

UNDERGROUND GAS PIPELINE AND ASSOCIATED ABOVE GROUND INSTALLATION



ENVIRONMENTAL STATEMENT Volume 1

Prepared by



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LIST OF ABBREVIATIONS

3LPE	3 layer polyethylene
AC	Alternating Current
ACC	Air Cooled Condenser
AGI	Above Ground Installation
AOD	Above Ordnance Datum
AUT	Automatic Ultrasonic Testing
BAP	Biodiversity Action Plan
BP	British Petroleum
BPA	British Pipelines Agency
BS	British standard
ВТ	British Telecom
CAA	Civil Aviation Authority
CCGT	Combined Cycle Gas Turbine
CCR	Carbon Capture Readiness
CCTV	Closed Circuit Television
CD	Compact Disc
CDM	Construction Design and Management
CECL	Coryton Energy Company Limited
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
	Close Internal Potential Survey
	•
CLG	Department for Communities and Local Government
CLG CLR	Department for Communities and Local Government Corringham Light Railway
CLG CLR CO ₂	Department for Communities and Local Government Corringham Light Railway Carbon Dioxide
CLG CLR CO ₂ CP	Department for Communities and Local Government Corringham Light Railway Carbon Dioxide Cathodic Protection
CLG CLR CO ₂ CP CPBC	Department for Communities and Local Government Corringham Light Railway Carbon Dioxide Cathodic Protection Castle Point Borough Council
CLG CLR CO ₂ CP CPBC CTMP	Department for Communities and Local Government Corringham Light Railway Carbon Dioxide Cathodic Protection Castle Point Borough Council Construction Transport Management Plan
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ES FID	Environmental Statement Further Information Document
EU	European Union
FBE	Fusion Bonded Epoxy
GEC	Gateway Energy Centre
GECL	Gateway Energy Centre Limited
GRF	Gas Reception Facility
GRP	Gas Reinforced Plastic
GW	Gigawatt
ha	hectares
HDD	Horizontal Directional Drill
HEO	Harbour Empowerment Order
HGV	Heavy Goods Vehicle
HRSG	Heat Recovery Steam Generator
HSC	Hazardous Substances Consent
HSE	Health and Safety Executive
HV	High Voltage
IEMA	Institute of Environmental Management and Assessment
IGE	Institute of Gas Engineers
IPC	Infrastructure Planning Commission
km	kilometers
kV	Kilovolts
LCPD	Large Combustion Plant Directive
LCV	Lower Calorific Value
LG	London Gateway
LPA	Local Planning Authority
LX	Lake Crossing
m	metres
mm	millimetres
MAPD	Major Accident Prevention Document
MAOP	Maximum Allowable Pressure
MOC	Minimum Offtake Connection
MOD	Ministry of Defence
MOF	Minimum Offtake Facility
MWe	Megawatts Electrical
N ₂	Nitrogen
NG	National Grid
NO _x	Nitrogen Oxides
NPS	National Policy Statement
NPS EN-1	Revised Draft Overarching National Policy Statement for Energy (EN-1)
NSIPs	National Significant Infrastructure Projects



NTaS	National Transmission System
NTS	Non-Technical Summary
OFGEM	Office of the Gas and Electricity Markets
OLIV	On-line Inspection Vehicles
OPA	Outline Planning Application
OPA	Oil Pipelines Agency
OS	Ordnance Survey
РВ	Parsons Brinckerhoff
PIG	Pipeline Internal Gauge
PLX	Pipeline Crossing
PP	Planning Permission
PPS	Planning Policy Statement
PSR	Pipelines Safety Regulations
PSSR	Pressure System Safety Regulations
RDX	Road Crossing
RLX	Rail Crossing
RTU	Remote Terminal Unit
RVX	River Crossing
SECL	Spalding energy Company Limited
SEE	Spalding Energy Expansion
SEEL	Spalding Energy Expansion Limited
SINC	Site of Importance for Nature Conservation
SO ₂	Sulphur dioxide
SPEAC	Shellhaven Project Environmental Action Committee
ТВС	Thurrock Borough Council
TEU	Twenty-foot Equivalent Shipping Container Units
TLX	Track Crossing
TR	Transformer Rectifier
TTGDC	Thurrock Thames Gateway Development Corporation
TWAO	Transport and Works Act Order
UK	United Kingdom
UPS	Uninterruptible Power Supply

PREFACE



PREFACE

In February 2010, Gateway Energy Centre Limited (GECL) submitted an application for Consent under Section 36 of the Electricity Act 1989 to the Department of Energy and Climate Change (DECC) to construct a 900 Megawatts Electrical (MWe) Combined Cycle Gas Turbine (CCGT) Power Plant to be known as Gateway Energy Centre or GEC. In addition, a direction that planning permission be deemed to be granted under Section 90 of the Town and Country Planning Act 1997 was also sought. The Consent application was accompanied by an Environmental Statement (ES) prepared in accordance with the requirements of the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 (as amended).

Following submission of the Section 36 Consent application, consultation responses were received and meetings were held with key consultees. In these consultation responses and meetings, a number of clarifications on the Section 36 Consent application were sought, and supplementary information was requested. The clarifications and supplementary information was presented in an Environmental Statement Further Information Document (ES FID) (which was accompanied by a number of supporting documents) and was submitted to DECC in December 2010.

GEC will be located on land within the London Gateway Port / London Gateway Logistics and Business Park development, collectively called the LG Development, which is currently in the early stages of construction. The LG Development is being promoted by DP World.

Further to the development of GEC, GECL proposes to construct an underground gas pipeline and associated Above Ground Installation (AGI) required in connection with the development of GEC. This ES has been prepared to accompany the application for planning permission to be made to Thurrock Thames Gateway Development Corporation (TTGDC) under the Town and Country Planning Act 1990 for the installation of the underground gas pipeline and associated AGI.

The installation of electrical infrastructure for the High Voltage (HV) grid connection associated with the development of GEC will be the subject of a separate application to be made in due course (to TTGDC / Thurrock Council under the Town and Country Planning Act 1990 and / or to the Infrastructure Planning Commission (IPC) (or to the Major Infrastructure Planning Unit which will replace the IPC) under the Planning Act 2008).

Should members of the general public wish to make a representation regarding the application for planning permission for the gas pipeline and associated AGI, then these should be forwarded to:

Matthew Gallagher Planning Development Officer *Thurrock Thames Gateway Development Corporation (TTGDC)* 2nd Floor, Civic Offices (CO1) New Road Grays Essex RM17 6SL

Copies of the application for planning permission with a plan showing the land to which it relates, the ES explaining GECL's proposals in more detail and presenting an analysis of the environmental implications of the gas pipeline and associated AGI, and the Non-Technical Summary (NTS) of the ES may be inspected during normal office hours at the following addresses:

Thurrock Thames Gateway Development Corporation2nd Floor, Civic Offices (CO1)New RoadGraysEssexRM17 6SLMonday to Friday:9 am to 5 pm

Opening Hours:

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	<i>Thurrock Council</i> Civic Offices New Road Grays Essex RM17 6SL	
Opening hours:	Monday to Thursday: Friday:	8:45 am to 5:15 pm 8:45 am to 4:45 pm
	Stanford-Le-Hope Libra High Street Stanford-Le-Hope Essex SS17 0HG	ıry
Opening hours:	Monday: Tuesday: Wednesday: Thursday: Friday: Saturday:	10 am to 1pm / 2 pm to 6 pm 10 am to 1pm / 2 pm to 5 pm Closed 10 am to 1pm / 2 pm to 6 pm 10 am to 1pm / 2 pm to 5 pm 10 am to 1pm / 2 pm to 5 pm
	Corringham Library Communities, Libraries a St John's Way Corringham Essex RM17 7LJ	nd Cultural Services
Opening hours:	Monday: Tuesday: Wednesday: Thursday: Friday: Saturday:	9 am to 7 pm 9 am to 5 pm 9 am to 1 pm 9 am to 7 pm 9 am to 5 pm 9 am to 5 pm

Alternatively, paper copies of this ES (including Volumes 2 and 3, and the stand-alone documents) can be purchased for a fee of £250 for each copy by writing to:

Chris Brake **Dalton Warner Davis LLP** 21 Garlick Hill London EC4V 2AU

CD copies of this ES (including Volumes 2 and 3, and the stand-alone documents) can be purchased for a fee of £5 each.

Copies of the NTS are available free of charge.

An electronic version of the application for planning permission and associated documents, including the ES, can be downloaded free of charge at the GEC website:

http://www.gatewayenergycentre.co.uk

SECTION 1

INTRODUCTION



1 INTRODUCTION

1.1 Application for Planning Permission

- 1.1.1 GECL seeks planning permission principally for:
 - The development of an underground gas pipeline, an Above Ground Installation (AGI) and ancillary development (including pipeline route markers, cathodic protection posts, M4 mark posts (for special crossings) and landscaping / biodiversity provision).
- 1.1.2 The application for planning permission is accompanied by the following documents:
 - Environmental Statement
 - Volume 1 Main Text
 - Volume 2 Appendices
 - Volume 3 Figures
 - Non-Technical Summary of the Environmental Statement
 - Design and Access Statement
 - Planning Statement
 - Statement of Community Involvement

1.2 The GEC Project

- 1.2.1 GEC will be located on land within the LG Development. The LG Development, promoted by DP World, is currently in the early stages of construction. The GEC site location is shown in Figure 1.1. The Ordnance Survey (OS) Grid Reference of the centre of the GEC site is approximately 573209, 182165.
- 1.2.2 The overall site boundary for the Section 36 Consent application for GEC covers approximately 29.1 hectares (71.9 acres) and incorporates areas to the north and west which may be used for temporary laydown during construction. However, once constructed the GEC site will be approximately 11.3 ha (28.0 acres) including land to be set aside for the purpose of installing carbon capture equipment if required in the future.
- 1.2.3 The GEC site is situated on the north bank of the Thames Estuary and lies approximately 6 km east of the A13. The A1014 dual carriageway (The Manorway) is located to the north of the site and runs east to west to provide a link with the A13, which in turn links in with the M25 at Junction 30. The River Thames runs in a west to east direction to the south of the site where DP World has recently commenced works on the new port facility associated with the LG Development.
- 1.2.4 The nearest residential settlements to the GEC site are at Corringham and Fobbing which lie approximately 4 km to the west, Canvey Island approximately 5 km to the east, and Basildon approximately 7 km to the north.
- 1.2.5 To the east of the GEC site is the existing Coryton Energy Company Limited (CECL) CCGT Power Station (700 m east), Shell Aviation Fuel Storage Farm and Petroplus' Coryton Oil Refinery (950 m east).

Benefits of Development

1.2.6 GECL considers that development of GEC and the underground gas pipeline and AGI provide the following benefits:



- Up to 900 MWe of new generating capacity, enough to supply approximately one million homes, thus helping to ensure continuity of supply of electricity in the UK and the south east of England given the pending closure of old coal / oil fired and nuclear power plants;
- Minimal transmission losses given GEC's location in the UK close to the area of maximum demand (the south east of England, including London), effectively, reducing fuel usage and lowering carbon dioxide (CO₂) emissions;
- Potential to help reduce the UK's carbon emissions as GEC would emit approximately 50 per cent less CO₂ than existing coal fired power plants;
- Flexibility of power generation to enable electricity production to be increased or decreased as renewable generation fluctuates (e.g. when there is little wind);
- Creation (via the development of GEC) of up to 600 construction jobs and 40 direct long term jobs during operation, and spend with local firms and suppliers;
- Creation (via the development of the underground gas pipeline and associated AGI) of up to a further 200 construction jobs, and spend with local firms and suppliers;
- Provision of up to 150 MWe to the LG Development to meet its power requirements, further minimising transmission losses and CO₂ emissions;
- Potential for the provision of steam and / or hot water to the LG Development and local area, which could reduce the overall amount of fuel needed to meet the equivalent energy requirements of standard heat generation;
- GEC will be designed to be Carbon Capture Ready (CCR) such that it will be able to be retrofitted with Carbon Capture and Storage (CCS) if this becomes technically and economically feasible. GEC is well located for CCS given its proximity to other power stations in the south east of England and prospective off shore CO₂ storage facilities; and
- GEC, which will be built on brownfield land, will be designed to be sympathetic to the LG Development and the local area.

GEC Operational Details

- 1.2.7 GEC will provide up to 900 MWe of power generation capacity. This will include the provision of up to 150 MWe to the LG Development, which is expected to meet its long-term electricity requirements. Additionally, GEC will be designed in such a way as to enable the supply of heat in the form or steam and / or hot water (for use in production / space heating / cooling) to facilities and / or customers in the vicinity of the GEC site (in particular to prospective customers of the LG Development).
- 1.2.8 GEC will likely comprise two gas turbine units which will be fuelled by natural gas. Each unit will comprise a gas turbine and a Heat Recovery Steam Generator (HRSG). The natural gas will be burnt in the combustion chamber of each gas turbine from where the hot gases will expand through the gas turbine to generate electricity. The hot exhaust gases are then used in the HRSG to generate steam, which in turn is used to generate electricity via steam turbine equipment.
- 1.2.9 The use of a combined gas and steam cycle increases the overall efficiency of the power plant. As such, GEC will be capable of generation in combined cycle mode with an electrical generation efficiency of approximately 55 per cent based on the Lower Calorific Value (LCV) of the fuel. This is considered to be a conservative approximation, and an electrical generation efficiency of 58 to 59 per cent may well be achievable at the time of contracting for equipment. If it becomes technically and



economically feasible to provide heat and / or power to surrounding facilities / customers, additional fuel utilisation gains may be achieved.

- 1.2.10 The spent steam leaving the steam turbine equipment will pass to an Air Cooled Condenser (ACC) where it will be condensed. The resultant condensate will be returned to the HRSGs for reuse. The use of ACCs has the potential to eliminate other environmental impacts associated with other cooling systems.
- 1.2.11 The flue gases from each CCGT module will be discharged to the atmosphere via two dedicated 75 m stacks. The height of these has been determined by a computer dispersion modelling study.
- 1.2.12 Figure 1.2 shows a schematic representation of the CCGT principle.
- 1.2.13 GEC may potentially have a positive net effect on climate change as it will likely replace other fossil fuel sources of electricity generation that have greater CO2 emissions per unit output.
- 1.2.14 In addition, GEC will be designed so as to be Carbon Capture Ready (CCR), with space made available in the design to allow for the retrofitting of a carbon capture plant in the future. This is discussed further in the CCR Feasibility Study which has been submitted in support of the Section 36 Consent application for GEC.

1.3 Infrastructure Connections

- 1.3.1 A new underground gas pipeline and associated Above Ground Installation (AGI) are required to deliver natural gas from the National Grid Gas National Transmission System to GEC for the purposes of generating electricity.
- 1.3.2 The new underground gas pipeline and associated AGI are required as the existing CECL Power Station gas pipeline and AGI do not have sufficient capacity to transport the required gas flow for the operation of both the CECL and GEC Power Stations.
- 1.3.3 At the AGI, the natural gas will be taken from a connection to the existing National Grid National Transmission System and transported to GEC via the proposed underground gas pipeline.
- 1.3.4 During operation, the only visible feature of the development will be the AGI. As with the existing AGI for the CECL Power Station, it is assumed that several confirmed mitigation measures (which serve to address landscape and visual impacts) will be applied as follows:
 - a) Screening in the form of landscaping will be provided. The details of such screening shall be agreed with TTGDC (in consultation with Thurrock Council) and are likely to be similar to that implemented at the existing AGI for the CECL Power Station given such landscaping is proven to be effective. The land take requirements of the proposed AGI are approximately 0.24 ha, without considering areas for roads and landscaping and 0.44 ha with areas for roads and landscaping.

The landscape and visual impacts noted during operations are those which are likely to be experienced after approximately 7 to 15 years of planting, when the landscaping has matured. GECL, in consultation with TTGDC, proposes to inter-plant older with younger specimens with the aim of minimising the time taken for the screening to mature and become fully effective;

b) Further landscaping and biodiversity works are to be carried out in the vicinity of the proposed AGI. Such works may include hedgerow strengthening and the planting of deciduous native hard wood species, to be undertaken in consultation with local land owners and TTGDC (in consultation with Thurrock Council); and



- c) GECL will discuss and agree an appropriate contribution with TTGDC, towards local Greengrid works. The local Greengrid, as set out in Thurrock Council's draft Core Strategy (February 2010, CSSP 5 – Sustainable Greengrid, paragraph 4.30), is intended to enable multifunctional land use of both public and private space as supported by a physical network of green links for people and wildlife. The Greengrid includes open space, biodiversity and green infrastructure (such as public rights of way).
- 1.3.5 Once constructed, the underground gas pipeline will not be visible following around one growing season.
- 1.3.6 The electricity generated at GEC will be dispatched to the HV National Grid system via a connection to a new substation. It should be noted that the use of the existing CECL Power Station overhead line has been discounted by National Grid due to a lack of compatibility with the regulations governing National Grid's existing transmission network (which are set by OFGEM).
- 1.3.7 The substation, including its connection to the existing Rayleigh Tilbury 400 kV overhead line, is to be consented and constructed by National Grid. The electrical connection from the substation to GEC is to be consented and constructed by GECL. As such, these will be subject to separate Consent applications. The responsibilities of National Grid and GECL are shown in Insert 1.1.



INSERT 1.1 – CONSENTING RESPONSIBILITIES OF NATIONAL GRID AND GECL





1.3.8 In addition to the above, interconnections may also be required to / from GEC to satisfy any Combined Heat and Power (CHP) (for the export of steam / hot water) and CCR (for the export of captured CO₂) requirements. These interconnections are discussed further in the CHP Assessment / Supplementary CHP Assessment and CCR Feasibility Study respectively, which have been submitted in support of the Section 36 Consent application for GEC.

1.4 The Developer

- 1.4.1 GEC will be owned and operated by GECL, which is part of the InterGen group of companies. InterGen, formed in 1995, is a global power generation company.
- 1.4.2 InterGen has 12 power plants totalling 6 254 MWe of production capacity. InterGen's plants are located in the UK, The Netherlands, Mexico, the Philippines and Australia. Historically, InterGen has developed more than 20 power generation facilities in ten countries across six continents, with a combined generating capacity of over 16 000 MWe.
- 1.4.3 InterGen is the UK's largest independent gas-fired power producer, with three plants in the UK that provide approximately 6 per cent of the country's average demand. The three plants include InterGen's 800 MWe CECL Power Station, situated 700 m to the east of the proposed GEC site. These power plants are among the cleanest and most technologically advanced in the world.
- 1.4.4 In March 2009, Spalding Energy Expansion Limited (SEEL) (which is part of the InterGen group of companies) submitted a Section 36 Consent application for a 900 MWe expansion at the Spalding CCGT Power Plant site (known as the Spalding Energy Expansion or SEE). Section 36 Consent for the SEE was granted in November 2010.

1.5 Overview of the Consenting Process

- 1.5.1 Nationally Significant Infrastructure Projects (NSIPs), as defined in Part 3 of the Planning Act 2008, include the construction of a pipeline by a gas transporter and the construction of a cross-country pipeline other than by a gas transporter.
- 1.5.2 However, as GECL is not a gas transporter and the proposed gas pipeline does not constitute a 'cross-country pipeline' for the purposes of the Planning Act 2008¹ the proposed gas pipeline does not fall within the ambit of Section 14(1)(f) / Section 14(1)(g) and Section 20 / Section 21 of the Planning Act 2008.
- 1.5.3 The gas pipeline and associated AGI will therefore require an application for planning permission under the Town and Country Planning Act 1990.
- 1.5.4 The application for planning permission is accompanied by this ES, which has been prepared in accordance with the requirements of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.

The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999

1.5.5 Any applications for development which are subject to the European Union (EU) EIA Directive (Directive 85/337/EEC) (as amended by Directive 97/11/EC, Directive 2003/35/EC and Directive 2009/31/EC) must be accompanied by an ES. The ES should describe the aspects of the environment likely to be significantly affected by the proposed development, considering in particular, effects on: human beings, fauna and flora, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them.

¹ Section 235(1) of the Planning Act 2008 provides that 'cross-country pipeline' has the same meaning as in the Pipelines Act 1962, namely "a pipeline whose length exceeds, or is intended to exceed 10 miles [16.093 km]". As the proposed gas pipeline is approximately 7.7 km in length, it is not a 'cross-country' pipeline.



- 1.5.6 The gas pipeline is defined as a 'Schedule 2 Development' under the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (the 1999 EIA Regulations). 'Schedule 2 Developments' include any oil or gas pipeline which has an area of works exceeding 1 hectare (ha) or (in the gas pipeline) has a design operating pressure exceeding 7 bar gauge. As the overall development will occupy an area of more than 1 ha, the proposed gas pipeline and associated AGI is classified as a Schedule 2 Development under the 1999 EIA Regulations.
- 1.5.7 Accordingly, this ES has been prepared to accompany the application for planning permission. This ES describes the development proposals for the gas pipeline and associated AGI, and conforms to the requirements in Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (the 1999 EIA Regulations).
- 1.5.8 The information to be included in an ES to accompany the application for planning permission for the gas pipeline and associated AGI from TTGDC is set out in Section 7.

The Planning (Hazardous Substances) Act 1990

1.5.9 The Planning (Hazardous Substances) Act 1990 is of limited relevance, as the proposed gas pipeline and AGI is classified as an 'Exempt Pipeline' by the Planning (Hazardous Substances) Regulations 1992. Under Regulation 4(8) of the Planning (Hazardous Substances) Regulations 1992, an 'Exempt Pipeline' means a pipeline used to convey a hazardous substance to or from a site (but does not include that part of the pipeline on, over or under a site to which it has an outlet or inlet; or a service pipe). Therefore a Hazardous Substances Consent (HSC) is not required for the gas pipeline and associated AGI.

SECTION 2

RATIONALE FOR DEVELOPMENT



2 RATIONALE FOR DEVELOPMENT

2.1 Background

- 2.1.1 Electricity is essential in a modern society. It powers a huge variety of things, from computers to lights to kitchen appliances to industrial plant. Therefore a growing economy, combined with the innovation to develop electronic devices, leads to a considerable upwards pressure on the UK energy market.
- 2.1.2 The national need for investment in energy infrastructure has been consistently recognised in various statements of Government Policy, referred to in the GEC ES, the GEC ES FID. These statements include Energy Markets Outlook Report (2009), Ofgem's Project Discovery Options for Delivering Secure and Sustainable Energy Supplies² (February 2010), and DECC's 2050 Pathways Analysis (July 2010).
- 2.1.3 These documents include the following key themes:
 - The need for unprecedented levels of investment to be sustained over many years in energy infrastructure in difficult financial conditions, including the need for flexible generation (such as CCGT);
 - The need to lower carbon emissions; and
 - Aim to use CHP which maximises efficiency;
- 2.1.4 The above national need for more power generation is further discussed in this Section, which provides the rationale for development.

2.2 Current Power Generation Capacity and Electricity Demand

- 2.2.1 Currently, the bulk of power generation in the UK is located in northern areas of England and Scotland, either in the vicinity of the UK coal fields or on the coast where fuel supplies can be readily imported. This situation is much the same for many renewable forms of generation including wind farms and hydroelectric plants that are generally situated in more remote locations where the resources they require are more abundant.
- 2.2.2 However, the main electricity demand in the UK is in the south (particularly London), the south east, the south west and some parts of the Midlands where demand, and the need to address flexible demand (as renewable forms of generation penetrate the UK Plant mix in greater capacity), is increasing.
- 2.2.3 Therefore, the current situation requires power to be transported to these areas of high demand via transmission lines belonging to the National Grid. As demand and flexible demand increases, the need to reinforce the electricity transmission system arises and more long distance transmission lines are required.
- 2.2.4 An alternative to new long distance transmission lines is to generate more electricity in the areas where it is needed. This not only helps negate the need for long power lines, but also gives the added environmental benefit of reducing electrical transmission losses which occurs as the electricity is transported along the transmission lines.
- 2.2.5 Transmission losses can amount to a significant quantity of electricity, such that a power station generating 1000 MWe in the north of England / Scotland would provide less than 940 MWe by the time it reached consumers in the south of England.
- 2.2.6 Currently, the UK has a total electricity generating capacity of around 82 GW based on various technologies. This includes approximately 2 GW of electricity generating

² Available on:

 $http://www.ofgem.gov.uk/MARKETS/WHLMKTS/DISCOVERY/Documents1/Project_Discovery_FebConDoc_FINAL.pdf$



capacity located in Northern Ireland, and some electricity generating capacity which supplies directly into the local distribution network rather than into the National Grid National Electricity Transmission System³.

