified adjacent to the proposed development area along the southern boundary of the site.
- Coliforms were detected in the groundwater and surface water at the site. URS conclude that this is likely to be as a result of local upgradient agricultural practices but may also be related to on-site activities.
- Elevated concentrations of ammonia were detected in groundwater. The origin was attributed to the former waste disposal area.

URS conclude that based on existing data, no remedial action was considered necessary at the site assuming a continued industrial land use scenario. However, it was identified that further assessment was required in some areas to confirm this conclusion, including areas where intrusive investigation was not possible due to the operational nature of the site.

It should be noted that the exceedances identified in the URS report are in comparison with generic assessment criteria which are conservative by nature. A site specific assessment, using site specific assessment criteria, may indicate that there are no risks to receptors associated with the exceedances identified.

13.3.2.4 Proposed Development Area Contamination Assessment

This development area is located in an area referred to as the Station Grounds - Lower Tier, which is generally flat.

This lower tier contains the main building, associated chimney stacks, cooling water pump house and process water treatment (steam purification) facility located adjacent to the proposed development area. The assessment also identified three excess / waste underground fuel storage tanks. These tanks are reportedly contained within below-ground vaults.

The above assessment involved the drilling of boreholes in the proposed development area: BH201 and BH202, and the monitoring of the existing groundwater well, BH3. A sediment sample, SS01, and a surface water sample, SW05, were also taken adjacent to the proposed development area.

Geology encountered in BH201 consisted of Made Ground comprising loose gravel to a depth of 0.4 metres below ground level (m bgl) overlying stiff, brown-grey, silty, sandy clay with boulders to a depth of 5.1m bgl. The clay was underlain by bedrock. Geology encountered in BH202 consisted of Made Ground comprising dense gravel to a depth of 0.3m bgl overlying boulders to a depth of 3.6m bgl overlying some clay with boulders to 6.4m bgl at which depth bedrock was encountered.

Two soil samples were analysed from BH201 for VOCs, TPH, PAHs, TOC and other inorganic parameters. Exceedances for a number of metals and fluoride were identified from the controlled water quantitative risk assessment in comparison to Generic Assessment Criteria (GAC) however, there were no exceedances for hydrocarbons or PAHs.

There were exceedances of groundwater assessment criteria for samples collected from locations MW201, MW202 and BH3 for anions, cations and coliforms. There was also an exceedance in BH202 for arsenic and in BH3 and MW202 for ammonia. There were no exceedances for any other metals, hydrocarbons or PAHs. These identified exceedances may be indicative of groundwater quality locally within the aquifer as similar exceedances are repeated across the entire site.

There was also one sediment sample (SS01) taken, with results showing exceedances above the screening criteria for hydrocarbons, metals and fluoride. The only exceedance recorded for the surface water sample, SW05, was for total phenols.

13.3.2.5 Designated Ecological Sites and Protected Species

According to the National Parks and Wildlife Service (NPWS), the River Barrow Estuary is a proposed Natural Heritage Area (pNHA). The River Barrow and the River Suir are designated as Special Areas of Conservation (SAC).

Groundwater resources within the study area are considered likely to be in hydraulic continuity with the River Barrow (at west) and Suir (at south). The surrounding area is predominantly agricultural. To the north of the site is a railway track and some agricultural lands beyond it. More agricultural lands are located to the east.

Both rivers water quality are reported by the EPA as “at risk of failing to meet good status in 2015” under the WFD (according to information given on the EPA web-site, accessed August 2009).

13.3.2.6 Groundwater Depth

The URS 2009 investigation confirmed the presence of groundwater in the fractured bedrock (Campile Formation) in each of the wells drilled in the lower tier of the site, at depths ranging between 7 and 17 m bgl. No groundwater was encountered in boreholes advanced on the upper tier, although the maximum depth drilled was19 m bgl.

13.3.2.7 Direction of Groundwater Flow

Based on groundwater elevations monitored by URS, groundwater flow was inferred to flow through the bedrock aquifer in a south-to-south-eastwards direction beneath the southern portion of the site towards the estuary. Tidal influences have not been assessed to the best of our knowledge.

13.3.2.8 Aquifer Productivity

The GSI classify the aquifer beneath the site (Campile Formation, rhyolithic felsic igneous rock) as “Regionally Important Aquifer - Bedrock which is Extremely Productive”; with known well yields ranging from 400 – 2,000 m^3/d (according to information given on the EPA web-site, accessed August 2009).

The GSI currently report that there is one recorded groundwater abstraction within approximately 3 kilometres of the site. This well is used for domestic supply and is located 2.7 kilometres to the southwest of the site, across the estuary.

13.3.2.9 Groundwater Vulnerability, Sensitivity and Water Management

The GSI has not identified any SPZs in this area (according to information given on the EPA web-site, accessed August 2009). In light of the information available and the criteria detailed in Table 13.3, the groundwater general vulnerability is considered to be ‘Extreme’, particularly at the west side of the site, where bedrock is near the surface. In accordance with the criteria detailed in Table 13.4, the groundwater general sensitivity is considered to be ‘Medium’ to ‘High’.

Since 2000, Water Management in the EU has been directed by the Water Framework Directive (WFD). The key objective of this Directive is that all water bodies in a Member State achieve (or retain) good status by 2015. In 2005, all water bodies were assessed and given a score based on the likelihood of them achieving this environmental objective. The potential scores are defined as follows.

- 1a - water body is at risk of failing to meet good status in 2015;

- 1b - water body is thought to be at risk of failing to meet the objective pending further investigation;
- 2a - water body is expected to meet good status in 2015, pending further investigation; and
- 2b - the water body is expected to meet good status in 2015.

The groundwater in the site area was classified as 2a in 2005, i.e. groundwater body is expected to meet good status in 2015, pending further investigation (according to information given on the EPA web-site, accessed August 2009).

13.4 Identification of Potential Impacts

Contaminant impact as a result of site operations has been identified by existing site investigation data. The likelihood of its presence in other areas not currently investigated is also considered high. In terms of a source-pathway-receptor relationship, the following is considered:

- Source category – as there is a long history (>25 years) of contaminative use, the presence of underground storage tanks and information from available data, the risk of a source being present is considered to be high.
- Pathway category – as groundwater is likely to be in continuity with the surface water body (Barrow Estuary) and flow directly to this receptor, the risk of a pathway being present is considered to be very high.
- Receptor category – as the estuary water quality is currently reported by the Environmental Protection Agency (EPA) as unpolluted (High status), and is adjacent to the site, the receptor has a very high rating.
- Severity category – the severity category can only be estimated but given the contamination in the area the severity is likely to be moderate (long term chronic risk likely) to severe (acute / short term risk and / or serious harm likely).

Various elements of both, the construction and operational phases have the potential to impact on soils and geology in the area of the proposed scheme. Potential types and sources of impact associated with the proposed scheme are set out in Table 13.6, below

Table 13.6: Potential Types and Sources of Impacts

Project Phase	Potential Impact Type	Potential Impact Type
Construction	Soil and sediment excavation during construction works	Materials potentially contaminated - cross contamination potential
	As above	Removal of uncontaminated soils and sediment
	Infiltration of surface water to new areas of open stripped, contaminated ground	Mobilisation of contaminant by infiltrating waters Creation of new pollution pathways through which contamination can cause further contamination of soils and sediment
	Leaks/spills of hazardous materials from construction equipment, storage areas etc	Contamination of soils and sediment
	Transport and disposal of spoil	Traffic and associated air and noise pollution
	Direct and indirect contact between human beings (including construction personnel) and contaminated land and / or associated hazardous vapours	Human health impacts
	Direct and indirect contact between flora and fauna and contaminated land	Ecological impacts

Project Phase	Potential Impact Type	Potential Impact Type
	Excavations carried out during the construction Piling	Ground settlement
	Contaminant releases / spills and subsequent infiltration into ground	Contamination of groundwater (e.g. oil)
	Changes in site drainage systems	Mobilisation of contamination through infiltration changes relating to site drainage
	Installation of foundations	Mobilisation of contamination through excavation/drilling works Creation of new pollution pathways through which contamination can cause further contamination of soils and sediment
	Dewatering	Localised disruption of existing groundwater levels
	Removal or remediation of contaminated overburden	Improvements in groundwater quality
	Parking bay area construction	Temporary compaction of natural soils
Operational		
	Chemical attack of subsurface structures Rainwater infiltration of, and leaching / migration from, any remaining areas of contamination Incorrect maintenance of drainage systems and SUDS	Contamination of soils and sediment
	Contaminant releases / spills and subsequent infiltration into ground	Contamination of groundwater (e.g. effluents and oils)
	Alteration of infiltration patterns due to creation / removal of hardstanding areas and alterations of existing drainage systems	Disruption of existing groundwater recharge patterns and mobilisation of soil/sediment contamination
	Corrosion / deterioration of concrete subsurface structures and drainage systems	Contamination of groundwater due to opening up of new transmission pathways for contaminants

13.5 Mitigation Measures

Soils, geology, groundwater, surface water and marine ecology are all closely interlinked such that the mitigation measures that relate to surface water and marine ecology are also relevant to this environmental topic and will help ensure that soils, sediments and groundwater are protected in an appropriate manner. In the interest of brevity, these mitigation measures are not repeated in this chapter and can instead be reviewed in:

- Chapter 14 (Surface water)
- Chapter 12 (Flora and Fauna)

This section therefore focuses on the mitigation measures that are to be implemented specifically for the protection of soils, sediment and groundwater.

13.5.1 Construction

- A 'Foundation Works Risk Assessment Report' will be prepared as part of the detailed design phase in accordance with appropriate guidelines.
- Hazardous materials and chemicals including oils, fuels, residues and wastes will be stored at least 15 metres distance from watercourses or areas at risk of flooding and site ponding. Hazardous materials will be located in a bunded area. The bunded areas will comply with best practice.

- Adequate stocks of hydrocarbon absorbent materials (e.g. spill-kits and/or booms) will be held on-site in order to facilitate response to accidental spills. Spill response materials will also be stored on all construction vehicles and vessels used. Competent personnel will be available to use the spill-kits in the case of a spill.

- All waste will also be stored within appropriate temporary areas prior to removal and treatment / recycling / disposal by appropriately authorised waste contractors in accordance with all relevant waste legislation. Waste will not be retained on site for more than six months unless consent from the relevant authority has been obtained.

- The location of plant, materials and the introduction of construction traffic management measures will include consideration of those that seek to minimise site compaction / erosion.

- Excavation will be restricted in times of high winds and heavy rainfall to minimise the potential for uncontrolled dust generation which has the potential to be contaminated.

- Refuelling of all plant will be conducted off site or in a designated appropriately contained secondary area on-site.

- Reuse of uncontaminated spoil will be encouraged and undertaken where possible as part of the waste management strategy for the project.

- Disposal of unused spoil will be undertaken at all times in accordance with all relevant legislation and in consideration of any contamination levels detected.

- Only uncontaminated soil is to be used in the construction of the scheme.

- Compaction of areas will be avoided where possible. Hoarding and signposting will be used in this regard to clearly demarcate haulage routes and other areas being used during construction. Landscaping and restoration will be undertaken with areas reinstated to their original condition, where possible.

In addition to those mitigation measures identified above, the following groundwater specific mitigation measures are also recommended:

- Draw-off points and pipework associated with hazardous materials will be located entirely within bunded areas. Drainage from the bunded areas will be diverted for collection and safe disposal.

- Any lubricants will be handled, stored and managed in accordance with all relevant legislation and best practice and will be reconditioned and reused where possible.

- In light of the fact that the intrusive works are likely to be located in areas of potential contamination, a Method Statement and Risk Assessment Report for excavation works (and any dewatering works required) will be prepared as part of the detailed design phase, in accordance with the guidelines produced by the Environment Agency (2000) and National Groundwater and Contaminated Land Centre (2001).

- Dewatering and excavation works will be carried out by trained, competent personnel (Competency to perform tasks is determined in consideration of appropriate education, training or experience).

- Water collected by means of any site drainage system and excavation / dewatering will be strictly controlled in accordance with all relevant legislation and in consultation with the relevant authority. Controls will include the use of silt / sediment traps and oil interceptors prior to the release to surface water bodies, surface water drains or foul sewers.

- Discharge of drainage / extracted waters to any water body will only be undertaken subject to approval by the relevant authorities and will be discharged in accordance with the conditions of any relevant consent granted in this regard.

- Any foul water generated by welfare facilities at the construction compounds will be contained and collected in portaloo facilities. Portaloo facilities will be maintained in an appropriate manner at all times.

- Best practice guidance as detailed by the Construction Industry Research and Information Association (CIRIA, 2001) will be adhered to at all times.

A Spoil Management Plan and a Contamination Management Plan will be developed during the detailed design phase as part of a wider CEMP prepared in accordance with best practice guidelines (DoEHLG, 2006). This plan will address any issues associated with contaminated soils and / or sediment, if present. It will be prepared in consultation with the relevant authorities and will include the following measures, as a minimum:

- Sampling of soils and sediments will be carried out where necessary in areas to be excavated. The necessity for such sampling will be determined by means of risk assessment exercises undertaken during preparation of the Spoil and Contamination Management Plan. Any sampling that is required will be undertaken prior to excavation taking place. Where necessary, a foreshore licence will be obtained in advance of any geotechnical investigations within the foreshore area.

- The results of any sampling will be used to develop and maintain a risk-based model of any potential hazards associated with the construction and operation of the proposed development.

- Any contaminated soils, sediment or groundwater that is encountered will be managed in accordance with best practice guidelines and all relevant legislation in consultation with EPA and any other relevant authorities.

- Spoil will be classified in consideration of the results of any sampling undertaken in order to identify the most appropriate route for disposal.

- Storage of contaminated material if encountered on-site will be avoided where possible. If storage on site is necessary, contaminated material, if present, will be strictly segregated into designated bunded areas where contaminants cannot leach into the underlying ground. If spoil is to be stored on site, consultation with the EPA will be undertaken, prior to commencing storage, to ensure that any relevant authorisations are obtained and that spoil is managed, at all times, in accordance with all relevant legislation.

- Piling of potentially contaminated terrestrial areas, if present, will be carried out in accordance with best practice guidelines such as those produced by National Groundwater and Contaminated Land Centre Report NC/99/77(2001).

13.5.2 Operation

- Measures will be taken to ensure that the concrete used to construct all below ground structures, including concrete piles and abutments in foundations, is sulphate resistant and resistant to corrosion to prevent degradation and decomposition of the concrete and potential long term contamination. Pre-cast concrete structures will be used wherever practicable.

In addition to those mitigation measures identified above, the following groundwater specific mitigation measures are also recommended:

- Hazardous chemicals and effluents will be stored and treated in accordance with all relevant legislation and best practice and will be reconditioned and reused where possible.

- Due to the volume of distillate oil required to be stored on site operations will be conducted in accordance with site specific requirements from the HSA and agreed with Wexford County Council and the EPA.

- Discharge of drainage / extracted waters to any water body will only be undertaken subject to approval of by the relevant authorities and will be discharged in accordance with the conditions of any relevant consent granted in this regard.

- A drainage strategy will be prepared as part of the detailed design for the project. As part of this strategy, measures will be undertaken to ensure that all drainage systems are of suitable capacity and design to ensure that increased infiltration of groundwater does not occur in areas at risk from contamination, if present. The drainage strategy will be prepared in consideration of all relevant legislation and best practice (as set out in the Greater Dublin Strategic Drainage Study (2005), BS EN 858-1 (Separator systems for light liquids) (2002), the UK Environment Agency's (2000) Pollution Prevention Guideline No. 3 (PPG3) and any other relevant best practice guidelines).

- Pipelines will be designed with adequate corrosion resistant materials, suitable for use and location.

13.6 Residual Impacts

13.6.1 Construction Phase

13.6.1.1 Removal of Potentially Contaminated Soils or Sediment

The potential of contaminated soils being present in the terrestrial and foreshore areas associated with the development is considered to be high and potential existing 'pollution linkages' have been identified. The proposed development will entail the remediation of the land where necessary to 'fit for use' standards and the breaking of 'pollution linkages'. Appropriate remediation is to be ensured, through the preparation of and adherence to, a Spoil and Contamination Management Plan, in consultation with the relevant authorities and as detailed in Section 13.5.1. Remediation of contamination and breaking of 'pollution linkages' has a positive impact, however, in the absence of any detailed information overstatement of this positive impact is avoided and the impact is deemed to be of low magnitude and significance.

The impact associated with the disposal of any contaminated spoil, if present, off-site is considered to be a negative impact of low significance. Disposal of spoil will take place in accordance with all relevant legislation. In light of these considerations, any impacts in this regard are considered to be of low significance.

13.6.1.2 Removal of Uncontaminated Soils and Sediment

In light of the area affected, removal of uncontaminated soils is considered to be an impact of low magnitude and significance. Reuse of soils where possible as part of a wider waste management strategy and as detailed in Section 13.5.1 has the potential to reduce the significance of this impact further.

The potential for removal of sediment via site run-off to impact on surface water is considered in Chapter 14 (Surface Water).

13.6.1.3 Creation of New Pollution Pathways through which Potential Contamination can generate further Contamination of Soils and Sediment

Removal of existing impermeable ground surface, such as tarmac or concrete hardstanding, could potentially lead to increased rainwater infiltration and leaching of contaminants, if present, to greater depths within the soil. If this is the case, the construction contractor will ensure that the duration for which soils are left open and exposed is minimised and that all reasonable mitigation measures have been pre-planned within the contractors work plans and method statements.

At this stage, the potential impacts associated with this activity are considered to be of low significance based on existing ground condition information.

Therefore, general mitigation measures to minimise or eliminate the potential impact from contaminants in ground during groundworks or hardstanding removal should include:

- Review of the existing information on ground conditions specifically with respect to the detailed scope of groundworks. This is to enable the planning of mitigation or remediation of known areas of soil contamination, and to highlight areas where further data will be required prior to construction.

- Where known contamination will be potentially encountered, the groundworks plan should contain pre-planned mitigation and remediation plans for this, dependant on the types, concentrations, ground conditions etc. of contaminants.

- Targeted soils investigations or sampling during the groundworks, when this is reasonably practicable to do so, as made possible / enabled by the groundworks or other construction phase work.

- General measures for the prevention of contaminant migration or leaching due to removal of impermeable cover or excavation and stockpiling. Specifically this should include the placing of temporary or permanent replacement impermeable cover, or of planned and controlled remediation or excavation, with associated control of waste disposal or temporary stockpiling of soils on site. The requirement for these measures will, in part, be determined by the application of contaminated land risk assessment in line with Irish Regulatory Guidance at that time, as well as the known requirements of the construction project at this time.

13.6.1.4 Contamination of Soils and Sediment

Management of hazardous material will be undertaken in compliance with the measures detailed in Section 13.5.1 in order to ensure that through good site and operational maintenance practice, no significant impacts occur with respect to contamination of soils.

13.6.1.5 Human Health Impacts

Impacts on public health will be avoided through careful control of access to the site as detailed in Section 13.5.1. Impacts relating to the health and safety of all construction personnel will be assured through implementation of the safety measures detailed in Section 13.5.1 and control measures as required under relevant Health and Safety Regulations. In light of this, no significant impacts are envisaged in this regard.

13.6.1.6 Contamination of Groundwater

Contamination of surface water and soils due to construction of the proposed scheme may lead to indirect impacts on groundwater as migration and infiltration of contaminants released to surface water, soils or sediment, if present, to underlying groundwater resources may occur. The mitigation measures that have been developed to minimise the potential risk of impacts on surface water are set out in Chapter 14 (Surface water). As described in Section 13.5.1, the mitigation measures are considered to reduce the potential for secondary impact to groundwater quality to occur. Any impacts to groundwater due to transmission of contaminants originally leaked to surface water and soils are therefore envisaged to be of low significance.

13.6.1.7 Removal of Potentially Contaminated Overburden

Removal of contaminated overburden, if present, is likely to have a positive impact on groundwater quality. This positive impact is considered to be of low significance.

13.6.1.8 Exposure of Subsurface Soils and Disturbance of Hardstanding Areas

Changes in surface water run-off and groundwater infiltration patterns are likely to occur in localised areas in light of the fact that the several development works are to temporarily expose subsurface soils and disturb hardstanding areas. In light of the mitigation measures set out in Section 13.5.1 regarding the design strategy to be developed as part of the detailed design and other measures, the impact that will occur is considered to be of low significance.

13.6.1.9 Dewatering

Significant impacts on existing groundwater levels due to dewatering during excavation works are not considered likely. Excavations and dewatering works are likely to be limited to the shallow soil levels and not affect the near surface bedrock aquifer. A relatively small area will therefore be affected. In light of the mitigation measures set out in Section 13.5.1 regarding method statements and other measures, any impacts that will occur are considered to be of no or low significance.

13.6.1.10 Compaction

Compacted areas will occur at the parking bay areas. The magnitude of the impact associated with the compacting of an area during construction is high as the soil is compressed and disturbed. A relatively small area will therefore be affected. When the mitigation measures are taken into consideration, the impact is considered to be of low significance.

13.6.2 Operational Phase

13.6.2.1 Soils and Sediment

Deterioration of subsurface concrete structures can occur due to chemical attack by existing ground conditions. Implementation of the mitigation measures detailed in Section 13.5.2 (i.e. the use of sulphate-resistant concretes for subsurface structures) will ensure that no significant impacts occur in this regard.

The potential for ongoing migration of any remaining ground contaminants during the operational phase of the development is considered to be low in light of the fact that the relevant areas will be paved over and drainage will be controlled as detailed in Chapter 14 (Surface Water). In light of this, any impacts that will occur are envisaged to be of no or low significance.

13.6.2.2 Changes in Surface Water Run-off and Groundwater Infiltration Patterns

Changes in surface water run-off and groundwater infiltration patterns are likely to occur only in localised areas in light of the fact that relevant areas will be paved over and drainage will be controlled as detailed in Chapter 14 (Surface Water). In light of the mitigation measures set out in Section 13.5.2 regarding the design strategy to be developed as part of the detailed design and other measures, the impact that may occur is considered to be of low significance.

13.6.2.3 Changes in Shallow Surface Drainage Patterns or Migration and Infiltration of Contaminants

Impacts due to changes in shallow surface drainage patterns or migration and infiltration of contaminants, if present, from surface water, soils or sediment to underlying groundwater resources are likely to be of low significance in light of the mitigation measures to be put in place as described in Section 13.5.2 and Chapter 14 (Surface Water).

13.6.2.4 Creation of New Transmission Pathways

Creation of new transmission pathways for contaminants, if present, (e.g. via corrosion of foundations) will be mitigated through the use of adequate materials (e.g. sulphate resistant concretes) as detailed in Section 13.5.2. In light of this, any impacts that may occur are likely to be of no or low significance.

13.7 Summary of Residual Impacts

A summary of the residual impacts associated with the proposed development is detailed in Table 13.7

Table 13.7: Summary of Residual Impacts

Impact Type	Impact Type	Importance / Sensitivity of the Receptor	Residual Impact Magnitude	Residual Impact Significance
Construction				
Sediment excavation during in-stream works Soil excavation during terrestrial works	Removal of potentially contaminated soils or sediment	Low	Positive – Low - medium	Positive – Low - medium
As above	Removal of uncontaminated soils and sediment	Low	Low	Low
Infiltration of surface water to new areas of open stripped ground	Creation of new pollution pathways through which contamination can generate further contamination of soils and sediment	Low	Low	Low (short term)
Leaks/spills of hazardous materials from construction equipment, storage areas etc.	Contamination of soils and sediment	Low	Low	Not significant
Transport and disposal of spoil	Traffic and associated air and noise pollution	Low	Low	Low
Direct and indirect contact between human beings (including construction personnel) and contaminated land and/or associated hazardous vapours	Indirect human health impacts	High	Low	Not significant
Localised contaminant releases/spills and subsequent infiltration into ground	Contamination of groundwater	Medium to High	High	Low
Removal of contaminated overburden	Improvements in groundwater quality	Medium to High	Positive Low	Positive Low

Impact Type	Impact Type	Importance / Sensitivity of the Receptor	Residual Impact Magnitude	Residual Impact Significance
Alteration of infiltration patterns due to removal of soil and/or hardstanding areas	Disruption of natural groundwater recharge patterns and mobilisation of soil/sediment contamination	Medium to High	Low to Medium	Low
Dewatering	Disruption of existing groundwater levels	Medium to High	Low	Not significant to Low
Compaction	Compaction of soils at parking bay areas	Medium	Medium	Low
Operation				
Chemical attack of subsurface structures Rainwater infiltration of, and leaching/migration from, any remaining areas of contamination Incorrect maintenance of drainage systems and SUDS	Contamination of soils and sediment	Low	Low	Low – Not Significant
Localized contaminant releases/spills and subsequent infiltration into ground	Contamination of groundwater	Medium to High	High	Low
Alteration of infiltration patterns due to removal of soil and/or hardstanding areas	Disruption of natural groundwater recharge patterns and mobilisation of soil/sediment contamination	Medium to High	Low to Medium	Low
Corrosion/ deterioration of subsurface structures (e.g. foundations)	Contamination of groundwater due to opening up of new transmission pathways for contaminants	Medium to High	Low	Not significant to Low

13.8 Summary Conclusions

The baseline assessment included a desktop study and a review of the findings of an intrusive environmental assessment. Baseline soils identified included fine-grained sandy and silty topsoil, loose brown clay, stiff silty sandy clays with boulders and Made Ground consisting mainly of gravel. Bedrock geology included rhyolites in grey and brown slaty mudstones with occasional andesites. Soil samples were taken during the intrusive environmental assessment and exceedances of the screening criteria were determined in a number of the samples collected.

Once the baseline was completed, an impact assessment was made on the identified constraints. Impacts can be split into two different phases, construction impacts and operation impacts.

The principal source of construction impacts are removal of soils and sediment, contamination mobilisation, contamination of groundwater and settlement. The removal of contaminated soils and sediment is a positive impact as contamination sources are removed. Mitigation measures involve the reuse of materials where possible, a waste management plan and appropriate material storage areas. In general the residual impacts are low to not significant.

The principal source of operational impacts is related to degradation of below ground structures by ground conditions. The residual impacts, once mitigation measures are implemented, are low to not significant.

14. Surface Water

14.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS describes the baseline surface water quality and hydrology of the receiving environment in the vicinity of the proposed development, the predicted and potential impacts of the proposed development and the mitigation measures needed, if any, to address any significant impacts with respect to water consumption, waste water discharge and flood risk.

Marine ecology is assessed in Chapter 12 (Flora and Fauna) and groundwater is assessed in Chapter 13 (Soils, Geology and Groundwater), although reference is also made in this Chapter to impacts on hydrogeology and the marine environment, where appropriate.

14.2 Methodology

14.2.1 Guidance Used

This section presents the methodology used in assessing the baseline surface water environment. As well as considering the relevant EPA guidance with respect to EIS's, this desk-based assessment was undertaken with reference to the following sources and publications:

- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. 272 of 2009)
- Draft River Basin Management Plan for the South Eastern River Basin District (SERBD, December 2008)
- Water Matters Report for Waterbody Barrow Suir Nore Estuary (*Water Maps* Map Viewer www.wfdireland.ie)
- Explanatory Note: Interim Classification of Irish Coastal and Transitional Waters for the Purposes of the EU Water Framework Directive, (EPA, June 2009)
- Trace Metal Concentrations in Shellfish from Irish Waters, 2003 (Marine Institute, September 2006)
- Water Quality in Ireland - Key Indicators of the Aquatic Environment (EPA, 2005)
- Water Quality in Ireland 2001 - 2003 (EPA, 2005)
- Water Quality in Ireland 2004 - 2006 (EPA)
- Planning Guidelines; The Planning System and Flood Risk Management - Consultation Draft Guidelines for Planning Authorities, (Department of Environment Health and Local Government (DEHLG) and Office of Public Works (OPW) September 2008)
- Flood Relief and Risk Management; Assessment of Potential Future Scenarios for Flood Risk Management - Draft Guidance, (OPW, 2009)

- Coastal Flooding and Tidal Surges (Department of Communications, Marine and Natural Resources (DCMNR), 2005)
- Ireland at Risk – The Impact of Climate Change on the Water Environment (DCMNR, 2007)

14.2.2 Study Area

The study area for this assessment encompasses the direct footprint of the development site and adjacent areas and the Barrow Suir Nore Estuary in the vicinity of the development.

14.2.3 Scope of Work

This is a desk-based assessment of the impacts of the development on the receiving environment in relation to water consumption, process waste water (mainly comprising boiler blowdown), cooling water (which is used to condense steam), foul water (comprising sewage and domestic type waste water), surface water run-off and flood risk.

14.2.4 Baseline Evaluation Criteria

Directive 2000/60/EC (the Water Framework Directive) was adopted by the European Parliament and Council in 2000. The Water Framework Directive (WFD) establishes a legal framework for the protection, improvement and sustainable management of inland surface waters, transitional waters, coastal waters and groundwater.

The aim of the WFD is to prevent the deterioration in the existing status of waters (including the maintenance of "High Status" where it exists) and to ensure that all waters, with some limited exceptions, achieve at least "Good Status" by 2015.

The *European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003)*, as amended by the *European Communities (Water Policy) (Amendment) Regulations, 2005*, transposed the WFD into Irish law establishing eight River Basin Districts (RBDs) on the island of Ireland for the co-ordinated management of water resources. Water bodies were delineated into groundwater, river, lake, transitional and coastal water bodies and, in accordance with the requirements of the WFD, an analysis of the characteristics and impact of human activity on each RBD was undertaken. This analysis provided an assessment of the likely condition of all water bodies and established a baseline for identifying future priority actions for subsequent stages in the river basin planning approach.

The *European Communities Environmental Objectives (Surface Waters) Regulations, 2009* (S.I. 272 of 2009) give effect to the criteria and standards to be used for classifying surface waters in accordance with the ecological objectives approach of the WFD. In accordance with the regulations waters classified as 'High' or 'Good' must not be allowed to deteriorate. Waters classified as less than good must be restored to at least good status within a prescribed timeframe. In addition, the regulations address certain shortcomings identified by the European Court of Justice in relation to Ireland's implementation of the Dangerous Substances Directive (76/464/EEC, as amended).

The regulations set standards for biological quality elements and physico-chemical conditions, supporting biological elements (e.g. temperature, oxygen balance, pH, salinity, nutrient concentrations and specific pollutants), which must be complied with. These parameters establish the "**ecological status**" of a water body.

The "**chemical status**" of a water body is assessed based on thresholds set for certain chemical pollutants, known as priority and priority hazardous substances.

A water body must achieve both "good ecological status" and "good chemical status" before it can be considered to be at "'good status".

The regulations also state that, for the purpose of classification, a status of less than good is assigned in the case of a body of surface water where the environmental objectives for an associated protected area requiring special protection by virtue of obligations arising from specific national legislation for the protection of water, or for the conservation of habitats and species directly dependent on water, are not met.

14.2.4.1 Intercalibration of Q-Rating and WFD Status

In Ireland a Q-rating system has been used to assess the sensitivities, abundance and diversity of macro-invertebrates and their relation to water quality. The Q-Rating system measures the effects of pollution by condensing biological information into a readily understandable form by means of a 5-point biotic index (Q-Values), an arbitrary system in which biodiversity and water quality are related where a Q-Value of Q5 indicates that conditions are close to reference conditions and a Q-Value of Q1 indicates the presence of serious pollution. The Q-rating system has been inter-calibrated with the WFD status values as detailed in Table 14.1.

Table 14.1: Q-Rating and WFD Status

Q-value Rating System	WFD Status
Q5, Q4-5	High Status
Q4	Good Status
Q3-4	Moderate Status
Q3, Q2-3	Poor Status
Q2, Q1-2	Bad Status
Q1	Bad Status

Source: www.epa.ie

The Barrow Suir Nore Estuary is classified as a Transitional Water Body (Water Body Code IE_SE_100_0100) of Moderate status (interim classification) and is within the South Eastern River Basin District (SERBD). The physico-chemical quality elements (ecological status) and the chemical pollutants (chemical status) thresholds applicable for transitional waters, as specified in the *European Communities Environmental Objectives (Surface Waters) Regulations, 2009* (S.I. 272 of 2009) are presented in Appendix 14.1 (Classification Criteria (Transitional Water Bodies)).

14.2.5 Impact Assessment Criteria

The source and type of all impacts is set out in Section 14.6 (Identification of Potential Impacts). The mitigation measures that are defined for any potentially significant impacts are set out in Section 14.7 (Mitigation Measures). Any likely residual impacts are evaluated in terms of magnitude and significance in Section 14.8 (Residual Impacts).

Magnitude

The magnitude of an impact is assessed in consideration of its intensity, and its extent in space and time. The criteria used to assess the magnitude of the developments impacts on surface water and the objectives of the WFD are presented in Table 14.2.

Table 14.2: Criteria for Assessment of Impact Magnitude

Criteria	Impact Magnitude
Impact is of long-term or permanent duration (>5 years);	High

Criteria	Impact Magnitude
Impact on surface water has a clearly noticeable and significant impact on the objectives of the WFD and the SERBD River Basin Management Plan; and The affected area has limited or no potential to recover.	
Impact is of medium-term duration (1-5 years); Impact on surface water has a clearly noticeable and significant impact on the objectives of the WFD and the SERBD River Basin Management Plan; and The affected area has the potential to recover.	Medium
Impact is of temporary (weeks) or short-term (months) duration; Impact on surface water has a clearly noticeable and significant impact on the objectives of the WFD and the SERBD River Basin Management Plan; and The affected area has the potential to recover.	Low

Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the importance / sensitivity of the affected area.

Impact significance is described as being *Not significant,* of *Low* significance, of *Medium* significance, or of *High* significance.

14.3 Baseline Description and Evaluation

14.3.1 Water Body Status

In 2008 the Barrow Suir Nore Estuary (Water Body Code IE_SE_100_0100) was categorised as a Transitional Water Body of overall **Moderate** Status (interim classification) with an overall risk result of **1a At Risk**. The water body passed the Specific Pollutants (Annex VIII of the WFD) criteria but failed in relation to Chemical Status (Annex X). Integrated Pollution Prevention and Control (IPPC) Point Risk Sources and Waste Water Treatment Plant Point Risk Sources were classified as **1a At Risk**. The Barrow River Estuary is classified as a proposed Natural Heritage Area (pNHA). The River Barrow and River Nore are classified as Special Areas of Conservation (SACs).

The overall objective for the Barrow Suir Nore Estuary is to restore it to Good status by 2015.

The estuary was considered to be of Good conservation status by the National Parks and Wildlife Service (NPWS) and at least Good overall protected areas status. The estuary failed in the chemical status category (Priority Hazardous Substances) only, the failure parameters were Brominated Diphenyl Ethers (BDE), Mercury, Benzo/Indeno-pyrenes, Endosulfan and Pentachlorobenzene, (it should be noted that there are no known discharges from the proposed development which would introduce these elements into the receiving environment).

Details of the criteria used by the EPA in determining the interim WFD classification for the Barrow Suir Nore Estuary are re-produced in Table 14.3 hereunder.

Table 14.3: EPA Interim Classification Criteria for the Barrow Suir Nore Estuary

General Conditions	Biological Quality Elements	Specific Pollutants (Annex VIII)	Chemical Status (Annex X)	Ecological Status	Surface Water Status	Conserv-ation Status (NPWS)	Overall Protected Area Status	Rivers Likely Status
High/Good/ Moderate[1]	Good	Pass	Fail[2]	Good	Moderate	Good	At Least Good	Not Specified

Source: Environmental Protection Agency

Notes:

1. High or Good status was achieved for Molybdate Reactive Phosphorous (MRP), Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD). Moderate status was achieved for Dissolved Inorganic Nitrogen (DIN). The European Communities Environmental Objectives (Surface Waters) Regulations does not include a DIN threshold for transitional water bodies. DIN is therefore not applicable for the purposes of WFD classification for the Barrow Suir Nore Estuary.

