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: $\mu g/m^3$

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.

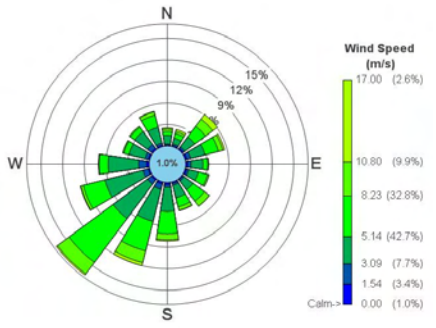
For meteorological data to be suitable for dispersion modelling purposes, a number of parameters need to be measured on an hourly basis. These include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

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.

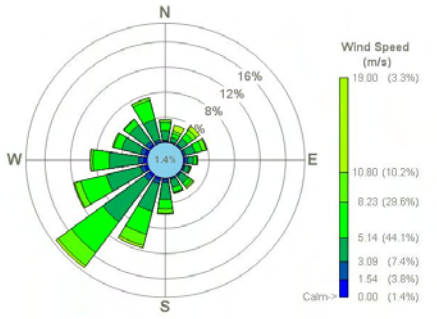
Data from 2008 was not included in the assessment as the Rosslare meteorological station was closed in the first quarter of 2008. Windroses produced from the station's data are presented in Figure 15.1: Rosslare Harbour – Wind Roses.

Figure 15.1: Rosslare Harbour - Wind Roses

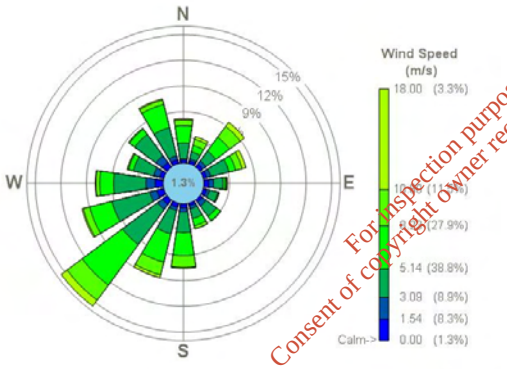
2003



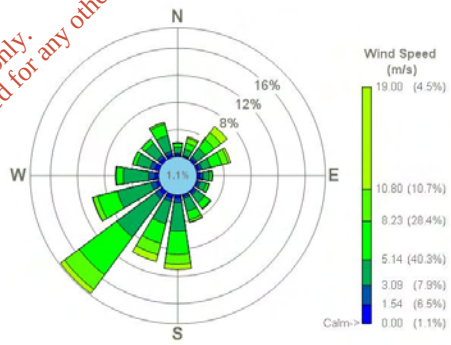
2004



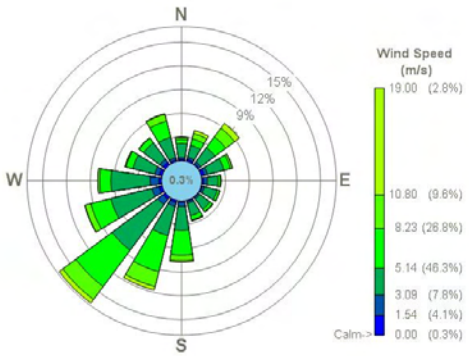
2005



2006



2007



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.