- 2.2.7 Based on information from UK Energy in Brief 2010, of the electricity distributed into the National Grid National Electricity Transmission System, the bulk of comes from fossil fuelled power stations (Coal 28 per cent, Oil 1 per cent and Gas 45 per cent)⁴.
- 2.2.8 However, the Large Combustion Plant Directive (Directive 2001/80/EC) (LCPD) requires power stations to adhere to stringent air quality standards. Several plants throughout the UK, totalling 12 GW, have opted-out of this obligation and, as such, are required to close by the end of 2015 or after 20 000 hours of operation after 1 January 2008, whichever is sooner.
- 2.2.9 The operating regimes of these opted-out plants will become a commercial decision to be taken by the plant operators. This means that it will be impossible to predict the timing and impact of the LCPD on the UK generation capacity. However, the Energy Markets Outlook Report, produced by the Department for Business Enterprise and Regulatory Reform (BERR) (now DECC) and OFGEM in October 2007 has forecast that based on historical operating patterns, the allowance of hours will be reached, by some of the opted-out plants, by early 2012.

³ Energy Markets Outlook, December 2008 (DECC and OFGEM)

⁴ UK Energy in Brief , July 2010 (DECC)



2.2.10 The main effects in the UK due to the opted-out coal and oil plants are shown in Table 2.1.

TABLE 2.1: IMPACTS OF THE LARGE COMBUSTION PLANT DIRECTIVE ON OPTED-OUT OIL AND COAL PLANTS $^{\rm 5}$

Type of Station	Stations	Capacity	Impact
Opted-out Coal	Didcot A Kingsnorth Cockenzie Tilbury Ferrybridge (part) Ironbridge	2100 MWe 2000 MWe 1200 MWe 1100 MWe 1000 MWe 1000 MWe	These stations are required to operate for no more than 20 000 hours after 1 January 2008 and must close by 31 December 2015. However, the plant could re-open as 'new plant' if they meet stringent new plant emissions standards.
	Total	8400 MWe	
Opted-out Oil	Fawley Grain Littlebrook	1000 MWe 1400 MWe 1200 MWe	These stations must close by 31 December 2015. They are likely to be used for peaking only (as they only become economical at high electricity prices) and so the 20 000 hour limit is unlikely to constrain their running.
	Total	3600 MWe	
	Total (Opted-out)	12000 MWe	

- 2.2.11 In addition, around 7.4 GW of generating capacity will be lost by 2020 due to the planned closure of some nuclear power plant, with an additional loss of 3.6 GW by 2035^4 .
- 2.2.12 The remaining fleet of nuclear power plant and their estimated closure dates is shown in Table 2.2.

TABLE 2.2: REMAINING FLEET OF NUCLEAR POWER PLANT AND THEIR ESTIMATED CLOSURE DATES $^{\!\!\!4}$

Power Station	Reactor Type	Net MWe	Start of Operation	Estimated Closure
Oldbury	Magnox	470	1968	2010
Wylfa	Magnox	980	1972	2010
Hartlepool	AGR	1210	1989	2014
Heysham 1	AGR	1200	1989	2014
Hinkley Point B	AGR	1260	1976	2016
Hunterston B	AGR	1210	1976	2016
Dungeness B	AGR	1080	1985	2018
Heysham 2	AGR	1200	1989	2023
Torness	AGR	1200	1988	2023
Sizewell B	PWR	1190	1995	2035

2.2.13 Therefore, only 33 per cent of the current nuclear power plant generating capacity is expected to exist beyond 2020.

 $^{^{5}}$ Electricity Generating Plant Closures (DECC). Available at:

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/markets/outlook/outlook_fuel/outlook_fuel.aspx



2.2.14 The 2007 'White Paper on Energy – Meeting the Energy Challenge' (published by BERR, now DECC) officially recognised the need to replace the retiring power generation capacity in the UK, stating that:

"If we are to maintain levels of electricity generation capacity equivalent to those available today, then new power stations need to be built in time to replace these closures and to meet increases in demand. On this basis, around 20 to 25 GW of new power stations will be needed by 2020".

- 2.2.15 An additional challenge is presented with the projected increases in the demand for electricity. Forecasts from the 2008 National Grid Seven Year Statement indicate that between 3.5 GW (Base Demand) and 7.1 GW (High Demand) of new generation capacity, in addition to that required to replace closures, will be required by 2015 (taking 2008 as the base year).
- 2.2.16 However, due to the economic downturn and the increasing use of general energy efficiency measures, there has recently been a decrease in the demand for electricity. This is reflected in the 2009 National Grid Seven Year Statement which indicates that there may only be a requirement for between 0.4 GW (Base Demand) and 3.5 GW (High Demand) of new generation capacity by 2015 (taking 2009 as the base year). This requirement has increased slightly, which is reflected in the 2010 National Grid Seven Year Statement which indicates a requirement for between 0.8 GW (Base Demand) and 4.3 GW (High Demand) of new generation capacity by 2015 (taking 2010 as the base year).
- 2.2.17 In making this statement it is important to note that the Seven Year Statement does not take into account plant closures and does not allow for any increase in power demand as the UK exits recession. Market commentators anticipate substantial demand growth in the medium to long term with the rise in the likes of the number of homes and expected growth in electric cars more than off-setting energy efficiency measures.
- 2.2.18 Current generation availability data, published in the 2008 Energy Markets Outlook Report, indicates that the effective generating capacity in the UK is around 17 per cent lower than the installed capacity. The Report also highlights that the electricity generating industry will face a significant challenge to ensure the timely delivery of new generating capacity following the closures of existing plant and the projected increases in demand.
- 2.2.19 In order to ensure that supply can meet the demand it is necessary to have sufficient available generating capacity to match the highest anticipated 'peak' demand at all times. The 2007 'White Paper on Energy Meeting the Energy Challenge' (published by BERR, now DECC) highlights the need to maintain the security and reliability of the energy supply in the UK.
- 2.2.20 The margin between demand forecasts and the available generation capacity is a strong indicator of the security of the electricity supply. This has been falling steadily in recent years, indicating that there is a decreasing amount of spare capacity available in the network, see Insert 2.1.





INSERT 2.1: DEMAND PROJECTIONS: PEAK DEMAND AND SUPPLY

- 2.2.21 Insert 2.1 excludes projects currently in the planning system / consented projects but which are yet to commence electricity production. Furthermore, it assumes an increase in demand of 3.5 GWe by 2015 in line with NG High Demand forecasts. Even when allowing for expected new projects coming on-line, in the coming years there is clearly a need for additional electricity generation in the UK such as GEC.
- 2.2.22 There is a clear need for additional electricity generation in the UK. The National Grid provides guidance to the market on locations for new generation through its charging for use of the system. As part of the market guidance, the National Grid issues their Seven Year Statement (SYS) that details the areas in which the company would welcome additional generating capacity.

2.3 Need for GEC

- 2.3.1 As explained above, the UK clearly needs additional flexible power generation, including CCGT. The 2010 SYS suggests that the general area where GEC would be located, i.e. the south east of England, requires a high amount of extra generation. This reflects the south east being the centre of power demand in the UK with the population expected to grow in the coming years. Consequently, locating GEC in the south-east would reduce transmission losses that would be associated with additional electricity generation situated in the north of the country and is therefore considered to be a more environmentally sustainable option (e.g. it has lower carbon intensity given the reduced transmission losses).
- 2.3.2 Locating GEC in the Thames Gateway has the added benefit of meeting the power demands of the LG Development which requires up to 150 MWe of power for its Port and Business and Logistics Park.
- 2.3.3 Supplying the neighbouring LG Development directly further reduces transmission losses and hence further improves environmentally sustainability. The direct power supply also helps to improve industry / business competitiveness.
- 2.3.4 GEC will also provide heat in the form of steam or hot water (for use in production / space heating / cooling) to facilities and / or customers in the vicinity of the GEC site (in particular to prospective customers of the LG Development). This again helps to



improve industry / business competitiveness and affords the potential to minimise the carbon footprint of GEC.

- 2.3.5 A further benefit of GEC is that it will offer flexibility of power generation to enable electricity production to be increased or decreased as renewable generation fluctuates e.g. when there is little wind. This further assists towards ensuring security of supply in the south east of England and the UK. This flexibility of power generation underscores GEC's favourable position in being able to meet the UK's requirement for generators that can meet not only the UK's demand but also the flexible nature of the UK's demand using low carbon technology with the additional bonus of being CCR.
- 2.3.6 In conclusion, there is a clear need for new generating plant in the UK and the GEC is located in the very region where new capacity is needed most as it is the area of highest and growing demand. The location also ensures that GEC can supply the LG Development directly with up to 150 MWe. These location advantages mean that electricity will not have to be transported far reducing transmission losses effectively maximising the efficiency of the plant and fuel used.

2.4 National Policy for Energy Infrastructure now covered by the Planning Act 2008

- 2.4.1 National Policy for energy infrastructure (including NSIPs) covered by the Planning Act 2008 is provided in the Revised Draft Overarching National Policy Statement (NPS) for Energy (EN-1) (NPS EN-1), and the technology-specific Revised Draft NPSs. Used together, the NPSs form the primary policy basis for decisions made by the IPC (and its successor) on applications for energy infrastructure / NSIPs under the Planning Act 2008.
- 2.4.2 Although, as discussed in Section 1.5, the gas pipeline and associated AGI do not fall under the remit of the Planning Act 2008, NPS EN-1 states (at Paragraph 1.2.1) that:

"In England and Wales this NPS is likely to be a material consideration in decision making on applications that fall under the Town and Country Planning Act 1990 (as amended). Whether, and to what extent, this NPS is a material consideration will be judged on a case by case basis".

Furthermore (at Paragraph 1.2.3) it states:

"Further information on the relationship between NPSs and the town and country planning system, as well as information on the role of the NPSs is set out in the letter to the Chief Planning Officers issued by the Department for Communities and Local Government (CLG) on 9 November 2009⁶".

2.4.3 In the letter to the Chief Planning Officers issued by the CLG it states (at Paragraph 13) that:

"The new single consent regime for NSIPs will operate alongside the town and country planning regime. Although the two regimes are legally different, there are close interactions between them".

Furthermore (at Paragraph 17) it states:

"NPSs may specifically set out policies which will need to be taken into account by decision-makers other than the IPC. ... LPAs and other decision-makers should therefore take account of those policies when determining applications for consent for below-threshold infrastructure applications made under the town and country planning regime".

2.4.4 Based on the above, it is therefore considered that the NPSs form a material consideration for the development of the gas pipeline and associated AGI.

⁶ <u>http://www.communities.gov.uk/documents/planningandbuilding/pdf/1376507.pdf</u>



- 2.4.5 Therefore information provided on National Policy for energy infrastructure in NPS EN-1 (and the associated discussion on the 'Need for New Nationally Significant Energy Infrastructure Projects') and the technology-specific Revised Draft NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (NPS EN-4) provides the basis for the rationale for development of the gas pipeline and associated AGI.
- 2.4.6 NPS EN-1 states (in Section 2.1):

"Energy is vital to economic prosperity and social well-being and so it is important to ensure that we have secure and affordable energy. Producing the energy the UK requires and getting it to where it is needed necessitates a significant amount of infrastructure, both large and small".

2.4.7 Furthermore, NPS EN-1 states (at Paragraphs 3.1.1 to 3.1.4):

"The UK needs a mix of all types of energy infrastructure in order to achieve energy security at the same time as dramatically reducing greenhouse gas emissions.

It is for industry to propose new energy infrastructure projects within the strategic framework set by Government. The Government does not consider it appropriate for planning policy to set targets for or limits on different technologies.

The IPC should therefore assess all applications for development consent for the types of infrastructure covered by the energy NPSs on the basis that the need for those types of infrastructure has been demonstrated by the government and that this need is urgent.

The IPC should give substantial weight to the contribution which projects would make towards satisfying this urgent need when considering applications for development consent under the Planning Act 2008".

2.4.8 It is considered that the above discussion on the National Policy for energy infrastructure is applicable to the development of the gas pipeline and associated AGI. Furthermore, as the gas pipeline and associated AGI form part of wider development of energy infrastructure (i.e. the development of GEC, including all it's associated benefits) it is also considered that, in line with NPS EN-1, the need (rationale) for the development of the gas pipeline and associated AGI has been demonstrated and the need for this development is urgent.

2.5 Benefits of Development

- 2.5.1 GECL considers that development of GEC and the underground gas pipeline and AGI provide the following benefits:
 - Up to 900 MWe of new generating capacity, enough to supply approximately one million homes, thus helping to ensure continuity of supply of electricity in the UK and the south east of England given the pending closure of old coal / oil fired and nuclear power plants;
 - Minimal transmission losses given GEC's location in the UK close to the area of maximum demand (the south east of England, including London), effectively, reducing fuel usage and lowering carbon dioxide (CO₂) emissions;
 - Potential to help reduce the UK's carbon emissions as GEC would emit approximately 50 per cent less CO₂ than existing coal fired power plants;
 - Flexibility of power generation to enable electricity production to be increased or decreased as renewable generation fluctuates (e.g. when there is little wind);
 - Creation (via the development of GEC) of up to 600 construction jobs and 40 direct long term jobs during operation, and spend with local firms and suppliers;



- Creation (via the development of the underground gas pipeline and associated AGI) of up to a further 200 construction jobs, and spend with local firms and suppliers;
- Provision of up to 150 MWe to the LG Development to meet its power requirements, further minimising transmission losses and CO₂ emissions;
- Potential for the provision of steam and / or hot water to the LG Development and local area, which could reduce the overall amount of fuel needed to meet the equivalent energy requirements of standard heat generation;
- GEC will be designed to be Carbon Capture Ready (CCR) such that it will be able to be retrofitted with Carbon Capture and Storage (CCS) if this becomes technically and economically feasible. GEC is well located for CCS given its proximity to other power stations in the south east of England and prospective off shore CO₂ storage facilities; and
- GEC, which will be built on brownfield land, will be designed to be sympathetic to the LG Development and the local area.
SECTION 3

PLANNING POLICY CONTEXT



3 PLANNING POLICY CONTEXT

3.1 Overview

- 3.1.1 This Section provides the planning policy context to the Proposed Development of a gas pipeline and AGI, connecting from the NG gas NTS No. 5 Feeder adjacent to St. Clere's golf course to the proposed GEC. First, there is an outline of the legislative background, which explains the role of the development plan defined in the Planning and Compulsory Purchase Act 2004 (PCPA 2004), other material considerations and recent Court decisions as to the significance of regional strategies (RSs); second there is an explanation of the Planning Act (PA 2008) which introduced a new system for consenting NSIPs, submitted to the IPC and the purpose of NPSs; third there is reference to the Localism Bill (LB) and its proposal to abolish RSs (Section 3.2). This is followed by a discussion of national planning and energy policy/ information which are both material considerations (Section 3.3) then regional policy set out in the EEP "saved" policies in the TBLP 1997 comprising the development plan and (Section 3.4). Finally, reference is made to other material considerations, namely Thurrock Council's submission draft TCSPMD and certain TTGDC policy documents, which are material considerations (Section 3.5). The Council's submission draft TCSPMD will be subject to an Independent Examination Hearing due to commence in March 2011.
- 3.1.2 The topics in ES Sections 9 to 17 present information to be assessed in accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended). Each ES Section includes a schedule listing key planning policies to inform the assessment process in which reference is made to development plan policies and important aspects of national policy.
- 3.1.3 The Proposed Development forms an essential element of the proposed GEC project. The application for Section 36 consent and deemed planning permission, submitted to DECC in February 2010 was accompanied by an ES and a Planning Statement; further information was also provided to DECC and consultees in December 2010 in the form of a GEC ES FID and a GEC SPS. The February 2010 GEC ES and Planning Statement provided the policy context for the Proposed Development as a whole: further information and additional information (supplementary information) was incorporated in the GEC ES FID and the SPS, including planning and energy policy considerations relevant to the proposed GEC, which had arisen between February and December 2010. Most of the policies referred to in the aforementioned February and December 2010 documents are considered relevant to this Application, comprising the Proposed Development (gas pipeline and AGI). In particular, national planning policies are considered to be of general relevance to both the GEC and this Proposed Development; there are some differences in the case of the EEP where paragraph 3.4.2 lists policies applicable to GEC, while paragraph 3.4.3 identifies those which are relevant to this Application.

3.2 Legislative Background

Planning and Compulsory Purchase Act 2004

3.2.1 The PCPA 2004 introduced powers, including a requirement for there to be a RS for each region in England and for the preparation of local development documents (LDDs) by LPAs, to replace local plans and unitary development plans. Until the relevant LDDs are approved, certain policies in extant plans have been *"saved"*, as in the case of the TBLP. The position is complicated by the Government's intention to abolish RSs (the EEP) but it will be explained in paragraphs 3.2.6 to 3.2.7 that a recent decision of the High Court means that, whereas at this time, the EEP remains part of the development plan, the Secretary of State's intention to revoke RSs is a material consideration.



- 3.2.2 Section 38(3) of the PCPA stipulates that in England, for any area other than Greater London, the development plan is:
 - (a) "the regional spatial strategy for the region in which the area is situated; and
 - (b) the development plan documents taken as a whole which have been adopted or approved in relation to that area."

The development plan documents relevant to this Application are as follows:

- The East of England Plan 2008 (EEP); and
- Thurrock Borough Local Plan 1997 (TBLP 1997) "saved policies".

The text of relevant policies from these plans is set out in Appendix A.

- 3.2.3 Section 38 (Development Plan) PCPA states:
 - "(5) If, to any extent, a policy contained in a development plan for an area conflicts with another development plan the conflict must be resolved in favour of the policy which is contained in the last document to be adopted, approved or published (as the case may be)
 - (6) If regard is to be had to the development plan for the purpose of any determination to be made under the planning acts, the determination must be made in accordance with the plan unless material considerations indicate otherwise"
- 3.2.4 Section 70(2) of the TCPA 1990 provides:
 - (2) In dealing with such an application the authority shall have regard to the provisions of the development plan, so far as material to the application, and to any other material considerations.

As provided by Section 70(2) TCPA 1990, *"material considerations"* must be taken into account in the decision making process. The Courts are the arbiters of what constitutes a material consideration; among examples, it includes Government's statements of planning policy and emerging policies in the form of draft policy statements.

- 3.2.5 The EEP is the most recent of the development plan documents and therefore should be given particular weight relative to the TBLP 1997. However, the position is not straight forward, as on 27.5.10, the Secretary of State for Communities and Local Government (CLG) announced his intention to abolish RSs; subsequently, on 6.7.10, the Secretary of State purported to revoke RSs, relying on the power granted to him by Section 79(6) of the Local Democracy, Economic Development and Construction Act 2009. On the same date, the Chief Planner for CLG wrote to Chief Planning Officers of LPAs stating that the Secretary of State had announced the revocation of RSs with immediate effect; this letter was accompanied by 'Guidance of Local Planning Authorities following the revocation of Regional Strategies' (Guidance). The Guidance advised that RSs no longer form part of the development plan for purposes of Section 38(6) of the PCPA 2004 that, in the longer term, the legal basis for RSs would be abolished through a "Localism Bill", that PPS11 Regional Spatial Strategies was cancelled and that references to RSs in other policy statements were no longer valid.
- 3.2.6 On 10.11.10, the Secretary of State's decision to revoke RSs was quashed by the High Court in the case of Cala Homes (South) Limited v. Secretary of State for CLG and Winchester City Council [2010] EWHC 2866 (Admin). At the same time, the Secretary of State made a written parliamentary statement in which he drew attention to his letter to local authorities dated 27.5.10; this gave notice of the Government's intention to rapidly abolish RSs, and he made available a draft clause in the proposed



Localism Bill which, if enacted, would repeal Part 5 of the Local Democracy, Economic Development and Construction Act 2009 and revoke RSs. Also, on 10.11.10, the Chief Planner (Steve Quartermain) for CLG wrote to Chief Planning Officers in England advising LPAs to *"still have regard to the letter of 27 May 2010 in any decisions they are currently making"*.

3.2.7 The letter of 10.11.10 has since been challenged in the High Court; the CLG website confirmed advice on the status of this letter in the following statement. "The Secretary of State is defending the challenge and believes and is advised that it is ill founded. Nevertheless, pending determination of the challenge, decision makers in local planning authorities and at the Planning Inspectorate will, in their determination of planning applications and appeals, need to consider whether the existence of the challenge and the basis of it effects the significance and weight which they judge may be given to the Secretary of State's statements and to the letter of the Chief Planner.". On 7.2.11 the High Court announced its decision in respect of the second challenge by Cala Homes (South Limited) (Cala Homes (South) v. Secretary of State [2011] EWHC 97 (Admin)), to the effect that the intended abolition of RSs by the Government is a material consideration which can be considered by LPAs and planning inspectors when making decisions in respect of applications for planning permission. At this time, the YHP 2008 remains part of the development plan (Section 3.4); although Clause 89 of the Localism Bill published on 13.12.10, if enacted would revoke RSs (Statement 3.2.11).

Planning Act 2008

- 3.2.8 The Planning Act 2008 (PA 2008) facilitated the establishment of the IPC, the introduction of a new system of development consents for NSIPs and the provision of NPSs relating to one or more categories of development referred to in the PA 2008. Section 14 lists NSIPs as including:
 - *"(a) the construction or extension of a generating station*
 - (b) the installation of an electric line above ground
 - (f) the construction of a pipe-line by a gas transporter
 - (g) the construction of a pipe-line other than by a gas transporter"
- The application for the proposed GEC was submitted in February 2010, on behalf of 3.2.9 GECL, to the Secretary of State for Energy in accordance with Section 36 Electricity Act 1989. As the GEC application preceded the requirement (from 1.3.10) for NSIPs to be submitted to the IPC, it is not subject to the jurisdiction of the PA 2008; however for consenting purposes, regard should be had to relevant NPSs. This Application has been submitted to TTGDC as the LPA and as the Proposed Development constitutes development which occupies 1 hectare or more of land under The Thurrock Development Corporation (Planning Functions) Order 2005, Article 3 (d)) and the gas pipeline is less than 16.093 kilometres. The Proposed Development is not itself an NSIP within the PA 2008 as defined in Section 20 (gas transporter pipelines) as it will not be constructed by a gas transporter. Even if constructed by a gas transporter, it would not fall within section 20 as it would not convey gas for supply to at least 50,000 customers or potential customers of one or more gas suppliers. (Section 20(5)); neither is the pipeline within Section 21 (other pipe lines), in that the Proposed Development is not a cross-country pipeline within the meaning given in Section 66 Pipe-lines Act 1962. The pipeline is also classified as an "exempt pipeline" by the Planning (Hazardous Substances) Regulations 1992 and therefore does not require Hazardous Substances Consent (HSC).
- 3.2.10 On 29.6.10, the Coalition published its policy on the IPC and NPSs. It was announced that the Government would be abolishing the unelected IPC and establishing a major infrastructure planning unit (MIPU) as part of the Planning



Inspectorate. The Government also announced that it would be continuing with NPSs, which would subsequently be ratified by Parliament before designation, after undertaking a further round of public consultation. The NPSs provide the primary basis for decisions by the IPC; they are also considered to be helpful to LPAs in providing their local impact reports and are likely to be a material consideration in decision making on applications under TCPA, to be judged on a case by case basis. A written Ministerial Statement by the Secretary of State for DECC on 18.10.10 announced that the revised draft NPSs would be subject to public consultation until 31.1.11. It was stated that decisions on new NSIPs (subject to the passage of the Localism Bill) will be taken in accordance with the framework of policies set out in the NPS.

Localism Bill

- 3.2.11 The Localism Bill, published on 13.12.10, includes reform of the planning system, with provision to abolish RSs, provide for neighbourhood plans, make pre-application consultation compulsory and (among others) in relation to nationally significant infrastructure, the abolition of the IPC and the transfer of functions to the Secretary of State. Clause 89 provides for the abolition of the regional planning tier, by enabling the repeal of Sections 82(1) and 83 and the remaining provisions of Part 5 of the Local Democracy, Economic Development and Construction Act 2009 and the revocation of existing RSs and the bodies responsible for maintaining those strategies; i.e. responsible regional authorities, made up of the relevant leaders' board and regional development agency. (Explanatory Notes LB 2010, paragraph 264).
- 3.2.12 With regard to NPSs, Part 5, Chapter 6, Clause 109 (if enacted) would amend section 5(4) of the PA 2008 by stipulating that a Statement may only be designated a NPS if either the consideration period has expired without the House of Commons having resolved that it should not be proceeded with, or the statement has been has been approved by a resolution of the House of Commons. At the time of preparing this Statement, the current state of the law (Cala Homes (South) v. Secretary of State [2011] EWHC 97 (Admin)) is that the Government's intention to introduce legislation to repeal regional strategies is a material consideration to be taken into account in planning decisions, and in particular when considering the weight to be afforded to regional strategies. However an appeal against the High Court's judgment in Cala Homes (No.2) is yet to be heard.