2. The water body failed both Maximum Allowable and Annual Average Concentrations – Analysis based on National Screening Exercise.

A copy of the report for the estuary is presented in Appendix 14.2 (Full Report for Water Body Barrow Suir Nore Estuary).

14.3.2 Existing Operations

The existing power generation plant comprises three conventional steam generating units (Units 1, 2 and 3) operating on Heavy Fuel Oil (HFO). Units 1 and 2 each have operating capacities of 60 MW. Unit 3 has an operating capacity of 120 MW.

Each Unit operates independently and comprises a boiler, steam turbine / condenser and auxiliary plant. Seawater, used for cooling of the steam turbine condensing plant, is dosed with Sodium Hypochlorite, as required. Boiler treatment chemicals currently in use on-site include aqueous Ammonia, aqueous Hydrazine and Tri-sodium Phosphate.

Units 1 and 2 have been operational since 1967/1968 whilst Units 3 has been in operation since 1972, with an established record of environmental compliance. The existing plant is regulated under IPPC licence Registration Number P0606-02, which will be required to be revised to include the proposed development.

14.3.2.1 Potable Water Consumption

Potable water, for use in the canteen, welfare facilities, water treatment plant (i.e. feedwater for the existing Units) and for general site cleaning is sourced from the Wexford County Council mains supply. Potable water consumption from the mains supply is approximately 177,161m^3/annum or 20m^3/hr, when all three Units are operating.

Approximate potable water consumption rates for the existing plant are presented in Table 14.4.

Table 14.4: Existing Potable Water Demands

Use	Average Demand (m3/hr)
Operation of Existing Units 1, 2 and 3	19.36
Domestic Water (welfare facilities, canteen, general site cleaning)	0.86
Total	**20.22**

14.3.2.2 Effluent Discharges

Typical effluent discharge volumes from the existing three Units amount to 17.36m^3/hr, approximate values for each Unit are provided hereunder:

- Unit 1: 4.48m^3/hr
- Unit 2: 4.48m^3/hr

- Unit 3: 8.40m^3/hr

Table 14.5 below presents the permitted discharges to water as specified in the existing IPPC licence (Registration Number P0606-02).

Table 14.5: Permitted Emissions to Water

Wastewater	Emission Point Reference No.	Max/Day (m3)	Max/Hr (m3)	Emission Limit Values (mg/l unless otherwise specified)
Condenser Cooling Water	SW2	1,204,080	50,170	Temperature 15°C above estuarine water 12.0°C (98%ile of hourly values over a year) Thermal Load 352 MWth (Maximum) 335 MWth (98%ile of hourly values over a year) Chlorine 0.5
Boiler Blowdown (Prior to dilution with surface water)	SW5	40	-	pH 6-10
Boiler Blowdown/Engine Room Drains (Prior to dilution with surface water)	SW6	-	-	pH 6-10 Mineral Oil 20
Engine Room Drains (Prior to dilution with surface water)	SW7	-	-	Mineral Oil 20
Cooling Water Screen Wash Water	SW8	1,970	-	Chlorine 0.5
Water Treatment Neutralisation Tank	SW13	150	-	pH 6-9 Ammonia 34 kg/day Suspended Solids 100

Source: IPPC licence (Registration Number P0606-02)

14.4 Proposed Development

It is proposed to construct a 430 MW natural gas fired Combined Cycle Gas Turbine (CCGT) power plant within the confines of the existing site. Subject to planning permission being granted, it is anticipated that the proposed development will be commissioned in 2012.

Details of the anticipated water consumption requirements and resultant waste water are provided in Sections 14.4.1 to 14.4.5 below, a summary of the flood risk assessment is provided in Section 14.4.6, the flood risk assessment report is presented in Appendix 14.3 (Flood Risk Assessment).

A full description of the development is provided in Chapter 3 (Description of the Development). Figure 14.1: Site Drainage Plan illustrates the existing and proposed drainage systems for the site.

14.4.1 Potable Water

A supply of feedwater is required to generate superheated steam in the Heat Recovery Steam Generator (HRSG). This feedwater initially enters the HRSG at its inlet and is then heated to produce high pressure / temperature superheated steam. The steam is expanded through the steam turbine, where it exits at low pressure and temperature, this low pressure steam is then condensed in the condenser back to feedwater.

The feedwater is then returned to the HRSG where the cycle is repeated. During this process there is a small amount of feedwater lost, due mainly to boiler blowdown and other losses. Under normal operation the total amount of boiler water losses from the steam / feedwater cycle amounts to approximately 6.05m^3/hr.

The make-up water supply, to overcome the above losses, will be produced in a new water treatment plant. The product water from the new water treatment plant is usually defined as demineralised water. The water treatment process will consist of filtration and a resin based treatment system. The potable water required for the water treatment plant will be supplied from the existing 9,500m^3 potable water reservoir which in turn is sourced from Wexford County Council mains supply. The reservoir also holds capacity for fire fighting purposes, approximately 1,140m^3, an additional 500m^3 will be provided from the existing fire water storage tank. The water treatment plant in itself produces waste water which, on average, will amount to 0.5m^3/hr.

Thus the total amount of make-up water required during normal operation i.e. when firing on natural gas will amount to approximately 6.55m^3/hr.

Prior to use, the treated (demineralised) water, produced in the new water treatment plant, will be stored in a 6,000m^3 capacity on-site demineralised water storage tank. The capacity of the tank and the throughput of the water treatment plant have been determined to allow for the provision of 94m^3/hr demineralised water injection to the gas turbine for NO_x emissions control purposes for a continuous period of 120 hours (as required by Commission for Energy Regulation (CER)) whilst firing on distillate fuel oil and for normal HRSG make-up water as described above. Firing on distillate will only occur very rarely for periodic testing or if an interruption in the natural gas supply occurs. Distillate oil firing has, therefore, not been considered for the purpose of analysing the amount of water consumed under normal, as opposed to abnormal, operation.

Water for general use on site (i.e. canteen, welfare facilities etc.) is not expected to exceed the existing average flow of 0.86m^3/hr. Therefore it is anticipated that the total amount of potable water required on site under normal operation will amount to 7.41m^3/hr. This equates to approximately 37% of the current demand of 20.22m^3/hr, once the CCGT plant has been fully commissioned.

Where necessary, supply of water from the mains supply will take place during low demand periods in order to minimise any potential impact on water supply in the area. It is also proposed to actuate the fill valve so it can be remotely isolated at periods of low system pressure.

14.4.2 Process Waste Water Discharges

14.4.2.1 Water Treatment Plant

Process waste water includes waste waters arising from the water treatment plant. Approximately 0.5m^3/hr of waste water, generated by the regeneration process of the resins in the water treatment plant, will be discharged to the proposed process waste water discharge pit. Waste water from the water treatment plant will comprise the salts removed from the potable water formed during the backwash of the resins from the demineralisation process.

14.4.2.2 HRSG

Process waste water arising from the HRSG includes boiler blowdown and waste waters from condensate drains and boiler water sampling. Prior to re-entry to the HRSG the feedwater will be thermally de-aerated and pH controlled by addition of aqueous Ammonia (NH_3), as required. Tri-sodium Phosphate (Na_3PO_4) will also be added to prevent scaling and an oxygen scavenging chemical, dilute Carbohydrazide (CO $(NHNH_2)_2$), will be added, as required, to achieve the water quality required for optimum operation of the boiler. The purpose of this treatment is to prevent corrosion of the HRSG and thus to extend its commercial life.

Boiler blowdown comprises water which has been circulating in the feedwater / steam cycle. In order to remove the build up of salts from the HRSG drums, (which remain in the drum once the water has evaporated off) it is necessary to continually “blow-down” approximately 1% of the total $500m^3/hr$ of circulating water (i.e. 5 m^3/hr). Boiler blow-down will discharge from the boiler to a flash / blowdown vessel and collect in a new process waste water discharge pit

On occasion there may be a requirement to increase the blowdown rate from the HRSG. This is an intermittent operation which will last for a very short period of time, a typical flow rate is in the order of $45.5m^3/hr$, for a period of up to four hours. The new $200m^3$ process waste water discharge pit has been sized to accommodate this intermittent blowdown.

In principle, the volume of blowdown water reduces the longer the plant is operational as less and less “fresh” demineralised water is being added to the system. Consequently the salt build-up in the drums is reduced. However, abnormal plant operations such as shutdowns, start-ups or excessive load cycling result in the addition of “fresh” demineralised water resulting in necessary blowdown. While blowdown water may have a high enough saline content to require removal from the HRSG drums, it should be noted that the saline content is generally much lower than that of the initial potable water supply.

Although not a normal flow rate, on occasion there will be some additional process discharges from the system to account for leaks and for boiler water sampling. A typical flow rate for these waste waters will be $1.05m^3/hr$.

14.4.2.3 Process Waste Water Discharge Pit

All process waste water, including water treatment plant effluent, arising from the new CCGT power plant will be collected in a process waste water discharge pit of $200m^3$ capacity, prior to a controlled discharge to outfall SW13. Refer to Figure 14.1 Site Drainage Plan.

The pit will include pH dosing, monitoring and recirculation units. The pH of the wastewater will be maintained at pH 6-9 by Sulphuric Acid / Sodium Hydroxide dosing, as required, prior to discharge.

The automated system will only discharge if the relevant parameters are within the limits to be specified in the revised IPPC licence. If any of the parameters fail to comply with the set limits the system will automatically switch back to recirculation mode and the waste water will be re-circulated back through the discharge pit. Discharge volumes will be measured via a flowmeter installed on the discharge line. In addition, the discharge pit will be fitted with an automatic sampler which will sample water discharges over a given period as directed by the EPA under the IPPC regime.

The overall average volume of process waste water discharge is estimated to be $6.55m^3/hr$. This equates to approximately 38% of the effluent discharges from the existing plant, which are of a similar physico-chemical make-up.

14.4.3 Cooling Water

A continuous flow of cooling seawater will be required to absorb heat from the steam turbine condenser and, depending upon the final design of the plant, from other heat exchangers associated with the proposed CCGT plant.

Cooling water will be abstracted from the Barrow Estuary, utilising the existing water intake and outfall systems, with some upgrade / refurbishment works in the cooling water pump house, as required. However the overall demand will be significantly reduced from the current maximum demand of 50,170/hr to approximately 20,000m^3/hr, when the CCGT is fully operation i.e. the volume will be reduced by 40%.

Cooling water will be screened through a series of fixed coarse screens and travelling fine screens, in order to remove debris from the cooling water prior to entering the pump chambers.

The screened cooling water will be pumped from the cooling water pumphouse to the steam turbine condenser and to the coolers of the closed cooling water system. The cooling water will then be discharged to the estuary via the existing outfall culvert.

In accordance with existing operations, cooling water will be chlorinated at the cooling water inlet by direct injection of Sodium Hypochlorite solution, as required, in order to control biological fouling of, and damage to, the condensers, principally by mussels which thrive in the conditions of fast flow encountered in warm cooling water systems. It is anticipated that approximately 5 litres per day of Sodium Hypochlorite may be used on occasions. Chlorine concentrations in the cooling water discharge will be maintained at a maximum concentration of 0.5 mg/l Chlorine measured at the cooling water outlet. It should be noted that use of biocides is currently very infrequent and this situation is unlikely to alter once the new CCGT plant has been commissioned.

It is intended to re-use as much of the existing cooling water (CW) system structures as possible (in accordance with Best Available Techniques, BAT). The allowable temperature rise through the cooling water system i.e. the difference between outlet and inlet) will remain unchanged at 12.0°C above estuarine water temperature. However, as the volume of discharge is anticipated to decrease from 50,170m^3/hr to 20,000m^3/hr the maximum thermal load is anticipated to decrease from the existing 352 MWth to 291 MWth.

14.4.4 Foul Water

A new collection system, separate from the surface water system, will be required to connect the proposed CCGT plant to the existing foul collection system and treatment plant. The area of the site containing the Above Ground Installation (AGI) will not generate any foul water.

As the existing foul water treatment system currently occupies the area of land proposed for the CCGT plant a new proprietary secondary treatment system is proposed. The specification of the proposed system will guarantee treatment of the waste water to a treatment standard of 25mg/l Biological Oxygen Demand (BOD), 35mg/l Suspended Solids (SS), 5 mg/l of Ammonia (as N) and 2 mg/l of Total Phosphorous (as P). The proposed system will be subject to maintenance contracts to assure compliance with the above standards. As there will be no net increase in the number of persons employed at the Great Island site over the present manpower levels, it is proposed that the new foul collection system for the CCGT will connect to the existing foul collection system discharging from the site via existing Outfall SW3.

During the construction phase temporary fully contained chemical portaloo toilets will be installed within the designated construction laydown area. It is anticipated that up to 35 portaloos will be required during the peak construction period, with each portaloo servicing approximately 14 construction workers. The contents of the portaloos will be removed from the site to an appropriately authorised facility.

14.4.5 Surface Water Run-off

Surface water runoff will consist mostly of rainwater, but with an allowance for spillages and wash water. As this has the potential to become contaminated with oily substances in some areas, oil interceptors will be included downstream of the proposed collection systems. Bypass oil interceptors will also include silt trap units which will remove any excess silt or grit which may become entrained in the surface water.

The CCGT area will use a new collection system to convey water to the existing drainage network. The surface water will be treated via a Class 1 bypass oil interceptor and silt trap unit, prior to discharge via existing Outfall SW4 and SW12. Surface water runoff from the AGI area, and its access road, will also be conveyed by a new collection system and treated via a silt trap unit and bypass oil interceptor prior to discharge via existing Outfall SW1.

Surface water run-off, process waste water, water treatment plant effluent and treated foul water will be discharged through separate channels prior to discharge to the estuary.

14.4.5.1 Bunds

Tanks containing potentially polluting substances will be bunded. These substances include distillate fuel oil, and Sulphuric Acid and Sodium Hydroxide. Additional chemicals, e.g. Ammonia, Tri-sodium Phosphate and dilute Carbohydrazide used for HRSG feedwater chemical dosing, will be stored in bunded receptacles in a designated area within the Water Treatment Plant.

Certain hardstanding areas (i.e. chemical storage, transformer and tank farm bunds) will require surface water to be pumped, following a visual inspection, into the existing free-flowing channels, thereby mitigating against accidental release of spillages into the drainage network. All surface water runoff will be directed through a hydrocarbon interceptor and silt trap prior to discharge to the estuary.

14.4.5.2 General Site Washings

Cleaning products will be water based of a biodegradable nature, wherever possible, general plant washings will be discharged to the estuary via a hydrocarbon interceptor and silt trap. Compressor cleaning washings, which require the use of hazardous detergents, will be removed from site by an appropriately authorised waste contractor.

14.4.6 Flood Risk

A preliminary flood risk assessment has been undertaken as part of this EIS which concludes that the proposed finished floor level is appropriate for the development site in terms of flood risk. A copy of the report is provided in Appendix 14.3 (Flood Risk Assessment).

14.4.7 Summary of Effluent Discharges

A summary of the proposed discharges from the site are provided in Table 14.6 hereunder.

Table 14.6: Proposed Effluent Discharges

Wastewater	Emission Point Reference No.	Max/Day (m3)	Max/Hr (m3)	Anticipated Max Concentrations (mg/l, unless otherwise specified)
Combined Water Treatment Plant Effluent and Process Water	SW13	1,920	80	25 ^{o}C (max) pH 6-9 BOD 20 Suspended Solids 30 Total Dissolved Solids 5,000 Mineral Oil 20 Ammonia (as N) 5 Total Phosphorous (as P) 5

Wastewater	Emission Point Reference No.	Max/Day (m3)	Max/Hr (m3)	Anticipated Max Concentrations (mg/l, unless otherwise specified)
Condenser Cooling Water	SW2	720,000	25,000	Temperature 12.0°C above estuarine water Thermal Load 291 MWth (Maximum) Chlorine 0.5

14.5 Application of Best Available Techniques

The plant has been designed in accordance with *Reference Document on Best Available Techniques for Large Combustion Plants, (adopted July 2006).*

The inherent efficiency of energy transformation is integral to the operation of a CCGT and, when compared with the existing plant, will result in a reduction of resource consumption and emissions of greenhouse gases, which is considered to meet the requirements of BAT.

The main waste water discharges which will be generated on site are:

- Treated process wastewater
- Cooling Water
- Treated foul water
- Surface Water Run-off

A BAT appraisal for each waste water discharge, and for raw materials usage on site, is provided hereunder.

14.5.1 Potable Water Supply

The potable water entering the site, as supplied by Wexford County Council, will be of drinking water quality and will be treated in a demineralisation plant prior to use. The quality of the potable water, and the nature of the closed loop CCGT system, minimises the volume of water and hence the volume of effluent generated on site. Dry cleaning methods will also be employed, wherever practicable, to reduce water consumption.

As detailed previously, it is anticipated that existing potable water demand will be reduced to 37% of the current maximum demand as a direct result of the replacement of the existing plant with the proposed CCGT.

14.5.2 Process Waste Water

The water used in the HRSG will be demineralised and conditioned with supplementary chemicals i.e. Carbohydrazide, Tri-sodium Phosphate and Ammonia. Dosing of boiler feedwater will be carefully controlled and minimised to reduce the impact of the discharges on receiving waters.

Process wastewater will be mixed and pH corrected, as required. The wastewater will be continuously monitored prior to discharge. If the parameters exceed the limits of the IPPC licence the wastewater will be recirculated back through the process waste water discharge pit. Settled solids will be removed from site by appropriately authorised contractors. Neutralisation and sedimentation are considered to meet the requirements of BAT for process waste water.

In accordance with BAT process waste water drains will run above ground, where practicable, and will be completely segregated from uncontaminated surface water.

14.5.3 Cooling Water

The re-use of the existing cooling water system complies with the principles outlined in the *Integrated Pollution Prevention and Control (IPPC) Reference Document on the application of Best Available Techniques to Industrial Cooling Systems, December 2001* as illustrated in Table 14.7 hereunder:

Table 14.7: Cooling Water System – BAT Assessment

BAT	Proposed Development
Where it involves technological changes, the application may be limited for existing cooling systems. For small cooling towers produced in series, a change in technology is considered to be technically and economically feasible. Technological changes for large systems are generally cost intensive requiring a complex technical and economic assessment involving a large number of factors. Relatively small adaptations to these large systems, changing part of the equipment, may be feasible in some cases. For more extensive changes of technology a detailed consideration and assessment of the environmental effect and the costs may be necessary.	Replacement of the existing cooling water system with a new system would cost in the order of an additional €30M. Detailed technical and economic studies will need to be carried out by the Tenderers for the project to optimise on their tender proposal which will be a balance between capital, cycle efficiency and hence operating cost. These studies will take into consideration unit operational costs especially fuel and will determine the most economic unit cost (€/kWh) to Endesa. It is anticipated however that re-utilising the existing CW system as much as possible for the new CCGT plant will readily achieve the required environmental limits.
Low direct energy consumption by the cooling system is achieved by reducing resistance to water and/or air in the cooling system, by applying low energy equipment. Where the process to be cooled demands variable operation, modulation of air and water flow has been successfully applied and can be considered BAT.	Once through seawater cooling is proposed as this is the most energy efficient cooling system. Sufficient water supply is readily available. Other potential designs include an Air Cooled Condenser (ACC), Wet Type Natural Draught Cooling Towers, Wet Type Forced Draught Cooling Towers and Hybrid Cooling Towers. For the reasons noted above, the project envisages the re-use of the existing CW system structures. The existing CW culverts/circuits are low resistance. It is intended to decrease this resistance further. Endesa are planning to replace three thermal steam turbine generator units (240 MW total capacity) with a 430MW CCGT (having a 120 MW steam turbine generator) thereby reducing the cooling water heat dissipation from the maximum allowable of 335 MWth to approximately 291 MWth. while the velocity, which is a factor of the culvert diameter, can be reduced from the existing 2.5m/s to approximately 2m/s which, in turn, significantly reduces the CW pump electric power requirement.
Recirculation of cooling water, using an open or closed recirculating wet system, is BAT where the availability of water is low or unreliable. In recirculating systems an increase of the number of cycles can be BAT, but demands on cooling water treatment may be a limiting factor. It is BAT to apply drift eliminators to reduce drift to less than 0.01% of the total recirculating flow.	
In an existing installation, optimizing internal and external reuse and reducing the amount and level of heat to be discharged must also precede any change to the potential capacity of applied cooling system. Increasing the efficiency of an existing cooling system by improving systems operation must be evaluated against an increase of efficiency by technological measures through retrofit or technological change. In general and for large existing cooling systems, the improvement of the systems operation is considered to be more cost effective than the application of new or improved technology and can therefore be regarded as BAT.	
Available and applicable options for reuse of heat must have been examined and used to reduce the amount and level of non-recoverable heat, before the dissipation of heat from an industrial process into the environment is considered.	District heating has been considered however its application is not suitable as there are no suitable users in the local area. In addition, the high commercial and energy costs and relatively high ambient air temperatures (mean daily average is 10^{o}C) means that it is generally impractical for situations such as at Great Island.
To achieve a high overall energy efficiency when handling large amounts of low level heat (10-25^{o}C) it is BAT to cool by open once-through systems. In a greenfield situation this may justify selection of a (coastal) site with reliable large amounts of cooling water available and with surface water with sufficient capacity to receive large amounts of discharged cooling water. BAT criteria for low level of	Once through seawater cooling is proposed as this is the most energy efficient cooling system.

BAT	Proposed Development
dissipated heat (<25°C) is to improve overall energy efficiency.	
In the case of rivers and/or estuaries once through can be acceptable if the extension of the heat plume in the surface water leaves passage for fish migration, the cooling water intake is designed aimed at reducing fish entrainment and the heat load does not interfere with other users of receiving surface water.	Screens are incorporated into the CW system.
Prevention and reduction of leakage of process substances into the cooling circuit.	The cooling water system is constructed of concrete, with the mechanical plant constructed of 316L stainless steel, condenser tube are constructed of titanium.
BAT is reducing the need for cooling water conditioning by reducing the occurrence of fouling and corrosion through proper design. In once-through systems, proper design is to avoid stagnant zones and turbulence and to maintain a minimum water velocity (0.8 [m/s] for heat exchangers, 1.5 [m/s] for condensers).	The velocity through the titanium tubes in the condenser will be approximately 1.5 - 1.8m/s. The velocity through the intake and discharge culvert is 2m/s.
For systems where different cooling streams are mixed in the outlet, pulse-alternating chlorination is BAT and can reduce even further free oxidant concentrations in the discharge. In general, discontinuous treatment of once-through systems is sufficient to prevent antifouling. Depending on species and water temperature (above 10-12°C) continuous treatment at low levels may be necessary.	An electrochlorination plant is not considered to be necessary due to limited mussel build-up in the CW system and the high energy and capital costs associated with such plant.
For seawater, BAT-levels of free residual oxidant (FRO) in the discharge, associated with these practices, vary with applied dosage regime (continuous and discontinuous) and dosage concentration level and with the cooling system configuration. They range from ≤ 0.1 [mg/l] to 0.5 [mg/l], with a value of 0.2 [mg/l] as 24h-average.	The proposed dosage rate of 5 litres per day is not considered to be significant. Dosage will be very infrequent.
Preventative maintenance and monitoring measures to prevent leakage e.g. leakage from heat exchangers, storage of chemicals.	Preventative maintenance and monitoring measures are currently, and will continue to be, implemented on site.
The near field is defined in a river as the area in which the mixing of the warm water plume with river water is incomplete. The water temperature in the near field depends upon the mixing of water released by the power plant with the water of the receiving environment. Heating can be reduced in this area by rapidly mixing the effluent with the water of the receiving environment by means of specific devices.	The existing plant has been operating for over 40 years and the new CCGT plant will dissipate considerably less heat to the Barrow Suir Nore Estuary.

14.5.4 Foul water

In accordance with BAT foul water, comprising sewage and domestic type waste water, emanating from the site will be treated in an on-site biological unit prior to discharge.

14.5.5 Surface Water Run-off

Surface water run-off will be discharged from all hardstanding areas via a silt trap and an oil / water interceptor. In general, hardstanding areas of the site will drain by gravity thereby minimising energy consumption. However, water collected in bunded areas (i.e. bulk storage tanks) will be required to be pumped (rather than gravity fed) in order to minimise the potential for contaminated water entering the drainage system. All bulk storage tanks will be fitted with automatic control systems to prevent overfilling.

All chemical conditioning materials required for boiler feedwater (i.e. aqueous Ammonia, Tri-sodium Phosphate and Carbohydrazide) will be stored under cover in UN approved containers. The chemical storage room will incorporate dedicated integral bunds. Spills and leaks will be cleaned by appropriately experienced personnel using absorbent materials. The waste arising will be disposed of off-site by appropriately authorised contractors.

Pipes, bunds and storage facilities will be regularly checked for deterioration, damage and leaks. Integrity testing and the maintenance of all waste water abatement, control and monitoring equipment will be incorporated into the on site maintenance programmes. All equipment will be maintained and calibrated in accordance with manufacturer's specifications.

14.5.6 Raw Material Selection and Use

Where necessary, supply of potable water will take place during low demand periods in order to minimise any potential impact on water supply in the area. It is also proposed to actuate the fill valve so it can be remotely isolated at periods of low system pressure. Feed water will be treated with conditioning chemicals prior to use in the HRSG. HRSG water will be subject to on site testing and monitoring to ensure optimisation.

Carbohydrazide, an oxygen scavenger, has been selected for use when operating the CCGT. Initially continued use of anhydrous Hydrazine was considered but an assessment of the comparative hazardous characteristics determined that Carbohydrazide was a more sustainable option.

The conditioning chemicals selected provide proven optimisation of the HRSG; their use will be optimised through controlled dosing. Cleaning products will be of a water based biodegradable nature, wherever possible. A hazardous detergent will however be required for compressor cleaning. Compressor cleaning waste will be produced on each cleaning occurrence to periodically remove dirt and grease from the turbine blades. It is anticipated that compressor cleaning will take place once per annum. Hazardous compressor cleaning washings will be removed from site by an appropriately authorised waste contractor.

14.6 Identification of Potential Impacts

14.6.1 Construction Phase

Potential construction phase impacts arising from this development are typical of those associated with any civil engineering activity and mainly relate to contamination of water bodies. The potential construction phase impacts of the proposed development on the estuary include:

- Escape of soil and sediment as a result of on-site construction activities. Potential sources include erosion of exposed ground, run-off from stockpiles of spoil and wheel-washing activities
- Escape of soil and sediment during trench excavations of drainage channels
- Release of potentially polluting substances, such as oils, paints, solvents and sanitary waste
- Discharge of cement or uncured concrete during construction
- Encountering contaminated land on site resulting in releases of potentially polluting substances

The risks to the Barrow Suir Nore Estuary, without any mitigation measures being implemented, are considered to be of medium significance in relation to the objectives of the WFD

14.6.2 Operational Phase

The overall operational phase impact of the proposed development on the Barrow Suir Nore Estuary, compared with the existing situation, is considered to be of low significance for the reasons outlined below.

According to the interim 2008 WFD classification the Barrow Suir Nore Estuary is classified as being of **Moderate** status. The WFD categorisation (and the associated Draft River Basin Management Plan for the SERBD) incorporates the discharges from the existing power plant which has been operational for over 40 years, with an established record of compliance. As detailed in Table 14.3, EPA Interim Classification Criteria for the Barrow Nore Suir Estuary, the NPWS considers the estuary to be of good conservation status. The ecological status was considered to be Good, with all relevant general conditions classified as being of either High or Good status.

The interim WFD categorisation was defaulted to Moderate status due to failures in the chemical status category only, specifically BDE, Mercury, Benzo/Indeno-pyrenes, Endosulfan and Pentachlorobenzene. There are no known discharges from the proposed development which would introduce these elements into the receiving environment and it is not considered that the proposed discharges will in anyway cause deterioration in categorisation status for the estuary.

The volumes of discharges proposed during the operational phase, which are of a similar physico-chemical composition to discharges from the existing plant, will be significantly reduced as presented in Table 14.8 below.

Table 14.8: Phased Reduction in Effluent Discharges

Waste Water	Existing 3 Units (m3/hr)	Proposed CCGT (m3/hr)
Boiler Blowdown	17.36	6.55
Condenser Cooling Water	50,170	25,000

Reported analytical data for many Transitional water bodies in Ireland, including the Barrow Suir Nore Estuary, is limited due to the non-implementation of a dedicated monitoring programme for Specific Relevant Pollutants. Data, for the purposes of WFD classification, has therefore been taken from the National Screening Exercise and the Marine Institute's shellfish waters monitoring programme and other related programmes, as appropriate. The level of confidence which can be assigned to these datasets is low to moderate. The reasons for which are outlined in EPA's explanatory note *Interim Classification of Irish Coastal and Transitional Waters for the Purposes of the EU Water Framework Directive* (June 2009) which are reproduced hereunder:

- *The data analysed were collected for the shellfish waters directive and therefore do not adhere to the sampling requirements of the WFD (Sampling points representative of 'status' within a water body, surveillance monitoring and frequency (i.e., considerably less than 12 times per year).*

- *Issues with respect to exceedence of lead (mostly EC MAC-EQS), copper and zinc (mostly SI 12 2001 AA-EQS) standards, which may in part reflect the natural variability of metals in seawater and to some extent uncertainties associated with their sampling measurement as seawater is a difficult matrix for metal analysis.*

- *Further investigation is required to determine whether such exceedence reflects natural variability, artefacts, or anthropogenic inputs within the catchment.*

- *Data on contaminants in shellfish flesh were also available for many of these areas and these provide a good picture of water quality with respect to some metals and organochlorine contaminants, as shellfish act as time integrated samplers for these substances.*

- *For some substances there were issues with Limit of Quantification being higher than the EQS.*

It should also be noted that many of the pollutant and chemical limit values specified in the *European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. 272 of 2009)* are based on mean annual values. Due to the limited datasets available it is possible that the classification of receiving waters will improve, without any mitigation measures being undertaken, once a body of analytical data becomes available.

All practicable steps will be taken to mitigate the adverse impact of the proposed discharges on the receiving water body i.e. the waste water will be treated to a high standard prior to discharge in accordance with BAT.

The replacement of a Heavy Fuel Oil firing power plant with a natural gas firing CCGT power plant is in accordance with Government policy to replace old and inefficient plant and is of significant overall environmental benefit. Irrespective of whether the proposed discharges take place the SERBD River Basin Management Plan will implement measures which will restore the water body from Moderate to Good status and it is not considered that the proposed development in any way contradicts the measures provided therein.

14.7 Mitigation Measures

Marine ecology and soils, geology and groundwater are all closely interlinked with surface water, such that the mitigation measures provided in this EIS in Chapter 12 (Flora and Fauna) and Chapter 13 (Soils, Geology and Groundwater) will help ensure that surface waters are protected. This section therefore focuses on the mitigation measures that are to be implemented specifically for the protection of surface water.

14.7.1 Construction Phase

An experienced and competent Contractor will be employed by Endesa to manage on-site construction activities. The Contractor will be required to develop a Construction and Environmental Management Plan which will include a Water Management Plan incorporating a comprehensive and integrated plan for erosion and sediment control. The plan will be reviewed regularly and modified as necessary. Regular inspections will take place to ensure measures are effective.

The following conditions will be included:

- Unnecessary clearing and grading will be avoided.
- Clearing adjacent to the estuary will be minimised. Silt control measures will be installed along the perimeter of trench excavations, where considered necessary.
- Construction activities will be phased to minimise soil exposure. Large areas of grading will be avoided in order to minimise erosion potential.
- All run off from areas of exposed soil will be diverted to a sediment trap on site during the construction phase. Water from the sediment trap will be discharged to the estuary via the drainage channel network, where practicable.
- To prevent chemical pollution, all liquid fuels and chemicals stored on site during the construction phase will be contained in suitable containers within bunds in a designated area away from the main construction site activities and at least 15 metres distance from watercourses or areas at risk of flooding and site ponding.
- On-site refuelling will be avoided where possible. Where this is unavoidable refuelling will only be carried out in designated bunded areas.
- Equipment will be regularly inspected and maintained and leaks repaired as soon as possible. If the equipment cannot be repaired it will be removed from the site. Accidental spillages will be contained and cleaned up immediately. Spill-kits will be provided on-site during the construction phase, as required.

- Contained chemical portaloo toilets will be used on site during the construction phase. All sewage will be removed from the site to an authorised treatment plant.

In addition, an intrusive contaminated land assessment will be undertaken prior to any construction works being undertaken. Any contaminated land encountered, which is considered to be at risk of mobilisation during the construction phase, will be removed to an appropriately authorised facility prior to construction activities commencing with prior agreement from EPA.

14.7.2 Operational Phase

Operational Phase mitigation measures are outlined hereunder.

- Appropriate limits for waste water discharges will be determined by the EPA under the IPPC licence which will be revised with due regard to the objectives of the WFD. The conditions of the existing IPPC licence will be complied with throughout the construction phase of the proposed development and any alterations provided in the revised IPPC licence will be complied with in full.

- A water quality monitoring programme will be developed for process waste water and surface water run-off. The parameters, thresholds and frequency required will be set by the EPA under the IPPC regime.

- All bunds and chemical containers will comply with the appropriate standards (e.g. BS:8007 *Code of practice for design of concrete structures for retaining aqueous liquids* (1987), Enterprise Ireland's *Best Practice Guide BPGCS005 Oil Storage Guidelines* etc.) and will be leak tested prior to commencement of operations and every five years thereafter, or as otherwise specified by the EPA.

- A Water Conservation Plan will be implemented for the proposed power plant during the operational phase.

14.8 Residual Impacts

14.8.1 Construction Phase

The implementation of mitigation measures as detailed above during the construction phase will ensure that the impact of the proposed development on water resources will not be significant.

14.8.2 Operational Phase

The existing plant has been in operation since 1967 / 1968 and is a licensed activity under the IPPC regime, as regulated by the EPA and the proposed development is consistent with the existing activities on the site. The proposed discharges are of a similar physico-chemical nature to existing waste water however, the volumes will be significantly reduced. As detailed in Chapter 12 (Flora and Fauna), due to combinations of the proposed ecological mitigation measures, the magnitude of impacts and the positive changes from the current situation, the proposed activities will not have an adverse effect on the integrity of the sites or the qualifying features of the conservation objectives of the Natura 2000 sites. As a consequence the overall residual impact of the proposed development on surface waters during the operational phase is considered to be not significant, when compared with the existing situation.

14.9 Summary Conclusion

A desk-based assessment of the surface water quality and hydrology of the receiving environment in the vicinity of the proposed development, the predicted and potential impacts of the proposed development and the mitigation measures needed, if any, to address any significant impacts with respect to water consumption, process waste water, cooling water, foul water, surface water and flood risk was undertaken.

As part of the proposed development an on-site water treatment plant will be required, where water for use in the HRSG will be demineralised to achieve a high purity. Wastewater from the demineralisation plant will comprise water containing the salts removed from the raw water or neutralised backwash of the resins from the demineralisation process. The pH of the wastewater will be maintained by acid or alkali addition, as required. The raw feedwater to the water treatment plant, which is of drinking water quality, will be supplied from the existing on-site reservoir which in turn is supplied from the Wexford County Council supply.

The feedwater used in the HRSG will be thermally de-aerated to remove oxygen and chemically treated to prevent corrosion of the tubes and components of the water / steam cycle.

Four distinct waste water streams will be discharged from the site; process waste water, surface water run-off, treated foul water (from sanitary facilities, wash rooms, mess rooms etc.) and cooling water.