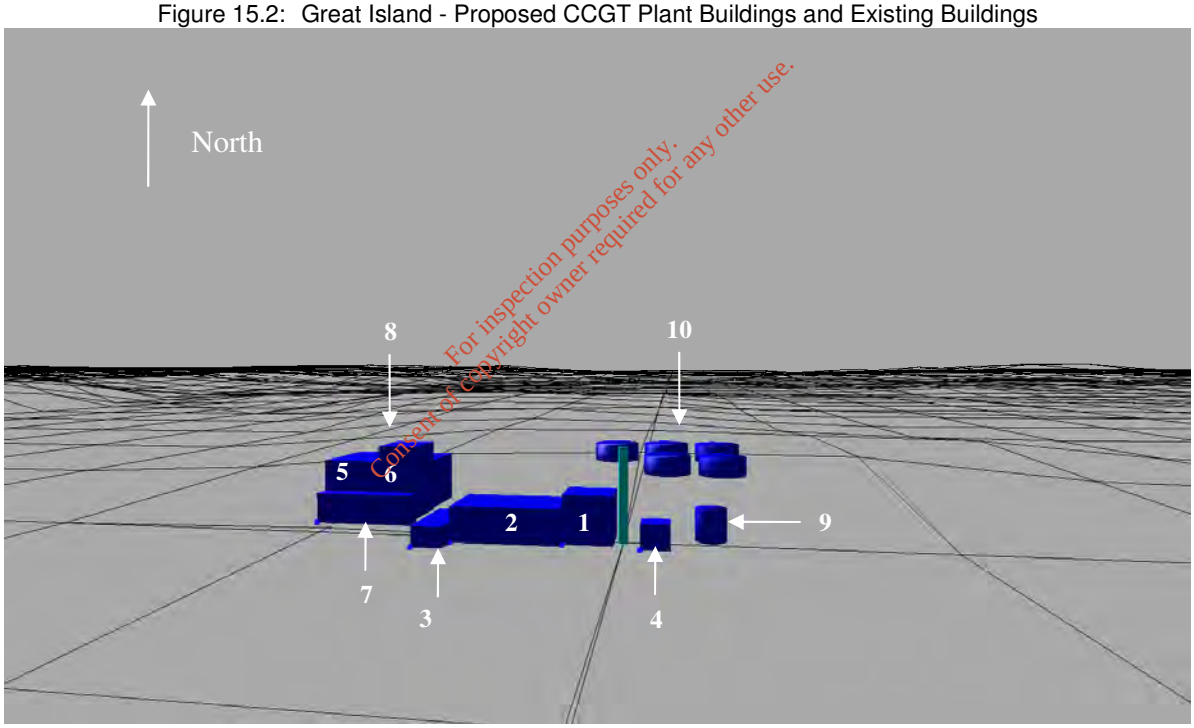
15.7.1.6 Building Downwash

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

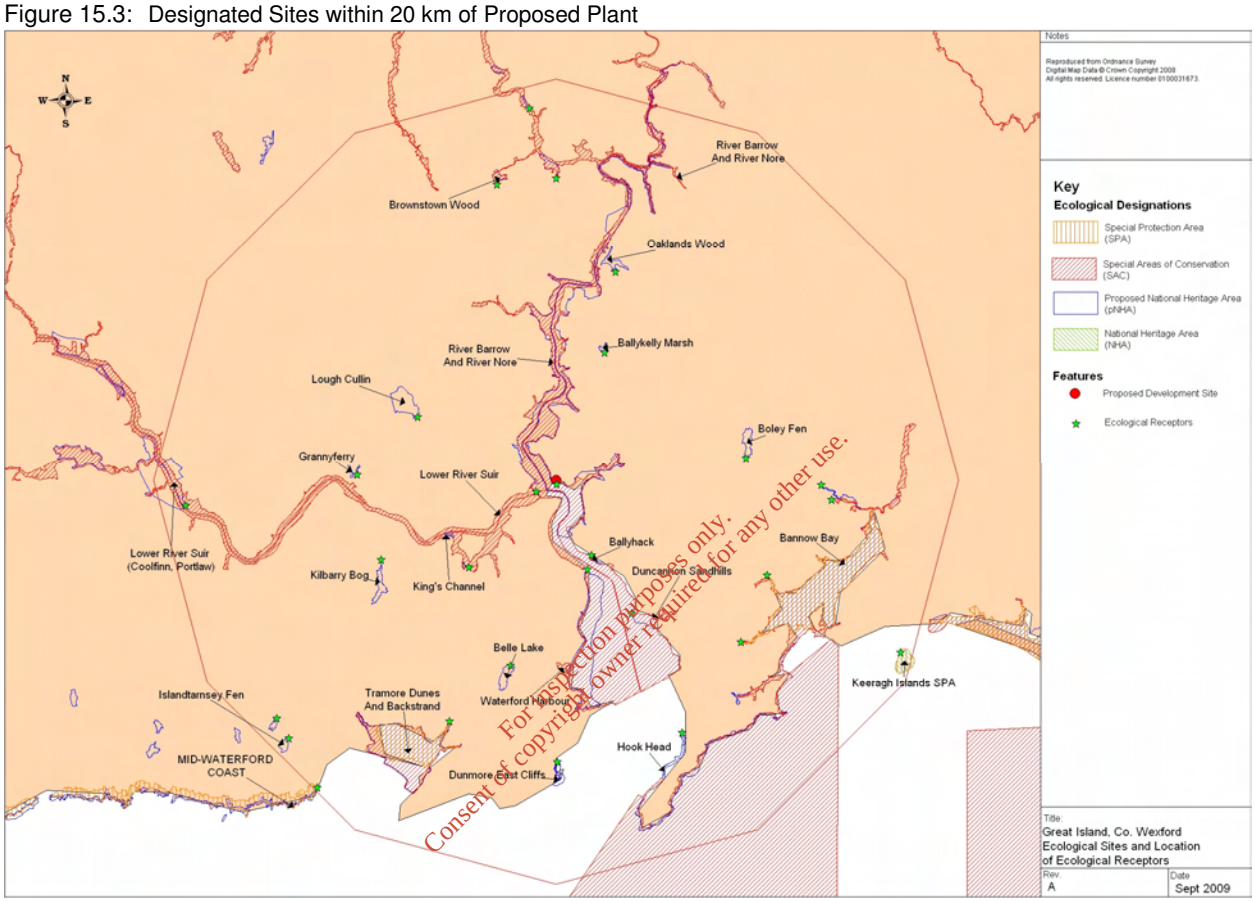
In order to assess potential effects process contributions on designated ecological sites within 20 kilometres of the proposed plant, within each designated site a series of receptors were chosen representing changes in process contributions across an area.