3.3 National Policy

Planning

Summary

3.3.1 Government policy in respect of land use planning is set out in planning policy statements (PPSs), planning policy guidance (PPGs), Circulars, White Papers and Ministerial Statements, which are material considerations that should be taken into account where relevant. The planning policy sources that are relevant to this Application comprise PPS1, Supplement to PPS1, PPG2, PPS4, PPS5, PPS7, PPS9, PPS10, PPS12, PPG13, PPG14, PPS23, PPG24, PPS25, Circular 5/05, Circular 6/05 and Guidance on Information Requirements and Validation 2010.

PPS1 – Delivering Sustainable Development (2005)

3.3.2 PPS1 confirms that where the development plan contains relevant policies, applications for planning permission should be determined in line with the plan unless material considerations indicate otherwise (paragraph 8). It defines key principles to be applied to ensure that development contributes to sustainable development, among which it identifies social cohesion and inclusion, protection and enhancement of the environment, prudent use of natural resources, sustainable economic development, integrating sustainable development in development plans and



delivering sustainable development including design and community involvement. Sustainable economic development necessitates choice, including that LPAs should recognise that economic development can deliver wider sub regional, regional and national benefits to be considered "*alongside any adverse local impacts*" (paragraph 23).

Planning and Climate Change – Supplement to PPS1 (2007)

Tackling climate change is a Government priority for the planning system, in which 3.3.3 contributing to the achievement of a low carbon economy is an ambition. The delivery of sustainable development is to be achieved through spatial strategies that include contributing to the Government's climate change programme, providing infrastructure where it is needed, energy efficiency, reduction in emissions, minimising vulnerability and providing resilience to climate change consistent with social cohesion/inclusion, conserving and enhancing biodiversity, reflecting development needs and interests of communities, responding to the concerns of business, and encouraging competitiveness and technological change, in mitigating and adapting to climate change (paragraph 9). Accordingly, policies should promote (and not restrict) renewable and low carbon energy and supporting infrastructure, for example, by colocating potential heat customers and heat suppliers (paragraphs 19/27). "Lowcarbon technologies are those that can help reduce carbon emissions. Renewable and/or low carbon energy supplies include, but not exclusively, those from biomass and energy crops; CHP/CCHP and (micro HP); waste heat that would otherwise be generated directly, or indirectly, from fossil fuel" (Glossary).

PPG2 Green Belts (1995 amended 2001)

PPG2 explains that "The fundamental aim of Green Belt policy is to prevent urban 3.3.4 sprawl by keeping land permanently open; the most important attribute of Green Belts is their openness" (paragraph 1.4) its purpose is to check the unrestricted sprawl of large built up areas, prevent neighbouring towns from coalescing, assist in safeguarding countryside from encroachment, preserve the setting and special character of historic towns and to assist in urban regeneration by encouraging the recycling of urban land (paragraph 1.5). The objectives of Green Belt are to provide access to open countryside, provide opportunities for outdoor sport/recreation, retain attractive landscapes, enhance landscapes near to where people live, improve damaged/derelict land around towns, secure nature conservation interest and retain land in agricultural/forestry and related uses (paragraph 1.6). The essential characteristic of Green Belt is its permanence, therefore protection must be maintained as far as can be seen ahead (paragraph 2.1). There is a general presumption against inappropriate development in Green Belt and, as such, development should not be approved except in very special circumstances (paragraph 3.1). "Inappropriate development is, by definition, harmful to the Green Belt. It is for the applicant to show why permission should be granted. Very special circumstances to justify inappropriate development will not exist unless the harm by reason of inappropriateness and any other harm, is clearly outweighed by other considerations" (paragraph 3.2). In considering land use objectives, it is stated that: "When any large scale development or redevelopment of land occurs in the Green Belt (including mineral extraction, the tipping of waste and road and other infrastructure development or improvements), it should, so far as possible contribute to the achievement of the objectives for the use of land in Green Belts (see paragraph 1.6). This approach applies to large-scale development irrespective of whether they are appropriate development or inappropriate development which is justified by very special circumstances..." (paragraph, 3.13). "In the case where amenity on a site adjacent to the Green Belt is lost as result of development of that site, it may be reasonable for obligations to provide for offsetting benefits on land in the Green Belt; as long as there is a direct relationship between the two sites"



(paragraph, 3.14). Visual amenities of Green Belt should not be *"injured"* by proposals for development within or conspicuous from Green Belt (paragraph 3.15).

PPS4 – Planning for Sustainable Economic Growth (paragraph 4)

- 3.3.5 PPS4 defines economic development as including development within B Use Classes, public and community uses, main town centre uses and "other development which achieves at least one of the following objectives:
 - Provides employment opportunities;
 - Generates wealth; and
 - Produces or generates an economic output or product."

The proposed GEC and the Proposed Development, which are integral, comprise infrastructure development; it provides a utility service; it satisfies each of the objectives above and is therefore "*economic development*" within the meaning of PPS4.

3.3.6 Policy EC2 (Planning for Sustainable Economic Growth) requires local planning authorities to (a) set out a clear economic vision and strategy for their area which "positively and proactively encourages sustainable economic growth" identifying priority areas for regeneration investment; (b) support existing business sectors; (c) is not relevant; (d) make the most efficient and effective use of land; (e) locate development which requires substantial transport movements in locations that are accessible (including rail and water transport where feasible): (f) plan for the delivery of sustainable transport and other infrastructure needed to support planned economic development; (g) is not relevant; (h) at the local level, safeguard land from other uses; Policy EC 10 – Determining Planning Applications for (i)-(k) are not relevant. Economic Development, in EC 10.1 requires local planning authorities to adopt "a positive and constructive approach towards planning applications for economic development" and notes that applications that "secure sustainable economic growth should be treated favourably". EC 10.2 requires all planning applications for economic development to be assessed against impacts including: (a) consideration of carbon dioxide emissions and resilience to climate change; (b) accessibility by a choice of means of transport; (c) design quality; (d) impact on economic/physical regeneration; (e) impact on local employment. However, even if it were considered that a proposal did not accord with the development plan, economic considerations would play an important part in the decision making process as indicated in Policy EC 11 – Determining Planning Applications For Economic Development (other than main town centre uses) not in accordance with an up to date Development Plan. It requires that local planning authorities should: (a) weigh market and other economic information, alongside environmental/social information; (b) take full account of longer term benefits (as well as costs of development), such as job creation or improved productivity including any wider benefits to national, regional or local economies; and (c) consider whether those proposals help to meet the wider objectives of the development plan.

PPS5 – Planning for the Historic Environment (March 2010)

3.3.7 PPS5 replaced the former PPG15 Planning and the Historic Environment and PPG16 Archaeology and Planning; the new PPS is supported by a Practice Guide, endorsed by the Department for Communities and Local Government, the Department for Culture, Media and Sport and English Heritage. The PPS sets out the Government's objectives for planning for the historic environment; these include conserving heritage assets in a manner appropriate to their significance by ensuring that decisions are based on the nature, extent and level of that significance, investigated to a degree proportionate to the importance of the heritage asset. Among the policies, Policy HE2 requires LPAs to ensure they have evidence about the historic environment and



heritage assets of their area; Policy HE6 states that LPAs should require an applicant to provide a description of the significance of the heritage assets affected and the contribution of their setting to that significance; Policy HE7 sets out the policy principles guiding the determination of applications for consent relating to all heritage assets; Policy HE12 describes the policy principles guiding the recording of information related to heritage assets including that the extent of the requirement should be proportionate to the nature and level of the assets' significance.

PPS7 – Sustainable Development in Rural Areas (2004)

PPS7 sets out national policies on development in rural areas, including the wider, 3.3.8 largely undeveloped countryside up to the fringes of larger urban areas. Planning policies are required to recognise the environmental, economic and social value of the countryside, continue to ensure that the quality and character of the wider countryside is protected and where possible enhanced, with particular regard to areas that have been statutorily designated for their landscape, wildlife or historic qualities, where greater priority should be given to restraint of potentially damaging development (paragraphs 14, 15, 16). The use of best and most versatile agricultural land (grades 1, 2, 3a) for development should be taken into account alongside other sustainability considerations, e.g. biodiversity, quality and character of landscape, amenity value, heritage, interest, access to infrastructure, work force, markets, maintaining viable communities and protection of natural resources including soil quality (paragraph 28). Nationally designated areas, such as National Parks and Areas of Outstanding Natural Beauty, have been confirmed by Government, as having the highest status of protection in relation to landscape and scenic beauty (paragraph 21). If major development is proposed in such areas, before being allowed to proceed, applications should address need and national interest, cost and scope for undertaking the development elsewhere, or in some other way and any detrimental effects and opportunities for mitigation. Where planning permission is granted for development in designated areas, it should be carried out to high environmental standards, through the application of appropriate conditions (paragraphs 22-23).

PPS9 (Biodiversity and Geological Conservation) (2005)

3.3.9 PPS9 sets out national policies for the protection of biodiversity and how the conservation of natural heritage is to be reflected in land use planning. The most important sites for biodiversity are those identified through international conventions and European Directives; SSSI which are not covered by international designations should be given a high degree of protection under the planning system (paragraphs 6/7). To a lesser extent but, nevertheless, important are sites of regional and local biodiversity and geological interest, ancient woodland and networks of natural habitats (paragraphs 9-12). The re-use of previously developed land contributes to sustainability by reducing the amount of countryside and undeveloped land required for building (paragraph 13). Development is also seen to provide opportunities for building in biodiversity as part of good design and LPAs should maximise such opportunities in and around development (paragraph 14). Circular 6/2005: Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System is discussed in this Statement 3.3.20.

PPS10 (Planning for Sustainable Waste Management) (2005)

3.3.10 PPS10 sets out national policies on different aspects of land use planning in England concerning the management of waste, its overall objective being *"to protect human health and the environment by producing less waste and by using it as a resource wherever possible"*, including the consideration of waste management in the site preparation/construction processes. It recommends that proposed new development should be supported by waste management plans which are encouraged to identify the volume and type of material to be demolished and / or excavated, opportunities



for the reuse and recovery of materials and to demonstrate how off-site disposal of waste will be minimised and managed (paragraph 34).

PPS12 – Local Spatial Planning (2008)

3.3.11 PPS12 sets out the key ingredients of local spatial plans and Government policies to be taken into account by LPAs in producing development plan documents and other LDDs. It is intended that spatial objectives for the local area, set out in the LDF, should be aligned with national plans and shared local priorities set out in sustainable community strategies; this would equate, at this time, to the Council's emerging Core Strategy. The strategy is to be supported by evidence of what physical, social and green infrastructure is needed, including natural resources for economic development. Among the physical infrastructure delivery agencies referred to are utilities companies.

PPG13 (Transport) (2001)

3.3.12 PPG13 describes its objectives as being to co-ordinate land use, planning and transport, to promote more sustainable transport choices promoting accessibility and reducing the need to travel, especially by car (paragraph 4).

PPG14 – Development on Unstable Land (1990)

3.3.13 The purpose of the guidelines is to advise local authorities, landowners and developers on the exercise of planning controls over development on land which is unstable, or potentially unstable, to ensure that development is suitable and that physical constraints are taken into account at all stages of planning (paragraph 2).

PPS23 – Planning and Pollution Control (2004)

- 3.3.14 PPS23 affirms that quality of land, air or water and potential impacts arising from development may be a material planning consideration. With regard to land affected by contamination and the objective to direct development to previously developed sites, the point is made that the presence of contamination can affect or restrict the beneficial use of land, though development can present an opportunity to deal with it (paragraph 2). It distinguishes between planning and pollution control as complementary regimes in which LPAs will work on the assumption that the relevant pollution control regimes will be applied and enforced (paragraph 10). In Appendix A, matters to be considered in preparing LDDs and possibly decisions on individual applications, include the economic and wider social needs for development (including potentially polluting development) such as the provision of a product or service .
- On the matter of planning control and, in particular, need and alternative sites 3.3.15 Annex 1 to PPS23: Pollution Control, Air and Water Quality, begins by stating that "Applicants do not normally have to prove the need for their proposed development, or discuss the merits of alternative sites. However, the nature of polluting or potentially polluting developments and national or regional need for them, or the location of a proposal in an environmentally-designated or sensitive area may make the availability, or lack of availability, of suitable alternative sites material to the planning decision. The assessment of need and of sustainability issues should take into account a comprehensive assessment of social, environmental and economic factors. It should be recognised that the need for a development in a particular location can outweigh negative impacts that would, in other locations, warrant refusing planning permission" (paragraph 1.54). Annex 1, Appendix 1C.1 refers to climate change as "one of the most serious environmental problems the world faces" and the encouragement the Government gives to reducing greenhouse gas emissions and its support for renewable forms of energy. Annex 1, Appendix 1G.1, in referring to development control considerations, notes that air quality will attract greater consideration where a development would be within or adjacent to an Air Quality Management Area (AQMA) (paragraph IG.1). Developers are to be encouraged,



where appropriate, to incorporate in their proposals sustainable drainage systems (SUDS) to source run-off from development including car parks, buildings, paved areas, etc. and to store water for non drinking purposes and to enable it to be released more slowly (Annex 1, paragraph 1.31).

PPG24 – Planning and Noise (1994)

3.3.16 PPG24 gives guidance to local authorities in England on the use of planning powers to minimise the adverse impacts of noise and its effects on the environment and the quality of life without placing unreasonable restrictions on development. In assessing applications, LPAs should give reasonable consideration to the compatibility of proposed activities with the surrounding uses and, in particular, the potential for increase in noise effects over time, different noise levels throughout the day and night and the nature of the noise effects likely to be produced. It also advises that "Much of the development which is necessary for the creation of jobs and the construction and improvement of infrastructure will generate noise" and that "the planning system should not place unjustified obstacles in the way of such development" (paragraph 10)

PPS25 (Development and Flood Risk) (March 2010)

- 3.3.17 PPS 25 explains how flood risk should be considered at all stages of the planning process and seeks to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk (paragraph 5). In determining planning applications LPAs should, among other considerations, apply the *"Sequential Approach"* to minimise risk, directing the most vulnerable development to areas of lowest flood risk and matching vulnerability of land use to flood risk (paragraph 8). This should be applied at all levels of the planning process, to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development/land use proposed (paragraphs 14-17 and Annex D). If, following application of the sequential test in Annex D, it is not possible, consistent with wider sustainability objectives for the development to be located in zones with a lower probability of flooding; the Exception Test can be applied as a means of managing flood risk while still enabling necessary development to occur (paragraph 18).
- Paragraph D.9 explains that for the Exception Test to be passed it must be 3.3.18 demonstrated that: (a) the development provides wider sustainability benefits to the community that outweigh flood risk; (b) the development should be on previously developed land; and (c) flood risk assessment (FRA) can demonstrate that the development will be safe without increasing flood risk elsewhere and where possible will reduce flood risk overall. Essential infrastructure in a high risk area needs to be designed and constructed to remain operational and safe for users in times of flood. The Exception Test should be applied by decision makers only after application of the Sequential Test and in the circumstances of Annex D Table D.1 when essential infrastructure cannot be located in Zones 1 or 2 (paragraph D10). Table D.2 comments on flood risk vulnerability classification (including "essential infrastructure"). It defines "essential infrastructure" as that which has to be in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations that need to remain operational in times of flooding. The table includes in the definition of "highly vulnerable", installations requiring HSC; such installations as energy infrastructure or carbon capture and storage that require coastal or water side locations or need to be located in other high flood risk areas, should be classified as "essential infrastructure". Table D3 matches flood risk vulnerability and flood zone compatibility. It indicates that in Zone 3a (High Probability) and Zone 3b (The Functional Floodplain) essential infrastructure uses require application of the Exception Test.



Circular 05/05 – Planning Obligations

3.3.19 Circular 05/05 provides guidance to LPAs in England on the use of planning obligations under Section 106 Town & Country Planning Act 1990. Annex A to the Circular sets out the statutory framework for planning obligations; Annex B to the Circular explains the policies of the Secretary of State and provides guidance on the use of planning obligations which LPAs should taken into account when determining applications and drafting policies.

Circular 06/2005 (Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System)

Circular 06/2005 provides administrative guidance on the application of the law 3.3.20 relating to planning and nature conservation in England. It compliments PPS9 and the Good Practice Guide. In Part I to the Circular it deals with the conservation of internationally designated sites. SPAs (classified under the EC Birds Directive). Special Areas of Conservation (SACs), designated under the EC Habitats Directive and Ramsar sites listed under the provisions of the Ramsar convention on wetlands of international importance. Part II deals with SSSIs and the consultation and notification of processes; Part III covers planning for nature conservation outside designated sites; Part IV deals with the conservation of species and Part V provides advice on other duties and the use of statutory powers. The Circular also states that: "When dealing with cases where a European protected species may be affected, a planning authority is a competent authority within the meaning of regulation 6 of the Habitats Regulations, and therefore has a statutory duty under regulation 3(4') to have regard to the requirements of the Habitats Directive in the exercise of its functions. So the Directive's provisions are clearly relevant in reaching planning decisions, and these should be made in a manner which takes them fully into account. The Directive's requirements include a strict system of protection for European protected species, prohibiting deliberate killing, catching or disturbing of species, the taking of eggs etc and damage to or destruction of their breeding sites or resting places. Derogations from this strict protection are allowed only in certain limited circumstances and subject to certain tests being met ..." (paragraph 116).

Guidance on Information Requirements and Validation (March 2010)

3.3.21 The Guidance on Information Requirements and Validation replaces Section 3 of Circular 01/2006 Design and Access Statements. SI 2010/567 Article 4C General Permitted Development Order 1995 (as amended) sets out the requirements for a DAS; this matter is not discussed further.

Energy

Summary

3.3.22 Government energy policy/ information is represented in the following documents, which are material to consideration of the GEC and related infrastructure; reference is also made to the objectives of reducing carbon dioxide emissions while maintaining security of supplies along with reports on the need for additional generating capacity and the Government's commitment to the role of CCS. This ES Section 2 refers to the main electricity demand being in the South, particularly London, the South East/South West and parts of the Midlands and that, by siting generating capacity close to where demand exists, there are environmental and economic benefits of reducing electrical transmission losses, by locating the GEC at the London Gateway (LG) site, compared with locating generating plant in the North of England or Scotland. It is also noted in this ES Section 2 (Table 2.1), that, in the South of

⁷ Regulation 3(4) of the Conservation (Natural Habitats &c) Regulations 1994 has been replaced by regulation 9(5) of the Conservation of Habitats and Species Regulations 2010



England, a number of large coal/oil fired plants will close as a result of LCPD by not later than the end of 2015. GEC ES Volume 1 Section 6, comments on the fact that the use of gas fired electricity generating plant can make a significant contribution to reducing CO_2 emission levels. The GEC ES and ES FID confirm that GEC will be capable of meeting incremental requirements of up to 150 MWe to the LG development, as well as improving efficiency through the provision of CHP and the eventual implementation of CCS.

Our Energy Future - Creating a Low Carbon Economy Cm 5761 (Energy White Paper) (2003)

3.3.23 The White Paper identifies three challenges, first climate change, second decline in the UK's indigenous energy suppliers and third, the need to update much of the UK's energy infrastructure. The White Paper refers to four goals: reducing carbon emissions, maintaining reliability of energy supplies, promoting competitive energy markets and ensuring every home is adequately and affordably heated. On the issue of maintaining reliability of energy supplies, the stated goal is that "people and businesses can rely on secure supplies of energy – gas, fuel and electricity at predictable prices delivered through the market" (paragraph 6.1). This is to be achieved through a resilient energy system which requires "a diverse system based on a mix of fuel types, a variety of supply routes, efficient international markets, back up facilities such as storage and a robust infrastructure" (paragraph 6.2).

The Government's Strategy for Combined Heat and Power for 2010 (DEFRA CHP Strategy)

3.3.24 The CHP Strategy reflects Government's belief that CHP has an important role to play in achieving the aims of the 2003 Energy White Paper. Consultations regarding CHP potential are referred to in GEC ES Section 8, the CHPA and the GEC Supplementary CHPA December 2010.

Climate Change - the UK Programme 2006/2007/2008

3.3.25 The 2006 document discusses the international challenge of climate change, delivering emissions reductions, and adapting to the impact of climate change. It notes that "The energy supply sector has contributed a large reduction in the UK's greenhouse gas emissions over the past decade ... largely through the switch away from more carbon intensive fuels such as coal and oil towards low or zero carbon emissions fuels such as gas, nuclear and renewables." It predicts that emissions will fall further "through to 2010 as a result of the impact on electricity demand of existing measures and a further increase in the share of gas fired electricity generation" (Energy Supply page 32). Subsequently, the 2007 Annual Report to Parliament indicated a reverse trend, in which fuel switching (as a result of price changes) from natural gas to coal for electricity generation was considered primarily responsible for carbon dioxide emissions in 2006 being higher than in 2005 (page 11, paragraph 18). However, the 2008 Annual Report shows carbon dioxide emissions during 2007 being lower than the 2006 figure, resulting from fuel switching back from coal to gas (Overview, page 9, paragraph 4).

The Energy Challenge – Energy Review (2006) CM 6887

3.3.26 The Review identifies two major long-term challenges, tackling climate change as global carbon emissions continue to grow and, delivering secure and clean energy at affordable prices as the UK becomes increasingly dependent on imports for its energy needs. On the matter of electricity generation, it is stated that "Over the next two decades, the UK will need substantial new investment in electricity generation capacity to replace closing coal, oil and nuclear power stations and to meet expected growth in electricity demand" (Cm 6887 paragraph 6.4.3). It advises that it is for the private sector to make the necessary investment decisions within the regulatory



framework set by the Government and for Government to ensure that this framework provides the right incentives, consistent with the goal of moving to a low carbon economy.

Meeting the Energy Challenge – A White Paper on Energy (2007) Cm 7124

- 3.3.27 Building on the principles set out in the 2003 White Paper, CM 7124 identifies two long term energy challenges of tackling climate change by reducing carbon dioxide emissions and ensuring secure, clean and affordable energy. It addresses energy and climate security, saving energy, heat and distributed generation, the utilisation of oil/gas/coal, electricity generation including investment frameworks, renewables, cleaner coal with carbon capture/storage for fossil fuels and nuclear power research and development, transport, planning and other matters. On the matters of reducing CO₂ emissions, it is stated that:
 - "The sector has made some progress in decarbonising since 1990, largely as result of the increased share of gas-fired generation in the mix" (paragraph 5.1.10), and
 - "Over the next two decades, the UK will need substantial investment in new generation capacity to replace the closing coal, oil, and nuclear power stations and to meet expected increases in electricity demand." (paragraph 5.1.11).
 - The White Paper predicts that some 22.5 GW of existing power stations may close by 2020 and that to maintain levels of capacity equivalent to those of today, new generating capacity needs to be built to meet those closures and increases in demand (paragraph 5.1.11)

DECC's Energy Markets Outlook Report 2008/2009 (EMOR)

- 3.3.28 EMOR 2008 refers to the main causes of interruption to energy supply, the additional challenges that will be faced as a consequence of closures (particularly coal plant) by 2016 under LCPD and the expectation of increasing diversity of potential sources of gas supply. Its view is that independently regulated competitive energy markets with an appropriate cost of carbon and support for emerging low carbon technologies is the way forward and that "the best way to deal with future uncertainties is to ensure that the market has access to all technologies". It notes that coal and gas fired plant have the advantage of being able to operate flexibly, regardless of weather conditions. EMOR 2008 predicts that around 12 GW of coal and oil fired generating plant which "opted out" under LCPD will have to close by not later than the end of 2015 and 7.3 GW of older nuclear capacity is scheduled to close by 2020.
- 3.3.29 EMOR 2009 restates the position that security of supply is a key element of Government Energy policy and correspondingly Ofgem's role in protecting consumers (EMOR 2009, 2.2.1) and it reaffirms the statements of EMOR 2007/8 that around 12 GW of older coal and oil plant will close by 2015 and 7 GW of nuclear stations by 2018 (EMOR 2008, 2.4.3). To complement the carbon markets, Government's plans predict in its lead scenario that around 30% of electricity will be generated from renewable generation sources by 2020 (EMOR 2009, 2.6.1) although to be clear, this includes carbon fuelled plants with CCS. It refers to the gas supply position having been improved by important developments in liquefied natural gas (LNG) import infrastructure at the South Hook and Dragon Terminals in Milford Haven (EMOR 2009, 2.8.1). However, as gas will remain an important part of the energy mix, the Government is clear that it is encouraging new investment in gas storage and import infrastructure through reform of the planning and consents regulatory framework (Box 5.1).