The process waste water to be discharged from the site comprises water from the demineralisation plant and boiler blow down comprising water which has been circulating in the water / steam cycle. The process waste water to be discharged contains levels of salts that are considered too high for the HRSG however, the levels are generally lower than that of the original “raw” feedwater. The process waste water will be collected in a process water discharge pit which will include pH dosing, monitoring and recirculation units. The pH of the wastewater will be maintained at pH 6-9 by Sulphuric Acid / Sodium Hydroxide dosing, as required, prior to discharge. The automated system will only discharge if the relevant parameters are within the limits to be specified in the revised IPPC licence. If any of the parameters fail to comply with the set limits the system will automatically switch back to recirculation mode and the waste water will be re-circulated back through the discharge pit. Discharge volumes will be measured via a flowmeter installed on the discharge line. In addition, the discharge pit will be fitted with an automatic sampler which will sample water discharges over a given period as directed by the EPA under the IPPC regime.

All surface water run-off collected on site will be treated via a silt trap unit and bypass oil interceptor prior to discharge. Foul waste water will be treated in a new proprietary secondary treatment system to specified limits prior to discharge. A continuous flow of cooling water will also be required to condense steam from the HRSG. Cooling water will be abstracted from, and discharged to, the Barrow Estuary, in accordance with existing operations, utilising the existing water intake and outfall systems.

The effluent discharges from the site will be of a similar composition to discharges from the existing plant; however, the volumes will be significantly reduced. As a consequence it is considered that the proposed development will not have a significant adverse impact on the receiving environment, when compared with the existing situation.

Potential construction phase impacts arising from this development are typical of those associated with any civil engineering activity and mainly relate to contamination of water bodies. The implementation of mitigation measures during the construction phase will ensure that the impact of the proposed development on water resources will not be significant.

15. Air Quality and Climate

15.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS presents a detailed air quality assessment predicting the potential effects of emissions generated during the construction and operation of the proposed development.

This chapter presents the results of the air quality assessment and includes:

- Assessment of the impact on the climate of the surrounding area (Refer to Section 15.2)
- Details of the guidance used (Refer to Section 15.3)
- Assessment of existing air quality conditions in the study area (Refer to Section 15.4)
- Identification of atmospheric emissions and key pollutants (Refer to Section 15.5)
- Identification of assessment criteria (Refer to Section 15.6.1 Construction Phase and Section 15.7.1 Operational Phase)
- Qualitative assessment of potential air quality impacts associated with the construction phase (Refer to Section 15.6.2)
- Quantification of operational phase emission rates and evaluation with reference to relevant emission limits (Refer to Section 15.7)
- Stack height determination (Refer to Appendix 15.3)
- Dispersion modelling of key pollutant releases from the proposed plant (Refer to Section 15.7)
- Evaluation of the dispersion modelling results with reference to relevant air quality criteria (Refer to Section 15.7)
- Identification of mitigation measures where necessary (Refer to Section 15.8)

The proposed plant will be designed to minimise atmospheric emissions using Best Available Techniques (BAT) and to ensure minimal air quality effects from residual emissions by release through a stack of an appropriate height. The resulting potential effects to sensitive receptors have been assessed utilising dispersion modelling techniques in accordance with best practice guidance.

15.2 Climate

15.2.1 Overview

This section identifies, describes and assesses the impact of the proposed plant on the climate of the surrounding area. The information obtained is based on a desk-top study of both macro and micro climatic features.

15.2.2 Methodology

The methodology employed comprised a desk study assessment of relevant available data from Met Éireann (meteorological office in Ireland) examining long-term weather patterns across a large geographical area (macro climate) and conditions at the local (micro-climate) level.

Data on climatic conditions, including observations on temperature, relative humidity, sunshine, rain, wind and general weather conditions are presented in Appendix 15.1 (Rosslare Meteorological Data).

A comparison of greenhouse gases among different technologies is presented in this section. The comparison covers CCGT power plants and conventional combustion facilities firing coal and heavy fuel oil to demonstrate the benefits from CCGT plants.

15.2.3 Existing Environment

15.2.3.1 Macro Climate

Macro climate is the climate of a large geographical area or country. Ireland's climate is influenced by the warm waters of the Gulf Stream and is in the path of the prevailing south-westerly winds coming from the Atlantic Ocean. Accordingly, Ireland does not suffer from temperature extremes experienced by many other countries at similar latitude. The average annual temperature is approximately 9°C.

Annual mean wind speeds vary between approximately four metres per second in the east midlands and seven metres per second in the northwest. Average rainfall varies between 800 and 2,800 millimetres with highest rainfall in the northwest, west and southwest of the country due to the dominating south-westerly winds from the Atlantic. The number of days with more than one millimetre of rainfall varies between 150 and 200 days per annum.

Ireland normally receives between 1,400 and 1,700 hours of sunshine each year, with sunshine duration being highest in the southeast of the country. Ireland's geographical position off the northwest of Europe close to the path of Atlantic low pressure systems tends to maintain the country in humid, cloudy airflows for much of the time.

15.2.3.2 Micro Climate

Wexford is bounded to the south by the Atlantic Ocean and to the east by the Irish Sea, to the west by County Waterford and the Barrow Estuary, and to the North West by County Kilkenny. The Blackstairs Mountains form part of the boundary to the north, as do the southern edges of the Wicklow Mountains.

The landscape of the county is diverse with largely low-lying fertile land as the characteristic landscape with complex agricultural patterns. Evergreen tree species are also extensively cultivated. The highest point in the county is Mount Leinster in the Blackstairs Mountains in the north-west on the boundary with County Carlow. The main geographical features of the county include the hilly valley of the River Barrow on the West, and the River Slaney through the centre.

Neutral and stable atmospheric stabilities are the most common type of stability category found in the region around the proposed site. This meteorological phenomena, typical Irish climate, occurs mainly when the weather is cloudy raining or windy. A combination of the aforementioned atmospheric stability categories restricts dispersion of pollutants from stacks close to the ground and air pollution levels are likely to increase under these meteorological conditions. Dispersion of pollutants is addressed in this assessment.

Wind roses summarise the occurrence of winds at a specific location, showing their strength, direction and frequency. Wind at a particular location can be influenced by numerous factors including obstruction by buildings or trees, the nature of the terrain and deflection by nearby mountains or hills. Wind roses at Rosslare Meteorological Station indicate that the prevailing wind direction is south westerly. Mean monthly wind strengths recorded range from 4.9 to 6.6 metres per second with winds between 6.2 and 6.6 metres per second being most prevalent.

15.2.4 Predicted Impacts

15.2.4.1 Construction and Operational Impacts

Due to the scale of the proposed development, during both the construction and operational phases of the development there are no predicted impacts on the macro and micro climate.

15.2.4.2 Greenhouse Gases

Under the Kyoto agreement, Ireland has committed to limiting the increase of greenhouse gases to 13% above its 1990 levels, a limit that has to be reached during the period 2008-2012. The EU Council has committed to achieving a 20% reduction in emissions of 1990 levels by 2020. Under the Greenhouse Gas Emissions Trading Directive 2003/87/EC listed operators are allocated greenhouse gas emissions allowances at the beginning of each year. If the operator does not meet their target they can buy or sell allowances within the EU. Combustion Installations such as the proposed development, with a rated thermal input exceeding 20 MW are included in this scheme. New entrants to the market must apply to the designated authority for an allowance of CO_2 emissions under the Directive.

Increased atmospheric levels of greenhouse gases such as Carbon Dioxide (CO_2) enhance the natural greenhouse effect and are widely recognised as the leading cause of climate change. CO_2 arises from a range of sources including the combustion of fossil fuels. The emissions from a combustion source are dependent both on the rate at which the fuel is consumed (dependent on the size and efficiency of the plant) and the inherent carbon content of the fuel.

The emissions intensity of the proposed power plant (assuming natural gas as the primary fuel) has been estimated and compared to other types of combustion plant. Based upon normal operating conditions, the emissions intensity of the plant are:

- CCGT at Great Island: 0.3429 tCO_2 / MW;
- Coal fired power station: 0.8505 tCO_2 / MW;
- Modern coal fired power station: 0.7560 tCO_2 / MW; and
- Oil fired power station: 0.6957 tCO_2 / MW.

Modern gas combustion plant in CCGT operation is widely recognised as being the most carbon efficient combustion technology and has been widely deployed throughout Europe.

The assumptions presented above clearly demonstrate that the proposed CCGT plant at Great Island presents a low carbon solution compared with alternative fossil fuel generation. Additional advantages associated with the proposed CCGT are that it is acknowledged to be a reliable, commercially proven technology that provides firm capacity.

15.2.5 Mitigation Measures

It is predicted that the proposed development will have no impacts on regional or local climate. Therefore, mitigation measures are considered unnecessary.

15.3 Air Quality

15.3.1 Guidance Used

15.3.1.1 Overview

The operation of the proposed development will be governed by various European Union (EU) air quality directives and Irish air quality regulations. These are detailed in the sub-sections below. Other pertinent environmental legislation includes the EU Large Combustion Plant Directive (2001/80/EC), and the Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC). Compliance with the Large Combustion Plant Directive and the IPPC Directive will be addressed through operational permitting with the Environmental Protection Agency (EPA) and are therefore not discussed further in this assessment.

15.3.1.2 European Union Legislation

EU Framework Directive 96/62/EEC on ambient air quality assessment and management came into force in November 1996 and had to be implemented by Member States by May 1998. This Directive aimed to protect human health and the environment by avoiding, reducing or preventing concentrations of air pollutants. As a Framework Directive, it required the European Commission to propose 'Daughter' Directives which set air quality limit and target values for seven pollutants, alert thresholds and guidance on monitoring, siting and measurement for individual pollutants. The four Daughter Directives are as follows:

- Council Directive 1999/30/EC (the first Daughter Directive) relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air

- Directive 2000/69/EC (the second Daughter Directive) relating to limit values for benzene and carbon monoxide in ambient air

- Directive 2002/3/EC (the third Daughter Directive) relating to ozone in ambient air

- Directive 2004/107/EC (the fourth Daughter Directive) relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008. This latest Directive merges the first three existing Daughter Directives and one Council Decision into a single Directive on air quality (it is anticipated that the fourth Daughter Directive will be brought within the new Directive at a later date). It also sets new standards and target dates for reducing concentrations of fine particles. Member States have two years to transpose the new Directive and until then the existing national legislation applies.

15.3.1.3 Irish Legislation

The Irish Air Quality Standards Regulations, 2002 (S.I. No. 271 of 2002) implement the requirements of the EU Framework Directive and relevant Daughter Directives.

Table 15.1 presents the air quality standards and target values for the pollutants relevant to this assessment as prescribed by the aforementioned EU and Irish legislation, hereafter referred to as 'air quality standards (AQS).

Table 15.1: Air Quality Standard and Target Values

Pollutant	Averaging Period	Standard /Target values	Not to be exceeded more than	Target Date
Oxides of Nitrogen (NO_X)	annual(a)	30	-	-
Nitrogen Dioxide (NO_2)	1 hour	200	> 18 times pcy(b)	01.01.10
	annual	40	-	01.01.10
Sulphur Dioxide (SO_2)	1 hour	350	> 24 times pcy(b)	-
	24 hour	125	> 3 times pcy(b)	-
	annual and winter(a)	20	-	-
Particulate Matter (PM_{10})	24 hour	50	>35 times pcy(b)	31-12-04
	annual	40	-	
Fine Particulate Matter ($PM_{2.5}$)	annual	25	-	31-12-15

Source: Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. Irish Air Quality Standard and Regulations, 2002 (S.I No.271 of 2002)
Units: µg/m^3

Notes: a) For the protection of vegetation and ecosystems. For SO_2 winter is the period between 1 Nov and 31 Mar
b) Per calendar year (pcy)
c) Target value.

15.3.2 Study Area

The Great Island area is mainly rural-agricultural. There are no significant atmospheric emission sources near the proposed development. The main licensed industrial facilities with potential atmospheric emission sources in these areas are approximately seven kilometres to the West of the proposed site.

The surrounding area is predominantly characterised by agricultural lands. The River Suir estuary flows to the south of the site. The River Barrow flows along the western boundary in a southerly direction into Waterford Harbour.

15.3.3 Sources of Information

Irish and European legislation and relevant guidelines are presented in this chapter. Source of information includes the Irish Statue Book website (http://www.irishstatutebook.ie) and the European Law website (http://eur-lex.europa.eu). Other air quality guidelines presented in this chapter includes UK Environment Agency and private organisations such as Environmental Protection UK and the Buildings Research Establishment. Information on air quality in Ireland is available from the national network monitoring sites and other published sources. For the purposes of this assessment, air quality monitoring data have been obtained from the EPA website meteorological data from the Irish meteorological office.

15.4 Air Quality – Baseline

15.4.1 Introduction

For regulatory purposes under the Framework Directive, each EU member state is divided into "Zones" and "Agglomerations". For Ireland, four zones are defined in the Air Quality Regulations (2002). The main areas defined in each zone are:

- Zone A: Dublin Conurbation
- Zone B: Cork Conurbation

- Zone C: Other cities and large towns comprising Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar and Balbriggan.

- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The proposed development at Great Island is located in Zone D as confirmed by the EPA in an email correspondence. Therefore, monitoring data has been sought from the EPA which is representative of rural areas in Ireland.

15.4.2 Monitoring Data

At the moment, there is no available air quality monitoring station representing air quality in Zone D in close proximity of the proposed site. Therefore, an average of all the air quality monitoring stations within Zone D has been used to provide background pollutant concentrations for the purposes of dispersion modelling. Monitoring data from other stations located in Zone C were not considered in this assessment as they are representative of urban areas and therefore concentrations are typically elevated due to higher contributions from road traffic emissions.

Table 15.2 presents the background concentrations of pollutants relevant to site activities measured at the Zone D monitoring stations for the most recent reports available (2005, to 2007). In addition, Table 15.2 presents the $PM_{2.5}$ concentrations at Old Station Road (Zone B) as $PM_{2.5}$ data is not currently measured in Zone D.

Table 15.2: Background Pollutant Concentrations (µg/m^3)

Monitoring Station	Pollutant	Averaging Period	2005	2006	2007	Average
Zone D(a)	NO_2	Annual Mean	7.7	5.0	8.8	7
	NO_X	Annual Mean	13.3	8.3	14.4	12
	SO_2	Annual Mean	3.3	2.0	3.4	3
	PM_{10}	Annual Mean	18.0	17.6	18.6	18
Old Station Road (Cork)	$PM_{2.5}$	Annual Mean	11.0	9.0	8.0	9

Source: Environment Protection Agency

(a) Average concentration from air quality stations located in Zone D as reported in EPA air quality reports.

15.4.3 Assumed Background Concentrations

For the purposes of describing the existing ambient air quality, a conservative assumption of the 90th percentile of the short-term observations (assumed to be hourly averaging periods) has been used as the background level. This is approximately equivalent to twice the annual mean.

Twice the value from 2005 to 2007 annual mean concentrations presented in Table 15.3 has been added to the short-term (hour and 24 hours) modelled value. For long-term averaging periods (annual), the 2005 to 2007 average annual mean concentrations measured for each pollutant has been added to the long-term modelled value Table 15.3 summarises the assumed ambient concentrations in the area of Great Island.

Table 15.3: Summary of Assumed Background Concentrations (µg/m^3)

Pollutant	Short-term	Long-term	Data Source (EPA air quality monitoring station)
Nitrogen Dioxide (NO_2)	14	7	Zone D[a]
Oxides of Nitrogen (NO_X)	-	12	
Sulphur Dioxide (SO_2)	6	3	
Particulate Matter (PM_{10})	36	18	
Particulate Matter ($PM_{2.5}$)	-	9	Old Station Road (Cork)

a. Average concentration from air quality stations located I Zone D as reported in EPA air quality reports.

15.4.4 Local Atmospheric Emission Sources and Cumulative Effects

The Great Island area is mainly rural-agricultural. There are no significant atmospheric emission sources near the proposed development. The nearest industrial facility is located three kilometres to the west. The main licensed industrial facilities with potential atmospheric emission sources in these areas are approximately seven kilometres to the west of the proposed site. Due to the distance of these facilities, and the fact that emissions from them are already accounted for within the assumed background concentrations of the study area, they do not require further explicit consideration within the dispersion model.

15.5 Sources of Atmospheric Emissions

15.5.1 Combined Cycle Gas Turbines

The proposed development will be designed to operate on natural gas as the primary fuel with distillate fuel oil used as back-up. The distillate fuel oil will be limited to 0.1% sulphur content as per the requirements of EU Directive 1999/32/EC.

The new power plant will use the latest technology gas turbine units to achieve an efficient and high availability plant. It is envisaged that firing on back-up fuel will occur for less than 2% (seven days per year) of the total firing time, predominantly to test that systems are functioning correctly.

Exhaust gases will be emitted to atmosphere through a single flue stack with a height of 60 metres. Refer to Section 15.7.1 and Appendix 15.2 (Stack Height Determination).

15.5.1.1 Key Pollutants

Overview

Further details of the relevant pollutants are provided below.

Oxides of Nitrogen

Combustion of fossil fuels generally produces many forms of nitrogen oxides, the principal ones being nitrogen monoxide (NO) and nitrogen dioxide (NO_2), commonly referred to as NO_X. The proportion varies depending on the combustion technology and the fuel being burnt. In the case of a gas turbine unit, approximately 90 - 95% of the NO_X is present as NO, with most of the remainder being NO_2. When NO enters the atmosphere, it is gradually oxidised to NO_2 by reaction with ozone and other chemicals in the air.

NO is a colourless and tasteless gas. It is readily converted to NO_2, a more harmful form of NO_X by chemical reaction with ozone present in the atmosphere. NO_2 is a yellowish-orange to reddish-brown gas with a pungent, irritating odour and a strong oxidant.

The production of NO_X during combustion depends on several factors, with the principal ones being: nitrogen in the fuel;

- Temperature of combustion;
- Geometry of the combustion chamber; and
- Ratio of fuel to combustion air.

All NO_X produced from the combustion of fossil fuels originates from nitrogen in the fuel or from nitrogen in the air that is used for combustion. NO_X from the fuel is referred to as 'fuel NO_X'and NO_X from the air is generally referred to as 'thermal NO_X'. The proportion of fuel NO_X to thermal NO_X and other emissions depends on the temperature of combustion. With an increase in combustion temperature, there is an increase in thermal NO_X emissions, and hence the overall NO_X emissions. The formation of thermal NO_X is strongly dependent on the maximum flame temperature and the period that the gases remain at this temperature.

Sulphur Dioxide

Sulphur Dioxide (SO_2) is a colourless, non-flammable gas with a penetrating odour that irritates the eyes and air passages. It reacts on the surface of a variety of airborne solid particles, is soluble in water and can be oxidised within airborne water droplets. The most common sources of SO_2 include fossil fuel combustion, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of waste and production of elemental sulphur. Coal burning is the single largest man-made source of sulphur dioxide accounting for about 50% of annual global emissions, with oil burning accounting for a further 25-30%. The most common natural source of sulphur dioxide is volcanoes.

Particulates

For the purposes of air quality assessments, particulate matter is normally split into two definitions on the basis of the particle diameter; 'dust' and 'respirable' particulates. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns. Respirable particulates are defined as those which are capable of penetrating to the gas-exchange region of the lungs. For the purpose of environmental assessment, many air quality standards assign this type of particulate to two further classifications; PM_{10} (particles with an aerodynamic diameter of up to 10 microns) and $PM_{2.5}$ (particles with an aerodynamic diameter of up to 2.5 microns).

The primary air quality issue associated with construction and decommissioning phase dust emissions is loss of amenity and / or nuisance caused by, for example, soiling of buildings, vegetation and washing and reduced visibility. Both airborne dust and deposited dust are therefore considered.

15.6 Assessment of Construction Phase

15.6.1 Methodology

Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns. Emissions of construction dust are predominantly associated with the movement and handling of minerals and therefore primarily composed of the larger fractions of this range which do not penetrate far into the respiratory system. The primary air quality issue associated with construction phase dust emissions is therefore loss of amenity and / or nuisance caused by, for example, soiling of buildings, vegetation and laundry and reduced visibility. Nevertheless, control measures at the source of the emission would ensure finer particulates would also be controlled. There is no formally recognised methodology for determining these effects and no statutory environmental quality standards to compare levels of deposited dust or concentrations in air.

Dust deposition is expressed in terms of mass per unit area per unit time, e.g. mg/m^2/day. Guidance from UK '*Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Annex 1: Dust*', (2005), states that most non-toxic dusts will begin to be perceived as a nuisance when deposition reaches 200 mg/m^2/day. This figure is based on an annual deposition rate and represents the threshold for significant nuisance. A range of criteria from 133 to 350 mg/m^2/day is found in other parts of the world.

The usefulness of numerical criteria to determine effects from construction dust is limited as the perception of loss of amenity or nuisance is affected by a wide range of factors such as character of the locality and sensitivity of receptors. Because of this, assessment methodologies that are based on a qualitative approach are advocated in a range of guidance including that produced by the Buildings Research Establishment (BRE) *Control of Dust from Construction and Demolition Activities, 2003*. Therefore, a qualitative approach has been adopted for this assessment based on key issues identified in the guidance from BRE.

The first stage of the assessment has involved the identification of construction activities which have the potential to cause dust emissions and the degree of that potential.

In the second stage of the assessment, all sensitive receptors with the potential to be significantly affected by construction dust emissions have been identified. The distances from source that construction dust effects are felt will depend on the extent and nature of built in mitigation measures, prevailing wind conditions, and the presence of natural screening by, for example, vegetation or existing physical screening such as boundary walls on a site. However, research indicates that effects from construction activities that generate dust are generally limited to within 150 - 200 metres of the construction site boundary. Therefore, all receptors within 200 metres of the construction site boundary have been identified and their sensitivity to effects determined in accordance with Table 15.4.

Table 15.4: Receptor Sensitivity

High	Medium	Low
Hospitals and clinics	Schools	Farms
Retirement Homes	Residential areas	Light and heavy industry
Hit-Technology industries	Food retailers	Outdoor storage
Painting and furnishing	Glasshouse and nurseries	Designated Site
Food processing	Horticultural land	
	Offices	

The final stage of the assessment has been to identify other local factors which may affect dust emissions such as meteorological conditions and natural screening.

On the basis of the above, elements of the construction phase have been afforded a risk descriptor of high, medium or low in relation to its potential for causing significant dust effects and receptor sensitivity as presented in Table 15.4. This is then used to describe the overall risk of construction dust effects, as presented in Table 15.5. Mitigation measures have then been provided with reference to *The control of dust and emissions from construction and demolition-Best Practice Guidance* London Authority (2006), which are considered to be robust and appropriate for applications in Ireland.

Table 15.5: Construction Phase Significance Criteria – Risk of Dust Effects

Dust Emission Potential	Receptor Sensitivity		
	Low	Medium	High
Low	None	Minor	Minor
Medium	Minor	Moderate	Moderate
High	Minor	Moderate	Substantial

Construction of the proposed development will require associated construction traffic comprising contractors' vehicles, Heavy Goods Vehicles (HGVs) and other diesel-powered vehicles. This will result in emissions of NO_x, fine particles and other combustion related pollutants. These pollutants are covered by air quality standards as discussed in Section 15.3.1.3.

Construction traffic flows on local roads are expected to be low and last for approximately 30 months. Existing background pollutant concentrations are very low (refer Section 15.3.1) and therefore emissions of combustion related pollutants on the local road network during the construction phase are expected to be negligible and of less significance than operational emissions from the proposed plant. Construction traffic emissions have therefore not been assessed further.

Construction work requires the use of a range of site plant, such as excavators, piling equipment and cranes as well as on-site generators and hand tools. Each of these plant has an energy demand and therefore leads to an emission either directly (i.e. from the exhaust gas of the plant) or indirectly (for example, emissions associated with electricity production).

Given the local and temporary nature of site plant, effects of emissions on local air quality are considered to be negligible. Construction plant emissions have therefore not been assessed further. Nonetheless, mitigations to reduce the effect of site plant on local air quality are discussed in Section 15.8 (Mitigation Measures).

15.6.2 Identification of Construction Phase Impacts

15.6.2.1 Overview

Subject to planning permission being granted it is anticipated that construction will commence in end 2010. Civil, mechanical, electrical works and commissioning of plant are expected to last for approximately 30 months. The anticipated phasing of works is as follows:

- Civil – 12 months
- Mechanical and Electrical – 15 months
- Testing and Commissioning – 3 months

Temporary facilities will be provided for the construction workers employed located within the proposed construction laydown area. These facilities will include portacabins, and welfare facilities.

Potential demolition of the existing units will be applied for under separate planning permission. Decommissioning of the existing units will be undertaken in agreement with the Environmental Protection Agency (EPA) and in accordance with the conditions of the existing IPPC Licence and Residuals Management Plan.

However, some limited demolition of existing infrastructure is required to facilitate the current project proposal and this is addressed in this assessment as presented below.

It is intended to re-use as much of the existing infrastructure as possible, however, the following equipment and facilities will have to be removed to allow the new plant to be constructed.

- Underground HFO Waste Store
- Underground Light Oil Waste Store
- Fuel Pump House

- Sewage Treatment Plant

The removal of the above facilities and equipment will be incorporated into the Construction and Demolition Waste Management Plan and will be undertaken, in agreement with the Environmental Protection Agency (EPA), in accordance with the conditions outlined in the Residuals Management Plan.

The following elements will require relocation to accommodate the drainage system of the new plant:

- Boiler Wash Effluent Tank
- Demineralisation Water Tank
- Water Treatment Plant Effluent Tank
- Process Waste Water Discharge Point SW13
- Oil Interceptor
- Stripping Tank
- Oil Spill Material Store

Activities during the construction phase will be controlled through a Construction Environmental Management Plan (CEMP). The CEMP will provide specific detail of the type and location of construction activities and particularly of site specific controls for environmental protection and will be updated as the development progresses.

The prevailing wind direction at the proposed site is predominantly from the southwest and therefore under normal circumstances any dust generated on site will be transported primarily to the northeast.

15.6.2.2 Identification of Dust Raising Activities

Table 15.6 below presents potential dust raising activities and their dust raising potential associated with the proposed plant.

Table 15.6: Proposed Development Activities with Dust Raising Potential

Stage	Description	Potential Dust-Raising Activities	Dust Raising Potential
Setup and enabling works	Relocation / Removal of Existing Structures / Installations	Excavation works. Earthmoving Transport of materials	Medium
Site clearance and ground works. As the site is an existing operating power generation plant, and the topography of the site is relatively level, site clearance works will be minimal	The topsoil layer will be cleared across the development site, as required. Removal of buildings and where possible this material will be reused on site. Relocation of five elements on site	Earthmoving Excavation Demolition Crushing Transport of materials Re-suspension of dust	High
Construction of new buildings	Construction of 44 buildings, structures and equipment to support the new power plant. Materials include: structural steel framed design clad with profiled steel sheet wall and roof cladding, concrete, stainless steel	Transport of materials Storage of materials Preparation of materials (cutting etc.) Resuspension of dust on unsurfaced roads	Medium

15.6.2.3 Identification of Sensitive Receptors

The surrounding area is predominantly characterised by agricultural lands. The River Suir estuary flows to the south of the site. The River Barrow flows along the western boundary in a southerly direction into Waterford Harbour. The closest dwelling is located over 200 metres from the proposed development.

Given the rural nature and lack of receptors in near vicinity to the site, overall receptor sensitivity is considered to be 'low' in accordance with Table 15.4: Receptor Sensitivity.

15.6.3 Summary

No sensitive human receptors are located within 200 metres of the proposed development site. Overall, receptor sensitivity is considered to be 'low' and overall dust raising potential 'medium' to 'high'. Therefore, the proposed development is concluded to represent an overall 'minor' risk of causing dust effects during the construction phase.

Mitigation measures outlined in Section 15.8.1 are suitable for a minor risk site and will be applied specifically to ensure significant effects at ecological receptors are avoided.

15.7 Assessment of Operational Phase

15.7.1 Methodology

15.7.1.1 Introduction

The approach to the assessment of emissions from the stack has involved the following key elements:

- Establishing the Ambient Concentration (AC) from consideration of local air quality monitoring data;
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising an advanced dispersion model; and
- Assessment of Process Contributions (PC) from the proposed plant in isolation and resultant Predicted Environmental Concentrations (PEC) taking into account cumulative effects through incorporation of the AC.

The AC has already been established in the previous sub-sections, Refer to Section 15.4 (Air Quality – Baseline). The quantitative assessment includes consideration of following operational scenarios:

- Scenario 1: Proposed 430 MW CCGT operating at full load firing natural gas. Includes consideration of long term and short term averaging air quality standards for NO_X, PM_{10} and $PM_{2.5}$.
- Scenario 2: Proposed 430 MW CCGT 430 MW operating at full load firing distillate fuel oil. Includes consideration of short term air quality standards for NO_X, SO_2, and PM_{10}.

15.7.1.2 Dispersion Model Selection

ADMS (the Atmospheric Dispersion Modelling System) version 4.1, is an internationally recognised model, and it was selected for this assessment. ADMS is a practical dispersion model, developed by Cambridge Environmental Research Consultants (CERC), which models a wide range of buoyant and passive releases to atmosphere either individually or in combination.

ADMS calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings, radioactive decay and deposition. The model has been subject to extensive validation by the Environment Agency for England and Wales and HSE (the UK Health and Safety Executive). Additionally, the EPA favours using ADMS for complex modelling scenarios as those presented in this chapter.

ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:

- A dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which have been used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence.

- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations, radioactive decay and buildings.

- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

15.7.1.3 Meteorological Data

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability, as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;

- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and

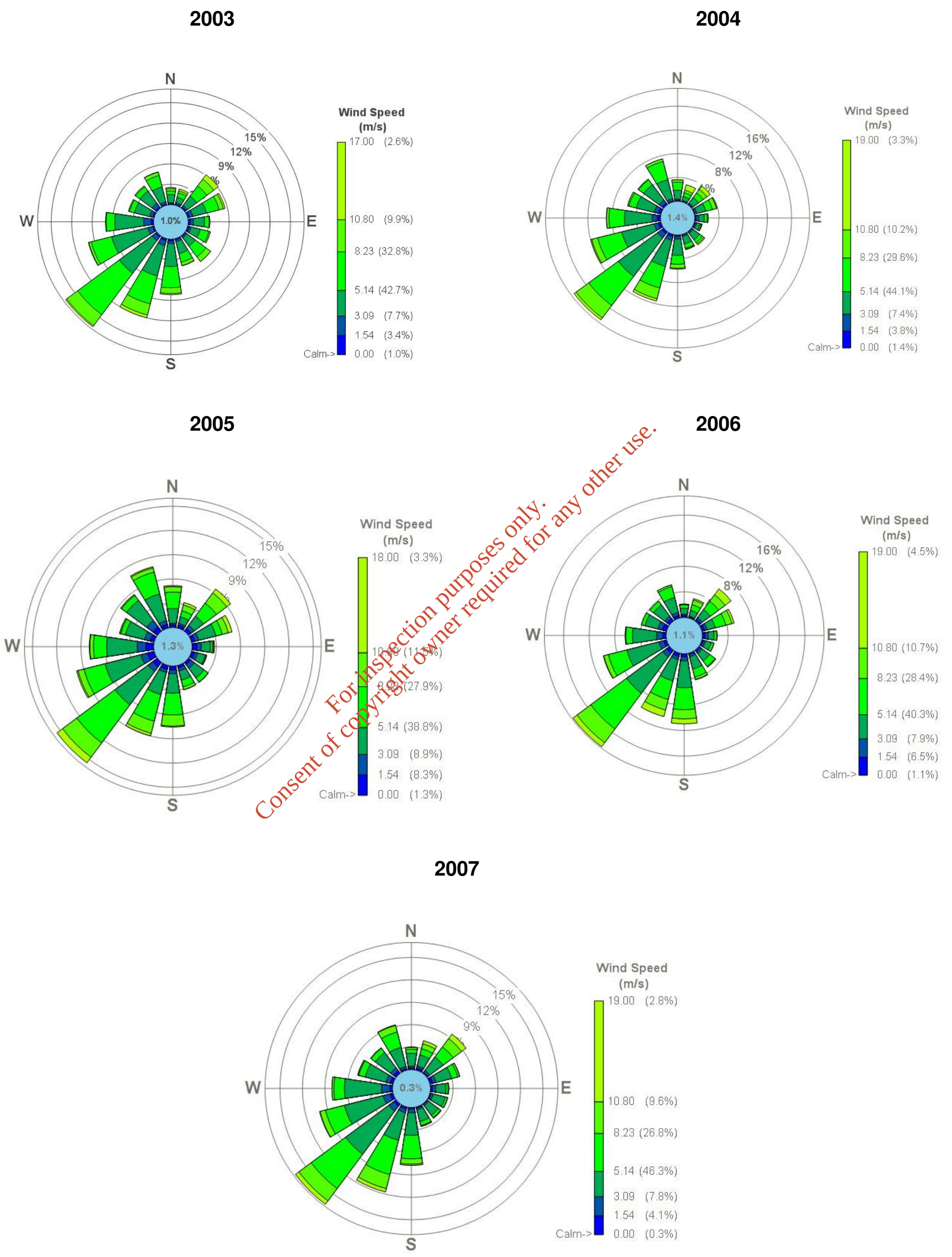
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, such as ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

For meteorological data to be suitable for dispersion modelling purposes, a number of parameters need to be measured on an hourly basis. These include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

The most representative observing station for the region of the proposed development site that records all the required parameters is at Rosslare Harbour. The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Therefore, five years of hourly sequential data from Rosslare Harbour (2003 to 2007) have been used as input data for the dispersion modelling to ensure that the full range of meteorological conditions that are likely to affect plume dispersion are considered within the assessment. The results presented are the maximum (worst case) concentrations of the 5 years modelled.

Data from 2008 was not included in the assessment as the Rosslare meteorological station was closed in the first quarter of 2008. Windroses produced from the station's data are presented in Figure 15.1: Rosslare Harbour – Wind Roses.

Figure 15.1: Rosslare Harbour - Wind Roses



15.7.1.4 Terrain

The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and increasing turbulence and, hence, plume mixing.

Complex terrain data exists within the study area of the air quality assessment (20 kilometre radius around the site). Therefore, terrain data has been included within the ADMS dispersion model with a terrain resolution of 200 metres for a fine grid (15 x 15km) and 350m for a coarse grid (40x 40 kilometres).

15.7.1.5 Surface Roughness

Roughness of terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length. The predominant land use within 15-20 kilometres of the proposed site can be characterised as mixed agricultural type and the River Barrow. To account for the largely cultivated land and water around the study area, a surface roughness length of 0.3 was assigned for the ADMS modelling.