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

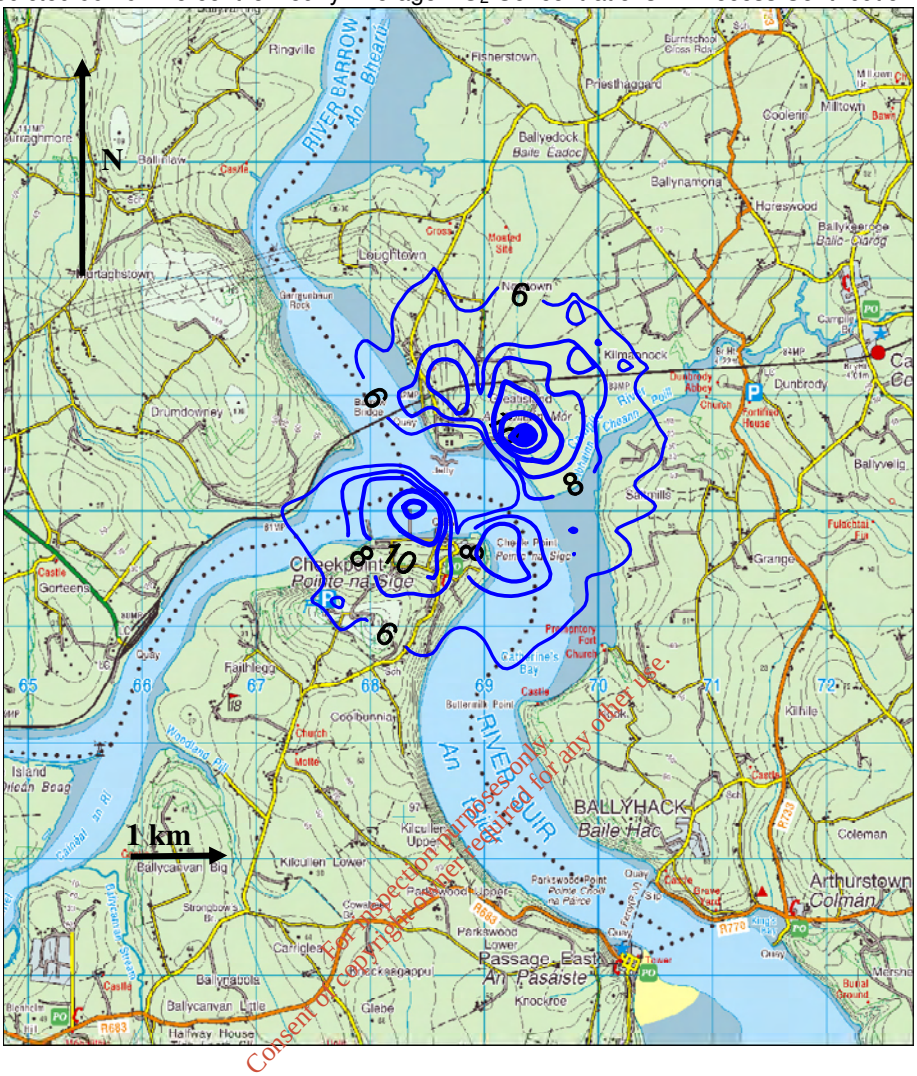
AC = Ambient Concentration

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

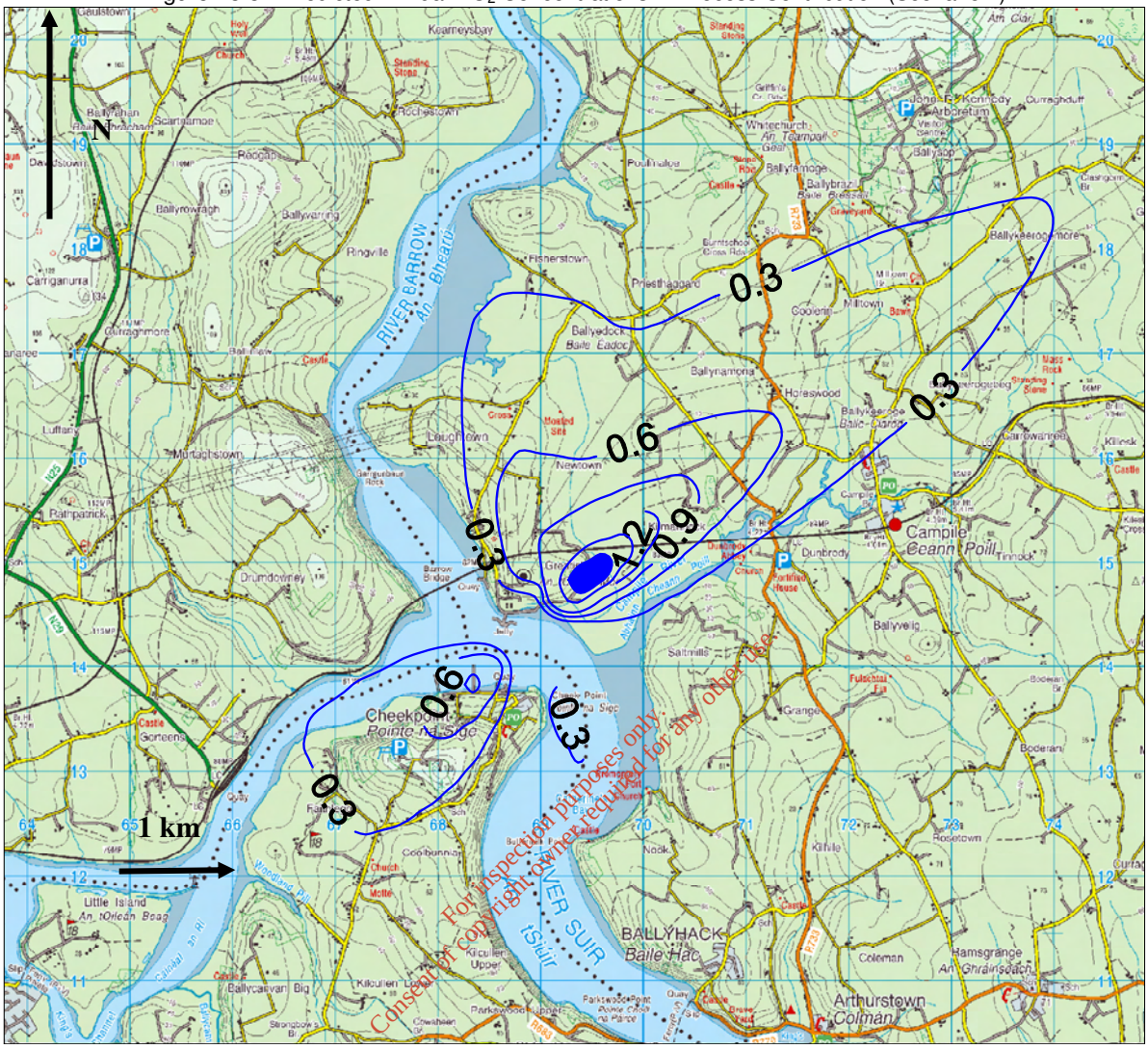
Proposed plant firing on natural gas

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 ($\mu g/m^3$)

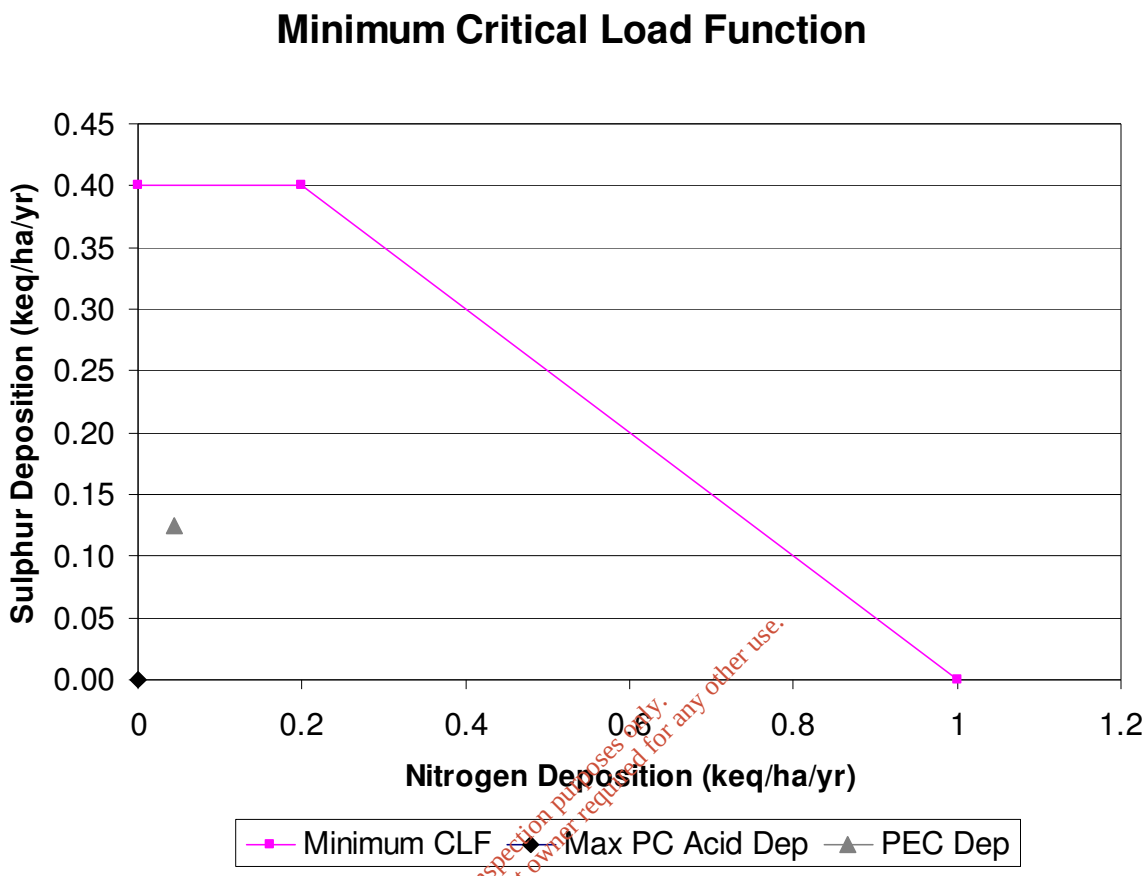
Site	Designation	Distance from Plant (km)	AQS	AC	PC	Max PC as % AQS	PEC
Balleyhack	pNHA	4.1	30	12	0.24	0.8	12.24
Balleykelly Marsh	pNHA	6.7	30	12	0.25	0.8	12.25
Mid Waterford Coast	SPA	19.0	30	12	0.04	0.1	12.04
Hook Head	pNHA, SAC	14.0	30	12	0.08	0.3	12.08
Boley Fen	pNHA	9.5	30	12	0.16	0.5	12.16
Dunmore 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 Hills	Eastern	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