Ofgem's "Sustainable Development Reports" 2007/2008/2009 (OSDR 2007/8/9)



3.3.30 OSDR 2007 notes that while the country is likely to meet its present greenhouse gas emissions targets of 12.5% below base year (1990) levels by 2008-2012 under the Kyoto Protocol "This has been largely driven by the switching from coal to gas fired electricity production over this period", which is a reminder of the positive role that has been played by investment in CCGT and other gas fired generating plant The subsequent OSDR 2008 re-affirms the Government's (paragraph 3.1). commitment to facilitating transition to a low carbon economy and to delivering long term secures energy supplies (paragraph 1.7). At the same time, it points to the fact that in the UK "companies will need to make substantial new investment in power stations, the electricity grid and gas infrastructure" (paragraph 1.8). It is also pointed out that CCS will be an important technology for the shift to achieve a low carbon economy (OSDR 2007 paragraph 6.23, OSDR 2008 paragraph 5.26). OSDR 2009 restates earlier advice that one of the challenges is to ensure adequate levels of generation over the period that old plants are phased out and new plants brought in. It refers to the Government's ambitious renewables targets of 30% of electricity being sourced from renewables by 2020 compared with 5% at the time when the report was produced (paragraph 1.6). Figure 25 shows NG's predicted generation mix to 2015/16 of which Ofgem says that substantial growth in gas and renewable energy capacity is set to be a feature of the next decade. While connection of CHP has levelled off, OSDR 2009 believes that renewable and low carbon heat will increasingly contribute to targets (Figure 9).

The UK Low Carbon Transition Plan – National Strategy for Climate and Energy 2009

3.3.31 Published by DECC, this refers to the first carbon budgets set in law following Budget 2009 committing to cut the UK's greenhouse gas emissions to the following levels:

Budget Period Reduction below 1990 levels

- 1 2008-2012 22%
- 2 2013-2017 28%
- 3 2018-2023 34%

These budgets are in line with those recommended by the Committee on Climate Change. The policy aim is to transform the power sector (Chapter 3) by generating electricity from clean sources such as renewables, nuclear and fossil fuel plants fitted with CCS equipment, which requires an electricity grid with larger capacity and the ability to manage greater fluctuations in electricity demand and supply. "*To make this transition, the Government needs to maintain the right conditions for energy companies to invest very large sums in new power stations*" (Summary page 52). It is planned that this strategy will achieve around 40% of electricity from low carbon sources by 2020 (page 52). In its concept of a "*roadmap*" to 2050, it is acknowledged that it is not possible to predict the precise mix of electricity generating technologies at that time but that the "*roadmap*" needs to be sufficiently flexible to adapt to technical developments in any sector (page 174).

DECC's Carbon Capture Readiness (CCR) Guidance Note for Section 36 Electricity Act 1989 Consent Applications (URN 09D/810) November 2009

3.3.32 The document refers to Article 33 of the EU Directive on the Geological Storage of Carbon Dioxide (2009/31/EC). Article 33 of the Directive requires that the technical and economic feasibility of retrofitting CCS equipment and the transport of CO₂ to storage sites should be assessed by the applicant and the consenting body during the process of deciding whether to grant an operating or construction licence for any new power station with electrical outputs at or over 300 MWe of the type covered by LCPD (paragraph 2). The test of whether a proposed power station is CCR means that DECC has concluded, at the time of consenting, that it will be technically and economically feasible to retrofit CCS equipment.



Ofgem Project Discovery Options for delivering Secure and Sustainable Energy Supplies (February 2010)

- 3.3.33 The Ofgem document highlights five key issues:
 - Need for unprecedented levels of investment to be sustained over many years in energy infrastructure in difficult financial conditions;
 - Uncertainty in future carbon prices likely to delay or deter investment in low carbon technology and lead to greater decarbonisation costs in the future;
 - Short term price signals not fully reflecting the value customers place on security of supply, such that incentives to make additional peak energy supplies available and to invest are not strong enough;
 - Interdependence with international markets exposes Great Britain to additional risk that may undermine Great Britain's security of supply and;
 - Higher costs of gas and electricity may mean increasing numbers of consumers experience fuel poverty and industry/business competitiveness is affected.

The document, which invited consultation by 31.3.10, highlighted the fact that "significant action will be called for given the unprecedented challenges facing the electricity and gas industries." In its comments on timing of policies and investments, it suggests that "If CCGT plants (which are likely to be the quickest to build) are required to fill any capacity gap, decisions [on] these would also be required by early 2013" (paragraph 6.5).

Gas Security of Supply policy statement from the Department of Energy and Climate Change April 2010

3.3.34 The Statement by DECC confirms that "as the cleanest and most reliable fossil fuel, gas will continue to play a central role in the UK's energy mix out to 2020 and beyond. In particular, gas fired electricity generation will help to maintain system flexibility as intermittent, renewable generation is scaled up (paragraph E.3) …". The Statement recognises that wind power "cannot be turned on and off when needed in the same way as a gas-fired power station", that there will be a continuing need for flexible electricity generation and that gas power stations "can therefore play an invaluable role in providing a reliable source of electricity and in smoothing supply across the system (paragraph 1.9)

Annual Energy Statement DECC Departmental Memorandum 27 July 2010

3.3.35 The Statement finds that UK gas supplies are healthy but, that in achieving a low carbon economy, the Government will encourage more investment in oil and gas production, promote strengthened bilateral relationships with key suppliers, achieve enhanced price stability through greater transparency, strengthen dialogue and shared information and promote low carbon growth. It describes coal and gas as remaining important for electricity generation in the medium term by providing base load generation capacity alongside nuclear and complementing intermittent renewables (page 18). It also sees carbon capture CCS as vital because it will enable coal and gas to continue this function without jeopardising emission reduction goals; thereby meeting security of supply needs (page 18).

Revised Draft Overarching National Policy Statement for Energy (EN-1)

3.3.36 EN-1 which replaced the draft NPS of November 2009 sets out national policy for the energy infrastructure constituents of the NSIPs listed in EN-1, namely onshore generating stations of more than 50 MW (and 100 MW offshore), produced from fossil fuels, wind, biomass, waste and nuclear (in respect of the sites listed in the Nuclear NPS EN6) (EN-1, paragraph 1.3.2). Other forms of energy NSIPs include electricity



lines at or above 132 kV, large gas reception, liquefied natural gas (LNG) facilities, underground gas storage and oil/gas pipelines, subject to specified minimum size limitations. Although the Proposed Development is not a NSIP (Statement 3.2.9), it is pointed out in EN-1 that in England and Wales, this NPS is likely to be a material consideration in decision making on applications that fall under the TCPA 1990 (as amended) to be judged on a case by case basis (EN-1, 1.2.1, EN-2, 1.2.3, EN-5, 1.2.3). Reference is also made (EN-1, 1. 2. 3) to a letter sent to Chief Planning Officers from DCLG on 9.11.09 explaining the relationship between NPSs and the town and country planning system, including advice that emerging policy in a published draft NPS may be relevant.

- 3.3.37 Part 2 EN-1 states that "energy is vital to economic prosperity and social wellbeing and so it is important to ensure that the UK has secure and affordable energy" (EN-1, 2.1). It considers that in making the transition to a low carbon economy, it is critical that the UK continues to have secure and reliable supplies of electricity and that to manage the risks; the country needs (paragraph 2.2.20):
 - sufficient capacity (including a greater proportion of low carbon generation) to meet demand at all times, requiring a safety margin of spare capacity;
 - capacity and associated supply chains (e.g. fuel for power stations) must be reliable enough to meet demand as it arises;
 - a diverse mix of technologies and fuels; and
 - effective price signals so that market has sufficient incentives to react in a timely way to minimise supply/demand imbalances.

Each of these items is applicable to GEC.

- 3.3.38 In the medium term, EN-1 considers there is a need to invest in additional infrastructure, particularly for electricity generation, gas importation and storage (EN-1, 2.2.21) and, while the Government plans to pursue its objectives for renewables, nuclear power and CCS, it is accepted that some fossil fuels will still be needed during the transition to a low carbon economy (EN-1, 2.2.23).
- 3.3.39 Part 3 considers the need for new NSIP projects and Section 3.1 sets out "the planning policy referred to earlier in this Statement 4.2.5. With regard to the need for new NSIPs, it is explained that electricity meets a significant proportion of our overall energy needs and that the country's reliance on it is likely to increase (EN-1, 3.3.1). EN-1 discusses, meeting energy security and carbon reduction objectives, replacement of closing electricity generating capacity, the need for more electricity capacity to support an increased supply from renewables, future increases in electricity demand, the urgency of the need for new electricity capacity, alternatives to new large scale electricity generation capacity (reducing demand, more intelligent use of electricity and interconnection of electricity systems) (EN-1 3.3). For a more comprehensive discussion on this matter of need, refer to Statement 4.2.5.
- 3.3.40 EN-1, Part 4 sets out the assessment principles to be addressed when assessing applications for NSIPs. The IPC is required to adhere to specified key principles when examining and determining applications including the assumption in Part 3 that there is an urgent need for new major energy infrastructure (EN-1, 4.1.1 (i)). The decision makers should also take into account any relevant NPSs, national, regional and local benefits (environmental, social, economic), including the contributions to the need for energy infrastructure, job creation, any long term or wider benefits and the relative benefits and dis-benefits identified by the EIA process (EN-1, 4.1.1). Before any application is refused, the adverse impacts must outweigh the project benefit, taking into account mitigation measures. The matters to be considered are listed below; these matters have been addressed in the GEC application (and where relevant in the application), namely the provision of an ES, consideration of the



requirements of the Conservation of Habitats and Species Regulations 2010; examination of alternatives; importance of good design; consideration of CHP; demonstrating that the project is CCR (enabling the eventual provision of CCS); climate change adaptation; grid connection requirements; pollution control/other environmental regulatory regimes; safety; hazardous substances; health; common law/statutory nuisance and security considerations.

3.3.41 Of the above, all relevant matters have been addressed in the EIA process and presented in the ES and accompanying documents. In particular, it is advised that the question of whether the project is likely to have a significant effect on European designated sites alone, or in combination with other plans or projects should be considered (EN-1, 4.3). The approach taken in this case at the screening stage has been to follow the approach taken in the Waddenzee1 case namely:

"45. In the light of the foregoing, the answer to Question 3(a) must be that the first sentence of Art.6(3) of the Habitats Directive must be interpreted as meaning that any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects."

- 3.3.42 There is no general policy requirement to consider alternatives or establish whether a proposed project represents the best option; however, applicants must include in the ES information about the main alternatives they have studied, where relevant, follow legal requirements under the Habitats Directive to consider alternatives and consider alternatives where required under NPSs (EN-1, 4.4.1/2). Given the level and urgency of need for new infrastructure, whether a policy or legal requirement exists to consider alternatives, the IPC should consider the following principles (EN-1, 4.4.3).
 - (a) The consideration of alternatives should be carried out in a proportionate manner.
 - (b) In considering alternatives, the IPC should be guided by whether it is realistic for the alternative to deliver the same infrastructure capacity as the proposed development in line with the urgency of the need.
 - (c) The IPC should have regard, as appropriate, to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals.
 - (d) Alternatives not studied in the ES should only be considered to the extent that the IPC thinks they are both important and relevant to its decision.
 - (e) The IPC should consider an application in accordance with the relevant NPSs.
 - (e) It should be reasonable for the IPC to conclude that alternative proposals not in accordance with the relevant NPS cannot be important and relevant to its decision.
 - (f) Alternative proposals that are not commercially viable, or where sites would not be physically suitable or alternative proposals are *"vague or inchoate"* may be excluded on the grounds that they are not important/relevant.
 - (g) Where alternatives are put forward by a third party, that party should provide evidence of the site suitability and the applicant should not necessarily have been expected to assess the site.

The alternatives considered by the GECL in respect of this Proposed Development have been described in the ES (Statement 2.2.1/2).



- 3.3.43 The criteria for good design for energy infrastructure are discussed in EN-1, 4.5 which notes that visual appearance of a building can be the most important factor in good design but that "The functionality of an object - be it a building or another type of infrastructure - including fitness for purpose and sustainability. is equally important" (EN-1, 4.5.1). It requires applicants to demonstrate how the design process was conducted and the design evolved; the IPC is directed to "take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements which the design has to satisfy" (EN-1, 4.5.4). Further advice on what should be expected by way of good design is provided in the technology specific NPSs, where relevant (EN-1, 4.5.6), whereas EN-4, 2.3 refers applicants to EN-1, 4.5, while stating that applicants should demonstrate good design, in particular, where mitigating the impacts relevant to the infrastructure. Grid connection (EN-1, 4.9) is not part of this application; it notes that whereas generating stations and related infrastructure will ideally be in a single application, where this is not possible, the reasons should be explained and if there are no obvious reasons why the necessary approvals for other elements are likely to be refused, that should not fetter its subsequent decisions on any related projects.
- 3.3.44 Planning and pollution control systems are separate but complementary (Statement 3.3.14); EN-1 advises that if the criteria identified at 4.10.8 (namely that potential releases can be adequately regulated, and that cumulative effects would not make the development unacceptable) are satisfied, the IPC should not refuse consent on the basis of pollution impacts, unless it has good reason to believe that any relevant necessary operational pollution control permits or licences or other consents will not subsequently be granted (EN-1, 4.10.9). The IPC is required to consult with the HSE on matters relating to safety (EN-1-4.11) and on hazardous substances consent applications, for which the IPC is the Hazardous Substances Authority (EN-1-4.12.1). Health effects should be assessed, which may arise from increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation or increases in pests (EN-1, 4.13); finally, common law/statutory nuisance (EN-1, 4.14) and security considerations should be addressed where relevant (EN-1, 4.15).
- EN-1, Part 5 sets out generic impacts to be considered, namely air quality and 3.3.45 emissions: biodiversity/geological conservation; civil/military aviation/defence interests; coastal change; dust/odour/artificial light/smoke/steam, insect infestation; flood risk; historic environment; landscape/visual impacts; land use including open Green Belt: noise/vibration; space, green infrastructure. socio-economic; traffic/transport impacts; waste management; water quality/resources. These matters have been addressed in the EIA process where relevant, which includes, in the case of the Revised Draft EN-4 gas pipelines, impacts concerning climate change adaptation, consideration of good design, hazardous substances/control of major accident hazards, noise/vibration, landscape/visual, water quality/resources and soil/geology.
- 3.3.46 Among the generic impacts listed in the previous paragraph are air quality / emissions, biodiversity / geological conservation, flood risk, historic environment landscape / visual and Green Belt. EN-1, 5.2 (Air Quality and Emissions) states that although an ES, when considering emissions to air, will include an assessment of CO₂ emissions, the IPC does not need to assess individual applications in terms of carbon emissions against carbon budgets, nor address CO₂ emissions, or any emissions performance standard that may apply to plant (EN-1, 5.2.2). EN-1, 5.3 (Biodiversity and geological conservation) refers to ODPM Circular 06/2005 and in England to Planning for Biodiversity and Geological Conservation: A Guide to Good Practice March 2006. Applicants should address in the ES any effects on international, national and locally designated sites of ecological or geological conservation importance, on protected species and habitats and on other species



identified as being of principal importance for the conservation of biodiversity (EN-1, 5.3.3). EN-1, 5.7 (Flood Risk) requires applications for energy projects of 1 hectare or greater in FZ 1 in England and all proposals for energy projects in FZs 2 and 3 in England to be accompanied by a flood risk assessment (FRA). The section explains the approach for the IPC to adopt, namely a FRA should be proportionate to the risk and appropriate to the scale, nature and location of the project; consider risk arising from the project in addition to risk of flooding to the project; take impacts of climate change into account; undertake the FRA by competent people; consider adverse and beneficial effects of flood risk; consider the vulnerability of those using the site and safe access; consider the different types of flooding, the range of flooding events and the residual risk and demonstrate this is acceptable; also consider the ability of water to soak into the ground, how drainage systems may be affected and if there is a need to be safe and remain operational during a worst case flood event and be supported by appropriate data (EN-1, 5.75). The IPC should be satisfied that the application is supported by site specific FRAs as appropriate, the sequential test applied as part of the site selection, a sequential approach applied at the site level to minimise risk, achieve consistency with flood risk management strategies, prioritise the use of SUDS and in flood risk areas be satisfied that the project is appropriately flood resilient (Statement 5.7.9). EN-1, 5.8 (Historic Environment) draws on PPS5 and its Practice Guide. The applicant's assessment of the historic environment should describe the significance of the heritage assets, however the level of detail should be proportionate to their importance and "no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset" (EN-1, 5.8.8) and from a decision making perspective, this should reflect the significance of the heritage assets (EN-1, 5.8.14).

- 3.3.47 EN-1, 5.9 (Landscape and Visual Impact) advises the IPC in its decision making that landscape effects depend on the existing character of the local landscape, its current quality, how highly it is valued and its capacity to accommodate change; such that the aim of the developer should be to minimise harm to the landscape and provide mitigation where practicable (EN-1, 5.9.7). It notes that, even in nationally designated areas, whereas the conservation of the natural beauty of the landscape and the countryside should be given substantial weight, the IPC may nevertheless recommend approval in exceptional circumstances, where it can be demonstrated that the proposed development is in the public interest (EN-1, 5.9.8/9 and see also Statement 3.3.8). With regard to visual impact, the IPC will have to judge whether effects on sensitive receptors outweigh the benefits of the project (EN-1, 5.9.17) and it is recommended that applicants draw attention to examples of existing permitted infrastructure with a similar magnitude of impact on sensitive receptors (EN-1, 5.9.18). On mitigation, attention is drawn to means of minimising landscape and visual effects through appropriate siting of infrastructure within the site, design including colours and materials and landscaping, as well as the design of buildings (EN-1, 5.9.20-22).
- 3.3.48 EN-1, 5.10 (Land use including open space, green infrastructure and Green Belt) requires that. Applicants should seek to minimise impacts on the best and most versatile agriculture land, preferably using land is areas of poorer quality, except where this would be inconsistent with other sustainability considerations; impacts on soil should be minimised; when developing previously used land, the risk posed by land contamination should be assessed (EN-1, 5.10.8). It is noted that "*The fundamental aim of Green Belt is to prevent urban sprawl by keeping land permanently open; the most important attribute of Green Belts is their openness*" and it suggests that reference is made to PPG2 (EN-1, 5.10.4, Statement 3.3.4). There is advice on IPC decision making on development in Green Belt, in which EN-1, 5.10.17 states as follows. "When located in the Green Belt, energy infrastructure projects are likely to comprise "inappropriate development. Inappropriate development is, by definition, harmful to the Green Belt and the general planning policy presumption



against it applies with equal force in relation to major energy infrastructure projects. The IPC will need to assess whether there are very special circumstances to justify inappropriate development. Very special circumstances will not exist unless the harm by reason of inappropriateness and any other harm is outweighed by other considerations. In view of the presumption against inappropriate development, the IPC will attach substantial weight to the harm to the Green Belt when considering any application for such development while taking account, in relation to renewable and linear infrastructure, of the extent to which its physical characteristics are such that it has limited or no impact on the fundamental purposes of Green Belt designation".

Revised Draft National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)

EN-2, Part 1 links this NPS, with EN-1, as providing the primary basis for decisions on 3.3.49 applications for NSIPs and advises that applications should be consistent with instructions and guidance in, EN-1 and any other relevant NPSs. EN-2 covers electricity generating infrastructure over 50 MW, namely coal fired, gas fired, integrated coal gasification combined cycle and oil-fired plant (EN-2, 1.7.1) and is mentioned here only to the extent that the Proposed Development is to supply gas to the proposed GEC which is itself within the scope of EN-2. Part 2 notes that the policies set out in this NPS are additional to those on generic impacts in EN-1; it concludes that there is a significant need for new major energy infrastructure and that, in the light of this, the need for the infrastructure covered by EN-2 has been demonstrated (EN-2 2.1.2). It refers to the factors influencing site selection by developers as land use, transport infrastructure, water resources and grid connection (EN-2, 2.2). On the matter of Government policy criteria for fossil fuel generating stations, the following must be met before consent can be given, namely CHP, CCR and CCS (for coal fired generating stations), also climate change adaptation and consideration of "good design" (EN-2, 2.3). Reference is also made to impacts of fossil fuel generating stations in respect of emissions to air, landscape and visual impact, noise / vibration, dust (applicable to coal), residue management (applicable to coal) and water quality resources (EN-2, 2.4-10). All relevant considerations in respect of the proposed GEC have been addressed in the EIA process.

Revised Draft National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)

- 3.3.50 It has been stated earlier that the Proposed Development is not a NSIP (Statement 3.2.9), however there is advice in EN-4, 1.2.3 that NPSs are likely to be helpful to LPAs as a material consideration in decision making on relevant applications that fall within the TCPA 1990 (as amended); to what extent an NPS is material will be judged on a case by case basis.
- 3.3.51 Part 2 notes that the policies set out in EN-4 are additional to those on generic impacts in EN-1, which sets out the Government's conclusion that there is a significant need for new major energy infrastructure generally and that, in the light of this, the need for gas supply infrastructure and gas and oil pipelines is such that the *"IPC should act on the basis that the need for the infrastructure covered by this NPS has been demonstrated"* (EN-4, 2.1.2). On the matter of site selection, it is stated that *"it is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites for gas supply infrastructure and gas and oil pipelines"* (EN-4, 2.1.3). Additional information in EN-1 Section 4.8 is that applicants should also take into account climate change adaptation, consideration of good design, hazardous substances and control of major accident hazards (COMAH).
- 3.3.52 EN-4, refers to gas and oil pipeline networks extending between storage and distribution but as already established, the advice given in EN-4 is capable of being



relevant to this Application. EN-4, 2.18 refers first to pipeline safety in which the principal legislation (Pipelines Safety Regulations 1996) requires that pipelines are designed, constructed and operated so that the risks are as low as is reasonably practicable, which Regulations are enforced by the HSE (EN-4, 2.18.4-6), also discussed in ES 17.0. Advice is given that, when designing the route of new pipelines, applicants should research relevant constraints, including the proximity of existing and planned housing, schools, hospitals, railway crossings, major road crossings, below surface usage, proximity to environmentally sensitive areas, main river and water crossings and proposals for mitigation (EN-4, 2.18.7-9). These matters are addressed in the ES Sections 5 and 6.

- 3.3.53 EN-4, 2.19 (Noise and Vibration) requires that all noise and vibration sensitive receptors likely to be affected will need to be identified taking into account preconstruction, construction (including HGV traffic) commissioning and operation including above ground plant (E-4, 2.19.1-4), for which there should be an assessment of noise and vibration effects and decision making in accordance with EN-1, 5.11, with measures for mitigation (E4, 2.19.5-7), which is addressed in ES 10.0.
- 3.3.54 EN-4, 2.20 (Landscape and Visual) refers to EN-1, 5.9 as providing the general principles to be applied to an assessment, the approach to the assessment and IPC decision making. It notes that long term impacts of pipelines upon landscape, are likely to be limited once buried and operational, while taking into account limitations on the ability to plant deep rooted vegetation over/adjacent to the pipeline, also structures and indication points necessary to identify the pipeline route and provide service access (EN-1, 2.20.2). Mitigation measures emphasised include reducing working widths and the use of drilling to avoid impacts on protected trees/hedgerows (EN-4, 2.20.6), addressed in the ES 6.0.
- 3.3.55 EN-4, 2.21 (Water Quality and Resources) refers to EN-1, 5.15 on setting out the generic policy on the protection of the water environment during construction, operation and decommissioning and EN-1, 4.10 on pollution control, requiring an assessment of the effects that will satisfy the IPC after consultation with the EA. Mitigation measures to protect the water environment my include techniques for crossing rivers and managing surface water and other measures including sustainable drainage systems.
- 3.3.56 EN-4, 2.22 (Soil and Geology) refers to the challenges of understanding soil types and underlying strata. Where a pipeline is to go under a designated area of geological or geomorphological interest, alternatives should be considered which either by pass the area or reduce the length to the minimum possible; consultation should also be undertaken at an early stage of development (EN-4, 2.22.3/4). From a consenting perspective, the two key determinants of suitability are whether the route is suitable and adverse impacts mitigated and that the route does not adversely affect the integrity of the pipeline (EN-4, 2.22.5). Mitigation should minimise effects on soil and geology, to ensure that residual impacts are minor and should include appropriate treatment of soil, with appropriate soil storage and reinstatement consistent with the Code of Practice for the Sustainable Management of Soils on Construction Sites (EN-4, 2.22.8).

3.4 Development Plan

East of England Plan 2008

3.4.1 Reference has been made in paragraph 3.2.6 to the High Court decision in the case of Cala Homes (South) which reinstated the EEP; it therefore remains part of the development plan, albeit that the Secretary of State has announced his intention to revoke RSs as is now proposed in the LB (paragraph 3.2.11).