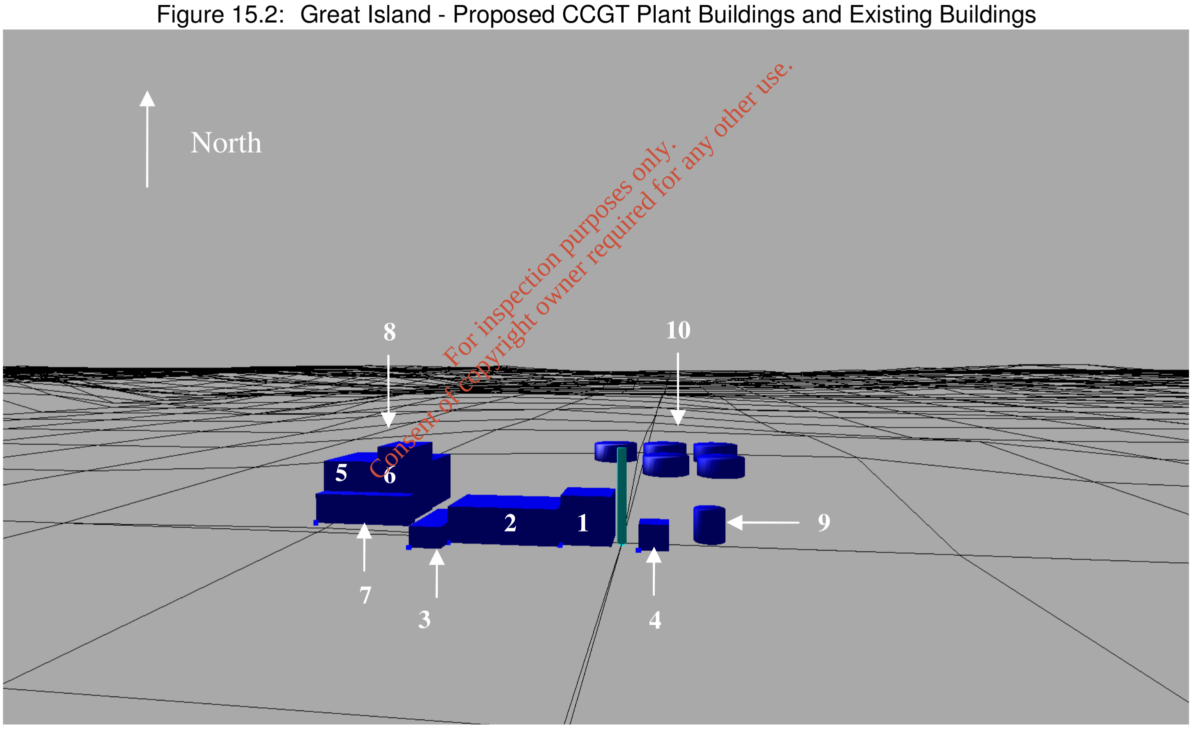
15.7.1.6 Building Downwash

The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30% of the stack height, downwash effects can be significant. The dominant buildings in the study area (i.e. with the greatest dimensions likely to promote turbulence) are the exiting boiler house buildings. The structures listed in Table 15.7 and illustrated in Figure 15.2 have been included in the dispersion model.

Table 15.7: Structure Dimensions

Structure	Number (refer to Figure 15.2)	Height (m)	Length (m)	Width (m)
Heat Recovery Steam Generator	1	31	31	26
Gas and Steam Turbine	2	23	69	37
Electrical Annex	3	13	47	20
Auxiliary Boiler	4	16	19	15
Boiler House 1	5	40	40	31
Boiler House 2	6	50	27	31
Boiler House 3	7	20	67	10
Station Engine Room (1-2)	8	35	79	37
Demineralised Water Tank	9	21		10 (radius)
5 Oil Tanks (each Tank)	10	15		20 (radius)

Figure 15.2: Great Island - Proposed CCGT Plant Buildings and Existing Buildings



15.7.1.7 Percentage Oxidation of NO_X to NO_2

Overview

The NO_x emissions associated with the power plant will typically comprise approximately 90% nitrogen monoxide (NO) and 10% nitrogen dioxide (NO_2) at source. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO_2, which is the principal concern in terms of environmental health effects.

There are various techniques available for estimating the portion of the NO_X that is converted to NO_2. Methods used for the calculation of long-term (annual mean) NO_2 concentrations and short-term (hourly mean) NO_2 concentrations used within the assessment are detailed below.

Long-Term Averaging Periods

The UK Environment Agency recommends that for a ‘worst case scenario’, a 70% conversion of NO_X to NO_2 should be considered for calculation of annual mean concentrations. If a breach of the annual average NO_2 air quality standard occurs, the UK Environment Agency requires further assessment where operators are asked to justify the use of percentages lower than 70%.

For the purposes of this assessment, a 70% conversion of NO_X to NO_2 is assumed for annual average NO_2 concentrations in line with the UK Environment Agency’s recommendations, which are considered relevant for applications in Ireland.

Short-Term Averaging Periods

Using a similar approach to the treatment of long-term averaging periods, the UK Environment Agency recommends that for a ‘worst case scenario’, a 35% conversion of NO_X to NO_2 should be considered for calculation of hourly mean concentrations. If a breach of the hourly mean NO_2 air quality standard occurs, the UK Environment Agency requires further assessment where operators are asked to justify the use of percentages lower than 35%.

Therefore, for the calculation of short-term contributions from the proposed plant to ground level concentrations of NO_2, 35% of the modelled NO_X contribution has been used as advocated by the UK Environment Agency which is considered relevant for applications in Ireland.

15.7.1.8 Emissions Data

The relevant emissions data for natural gas and distillate fuel oil firing corresponding to Scenarios 1 to 2 respectively are summarised in Table 15.8. Pollutant emission rates are based on the relevant emission limits for NO_x, SO_2, PM_{10} and $PM_{2.5}$ established in the Large Combustion Plant Directive. Emissions data represent current likely ‘worst case’ scenarios.

Table 15.8: Air Emissions Data from Great Island CCGT Power Plant

Parameter\Scenario	1	2
Fuel Type	Natural Gas	Distillate Fuel Oil
NOx Concentration (mg/Nm3)(b)	50	120
NOX Mass Emission Rates (g/s)	39.9	115.3
SO2 Concentration (mg/Nm3)(b)	-	0.1% Sulphur Content
SO2 Mass Emission Rates (g/s)	-	43.3
PM Concentration (mg/Nm3)(b)	5	50
PM10 Mass Emission Rates (g/s)	1.3	15.6

Parameter\Scenario	1	2
Actual Volumetric Flow (m3/s)	765.7	829.8
Efflux Temperature (°C)	89.9	102.7
Efflux Velocity (m/s)	27.1	29.3
Stack Diameter (m)	6	
Stack Height (m)(C)	60	

Note: (a) Assumes Normal Operating Mode – CCGT at full load,
(b) Concentrations at 15% O_2 Dry, 0 °C, 1 atm
(c) See Stack Height Determination in Appendix 15.2

The primary fuel used by the power plant will be natural gas. Therefore, Scenario 1 assumes a 100% annual plant load factor (8,760 hours) as a worst case assumption (in reality the actual annual plant load factor will be lower to account for periods of shut down and maintenance).

As noted previously, back-up fuel (considered in Scenario 2) will be used rarely (expected to be less than 2% of the operating hours) with normal operation being on natural gas. It is therefore not appropriate to consider long-term averaging periods (annual mean) for Scenario 2 when firing on distillate fuel oil. In order to infer the maximum potential short-term effects, the proposed development is assumed to operate firing on distillate fuel oil with a 100% plant load factor to ensure that consideration of plant operation coinciding with the worst-case meteorological conditions for dispersion is conservatively addressed.

Appendix 15.2 presents the methodology and results of the stack height determination. The objective of the stack height determination is to establish at what stack height local building wake effects are no longer a major constraint thereby ensuring the adequate dispersion of pollutants. The primary determinant of the stack height is therefore the local building heights. The model was run assuming stack heights between 40 metres and 80 metres at 10 metres incremental spacing. Results were obtained for short term and long term NO_2 averaging periods in order to determine an appropriate stack height.

15.7.1.9 Human Health Receptors

The area immediately surrounding the proposed site is a rural area with the River Barrow located to the south section of the plant. In order to assess potential impacts on sensitive receptors, modelling was carried out to predict pollutant concentrations across a study area of 20 kilometres from the plant's stack. This involved modelling a fine grid of receptors up to 7.5 kilometres from the CCGT stack with a receptor spacing of 200 metres, and a coarse grid of receptors up to 15 kilometres away with a receptor spacing of 1 kilometre.

Outputs from the modelled grid have been used to present the maximum ground level process contributions from the modelled Scenarios. The maximum concentrations have been interpreted against the significance criteria described below to assess the overall significance of operation phase impacts.

In addition, outputs from the modelled grids have been used to produce contour plots to illustrate the geographical spread of process contributions across the study area.

15.7.1.10 Significance Criteria - Human Health Receptors

A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance'.

Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively.

In order to ensure that the descriptions of effects used within this report are clear, consistent and in accordance with recent guidance, definitions have been adapted from Environmental Protection UK Development Control: Planning for Air Quality in the absence of any equivalent in Ireland.

Table 15.9 provides descriptors used for changes in concentrations as a result of the proposed development.

Table 15.9: Magnitude Descriptor for Process Contributions (PC)

Descriptor	Averaging Periods	
	Short Term	Long Term
Very large	> 50%	>25%
Large	25 – 50%	15-25%
Medium	15 – 25%	10-15%
Small	10 – 15%	5-10%
Very Small	5 -10%	1-5%
Extremely Small	<= 5%	<= 1%

Note: Change as a percentage of the relevant Air Quality Standard

The magnitude of the change identified must be considered in the context of existing air quality conditions within the study area in order for the significance of that magnitude to be determined. The most important aspects to consider are whether existing concentrations are above or below the relevant air quality standard.

Table 15.10 provides descriptors for the significance of air quality effects based on the magnitude descriptors in the context of existing conditions. It should be recognised that professional judgement is required in the interpretation of air quality assessment significance. Table 15.10 is intended as a tool to help interpret the results of the air quality assessment.

The significance framework described above has been applied to maximum ground level concentrations as determined by the dispersion modelling.

Table 15.10: Descriptors for Impact Significance

Absolute Concentrations in Relation to AQS	Extremely Small	Very Small	Small	Medium	Large	Very Large
Above AQS without scheme	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below AQS without scheme, above with scheme	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below AQS with scheme, but not well below	Negligible	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well below AQS with scheme	Negligible	Negligible	Slight adverse	Slight adverse	Slight adverse	Moderate adverse

Notes: The EPUK example had been used as a framework for this assessment; however, professional judgment is still required to determine the significance of any change.
'AQS = Air Quality Standard
'Well below standard' = <75% of the AQS

15.7.1.11 Ecological Assessment

Overview

The assessment of the effects of emissions to air from the proposed plant on ecologically designated sites has been carried out. European and nationally designated sites within a 20 kilometre radius have been considered within the assessment. Special Areas of Conservation (SAC), Special Protection Areas (SPA), Natural Heritage Areas (NHA) and Proposed Natural Heritage Areas (pNHA) designations were identified in this area, as shown in Figure 15.3 hereafter referred to as 'designated sites'.

Predicted process contributions to atmospheric concentrations and deposition have been presented for comparison with relevant critical levels and critical loads. As critical levels and critical loads are based on long term (annual) averaging periods, concentrations at designated sites have been presented based on the results for Scenario 1 only. Therefore, contributions from SO_2 emissions have not been considered further as these emissions will be present for very short term periods.

Critical Levels

Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding Irish air quality regulations. NO_X has been identified as the key pollutant to assess air quality impacts on designated sites. For all receptors, process contributions and predicted environmental concentrations of NO_X have been calculated for comparison against the critical level. Background NO_X concentrations at each designated site are identified in Table 15.3.

Critical Loads-Overview

Critical loads are quantitative estimates of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Critical Loads – Acidification

Process contributions to acid deposition have been derived from dispersion modelling using ADMS. Deposition rates were calculated using the following empirical methods in the Habitats Directive (AQTAG 06) guidance:

- Calculate dry deposition flux (0.0015 m/s for NO_X assumed as deposition velocities):

Dry deposition flux = ground level concentration x deposition velocity

($\mu g/m^2/s$) ($\mu g/m^3$) (m/s)

- Convert units from $\mu g/m^2/s$ to units of kg/ha/year by multiplying the dry deposition flux by standard conversion factors (96 for NO_X).

- Convert to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux (kg/ha/year) by standard conversion factors (0.071428 for N).

Wet deposition in the near field is not significant compared with dry deposition for nitrogen and therefore for the purposes of this assessment, wet deposition has not been considered further.

Contributions to acid deposition have been compared with critical loads for acidity applicable to the study area. These have been obtained from a report published by the Netherlands Environmental Assessment

Agency in 2005 which provides maps of critical loads of acidity across Europe. For Ireland critical loads are provided for '(semi)natural vegetation', 'forest', and 'all ecosystems'. Due to the range of habitats present in the study area, critical loads applicable to 'all ecosystems' have been used. Excerpts of the maps, focussing on critical loads for Ireland, are presented in Appendix 15.3 (Critical Load / Deposition Maps). Where a range of critical loads is provided by the maps, the lowest critical load has been selected to ensure a conservative assessment. Furthermore, where the study area encompasses more than one critical load range, the most conservative (lowest) has been used.

Sulphur and nitrogen compounds can contribute to acidification. Therefore, a Critical Load Function (CLF) has been developed which defines combinations of sulphur and nitrogen deposition that will not cause harmful effects. The use of a CLF also allows assessment of the effects of processes which contribute to acid deposition - in this case combustion of natural gas resulting in emissions of nitrogen.

In order to allow comparison of total acid deposition with critical loads for acidity, values for background deposition of acid have been added to modelled process contributions. Background deposition values have been obtained from a report published by the Norwegian Meteorological Institute in 2006 (under the EMEP Programme), which provides maps of background deposition of nitrogen across Europe. Excerpts of the maps, focussing on background concentrations for Ireland, are also presented in Appendix 15.3. Use of the EMEP data within the assessment is considered appropriate as it is also used by Netherlands Environmental Assessment Agency in their critical load status reports.

Where a range of background deposition is provided by the maps, the highest value has been selected to ensure a conservative assessment.

Critical Loads – Eutrophication

Process contributions to nitrogen deposition have been derived from dispersion modelling using ADMS. Deposition rates were calculated using empirical methods in the Habitats Directive (AQTAG 06) guidance as follows:

- Calculate NO_X dry deposition flux (0.0015 m/s for NO+ assumed as deposition velocity):

Dry deposition flux = ground level concentration x deposition velocity

($\mu g/m^2/s$) ($\mu g/m^3$) (m/s)

- Convert units from µg/m2/s to units of kg/ha/year by multiplying the dry deposition flux by standard conversion factors (96 for NO_X).

Wet deposition of nitrogen in the near field has not been considered for the reasons given previously.

Contributions to nitrogen deposition have been compared with critical loads for nutrient nitrogen in the study area. These have been obtained from a report published by the Netherlands Environmental Assessment Agency in 2005. Excerpts of the maps, focussing on critical loads for Ireland, are presented in Appendix 15.3.

Where a range of critical loads is provided by the maps, the lowest critical load has been selected to ensure a conservative assessment.

Receptors

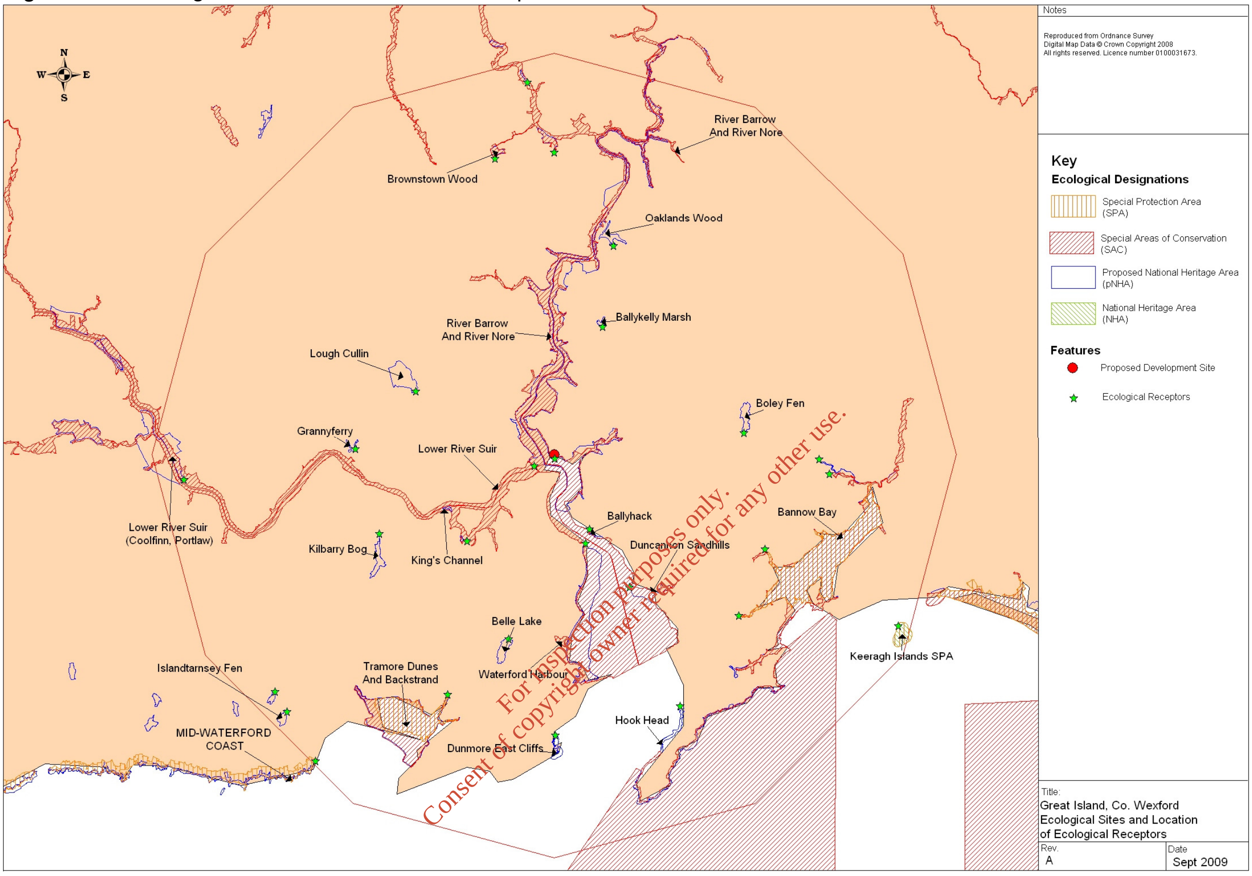
In order to assess potential effects process contributions on designated ecological sites within 20 kilometres of the proposed plant, within each designated site a series of receptors were chosen representing changes in process contributions across an area.

Figure 15.3 (Designated Sites within 20 km of Proposed Plant) shows the location of the designated sites in relation to the proposed plant and discrete receptors assessed.

15.7.1.12 Significance Criteria – Ecological Receptors

For the assessment of designated sites, Process Contribution effects are concluded to be negligible if the process contribution is less than 1% of the relevant critical level or critical load.

Figure 15.3: Designated Sites within 20 km of Proposed Plant



15.7.2 Identification of Operational Phase Impacts

15.7.2.1 Introduction

The results of the dispersion modelling are summarised and interpreted below for each of the assessment scenarios. The model results are presented in tabular form and as contour plots.

15.7.2.2 Scenario 1

Table 15.11 summarises the results of modelling maximum Process Contributions (PCs) to ground level NO_2, PM_{10} and $PM_{2.5}$ concentrations from the proposed plant firing natural gas and resultant Predicted Environmental Concentrations (PECs), including the Ambient Concentration (AC). All results presented in Table 15.12 are compared with the relevant air quality standards. Maximum predicted annual mean Process Contributions from the five modelled years have been presented.

Table 15.11: Significance of Impacts - Scenario 1 (µg/m^3)

Pollutant	Averaging Period	AQS	PC Max	Max PC as % of AQS	Magnitude of PC	AC	PEC Max	Max PEC as % of AQS	Significance Descriptor
NO_2	1 hour (99.79th percentile)	200	17.6	8.8	Very Small	14	31.6	15.8	Negligible
	Annual	40	2.2	5.5	Small	7	9.2	22.9	Slight Adverse
PM_{10}	24 hour (90.41th percentile)	50	0.7	1.4	Extremely Small	36	36.7	73.4	Negligible
	Annual	40	0.1	0.3	Extremely Small	18	18.1	45.3	Negligible
$PM_{2.5}$	Annual	25	0.1	0.4	Extremely Small	9	9.1	36.4	Negligible

Notes:

AQS = Air Quality Standard

PC = Process Contributions

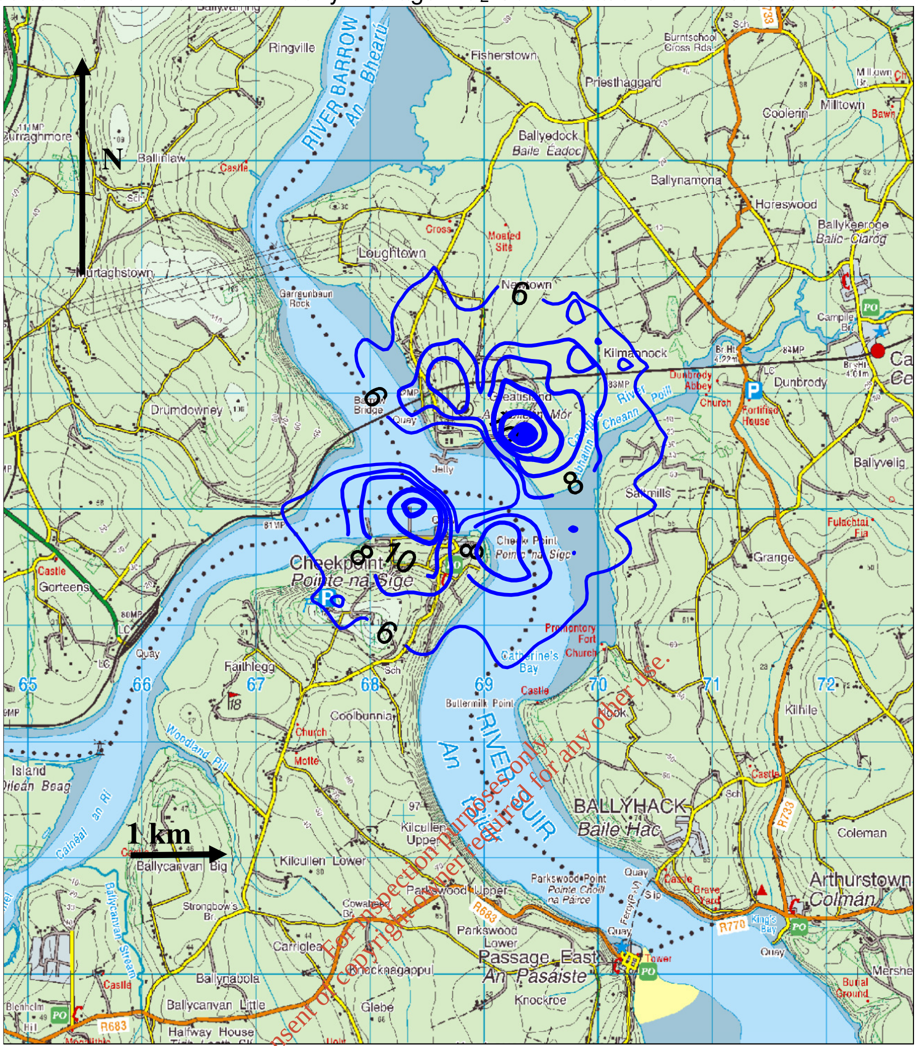
AC = Ambient Concentration

PEC = Predicted Environmental Concentration (PC + AC).

Contour plots of short-term and long-term NO_2 contributions are presented in Figure 15.4 and Figure 15.5. The contour plots indicate that the highest short-term and long-term contributions of NO_2 from the proposed development are predicted to occur approximately within 250 metres to the north-east of the site.

Table 15.11 indicates that the Predicted Environmental Concentrations for all pollutants are 'well below' the relevant air quality standards. Effects from Process Contributions are concluded to be 'negligible' for all pollutants and averaging periods with the exception of annual mean NO_2 concentrations which are concluded to be 'slight adverse'.

Figure 15.4: Predicted 99.79th Percentile Hourly Average NO_2 Concentrations – Process Contribution (Scenario 1)



Notes:

Concentrations in µg/m^3

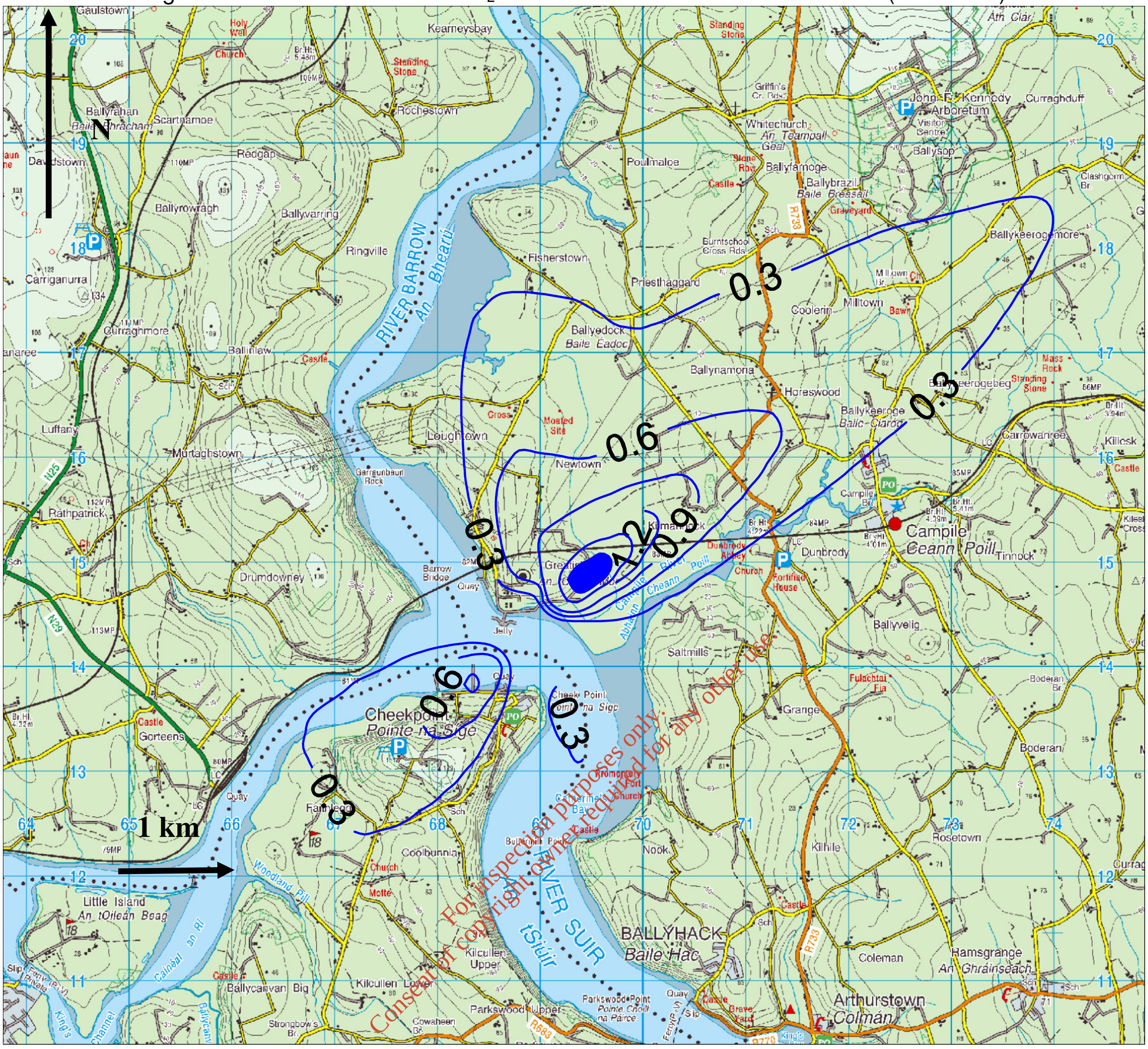
Proposed plant firing on natural gas

35% of NO_X to NO_2 conversion

2003 meteorological year (worst case)

Contours at 2µg intervals

Figure 15.5: Predicted Annual NO_2 Concentrations – Process Contribution (Scenario 1)



Assumptions:

Concentrations in µg/m^3

Proposed development firing on natural gas

70% of NO_X to NO_2 conversion

2003 meteorological year (worst case)

Contours at 0.3 µg intervals

15.7.2.3 Scenario 2

The results of modelling maximum Process Contributions (PC) to ground level concentrations from the proposed plant when firing distillate fuel oil and resultant Predicted Environmental Concentrations (PEC), including the Ambient Concentration (AC) are summarised in Table 15.12 and compared with the relevant air quality standard (AQS). Results presented are for short term averaging periods only (i.e. 1 hour and 24 hour) as the plant will only fire on distillate fuel oil for short periods. Maximum predicted annual mean Process Contributions from the five modelled years have been presented.

Table 15.12: Significance of Impacts - Scenario 2 (µg/m[3])

Pollutant	Averaging Period	AQS	PC Max	Max PC as % of AQS	Magnitude of PC	AC	PEC Max	Max PEC as % of AQS	Significance Descriptor
NO_2	1 hour (99.79th percentile)	200	45	22.4	Medium	14	59	29.4	Slight Adverse
SO_2	1 hour (99.73th percentile)	350	48	13.8	Small	6	54	15.6	Slight Adverse
	24 hour (99.2nd percentile)	125	29	23.6	Medium	6	35	28.4	Slight Adverse
PM_{10}	24 hour (90.41th percentile)	50	3.7	7	Very Small	36	39.7	79.3	Slight Adverse

Notes:

AQS = Air Quality Standard

PC = Process Contributions

AC = Ambient Concentration

PEC = Predicted Environmental Concentration (PC + AC).

The results presented in Table 15.12 show that the Process Contributions and Predicted Environmental Concentrations of all pollutants considered are well within the relevant air quality standards.

Contributions of NO_2 and SO_2 are less than 25% of the relevant air quality standards and Predicted Environmental Concentrations are less than 30% of the relevant air quality standards. Maximum short-term NO_2 and SO_2 impacts are therefore considered to be of 'slight adverse' significance.

Short-term contributions of PM_{10} are less than 10% of the relevant air quality standards and as Predicted Environmental Concentrations are 45% or less of the relevant air quality standards, maximum short-term PM_{10} impacts are considered to be 'negligible'.

To realise the effects presented in Table 15.12, the proposed plant would need to operate on distillate fuel oil, coinciding with the worst-case meteorological conditions for dispersion. Even on this basis, effects are not considered to be significant and in practice, such events are unlikely and represent the absolute upper limits for short-term effects from the facility.

15.7.2.4 Auxiliary Boilers

In addition to the gas turbine unit, there may also a requirement for an auxiliary boiler on site. The auxiliary boiler will also fire natural gas but is a negligible emission source compared with emissions from the gas turbine (it's emissions being only about 0.5% of those from the CCGT).

15.7.3 Ecological Assessment

15.7.3.1 Critical Levels

Results of predicted NO_X contributions from the proposed plant are presented in Table 15.3. Maximum predicted annual mean Process Contributions from the five modelled years have been presented.

The maximum modelled increase in annual mean NO_X concentrations at ecological sites within 20 kilometres of the proposed plant is at the Lower River Suir (2.9% of the air quality standard). Lower River Suir is designated as a Special Area of Conservation (SAC) located approximately 1.1 kilometres South West of the proposed site. As all process contributions are well below 1% of the AQS with the exception of the Lower River Suir, and the predicted environmental concentrations are well below the relevant AQS, effects on designated sites are concluded to be negligible.

15.7.3.2 Critical Loads – Acidification

Contributions to nitrogen acid deposition at each designated site have been derived from the ADMS dispersion modelling. Figure 15.6: Minimum Critical Load Function – Lower River Suir presents a Critical Load Function (CLF) based on the minimum critical load for the Lower River Suir which is predicted to experience the greatest increases in acid deposition, along with the maximum predicted total acid deposition (i.e. including background). It can be seen that, with or without contributions from the proposed plant, predicted acid deposition is below the critical load 'envelope of protection'. Furthermore, maximum predicted process contributions to acid deposition are very small in comparison to the minimum CLF.

Table 15.13: NO_X Critical Levels at Designated Sites ($\mu g/m^3$)

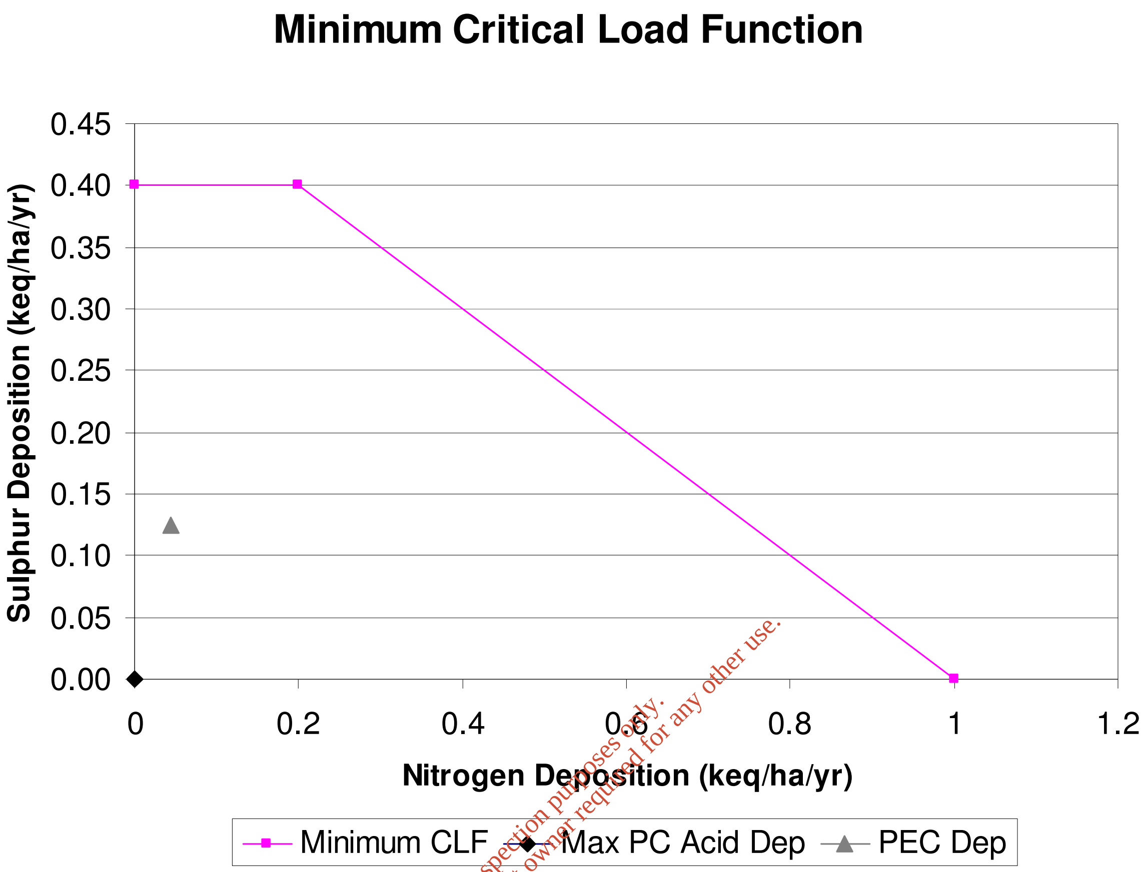
Site	Designation	Distance from Plant (km)	AQS	AC	PC	Max PC as % AQS	PEC
Balleyhack	pNHA	4.1	30	12	0.24	0.8	12.24
Balleykelly Marsh	pNHA	6.7	30	12	0.25	0.8	12.25
Mid Waterford Coast	SPA	19.0	30	12	0.04	0.1	12.04
Hook Head	pNHA, SAC	14.0	30	12	0.08	0.3	12.08
Boley Fen	pNHA	9.5	30	12	0.16	0.5	12.16
Dunmore East Cliffs	pNHA	14.0	30	12	0.07	0.2	12.07
Duncannon Sandhills	pNHA	7.6	30	12	0.12	0.4	12.12
Belle Lake	pNHA	9.4	30	12	0.05	0.2	12.05
Carrickavrantry Reservior	pNHA	18.3	30	12	0.04	0.1	12.04
Islandtarnsery Fen	pNHA	18.4	30	12	0.04	0.1	12.04
Kilbarry Bog	pNHA	9.5	30	12	0.09	0.3	12.09
Kings Channel	pNHA	6.1	30	12	0.18	0.6	12.18
Grannyferry	pNHA	9.9	30	12	0.05	0.2	12.05
Lough Cullin	pNHA	7.6	30	12	0.07	0.2	12.07
Lower River Suir (Coolfinn, Portlaw)	pNHA	18.4	30	12	0.03	0.1	12.03
Lower River Suir	SAC	1.1	30	12	0.88	2.9	12.88
Rathsnagadan Wood	pNHA	18.0	30	12	0.07	0.2	12.07
Kylecorragh Wood	pNHA	15.1	30	12	0.08	0.3	12.08
Brownstown Wood	pNHA	15.0	30	12	0.06	0.2	12.06
Waterford Harbour	pNHA	4.6	30	12	0.23	0.8	12.23
Tramore Back Strand	SPA	13.0	30	12	0.04	0.1	12.04
Tramore Dunes and Backstrand	pNHA, SAC	13.0	30	12	0.04	0.1	12.04
Keeragh Islands	NHA, SPA	19.1	30	12	0.04	0.1	12.04
Oaklands Wood	pNHA	10.8	30	12	0.13	0.4	12.13
Tintern Abbey	pNHA	11.4	30	12	0.07	0.2	12.07
Bannow Bay	SPA	12.2	30	12	0.05	0.2	12.05
	SAC	13.7			0.10	0.3	12.10
	pNHA	13.2			0.11	0.4	12.11
Barrow River Estuary	pNHA	0	30	12	0.01	0.0	12.01
River Barrow and River Nore	pNHA	0	30	12	0.01	0.0	12.01

Notes: PC = Process Contributions; PEC = Predicted Environmental Concentration; AQS = Relevant Air Quality Standard

Table 15.14: Maximum Predicted Acid Deposition Contribution at Designated Sites (keq/ha/year)

Site	Designation	Max Predicted Acid Deposition Contribution
Balleyhack	pNHA	0.0024
Balleykelly Marsh	pNHA	0.0026
Mid Waterford Coast	SPA	0.0005
Hook Head	pNHA, SAC	0.0008
Boley Fen	pNHA	0.0016
Dunmore East Cliffs	pNHA	0.0007
Duncannon Sandhills	pNHA	0.0013
Belle Lake	pNHA	0.0005
Carrickavrantry Reservior	pNHA	0.0004
Islandtarnsery Fen	pNHA	0.0004
Kilbarry Bog	pNHA	0.0009
Kings Channel	pNHA	0.0019
Grannyferry	pNHA	0.0005
Lough Cullin	pNHA	0.0007
Lower River Suir (Coolfinn, Portlaw)	pNHA	0.0003
Lower River Suir	SAC	0.0091
Rathsnagadan Wood	pNHA	0.0007
Kylecorragh Wood	pNHA	0.0009
Brownstown Wood	pNHA	0.0006
Waterford Harbour	pNHA	0.0023
Tramore Back Strand	SPA	0.0004
Tramore Dunes and Backstrand	pNHA, SAC	0.0004
Keeragh Islands	NHA, SPA	0.0005
Oaklands Wood	pNHA	0.0013
Tintern Abbey	pNHA	0.0008
Bannow Bay	SPA	0.0005
	SAC	0.0010
	pNHA	0.0011
Barrow River Estuary	pNHA	0.0001
River Barrow and River Nore	pNHA	0.0001

Figure 15.6: Minimum Critical Load Function – Lower River Suir



Note: CLF: Critical Load Function
PC: Process Contribution to Acid Deposition
PEC: Predicted Environmental Concentration Deposition (Process Contribution + Background)

15.7.3.3 Critical Loads – Eutrophication

Contributions to the Critical Loads for Eutrophication at each site have been derived from the ADMS dispersion modelling.