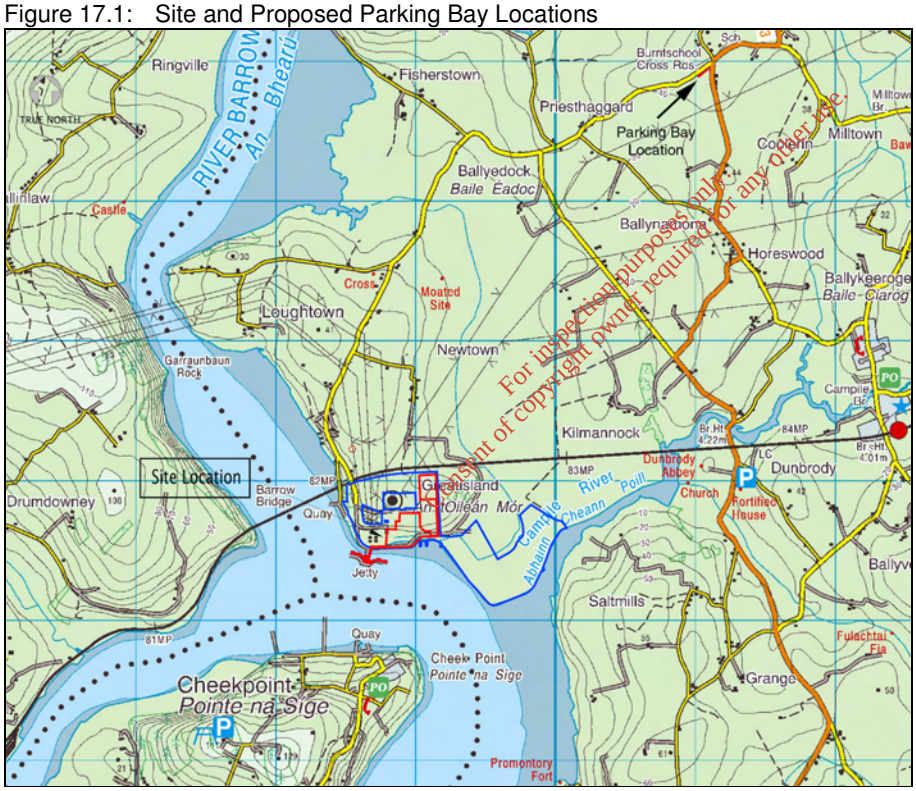
Standards / Procedures

- 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

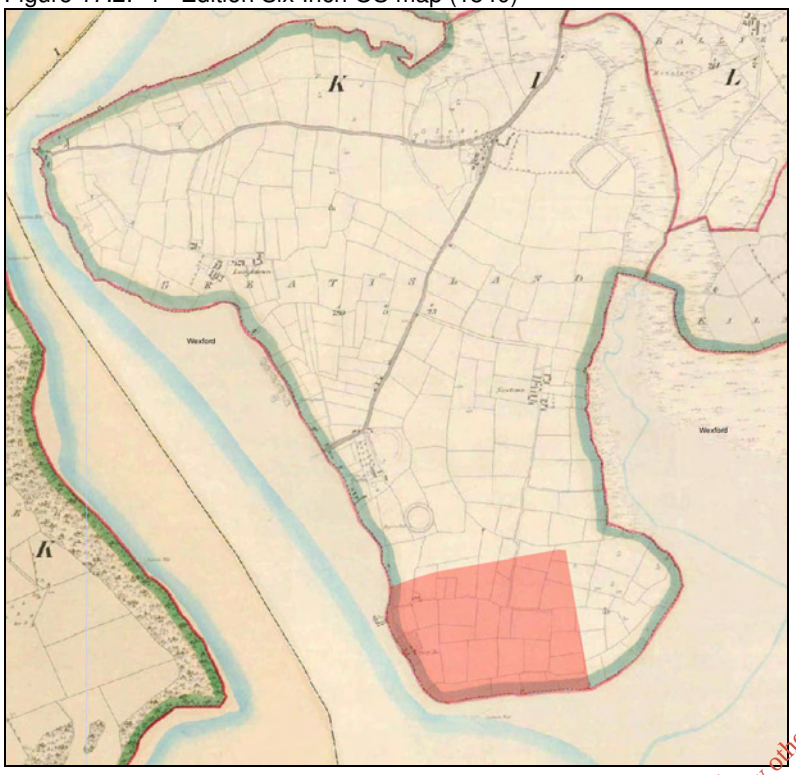


Source: Supplied by client (with additions)

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.

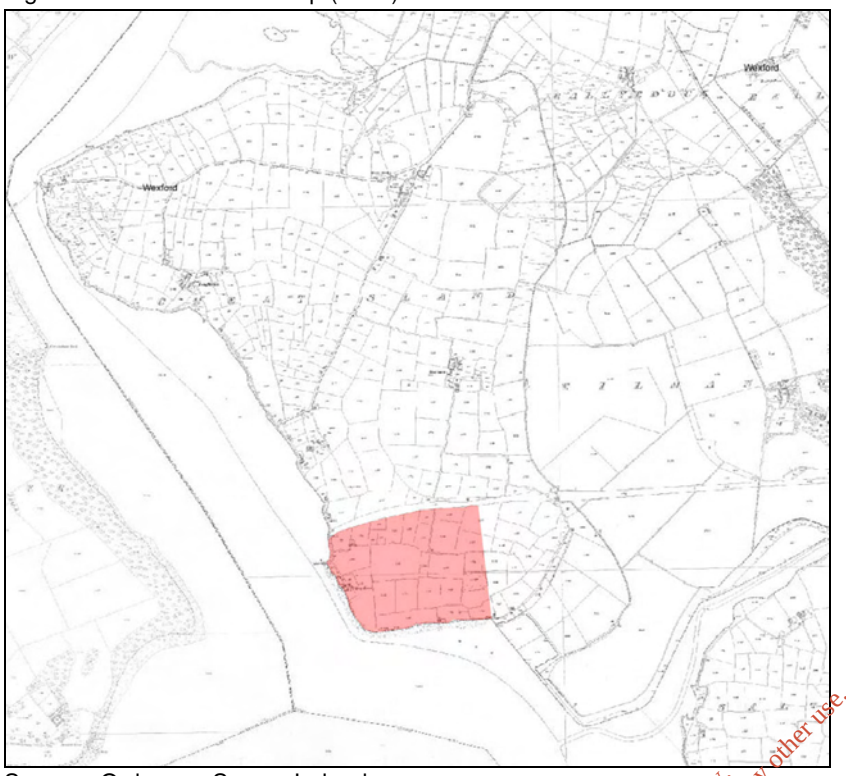
Figure 17.2: 1st Edition Six-Inch OS map (1840)