3.4.2 In the 2010 GEC ES 3.4, there is an explanation of EEP policies in respect of the proposed power station which addresses:

Overall Spatial Vision Objectives	
Growth area – Thames Gateway	Policy SSI (Achieving Sustainable Development) Policy SS2 (Overall Spatial Strategy) Policy SS3 (Key Centres for Development Change) Policy SS5 (Priority Areas for Regeneration) Policy SS7 (Green Belt) Policy SS8 (Urban Fringe) Policy SS9 (The Coast)
Economic Development	Policy E1 (Job Growth) Policy E2 (Provision of Land for Employment) Policy E3 (Strategic Employment Sites) Policy E4 (Clusters)
Culture	Policy C1 (Cultural Development)
Transport	Policy T1 (Regional Transport Strategy Objectives and Outcomes) Policy T2 (Changing Travel Behaviour) Policy T6 (Strategic and Regional Road Networks) Policy T9 (Walking, Cycling and Other Non-Motorised Transport) Policy T10 (Freight Movements) Policy T11 (Access to Ports) Policy T14 (Parking)
Environment	Policy ENV1 (Green Infrastructure) Policy ENV2 (Landscape Conservation) Policy ENV3 (Biodiversity and Earth Heritage) Policy ENV6 (The Historic Environment) Policy ENV7 (Quality in the Built Environment)
Carbon Dioxide Emissions and Renewable Energy	Policy ENG1 (Carbon Dioxide Emissions and Energy Performance) Policy ENG2 (Renewable Energy Targets)
Water	Policy WAT1 (Water Efficiency) Policy WAT2 (Water Infrastructure) Policy WAT4 (Flood Risk Management
Waste	Policy WM7 (Provision for Hazardous Waste and Regionally Significant Facilities)
Essex Thames Gateway Sub Region	Policy ETG1 (Strategy for the Sub-Region) Policy ETG2 (Thurrock Key Centre for Development and Change) Policy ETG5 (Employment Generating Development) Policy ETG6 (Transport Infrastructure)

3.4.3 One of the three largest Growth Areas is "Thames Gateway, a regeneration area of national importance which includes part of South Essex (Essex Thames Gateway)" (GEC ES 3.5). This eastern part of Thurrock is within the Essex Thames Gateway, one of the Growth Areas "Where the most significant development and regeneration challenges in the region are concentrated" (EEP 3.8). Among the policies, those that are most relevant to the Proposed Development are SS1, SS2, SS5, SS7, SS8, E1, E2, E3, E4, T1, T2, T6, T9, ENV1, ENV2, ENV3, ENV6, ENV7, ENG1, ENG2, WAT4, ETG1, ETG5 on which this PS comments briefly.

Spatial Strategy

3.4.4 An aim of the spatial strategy is to accommodate higher levels of growth in sustainable ways (paragraph 3.3); Thames Gateway is defined as a regeneration



area of national importance which includes part of South Essex (paragraph 3.5). Relevant policies are below.

- SS1 (Achieving Sustainable Development) gives weight to a number of key national planning policies including achieving a sustainable economy and adopting a precautionary approach to climate change; the explanation behind the policy is that it advocates using resources wisely to ensure that "all development is compatible with environmental limits, including in regard to carbon performance, and that no development adversely affects the integrity of sites of European or international importance for wildlife" (EEP 3.9).
- SS2 (Overall Spatial Strategy) directs most strategically significant growth towards major urban areas, building on existing infrastructure and developing previously used land.
- SS5 (Priority Areas for Regeneration) refers to Essex Thames Gateway (ETG) as one of the "areas with generally weak economic performance and significant areas of deprivation", where locally significant regeneration is required that:
- SS7 (Green Belts) states that "the broad extent of green belts in the East of England is appropriate and should be maintained."
- SS8 (Urban Fringe) encourages "the enhancement, effective management and appropriate use of land in the urban fringe" and complements Policy ENV1 in recognising the importance of improving the urban fringe.

Economic Development

- 3.4.5 The aim of economic development policies is to grow the region's economy and encourage greater investment; it proposes that the most dynamic areas, sectors and clusters should continue to grow to lead economic progress and achieve competitive advantage, while promoting a step change in employment provision, particularly in priority areas for regeneration. Relevant policies are below.
 - *E1 (Job Growth)* contains indicative targets for net growth in jobs for the period 2001-2021 which indicates 55,000 jobs in Essex Thames Gateway, shared between Thurrock, Basildon, Castle Point, Southend-on-Sea and Rochford.
 - *E2 (Provision of Land for Employment)* requires LDDs to ensure that there is an adequate range of sites/premises to support the full range of sectoral requirements to meet the indicative job growth targets of Policy E1 which would include sections/clusters identified in Policy E3.
 - E3 (Strategic Employment Sites) requires that sites should be provided in various locations including "Thames Gateway linked to the strategies for the key centres at Basildon, Southend-on-Sea and Thurrock Urban Area".
 - *E4 (Clusters)* although not specifying LG by name, it is clear that the list is not exclusive; it defines "*clusters*" as "*concentrations of companies in related activities* …" (EEP 4.14); it refers to transport gateways and renewable energy as a key sector, which is pertinent to LG and the proposed GEC.

Transport

- 3.4.6 The existing transport network was an important factor in shaping the spatial strategy, which seeks to reduce dependence on car travel; managing car usage while improving the scope for alternatives is considered to be potentially the best way to meet demand in urban areas. Relevant policies are below.
 - *T1 (Regional Transport Strategy Objectives and Outcomes)* aims to achieve transport by more sustainable modes, while reflecting the functionality of the



region's transport networks, the efficient use of existing transport infrastructure and increased movements by public transport, walking and cycling.

- *T2 (Changing Travel Behaviour)* is about achieving a significant change in travel behaviour.
- *T6 (Strategic and Regional Road Networks)* referring to the existing road network, supports the efficient movement of freight which cannot be carried by rail or waterway, so as to minimise its impact on the environment and local transport networks.
- *T9 (Walking, Cycling and Other Non Motorised Transport)* requires pedestrians, cyclists and other non motorised forms of transport to be managed and improved, to enhance residents' access to work.

Environment

- 3.4.7 The principles for the management of the East of England's environment envisage conservation and enhancement of the natural, historic and built environment, including protection of the countryside and promoting biodiversity. Relevant policies are below.
 - *ENV1 (Green Infrastructure)* defines as protected sites, nature reserves, green spaces, waterways and green linkages which will be in settlements and surrounding areas developed to maximise biodiversity, contribute to achieving carbon neutral development and flood attenuation and opportunities taken to develop and enhance networks for walking and cycling.
 - *ENV2 (Landscape Conservation)* refers to the region's nationally designated landscapes and Areas of Outstanding Natural Beauty, however these features do not exist in the vicinity of the Site.
 - *ENV3 (Biodiversity and Earth Heritage)* affords the strongest levels of protection to internationally/nationally designated sites while requiring proper consideration of other habitats and species.
 - *ENV6 (The Historic Environment)* requires plans to identify, predict, conserve and where appropriate, enhance the historic environment, its archaeology, historic buildings, places and landscapes.
 - ENV7 (Quality in the Built Environment) requires high quality design of all new development, coupled to "high standards of environmental performance"; the policy is directed towards urban development but includes reference to addressing crime prevention, community safety and reducing pollution, including noise and light.

Carbon Dioxide Emissions and Renewable Energy

- 3.4.8 Reference is made to the Supplement to PPS1 and how planning should promote approaches to the location and design of development which encourages incorporation of suitable technologies and reduction of energy consumption and carbon emissions. Relevant policies are below.
 - ENG1 (Carbon Dioxide Emissions and Energy Performance) by referring to PPS, it is made clear that tackling climate change is a key priority for the planning system (paragraph 9.2); the policy advises that LPAs should encourage the supply of energy from decentralised, renewable and low carbon sources supported by development plan documents, by which non residential floorspace above 1,000 m² (and residential) should secure at least 10% of its energy from decentralised, renewable or low carbon sources.



• *ENG2 (Renewable Energy Targets)* - efforts should be made to switch to energy produced from renewable and low carbon sources and to encourage the use of CHP, while ensuring security of supply (paragraph 9.5).

Water

- 3.4.9 As the driest region in England, there is an emphasis on management of water resources as well as dealing with flood risk. Relevant policies are below.
 - WAT4 (Flood Risk Management) identifies coastal and river flooding as a significant risk in parts of the region; the "priorities are to defend existing properties from flooding and locate new development where there is little or no risk of flooding"; the EER vulnerability to flooding is increasing; where some flood risk is unavoidable, it must be considered all stages of the planning process (paragraph 10.13).

Essex Thames Gateway Sub Region

- 3.4.10 The Essex part of the Thames Gateway Sub Region (south of the A13 in Thurrock) is prioritised for urban regeneration; this includes major port infrastructure, including the proposed LG Development. Relevant policies are below.
 - *ETG1 (Strategy for the Sub-Region)* aims to achieve transformational development throughout the Essex Thames Gateway which plans to substantially increase the number of homes and jobs, give the area a more attractive image, significantly increase the overall value of the economy, enhance the education and skills base and protect the natural and historic environment.
 - ETG5 (Employment Generating Development) envisages that of the 55,000 net additional jobs planned for the ETG in the period 2001-2021, almost half (26,000 jobs) will be created within Thurrock (whole LA area). TTGDC and local authorities should facilitate these job increases by promoting a competitive sub-regional business environment.

Thurrock Borough Local Plan 1997

Background

3.4.11 The Secretary of State made a direction on 20.9.07 under paragraph 1 (3) of Schedule 8 to the PCPA that certain policies contained in the TBLP are to be "*saved*", among which some are relevant to the Proposed Development. In the 2010 GEC ES, there is an explanation of relevant TBLP policies in respect of the proposed power station; these policies remain relevant to this Application except that transport policies T18 (Railways – Freight Facilities) and T20 (Waterways – Freight Facilities) are not relevant to this Proposed Development. The policies that are most relevant to this Application are BE1, BE2, BE4, BE10, BE11, BE26, GB1, GB2, LN2, LN3, LN12, LN15, LN16, T1, T6, T8, T11.

Land Use

3.4.12 The site of the proposed GEC is within an area on the TBLP Proposals Map to which Policy E8 (Oil Refineries) applies in respect of development for new oil refinery activities. Although Policy E8 is "saved", it has effectively been superseded by the approval of the LG Development which is recognised in the EEP and in the Council's Core Strategy. The areas between Stanford-le-Hope and Mucking and eastwards to GEC are subject to various designations including land subject to Policy GBI (The Green Belt in Thurrock), Policy LN2 (Landscape Improvement Area), Policy LN3 (Landscapes of Local Importance), Policy LN15 (Sites of Importance for Nature Conservation – SINC).

Built Environment



- 3.4.13 Chapter 3 defines the objective of the built environment as being to *"improve the quality of the environment in town and country"*; relevant policies are BE1, BE2, BE4, BE10, BE11 and BE26. Comments on these policies are below.
 - BE1 (Design of New Development) requires a high standard of design in all new development with particular attention to mass, form and scale, the constituent elements of design, quality and appropriateness of materials, landscaping, treatment of spaces, vehicular and pedestrian access and the integration of development with its immediate surroundings and wider setting.
 - *BE2 (Development Control Policies)* seeks to regulate development in the public interest through the application of policy criteria, planning standards, guidelines and conditions.
 - *BE4 (Landscaping)* seeks concurrent submission of landscaping details with applications.
 - *BE10 (Infrastructure)* only permits development of land when there is adequate infrastructure; this requires adequate infrastructure either to exist, or to be provided by the developer.
 - *BE11 (Energy Efficiency)* provides that, in considering development, the Council will take into account the need for energy efficiency; the justification behind this policy is that the conservation of non renewable forms of energy (e.g. coal and oil) is of major importance in creating sustainable development; the policy does not address low carbon forms of energy, its benefits were not recognised at the time.
 - *BE26 (Development of Contaminated Land)* requires that when considering development, surveys will be required to demonstrate that remediation will enable reclamation.

Green Belt, Landscape and Nature Conservation

- 3.4.14 Chapter 4 defines the objective of the Green Belt as being to "keep the Green Belt open and only allow building in the most exceptional circumstances"; Chapter 5 (as with Chapter 3) defines the objective as "improving the quality of the environment in both town and country" in which it aims to "protect and enhance areas of good quality agricultural land, attractive and traditional landscapes and areas of nature conservation value".
- 3.4.15 Relevant policies are GB1, GB2, LN2, LN3, LN12, LN15, LN16 and summarised below.
 - *GB1 (Green Belt)* stipulates that planning permission will not be given, "*except in very special circumstances, for the construction of new buildings or for the change of use of land or the re-use of existing buildings*" unless it is for one of the purposes specified in the policy.
 - GB2 (Design consideration in the Green Belt) requires that, where proposals for development in the Green Belt are acceptable in principal and buildings are proposed, they should be properly designed and constructed of sound materials appropriate to the countryside, taking into account siting, scale, layout, location and landscaping; the development should not have a detrimental effect on the amenities of local residents, rural activities, countryside users or highway safety; development should safeguard, maintain and enhance existing landscape features, watercourses, trees and hedges.
 - LN2 (Landscape Improvement Areas) the Council will expect "sympathetic landscaping schemes in association with new developments".



- LN3 (Landscapes of Local Importance) will only permit development "*if it would* not cause permanent loss, or damage to, the character of the landscape"; the area south of Corringham is one of several locations included in the policy for their contribution to the landscape generally.
- *LN12 (Development Proposals and Nature Conservation)* requires new proposals for development to give proper consideration to a site's nature conservation value, not to prejudice wildlife habitats and, where appropriate, to provide for new habitat creation and management.
- LN15 (Sites of Importance for Nature Conservation SINC) requires that, in the areas identified, "development will only be permitted which would materially harm their nature conservation value".
- LN16 (Areas of Local Nature Conservation Significance and Ecological Corridors) - requires that proposals for development should retain the nature conservation interest of all ecological corridors indicated on the Proposals Map and listed in TBLP Appendix 7.
- 3.4.16 In considering these policies, it should be noted that the majority of the effects of the Proposed Development are temporary and that the above ground works (principally the AGI) are small in scale.

Employment

3.4.17 Thurrock has a long tradition of industry, including development which utilises the riverside location of the Borough. It is noted that the industrial base, which previously provided a large number of jobs, has declined; the Plan aims to accommodate a higher level of employment growth within the Borough and to diversify job types (7.3).

Transport

- 3.4.18 Chapter 11 defines the objective of its approach to transport as being to "*improve the transport network in order to facilitate the level of growth and development proposed in the Plan and to resolve existing shortcomings.*" The ES confirms that only during the construction phase is there the potential for residual impacts; relevant policies are therefore limited to those involving a balanced transport strategy, traffic management, footpaths and cycleways. Relevant policies are T1, T6, T8, T11.
 - *T1 (Balanced Transport Strategy)* seeks, among other considerations, to counter the potential effects of increased traffic by pursuing policies aimed at reducing the reliance on and unnecessary use of the motor vehicles while promoting the greater use of alternative modes of transport.
 - *T6 (Traffic Management)* envisages the Council imposing appropriate measures, as and when considered necessary, to regulate or deter the passage of traffic on specified roads where problems are identified, including the prohibition of commercial vehicles along environmentally sensitive sections of road (as indicated on the Proposals Map).
 - *T8 (Existing and New Public Footpaths)* encourages greater use of public footpaths, the retention and maintenance of pedestrian rights of way and provisions of sign posting, as necessary. It emphasises that public footpaths are a valuable means of communication at the local level.
 - *T11 (Cycleways)* promotes greater use of the bicycle as a means of transport, which is considered to have a significant part to play in the Council's transportation strategy, aimed at reducing reliance on the motor car. Measures will include seeking the provision of secure facilities for the parking of bicycles at all locations where need is identified and introducing advisory signposted cycle routes throughout the Borough.



3.5 Local Development Framework

Thurrock Core Strategy

Background

- 3.5.1 On 27.1.10, Thurrock Council resolved to approve for publication the Council's Draft *Thurrock Core Strategy and Policies for Management of Development (TCSPMD)*, development plan document. It was published for consultation between 26.2.10 and 9.4.10 under Regulation 27 of the Town and Country Planning (Local Development) (England) Regulations 2004 and submitted to the Secretary of State on 30.4.10. Subsequently, the Council issued for consultation between 12.11.10 and 31.12.10, a Schedule of Proposed Focussed Changes to the Submission Core Strategy and Policies for Management of Development (CSPMD). The Schedule refers to the revocation of the RS; however, the Council decided that it would *"sustain the underpinning Spatial Development strategy that was envisaged in the former East of England Plan"* as it *"considers the basic strategy for the Sustainable Regeneration of Thurrock set out in the former Plan and Evidence Base that underpinned the long term strategy remains valid"* (Schedule paragraph 2.6). An independent examination hearings of the Core Strategy began in March 2011.
- 3.5.2 The following are relevant to this Application, strategic spatial objectives; SSO2, SSO3, SSO10, SSO11, SSO12, SSO13, SSO14, SSO17, SSO18, SSO19; spatial policies CSSP2, CSSP3, CSSP4, CSSP5; thematic policies CSTP6, CSTP12, CSTP18, CSTP19, CSTP21 CSTP22, CSTP23, CSTP24, CSTP25, CSTP26, CSTP27. Policies for management of development PMD1, PMD2, PMD4, PMD6, PMD7, PMD9, PMD10, PMD12, PMD13, PMD14, PMD15, PMD16. These policies are relevant to GEC and the Proposed Development.

Vision / Objectives

- 3.5.3 Chapter 3 sets the context for the spatial vision and strategic objectives for Thurrock; it notes that there is a need to diversify Thurrock's economic base to provide the local community with more training and employment opportunities in the growth sectors; *"its policies aim to ensure that growth in local businesses is supported and promoted"* (3.8.(8)). LG is identified as one of five regeneration areas, comprising a major logistics, import/export employment development creating 11-13,000 jobs to *"secure the long-term future of the industry in Thurrock"*; it envisages that *"Development of ancillary, associated and spin-off employment activities will take place on the wider employment site, including a strategic lorry park. There is also potential scope for large-scale high quality campus style relocation or inward-investment business developments"* (3.38).
- 3.5.4 The Core Strategy sets out a number of strategic spatial objectives, including: increasing prosperity and employment growth in the five strategic hubs (SSO2); supporting local businesses, attracting inward investment and high skill jobs, including environmental industries by providing appropriate sites (SSO3); providing a safe transport system that supports accessibility, manages the need to travel and encourages environmentally friendly modes of transport such as cycling, walking and public transport (SSO 10) sustaining and enhancing the open character of the Green Belt, only allowing development in very special circumstances (SSO11); protecting the natural, historic and built environment (SSO12); developing the Greengrid network of biodiversity sites (SSO13); promoting sustainable development though the prudent use of water and other natural resources, sustainable design, methods and materials, and integration of land-use with the maximum re-use of land (SSO14); minimising the impact of climate change by supporting the provision of renewable and low carbon energy sources and ensuring that new development incorporates climate change adaptation (SSO17); reducing/managing risk of flooding through location, layout and



design (SSO18); and safeguarding/enhancing the Thurrock riverside and coastal land in its various roles, including port-related activity at Tilbury and LG (SSO19).

Spatial

Chapter 4 Spatial Policies - identifies the Thames Gateway South Essex sub-region 3.5.5 as one of the "Engines of Growth" for the region in which LG and Tilbury Ports is one of two key economic drivers and future areas of development (4.10). The Thurrock Economic Development Strategy 2009 (TEDS) "focuses future growth upon the existing core economic sectors and the identified growth sectors". It suggests that the growth sectors identified by the TEDS could offer additional sources of new employment and contribute to economic diversification, of which one is "energy" (paragraphs 4.11/12). Policy CSSP2 (Sustainable Employment Growth) includes a table of Key Economic Strategic Economic Hubs. For the LG Development, it refers to port, logistics and transport as core sectors; it names environmental technologies, recycling and energy as growth sectors and training, innovation and research facility, business and distribution park as flagship developments, producing an indicative job growth of 11,000-13,000 jobs. Policy CSSP3 (Sustainable Infrastructure) explains that essential social and physical infrastructure must be put in place to deliver regeneration in Thurrock and identifies various infrastructure projects, including a new power station at Tilbury. Policy CSSP4 (Sustainable Green Belt) in seeking to deliver the objectives of PPG2, explains that the Council will maintain the permanence of the Green Belt boundaries, resisting development where there would be any danger of coalescence and maximising opportunities for increased public access, leisure and biodiversity. The Council will seek to reinforce the Green Belt boundary through structural enhancement of landscape; development proposed in the Green Belt will have to "fully comply with the relevant thematic and Development Management policies". Policy CSSP5 (Sustainable Greengrid) includes measures to protect and manage Greengrid and deliver Improvement Zones.

Employment

3.5.6 Chapter 5 contains a number of thematic policies including core strategic policies concerning employment, environment, climate change, water, waste and strategic infrastructure. On the matter of strategic employment provision, *Policy CSTP6 (Strategic Employment Provision)* notes that the Thurrock Employment Study indicates that the 26,000 person job target will be challenging to deliver by 2026 (5.48). The policy advises that, whereas the Council will safeguard existing primary/secondary industrial/commercial land, it will consider economic development that includes no B Class uses, provided certain criteria are met.

Socially Inclusive Communities

3.5.7 *Policy CSTP12 (Education and Learning)* encourages, among others, opportunities for learning and training facilities, the co-ordination of new educational provision with new development, environmental, economic and social (educational and community) sustainability; proposals for new development will be required to contribute towards education in accordance with Policies CSSP3, PMD16 and the Developer Contribution SPD.

Environment

3.5.8 *Policy CSTP18 (Green Infrastructure)* is concerned with improving the Borough's green assets and requiring new development to result in a net gain in green infrastructure including incorporating habitat/wildlife creation technologies within new development such as green roofs and walls. *Policy CSTP19 (Biodiversity)* encourages measures to contribute positively to the overall biodiversity in the Borough; the Council aims to safeguard and enhance designated sites to mitigate the effects of past habit loss, fragmentation, development and climate change and will



prepare biodiversity management plans with partners. Policy CSTP21 (Productive Land) recognises the importance of food security and will ensure the protection, conservation and enhancement of agriculture, productive land and soil; development of the best and most versatile land will not be supported except in exceptional circumstances; productivity of land will be supported. Policy CSTP22 (Thurrock Design) seeks to achieve high quality design to improve the quality of the environment particularly in the Regeneration Areas and Key Strategic Economic Hubs, including by ensuring that development embraces the use of sustainable, renewable resources of energy and low-emissions technology. The policy supports a robust design process in which development should demonstrate respect for the distinct characteristics of areas and consider how to address the particular sensitivities and capacity of the places within which development is to occur, including Policy CSTP23 (Thurrock Character and how adverse impacts are mitigated. Distinctiveness) similarly seeks to protect, manage and enhance the character of Thurrock to ensure improved quality and strengthened sense of place by identifying areas where character is a key issue, including Regeneration Areas, Key Strategic Economic Hubs and Green Belt, by retaining and enhancing significant natural, historic and built features and strategic and local views which contribute to the character and sense of place of the borough. Policy CSTP24 (Heritage Assets and the Historic Environment) requires the preservation or enhancement of the historic environment and that all development proposals should accordingly consider and appraise development options and demonstrate that the final proposal is the most appropriate.

Climate Change

- 3.5.9 Policy CSTP25 (Addressing Climate Change) evidence base refers to priorities which include reducing CO₂ and N2O emissions from the industrial/commercial sector, particularly from gas/electricity consumption (paragraph 5.157); the policy requires development to address climate change adaption measures, including reduction of emissions, renewable carbon technologies, passive design, recycling, waste minimisation, mitigation measures to support reductions in CO₂ emissions across all sectors and increasing renewable and low carbon energy. New development should incorporate climate change resistant features and not be at risk from flooding.
- 3.5.10 Policy CSTP26 (Renewable or Low Carbon Energy Generation) will promote and facilitate proposals for centralised renewable or low carbon energy schemes at appropriate locations and standards at Tilbury and LG. It will promote the delivery of district energy networks in priority locations to increase the proportion of energy delivered from renewable and low carbon sources; it states that *"The Council will only view an application as unacceptable where it produces a significant adverse impact that cannot be mitigated"*.

Water, Riverside, Coastal

3.5.11 *Policy CSTP27 (Management and Reduction of Flood Risk)* commits to using land use planning to implement and support flood risk management and working alongside the EA, including in ensuring that where possible, new development contain spaces for water including naturalisation and environmental enhancement.

Policies for Management of Development

- 3.5.12 Chapter 6 includes a number of policies for the management of development; in conjunction with the strategic spatial and thematic policies, these are the basis for the determination of applications.
 - Policy PMD1 (*Minimising Pollution and Impacts on Amenity*) restricts development where it would cause unacceptable effects on the amenity of an area and on neighbouring or future occupiers. Particular consideration will be



given to the location of sensitive land uses such as housing, school, health facilities and biodiversity sites; where necessary, the Council may require applications to address matters including air pollution, noise pollution, contaminated land, odour, light pollution, water pollution and visual intrusion.