Maximum process contributions from the dispersion modelling are reported in Table 15.15. The results are compared with the assumed critical load. Predicted total nitrogen deposition contribution at each designated site is presented and compared with the relevant critical load.

The results presented in Table 15.15 indicate that nitrogen deposition contributions to all designated sites are less than 1% of the critical load except Lower River Suir which is approximately 2.3%. Table 15.15 presents results for the total nitrogen deposition (i.e. including background deposition). It can be seen that no exceedances of the critical load are predicted.

Table 15.15: Predicted Total Nitrogen Deposition at Ecological Receptors (kg N/ha/yr)

Site	Designation	Critical Load	Maximum Predicted N Deposition Contribution	Maximum Predicted N Deposition Contribution as % Critical Load	Background N Deposition	Maximum Predicted Total N Deposition	Maximum Predicted Total N Deposition as % of Critical Load
Balleyhack	pNHA	5.6	0.034	0.6	0.609	0.034	11.5
Balleykelly Marsh	pNHA	5.6	0.036	0.6	0.609	0.036	11.5
Mid Waterford Coast	SPA	5.6	0.006	0.1	0.609	0.006	11.0
Hook Head	pNHA, SAC	5.6	0.011	0.2	0.609	0.011	11.1
Boley Fen	pNHA	5.6	0.023	0.4	0.609	0.023	11.3
Dunmore East Cliffs	pNHA	5.6	0.010	0.2	0.609	0.010	11.1
Duncannon Sandhills	pNHA	5.6	0.018	0.3	0.609	0.018	11.2
Belle Lake	pNHA	5.6	0.007	0.1	0.609	0.007	11.0
Carrickavrantry Reservior	pNHA	5.6	0.006	0.1	0.609	0.006	11.0
Islandtarnsery Fen	pNHA	5.6	0.006	0.1	0.609	0.006	11.0
Kilbarry Bog	pNHA	5.6	0.013	0.2	0.609	0.013	11.1
Kings Channel	pNHA	5.6	0.026	0.5	0.609	0.026	11.3
Grannyferry	pNHA	5.6	0.007	0.1	0.609	0.007	11.0
Lough Cullin	pNHA	5.6	0.010	0.2	0.609	0.010	11.0
Lower River Suir (Coolfinn, Portlaw)	pNHA	5.6	0.004	0.1	0.609	0.004	10.9
Lower River Suir	SAC	5.6	0.127	2.3	0.609	0.127	13.1
Rathsnagadan Wood	pNHA	5.6	0.009	0.2	0.609	0.009	11.0
Kylecorragh Wood	pNHA	5.6	0.012	0.2	0.609	0.012	11.1
Brownstown Wood	pNHA	5.6	0.009	0.2	0.609	0.009	11.0
Waterford Harbour	pNHA	5.6	0.033	0.6	0.609	0.033	11.5
Tramore Back Strand	SPA	5.6	0.006	0.1	0.609	0.006	11.0
Tramore Dunes and Backstrand	pNHA, SAC	5.6	0.006	0.1	0.609	0.006	11.0
Keeragh Islands	NHA, SPA	5.6	0.006	0.1	0.609	0.006	11.0
Oaklands Wood	pNHA	5.6	0.018	0.3	0.609	0.018	11.2

Site	Designation	Critical Load	Maximum Predicted N Deposition Contribution	Maximum Predicted N Deposition Contribution as % Critical Load	Background N Deposition	Maximum Predicted Total N Deposition	Maximum Predicted Total N Deposition as % of Critical Load
Tintern Abbey	pNHA	5.6	0.011	0.2	0.609	0.011	11.1
Bannow Bay	SPA	5.6	0.008	0.1	0.609	0.008	11.0
	SAC	5.6	0.014	0.2	0.609	0.014	11.1
	pNHA	5.6	0.016	0.3	0.609	0.016	11.2
Barrow River Estuary	pNHA	5.6	0.001	0.0	0.609	0.001	10.9
River Barrow and River Nore	pNHA	5.6	0.001	0.0	0.609	0.001	10.9

15.8 Mitigation Measures

15.8.1 Construction Phase

In order to control potential effects from dust raising activities on site during construction a Construction Environmental Management Plan (CEMP) will be developed and implemented. The CEMP will provide a framework for the management and implementation of construction activities incorporating the mitigation measures identified in the relevant chapters of this EIS, including dust and traffic control measures, a Construction and Demolition Waste Management Plan, a Sediment Management Plan and a Pest Control Programme. The CEMP will be reviewed regularly, and revised as necessary, to ensure that the measures implemented are effective.

During the civil construction works, the site boundary will be clearly marked with high visibility tape and the appointed contractor will not be permitted to use any areas outside the identified site boundary for any activity relating to construction.

This section provides mitigation measures that are deemed suitable for the construction period given the location of the proposed plant to sensitive receptors.

15.8.1.1 Site Planning

- Erection of effective barriers around dusty activities or the site boundary;
- No burning of waste materials will be permitted;
- Plan site layout – machinery and dust causing activities will be located away from sensitive receptors;
- Identify a responsible person in charge; and
- Hard surface on haul routes within the site (i.e. not exposed mud).

15.8.1.2 Construction traffic

- All vehicles will switch off engines when not in use, where practicable, i.e. no idling vehicles;
- All vehicles effectively cleaned or washed before leaving the site;
- All loads entering and leaving site to be covered as appropriate; and
- Hard surfacing and effective cleaning of haul routes and appropriate speed limits around site will be implemented.

15.8.1.3 Removal of Existing Structures

- Use water as dust suppressant;
- Cutting equipment to use water as suppressant or suitable local exhaust ventilation systems; and
- Securely cover skips and minimise drop heights.

15.8.1.4 Site Activities

- Dust generating activities will be minimised;

- Water will be used as a dust suppressant where applicable;
- Stockpiles will be kept for the shortest possible time and securely sheeted; and
- If applicable, ensure concrete crusher or concrete batcher has a permit to operate.

15.8.2 Operational Phase

No mitigation measures in addition to those already inherent in project design and considered within the dispersion modelling (compliance with emission limits and air quality standards) are proposed. The following key design features have been accounted for:

- Exhaust stack height of 60 metres have been proposed to ensure effective dispersion of emissions by overcoming local building wake effects;
- Low NO_x technology will be employed which comprises dry-low NO_x burners for use when gas firing and water injection when firing distillate fuel oil.

15.9 Residual Impacts

15.9.1 Construction Phase

Residual impacts from the construction phase are not anticipated as mitigation measures have been identified to control potential dust impacts. In addition, the construction phase will occur for a maximum of 30 months.

15.9.2 Operational Phase

Residual impacts from the operational phase are not anticipated as the results of the dispersion modelling indicate that impacts will be 'negligible' to 'slight adverse', at worst.

15.10 Summary Conclusion

A detailed air quality assessment has been undertaken to determine the effects of the proposed development on local air quality, and climate as part of the Environmental Impact Assessment Process.

During both the construction and operational phases of the development there are no predicted impacts on the macro and micro climate.

Baseline air quality concentrations have been derived from the Environmental Protection Agency annual report. Concentrations of all relevant pollutants are well below the respective air quality standards within the study area.

Assessment of construction phase impacts has identified that there is a 'minor' risk that the proposed development would cause significant dust effects. Appropriate mitigation measures have therefore been proposed, which will be implemented as part of a CEMP, to minimise the risk of significant impacts.

The proposed plant will be designed to minimise emissions from the stack via inherent emissions control technologies in order to achieve emission limits established by Irish and European Union Legislation.

Emissions from the proposed plant have been assessed through detailed dispersion modelling following good practice guidance. A suitable stack height has been determined for effective dispersion of pollutants taking into account nearby buildings and terrain.

The results of the dispersion modelling reported in this assessment show that concentrations of all relevant pollutants are predicted to remain well below the relevant air quality standards when the plant is firing on either natural gas or distillate fuel oil. The predicted impacts of the maximum Process Contributions for all pollutants are concluded to be of negligible to slight adverse significance.

Impacts on Designated Sites as a result of atmospheric NO_x concentrations, acid deposition, and nitrogen deposition have been assessed. All Process Contributions are less than one percent of the relevant Environmental Quality Standards except at the Lower River Suir where Process Contributions of NO_x and nitrogen deposition are above one percent of the critical level and relevant critical load. However, total NO_x concentrations and nitrogen deposition rates (including background concentrations) at the Lower River Suir remain well below the relevant criteria and hence are not significant in air quality terms. The ecological assessment has concluded that the air quality effects at the Lower River Suir site are negligible. The significance of this is also discussed in Chapter 12 (Flora and Fauna).

Detailed dispersion modelling of the operational phase predicts that the significance of effects of the proposed plant on human health and sensitive ecological receptors would be categorised as 'negligible overall.

16. Landscape and Visual

16.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This chapter of the EIS presents the results of the assessment of landscape and visual impacts of the proposed Great Island power plant.

The chapter considers effects of the proposal on:

- landscape character and resources, including effects on the aesthetic values of the landscape, caused by changes in the elements, characteristics, character and qualities of the landscape; and

- visual amenity, including effects upon potential viewers and viewing groups caused by change in the appearance of the landscape as a result of the development.

Landscape character and resources are considered to be of importance in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people. Impacts on visual amenity as perceived by people, are therefore clearly distinguished from, although closely linked to, impacts on landscape character and resources. Landscape and visual assessments are therefore separate, although linked processes.

This assessment is supported by illustrated Figures (16.1 – 16.6) contained in Appendix 16.3 (Figures) and photomontages (Figures 16.7a – 16.7g) contained in Appendix 16.4 (Photomontages).

16.2 Methodology

16.2.1 Guidance Used

The methodology used for this assessment has been derived with reference to the 'Guidelines for Landscape and Visual Impact Assessment' as published by the Landscape Institute and Institute of Environmental Management and Assessment (2002). The methodology also takes account of EPA, (2002), Guidelines on the information to be contained in EIS and EPA, (2003), Advice Notes on Current Practice in the preparation of EIS.

16.2.2 Study Area

The study area comprises the potential zone of visual influence of the scheme. This covers an area of 20 kilometre radius from the centre of the site and is illustrated in Figure 16.2: Zone of Theoretical Visibility (ZTV) – Proposed Great Island Power Plant and Viewpoint Locations.

16.2.3 Baseline Evaluation Criteria

The landscape of the study area is described with reference to County Landscape Character Assessment data where available.

The zone of theoretical visibility (ZTV) of both the existing Great Island power plant and the proposed Great Island power plant has been calculated and illustrated in Figures 16.1: Zone of Theoretical Visibility (ZTV) – Existing Great Island Power Plant and Figure 16.2: Zone of Theoretical Visibility (ZTV) – Proposed Great

Island Power Plant and Viewpoint Locations. The ZTV highlights the geographic areas from which views of all or a part of the existing or proposed scheme is likely to be gained. These ZTVs are based on bare ground and do not take into account of screening by buildings and vegetation. In practice, many views towards the site will be filtered or screened by existing vegetation and by intervening settlements. Viewpoints across the ZTV were selected as representative of the range of views and types of viewer likely to be affected by the project. These viewpoints have been identified to facilitate the assessment of likely impacts on visual amenity and visual receptors (i.e. viewers) from these specific locations.

The assessment of the sensitivity of a landscape or viewpoint to change has been undertaken with reference to the above mentioned guidelines and is set out in Table 16.1 and Table 16.2. Key terms and definitions used in this chapter are defined in the glossary.

The sensitivity of landscape resources and viewers is assessed specifically in relation to the proposed change arising from the proposed Great Island power plant. The evaluation of 'sensitivity to the proposed change' as referred to in the table below takes account of the fact that the proposed change will be located on the site of an existing power plant.

Table 16.1: Evaluation criteria for baseline landscape

Criteria	Importance / Sensitivity to proposed change
• A landscape protected by a regional (structure plan) or national designation • A landscape widely acknowledged for its quality and value • A landscape with distinctive character and low capacity to accommodate the type of change envisaged • A landscape with important features that are rare on a local, regional or national scale	High
• A moderately valued landscape • A landscape that is potentially locally important • A landscape of some quality whose character, landuse, pattern and scale may have the capacity to accommodate a degree of the type of change envisaged • A landscape with important features that are not common on a local, regional or national scale	Medium
• A landscape which is not valued for its scenic quality • A landscape where its character, existing landuse, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change • A landscape with important features that are common on a local, regional or national scale	Low

Table 16.2: Evaluation criteria for baseline visual amenity and viewers

Criteria	Importance / Sensitivity to proposed change
• Viewers with a proprietary interest and prolonged viewing opportunities e.g. residents and recreational users with a specific interest in the landscape • Views from widely recognised and highly important viewpoints e.g. may include recognised viewpoints that appear on maps or in guidebooks, are referred to in literature or art or are provided with facilities to enhance enjoyment of views • Views from amenity routes or landscapes of high value • A view of high quality, as perceived by the viewer A view that is enjoyed by large number of viewers and/or viewers of high sensitivity	High

Criteria	Importance / Sensitivity to proposed change
• Viewers with a moderate interest in their environment e.g. travelling individuals and recreational users other than those detailed above • Views from viewpoints within areas of moderate importance, quality and/or value • A view of medium quality, as perceived by the viewer • A view that is enjoyed by a moderate number of viewers and/or viewers of moderate sensitivity	Medium
• Viewers with a passing interest in their surroundings or whose interest is not specifically focussed on the landscape e.g. people at their place of work • Views from viewpoints within areas of low importance, quality and/or value • A view of low quality, as perceived by the viewer • A view that is enjoyed by a small number of viewers and/or viewers of low sensitivity	Low

Although residents may be particularly sensitive to changes in their visual amenity, most landuse planning regimes consider that public views are of greater value than views from private property. However, if a number of residents are effected, the impact may be considered to be a community impact and therefore may potentially be of greater significance (Landscape Institute and Institute of Environmental Management and Assessment, 2002).

The criteria detailed in Table 16.1 and Table 16.2 have been devised in consideration of the 2002 Guidelines. They act only as a guide. Every project and potential impact is assessed on its own merits using professional judgment and experience.

16.2.4 Impact Assessment Criteria

The types and sources of impacts are set out in Table 16.14: Potential Types and Sources of Impact. The mitigation measures that are defined for any significant impacts are set out in Section 16.4: Mitigation Measures. Each of the potential residual impacts that are identified is evaluated in terms of magnitude and significance in Section 16.6: Residual Impacts Operation phase.

16.2.4.1 Magnitude

The magnitude of change affecting landscape or visual amenity depends on the nature, scale and duration or degree of permanence of the particular change that is envisaged. The magnitude may vary depending on the extent to which the development is visible and therefore may vary with distance from the development, the angle of view and the duration of view. The magnitude of change may also vary depending on the extent to which important changes to landscape features, backdrop or outlooks occur and the degree to which the new development contrasts with the existing view. In the case of designated landscape areas, magnitude is assessed in consideration of the potential for the objectives and integrity of a designated landscape area to be compromised.

The criteria used to assess the different levels of magnitude of impacts on landscape and visual amenity and viewers are set out in Table 16.3 and Table 16.4 respectively.

Table 16.3: Criteria for Assessment of Magnitude of Change in Landscape

Criteria	Magnitude
A clearly evident and frequent or continuous change in key landscape characteristics or components affecting an extensive area	Very large
A clearly evident change either over a restricted area or infrequently perceived or a moderate change in key landscape characteristics or components, frequent or continuous and over a wide area	Large
A moderate change either over a restricted area or infrequently perceived or a small change in key landscape characteristics or components over a wide area.	Medium
A barely or rarely perceptible change in key landscape characteristics or components.	Small
An imperceptible change. Very small area affected	Very small

Table 16.4: Criteria for Assessment of Magnitude of Change on Visual Amenity and Viewers

Criteria	Magnitude
Major changes in view such as those that occur at close distances, changes affecting a substantial part of the view, changes that are continuously visible for a long duration, or changes obstructing a substantial part or important elements of the existing view.	Very large
Clearly perceptible changes in views such as those that occur at intermediate distances, changes resulting in a either a distinct new element in a significant part of the view, or a more wide ranging, less concentrated change across a wider area.	Large
Moderate changes in views, such as those that occur at long distances, changes visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view.	Medium
Changes that are barely visible, such as those that occur at very long distances, or are visible for a very short duration, perhaps at an oblique angle, or which blends with the existing view.	Small
Imperceptible change.	Very small

16.2.4.2 Significance

The significance of an impact is assessed as set out in Table 16.5, in consideration of the combined effect of the importance and / or sensitivity of the landscape or viewer and the magnitude of change expected because of the proposed scheme. Table 16.5 acts as a guide only and each case is assessed on its own merit as factors unique to each specific circumstance need to be considered.

Table 16.5: Criteria for Assessment of Impact Significance

Sensitivity of Landscape / Viewpoint to the proposed change	Magnitude of Change				
	Very Small	Small	Medium	Large	Very Large
Low	Not significant	Low significance	Low significance	Medium significance	Medium or High Significance
Medium	Not significant	Low significance	Medium significance	High significance	High or Very High Significance
High	Not significant	Low significance	Medium or High significance	High or Very High Significance	Very High significance

Landscape and visual impacts may be:

- Positive: a change that improves the quality of the environment (for example, a change that improves landscape diversity or removes an existing negative features); or
- Neutral: a change that does not affect the quality of the environment; or
- Negative: a change that reduces the quality of the environment (for example, an impact on broadleaved woodland of high quality or obstruction of an existing high quality view.

For the purposes of this assessment, impact significance, will be interpreted as being negative unless otherwise stated.

Impacts may also be:

- Direct: relating to physical changes to a receiving landscape as a result of the footprint of the proposal; or
- Indirect: relating to changes in the character of a landscape as a result of the visibility of proposal.

16.3 Baseline Description and evaluation

16.3.1 Policy Framework

The site for the proposed plant is located within the site of the existing Great Island power plant at Great Island, Co. Wexford at the confluence of the Rivers Suir and Barrow. The County Boundary of Kilkenny lies almost immediately west of the site within the Barrow River whilst further south west, lies the County Boundary of Waterford within the Suir River. Relevant Policy from the County Plan for Wexford is tabulated below and relevant policy from both Kilkenny and Waterford County plans are contained in Appendix 16.1 (Baseline Policy). County based Landscape character assessment data, including descriptions of landscape character areas for Counties Wexford and Kilkenny are included in Appendix 16.2 (Landscape Character Areas). Currently no county landscape character data are available for Waterford.

16.3.1.1 Wexford County Development Plan 2007 – 2013

Table 16.6: Policies and Objectives

Section	Details
Objective TRL 1	To protect and conserve those natural, built and cultural features that form the resources on which the County's tourist industry is based.
Policy L1	In assessing developments the Council will have regard to the guidance contained in the Landscape Character Assessment. Proposed developments should reflect the guidance contained in the Landscape Character Assessment and seek to minimise the visual impact, particularly in areas designated as Sensitive and Vulnerable Landscapes.
Coastal Zone Policies	Policy CZ1 The Council shall protect and retain remaining undeveloped coastal areas and areas which are vulnerable and sensitive to inappropriate development from intensive, haphazard, unnecessary housing, tourism and recreation development. Policy CZ2 The Council shall undertake environmentally sensitive coastal protection works and ensure that new development does not exacerbate existing problems of coastal protection or result in altered patterns of erosion, deposition or flooding elsewhere along the coast to the detriment of important habitats or coastal features. Policy CZ3 Prohibit any new building or development including caravans and temporary dwellings within 100m of soft shorelines. Policy CZ4 Ensure that no new habitable structures are permitted below 3 metres (O.D. Malin) in the interests of public safety, the protection of property and residential amenity.

16.3.2 Receiving Landscape Character

County landscape character assessment data was available for both Counties Wexford and Kilkenny to inform this assessment.

The landscape character areas located within the 20 kilometre radius study area are listed in Table 16.7 and Table 16.8 below, together with an assessment of the sensitivity of each landscape character area as abstracted from the county data where available. The assessment of landscape sensitivity in the County Study was undertaken with reference to five categories. These are 1 = degraded, 2 = robust, 3 = normal, 4 = sensitive, 5 = vulnerable. Appendix 16.1 (Baseline Policy) provides further descriptive information on the landscape character areas taken from the County Landscape Character Assessments together with definitions for each of the sensitivity ratings. These are also illustrated in Figure 16.3: Receiving landscape Character – County Landscape Character Assessment.

In the case of each of the units listed below, the sensitivity rating varies within each in accordance with the definitions and methodology for landscape sensitivity assessment set out in the County Landscape Assessment and summarised in Appendix 16.1.

Table 16.7: Wexford County Landscape Character Assessment (Appendix V of County Development Plan)

No.	Main Units	Subdivisions or Landscapes within landscapes	Sensitivity Weighting
1	Uplands		Varies – Refer to Appendix 16.1
2		Uplands – Blackstairs Range	
3	Lowlands		

No.	Main Units	Subdivisions or Landscapes within landscapes	Sensitivity Weighting
4		Lowlands – Barrow River Corridor	
5		Lowlands – South Area	
6	Coasts	Coasts - South Coastal	

The assessment of landscape sensitivity in the Kilkenny County landscape assessment was undertaken with reference to five categories. These are 1 = degraded, 2 = robust, 3 = normal, 4 = sensitive, 5 = vulnerable. Appendix 16.1 provides further descriptive information on the landscape character areas taken from the County Landscape Character Assessments together with definitions for each of the sensitivity ratings.

In the case of each of the units listed below, the sensitivity rating varies within each in accordance with the definitions and methodology for landscape sensitivity assessment set out in the County Landscape Assessment and summarised in Appendix 16.1.

Table 16.8: Kilkenny Landscape Character Assessment

No.	Landscape Character Area	Sensitivity Weighting
I	Barrow Valley	Varies – Refer to Appendix 16.1
D	Brandon Hill	
H	Nore Valley	
E	South Eastern Hills	
G	South Kilkenny Lowlands	
C	South Western Hills	
C2	South Western Hills Southern Transition Zone	
J	Suir Valley	

16.3.2.1 County Waterford

In the absence of a County Landscape Character Assessment for Waterford, broad landscape character areas were identified for the purpose of this assessment and these are listed below and illustrated in Figure 16.3: Receiving Landscape Character – County Landscape Character Assessment.

- Waterford City Urban Character Area
- River Suir Corridor Landscape Character Area
- South Coast and Waterford Harbour Fringe Landscape Character Area
- Waterford Rolling Farmed landscape with occasional Loughs Landscape Character Area

An analysis of the Zone of Theoretical Visibility (ZTV) of the proposal and the above referenced landscape character areas was undertaken. In the case of some of the landscape character areas (LCAs), the impact of the proposal on the character of these landscapes was assessed at the outset to be not significant. A combination of two key factors listed below formed the basis for the scoping out of certain landscape character areas:

- the proposal, being located some considerable distance from the nearest part of a given LCA were assessed to be scarcely visible or visible as a very small element from that LCA

- the proposal, being theoretically visible over a very small proportion of a given LCA, hence only a small proportion of that landscape is expected to afford views of the proposal

On this basis, some of the landscape character areas located within the study area were scoped out of the detailed assessment leaving some landscape character areas for which varying levels of significance are expected to arise. These are listed in Table 16.9 below together with an assessment of their sensitivity to the proposed change.

The assessment of sensitivity to the proposed change takes account of the fact that all of the landscape character areas assessed are currently affected by the existing power plant which, owing to its scale, is visible from many locations as indicated theoretically in Figure 16.1: Zone of theoretical visibility (ZTV) – Existing Great Island Power Plant. In addition, the proposed change will occur on the site of the existing power plant and not on a green field or undeveloped site. Thus, the sensitivity to the proposed change, in each case, is lower, than would be the case if the proposal were sited on an undeveloped site.

Table 16.9: Baseline Evaluation of County Landscape Character

No.	Landscape Character Area	Description of Factors contributing to sensitivity	Importance/ Sensitivity to the proposed change
Wexford			
6	Coasts - South Coastal	The character and high scenic quality of this landscape is very much defined by the coastal influence. The south western part of this area is influenced by Waterford Harbour whilst the southern and eastern part is influenced by the Atlantic ocean and Bannow Bay. Thus the scenic outlook or aspect of these areas is orientated away from the proposed change. A relatively small proportion of the character of this landscape, in the north west, will be influenced by the River Suir. The scenic outlook of these areas is oriented in the direction of the proposed change. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low
3	Lowlands	The more elevated farmland located on the western part of this landscape character area is visually exposed in locations where vegetation screens are absent. This part of this landscape character area comprises farmland whose rural and relatively undeveloped character contributes to the scenic quality of the area. A proportion of this landscape will not be visually exposed to the development owing to the rolling and hilly topography as well as vegetation cover. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low
5	Lowlands - South Area	This area includes the particular mountain landscape associated with Slieve Coltair and surrounding farmland. Parts of this area are visually exposed in the direction of the proposed change, in particular the elevated landscape of Slieve Coltair and the farmed landscape overlooking the River Barrow. The elevated mountain landscape visually screens some of the farmed landscapes further north from the site for the proposed change Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low
4	Lowlands - Barrow River Corridor	This scenic farmed landscape overlooks the River Barrow and is relatively visually exposed in the direction of the river and the site of the existing power plant. Further north of Stokestown, the course of the river	Low

No.	Landscape Character Area	Description of Factors contributing to sensitivity	Importance/ Sensitivity to the proposed change
		changes abruptly and large woodland areas are present. North of Stokestown, The site for the proposed change is visually screened. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	
Kilkenny			
E	South Eastern Hills	Part of this landscape overlooks the River Barrow and is relatively visually exposed in the direction of the proposed change. Further inland, the elevated landscapes in the vicinity of Mullinavat feature large areas of woodland including coniferous forests which will visually screen the proposal from these locations. The topography of the farmed landscapes at lower elevation, comprise clusters of small hills from which limited visibility in the direction of the River Barrow is available. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low
J	Suir Valley	This is a highly scenic landscape whose character is influenced greatly by the Rivers Barrow and Suir. Visually, this landscape is oriented out onto these rivers and, in part, in the direction of the proposed change. Further north of Forestalstown, an abrupt bend in the River Suir together with the presence of woodland at Stokestown, Co. Wexford currently screens views of the site from the river edge north of this location. At Waterford City and west of the city, the urban fabric and the changing course of the River Suir screens views of the site west of this location. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low

16.3.2.2 County Waterford

The *Waterford City Urban Character Area* is not visually exposed to the site owing to the built up nature of this area. Taking this into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.

The *River Suir Corridor Landscape Character Area* is a visually exposed landscape of high scenic quality. Whilst this river landscape in the vicinity of Cheekpoint currently affords views of the site for the proposal, the river landscape further west is screened from view of the site owing to the built up area of Waterford City and the changes in the course of the river. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.

16.3.2.3 Local Landscape Character

In addition to the above County level landscapes, the local landscape immediately surrounding the site for the proposal was examined and two local landscape character areas (LLCAs) were identified for the purpose of the assessment. These are described in Table 16.10 below together with an assessment of their sensitivity to the proposed change. These are also illustrated in Figure 16.4: Receiving Landscape Character – Local Landscape Character Areas (LLCAs).

Table 16.10: Baseline evaluation of Local landscape character areas (LLCAs)

Name	Description	Sensitivity Weighting
Industrialised landscape of Great Island LLCA	This area comprises the site of the existing Great Island power plant. It is a largely developed and degraded landscape which has little landscape value and is visually unattractive. Apart from a large area of woodland to the north, this site features large bulky power plant structures. Owing to the overall low landscape quality and value this area is assessed to be of low sensitivity to the proposed change.	Low
Rivers Suir and Barrow farmed landscapes with settlements LLCA	These areas comprise farmland with some small riverside settlements such as that at Cheekpoint. Much of the area is undeveloped, rural and relatively remote in character. The confluence of the Rivers Suir and Barrow is central to this area and both rivers are key defining elements influencing the character of this area and contributing to scenic quality. The character of this landscape is, however, adversely affected by the presence of the existing Great Island power plant located in the adjacent industrialised landscapes referred to above. The existing power plant is visible from many locations in this area and is often visually prominent. Given the detracting influence of this power plant on landscape character and the fact that the proposed change will occur on the site of the existing power plant, a medium sensitivity to the proposed change is assessed to arise.	Medium

16.3.3 Designated Landscapes and Views

The designated landscapes and views contained within the 20 kilometre study are listed below as follows and illustrated in Figure 16.5 – Landscape Designations:

16.3.3.1 Co. Wexford

- Coastal Zone Policy Area applies to the Hook Peninsula and Bannow Bay Area

16.3.3.2 Co. Kilkenny

- Areas of High Amenity (Map Ref: 6) – Area at Tipperary border bounded by roads nos. 364,363,346,488 and 489
- Area of High Amenity no (Map Ref: 7) – Area bounded to north by N24 and to the south, south east by the River Suir
- Area of High Amenity no (Map Ref: 8) - Barrow / Suir Estuary, between New Ross and Wexford, bordered by rivers and by road no. 674
- Area of High Amenity no (Map Ref: 9) – Barrow – Nore river valley area
- View to be preserved and protected V9 – View to south east over Barrow Valley on the N25, New Ross to Waterford Road
- View to be preserved and protected V21 – Views south west over the River Suir at Grannagh Castle to the Comeraghs
- Views to be preserved and protected V22 – Views over the confluence of Rivers Suir and Barrow at Snow Hill

16.3.3.3 Co. Waterford

- Sensitive Landscapes – small areas in many locations within the study area including Tramore Strand, Dunmore East environs and areas located to the south west of Waterford City
- Visually Vulnerable Areas – Coastlines, river banks, lake shores, headlands and promontories and skylines of upland areas
- Scenic Route SR 14 – From Ballyvoyle Head to Bunmahon via Fennor to Tramore and Waterford City
- Scenic Route SR 15 – From Waterford City to Belle Lake, via Woodstown to Waterford Harbour. North to Passage East, Cheekpoint returning to Waterford City

An analysis of the zone of theoretical visibility (ZTV) of the proposal and the above referenced designated landscapes and views was undertaken. In the case of some of these, the impact of the proposal on the character of these designated landscapes and views were assessed at the outset to be not significant for the reasons stated above in regard to landscape character areas.

On this basis, a number of the designated landscapes and views located within the study area were scoped out of the detailed assessment leaving some designated landscapes and views for which varying levels of significance may arise. In the case of Visually Vulnerable Areas and Scenic Routes in Waterford County which cover an extensive geographic area, sections of these designated sites were selected for assessment based on their location relative to the site for the proposed change. The designated landscapes, scenic routes and views selected for assessment are listed in Table 16.11. Each designated area is assessed in terms of its sensitivity to the proposed change. This takes into account the fact that the proposed change will occur on an already developed site and hence, the sensitivity to the proposed change, in each case, is lower, than would be the case if the proposal were sited on an undeveloped site.

Table 16.11: Baseline Evaluation of Designated Landscapes and Views

Name.	Description of factors contributing to sensitivity	Importance / Sensitivity to the proposed change
Kilkenny		
Area of High Amenity no (Map Ref: 8) - Barrow / Suir Estuary, between New Ross and Wexford, bordered by rivers and by road no. 674	This is a relatively visually exposed area of high scenic quality owing largely to the influence of the River Barrow. Part of this area is visually exposed to the site for the proposal however other areas within this landscape are currently visually screened from the site by vegetation and due to the changing course of the River Barrow and the topography on the County Wexford side of this river Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	Low
Views to be preserved and protected V22 – Views over the confluence of Rivers Suir and Barrow at Snow Hill	This view over the Rivers Barrow and Suir is of high scenic quality and is specifically oriented towards the confluence of the Rivers Suir and Barrow which includes the site for the proposed change. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be medium.	Medium
Waterford		
Sensitive Landscape in the vicinity of	This landscape in the vicinity of the Lough is well wooded	Low

Name.	Description of factors contributing to sensitivity	Importance / Sensitivity to the proposed change
Ballyscanlan Lough	in part. The wooded vegetation screens a large proportion of this area from the site for the proposed change. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be low.	
Visually Vulnerable Landscape at the confluence of the Rivers Suir and Barrow	This visually vulnerable area, located at the edges of the River and Waterford Harbour is of high scenic quality and a proportion of this visually vulnerable landscape overlooks the site for the proposed change. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be medium.	Medium
Scenic Route SR 15 – In the vicinity of Cheekpoint.	A part of this scenic route is visually oriented towards the confluence of the Rivers Suir and Barrow and the site for the proposed change. Taking the above into account and the fact that the proposed change will arise on the site of the existing Great Island power plant, the sensitivity to the proposed change is assessed to be medium.	Medium

16.3.4 Cultural Assets

Impacts on the setting of some of the cultural assets, from which theoretical views of the proposal are expected to be gained, were assessed from a landscape and visual perspective. Sites considered for inclusion in the assessment include the following:

- Sites located within a 2 kilometre radius from the centre of the proposal;
- All National Monuments highlighted in the ZTV from which, theoretical views of a part of the proposal are expected to be gained; and
- Sites, located outside the 2 km radius, identified as being in a visually prominent location on the edges of the Barrow Estuary near to the proposal.