Source: Ordnance Survey Ireland

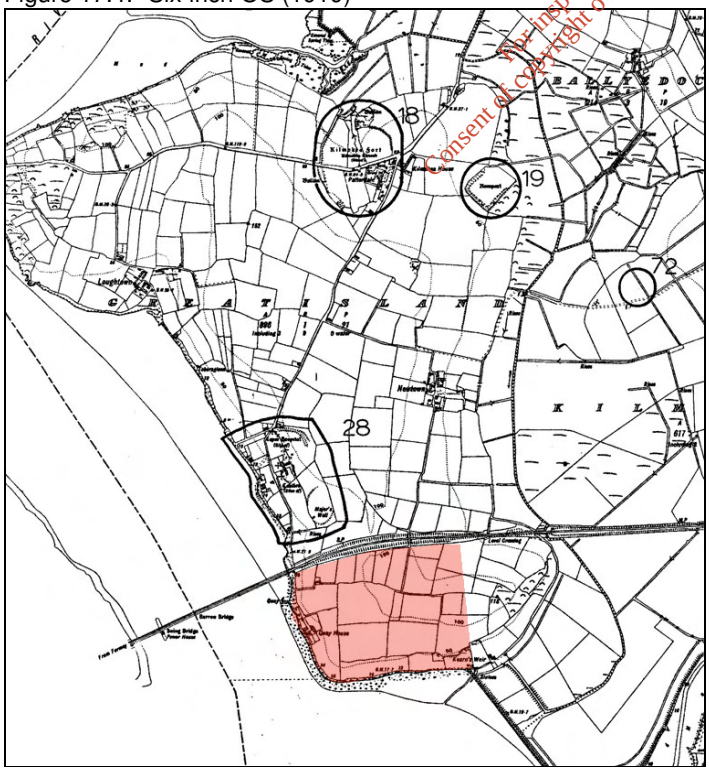
From an analysis of the First Edition 1840 six-inch Ordnance Survey map it can be seen that the layout of the proposed development site has not changed substantially prior to the construction of the existing power station. In the 1840s the development site was divided into a number of fields, with a 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)



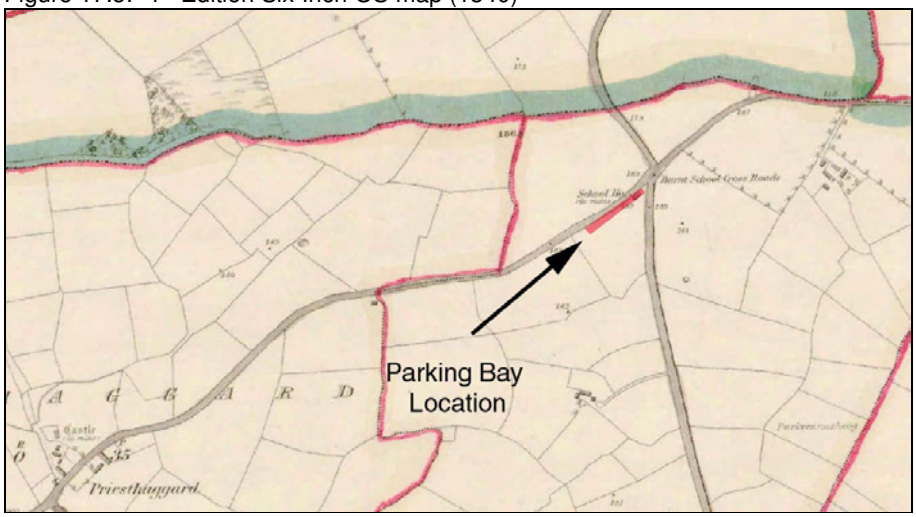
Source: Ordnance Survey Ireland

Figure 17.4: Six-inch OS (1919)



Source: Archaeological Survey of Ireland

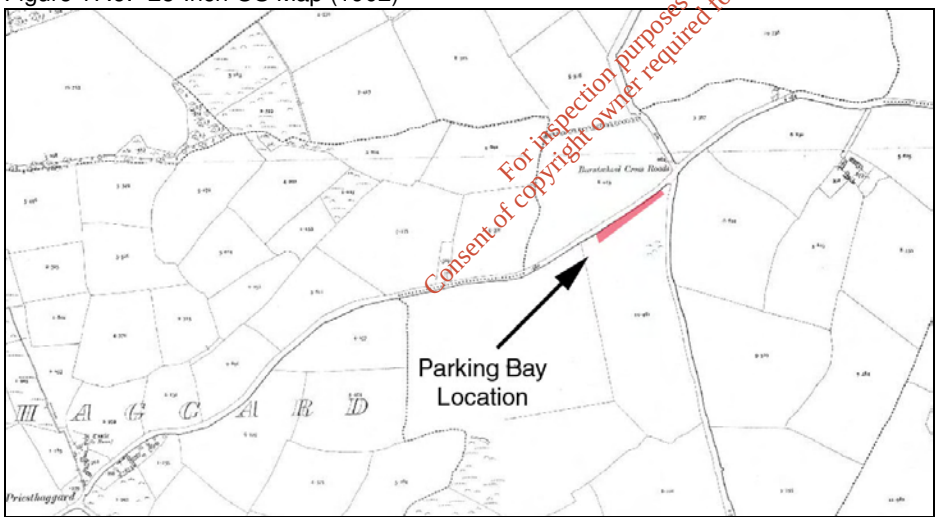
Figure 17.5: 1st Edition Six-Inch OS map (1840)