- *Policy PMD2 (Design and Layout)* is concerned with ensuring that the design of new development responds sensitively to the site and its surroundings and where appropriate to mitigate against any negative impacts.
- Policy PMD4 (Historic Environment) seeks to ensure that the fabric and setting of heritage assets, including listed buildings, conservation areas, scheduled ancient monuments and other important archaeological sites, and historic landscape features are appropriately protected and enhanced.
- Policy PMD6 (Development in the Green Belt) is concerned with maintaining, protecting and enhancing the open character of the Green Belt in accordance with the provisions of PPG 2 and, correspondingly, planning permission will only be granted for new development when it meets the requirements and objectives of PPG2.
- Policy PMD7 (Biodiversity and Development) applies a sequential approach in requiring development proposals to demonstrate that any significant biodiversity habitat or geological interest of recognised local value is retained and enhanced on site; where this is not possible and there is no suitable alternative site available for the development, such loss must be mitigated and, if mitigation is not possible, developers should provide appropriate compensation within Thurrock. Where appropriate, applications should explain why loss is unavoidable, assess what species/habitat would be lost or adversely affected and explain how those effects will be mitigated through on site, or off site measures or compensation. Proposals for development should incorporate biodiversity features such as green/brown roofs and the creation of green corridors for wildlife; biodiversity management plans may be required.
- *PMD9 (Road Network Hierarchy)* is included to ensure that proposals for development affecting the highway will be considered in relation to the road network hierarchy and the function of each level of that hierarchy; thereby mitigating adverse impacts on the transport system, including capacity, safety, air quality and noise. In defining the road network, reference is made to level 1 routes (corridors of movement comprising strategic non-trunk roads and rural urban distributors), level 2 routes (urban and rural road/streets) and level 3 routes (local roads and streets).
- *PMD10 (Transport Assessments and Travel Plans)* requires applications for planning permission to be accompanied with Transport Assessments, Transport Statements, and Travel Plans in accordance with the Department for Transport guidance.
- Policy PMD12 (Sustainable Buildings) is concerned with ensuring new developments are sustainable by utilising sustainable construction techniques to minimise water and energy consumption, maximise water efficiency/water recycling and the use of recycled materials and minimise waste/maximize recycling during and after construction.
- Policy PMD13 (Decentralised Renewable and Low-Carbon Energy Generation) supports decentralised, renewable or low-carbon energy and the provision of district energy networks to serve new development. In priority locations, the policy requires all opportunities for establishing district energy networks to be taken up; priority locations are those which provide 100 dwellings or more,



residential sites larger than 2 hectares and non-residential developments with a total floorspace exceeding 10,000 m².

- Policy PMD14 (Carbon Neutral Development) requires developers to demonstrate that all viable energy efficiency measures and renewable or lowcarbon technology opportunities have been utilised to minimise emissions.
- *PMD15 (Flood Risk Assessment)* requires the management of flood risk to be considered at all stages of the planning process taking into account PPS 25 and incorporating SUDS techniques as part of development.
- Policy PMD16 (Developer Contributions) advises that, where needs would arise as a result of development; the Council will seek to secure planning obligations under Section 106 of the TCPA 1990 and in accordance with Circular 5/05 and other relevant guidance

3.6 Thurrock Thames Gateway

- 3.6.1 TTGDC's website advises that the Corporation determines planning applications that fall within its ambit (paragraph 3.2.9), however the Council is responsible for the preparation of the statutory Local Development Framework (LDF) which, when adopted, will provide the spatial strategy, policies and proposals to guide the future development and land use in the Borough up to 2026. TTGDC has produced a number of plans; however, these are non statutory and therefore, although they are capable of being material considerations, they do not form part of the development plan.
- 3.6.2 Among the various documents produced by TTGDC, the following are of some relevance:
 - A Framework for Regeneration and Sustainable Growth 2005
 - Thurrock Spatial Plan 2007
 - East Thurrock Master Plan 2009

Framework for Regeneration and Sustainable Growth

- 3.6.3 The Framework refers to TTGDC's broad statutory objective from which it has developed a number of corporate aims to:
 - Improve the supply of housing;
 - Generate jobs and diversification of employment;
 - Develop skills;
 - Balance the social structure of the Borough;
 - Improve infrastructure and transport access; and
 - Improve the quality of the environment and public realm.

These have been translated into a series of strategic objectives, which include riverside regeneration, employment innovation and economic development and port(s) logistics and distribution (paragraphs 1.10, 1.11).

- 3.6.4 The Framework identifies cross cutting strategic goals to deliver the Thames Gateway sustainable communities and population and economic growth including:
 - Contribute to the provision of sufficient capacity to meet strategic growth targets including 26,000 new jobs and 18,500 new homes in a sustainable way by 2021 (item 1);



- Increase participation and attainment in life long education and skills development (item 2);
- Create a wide range of jobs with a future (item 3); and
- Ensure that development and regeneration take place in an environmentally sensitive way (item 9).

Against the background of these policies, one of the priorities is that "*Thurrock has long been a home for power generation and the infrastructure can now be utilised by renewable energy production on a large scale*" (paragraph 4.73).

Thurrock Spatial Plan

3.6.5 The Plan sets out the amount and broad locations of development; it draws on the earlier Regeneration Framework which set the future direction for regeneration in the area and provided the basis to develop projects and a work programme (page 12). The regeneration of Thurrock is to be led by growth in the number and diversity of jobs, with the main locations for jobs growth being centred on five hubs including LG (page 23).

East Thurrock Master Plan

3.6.6 The Master Plan has been prepared by TTGDC to guide the growth of East Thurrock to 2021; the Plan area includes Corringham, Stanford-le-Hope and the employment areas to the east. Broad strategic themes of the Plan include generating jobs and diversifying employment, enhancing the potential of the LG Development, improving the supply of housing, developing and enhancing skills, balancing the social structure, improving transportation, improving design/quality of the public realm and enhancing cultural life. The Plan reaffirms the employment targets for Thurrock (26,000 jobs) and the LG Development (approximately 11,500 jobs). Reference is made to the Council's Thurrock Economic Development Strategy 2008 which supports maximising employment opportunities and investment in target growth areas, including generating a stronger skills base and improving the inward investment offer.
SECTION 4

THE GEC DEVELOPMENT / GEC SITE SURROUNDINGS



4 THE GEC DEVELOPMENT / GEC SITE SURROUNDINGS

4.1 Description of GEC

4.1.1 GEC will provide up to 900 MWe of power generation capacity. This will include the provision of up to 150 MWe to the LG Development, which is expected to meet its long-term electricity requirements. Additionally, GEC will be designed in such a way as to enable the supply of heat in the form or steam and / or hot water (for use in production / space heating / cooling) to facilities and / or customers in the vicinity of the GEC site (in particular to prospective customers of the LG Development).

4.2 GEC Configuration

- 4.2.1 GEC will likely comprise two gas turbine units which will be fuelled by natural gas. Each unit will comprise a gas turbine and a HRSG, which will serve steam turbine equipment.
- 4.2.2 There may be one common steam turbine or one steam turbine per gas turbine. As such there are currently two layout options which are considered in relation to GEC. These are layouts for a single-shaft design (one steam turbine per gas turbine) and a multi-shaft unit design (one common steam turbine for both gas turbines). Under both single and multi-shaft layout options the total electrical output of GEC will be approximately 900 MW at typical site ambient conditions. However, the final electrical output of GEC will be dependent upon the final technology and manufacturer choice.

Process Description

- 4.2.3 The natural gas will be burnt in the combustion chamber of each gas turbine from where the hot gases will expand through the gas turbine to generate electricity. Each gas turbine will comprise an inlet air filter, an air compressor, combustion chamber, power turbine and exhaust silencer.
- 4.2.4 The hot exhaust gases (which still contain recoverable energy) are then used in the HRSG to generate steam, which in turn is used to generate electricity via steam turbine equipment.
- 4.2.5 The use of a combined gas and steam cycle increases the overall efficiency of the power plant. As such, GEC will be capable of generation in combined cycle mode with an overall electrical generation efficiency of approximately 55 per cent based on the LCV of the fuel. This is considered to be a conservative approximation, and an electrical generation efficiency of 58 to 59 per cent may well be achievable at the time of contracting for equipment. If it becomes technically and economically feasible to provide heat and / or power to surrounding facilities / customers, additional fuel utilisation gains may be achieved.
- 4.2.6 The spent steam leaving the steam turbine equipment will pass to an ACC where it will be condensed. The resultant condensate will be returned to the HRSGs for re-use, minimising water usage.
- 4.2.7 The use of ACCs has the potential to eliminate other environmental impacts associated with other cooling systems. For example, the use of ACCs, rather than a wet cooling system, has the following benefits:
 - No visible cooling tower plumes;
 - Significantly lower water consumption;
 - No surface water abstraction or discharge of heated cooling water to water courses; and
 - Reduced use of water treatment chemicals.



- 4.2.8 The steam turbine system will comprise the turbine equipment itself, a multi-cell air cooled condenser, condensate extraction pumps and air extraction equipment.
- 4.2.9 Natural gas is a clean fuel and does not produce the particulate or sulphur emissions associated with burning coal. As a result, flue gas cleaning equipment is not required as all atmospheric emissions from the plant will be controlled at the source.
- 4.2.10 The flue gases from each CCGT module will be discharged to the atmosphere via two dedicated 75 m stacks. The height of these has been determined by a computer dispersion modelling study.
- 4.2.11 Figure 1.2 shows a schematic representation of the CCGT principle.
- 4.2.12 GEC may potentially have a positive net effect on climate change as it will likely replace other fossil fuel sources of electricity generation that have greater CO2 emissions per unit output.
- 4.2.13 In addition, GEC will be designed so as to be CCR, with space made available in the design to allow for the retrofitting of a carbon capture plant in the future. This is discussed further in the CCR Feasibility Study which has been submitted in support of the Section 36 Consent application for GEC.

4.3 Infrastructure Connections

Gas Connection

- 4.3.1 The natural gas used as fuel by the gas turbines is proposed to be taken from a new underground gas pipeline routed to GEC from a new AGI where there will be a connection to the existing National Grid NTaS Number 5 Feeder pipeline.
- 4.3.2 The new underground gas pipeline and associated AGI are required as the existing CECL Power Station gas pipeline and AGI does not have the capacity to transport the required gas flow for the operation of both the CECL Power Station and GEC. Therefore, it is not possible to utilise the existing CECL Power Station gas pipeline and AGI.
- 4.3.3 These proposed works are the subject of this ES. Further details are provided in Section 5.
- 4.3.4 Although not within the scope of this ES, it may be that the National Grid NTaS Number 5 Feeder pipeline may require some reinforcements due to the supply requirements of GEC. The details and timescales of any reinforcements would be subject to further analysis by National Grid.

Electrical Connection

- 4.3.5 The electricity generated at GEC will be dispatched to the HV National Grid system via a connection to a new substation. The substation, including its connection to the existing Rayleigh Tilbury 400 kV overhead line, is to be consented and constructed by National Grid. The electrical connection from the substation to GEC is to be consented and constructed by GECL. As such, these will be subject to separate Consent applications. The responsibilities of National Grid and GECL are shown in Insert 1.1.
- 4.3.6 National Grid's application for consent for the substation and connection to the existing Rayleigh Tilbury 400 kV overhead line is likely to be made to the Infrastructure Planning Commission (IPC) (or to the Major Infrastructure Planning Unit which will replace the IPC) for a Development Consent Order (DCO) under the Planning Act 2008.
- 4.3.7 GECL's application for consent for the electrical connection from GEC to National Grid's proposed new substation will be for an overhead line or underground cable, or a combination of both. The application(s) will be to the IPC (or to the Major



Infrastructure Planning Unit which will replace the IPC) if it is for an overhead line or to TBC / TTGDC under the Town and Country Planning Act 1990 if it is an underground cable. A combination of an overhead line and underground cable connection will require an application to the IPC or to the IPC and TBC / TTGDC.

- 4.3.8 These applications will include details of the development proposals, and will be accompanied by ESs conforming to the requirements of the relevant EIA Regulations (Infrastructure Planning (Environmental Impact Assessment) (England and Wales) Regulations 2009 / Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999).
- 4.3.9 Feasibility work on substation options by National Grid resulted in the identification of 13 potential substation locations. These are shown in Insert 4.1. Additionally, a number of other options (such as using the existing CECL Power Station overhead line) have been considered.





INSERT 4.1 – NATIONAL GRID SUBSTATION LOCATIONS



- 4.3.10 Following further feasibility work by National Grid, two potential substation locations were rejected where the land already has planning permission for development. This left 11 potential substation locations to be considered. Additionally, the further feasibility work also discounted the option of using the existing CECL Power Station overhead line due to a lack of compatibility with the regulations governing National Grid's existing transmission network (which are set by OFGEM).
- 4.3.11 Whilst the selection of a substation location and its connection to the existing Rayleigh Tilbury 400 kV overhead line is ongoing (by National Grid) and the electricity connection between the substation and GEC (by GECL) is still subject to feasibility work (including consideration of environmental, planning, technical and commercial factors) and discussion with key stakeholders,, from the 11 potential substation locations National Grid has identified 2 preferred substation locations (sites 1 and 5B). These are described here and shown in Inserts 4.2 to 4.3. The primary reasons these have been selected by National Grid is that:
 - Site 1, whilst within the Green Belt, would have the least associated infrastructure; and,
 - Site 5B would be location on land which is already classed as industrial.
- 4.3.12 National Grid is to undertake further consultation and public exhibitions in Spring 2011 on the 2 preferred substation locations. Additionally, GECL has commenced work on the potential routes that the electrical connection from GEC to the (National Grid) substation may take and the likely form of the connection (e.g. underground / over ground / combination).
- 4.3.13 The initial results of the GECL's routing work will be presented with National Grid in it second phase of public exhibitions in Spring 2011.





INSERT 4.2 – INDICATIVE NATIONAL GRID SUBSTATION SITE 1 AND ROUTE

Substation Site 1 is located to the south of Fobbing and the east of Corringham, It is currently a greenfield site within the Green Belt, and is approximately 5m AOD.

From the easement to the east of the GEC site, the electrical connection parallels the existing CECL Power Station line to the south, and runs to the west, potentially crossing though the Northern Triangle (mitigation land associated with the LG Development) and Corringham Marshes Site of Importance for Nature Conservation (SINC).





INSERT 4.3 – INDICATIVE NATIONAL GRID SUBSTATION SITE 5B AND ROUTE

Substation Site 5B is located east of Stanford-le-Hope, south of the freight line to the Coryton Oil Refinery (Freight Railway Line). The site is currently brownfield land, within an area of employment development, and is approximately 5 to 10 m AOD.

From the easement to the east of the GEC site, the electrical connection parallels the existing CECL Power Station line to the south, initially runs to the west, before turning in a south direction to end at substation location 5B. This route potentially crosses though the Northern Triangle (mitigation land associated with the LG Development) and Corringham Marshes SINC.



Discussion of Electricity Connection Routing Options and Assessment of Potential Impacts

- 4.3.14 The final selection of a substation location and its subsequent connection to the existing Tilbury Rayleigh 400kV overhead line will be a matter for National Grid, taking into account feasibility work and consultation with key stakeholders, including members of the public.
- 4.3.15 The final route and form of connection from the substation to GEC (that is whether it is to be via overhead lines or underground cables, or a combination of both) has not been determined at this time; this will be a matter for GECL, taking into account feasibility work and consultation with key stakeholders, including members of the public, once the preferred substation location has been finalised by National Grid.
- 4.3.16 Revised Draft Overarching National Policy Statement for Energy (EN-1), in conjunction with the Revised Draft National Policy Statement for Electricity Networks Infrastructure (EN-5), will be relevant to the consideration of electricity infrastructure. Indeed, EN-5, together with EN-1, provides the primary basis for the IPC on decisions on DCO applications for NSIPs. EN-1: Part 4 sets out the general principals to be applied in the assessment of DCO applications for energy infrastructure, while EN-1 Part 5 identifies the generic impacts to be considered.
- 4.3.17 EN-5: Part 2 sets out policy on the assessment of impacts on development including above ground electricity lines of 132 kV and above, and other associated electrical infrastructure. It notes that National Grid is required to bring forward the most efficient solution in terms of network design, taking into account current and reasonably anticipated future generation demand and has a statutory duty to provide a connection wherever one is required. Attention is drawn to climate change adaptation, consideration of good design, impacts of electricity networks associated with biodiversity and geological conservation, landscape and visual and noise and vibration.
- 4.3.18 It is advised that in considering whether all or part of the proposed electricity lines should be underground to obtain benefits in reduction of landscape / visual impacts, the benefits will need to be weighed against other impacts (economic, environmental, social) and technical challenges. It is stated that applications for overhead line proposals should only be refused if the benefits of underground cabling outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable.

CHP Connections

4.3.19 Interconnections and easements may also be required for CHP (for the export of steam / hot water) and CCR (for the export of captured CO₂). These are discussed further in the CHP Assessment / Supplementary CHP Assessment and CCR Feasibility Study respectively, which have been submitted in support of the Section 36 Consent application for GEC (Available at http://www.gatewayenergycentre.co.uk/).

4.4 The GEC Site

- 4.4.1 GEC will be located on land within the LG Development. The LG Development, promoted by DP World, is currently in the early stages of construction. The GEC site location is shown in Figure 1.1. The Ordnance Survey (OS) Grid Reference of the centre of the GEC site is approximately 573209, 182165.
- 4.4.2 The overall site boundary for the Section 36 Consent application for GEC covers approximately 29.1 hectares (71.9 acres) and incorporates areas to the north and west which may be used for temporary laydown during construction. However, once constructed the GEC site will be approximately 11.3 ha (28.0 acres) including land to



be set aside for the purpose of installing carbon capture equipment if required in the future.

- 4.4.3 The GEC site is situated on the north bank of the Thames Estuary and lies approximately 6 km east of the A13. The A1014 dual carriageway (The Manorway) is located to the north of the site and runs east to west to provide a link with the A13, which in turn links in with the M25 at Junction 30. The River Thames runs in a west to east direction to the south of the site where DP World has recently commenced works on the new port facility associated with the LG Development.
- 4.4.4 The nearest residential settlements to the GEC site are at Stanford-le-Hope, Corringham and Fobbing which lie approximately 4 km to the west, Canvey Island approximately 5 km to the east, and Basildon approximately 7 km to the north.
- 4.4.5 To the east of the GEC site is the existing Coryton CCGT Power Station (700 m east), Shell Aviation Fuel Storage Farm and Petroplus' Coryton Oil Refinery (950 m east).

4.5 The LG Development⁸

- 4.5.1 The LG Development comprises a deep-sea global container shipping port (LG Port) and a logistics and commercial centre (LG Logistics and Business Park). These are currently being developed on the site of the former Shell Oil Refinery at Shell Haven near Corringham and Stanford-le-Hope (Essex) on the northern banks of the Thames Estuary.
- 4.5.2 The LG Port involves the provision of up to seven deep-sea shipping berths and associated container handling facilities with a quayside approximately 2.7 km in length. Once fully developed, the LG Port will have an annual capacity of approximately three and a half million Twenty-foot Equivalent Shipping Container Units (TEUs).
- 4.5.3 Associated with the LG Port is: the dredging of higher parts of the River Thames navigation channel to provide for the passage of container vessels; the twin tracking of the Thames Haven branch railway line to provide rail freight connectivity via the wider rail network; and, the provision of highway access facilities providing connection to the strategic highway network via the adjacent A1014 (The Manorway) and the A13.
- 4.5.4 The LG Logistics and Business Park is located directly to the north of the LG Port and comprises the provision of up to approximately 938 000 square metres of commercial floor space and associated site infrastructure (including an internal highway network, drainage and landscaping). The commercial buildings to be situated within the LG Logistics and Business Park are expected to have footprints up to 120 000 square metres.
- 4.5.5 The commercial buildings / developments to the eastern and southern perimeter of the LG Logistics and Business Park will benefit from direct access to the rail network via the Thames Haven Branch Line or common user rail sidings. In addition, as with the LG Port, the LG Logistics and Business Park benefits from the provision of highway access facilities providing connection to the strategic highway network via the adjacent A1014 (The Manorway) and the A13.

The LG Development Planning History

4.5.6 The nature of the LG Development is such that a wide variety of Consent applications were required. The initial con-current applications associated with the LG Port, LG Logistics and Business Park, and Associated Works included applications for:

⁸ The majority of this discussion is taken from 'London Gateway Access Road Environmental Statement' (June 2010) – Section 1 (Introduction)



- A Harbour Empowerment Order (HEO) under the Harbours Act 1964 associated with the proposed Port;
- An Outline Planning Application (OPA) under the Town and Country Planning Act 1990 for the proposed LG Logistics and Business Park; and
- A Transport and Works Act Order (TWAO) under the Transport and Works Act 1992 for rail infrastructure associated with the LG Logistics and Business Park development.
- 4.5.7 The above applications, all of which were accompanied by respective ESs, were approved on 30 May 2007. The TWAO was made on 7 September 2007 and came into force on 28 September 2007. The HEO was made on 2 May 2008 and came into force on 16 May 2008.
- 4.5.8 The applications (and their subsequent approvals) were informed by the following ESs:
 - The HEO Environmental Statement (2002), which considered the likely significant environmental effects associated with the development of the LG Port and associated facilities;
 - The OPA Environmental Statement (2002), which considered the likely significant environmental effects associated with the LG Logistics and Business Park and associated facilities;
 - The TWAO Environmental Statement (2002), which considered the likely significant environmental effects associated with the development of the proposed rail improvements; and
 - The Consolidated Environmental Statement (2004), which considered the likely significant cumulative environmental effects associated with all three developments.
- 4.5.9 Further to the above, an additional ES has been prepared and submitted as part of an application for Planning Permission (PP) for the proposed 'Refined Access Road Arrangement' under the Town and Country Planning Act 1990. This is referred to as the PP Environmental Statement (June 2010).
- 4.5.10 As a result, a substantial proportion of the existing environment at the GEC site (located on land within the south east corner of the LG Development) and surrounding area is already well understood and the baseline conditions are already established.

4.6 The GEC and LG Development Site Surroundings⁹

- 4.6.1 The current form of both the GEC and LG Development sites reflects its former use as the site of the Shell Oil Refinery, and therefore the majority of the site is generally laid out in a grid formation consisting mainly of access roads, pipelines, remaining plant, hard standing and open car parks. The current form of the site is shown in Figure 4.1.
- 4.6.2 The A1014 (The Manorway) runs along the northern edge of the LG Development for much of its length. From the A1014 (The Manorway) the LG Development site is currently accessed via three access gates. The nearest of these to the GEC site is Gate 3, the most easterly access gate.
- 4.6.3 Land within the northern border of the LG Development site largely consists of grazing marshland interspersed by a network of reed-fringed drainage ditches and creeks.

⁹ The majority of this discussion is taken from 'OPA Environmental Statement' (Complied Version 2004) – Section 2.2 (General Site Description and Land Uses)



- 4.6.4 Land along the western border of the LG Development site (beyond the grazing marshland) is cultivated arable land which rises gently towards the north. This land is characterised by generally rectangular arable fields enclosed by hedgerows and trees.
- 4.6.5 A number of farms are situated to the west, which include three Grade II Listed Buildings: Old Hall; Old Garlands; and, Great Garlands Farm. Further west, the cultivated arable land abuts a sports ground on the edge of Stanford-le-Hope. This area forms the boundary of Stanford-le-Hope, and adjoins existing housing characterised by a mixture of post-war local authority and 1960s / 1970s suburban style housing developments.
- 4.6.6 The south western boundary of the LG Development is formed by field and ditch boundaries between Stanhope Industrial Park and Stanford-le-Hope. Further to the south west, along the banks of the River Thames, the land consists of marshes and mudflats.
- 4.6.7 Most of the southern boundary of the LG Development is adjacent to the River Thames.
- 4.6.8 Located east of the GEC and LG Development sites is the Shell Aviation Fuel Storage Farm, the existing CECL Power Station and the Coryton Oil Refinery.

Historic GEC and LG Development Site Uses

- 4.6.9 The Shell Oil Refinery was built at Shell Haven (or Shellhaven).
- 4.6.10 Shell Haven was originally an inlet on the north bank of the River Thames, about a mile to the west of Canvey Island, which formed the mouth of Shell Haven Creek. From the inlet, Shell Haven Creek runs east, south of the village of Fobbing, separating Corringham Marsh from Fobbing Marsh.
- 4.6.11 Shell Oil first arrived in Shell Haven in the form of the Asiatic Petroleum Company Limited (a sales company formed by Royal Dutch Petroleum and the Shell Transport and Trading Company, prior to their merger as Royal Dutch Shell).
- 4.6.12 A license was obtained in 1912 to store petroleum at Shell Haven, and refinery operations began on a 40 ha site in 1916 with a distillation plant which produced fuel oil for the Admiralty. In 1919 the distillation plant was converted to manufacture bitumen for road surfacing. In 1925, a new plant was erected for the manufacture of lubricating oils and the first high viscosity oils were produced in 1937.
- 4.6.13 Subsequent development in 1946 saw the commission of plant producing high grade paraffin for candles. In 1947, expansion began on a 400 ha site to the west of the original refinery which saw the construction of a distillation unit designed for Middle East crude oil. This began operations in 1950 with crude oil being pumped into tanks before being distilled to produce butane, methane, petrol, kerosene, gas oil and bitumen.
- 4.6.14 Subsequent to this various units were added to produce valuable hydrocarbons from the distillation residue, including a new bitumen plant which began production in 1981.
- 4.6.15 In 1992, a major capital investment was completed, adding a 'Naphtha Minus' complex which contained an isomerisation unit, benzene recovery and gas turbine power generation. A new control centre was added.
- 4.6.16 By this time the Shell Oil Refinery had a capacity of 4.6 million tonnes per annum and the site covered 800 ha with a 27 km perimeter. It had five jetties which could handle tankers of up to 300 000 tons capacity.
- 4.6.17 The Shell Oil Refinery ceased main operations on the site at the end of 1999, and the site is currently a 'Brownfield' site with the majority of the structures being cleared.