Sites were scoped out of the assessment process based on criteria as follows:

- Sites or structures which are preserved below ground, with limited or no physical appearance above ground were considered to be of minimal sensitivity to the proposed change as the landscape setting of same is largely perceptual rather than physical and visual.
- Sites or structures for which, some surface features are present but are only visually apparent at very short range and to an extent only noticeable by someone with archaeological training. Such sites would not be prominent landmark features, only being visually identifiable (by the trained eye in some cases) at very close range (under 50m).
- Sites or structures located within a built up area are considered to be visually separate from the proposal unless of a prominent and upright nature and where unrestricted views were available towards such features from the surrounding landscape. Similarly, sites or structure situated within a woodland are considered to be visually separated from the proposal.

The remaining sites were assessed for their sensitivity to the proposed change based on the following criteria:

- Site landscape setting.
- Accessibility of each site for public appreciation, either visually or physically.
- Presence of existing detracting elements which adversely affect setting.

Table 16.12 provides details of the sites together with an indication, where applicable, of sensitivity to the proposed change.

Table 16.12: Baseline Evaluation of Cultural Assets

Name.	Description of factors contributing to sensitivity	Importance / Sensitivity to the proposed change
Structures located within a 2 km radius distance from the proposal		
Archaeological Complex including two castles near Great Island, Co. Wexford – WX039-028001 to 028005	According to the zone of theoretical visibility, views of the proposal will be gained from this site. In reality this will not be the case as currently the mature vegetation along the rail corridor boundary will visually separate some of this area from the proposed change. There are however locations in the immediate surrounding landscape where this site may be visible in combination with the proposed change and also the existing power plant which currently affects the setting of this site.	Low
A moated site within the townland of Great Island, Co. Wexford WX039 - 019	The moated site features mature hedgerow vegetation similar to that present on the field boundaries of the wider landscape in this area. The moated site structures are not visually prominent elements in the wider landscape.	Scoped out of the assessment
Monuments associated with the monastic site of Kilmokea, Co. Wexford. WX039-018001 - 018009	According to the zone of theoretical visibility, views of the proposal will not be gained from a large part of this site. Mature vegetation on the boundaries of this site will visually separate this site from the proposal. There are however locations in the immediate surrounding landscape where this site may be visible in combination with the proposed change and also the existing power plant which currently affects the setting of this site.	Low
Unclassified enclosure in the townland of Kilmannock WX039-072	This is not a visually prominent feature visible from the wider landscape. Mature hedgerow vegetation marks the location of this site and is similar to the field boundary vegetation in the surrounding area.	Scoped out of the assessment
Unclassified enclosure in the townland of Kilmannock WX039-077	This is not a visually prominent feature visible from the wider landscape. Mature hedgerow vegetation marks the location of this site and is similar to the field boundary vegetation in the surrounding area.	Scoped out of the assessment
National Monuments		
Dunbrody Abbey WX039-030001-	The ruins of this Cistercian Abbey are a complex of structures of varying height and scale which are visible from the surrounding local landscape. Because of its visibility, this monument and its setting is assessed to be an important feature that makes a contribution to the character of the local landscape in this area. The site is accessible to the public as a visitor attraction. The setting of this site from a landscape and visual amenity perspective is considered to be already affected by the existing Great Island power plant.	Medium
Sites, located outside the 2km radius, identified by the heritage specialist as being potentially relevant to the landscape and visual assessment.		
RMPs located in upland areas in Co. Kilkenny and Co. Wexford and a site of a possible enclosure south of Cheekpoint, Co. Waterford.	These sites have been scoped out of the assessment. The sites, being located more than 2km from the proposal are, because of their distance, considered to be less sensitive to the proposed change than the sites located nearer to the proposal. In addition, the landscape settings of these sites is already affected by the presence of the existing Great Island power plant structures which are of a much greater scale and will be more visually conspicuous in the landscape than the proposed Great Island power plant.	Scoped out of the assessment

16.3.5 Visual Amenity and Viewers

15 key representative viewpoints have been selected within the zone of theoretical visibility associated with the scheme. The viewpoints have been selected to represent the range of locations, distances and directions from which people will see elements of the proposed scheme and also the range of viewer types that exist including recreational users (R), residents (H) and those engaged in travel (T). Table 16.13 details the location of each viewpoint, the viewer type most likely associated with each viewpoint, a description of the components in the existing view and the viewpoint sensitivity. In many cases, the viewpoint sensitivity is assessed to be high and reflects, in part, the quality of the existing view. However, in some locations the quality of the existing view is assessed to be medium or low. This assessment takes account of the fact that the existing Great Island power plant is clearly visible in these views, albeit recognising that the degree of visual prominence varies with each view.

Table 16.13: Viewpoint Locations – Baseline Evaluation

ID	Location	Easting	Northing	Elevation in metres	Distance in Km	Viewer Type	Components in the existing view	Sensitivity of the viewpoint to the proposed change
1	Near confluence of Rivers Barrow and Suir, Co. Kilkenny.	267275	114105	23	1.27	H-Few	Scrub vegetation in the foreground. Confluence of Rivers Suir and Barrow. Stacks and buildings associated with the Great Island Power Plant are prominent elements in the view. Power lines.	Medium
2	Settlement of Ballinlaw on Western edge of River Barrow,. Co. Kilkenny.	266210	1117051	59.6	3.07	H-Few R-Mod	Pastoral farmland in the foreground. Deciduous scrub vegetation. Confluence of Rivers Suir and Barrow. Rail bridge crossing. Stacks and buildings associated with the Great Island Power Plant occupy a central and prominent position in the view. Pylons and power lines are also visible above the line of mature woodland.	Medium
3	Western Edge of River Barrow, north of Cheekpoint, Co. Kilkenny.	267262	118373	7.3	3.6	H-Few R-Mod	River Barrow. Rolling farmed landscape between Fisherstown and Loughtown. Hedgerows. Scattered trees and tree groups. Stacks associated with the existing Great Island Power Plant are small but prominent elements in the view. .	Medium
4	Settlement of Rathnure	266587	120465	83.5	5.8	H-Mod	Scrub vegetation and farmland in foreground. River Barrow. Wexford landscape including Slieve Coltair (in good visibility). Stacks associated with the existing Great Island Power Plant are barely visible in the distance.	High
5	Settlement of Ballycurrin, west of New Ross	266366	126800	140	11.9	H-Few	Rolling Farmed landscape. River Barrow and mature wooded vegetation. Stacks associated with the existing Great Island Power Plant are visible as very small elements which are almost imperceptible from this location.	High
6	Cheekpoint, Co Waterford	268611	113758	5.1	0.7	H-Few R-Mod	Harbour and confluence of the Rivers Suir and Barrow. The existing Great Island Power plant is present as a dominant and sizable entity in the existing view and detracts greatly from the view quality.	Low
7	Settlement of Parkswood on R683 Road Route	269249	110496	45.3	3.9	H-Few R-Many	Wooded vegetation in foreground. River Suir. The stacks of the existing Great Island Power Plant are clearly visible and occupy a prominent location in the view.	Medium

ID	Location	Easting	Northing	Elevation in metres	Distance in Km	Viewer Type	Components in the existing view	Sensitivity of the viewpoint to the proposed change
8	Hook Head	273990	98772	14.5	16.5	R-Many H-Mod	Relatively flat farmland in the foreground. Waterford Harbour in far distance. Creadan Head. Stacks associated with the existing Great Island Power Plant are visible but overall difficult to see from this location.	High
9	Near settlement of Arthurstown	272613	112188	70	4.1	H-Mod	Wooded farmed landscape with scattered dwellings. Landscape associated with Cheekpoint in far distance. Stacks associated with the existing Great Island power plant are barely visible in part.	High
10	Dunbrody Abbey	271282	115054	9.4	2.08	R-Many	Rolling farmed landscape. Woodland. Dunbrody Abbey in the foreground. The stacks and some of the buildings associated with the Great Island power plant are clearly visible as prominent elements in this view.	Medium
11	Great Island	268506	115091	15	0.1	H-Few	Access road. Dwelling. Woodland vegetation. Stacks associated with the existing Great Island power plant are visible as prominent and somewhat overbearing elements in the view.	Low
12	Viewing point on Slieve Coltair	272859	120526	0.19	6.6	R-Many	Large expanse of landscape of County Wexford and Waterford and Kilkenny beyond River Barrow. Existing Great Island Power Plant is barely visible from this location.	High
13	River Suir shoreline near Ballyhack	270159	112831	2.15	1.9	H-Few R-Mod	River landscape with mature vegetation. Cheekpoint. The existing Great Island Power Plant is clearly visible as a prominent element in the view.	Medium
14	Williamstown Park (residential estate) East of Waterford City	261872	110407	56	7.8	H-Many	Dwellings and streetscapes. Street lighting. Buildings and structures in far distance. Rolling farmland in the background. Stacks associated with the Great Island Power plant in the background.	Medium
15	Burntschool Crossroads	271151	118016	49	3.6	H-Few W-Mod	Managed boundary roadside hedgerow. Mature Tree. Stacks associated with the existing Great Island power plant are just visible above the line of the hedgerow.	High

An indication of the viewer type and likely number of viewers who may be affected at each viewpoint is provided in the table with reference to the following broad definitions.

Viewer Type: H = Residential, R = Recreational, T = Road Users, W = Workers

Viewer numbers: Many > 50, Mod = 15-50, Few = 0-15

Potential types and sources of impact associated with the proposed scheme are set out in Table 16.14.

Table 16.14: Potential Types and Sources of Impact

Project Phase.	Potential Impact Type	Potential Impact Source
Construction	Direct physical changes to local landscape or visual amenity	Installation of security fencing and access control and signage. Construction laydown area measuring 2.26ha Construction equipment, plant and machinery Site survey and geotechnical investigation work. Relocation or removal of existing structures to facilitate new plant installation Site preparation, including levelling and grading. Construction of proposed power plant buildings and structures.
	Indirect changes to the character of a local landscape or visual amenity	Above mentioned structures and activity, where visible in the wider landscape, will indirectly affect the character of that landscape.
Operation	Direct physical changes arising from: The introduction of new structures into the receiving landscape Loss of landscape elements, including permanent land loss and loss of built elements or vegetation Changes in physical topography	Structures, footprint and lighting associated with the proposed scheme. Ancillary gas installation works. Earthworks, specifically changes arising from modification of tank bunds associated with the distillate oil storage area.
	Indirect changes to the character of a local landscape or visual amenity	Above mentioned structures and activity, where visible in the wider landscape, will indirectly affect the character of that landscape.

16.4 Mitigation Measures

16.4.1 Construction

The following mitigation measures will be applied throughout the construction phase to minimise the potential for landscape and visual impacts:

- Fencing will be erected around the construction site
- Fencing will be erected to protect vegetation to be retained, where required, including the area around the construction laydown area during the construction period in accordance with best practice as detailed in BS 5837 2005 (Trees in relation to construction)
- Materials and machinery shall be stored tidily behind fencing within the construction area during the works
- Portable machinery shall be stored behind fencing in compounds when not in use

- Roads providing access to site compounds and work areas shall be maintained free of excessive dust and mud as far as is reasonably practical
- Lighting of compounds and work sites shall be restricted to agreed working hours and that which is necessary for security and safety
- Temporary fencing, barriers, traffic management and signage shall be removed when no longer required
- On completion of construction, all remaining spoil and construction material shall be removed
- Worksites and other land occupied on a temporary basis will be fully reinstated
- A Construction Environmental Management Plan (CEMP) containing details of the mitigation measures will be implemented

The assessment of residual construction impacts detailed in Section 12.6 assumes that the mitigation measures described in this section are implemented.

16.4.2 Operation

The proposed scheme design has a number of features integral to the design which will contribute to the mitigation of landscape and visual impacts.

- The proposed power plant is to be sited within the boundary of the existing power plant. This is an already developed site and hence landscape losses in terms of undeveloped land or vegetation will be kept to a minimum. There will, however, be a requirement to clear an area of woodland measuring 2.26 hectares to facilitate the construction laydown area
- The proposed power plant, located within and adjacent to existing power plant structures will be viewed in association with the existing plant. As a result, the impact on landscape character and visual amenity will be less than would be the case if the proposal were sited on a greenfield site
- The engineering design has sought to minimise the height of the proposed stack in order to minimise the extent of potential indirect landscape and visual impacts
- The colour finish to be applied to the principal structures has been selected to minimise visual impact. In pursuing this, the colour of the existing power plant was taken into account. In addition, a horizontal band detail, applied in a slightly contrasting colour to that used on the main power plant, will be applied to the larger structures. This will visually enhance the proposal by breaking up the overall mass of the larger structures associated with the power plant

Additional mitigation measures in the form of proposed planting to replace that removed in the construction laydown area are illustrated in Figure 16.6: Landscape Mitigation.

16.5 Residual Impacts: Construction Phase

Construction activities associated with the proposed development are expected to last for approximately 30 months. Structures and activities which will be the main sources of construction impacts are outlined above in Table 16.14: Potential Types and Sources of Impact. The scale of the construction activity is likely to vary over the 30 month period. There will be periods of time for which intensive construction activities are likely to take place and elements such as tall cranes and other moving plant and machinery together with construction vehicles will be clearly visible from locations in the receiving landscape. During these periods, the magnitude of change on the character of the receiving landscape and on viewers at the viewpoints is likely to be greater than in the operating phase. There will be other periods during the construction phase for which very little visible construction activity may be taking place. Thus, the significance of impact on the receiving landscape character and on viewers at the viewpoint locations is likely to vary during the 30 month period overall.

The assessment of construction impacts assumes that the construction mitigation measures referred to above are implemented.

16.5.1 Impacts on Landscape character

Impacts on the receiving landscape character areas outlined in the County Landscape Character Assessments referenced above are discussed below. Significant impacts are expected to arise on some of these landscape character areas whilst for others; construction impacts are assessed to be not significant.

16.5.1.1 County Wexford

Four of the landscape character areas located in this county are assessed to be of low sensitivity to the proposed change. Construction activities and plant and machinery will be visible from locations within these landscapes on occasions during the 30 month period. In the case of Coasts – South Coastal and Lowlands – Barrow River Corridor, the magnitude of change is assessed to reach a maximum range of medium. Thus a low impact significance is assessed to arise. In the case of Lowlands – South Area, the magnitude of change is assessed to be small and an impact of low significance is assessed to arise. In the case of Lowlands, the impact will be not significant.

16.5.1.2 County Kilkenny

Both the Kilkenny South Eastern Hills and the Suir Valley landscape character areas are assessed to have a low sensitivity to the proposed change. Construction activities will be visible on occasions from locations within this area although because of distance from the proposal these will be seen as small elements. The magnitude of change is assessed to be small resulting in an impact of low significance.

16.5.1.3 County Waterford

Both the Waterford City Urban Character Area and the River Suir Corridor Landscape character Area are assessed to have a low sensitivity to the proposed change. Construction activities will be clearly visible on occasions from locations within the River Suir Corridor, however these, where visible, will usually be seen as very small elements in the wider landscape and in fact will not be visible at all from the western part of this landscape. The magnitude of change on this landscape character area is assessed to be very small resulting in an impact of low significance. A very small magnitude of change is assessed to arise in the Waterford City Urban Character Area, owing to its distance from the proposal. An impact that is not significant is assessed to arise.

16.5.2 Visual Impacts

Visual impacts will arise due to the construction activities described in Table 16.14. Visual impacts during the construction phase will be derived from the presence of construction plant and machinery including tall structures, for example, cranes together with moving plant, machinery and construction vehicles. Changes, in terms of the removal of existing power plant structures and the introduction of new structures will also be sources of temporary visual impacts.

Significant visual impacts are likely to arise at viewpoints 1, 2, 6, 7, 10, 11 and 13. There will be periods during the construction phase where visual impact significance will be greater than that assessed for the operating phase at some of these viewpoints. This reflects the periods during which construction activities are likely to be more visible, owing to the presence of tall cranes and moving plant and machinery, than the operating phase of the plant and hence a greater magnitude of change is assessed to arise in the proposed view. In the case of viewpoint 11, views of the construction traffic entering and leaving the site will be available at intervals. A small to medium magnitude of change is assessed to arise at this viewpoint of low sensitivity resulting in an impact of low significance. In the case of viewpoint 6, the construction machinery and activities will be visible at short range, however the magnitude of change is assessed to be large and the impact significance is medium as reported for the operating phase. At viewpoint 1, the construction plant and activities will be clearly visible on occasions however the magnitude of change and significance of the impact is assessed to be the same as for the operating phase. This takes account of the presence of the existing power plant which will continue to be visually dominant. The significance of the visual impact for the remainder of the viewpoints; 2, 7, 10 and 13 is assessed to be the same as that assessed for the operating phase although this will be for a short term period.

16.6 Residual Impacts: Operational Phase

Residual impacts on landscape character and visual amenity will arise as a result of the proposal. The significance of the impact takes account of the fact that the proposed change will arise on the site of an existing power plant. The structures associated with this existing plant are notably larger in size, for example, the stacks associated with the existing Great Island power plant are both 137 metres approximately in height whilst the proposed main stack is 60 metres.

Thus the existing power plant is expected to be more visually dominant than that proposed.

Given that some of the landscape and visual mitigation measures are embedded in the design of the power plant, the assessment of impacts takes into account these measures which will be implemented at construction stage.

16.6.1 Impacts on Landscape Character

The impact of the proposal on the receiving landscape character areas was assessed. This assessment was undertaken with reference to the county landscape character areas for Wexford and Kilkenny available from County Development plans and landscape character areas derived for this assessment for County Waterford as listed in Table 16.9 and cited in Section 16.3.2.2.

16.6.1.1 Wexford Coasts – South Coastal Area

Direct impacts will arise in this landscape character area as a result of the loss of an area of existing woodland located within the existing power plant site;

Permanent and direct impacts will arise from the physical introduction of new structures associated with the power plant. Indirect effects will also arise in this landscape because of the visibility of the scheme. The most visually prominent elements of the scheme include the following listed below in Table 16.15 together with dimensions.

Table 16.15: Visually prominent structures

Name	Length (m)	Width (m)	Height (m)
Turbine Building	69.2	36.5	22.66
Heat Recovery Steam Generator	31.0	26.4	30.88
Electrical / Control Building	43.7	20.1	13.09
Main Stack		6.0 (I.D)	60
Auxiliary Boiler Building	18.7	14.7	16
Auxiliary Stack	-	-	30
Demineralised Water Storage Tanks		20 (I.D)	20.5
Water Treatment Plant	25.6	20.5	7.35
Acid and Alkali Storage Tanks	16	4	3.5
Gas Fuel Treatment Building	25.6	8.6	4.0

Views of the proposal, in particular the stacks and larger scale structures will be clearly gained at relatively short range along the edges of the River Suir in the vicinity of Arthurstown, Ballyhack and Campile. Further south, views of the proposal will be gained from very small parts of this landscape character area at Broomhill and Hook Head. The areas theoretically affected represent a very small proportion of the overall landscape character area as illustrated in Figure 16.2: Zone Of Theoretical Visibility, Proposed Great Island Power Plant and Viewpoint Locations. Actual visibility will be less than that illustrated owing to the screening effect of vegetation. The farmed landscape pattern in this area features many mature hedgerows.

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.2 Wexford Lowlands

Very small patches of this farmed landscape in the northern and western part of this character area are likely to afford views of the proposal. Much of this landscape character area will be unaffected by the proposal. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 2.2 kilometres. At this distance, the proposal is likely to be seen as relatively small elements in the wider landscape and read as part of the existing baseline.

An overall very small magnitude of change is assessed to arise to this landscape character area of low sensitivity resulting in an impact that is not significant. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.3 Wexford Lowlands – South Area

Views of the proposal will be gained from a relatively small proportion of this landscape according to the zone of theoretical visibility. The presence of woodland and hedgerow cover will mean that the proposal will be visible over a considerably smaller area than indicated in Figure 16.2. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 2 kilometres. At this distance, the proposal is likely to be seen as small to medium elements in the wider landscape. The main areas of visibility will be confined to a small proportion of the overall landscape character area and this includes the summit of Slieve Coltair and farmland located to the south west of this mountain, near to the river.

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.4 Wexford Lowlands – Barrow River Corridor

Views of the proposal will be gained from the southern part of this landscape according to the zone of theoretical visibility. The presence of woodland and hedgerow cover will mean that the proposal will be visible over a considerably smaller area than indicated in Figure 16.2 except near the water's edge where no vegetation screens are present. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 100 metres. At approximately this distance, the proposal is likely to be seen as large elements in the wider landscape however further north, they will appear smaller. The main areas of visibility are confined mostly to the immediate farmed shoreline and include the townlands of Loughtown, Fisherstown and Killowen.

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.5 Kilkenny, South Eastern Hills

Views of the proposal will be gained from a relatively small proportion of this landscape according to the zone of theoretical visibility. The presence of woodland and hedgerow cover will mean that the proposal will be visible over a considerably smaller area than indicated in Figure 16.2. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 800 metres. At this distance, the proposal is likely to be seen as large elements in the wider landscape. Further afield the proposal, where visible, will usually be seen as small or very small elements. The main areas of visibility will be confined to a small proportion of the overall landscape character area near the rivers Barrow and Suir.

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.6 Kilkenny Suir Valley

Views of the proposal will be gained from a very small proportion of this landscape according to the zone of theoretical visibility. The presence of woodland and hedgerow cover will mean that the proposal will be visible over a considerably smaller area than indicated in Figure 16.2. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 500 metres. At this distance, the proposal is likely to be seen as large elements in the wider landscape. Further afield the proposal, where visible, will be seen as small or very small elements. The main areas of visibility extend from Rochestown southwards to the rail bridge (Waterford to Wexford Line) and west as far as Gorteens.

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.7 Waterford City Urban Character Area

Most of the urban area will be visually screened from the proposal owing to the built up nature of this area.

An overall very small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact that is not significant.

16.6.1.8 River Suir Corridor Landscape Character Area

Views of the proposal will be gained from a relatively small proportion of this landscape and the main areas include the riverside landscape between Cheekpoint and Little Island. The distance from the nearest point in this character area to the nearest point of the site for the proposal is approximately 600 metres. At this distance, the proposal is likely to be clearly seen in the wider landscape. Further afield the proposal, where visible, will usually be seen as small or very small elements

An overall small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant and that the proposal will be theoretically visible over a smaller area within this landscape character area compared with the existing power plant.

16.6.1.9 Impacts on Local Landscape Character

Impacts on local landscape character are outlined below with reference to the local landscape character areas identified as follows

Industrialised landscape of Great Island LLCA

This landscape will be directly affected as a result of the introduction of the proposed structures. Impacts on the character of this landscape will also arise from the presence and visibility of the proposal. The proposal will be visually screened, either fully or in part, by the existing power plant facilities from a large proportion of this landscape. The existing power plant occupies a large proportion of this area and will continue to be visually dominant. A small magnitude of change is assessed to arise in this landscape of low sensitivity resulting in a low impact. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant

Rivers Suir and Barrow farmed landscapes with settlements LLCA

Views of the proposal will be gained from a relatively large proportion of this landscape. In some locations these will be seen as relatively small elements and in places located nearer to the proposal, they will be seen as large elements in the wider landscape setting. An overall medium magnitude of change is assessed to arise in this landscape of medium sensitivity resulting in a moderate impact. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant

16.6.2 Impacts on Designated Landscapes and Views

16.6.2.1 Area of High Amenity no (Map Ref: 8) - Barrow / Suir Estuary, between New Ross and Wexford, bordered by rivers and by road no. 674, Co Kilkenny

A continuous stretch of the river edge landscape will be affected by the proposal from Gorteens as far north as Ringville. Further north, isolated patches of this landscape will afford views of the proposal but in many areas, views will not be available owing to the screening provided by the topography of the Wexford farmland on the eastern side of the River Barrow.

An overall medium magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant.

16.6.2.2 Views to be preserved and protected V22 – Views over the confluence of Rivers Suir and Barrow at Snow Hill, Co. Kilkenny

According to the zone of theoretical visibility, less than half of the length of this view is likely to afford views of the proposal. Where visible, a medium magnitude of change could be experienced by the viewer.

An overall medium magnitude of change is assessed to arise to this view of medium sensitivity resulting in an impact of medium significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant.

16.6.2.3 Sensitive Landscape in the vicinity of Ballyscanlan Lough, Co Waterford

This area is located far from the proposal. Viewing opportunities are not widely available in this area owing to the presence of vegetation cover and in locations where the proposal is visible; they will be seen as very small elements in the landscape.

An overall very small magnitude of change is assessed to arise to this landscape of low sensitivity resulting in an impact that is not significant. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant.

16.6.2.4 Visually Vulnerable Landscape at the confluence of the Rivers Suir and Barrow

Much of this visually vulnerable landscape at the confluence of the rivers will be affected by the proposed change. A small section of the river edge landscape between Cheekpoint and Passage East will be visually screened from the proposal owing to the course of the river and the topography in this location. An overall medium magnitude of change is assessed to arise at this landscape of medium sensitivity resulting in an impact of medium significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant.

16.6.2.5 Scenic Route SR 15 – In the vicinity of Cheekpoint, Co Waterford

Views of the proposal will be gained from this scenic route in the vicinity of Passage East. In these locations the proposal will usually be clearly visible and in some cases quite prominent.

Taking into consideration, the scenic route as a whole, an overall small magnitude of change is assessed to arise to this scenic route of medium sensitivity resulting in an impact of low significance. The magnitude of change takes account of the fact that the scale of the proposal is smaller than the existing power plant.

16.6.3 Impacts on Cultural Assets

16.6.3.1 Archaeological Complex including two castles near Great Island

The landscape setting of this site is already adversely affected by the existing Great Island power plant and by a series of power lines which cross this area. There may be locations in the immediate surroundings west of the site from which both this site and the proposal will be visible. The existing power plant will be more visually dominant owing to its size.

A very small magnitude of change is assessed to arise on the setting of this monument of low sensitivity resulting in an impact that is not significant. This takes account of the fact that the existing Great Island power plant is much larger in scale than the proposed power plant.

16.6.3.2 Monuments associated with the monastic site of Kilmokea

The landscape setting of this site is already adversely affected by the existing Great Island power plant. In locations where the landscape setting of this monument may be appreciated by viewers, the proposal may also be visible in association with the existing larger scale power plant.

A very small magnitude of change is assessed to arise on the setting of this monument of low sensitivity resulting in an impact that is not significant. This takes account of the fact that the existing Great Island power plant is much larger in scale than the proposed power plant.

16.6.3.3 Dunbrody Abbey

The proposed power plant will be visible from this site and its immediate environs. The proposal will be seen in close association with the structures of the existing Great island power plant which is much larger in scale. The viewer's appreciation of this site is thus already adversely affected by the presence of the existing power plant.

A small magnitude of change is assessed to arise on the setting of this monument of medium sensitivity resulting in an impact that is of low significance. This takes account of the fact that the existing Great Island power plant is much larger in scale than the proposed power plant.

16.6.4 Visual Impacts

16.6.4.1 Great Island Proposed Power Plant Visibility

The proposal will be seen by those living, visiting, working and travelling around in the receiving landscape. The main areas where views of the proposal will be gained are listed as follows:

- Farmed landscapes along the margins of the River Barrow in Co. Kilkenny and Co. Wexford from the Barrow Rail bridge up to Fisherstown, Co Wexford and Rochestown Co. Kilkenny. Further north along the river, views of the proposal may be gained from isolated patches of farmland located further back from the river edge in more elevated locations;

- Farmed landscapes along the River Suir, specifically that located between Great Island and Ballyhack in Co Wexford and that located between Cheekpoint and Passage East in Co. Waterford;

- Farmed landscapes along the edges of the River Suir in Counties Kilkenny and Waterford from the confluence of the Rivers Suir and Barrow to Waterford City.

- Very small isolated elevated areas within and west of Waterford City. Much of the urban area itself will be screened from view of the proposal;

- Isolated elevated locations in Kilkenny, for example, the townland of Ballycurrin and on part of the R704 road route approaching New Ross;

- Isolated elevated locations in Wexford such as the summit of Slieve Coltair and at Hook Head;

16.6.4.2 Operational Visual Impacts at Fixed Viewpoint Locations

The adverse impact on each viewpoint was assessed taking into account the sensitivity of the viewpoint, the magnitude of change in the view and the resulting significance of impact. The results are presented in Table 16.16: Operational Visual Impacts at Fixed Viewpoint Locations. The assessment was assisted by the preparation of photomontage images of the development for seven of the viewpoint locations. These are viewpoints 2, 6, 7, 10, 11, 12 and 15 and are illustrated in Figures 16.7a – 16.7g.

It must be appreciated that photomontages by their nature give a restricted and artificial view, and the real effect can only be seen by experiencing the view in person. The illustrations do not therefore provide an exact replication of future views, but the proposal is shown to scale to give an idea of the size of the structures and their effect on the view. In assessing visual impacts, consideration is given to the effect of light and weather conditions on visibility, and the variation in the view around the exact position of the photograph.

Visual impacts of a very high or high significance are not assessed to arise at any of the viewpoint locations.

Visual impacts of a medium significance are assessed to arise at viewpoints 1 and 6. In the case of viewpoint 1, the sensitivity of the viewpoint is assessed to be medium and this reflects the detracting elements in this view, namely the existing power plant which is relatively prominent in the view together with power lines and the somewhat run down quality of the immediate landscape in the foreground. The viewer's sensitivity to the proposed change at this location also takes account of the fact that the proposal will be located on the site of an existing power plant site. A medium magnitude of change is assessed to arise and this is based on the expected partial visibility of the proposal at short range above the line of existing vegetation in association with the existing power plant.

Viewpoint 6 is assessed to be of low sensitivity to the proposed change. The low sensitivity assessment takes account of the fact that the existing Great Island power plant is a particularly dominant element which occupies a large proportion of the view and adversely affects the quality of the existing view. The viewer's sensitivity to the proposed change at this location also takes account of the fact that the proposal will be located on the site of the existing power plant site. A large magnitude of change is assessed to arise as a result of the proposal which will extend westwards along the river margin. The structures associated with the proposal will be dominant elements in the view. They will, however, be seen in association with the existing power plant which is even larger and will remain the most dominant element in the view. An impact of medium significance is assessed to arise.

Visual impacts of a low significance are assessed to arise at viewpoints 2, 7, 10 and 13. Each of the viewpoints is assessed to have a medium sensitivity to the proposed change. This takes account of the visibility of the existing power plant as a detracting element which adversely affects the quality of the existing view. The viewer's sensitivity to the proposed change at this location also takes account of the fact that the proposal will be located on the site of an existing power plant site. The magnitude of change at each viewpoint is assessed to be small. This reflects in part the distance of the viewer from the proposal and the scale of the proposal that will be seen as smaller elements in the view compared with the existing Great Island power plant.

Visual impacts that are not significant are assessed to arise at the remaining viewpoint locations. In the case of viewpoints 4, 5, 8, 9, 12 and 15, the sensitivity of the view is assessed to be high and this reflects largely the quality of the existing view together with the viewer type. The existing Great Island power plant is barely visible as a very small element from these viewpoints and visibility would be dependant on weather conditions. For this reason, the existing plant is not considered to detract from the quality of the existing view and hence the high sensitivity to the proposed change is assessed to arise. The magnitude of change in each view is assessed to be very small and this reflects the distance from the viewpoint to the proposed change together with the scale of the proposal which will be seen as smaller elements in the view compared with the existing power plant. In the case of viewpoint 35, the proposal will be screened from view by existing vegetation.

In the case of viewpoints 3 and 14, a medium sensitivity to the proposed change is assessed to arise. This takes account of the existing Great Island power plant as small but noticeable elements which detract from the quality of the view. The magnitude of change in each view is assessed to be very small and this reflects the distance from the viewpoint to the proposed change together with the scale of the proposal when compared with the existing plant. In weather conditions that give rise to poor visibility, the existing Great Island power plant and the proposed changes may not be visible at all from these locations.

In the case of viewpoint 11, the sensitivity of the viewpoint is assessed to be low and this reflects the presence of the existing power plant stacks as large and visually dominant elements which detract from the quality of the view. The magnitude of change is ranked as very small. In fact the proposed change will be screened from view by existing vegetation.

Table 16.16: Operational Visual Impacts at Fixed Viewpoint Locations

ID	Location	Proposed View	Sensitivity of Viewpoint to Proposed Change	Magnitude of Change	Significance of Impact
1	Near confluence of Rivers Barrow and Suir, Co. Kilkenny.	The proposed stack and parts of the proposed buildings and structures will be visible at short range in association with the existing power plant. The structures will be visible above the line of existing vegetation.	Medium	Medium	Medium
2	Settlement of Ballinlaw on Western edge of River Barrow, Co. Kilkenny.	The proposed stack and parts of the proposed buildings and structures will be visible as small elements in association with the existing power plant. The proposal will be clearly visible from a more elevated location.	Medium	Small	Low
3	Western Edge of River Barrow, north of Cheekpoint, Co. Kilkenny.	The upper portion of the proposed stack will be visible as very small elements behind rolling hills in the Wexford riverine landscape in association with the existing power plant.	Medium	Very Small	Not Significant
4	Settlement of Rathnure	The upper portion of the proposed stack will be visible as very small elements in association with the existing power plant.	High	Very Small	Not Significant
5	Settlement of Ballycurrin, west of New Ross	The upper portion of the proposed stack will be visible from an elevated location as a very small element in the wider landscape setting in association with the existing Great Island Power Plant. Visibility will be dependant on weather conditions.	High	Very Small	Not Significant
6	Cheekpoint, Co Waterford	The proposed stack, buildings and structures will be clearly visible at short range in association with the existing Great Island Power Plant.	Low	large	Medium
7	Settlement of Parkswood on R683 Road Route	The proposed stack and some of the proposed buildings and structures will be clearly visible in the wider landscape in association with the existing Great Island Power Plant.	Medium	Small	Low
8	Hook Head	The proposal will be barely visible and visibility will be dependant on weather conditions.	High	Very Small	Not Significant
9	Near settlement of Arthurstown	The tips of the proposed stack will be visible above the line of existing mature vegetation in association with the existing Great Island Power Plant.	High	Very Small	Not Significant

ID	Location	Proposed View	Sensitivity of Viewpoint to Proposed Change	Magnitude of Change	Significance of Impact
10	Dunbrody Abbey	The stack and parts of some of the proposed structures will be clearly visible as small elements in association with the existing Great Island Power Plant.	Medium	Small	Low
11	Great Island	The proposal will be screened from view by existing vegetation.	Low	Very Small	Not Significant
12	Viewing point on Slieve Coltair	The proposed power plant will be barely visible as a very small element in association with the existing Great Island Power Plant. Visibility will be dependant on weather conditions.	High	Very Small	Not Significant
13	River Suir shoreline near Ballyhack	The proposed power plant stack, buildings and structures will be clearly visible as relatively small elements in association with the existing Great Island power plant.	Medium	Small	Low
14	Williamstown Park (residential estate) East of Waterford City	The proposed stack will be visible as a small element in association with the existing urban fabric and the existing Great Island Power Plant stacks in the distance.	Medium	Very Small	Not Significant
15	Burntschool Crossroads	The proposal is expected to be screened from view from this location by existing vegetation.	High	Very Small	Not Significant

16.6.4.3 Summary of Landscape Impacts

Impacts on landscape character, designated landscapes and cultural assets are summarised below in Table 16.17.