Source: Ordnance Survey Ireland

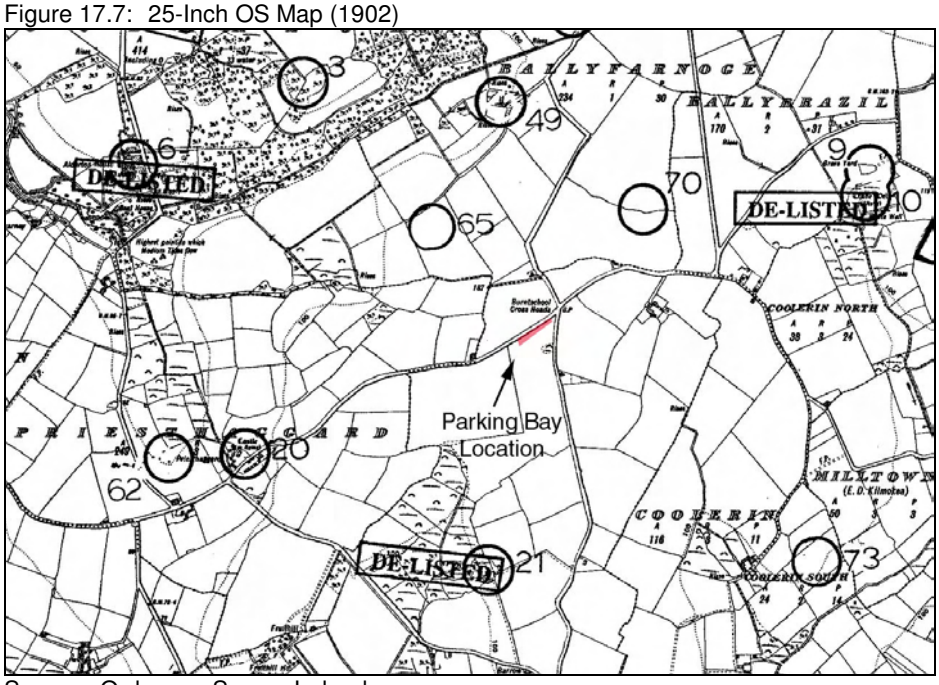
The proposed parking bay is situated within an area that has not changed greatly from the First edition to the 1919 6-inch map. The only feature of note can be seen in the First edition map where, at the northeast corner of the field, the ruins of a school house are depicted. It is possible that this 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

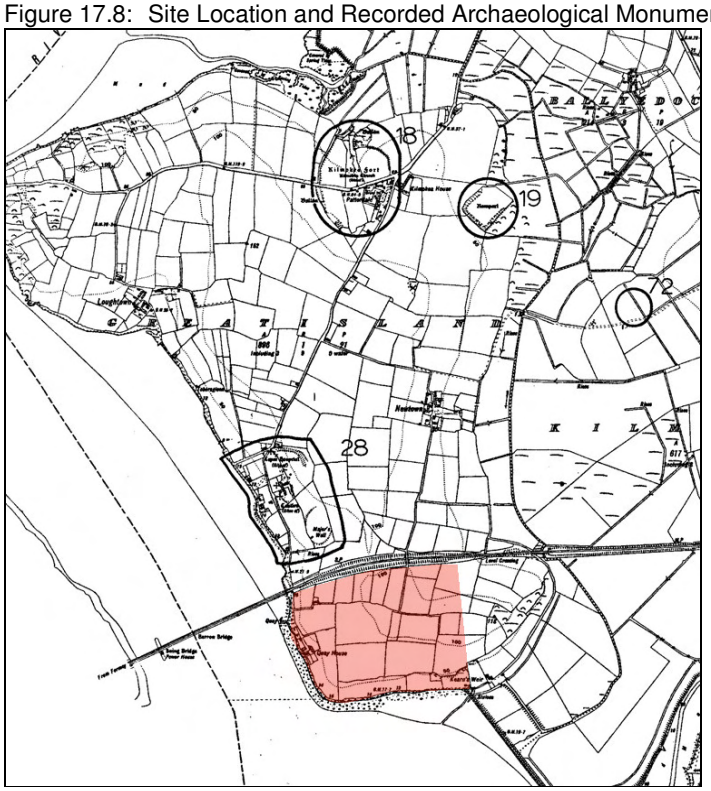
- **WX039-028002-**, an Anglo-Norman masonry castle in the townland of Greatisland
- **WX039-028003-**, an unclassified castle in the townland of Greatisland
- **WX039-028004-**, an unclassified enclosure in the townland of Greatisland
- **WX039-028005-**, a leaper hospital in the townland of Greatisland
- **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