- 4.6.18 There the Shell Aviation Fuel Storage Farm (lying to the east of the LG Logistics and Business Park and the GEC site) is to be retained by Shell.
- 4.6.19 To the east of the GEC site, the LG Development and the Shell Aviation Fuel Storage Farm is the Coryton Oil Refinery owned by Petroplus.
- 4.6.20 Development on the Coryton Oil Refinery site began in 1895 when Kynochs (an ammunitions firm) purchased Borley Farm to the east of Shell Haven Creek in order to build an explosives factory. Construction of the factory began in 1897, and an associated village was set up for workers called Kynochtown. In 1901, the Kynochs also built the Corringham Light Railway (CLR) to transport workers to the explosives factory. The Kynochs works was closed in 1919.
- 4.6.21 The site and the CLR were taken over by Cory Brothers Limited of Cardiff (coal merchants) who built an oil storage depot, renaming Kynochtown as Coryton. This oil storage depot later became Coryton Oil Refinery. In 1950 Coryton and the CLR were sold to the American Vacuum Oil Company, later to become Mobil.
- 4.6.22 The Coryton Oil Refinery came on stream in 1953, and in the 1970s the associated village was demolished and absorbed into the Coryton Oil Refinery site. Coryton Oil Refinery was operated by BP from 1996 when Mobil's fuel operations were placed into a joint venture with BP. Following the 1999 merger of Mobil with Exxon, the remaining interest in the refinery was sold to BP in 2000.
- 4.6.23 In 2007 Coryton Oil Refinery was sold by BP to Petroplus and remains in production today, lying between Shell Haven Creek (to the west) and Hole Haven Creek (to the east). This lies approximately 950 m east of the GEC site.
- 4.6.24 The existing CECL Power Station is also situated to the east of Shell Haven Creek, approximately 700 m east of the GEC site.

SECTION 5

GAS PIPELINE ROUTE AND AGI LOCATION SELECTION AND DESCRIPTION



5 GAS PIPELINE ROUTE AND AGI LOCATION SELECTION AND DESCRIPTION

5.1 Alternatives

- 5.1.1 The 1999 EIA Regulations require that the ES should include an outline of the main alternatives that have been studied by the applicant and an indication of the main reasons for its choices, taking into account the environmental impacts.
- 5.1.2 In the case of the proposed gas pipeline and associated AGI the main alternatives that have been considered are:
 - Alternative gas pipeline routes; and
 - Alternative AGI locations.
- 5.1.3 These alternatives are described in this Section, along with a description of the selected gas pipeline route and associated AGI location.

5.2 Gas Supply Options and Selection

Identifying a Suitable Gas Supply

- 5.2.1 From a technical / engineering perspective, identification of potential gas pipeline route and AGI location options began with establishing the optimal point at which to take high pressure gas from the existing National Grid National Transmission System.
- 5.2.2 In order to take high pressure gas from the National Grid National Transmission System, the optimal connection point is to a "Feeder", which is an existing high pressure gas pipeline owned and operated by National Grid Gas.
- 5.2.3 An alternative would be to take gas from National Grid's Local Distribution Network. This operates at a lower pressure than the National Grid National Transmission System, and therefore a compressor would be needed to increase the pressure to the required level. The gas would then be transported via a pipeline to GEC.
- 5.2.4 However, this was not considered practicable for GEC as the nearest Local Distribution Network Pipeline to GEC is the gas distribution system to Canvey Island and this has insufficient gas flow and pipe diameter to supply both GEC and its other existing customers, such as the residents of Canvey Island.
- 5.2.5 In addition, such a solution is not energy efficient as the compressors require a significant amount of electricity to operate. Therefore it is not environmentally efficient. Furthermore, a gas compressor station would need to be constructed close to the tie in point to the Local Distribution Network Pipeline or at the GEC which would likely increase environmental impact.
- 5.2.6 Consequently, the use of the Local Distribution Network as an alternative to the National Grid National Transmission System was been discounted on environmental and technical / engineering grounds.

Identifying a Suitable National Grid National Transmission System Feeder

5.2.7 The National Grid National Transmission System Feeder pipelines in the vicinity of the GEC site are shown in Insert 5.1.



INSERT 5.1: MAP OF THE NATIONAL GRID NATIONAL TRANSMISSION SYSTEM FEEDER PIPELINES NEAR THE GEC SITE



Feeder 17

- 5.2.8 Feeder 17, to the west of Feeder 5 as shown in Insert 5.1, has been discounted on the basis it would require a longer underground gas pipeline to connect to GEC (by approximately 3 km). This would consequently have a greater environmental impact.
- 5.2.9 Additionally, the underground gas pipeline route would need to cross Feeder 5 north of the Thames to reach the GEC site which would result in additional and unnecessary costs.

Dual Feeder 5

- 5.2.10 A pipeline connection to the GEC site from the Dual Feeder 5 would be around the same distance as that for the Feeder 5 north of the Thames (around 7.7 km) if a direct route could be utilised.
- 5.2.11 However, this option has been discounted on the basis that it would require a HDD or a microtunnel tunnel to cross the River Thames, incurring a much higher cost.
- 5.2.12 In addition, the gas pipeline would be harder to maintain from an operational and health and safety perspective as most of the route would be within a major waterway. There would need to be annual river bed surveys to comply with the pipeline design code and the pipeline would require specialist diving companies to work in a busy shipping lane increasing the risk to the diving company personnel. There is also the possibility of damage to the pipeline from dredging movements and changes in sea bed levels.
- 5.2.13 Furthermore, the route of the pipeline would need to be carefully selected so as not to impinge on the deepwater channels required for the development of the new LG Port.
- 5.2.14 As such, it is highly likely that this pipeline route would need to be amended to ensure it avoids deepwater dredged channels and resulting in a length longer than original 7.7 km direct route. As such, from an environmental perspective, this route (including



the crossing under the River Thames) is very likely to have a greater environmental impact.

5.2.15 There would also need to be a detailed network analysis conducted to ensure that the required gas flow can be provided as the Dual Feeder 5 is used to supply gas to the south of London.

Feeder 5

- 5.2.16 Feeder 5, north of the River Thames is the closest to the proposed GEC site. As such, Feeder 5 offers the potential for the least environmental impact.
- 5.2.17 Feeder 5 is also used by the existing CECL Power Station. There is an existing AGI, with existing infrastructure including access roads and, electrical and telecommunications connections. As such, if this location is chosen for the associated AGI for GEC, the existing infrastructure will assist in minimising any environmental impacts.

5.3 AGI Location Options

- 5.3.1 In principal, an AGI can be located anywhere along a Feeder.
- 5.3.2 In reality, the location of an AGI is driven by a number of factors, including concerns relating to the: environment; health and safety; availability of land; road access; availability of electrical supplies; congestion; and, planning matters.
- 5.3.3 In addition, an AGI needs to be located as close to the Feeder as practicable to ensure that there can be an emergency isolation valve installed to comply with HSE requirements and ensure the safety of the high pressure system. The emergency isolation valve is required in this case to ensure GEC's gas connection can be isolated / shut-off from National Grid's National Transmission System in an emergency situation.
- 5.3.4 Furthermore, locating the AGI as close to the Feeder as practicable minimises the length of gas pipeline that cannot be subject to inspection by an intelligent pig (an online integrity monitoring device that is run through the pipeline at regular intervals to confirm pipeline integrity). The length of buried pipeline that cannot be inspected by an intelligent pig is that from the Feeder to the AGI and is kept to as short a length as possible. It is also installed within the confines of any AGI, which means the risk of damage due to third party intervention can be controlled.
- 5.3.5 IGE/TD/1 is the design code adopted by the Institute of Gas Engineers (IGE) for high pressure gas pipelines in the UK. It is the also pipeline design code that is accepted by the HSE for gas pipeline design, construction, operation and maintenance in the UK.
- 5.3.6 IGE/TD/1 is the pipeline design code that shall be utilised for the underground gas pipeline for GEC and recommends that high pressure gas lines are designed, so that they are capable of being intelligently pigged. Consequently, the ideal distance between the connection to the National Grid National Transmission System Feeder and AGI is 0 m as this ensures that the majority of the length of the high pressure gas pipeline from GEC to the Feeder can be subject to intelligent pig inspection. However, as with other AGIs in the UK and the existing AGI for the CECL Power Station which is some 5 m from the Feeder, in practice locating an AGI 0 m from the Feeder is often impracticable.
- 5.3.7 In cases such as these, where inspection by an intelligent pig is not possible, the pipework will be maintained in accordance with IGE/TD/1. This includes the provision of a dedicated cathodic protection system to mitigate the external corrosion risk, will containment of the pipeline within an AGI to limit the risk of third party damage and construction of the pipework from heavy wall pipe to provide additional integrity.

SECTION 5 **GAS PIPELINE ROUTE AND AGI** LOCATION SELECTION AND DESCRIPTION



- 5.3.8 Given that Feeder 5 is to be used and the AGI needs to be as close to Feeder 5 as possible, the potential locations for the AGI are shown in Insert 5.2.
- 5.3.9 Insert 5.2 shows the location of the two existing AGIs (Horndon on the Hill to the north and Butts Lane to the south). The green boxes on Insert 5.2 also show potential alternative locations for a new AGI.



5.4 **Gas Pipeline Route Options**

- 5.4.1 Initial Option Analysis has indicated that there are a number of potential options available for the route of the gas pipeline and the location of the associated AGI. These are:
 - Route 1 (associated AGI located at Horndon on the Hill);
 - Route 2 (associated AGI located at Horndon on the Hill);
 - Route 3 (associated AGI located at Horndon on the Hill);
 - Route 4 (associated AGI located west of Mucking and south of Stanford-le-Hope); and
 - Route 5 / Along the Existing Pipeline Route (associated AGI located west of Mucking and south of Stanford-le-Hope).
- 5.4.2 These Options are described below and shown in Figure 5.1.

Route 1

- 5.4.3 This route is approximately 10.5 km long. The route starts close to the existing National Grid Horndon on the Hill AGI. The proposed associated Minimum Offtake Connection (MOC) AGI would be constructed in close proximity to the Horndon on the Hill AGI, as the No. 5 Feeder runs through the site.
- 5.4.4 From the AGI, the route heads east and crosses North Hill (Road), before passing between Wrens Park Farm and Arden Hall. The route then carries on east for approximately 1 km before taking a north easterly turn to parallel the A13 dual carriage way for approximately 1 km. The pipeline route then crosses the A13 and the passenger railway line that runs from Shoeburyness to London Fenchurch Street



(Passenger Railway Line) to the south of the A13, and parallels the Passenger Railway Line for about 1 km, on the southern side of the tracks. The pipeline route then diverts east to pass through a row of properties along High Road north of Fobbing, before finally diverting south towards the proposed GEC site location.

Route 2

- 5.4.5 This route is approximately 9.7 km long, and follows a similar path to Route 1 with one major difference.
- 5.4.6 The same location is proposed for the AGI as for Route 1 and the route crosses the A13 dual carriage way and the Passenger Railway Line at the same locations as Route 1. The main difference is that Route 2 does not pass through the row of properties along High Road to the north of Fobbing. Instead Route 2 diverts south before reaching the row of properties along High Road.
- 5.4.7 The route follows the Passenger Railway Line for approximately 1 km after the A13 and railway crossing before diverting south for about 2 km as it passes through the undeveloped area between Corringham and Fobbing. The pipeline route then crosses Lion Hill (Road) and carries on in a south easterly direction for approximately 1 km, before crossing The Manorway. Once The Manorway has been crossed, the pipeline route diverts east for approximately 1 km before heading south to the proposed GEC site location.

Route 3

- 5.4.8 This route is approximately 8.5 km long. Again, the proposed location for the AGI is close to the existing National Grid Horndon on the Hill AGI.
- 5.4.9 From the AGI, the route heads approximately 1 km east before crossing North Hill. Shortly after this road crossing, the route takes a south easterly diversion and runs parallels to North Hill (Road) for approximately 1 km, as it passes between Arden Hall and the Arden Hall Cottages. The route then crosses the A13 dual carriage way and two slip roads. After the A13 crossing, the proposed route crosses the Passenger Railway Line and then closely parallels The Manorway through Stanford-le-Hope. The route crosses The Manorway and carries on east along the road. The High Road is then crossed north of Oak Farm before the route crosses some overhead power cables. The route turns north east and crosses to the north of The Manorway, where it parallels The Manorway for about 1 km, before finally crossing The Manorway once again. The route then follows The Manorway east for about 1 km before finally diverting south to the proposed GEC site location.

Route 4

- 5.4.10 Route 4 is the shortest of the options at approximately 6.3 km long. The proposed location for the AGI is next to the existing Butts Lane AGI (which serves the existing CECL Power Station) situated west of Mucking and to the south of Stanford-le-Hope.
- 5.4.11 From the AGI, the pipeline turns south east and crosses two parallel overhead power cables. The route then turns east to cross Walton's Hall Road before crossing the Passenger Railway Line. The route carries on east past Mucking, before diverting approximately 1 km north towards Stanhope Industrial Park. The route continues east towards Stanford-le-Hope Marshes before turning north west to cross the Thames Haven Branch Line approximately 10 m west of the marshes. Rainbow Lane (Track) is then crossed, and the route continues north passing the south east of Great Garlands Farm, before crossing The Manorway near Old Hall Farm. This proposed route corridor then continues in a generally eastern direction, before diverting south to cross The Manorway to the GEC site.

Route 5 / Along the Existing Pipeline Route



- 5.4.12 This route is approximately 7.7 km long. Paralleling the existing CECL Power Station gas pipeline route would mean that the proposed AGI could be located adjacent to the existing AGI situated west of Mucking and to the south of Stanford-le-Hope.
- 5.4.13 From the proposed AGI, the proposed route corridor (likely to be mainly to the north of the existing CECL Power Station gas pipeline) would head east, crossing Butts Lane and the Passenger Railway Line.
- 5.4.14 After crossing the Passenger Railway Line, the proposed route corridor heads north east following the route of the existing over ground electric lines. The proposed route corridor would continue to the south east of the sewage works and towards the North Shell Angling Lakes, crossing the Thames Haven Branch Line and Wharf Road. It is highly probably that a Horizontal Directional Drill (HDD) section would be required for the gas pipeline from the sewage works to the Wharf Road crossing, underneath the northern most Shell Angling Lake.
- 5.4.15 After this section, the proposed route corridor would closely follow the existing gas pipeline to cross Rainbow Lane and go past the south east of Great Garlands Farm, before crossing The Manorway. This proposed route corridor then continues in a generally eastern direction, before diverting south to cross The Manorway to the GEC site.

5.5 Gas Pipeline Route and AGI Location Selection

5.5.1 Based on an evaluation of the above Route Options (including consideration of technical, planning, environmental and commercial factors) Route 5 (along the existing pipeline route) was selected as the preferred route for the gas pipeline. Accordingly, the proposed AGI location would be adjacent to the existing AGI situated west of Mucking and to the south of Stanford-le-Hope.

Selected Gas Pipeline Route Advantages

- 5.5.2 There are a number of advantages in selecting Route 5 (along the existing pipeline route) as the preferred option. These advantages include:
 - Route 5 has a preferable connection point to the existing NTaS Number 5 Feeder Pipeline to the west of Mucking and to the south of Stanford-le-Hope, as the alternative proposed Horndon on the Hill connection point (associated with Routes 1, 2 and 3) is already congested;
 - The route is closest in routing to the existing CECL Power Station gas pipeline route, which is a proven route for a gas pipeline;
 - Route 5 follows the easements of the existing CECL Power Station gas pipeline route, and will therefore require minimal expansion / disruption to land owners compared to a completely new route;
 - The route has lower potential for significant environmental impacts when compared to the other route options; and
 - Route 5 retains a degree of success as a pipeline route (being associated with the route of the existing CECL Power Station gas pipeline) and therefore benefits from historic knowledge of the route coupled with operational familiarity provided by the CECL Power Station operations and maintenance team.
- 5.5.3 Further to the above, Route 5 follows part of the route of the recently approved Calor Gas Pipeline, and therefore has been established as being acceptable from a planning perspective. As stated (in Paragraph 2.14) of the Canvey Terminal to Stanford-le-Hope Gas Pipeline – Environmental Statement (June 2006) [undertaken by RPS Ltd] the proposed gas pipeline route alignment has been designed with the following guiding principles:



- Routed away from habitation (and any potential future developments) as much as possible to reduce the impacts during construction;
- Routed close to existing hydrocarbon pipelines to minimise the proliferation of pipelines; and
- Routed close to existing pipelines to minimise the number of different landowners / tenants affected.
- 5.5.4 The same reasoning and guiding principles can be applied to the routing of the gas pipeline which is the subject of this ES.

Selected AGI Location Advantages

- 5.5.5 Based on technical factors, the following has influenced the selection of the AGI location:
 - The Horndon on the Hill AGI cannot be utilised as it has insufficient gas capacity and may need reinforcement works. In addition, there are a large number of existing gas connections to the Horndon on the Hill AGI. This results in it being a congested site and inherently harder to connect into.
 - The existing AGI for the CECL Power Station at Butts Lane cannot be utilised as it has insufficient gas capacity.
 - A new AGI could be constructed either north of the Horndon on the Hill AGI or south of the existing AGI for the CECL Power Station as shown in Insert 5.2. However, both of these locations are further away from GEC and therefore will require a longer underground gas pipeline.
 - A new AGI could be constructed south of the Horndon on the Hill AGI and north of the existing AGI for the CECL Power Station as shown in Insert 5.2. In this scenario, the underground gas pipeline route may be more circuitous in order to avoid the main residential area of Stanford-le-Hope. Therefore this option will likely require a longer underground gas pipeline.
- 5.5.6 Overall, a connection to Feeder 5 north of the River Thames close to the existing AGI for the CECL Power Station deemed to be the optimal for the associated AGI. The selection of this location maximises potential and therefore reduces potential environmental impact.

5.6 Detailed Route Description and Crossing Schedule

Detailed Route Description

- 5.6.1 The following sub-section provides a detailed description of the proposed gas pipeline route in a west to east direction, from the new Butts Lane AGI west of Mucking and to the south of Stanford-le-Hope (shown in Figures 5.2a and 5.2b) to the Gas Reception Facility (GRF) at the GEC site.
- 5.6.2 For the purposes of clarity and understanding, it is advisable to read the following sub-section in conjunction with Figures 5.3a to 5.3e.
- 5.6.3 The crossings are also referenced in Figures 5.3a to 5.3e and are defined as follows:
 - DX Ditch Crossing;
 - LX Lake Crossing;
 - PLX Pipeline Crossing;
 - RDX Road Crossing;
 - RLX Railway Crossing;



- RVX River Crossing; and
- TLX Track Crossing.
- 5.6.4 A number of public footpaths are also crossed. These are referenced in the text where relevant.

The Above Ground Installation

- 5.6.5 The Butts Lane AGI, west of Mucking and south of Stanford-le-Hope, would be unmanned. The AGI would be surrounded by a security fence with continuous closed circuit television (CCTV) security monitoring.
- 5.6.6 Figure 5.2a shows the layout of the proposed AGI, and Figure 5.2b shows the elevations of the proposed AGI. Both figures include indications of the likely landscaping that would be incorporated. The land take requirements of the proposed AGI are approximately 0.24 ha, without considering areas for roads and landscaping and 0.44 ha with areas for roads and landscaping.

Proposed AGI to Wharf Road (RDX2) - Figure 5.3a

- 5.6.7 The proposed gas pipeline will leave the new AGI, just south of the existing AGI situated west of Mucking and to the south of Stanford-le-Hope, and will run due east. The route crosses the track that serves the existing AGI for the CECL Power Station gas pipeline (TLX1), Butts Lane (RDX1) and the Passenger Railway Line (RLX1).
- 5.6.8 The route then heads north east under a number of fields (which will include a ditch crossing (DX1)), Mucking Creek (RVX1), the existing CECL Power Station gas pipeline (PLX1), the North Shell Angling Lake (LX1), the Thames Haven Branch Line (RLX2) and Wharf Road (RDX2).
- 5.6.9 All these crossing are likely to be included in one section of continuous Horizontal Directional Drilling (HDD).

Wharf Road (RDX2) to Ditch Crossing (DX7) – Figure 5.3b

- 5.6.10 At the end of the HDD section, the route continues in a north east direction, through a number of fields, crossing two ditches (DX2 and DX3¹⁰).
- 5.6.11 The route crosses Rainbow Lane (RDX3)¹¹, before turning in a more easterly direction.
- 5.6.12 It is at this point that the route would cross the route of the proposed DP World / LG Development Access Road (RDX4). This crossing would also include the proposed bridleway line (BR189) which is required pursuant to conditions in the LG Port HEO.
- 5.6.13 The route then heads north east again, crossing a number of ditches (DX4 and DX5) to the south east of Great Garlands Farm. To the north east of Great Garlands Farm the route crosses a ditch (DX6), a track (called Manor Way track) (TLX2) and another ditch (DX7).

Ditch Crossing (DX7) to Ditch Crossing (DX16) – Figure 5.3 c

5.6.14 After crossing the ditch (DX7), the route continues in a more northerly direction crossing another ditch (DX8).

¹⁰ DX3 is also noted as Footpath 38 on

http://maps.thurrock.gov.uk/localview/OnTheMap.aspx?e=565375&n=181300&layerID=TC_PUBLIC_RIGHTS_OF_WAY&scale =200000&highlight=true&cmd=ftn

¹¹ DX3 is also noted as Bridleway 39 on

 $[\]label{eq:http://maps.thurrock.gov.uk/localview/OnTheMap.aspx?e=565375&n=181300&layerID=TC_PUBLIC_RIGHTS_OF_WAY&scale=200000&highlight=true&cmd=ftn$



- 5.6.15 After this crossing the route turns north east again, crossing a track (TLX3), four National Grid pipelines (PLX2, PLX3, PLX4 and PLX5), a ditch (DX9) and the A1014 (The Manorway) (RDX5). It is likely that these crossings will be included in one HDD section.
- 5.6.16 Following the HDD section, the route turns east crossing land to the north of the A1014 (The Manorway) and the LG Development. A number of ditches are crossed (DX10, DX11, DX12, DX13, DX14, DX15 and DX16).

Ditch Crossing (DX16) to Pipeline Crossing (PLX12) - Figure 5.3d

- 5.6.17 Following ditch crossing (DX16), the route turns once again in a north east direction.
- 5.6.18 The route crosses a ditch (DX17), two pipelines (PLX6) (BPA) and PLX7 (OPA)), a ditch (DX18) and track (TLX4) (Footpath Number 143) and another ditch (DX19). It is likely that these crossings will be included in one HDD section.
- 5.6.19 Following the HDD section, the route continues north east crossing a ditch (DX20) before turning south east at a ditch crossing (DX21). The route then crosses four pipelines (three National Grid and one OIKOS) (PLX8, PLX9, PLX10, and PLX11) which will be included in one HDD section.
- 5.6.20 Following this the route then crosses two ditches (DX22 and DX23), a river (the Manorway Fleet Drain) (RVX2) and a ditch to the east of the river (Manorway Fleet drain) (DX24). It is likely that the river (RVX2) and the ditch (DX24) crossing will be included in one HDD section.
- 5.6.21 The route continues in a south east direction, before turning due south to cross the existing CECL Power Station gas pipeline (PLX12).

Pipeline Crossing (PLX12) to the GRF at GEC – Figure 5.3e

- 5.6.22 After turning due south to cross the existing CECL Power Station gas pipeline (PLX12) the route crosses a river (the Manorway Fleet Drain) (RVX3) and the A1014 (The Manorway) (RDX6). It is likely that the gas pipeline, river and A1014 (The Manorway) will be crossed in one HDD section.
- 5.6.23 The route then crosses two pipelines (PLX13 (OPA) and PLX14 (BPA)).
- 5.6.24 The route then passes into the easement to the east of the GEC site, and continues running south. The route crosses the LG Development Gate 3 access (RDX7) and the proposed DP World common user siding (RLX3) before passing into the GRF at GEC.