Table 16.17: Summary of Impacts

No.	Landscape Character Area / Local Landscape Character Area / Designated Landscape / Cultural Asset	Importance/ Sensitivity to the Proposed Change	Magnitude of Change	Significance of impact
Landscape Character				
Landscape Character Areas, Co. Wexford				
6	Coasts - South Coastal	Low	Small	Low
3	Lowlands	Low	Very Small	Not Significant
5	Lowlands - South Area	Low	Small	Low
4	Lowlands -Barrow River Corridor	Low	Small	Low
Landscape Character Areas, Co. Kilkenny				
E	South Eastern Hills	Low	Small	Low
J	Suir Valley	Low	Small	Low
Landscape Character Areas, Co. Waterford				
1	Waterford City urban Character Area	Low	Very Small	Not Significant
2	River Suir Corridor Landscape Character Area	Low	Small	Low
Local Landscape Character Areas (LLCAs)				
	Industrialised landscape of Great Island LLCA	Low	Small	Low
	Rivers Suir and Barrow farmed landscapes with settlements LLCA	Medium	Medium	Medium
Designated Landscapes				
Designated Landscapes, Co. Kilkenny				
	Area of High Amenity no (Map Ref: 8) - Barrow / Suir Estuary, between New Ross and Wexford, bordered by rivers and by road no. 674	Low	Medium	Low
	Views to be preserved and protected V22 – Views over the confluence of Rivers Suir and Barrow at Snow Hill	Medium	Medium	Medium
Designated Landscapes, Co. Waterford				
	Sensitive Landscape in the vicinity of Ballyscanlan Lough	Low	Medium	Medium
	Visually Vulnerable Landscape at the confluence of the Rivers Suir and Barrow	Medium	Small	Low
	Scenic Route SR 15 – In the vicinity of Cheekpoint.	Medium	Very Small	Not Significant
Cultural Assets				
	Archaeological Complex including two castles near Great Island, Co. Wexford – WX039-028001 to 028005	Low	Very Small	Not Significant
	Monuments associated with the monastic site of Kilmokea, Co. Wexford. WX039-018001 - 018009	Low	Very Small	Not Significant
	Dunbrody Abbey WX039-030001-	Medium	Small	Low

16.6.4.4 Cumulative Landscape and Visual Impacts

The preceding sections of this chapter have addressed the impacts of the proposed Great Island power plant on the landscape and visual environment. The cumulative assessment seeks to addresses the impact of the proposals together with other power plant developments of a similar scale and type as cited in Chapter 9 (Human Beings – Land Use), located within 5 kilometres of the proposed Great Island power plant. As there are no such power plants of a similar scale referenced in Chapter 9, cumulative landscape and visual impacts will not arise.

16.7 Summary Conclusion

The impact of the proposed Great Island power plant on landscape character and landscape resources and visual amenity was assessed.

The geographic scope of the landscape and visual impact assessment covers a 20 kilometre radius from the centre of the proposal. This area of search was selected in recognition of the potential for tall structures associated with the proposal to affect landscape character and visual amenity for a distance of up to 20 kilometres from the centre of the proposal.

The character of the receiving landscape is assessed to be adversely affected because of the visibility of the proposal from the wider landscape. These impacts on landscape character are assessed with reference to County landscape character assessment data for Counties Wexford and Kilkenny. In the absence of available landscape character data for County Waterford, broad character areas were identified for the purpose of the assessment. The significance of the impact takes account of the fact that the proposals will be seen from within these landscapes in association with the existing Great Island power plant.

Significant adverse impacts are assessed to arise in some of the receiving landscape of County Wexford. The 'Wexford Coasts – South Coastal Area' will be directly affected by the proposal, which will be located within this landscape character area. Indirect impacts on the character of this landscape will also arise as a result of the visibility of the proposal and the significance of this is assessed to be low. A low impact significance is predicted to arise also for 'Wexford Lowlands – South Area' and 'Wexford Lowlands – Barrow River Corridor' landscape character areas.

An adverse impact of low significance is assessed to arise in the 'Kilkenny South Eastern Hills' and the 'Kilkenny Suir Valley' landscape character areas in County Kilkenny. In County Waterford, an impact that is not significant is assessed to arise in the 'Waterford City Urban Character Area'. An impact of low significance is assessed to arise in the 'River Suir Corridor Landscape Character Area'.

Impacts on the Local Landscape Character Areas (LLCAs) are assessed to arise and the levels of significance are assessed to be low and medium for the 'Industrialised landscape of Great Island' LLCA and the 'Rivers Suir and Barrow farmed landscapes with settlements' LLCA respectively.

Impacts on designated landscapes, scenic routes and views are assessed to arise. In County Kilkenny, an adverse impact of medium significance is assessed to arise for V22 – Views over the confluence of Rivers Suir and Barrow at Snow Hill, County Kilkenny. An impact of low significance is assessed to arise for the Area of High Amenity (map ref 8) Barrow Suir Estuary, between New Ross and Wexford, bordered by rivers and by road no 674.

In County Waterford, an adverse impact of medium significance is assessed to arise for the 'Visually Vulnerable Landscape at the confluence of the Rivers Suir and Barrow. An impact of low significance is assessed to arise at the Scenic Route SR15 – in the vicinity of Cheekpoint.

Adverse impacts on the setting of cultural assets in terms of landscape and visual amenity are assessed to arise at Dunbrody Abbey. The impact significance is low.

Adverse visual impacts of a medium significance are assessed to arise at viewpoints 1 – Near confluence of Rivers Barrow and Suir, County Kilkenny and viewpoint 6 – Cheekpoint, County Waterford. Adverse visual impacts of a low significance are assessed to arise at the following viewpoints:

- 2 - Settlement of Ballinlaw on Western edge of River Barrow, County Kilkenny
- 7 - Settlement of Parkswood on R683 Road Route
- 10 – Dunbrody Abbey
- 13 - River Suir shoreline near Ballyhack

Visual impact significance takes account of the fact that the existing Great Island power plant will continue to be present in the view and will be larger in scale in the view than the proposed Great Island power plant. The quality of the existing view at each viewpoint location is therefore already adversely affected by the existing power plant. Hence the significance of visual impact at each viewpoint location is lower than would be the case if the site was an undeveloped area with no existing power plant facilities.

17. Material Assets

17.1 Archaeology Architecture and Cultural Heritage

17.1.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This section of the EIS describes the existing environment directly relating to the archaeology, architecture and cultural heritage in the vicinity of the proposed development, and addresses the potential impacts of the proposed development and the mitigation measures needed to address the likely significant impacts.

17.1.2 Methodology

For the purpose of setting the proposed development within its wider archaeological, architectural and cultural heritage landscape, and to assess the potential of the site, a comprehensive desk top study of available sources and a field inspection were undertaken.

17.1.2.1 Desk Top Study: Resources Used

The Record of Monuments and Places

The Record of Monuments and Places (RMP) is compiled by the Archaeological Survey of Ireland (ASI) and comprises lists and maps of all monuments with known locations. The files for these sites contain details of documentary sources and aerial photographs, early maps, Ordnance Survey (OS) memoirs, Office of Public Works (OPW) Archaeological Survey notes and other relevant publications. These were studied in the Sites and Monuments Records Office.

Topographical Files

The topographical files in the National Museum of Ireland (NMI) identify all recorded finds held in the NMI archive that have been donated to the state in accordance with national monuments legislation. The files were consulted to determine if any archaeological artefacts had been recorded from the development site area.

Cartographic Sources

Reference to cartographic sources is important in tracing land use development within the area as well as providing important topographical information on sites and areas of archaeological potential. Primary cartographic sources consulted consisted of the first edition (1840) and second edition (1919) six-inch Ordnance Survey maps.

Excavations

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that may have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2005.

National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) was consulted to identify post-1700 architectural heritage of Ireland. NIAH surveys provide the basis for recommendation to planning authorities for inclusion of particular structures or features in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities.

Local Development Plan

The Wexford County Development Plan 2007 - 2013, the Kilkenny County Development Plan 2008 - 2014 and the Waterford County Development Plan 2005-2011 were consulted. Included within the Development Plans are the Archaeological Monuments and Sites in state ownership and guardianship, and those subject to Temporary Preservation Orders and subject to Registration. The Development Plans includes the above mentioned RPSs which list every structure of special architectural, archaeological, artistic, cultural, scientific, social or technical interest within the county area.

Aerial Photography

Ordnance Survey Ireland aerial photography (2000 & 2005) of the subject site was examined.

17.1.2.2 Study Area

All sites within a radius of two kilometres of the proposed development were identified.

17.1.2.3 Legal and Policy Guidance Used

The following legislation, standards and guidelines were considered during the assessment.

Legislation

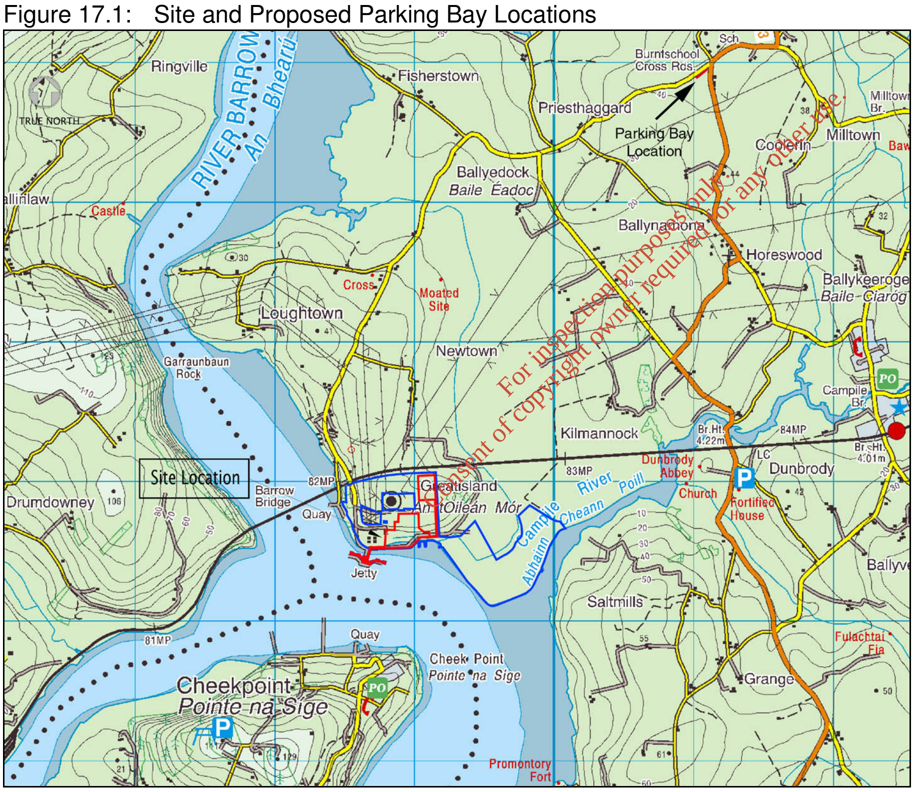
- Architectural Heritage (National Inventory) and Historic Properties (Miscellaneous Provisions) Act, 1999
- Charter for the Conservation and Restoration of Monuments and Sites (Venice 1964)
- Convention for the Protection of World Cultural and National Heritage, 1972
- Council of Europe Convention on the Protection of the Archaeological Heritage of Europe, (the '*Granada Convention*') ratified by Ireland in 1997
- European Convention Concerning the Protection of the Archaeological Heritage (the '*Valetta Convention*') ratified by the Republic of Ireland in 1997
- Framework and Principles for the Protection of the Archaeological Heritage, 1999, Department of the Arts, Heritage, Gaeltacht and the Islands
- Heritage Act, 1995
- International Council on Monuments and Sites (ICOMOS), advisory body to UNESCO concerning protection of sites and recommendation of World Heritage sites ratified by the Republic of Ireland in 1992
- National Cultural Institutions Act, 1997
- National Monuments Act, 1930, as amended 1954, 1987 and 2004

- Action on Architecture 2002 - 2005, Government Policy on Architecture
- Department of the Environment, Heritage and Local Government (DoEHLG), *Architectural Heritage Protection Guidelines for Planning Authorities*, 2004
- Department of the Environment, Heritage and Local Government, *NIAH Handbook Edition*, June 2006

17.1.3 Desk Top Study: Study Area Description and Evaluation

The development site is currently occupied by the Great Island power station and ancillary buildings (refer to Figure 17.1). The site is bounded to the north and east by fields, to the south by the River Suir and an access road at the west. It is also proposed to construct a temporary parking bay to the northeast of the development site in order to allow construction traffic to safely pass each other. The site of the parking bay is located within a large rectangular field currently used for tillage. This field is bounded to the north by an unclassified road, to the east by the R733 and to the south and west by several other fields.

Figure 17.1: Site and Proposed Parking Bay Locations

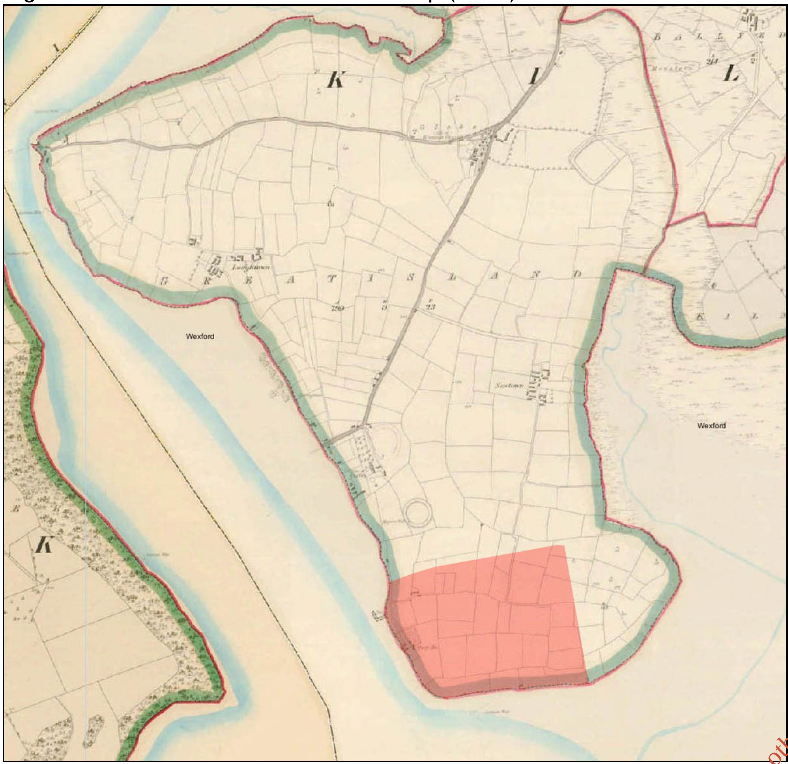


Source: Supplied by client (with additions)

17.1.3.1 Cartographic Evidence

Analysis of historic mapping shows the human impact on the landscape and its evolving nature over clearly defined time intervals. The comparison of editions of historic maps can show how some landscape features have been created, altered or removed over a period of time. Depicted landscape features of interest include: archaeological sites (e.g. ringforts, cashels, cairns, megaliths); historical structures (e.g. castles, tower houses, churches, and graveyards); vernacular structures (e.g. dwellings and farms), industrial archaeology (e.g. limekilns, forges, mills, quarries and so on); townland and field boundaries, drainage ditches; lakes, rivers and streams.

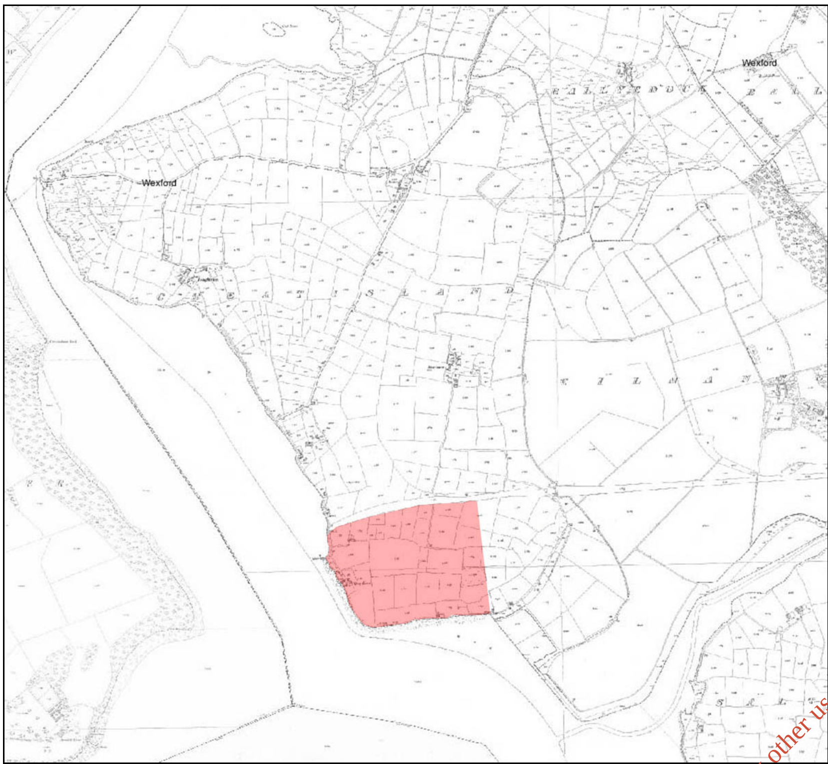
Figure 17.2: 1st Edition Six-Inch OS map (1840)



Source: Ordnance Survey Ireland

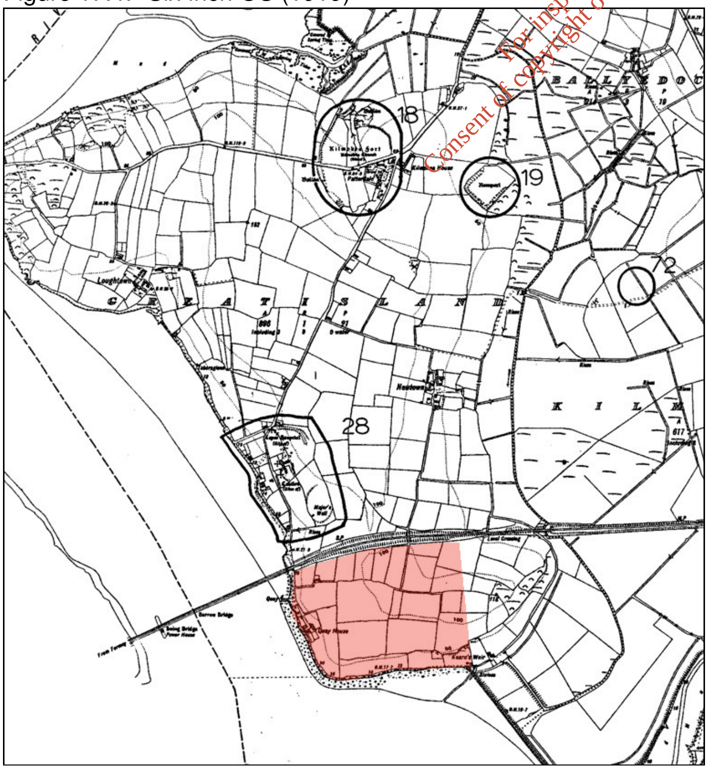
From an analysis of the First Edition 1840 six-inch Ordnance Survey map it can be seen that the layout of the proposed development site has not changed substantially prior to the construction of the existing power station. In the 1840s the development site was divided into a number of fields, with a small jetty and RMP **WX039-028004-** clearly visible to the west and north, respectively, of the development site. The later 25-inch map shows that some of the field boundaries had changed slightly, with several fields becoming larger. To the east of the site there is the addition of several large fields where the draining of the area at the confluence of the River Suir and the Campile River allowed for land reclamation. To the immediate north of the site the boundaries of the rail line (but no track or bridge across the Barrow River) can be seen. The 1919 Ordnance Survey 6-inch map again shows several fields becoming larger and the rail track and expansion bridge had been completed.

Figure 17.3: 25-Inch OS Map (1902)



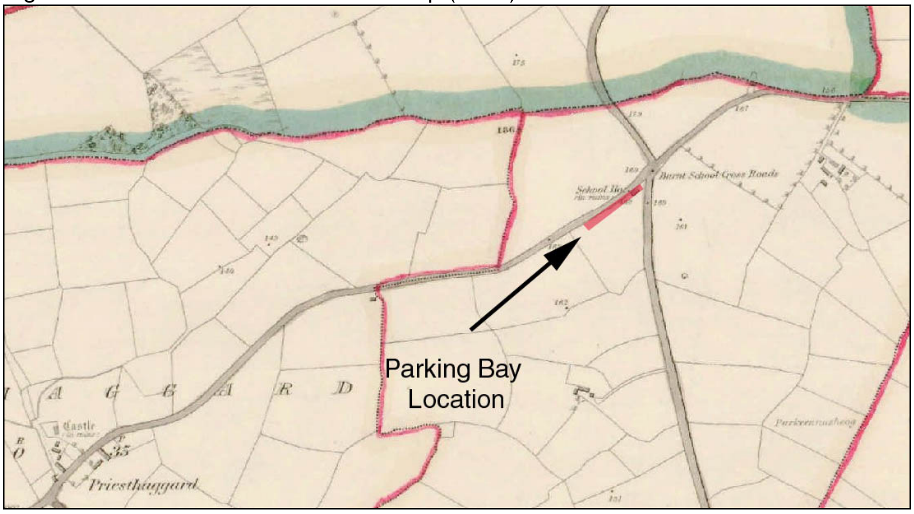
Source: Ordnance Survey Ireland

Figure 17.4: Six-inch OS (1919)



Source: Archaeological Survey of Ireland

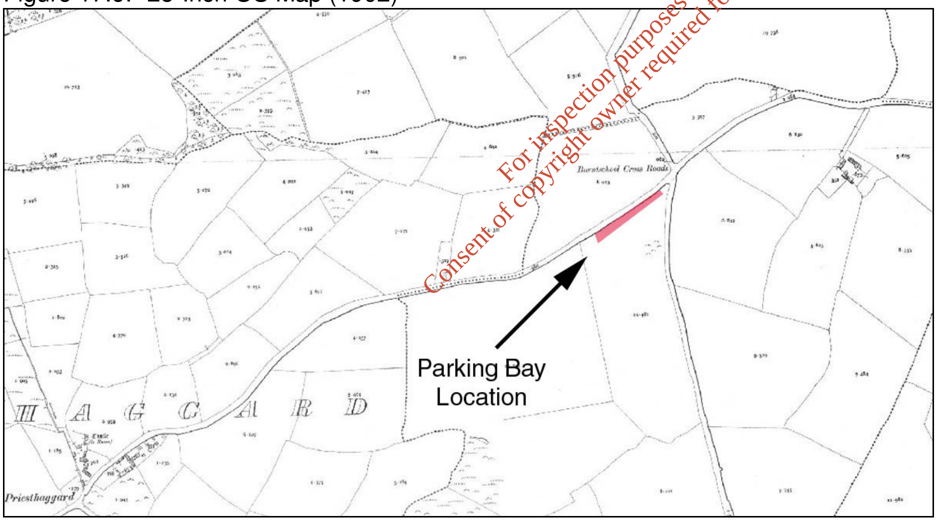
Figure 17.5: 1st Edition Six-Inch OS map (1840)



Source: Ordnance Survey Ireland

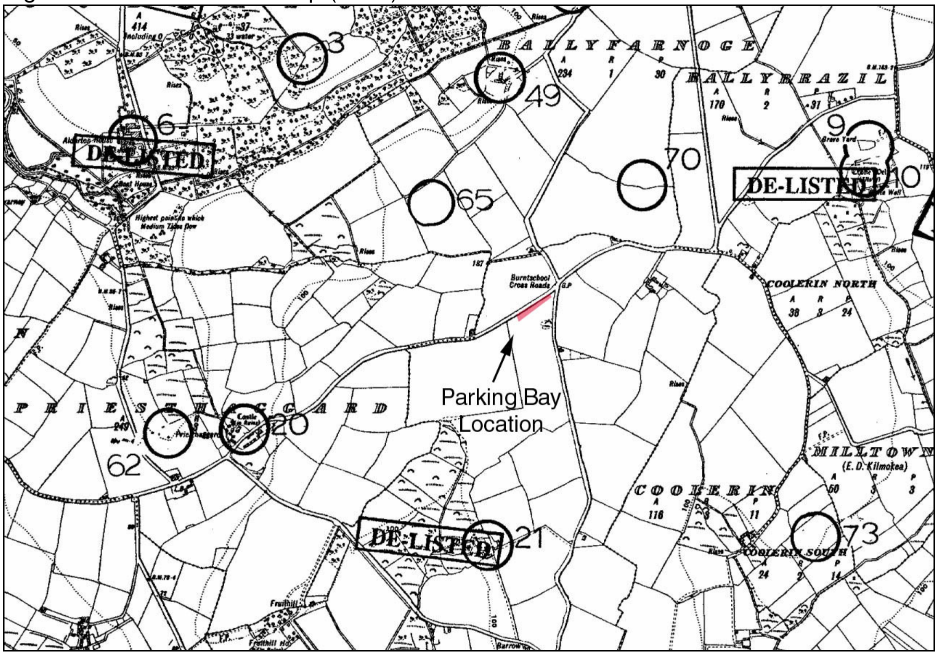
The proposed parking bay is situated within an area that has not changed greatly from the First edition to the 1919 6-inch map. The only feature of note can be seen in the First edition map where, at the northeast corner of the field, the ruins of a school house are depicted. It is possible that this is the school that gives the crossroads its name (Burntschool Cross Roads). These ruins are not depicted in the later 25-inch map with only slight variations in the layout of the boundaries being of note.

Figure 17.6: 25-Inch OS Map (1902)



Source: Ordnance Survey Ireland

Figure 17.7: 25-Inch OS Map (1902)



Source: Ordnance Survey Ireland

The Land Registry aerial photograph of 2005 (from OSI see Plate 17.1) shows the site occupied by the current power station. This has removed most of the earlier field boundaries within the subject site, though several survive at the north of the site near to the service reservoir. A new road giving access to the power station is also visible. The location of the parking bay is shown as being within an open field with no visible anomalies (see Plate 17.2).

Plate 17.1 Land Registry Aerial Photograph

Plate 17.2 Land Registry Aerial Photograph

17.1.3.2 Cultural Heritage

Greatisland (Great Island)

The proposed development site is located within the townland of Greatisland (or Great Island) in the parish of Kilmokea and barony of Shelburne Co. Wexford. Though today it is joined to the Hook peninsular at the confluence of the rivers Barrow and Suir, prior to the nineteenth century, it was a strategically placed island not only at the junction of these two rivers; which allowed for travel along the Suir as far as Cahir, as far as Monasterevin along the Barrow and nearly as far as Kilkenny along the Nore (Colfer 2004, 3), but was also in proximity to Waterford harbour. Though no specific date for the reclamation of the land to the north and to the southeast and east of Greatisland is available, it can be surmised that it occurred sometime between the end of the 18th and the beginning of the 19th century. A map from 1797 by the Rev. D. A. Beaufort (*A New Map of Ireland Civil and Ecclesiastical*) shows Greatisland as an island and, forty years later, when Lewis (1837, 181) described the parish of Kilmokea he stated that "...*since the recession of the tide* (Greatisland has) *been embanked and reclaimed*" and the 1st Edition OS map of 1840 (Figure 17.2) shows it connected at the northeast to the peninsula.

Though no Iron Age activity has been found upon Greatisland the area was likely to have been an important centre of commercial activity at this time as the second-century AD map by Ptolemy, which was based on the accounts of merchants and sailors and showed known places in Ireland, showed the River Birgos, modern day Barrow (Colfer 2004, 21). From the Early Christian period the principle monastic site of the region was that of Kilmokea (**WX039-018001-009**). It is also believed that Greatisland was the site of *Inis Doimle* (M. Ní Dhonnchadha, 'Inis Teimle, between Uí Chennselaig and the Déissi', *Peritia* 16 (2002) 451–8). Found within the monastic enclosure of Kilmokea was the remains of a horizontal watermill, two bullán stones and a high cross. Though it is unclear as to whether or not the monastic site of Kilmokea is that of *Inis Doimle* or a different site on the island, both did not survive into the historic period (O'Sullivan O.P. 1987 http://snap.waterfordcoco.ie/collections/ejournals/100754/100754-3.pdf and Colfer 2004, 25).

Plate 17.3 Aerial View of Kilmokea (from Colfer 2004, 26)

There are recorded Viking raids of the island; two recorded instances of attack came in 822 and 825, with a further two recorded in the tenth century. In 953, Amlaíb Cuarán, king of Dublin, attacked in alliance with Tuathal, overking of Leinster and nine years later members of the dynasty of Ímar, based in the Hebrides, sacked Greatisland (Downham 2004 http://www.ncte.ie/viking/wford.pdf). During this period Greatisland was not only an important monastic centre but also situated at a strategic ferry crossing between the Viking towns of Waterford and Wexford (Colfer 2004, 30). Local tradition identifies some of the earthworks seen on Greatisland as Viking defences with Lewis (1837, 181) recording that on "...*'the Island' are vestiges of two intrenchments, by some supposed to have been thrown up by the Danes to defend the pass to Ballinlaw ferry*...".

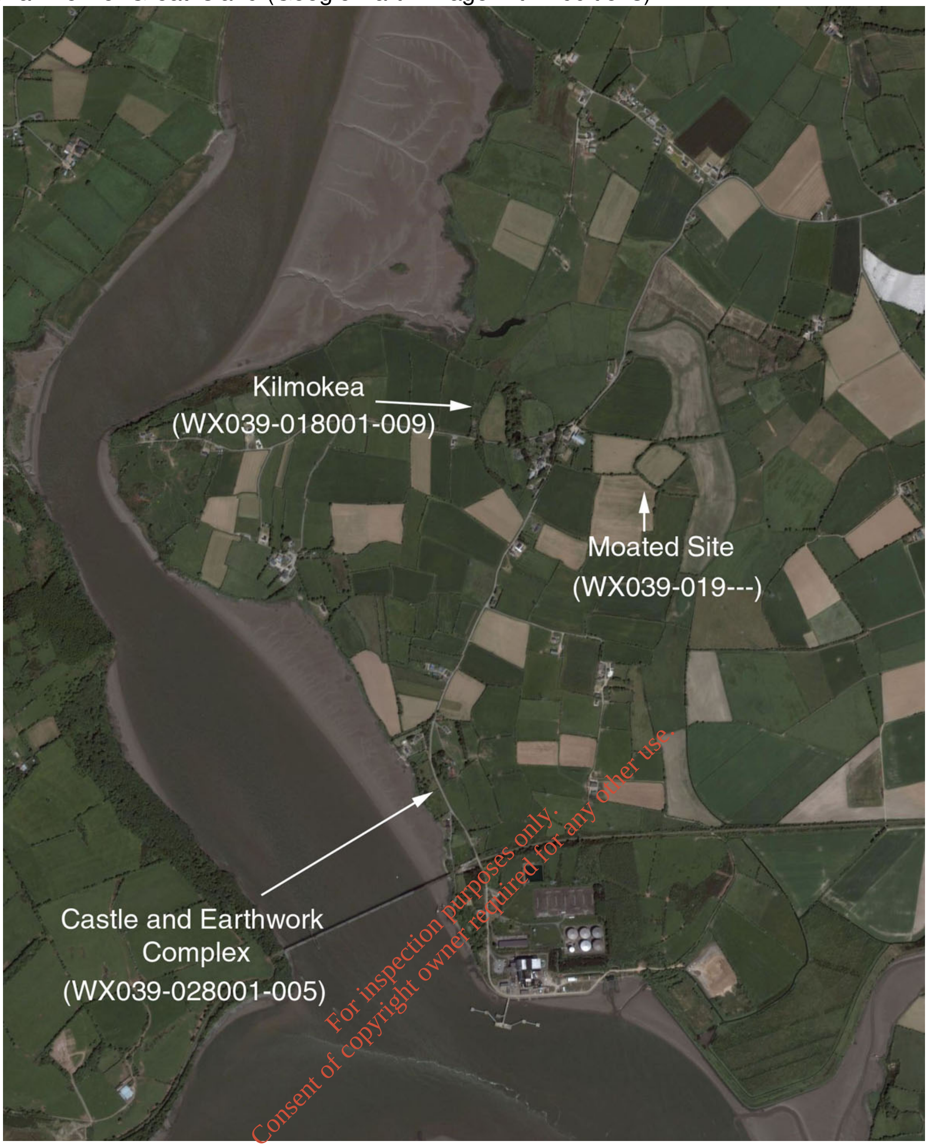
The importance of Greatisland continued into the twelfth and thirteenth centuries when it became an important Anglo-Norman centre. In 1169 extensive tracts of land, including Greatisland as part of the barony of Shelbourne was given by Dermot MacMurrough to Hervey de Montmorency after the capture of Wexford. Montmorency established his headquarters on Greatisland with the island becoming known as Hervey's island and his estate being referred to as the 'manor of the island' (Colfer 2004, 33). Hervey also granted a large area of land to the south of Greatisland for the establishment of a Cistercian abbey at Dunbrody.

A town, known as 'the town of the Island', was established at this time on Greatisland with Hervey believed to be its founder (Colfer 2004, 35). Though its location is unknown several Anglo-Norman and medieval settlement features are visible or their locations are known. In particular at the north of Greatisland, and to the east of the monastic site, is a large rectangular moated site (**WX039-019---**) and approximately 350 metres to the northwest of the development site is the archaeological complex **WX039-028001-005**. This consists of two castles, one of which is an early Anglo-Norman stone castle, a castle-ringwork, an enclosure and a leaper hospital. It is possible that the town of the Island grew around the Anglo-Norman castle forming a motte-and-bailey-like settlement.

The town of the Island was likely to have been established to take advantage of its riverine and land connections as a centre of commerce. Though the establishment of New Ross and the royal trade embargos on ports in County Wexford in support of Waterford would have curtailed this, development did take place. However, towards the end of the thirteenth century the town and castle were in noticeable decline. Accounts from the 1280s, published in Hore's *History of the town and county of Wexford* (Vol. 3, 1901), mention a tidal mill being damaged by the sea on several occasions and being burnt on another occasion, and that the corn-drying kiln was seldom visited. Some attempts were made to improve the state of the town as included in these accounts are details of the repairs and their costs to the mill and the castle. However, by 1307 the castle is valued as being worthless and no longer with a roof (Colfer 2004, 36). By the sixteenth century the town of the Island had ceased to function with only the castle and several wooded areas depicted on Francis Jobson's 1591 map of Waterford Harbour (Colfer 2004, 36). The *Civil Survey*, conducted between 1654 and 1656, mentioned two stone houses and two castles, one of which was in ruin.

Plate 17.4: Detail of Francis Jobson's map from Colfer (2004, 36)

Plate 17.5 Aerial View of Great Island (Google Earth Image with Additions)



Ballynamona and Priesthaggard

The location of the parking bay is situated within the townland of Ballynamona which is in the parish of Kilmokea and the barony of Shelburne. Though there is no confirmed Irish name for this townland, other townlands named Ballynamona have been translated into Irish as *Baile na Móna* (www.logainm.ie). This can be translated to meaning the homestead or townland of the bog (Flanagan and Flanagan 1994, 123). There is no specific reordered history of this townland, however its locations close to Greatisland and within the barony of Shelburne puts them within a centre of both early medieval and Anglo-Norman settlement. A review of the RMPs within the area, for example **WX034-071---** (standing stone), **WX039-005---** (stone row), located to the north and **WX039-062---** (fulachta fiadh), within the townland of Priesthaggard to the west, also shows exploitation of the area during the prehistoric period.