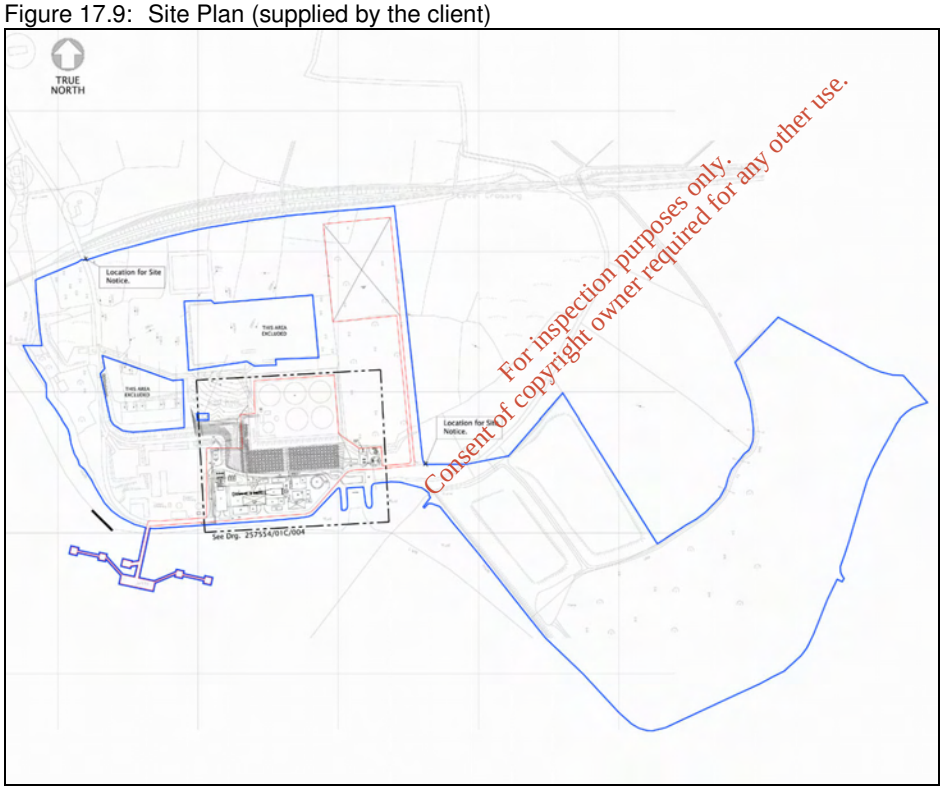
Note: All distances are from the power station

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

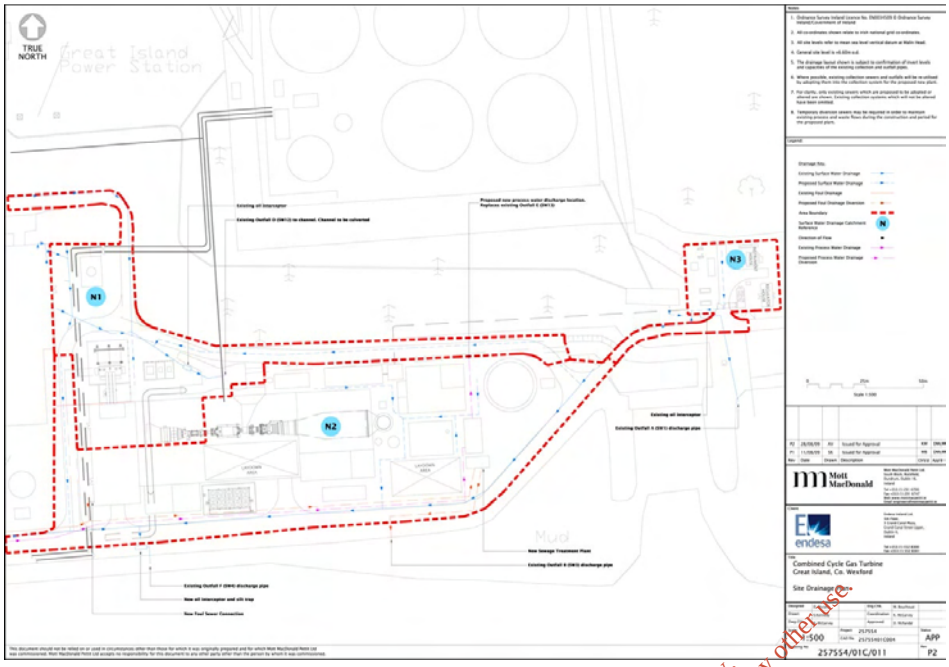
An inspection of the development site (Refer to Figure 17.9) was carried out on 23rd July 2009. The proposed construction area incorporates part of the area now used for the two existing stacks, and portion of the administration buildings. No original ground surface is visible, being covered in concrete 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.

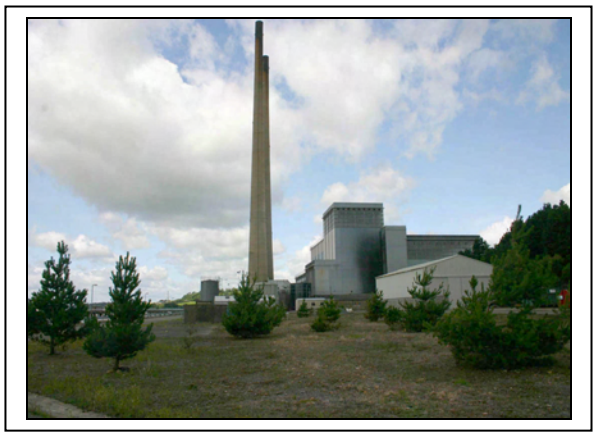


Plate17.7 Existing plant, from SE,

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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