Dunbrody Abbey

Dunbrody Abbey is located approximately 2.25 kilometres to the east of the development site, within the townland of Dunbrody in the parish of St James & Dunbrody and the barony of Shelburne. It is situated on the southern bank of the Campile River, an inlet on the east shore of Waterford Harbour. The abbey was founded by Hervey de Montmorency in 1171-1175 (Colfer 2004, 34) for the Cistercians with it given to the abbey of Buildwas, Shropshire, England. However, after they received an unfavourable report on the quality of the land and the ferocious nature of the neighbouring barbarians the land was transferred to the abbey of St Mary's of Dublin in 1182. In 1348 Edward III seized the abbey and its possessions as the monks refused to give alms or exercise hospitality (Harbison 1992, 334) and several years later it became independent from St Mary's. In 1374 Pope Gregory XI allowed the Abbott to wear a mitre and raised him to the position of a Lord of Parliament.

In 1533 a report was issued advising that Dunbrody Abbey, along with several others, should be suppressed as they were giving more support to Irishmen than to the king and his subjects. Three years later, on the 6th May 1536 Dunbrody abbey was suppressed with the abbey and its lands granted to Sir Osborne Etchingham who adapted the abbey as a dwelling (Colfer 2004, 68). The abbey was abandoned in the seventeenth century with the construction of Dunbrody Castle.

Samuel Lewis in 1837 described the ruins "... *as among the most interesting and magnificent relics of antiquity in the south of Ireland ...*" (Lewis 1837, 568). In 1852 the west window and south wall were destroyed when the west gable fell in.

Plate 17.6 Aerial View of Dunbrody Abbey (from Colfer 2004, 198)

Waterford

The original Irish name of Waterford City is *Port Láirge* meaning Port of the thigh (Downham 2004 http://www.ncte.ie/viking/wford.pdf). The modern day name derives from the Norse name *Vader-Fiord* or *Vedrarfjiordr* meaning windy fjord or rams fjord. The foundation of Waterford city as a place of importance is from the middle of the ninth century when the area was settled and defended by Vikings and becoming one of the important Viking towns in Ireland. In 1170 the city was taken by Strongbow (Richard de Clare) the leader of the Anglo-Norman forces after the Norsemen of Waterford, who had joined forces with Irish from Déisi, were defeated at the battle of Baginbun in Co. Wexford (Colfer 2004, 33). Strongbow was made heir to the McMurrough lands in Leinster and married Dermot Mac Murchada's daughter in Waterford. In 1171 the city was visited by King Henry II who granted Waterford the status of a royal city.

Waterford became one of the chief ports of Ireland during this period with trading contacts in England and on the continent. The city flourished during the 13th century and many new monasteries, friaries and churches were built. During the fourteenth and fifteenth century the city still remained loyal to the English crown and was attacked on several occasions. After the attack on the city by Perkin Warbeck the motto *Urbs intacta manet Waterford* was bestowed by Henry II.

In 1649 the city was besieged by Cromwell, however, the city managed to hold out against the Cromwellian forces and it was not until the following year when forces under the command of Ireton took control of the city. It was recorded in the early nineteenth century (Lewis 1837, 687) as having a large import and export trade, principally with England. The main exports were agricultural produce with the main imports being tobacco, sugar, tea, coffee, pepper, tallow, pitch and tar, hemp, flax, wine, iron, potashes, hides, cotton, dye-stuffs, timber, staves, saltpetre, and brimstone, coal, culm, soap, iron, slate, spirits, printed calico, earthenware, hardware, crown and window glass, glass bottles, bricks, tiles, gunpowder, and bark. By the mid-nineteenth century Waterford also had four ship-building yards.

New Ross

The town of New Ross is located in the parish of St Mary's and the barony of Bantry (*Alphabetical Index to the Townlands,* 1982). Its original Irish name is *Ros Mhic Thriúin* meaning The Wood of the Son of Treon. The town was founded by William Marshal at the end of the twelfth century and became a prosperous inland port town. The town was the target for attack during the 13th and 14th centuries by Irish chieftains, particularly the McMurrough-Kavanagh clan. In 1649 New Ross was captured by Oliver Cromwell after he had captured Wexford.

During the 1798 Rebellion a battle took place in New Ross on 5 June between the Irish rebels and the British forces. The poorly armed rebels captured most of the town by weight of numbers and drove out the defending soldiers. The soldiers returned later in the day and recaptured the town

17.1.3.3 Archaeological and Historical Context

The recorded archaeological monuments (RMPs) which are in the immediate vicinity of the subject development site, though outside it, are as follows:

- **WX039-018001-**, an unclassified earthwork in the townland of Greatisland
- **WX039-018002-**, a church in the townland of Greatisland
- **WX039-018003-**, a bulláun stone in the townland of Greatisland
- **WX039-018004-**, a high cross in the townland of Greatisland
- **WX039-018005-**, a bulláun stone in the townland of Greatisland
- **WX039-018006-**, a graveyard in the townland of Greatisland
- **WX039-018007-**, an ecclesiastical enclosure in the townland of Greatisland
- **WX039-018008-**, a horizontal watermill in the townland of Greatisland
- **WX039-018009-**, a font in the townland of Greatisland
- **WX039-019---**, a moated site in the townland of Greatisland
- **WX039-028001-**, a castle-ringwork in the townland of Greatisland

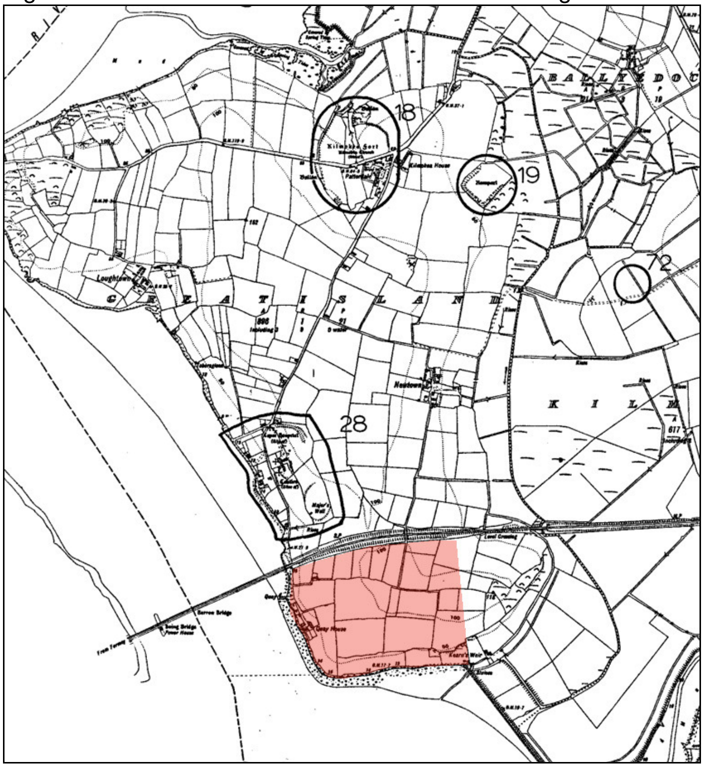
- **WX039-028002-**, an Anglo-Norman masonry castle in the townland of Greatisland
- **WX039-028003-**, an unclassified castle in the townland of Greatisland
- **WX039-028004-**, an unclassified enclosure in the townland of Greatisland
- **WX039-028005-**, a leaper hospital in the townland of Greatisland
- **WX039-072---**, an unclassified enclosure in the townland of Kilmannock
- **WX039-077---**, an unclassified enclosure in the townland of Kilmannock

The closest recorded archaeological monument to the site is **WX039-028004-**, which is located approximately 0.15 kilometres to the north of the proposed site. Refer to Figure 17.8 Site Location and Recorded Archaeological Monuments.

Chapter 16 (Landscape and Visual) addresses the impact of the proposed plant on the setting of selected archaeological features within the immediate and wider setting of the proposed development from a landscape character and visual amenity perspective. The scope of this assessment is outlined in Chapter 16. The RMPs located closest to the development are **WX039-028001-**, **WX039-028002-**, **WX039-028003-**, **WX039-028004-**, **WX039-005-**.

A review of the Zone of Theoretical Visibility (ZTV) reveals that the proposed power station is theoretically visible from eight RMPs within the immediate vicinity (within 2 kilometres): **WX039-019---**, **WX039-28001-**, **WX039-28002-**, **WX039-028003-**, **WX039-028004-**, **WX039-028005**, **WX039-072---** and **WX039-077---**. Appendices 17.1 and 17.2 list all the RMPs that are within the ZTV for the buildings and stacks of the proposed power station. It is important to note that ZTVs do not take account of the visual screening afforded by intervening vegetation, buildings or minor changes in topography, such as road cuttings. It is important to note that the proposals will be located on the site of the existing Great Island Generating Station and hence the landscape setting and viewer appreciation of these monuments is already adversely affected by these existing power plant structures.

Figure 17.8: Site Location and Recorded Archaeological Monuments



Source: Archaeological Survey of Ireland

No RMPs are located within or adjacent to the boundaries of the parking bay. The nearest RMP is **WX039-065---** (unclassified enclosure) located approximately 600m to the west. In total 25 RMPs are located within the immediate vicinity (within 2 kilometres) of the parking bays' location: **WX034-071---** (standing stone), **WX039-003---** (unclassified earthwork), **WX039-005---** (stone row), **WX039-007---** (ringfort, rath/cashel), **WX039-008---** (bivallate ringfort), **WX039-009001-** (church), **WX039-009002-** (graveyard), **WX039-009003-** (ecclesiastical enclosure), **WX039-020---** (tower house), **WX039-022---** (fulachta fiadh), **WX039-023001-** (church), **WX039-023002-** (graveyard), **WX039-024001-** (bawn), **WX039-024002-** (house – 16th/17th century), **WX039-049---** (tower house) **WX039-057001-** (church), **WX039-057002-** (graveyard), **WX039-023003-** (graveslab), **WX039-059---** (horizontal watermill), **WX039-061---** (fulachta fiadh), **WX039-062---** (fulachta fiadh), **WX039-065---** (unclassified enclosure), **WX039-070---** (unclassified enclosure), **WX039-071---** (unclassified enclosure), , **WX039-073---** (unclassified enclosure), **WX039-078001-** (unclassified enclosure), **WX039-078002-** (souterrain) and **WX039-087---** (unclassified enclosure). A further eight RMPs have been delisted from the RMPs though SMR (Sites and Monument Records) information is still accessible from the National Monuments Service (www.archaeology.ie), these are: **WX039-001** (standing stone – possible location), **WX039-002** (standing stone – possible location), **WX039-004** (standing stone – possible location), **WX039-006** (unclassified castle), **WX039-010** (ritual site – howe), **WX039-011** (redundant record), **WX039-012** (ritual site – howe), **WX039-021** (redundant record). **WX039-001**, **WX039-002** and **WX039-004** are also listed within the Archaeological Inventory of county Wexford (Moore 1996, 18).

A search of the database www.excavations.ie did not reveal any excavations in the townlands of Greatisland or Ballynamona. The excavation database was also searched for the nearby townlands of Ballinlaw, Ballybrazil, Ballyedock, Ballyfarnoge, Cheekpoint, Coolerin, Drumdowney, Fisherstown, Horeswood, Kilmannock, Poulmaloe, Priesthaggard and Ringville and no information was returned. Though not listed in the above database, an excavation was carried out in the townland of Greatisland within the northern area of **WX039-28001-005**. The laying of service pipes in this area had disturbed human remains. The archaeological investigation of the machine cut trench discovered the incomplete skeletal remains of one adult female and an adult male, with one buried within a stone tomb, dated to between the 13th and 15th centuries. It was believed that these were associated with the leper hospital (NMI Topographic File 1A/6/79).

A review of the Shipwreck Survey of Ireland identified that there are no wrecks within the immediate vicinity of Greatisland. Appendix 17.3 lists the wrecks located within the wider subject area; including Waterford Harbour and the Rivers Barrow, Suir and Campile.

17.1.3.4 Architectural Heritage

There are no protected structures on the subject site as per a search of the *Wexford County Development Plan 2008 - 2014*. The nearest protected structure, as per a search of the *Kilkenny County Development Plan 2008-2014, Wexford County Development Plan 2008 – 2014, the Waterford County Development Plan 2005-2011 and the National Inventory of Architectural Heritage* (NIAH), is the Barrow Railway Viaduct, 0.25 kilometres west of the proposed power plant. No protected structures are situated on or within the general vicinity of the parking bay. A full list of the protected structures situated near to the development site is included in Table 17.1 below.

Table 17.1: Table of Protected Structures

Reg No	Name	Townland	Description	Co-ordinates	Distance from site
D12	Barrow Railway Viaduct	Drumdowney Upper, Co. Kilkenny	Fifteen-span bridge, 2130 ft (650 m) in length over the Barrow River. Completed in 1906. Each of its 13 main spans is supported on twin cast-iron piers, the two central spans being pivoted in the middle to allow boats to pass through.	267899/ 114524	0.25 km
WC 0688	Kilmannock	Kilmannock, Co. Wexford	No Description Available	Location Not Given	2.2 km (?)
68	The Cottages	Cheek Point, Co. Waterford	End (southern) of terrace of six single-storey cottages stepped down hillside.	268599/ 113690	1.03 km
69	The Cottages	Cheek Point, Co. Waterford	Second cottage from south of terrace of six single-storey cottages stepped down hillside.	268598/ 113702	1.03 km
70	The Cottages	Cheek Point, Co. Waterford	Third cottage from north of terrace of six single-storey cottages stepped down hillside.	268594/ 113723	1.03 km
71	The Cottages	Cheek Point, Co. Waterford	Second cottage from north of terrace of six single-storey cottages stepped down hillside.	268592/ 113734	1.03 km
75	The Cottages	Cheek Point, Co. Waterford	End (northern) of terrace of six single-storey cottages stepped down hillside.	269589/ 113745	1.03 km
73	The Mount	Cheek Point, Co. Waterford	Freestanding single-bay two-stage Gothic-style folly, c.1750, on a circular plan. Pointed-arch window openings. Set back from road on elevated site.	268933/ 113786	0 81 km

Reg No	Name	Townland	Description	Co-ordinates	Distance from site
74	Daisybank House	Cheek Point, Co. Waterford	Five-bay three-storey over basement red brick house with dormer attic, c.1765, with single-storey lean-to return to north. Subsequently in use as hotel. Extensively renovated in the late 20th century. Sited perpendicular to road on a sloping site with random rubble stone perimeter boundary wall	268208/ 113639	1 05 km

Note: All distances are from the power station

Source: Kilkenny County Development Plan 2008-2014, Wexford County Development Plan 2008 – 2014, the Waterford County Development Plan 2005-2011, NIAH

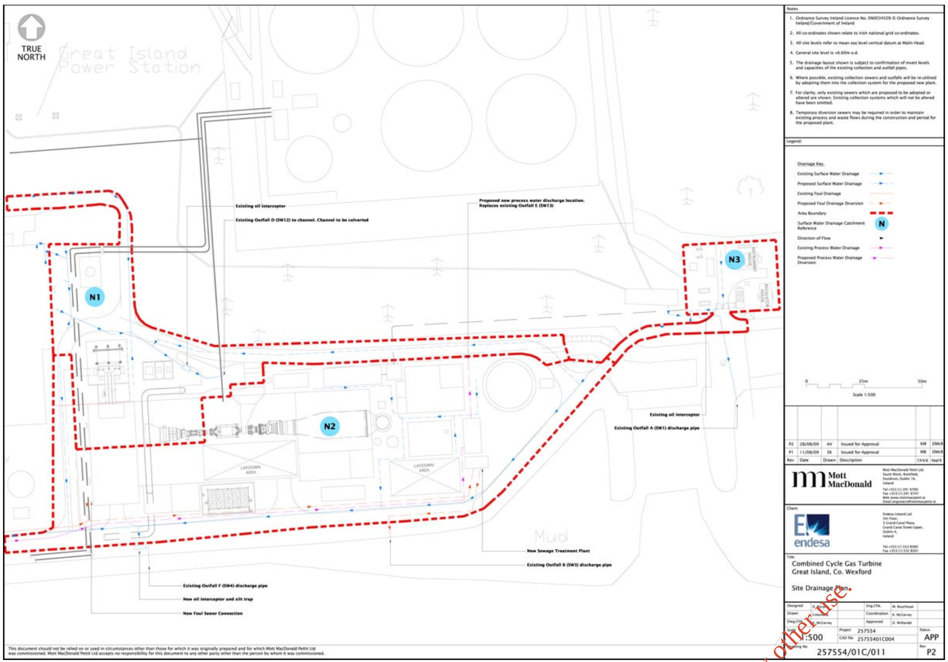
17.1.4 Field Inspection: Description and Evaluation

An inspection of the development site (Refer to Figure 17.9) was carried out on 23rd July 2009. The proposed construction area incorporates part of the area now used for the two existing stacks, and portion of the administration buildings. No original ground surface is visible, being covered in concrete and tarmac. It is likely that this area was extensively scarped prior to construction of the existing plant.

Figure 17.9: Site Plan (supplied by the client)

No new outfall locations are proposed as part of the new development, it is proposed to utilise existing pipes with some internal drainage channels being redirected (Refer to Figure 17.10). These are located above the waterline and as such no impact will occur on the inter-tidal zone.

Figure 17.10: Site Plan (supplied by the client)



A laydown area is proposed to the immediate north-eastern side of the plant, in an area of planted trees. No archaeological features were noted here, however, the dense growth of trees prevented a clear assessment of the ground at the time of inspection. An aerial photo viewed in the existing power station shows the area before it was planted. At that time it was a green-field site, with no extant archaeological features visible on the photograph.

An inspection of the proposed parking bay location was carried out on the 11th November 2009. The site of the proposed parking bay is located directly to the southwest of Burntschool Crossroads. It is proposed to construct a 110 metre long, 20 metre wide pull in area and for the parking bay to be 7.5 metre wide with a 15 metre wide exit. The topsoil will be removed to a depth of between 0.45 - 0.50 metres which will then be filled with stone. The existing northerly hedgerow, this separates the field from the unclassified road, may have to be removed to allow access to the bay. The preferred method of construction will utilize existing gateways, however it may be necessary to remove areas of the hedgerow at the entrance and exit to the parking bay. It is important to note that the methodology for the development of this area has yet to be finalised. The proposed location is situated within a large rectangular shaped field currently used for tillage. No extant archaeological features and nothing of an archaeological nature were noted within the boundaries of the proposed location.

Plate17.7 Existing plant, from SE,

Plate 17.8 Proposed construction area, from W

Plate 17.9 Tidal area at S, from E

Plate 17.10 Laydown area at E, from SE

Plate 17.11 Proposed parking Bay location, from west

Plate 17.12 Road and boundary proposed parking bay location, from west

17.1.5 Identification of Potential Impacts on the Existing Environment

Ground disturbance associated with the proposed development will include the following:

- Construction of the proposed Natural Gas Fired CCGT Power plant
- Ancillary site works
- Construction of a parking bay

17.1.5.1 'Do Nothing' Impacts

If no development is carried out on this site the potential subsurface archaeology will not be impacted in any way and will remain undisturbed.

17.1.5.2 Potential Impacts

No items of archaeological, architectural or cultural heritage value were noted as being extant on the subject site. However, the proposed development site does have the potential to yield sub surface archaeological material.

The site is located approximately 0.15 kilometres from the zone of archaeological potential (ZAP) of the closest archaeological recorded monument (RMP) **WX039-028001-005**, a castle-ringwork, an Anglo-Norman masonry castle, an unclassified castle, an unclassified enclosure and a leper hospital, situated in the townland of Greatisland. The closest non-extant archaeological recorded monument is situated to the north (RMP) **WX039-028004-**, an unclassified enclosure, located approximately 0.15 kilometres from site.

As construction traffic will approach the site from the north, it will be necessary to construct a temporary parking bay approximately 3.5 kilometres north of the power plant. No items of archaeological, architectural or cultural heritage value were noted as being extant within the boundaries of the proposed location. However, the proposed location does have the potential to yield sub surface archaeological material.

There are no archaeological recorded monuments (RMPs) within the subject site and no "*new*" (that is unrecorded) archaeological features identified as being extant during the walkover inspection. However, the subject site does have the potential to yield archaeological remains subsurface, which at present show no above-ground register.

As a power plant already exists on the site, it is suggested that a visual impact has already occurred.

Predicted impacts can be suggested from the information available. The description and evaluation of the predicted impacts are as discussed in the following sections.

17.1.5.3 'Worst Case Scenario'

Should the proposed development proceed without archaeological mitigation measures, there is the possibility that archaeological material may by uncovered and / or destroyed without the supervision and guidance of a professional archaeologist.

17.1.6 Mitigation Measures

There are no recorded archaeological monuments or sites of architectural heritage value within the site of the proposed development and no upstanding archaeological sites and features were noted within the site during the field assessment.

However, as noted above, there is the potential for previously unrecorded archaeological remains to survive on the site. It is recommended that **archaeological monitoring** should be conducted by a qualified archaeologist during the site clearance and excavation works.

It is also recommended that **archaeological monitoring** should be conducted during the construction of the overtaking bay

Reason: Both the location of the power station and the parking bay are situated within an archaeologically rich landscape.

Should any archaeological features or material be uncovered during the course of the pre-development testing, monitoring or any phase of the construction works, works should cease immediately, and the National Monuments Service of the Department of Environment, Heritage and Local Government should be informed. Time must be allowed for a suitably qualified archaeologist(s) to inspect and assess any such material. If it is established that archaeologically significant material is present full archaeological excavation and recording will be required.

The recommendations given here are subject to the approval and ratification of the National Monuments Service of the Department of Environment, Heritage and Local Government.

17.1.7 Residual Impacts

It is not anticipated that any residual impacts of significance will remain if the appropriate archaeological mitigation measures are put in place.

17.1.8 Summary Conclusion

This chapter of the Environmental Impact Statement describes the existing environment directly relating to the archaeology, architecture and cultural heritage in the vicinity of the proposed development, and addresses the potential impacts of the proposed development and the mitigation measures needed to address the likely significant impacts. For this purpose a comprehensive desk top study and a field inspection were undertaken.

It was found that no items of archaeological, architectural or cultural heritage value were extant on the subject site. However, the proposed development site was seen to have the potential to yield sub surface archaeological material. The site is located within an archaeologically rich landscape being within two kilometres of 17 RMPs. The closest recorded monument, approximately 0.15 kilometres from the boundaries of the development site, is **WX039-028001-005**, a castle-ringwork, an Anglo-Norman masonry castle, an unclassified castle, an unclassified enclosure and a leper hospital.

In addition, as construction traffic will approach the site from the north, it will be necessary to construct a temporary parking bay approximately 3.5 kilometres north of the power plant. No items of archaeological, architectural or cultural heritage value were noted as being extant within the boundaries of the proposed location. However, the proposed location does have the potential to yield sub surface archaeological material.

In light of these results, it is recommended that **archaeological monitoring** should be conducted by a qualified archaeologist during the site clearance and excavation works within the development site and at the location of the parking bay.

It is not anticipated that any residual impacts of significance will remain if the appropriate archaeological mitigation measures are put in place.

17.2 Utilities

17.2.1 Introduction

An environmental impact statement (EIS) must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed development. This section of the EIS has been prepared in order to help fulfil this requirement with respect to utilities in the area of the proposed development. In this context, utilities are understood as including all utilities operated by third parties, such as public and private utility companies and authorities.

17.2.2 Methodology

17.2.2.1 Guidance Used

The methodology of this assessment has been devised in accordance with the relevant EPA guidance

- EPA, (2002), Guidelines on the information to be contained in EIS
- EPA, (2003), Advice Notes on Current Practice in the preparation of EIS

17.2.2.2 Study Area

The dimensions of the study areas for this topic are set out in Table 17.2.

Table 17.2 Study Area

Aspect under Study	Dimensions of the Study Area
Material Assets: utilities	The study area comprises any utilities that could potentially be affected by elements associated with the proposed development. These utilities are typically located in direct proximity to the proposed development footprint

17.2.2.3 Baseline Evaluation Criteria

Utilities infrastructure is considered to be very important. This infrastructure ensures that power (electricity / gas); water and amenity services are provided to all individuals in a reliable consistent manner. The day-to-day lives of all individuals are highly dependent on this supply. Disruption of supply can have a significant impact on fundamental components of any community including manufacturing, provision of services, transport and individual quality of life. Disruption of utilities at single point locations can often significantly impact on the functionality of the infrastructure over a large area. Relatively minor impacts can therefore affect a large number of receptors and these receptors are highly sensitive to disruption because they are accustomed to, and dependent on, a continuous reliable supply.

The criteria set out in Table 17.3 have been devised in light of the considerations set out in this section.

Table 17.3: Criteria for Baseline Evaluation of Utilities

Criteria	Importance/ Sensitivity
All utilities infrastructure	High

17.2.2.4 Impact Assessment Criteria

The source and type of all impacts is set out in Section 17.2.3 (Identification of Potential Impacts). The mitigation measures that are defined for any significant impacts are set out in Section 17.2.4 (Mitigation Measures). Each of the potential residual impacts that are identified are evaluated in terms of magnitude and significance.

Magnitude

The criteria used to assess the magnitude of the proposed development impacts on utilities are shown in Table 17.4.

Table 17.4: Criteria for Assessment of Impact Magnitude

Criteria	Impact Magnitude
Long-term disruption of service e.g. for more a week or more; Relevant stakeholders are notified at short notice or not at all prior to disruption taking place; and/or The level of service provided by the original utilities infrastructure may not be reinstated.	High
Medium-term disruption of service e.g. for up to two days; Relevant stakeholders are notified prior to disruption taking place; and The level of service provided by the original utilities infrastructure is reinstated or improved.	Medium
Short-term disruption of service e.g. for several hours; Relevant stakeholders are notified prior to disruption taking place; and The level of service provided by the original utilities infrastructure is reinstated or improved.	Low

Significance

The significance of all impacts is considered in relation to the magnitude of the impact and the importance/sensitivity of the affected area. Impact significance is described as being *Not significant*, of *Low significance*, of *Medium significance*, or of *High significance*.

17.2.2.5 Baseline Description and Evaluation

A small number of utilities services have been identified within the study area. Standard utilities are associated with the water supply and the telecommunication services to and off site.

Potable water, for use as make-up water to the existing water treatment plant for the production of process water, canteen, welfare facilities and for general site cleaning is sourced from the mains supply. A water main, owned by the local authority provides water to the water reservoir in the north of the site.

An ESB substation (220 kV) exists in the northern part of the site to the south of the existing water reservoir. It is connected to the national grid network of the region via three overhead power lines crossing the northern part of the site.

An ESB substation (110 kV) exists in the northern part of the site, to the south west of the existing water reservoir. It is connected to the regional power network of the region via four 110kV overhead power lines crossing the northern part of the site.

17.2.3 Identification of Potential Impacts

Potential types and sources of impacts associated with the proposed development are set out in Table 17.5 to third party utilities.

Table 17.5 Potential Types and Sources of Impact

Project Phase	Potential Impact Type	Potential Impact Source
Construction	Severance or disruption of utilities	Ground excavation and subsurface works
Operation	Disruption of power supply	Power surges etc.

17.2.4 Mitigation Measures

Publicly owned utility services within the study area have been identified. In advance of intrusive construction activities they will be marked on site.

17.2.4.1 Construction

All works associated with the construction of the new power plant will occur within the existing power plant site and no third party services are likely to be impacted upon. With mitigation measures in place the magnitude of all impacts on utilities during construction is considered to be of low magnitude and is therefore not considered to be significant. The operation of the proposed power plant will improve on the existing level of power supply to the regional and national network. Where unavoidable and unforeseeable disruptions occur, stakeholders will be notified as soon as possible. With these mitigation measures in place the operation of the scheme will not impact on utility services.

All utilities that cross the area of the proposed development will be protected, lowered or raised, relocated or diverted as necessary to avoid any disruption.

All works will be carried out in ongoing consultation with the relevant statutory undertakers and County Council representatives and will comply with their requirements (including health and safety) and all relevant codes of practice.

Agreement will be reached prior to any works taking place and relevant design documentation prepared. The works will be coordinated and programmed in consultation with the relevant undertaker to minimise the potential for disruption. The contractor will be responsible for design and co-ordination of utility diversionary works.

Where necessary, and depending on service level agreement, alternative measures are to be taken to ensure continuity of the service while works are ongoing.

17.2.4.2 Operation

The existing level of power supply services to the regional and national network provided by the original utilities infrastructure will be reinstated or improved. The upgrade of the facility will ensure that all utilities on the site will be built and constructed to BAT with relevant fail safe mechanisms in place to ensure a continuous service. Where unavoidable and unforeseeable disruptions occur, stakeholders will be notified as soon as possible.

17.2.5 Residual Impacts

17.2.5.1 Construction Phase

The works are primarily located within the existing power plant site and no additional land-take is required. Consequently, the location of the works is such that no third party services are likely to be impacted upon.

The ESB substation and associated power lines will not interfere with proposed works in this area. Relocation will not therefore be necessary.

Provided that the mitigation measures described in Section 17.2.4 (Mitigation Measures) are put in place, the magnitude all impacts on utilities are considered to be of low magnitude and therefore are not considered to be significant.

17.2.5.2 Operational Phase

Provided that the mitigation measures specified in Section 17.2.4 (Mitigation Measures) are implemented, the operation of the proposed development will not impact on utility services.

17.2.6 Summary Conclusion

A small number of utility services have been identified within the study area, which comprises any utilities that could potentially be affected by elements associated with the proposed development. These include standard utilities associated with the water supply (a water main, owned by the local authority provides water to the water reservoir in the north of the site) and telecommunication services to and off site. In addition, there are two substations (220 kV and 110 kV) located in the northern part of the site which are connected to the national grid network via overhead power lines crossing the northern part of the site.

All utilities that cross the area of the proposed development will be protected, lowered or raised, relocated or diverted during the construction phase as necessary to avoid any disruption. All works will be carried out in ongoing consultation with the relevant statutory undertakers and County Council representatives and will comply with their requirements (including health and safety) and all relevant codes of practice.

All works associated with the construction of the new power plant will occur within the existing power plant site and no third party services are likely to be impacted upon. With mitigation measures in place the magnitude of all impacts on utilities during construction is considered to be of low magnitude and is therefore not considered to be significant. The operation of the proposed power plant will improve on the existing level of power supply to the regional and national network. Where unavoidable and unforeseeable disruptions occur, stakeholders will be notified as soon as possible. With these mitigation measures in place the operation of the scheme will not impact on utility services.

18. Interactions of the Foregoing

18.1 Introduction

An environmental impact statement must contain a description of likely significant impacts on defined environmental aspects (air, soil, water etc.) due to the construction and operation of the proposed development. Some impacts will affect more than one environmental topic because interactions are recognised to occur.

Two types of impact interaction are recognised to exist in this regard:

- **Cross-media impacts**: impacts that affect more than one environmental topic;
- **Cumulative impacts**: impacts which accumulate over space or time to generate a larger overall impact. Cumulative impacts are subdivided into:

  - Intra-project cumulative impacts – impacts relating to the main project; and

  - Inter-project cumulative impacts – impacts relating to the main project and other projects affecting the same environmental media.

Impact interactions and inter-relationships have been considered throughout the EIA process and are described in each of the individual impact chapters. The purpose of this chapter is therefore to provide a brief summary of the main interactions that were considered as part of the assessment.

18.2 Cross-media Impacts

The matrix that is presented as Table 18.1 has been developed to identify cross-media impact interactions. The nature of the environment is such that cross-media interactions between all environmental topics are potentially possible and/or may occur to a certain extent for most projects. The purpose of the matrix is therefore to highlight key interactions that are recognised to be specific to this project and warranting special consideration. In the matrix, a white square indicates no interaction, while a green square indicates that a key interaction exists. The key interactions that have been identified are discussed further in Table 18.2.

Table 18.1: Cross-media Impact Interactions Matrix

	Traffic	Land-use	Socio-economics	Noise and Vibration	Air Quality and Climate	Landscape and Visual	Flora and Fauna	Soils, Geology and Groundwater	Surface water	Archaeology, Architectural Heritage and Cultural Heritage	Utilities
Traffic											
Land-use											
Socio-economics											
Noise and Vibration											
Air Quality and Climate											
Landscape and Visual											
Flora and Fauna											
Soils and Geology Groundwater											
Surface water											
Archaeology, Architectural Heritage and Cultural Heritage											
Utilities											

Table 18.2: Key Cross-media Interactions

Key Interaction	Description
Air Quality and Flora and Fauna	The potential for impacts resulting from atmospheric emissions associated with the operational phase of the development have been considered in Chapter 12 (Flora and Fauna) and Chapter 15 (Air Quality and Climate).
Surface Water and Flora and Fauna	The potential for impacts resulting from aqueous emissions discharges associated with the operational phase of the development have been considered in Chapter 12 (Flora and Fauna) and Chapter 14 (Surface Water)
Traffic, Air and Noise	The potential for traffic to cause air and noise emissions has been considered in Chapter 15 (Air Quality and Climate) and Chapter 11 (Human Beings - Noise and Vibration).
Land-use, Noise, Vibration, Air and Landscape	The potential for noise, air and landscape impacts to have an impact on human beings and landuse has been considered in Chapter 11 (Human Beings - Noise and Vibration), Chapter 15 (Air Quality and Climate) and Chapter 16 (Landscape and Visual).
Noise, Vibration, Flora and Fauna	The potential for noise and vibration impacts on flora and fauna is considered in Chapter 12 (Flora and Fauna).
Landscape and Visual and Archaeology, Architectural and Cultural Heritage	Features of archaeological, architectural or cultural importance are described in the archaeology chapter. These features have been taken into consideration as features of the landscape when defining local landscape character areas in Chapter 16 (Landscape and Visual). Landscape impacts on features of archaeological, architectural or cultural importance are described in Chapter 17.1 (Archaeology, Architectural Heritage and Cultural Heritage).
Soils and Geology and Land-use	The extent to which current contamination of soils impacts on land-use is considered in Chapter 13 (Soils, Geology and Groundwater).
Soils and Geology, Surface water and Groundwater	Soils, sediment, surface water and groundwater are recognised to be intrinsically linked because of the location of the project in an area where groundwater tends to be quite close to the surface, groundwater flows towards surface water bodies and surface water tidal flows impact on groundwater levels. Any impact on any one of these environmental topics therefore has the potential to affect the other topics. This is discussed in each relevant chapter i.e. Chapter 13 (Soils, Geology and Groundwater) and Chapter 14 (Surface water)

Key Interaction	Description
Soils and Geology, Archaeology, Architectural and Cultural Heritage and Utilities	Ground excavation of soils and sediment can lead to impacts on features of archaeological importance and utilities which may lie within soils and sediment. The potential for impacts in this regard is considered in Chapter 17.1 (Archaeology, Architectural Heritage and Cultural Heritage) and Chapter 17.2 (Utilities).

18.3 Cumulative Impacts

The potential for other developments in the same area as the Great Island power plant development to have a cumulative impact has been considered. The assessment of the potential for cumulative impacts are typically limited to projects that are already underway, projects that are in the planning system and that are of a size and nature that warrant consideration.

The Waterford Container Terminal is the only relevant development within the proximity of the Great Island development, approximately 2 kilometres upstream of the power plant on the River Suir at Belview Port. However, it is not anticipated that potential cumulative impacts will result from the Belview Port development.

Given the rural location of the proposed development, cumulative impacts arising due to the existence of other major construction projects are not present.

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