Crossing Schedule

5.6.25 Table 5.1 provides the crossing schedule for the proposed gas pipeline route.

SECTION 5 GAS PIPELINE ROUTE AND AGI LOCATION SELECTION AND DESCRIPTION



	Crossing Number	Location	Crossing Technique ¹²
Figure 5.3a	TLX 1	Track to Existing CECL Gas Pipeline AGI / Access Road to proposed AGI	Auger
	RDX 1	Butts Lane	Auger
	RLX 1	Passenger Railway Line	Micro-Tunnel
	DX 1	Ditch within Anglian Water land	HDD 1
	RVX 1	Mucking Creek	HDD 1
	PLX 1	Existing CECL Gas Pipeline	HDD 1
	LX 1	North Shell Angling Lake	HDD 1
	RLX 2	Thames Haven Branch Line (Freight Railway Line)	HDD 1
	RDX 2	Wharf Road	HDD 1
Figure 5.3b	DX 2		Open Cut
	DX 3	Also Footpath Number 38	Open Cut
	RDX 3	Rainbow Lane / Bridleway 39	Open Cut
	RDX 4	 Proposed New DP World / LG development Access Road (yet to be constructed). To include the proposed bridleway line (BR189) (also yet to be constructed) 	Auger
	DX 4		Open Cut
	DX 5		Open Cut
	DX 6		Open Cut
	TLX 2	Manorway Track	Open Cut
	DX 7		Open Cut
Figure 5.3c	DX 8		Open Cut
	TLX 3	Track Crossing to the south of Old Hall Farm	HDD 2
	PLX 2	National Grid Pipeline	HDD 2
	PLX 3	National Grid Pipeline	HDD 2
	PLX 4	National Grid Pipeline	HDD 2
	PLX 5	National Grid Pipeline	HDD 2
	DX 9		HDD 2
	RDX 5	A1014 (The Manorway)	HDD 2
	DX 10		Open Cut
	DX 11		Open Cut
	DX 12		Open Cut
	DX 13		Open Cut
	DX 14		Open Cut
	DX 15		Open Cut
	DX 16		Open Cut

TABLE 5.1: CROSSING SCHEDULE

¹² Construction methods / crossing techniques are described in more detail in Section 6.

SECTION 5 GAS PIPELINE ROUTE AND AGI LOCATION SELECTION AND DESCRIPTION



Figure 5.3d	DX 17		HDD 3	
	PLX 6	BPA Pipeline	HDD 3	
	PLX 7	OPA Pipeline	HDD 3	
	DX 18		HDD 3	
	TLX 4	Old Railway Track Crossing / Footpath Number 143	HDD 3	
	DX 19		HDD 3	
	DX 20		Open Cut	
	DX 21		Open Cut	
	PLX 8	National Grid Pipeline	HDD / Auger	
	PLX 9	National Grid Pipeline	HDD / Auger	
	PLX 10	National Grid Pipeline	HDD / Auger	
	PLX 11	OIKOS Pipeline	HDD / Auger	
	DX 22		Open Cut	
	DX 23		Open Cut	
	RVX 2	The Manorway Fleet Drain	HDD 4	
	DX 24		HDD 4	
	PLX 12	Existing CECL Gas Pipeline	HDD 5	
Figure 5.3e	RVX 3	The Manorway Fleet Drain	HDD 5	
	RDX 6	A1014 (The Manorway)	HDD 5	
	PLX 13	OPA Pipeline	HDD 5	
	PLX 14	BPA Pipeline	HDD 5	
	RDX 7	LG Development Gate 3 access	Tunnel	
	RLX 3	Proposed DP World Common User Siding (yet to be constructed)	Tunnel	



5.7 Further Route Refinement and Area Covered by the EIA

- 5.7.1 Further refinement of the proposed gas pipeline route / crossing techniques within the route corridor is likely to occur at the detailed design stage as a result of stakeholder consultation, archaeology, landowner negotiations, utility information and ground investigations.
- 5.7.2 Any such refinement would be limited and would take place within the survey area covered by this ES. Figure 5.4 presents the survey area for the purposes of the EIA which comprises a 1 km wide route corridor (approximately 500 m either side of the proposed gas pipeline).
- 5.7.3 Throughout this ES, this is referred to as the 'Route Study Corridor'.
- 5.7.4 During construction of the gas pipeline, the working width will be between 26 to 30 m depending on location. Where special crossing techniques are required, the working width may need to be increased. However, during construction the maximum land take is expected to be approximately 23 ha. Following completion of construction, the gas pipeline will be fully underground and the surface will recover within around one growing season.
- 5.7.5 During operation, the largest land take will be associated with the AGI, and is expected to be approximately 0.44 ha, including areas for roads and landscaping.

5.8 Gas Pipeline Design

- 5.8.1 The gas pipeline will be designed, constructed and tested to comply with the Institute of Gas Engineers' (IGE) Recommendations on Transmission and Distribution Practice IGE/TD/1: Edition 5, 2009 Steel Pipelines and Associated Installations for High Pressure Gas Transmission (IGE/TD/1).
- 5.8.2 The gas pipeline will be buried for approximately 7.7 km between a new proposed AGI close to the existing CECL Gas Pipeline AGI located at Butts Lane, west of Mucking and to the south of Stanford-le-Hope, and a new GRF within the GEC site.
- 5.8.3 The gas pipeline will be constructed from high-grade welded steel pipe and will be either 407 mm or 457 mm Outside Diameter (OD), with a design pressure of 79.5 bar g and a Maximum Allowable Operating Pressure (MAOP) of 75 bar g.
- 5.8.4 The standard pipe wall thickness will comply with the requirements of IGE/TD/1, which defines the minimum safe separation distance between a high pressure gas pipeline and normally inhabited buildings / major roads / railways. This is known as the building proximity distance (BPD). If buildings / major roads / railways are closer than 1 BPD, thicker-walled pipe known as proximity pipe will be used in that section. Therefore, proximity pipe will be used where additional protection is required to comply with the pipeline design code, e.g. close to normally occupied buildings, roads, railways, rivers and ditch crossings. For the proposed gas pipeline, the BPD is 41 m for standard pipe wall thickness. There is 1 dwelling located within 41 m of the proposed gas pipeline. There are no sensitive developments such as homes for the elderly, schools and hospitals, or very large facilities such as spectator stadiums, located sufficiently close to the proposed pipeline to require proximity pipe as defined by IGE/TD/1. The exact locations and lengths where proximity pipe will be used will be confirmed during the detailed design stage.
- 5.8.5 The proposed gas pipeline will be protected against corrosion with a high quality external coating acting in conjunction with an impressed current CP system and AC corrosion mitigation scheme.
- 5.8.6 The depth of cover will be in accordance with recognised industry standards and will not be less than 1.2 m in agricultural land, and 2 m under roads. At water crossings, the minimum depth of the gas pipeline will not be less than 1.7 m below the bed.



Furthermore, where the water crossing is not under the control of statutory authorities, concrete impact protection may be provided if the crossing technique permits.

SECTION 6

CONSTRUCTION METHODS AND OPERATION



6 CONSTRUCTION METHODS AND OPERATION

6.1 Introduction

- 6.1.1 This Section provides information on the design, construction, operation and decommissioning of the underground gas pipeline and associated AGI.
- 6.1.2 The majority of environmental impacts arising from the development of gas pipelines and their associated AGIs occur during construction. Accordingly, this Section describes the standard methods which are likely to be used in full or in part during construction of the proposed underground gas pipeline and associated AGI. These construction methods represent proven methods that have been developed over many years from experience on similar projects.
- 6.1.3 Information on the operation and maintenance of the gas pipeline and associated AGI is also presented, along with a brief summary of decommissioning requirements.

6.2 The Above Ground Installation

- 6.2.1 The proposed Butts Lane AGI will be an un-manned facility. It will be constructed adjacent to the existing CECL Gas Pipeline AGI, situated west of Mucking and to the south of Stanford-Ie-Hope.
- 6.2.2 The application for planning permission to which this ES relates is for the overall Butts Lane AGI. The Butts Lane AGI would comprise two separate AGIs, one to be owned and operated by National Grid and the other to be owned and operated by GECL. The two AGIs would be located adjacent to each other, but would be separated by a fence.
- 6.2.3 The overall Butts Lane AGI facility will comprise the following:
 - National Grid Infrastructure
 - National Grid MOF connection;
 - National Grid and GECL instrument kiosk;
 - National Grid and GECL emergency shutdown device (a key safety feature);
 - National Grid instrumentation; and
 - Isolation joint to electrically isolate the GEC gas pipework from the National Grid pipework.
 - GECL Infrastructure
 - PIG launcher (which runs through the gas pipeline to inspect it);
 - Standby generator (to ensure the AGI can work during the likes of blackouts);
 - Vents;
 - Above ground pipework;
 - Fencing for security purposes;
 - Security Lighting and CCTV;
 - Landscaping and Biodiversity (to be undertaken in consultation with TTGDC) to ensure the AGI blends in; and
 - An appropriate contribution to Greengrid.



- 6.2.4 The proposed layout and elevation of the Butts Lane AGI are shown in Figure 5.2a and 5.2b respectively.
- 6.2.5 The Butts Lane AGI will likely be surrounded by a steel palisade security fence approximately 2.7 m high with two double-gated entrances (one for the NG AGI and one for the GEC AGI). The equipment within the AGI, with the exception of lighting columns discussed below, will be lower than 2.7 m. There will be emergency personnel exit gates for both AGIs.
- 6.2.6 A length of buried pipe approximately 2 m long within the NG AGI will connect the NTaS Number 5 Feeder pipeline to the proposed NG AGI. From the NG AGI, a short length of pipe will be routed to the GEC AGI. There will be an isolation joint installed to electrically isolate the NG pipework from the GEC pipework. Once this short length of pipe is within the confines of the GEC AGI, it will rise above ground, from where it is described as "piping". The materials or "fittings" welded into the piping will include: isolation joints; large ball line valves; pig launcher; ESD; small valves; and field instruments to monitor gas flow, temperature and pressure. The isolation joint shall isolate the piping from the GEC gas pipeline cathodic protection system that will provide the buried gas pipeline with an anti-corrosion impressed current cathodic protection system. All above ground piping will be painted with a high quality paint system.
- 6.2.7 There will be a separate Glass Reinforced Plastic (GRP) control kiosk within each AGI into which ducted cabling from the field instruments will converge into a Remote Terminal Unit (RTU). A communication system, via a British Telecom (BT) / similar link, will send monitoring signals back to the NG and GEC control centres. Back up power may be provided from a bank of batteries connected to an Uninterruptible Power Supply (UPS) unit to cover for a sudden loss of mains power. A stand-by diesel generator shall also be provided for longer periods of supply failure. Mains power will be supplied by the local electricity utility into a meter cabinet and BT / similar will install a telephone / datalink cable. There is already an existing electricity supply and BT / similar phone link to the existing AGI which could be utilised.
- 6.2.8 There is no requirement for mains drainage piping. Run-off surface water will flow off the roads onto the stone chippings and / or soak away trenches. The civils works will include a concrete / tarmacadam road into the off-take and several concrete bases to support the pipe fittings and pigging facilities, as well as paved footpaths.
- 6.2.9 The remainder of the AGI site will be covered in a layer of terram and chippings spread over it.
- 6.2.10 Three 4.5 m high lighting columns (one for the NG AGI and two for the GEC AGI) will be erected to provide illumination should maintenance works be necessary in hours of darkness. These will also provide support for the CCTV cameras.
- 6.2.11 A car parking area will be installed outside the gated entrance.
- 6.2.12 Landscaping will be planted in order to screen the AGI. This will be agreed with TTGDC, and will aim to provide biodiversity enhancement and supplement the landscaping already present at the existing AGI site. An indication of the area provided for landscaping can be seen in Figures 5.2a, and further discussion is provided in Section 11.
- 6.2.13 Inserts 6.1 to 6.4 are photographs inside the existing CECL Gas Pipeline AGI. These indicate the proposed scale of development. It should be noted that the existing security fence at the CECL Gas Pipeline AGI is also 2.7 m high, with the majority of the equipment shown at a lower height than the fence.





INSERT 6.1 – INSIDE THE NORTH WEST CORNER OF AGI

The Insert above shows the PIG launcher (which forms the majority of the CECL infrastructure) and the CECL instrument kiosk. The equipment sits well below the 2.7 m security fence with the exception of the lighting column.



INSERT 6.2 – INSIDE THE NORTH EAST CORNER OF AGI

The Insert above shows the PIG launcher (which forms the majority of the CECL infrastructure), the National Grid instrument kiosk and the CECL instrument kiosk. The equipment sits well below the 2.7 m security fence with the exception of the lighting column.



INSERT 6.3 – INSTRUMENT KIOSKS



The Insert above shows the National Grid instrument kiosk (right) and the CECL instrument kiosk (left). The double gated security entrance can be seen behind.

INSERT 6.4 – NATIONAL GRID EQUIPMENT



The Insert above shows the National Grid infrastructure.


6.3 Gas Pipeline Construction

- 6.3.1 Construction of an underground gas pipeline is by a pipeline "spread". This is defined as the unit of manpower, plant and equipment necessary to construct a pipeline, from surveying the route through to reinstatement of the land. All construction activities will be undertaken within a temporarily fenced-off strip of land, which is referred to as the "working width". The working width will typically be 26 to 30 m wide, with the pipe offset from the centre line to allow for construction access. Pipeline construction practices will follow those used by National Grid for the construction of their cross-country pipelines.
- 6.3.2 This working width may be increased in size adjacent to road and other crossings to provide additional working areas and storage for materials or plant. Conversely, its size may be decreased in areas of environmental sensitivity or in close proximity to existing services. Further information on road / other crossings and areas of environmental sensitivity, with associated discussion, is provided later in this Section.
- 6.3.3 Access to the working width will be at defined points to be agreed by the Local Planning Authority and landowners / occupiers. Points of access will be carefully controlled and signposted.
- 6.3.4 Typical working width layouts are shown in Inserts 6.5 and 6.6.





INSERT 6.5 – ILLUSTRATIVE WORKING WIDTH LAYOUT – MAINLINE

INSERT 6.6 - ILLUSTRATIVE WORKING WIDTH LAYOUT - CROSSINGS





6.3.5 Following the establishment of the gas pipeline route, and the required working width, the normal sequence of events during gas pipeline construction follows those described in this sub-section.

Fencing

- 6.3.6 After surveying and pegging the gas pipeline route, the first activity is to erect temporary fences along the boundaries of the working width before any of the principal construction activities begin.
- 6.3.7 Fencing in fields will usually consist of rope supported by wooden posts. In areas where livestock requirements dictate, the fencing will usually comprise strands of plain or barbed wire and / or square mesh netting, as considered appropriate. Gates and stiles are incorporated into the fencing wherever access must be maintained, such as for public paths, farm tracks or for livestock movements.
- 6.3.8 Fencing and access requirements will have been agreed in advance with the landowners / occupiers.
- 6.3.9 Overhead power lines would be identified and barriers erected to restrict the maximum height of vehicles that may traverse underneath, in accordance with the requirements of the Health and Safety Executive (HSE) given in GS 6: 'Avoidance of Danger from Overhead Electric Power Lines'.
- 6.3.10 The location of the existing CECL Power Station gas pipeline and other pipelines will be identified and fenced off to ensure that crossings of pipelines by construction plant can only take place at agreed points to mitigate the risk of damage.

Land Drainage Works

- 6.3.11 Pre-construction drainage will be installed wherever appropriate to help prevent water logging of the working width, and reduce future construction drainage problems.
- 6.3.12 Particular emphasis is placed on ensuring that existing agricultural land drainage systems crossed by the gas pipeline are maintained and reinstated. At the detailed design stage, land drainage in each field will be carefully inspected and a record prepared.
- 6.3.13 In discussion with landowners / occupiers, a pre-construction scheme will be developed for those areas where such a scheme is deemed necessary. This may entail the installation of new header drains to intercept the existing land drainage which will be cut by the gas pipeline trench. This serves to maintain the existing drainage system during the construction period whilst minimising the possibility of surface water entering the working area.
- 6.3.14 During construction, all drains encountered during trench digging operations would be identified and recorded. An appropriate method of permanent reinstatement will be devised and agreed with the landowner / occupier. Where the gas pipeline passes under an existing land drain, the usual method of reinstatement is to install a replacement section of drain with a permanent, rigid support carrying it over the filled-in pipe trench. Where necessary, new lateral and header drains would be laid to new outfalls to replace drains rendered inoperative by the gas pipeline.

Topsoil Stripping

- 6.3.15 Topsoil would be stripped from within the working width and stored to one side to prevent it being mixed with subsoil or being damaged by over-compaction.
- 6.3.16 Some hedgerows may need to be removed to allow continuous access along the working width. Since hedgerows which have been removed have to be replaced, only the minimum width required for construction is removed. Established trees would be avoided where possible, with both hedging and trees remaining within the working



width protected with fencing material where appropriate. Any stone dykes will be dismantled and the stone safely stored for later reinstatement.

- 6.3.17 In areas of significant environmental sensitivity or very poor soil conditions, topsoil stripping may be omitted in favour of temporary roadways. These roadways will be constructed of a geotextile material and / or hardcore which will be laid over the ground. The topsoil strip and excavation will be limited to the width of the pipe trench alone. In other instances where the topsoil is particularly shallow, the layer of topsoil and the layer of subsoil immediately below it may be stripped and stored separately.
- 6.3.18 During topsoil stripping, an archaeological watching brief will be present on site to oversee any excavation works.

Pipe-stringing

- 6.3.19 The gas pipeline is constructed from pre-coated lengths of steel pipe, anywhere between 12 to18 m long. The pipes are initially delivered to a pipe storage yard. The pipe storage yard location(s) will be agreed at a future date and will be located along the underground gas pipeline and associated AGI application corridor and / or potentially within the GEC site. Once required, the pipes would be transported to the working width and laid on wooden sleepers (skids) or cradles along a line parallel to the proposed trench.
- 6.3.20 Insert 6.7 shows pipes strung out on wooden skids. Gaps would be left where access across the working width is required. Bends would be installed at changes of direction, factory-made where there are sharp changes of direction ('hot bends') or field bends where the changes are less severe ('cold bends').



INSERT 6.7 – PIPES STRUNG OUT ON WOODEN SKIDS

Welding and Joint Coating

- 6.3.21 The pipes would be welded together to form a continuous steel tube, where each weld is subjected to automatic ultrasonic testing (AUT) inspection. Any faults detected would be repaired or cut out and replaced and then re-inspected.
- 6.3.22 The pipes arrive on site with a protective coating already applied except at their ends. After welding and inspection, the bare metal at the joints would be cleaned and a coating applied to make the pipeline coating continuous along its entire length.



6.3.23 The gas pipeline coating would then be tested along the whole of its length to detect any damage or other defects. Any defects would then be repaired and the gas pipeline coating repaired and then re-tested.

Trenching and Laying

- 6.3.24 A trench will be excavated to a depth that will allow the gas pipeline to be buried with a minimum cover of 1.2 m. The subsoil from the pipe trench excavation will be separated from the topsoil. At road and rail crossings, special sections and some other crossings, the depth of cover may be increased. There will be an obligation on the part of the construction contractor to obtain consents from statutory authorities and statutory undertakers prior to crossing these features.
- 6.3.25 At times it may be necessary to dewater the open trench. Prior to such an activity commencing, schemes will be developed on an area by area basis in consultation with the affected landowners / occupiers.
- 6.3.26 During pipe laying, side boom tractors or equivalent plant are used to lower the gas pipeline into the trench, taking care to avoid damage to the pipe coating. This is shown in Insert 6.8.



INSERT 6.8 – LOWERING PIPE INTO A PREPARED TRENCH

- 6.3.27 By utilising standard factory coatings such as 3 layer polyethylene (3LPE) or Fusion Bonded Epoxy (FBE) the pipe will have protection from stones and flints. However where field coatings have been applied, a bed of sand may be used to provide additional padding and protection to the gas pipeline and applied field coating system.
- 6.3.28 The trench will then be backfilled with the excavated subsoil. The subsoil is carefully compacted around and over the pipe up to the top of the trench.



Cleaning, Gauging, Testing

- 6.3.29 The gas pipeline will be cleaned internally using a "pig" which will be driven through the pipe by water or compressed air. A "gauging pig" is then driven through to check the internal diameter of the gas pipeline so as to enable irregularities to be detected and, if necessary, rectified. In addition, a "calliper pig" will be employed to confirm the pipe geometry, and deem that the pipe dimensions are suitable to accommodate an "intelligent pig".
- 6.3.30 The gas pipeline will be hydrostatically tested by closing off the ends, filling it with water and increasing the pressure to a pre-determined level higher than the pressure it is designed to operate at. Water used for this purpose may be drawn from a suitable local watercourse and will subsequently be discharged in accordance with approved method statements and EA requirements.
- 6.3.31 On completion of pressure testing the gas pipeline will be dried with a combination of "drying pigs" and clean compressed air to the required dew point. The gas pipeline will then be purged with nitrogen (N_2) prior to being commissioned with natural gas.

Permanent Reinstatement

- 6.3.32 Reinstatement, including replacement of the stored topsoil and reseeding of pastureland, will be carried out within the same year as construction, unless prevented by adverse weather. As agreed with the landowners / occupiers, reinstatement may include deep cultivation or ripping of the subsoil if it has been significantly compacted and spreading of the stored topsoil.
- 6.3.33 Typical land reinstatement is shown in Insert 6.9.

INSERT 6.9 – TYPICAL LAND REINSTATEMENT



6.3.34 Banks, walls and fences will be reinstated and hedges replanted between protective fences. Permanent gas pipeline aerial and ground marker posts and cathodic protection test posts will be installed at agreed locations, generally on field boundaries, so as to minimise interference with normal agricultural operations.



6.3.35 Finally, the temporary fencing along the working width will be removed, unless the landowner / occupier prefer it to be left in place until the re-seeded pastureland is fully established, which would typically take one growing season. In ecologically sensitive areas reinstatement may be modified to suit the local prevailing conditions.

6.4 Typical Crossing Techniques

- 6.4.1 In addition to the main spread, special teams will be set up by the appointed Construction Contractor to undertake any works associated with road / rail crossings, or other sections which require some variation from the standard methods. These works are defined as "special crossings".
- 6.4.2 For example, in sections of particular environmental sensitivity, modifications are made to the standard spread technique and / or to the timing of construction with a view to minimising environmental impacts.
- 6.4.3 Table 5.1 has provided a list of the crossing techniques likely to be required for the proposed gas pipeline.
- 6.4.4 Therefore, the rate at which the pipeline spread advances is determined by the nature of the terrain, the frequency of special crossings and other factors.
- 6.4.5 At special crossings the standard construction procedure is adapted to suit each site's specific needs, and to satisfy the requirements of the relevant authorities and landowners / occupiers.
- 6.4.6 In addition to adapted construction methods, further measures may be taken to reduce the risk of third party damage to the gas pipeline. These may include: increased depth of cover; thicker walled pipe; installation of pipeline warning tape; concrete slab placement above the gas pipeline; and, screw anchors or concrete weight coating applied to the pipe.

Open Cut – Private Roads / Tracks / Ditches

- 6.4.7 For private roads / tracks / ditches the open cut construction technique may be used whereby a trench is dug directly across the private road / track. Once dug, a short section of pipe is installed and the trench backfilled with the graded excavated material. The surface of the private road / track / ditch will then be reinstated with appropriate material.
- 6.4.8 In the case of ditches, the pipe will be installed at the depth required by the pipeline design standard IGE/TD/1, and protective concrete slabs will be installed if the crossing technique permits this.

Auger Boring (Typical Trenchless Method)

- 6.4.9 The auger boring method is shown in Insert 6.10
- 6.4.10 This method is likely to be used for all 'B' and 'C' class roads where the disturbance caused by a gas pipeline crossing by open cut may be regarded as unacceptable. Auger boring may also be used at some watercourse and third party pipeline crossings.



INSERT 6.10 – AUGER BORING AT A ROAD CROSSING

- 6.4.11 Auger boring is a relatively simple trenchless technique that limits surface disturbance. Two pits are dug, one at either end of the crossing section. The sides of the pits will be either graded with a gentle slope, or, if there is limited space, interlocking sheets and frames may be installed to provide sufficient support to the pit and prevent collapse.
- 6.4.12 The drilling pit is dug wide enough and long enough to take a set of rails on which the auger equipment will run and also accommodate a full length of pipe. It is necessary to increase the working width at crossings in order to store the extra spoil and accommodate the extra plant, vehicles, welfare facilities and other equipment required for this activity.
- 6.4.13 It should be noted that not all ground conditions are suitable for auger boring, notably where there are large boulders present.
- 6.4.14 During drilling, a short length of sacrificial pipe is normally placed between the drillinghead and the live pipe and thrust through the ground until it reaches the reception pit on the far side of the crossing. An auger tool called a helix removes the spoil from within the pipe and returns it to the drilling pit.
- 6.4.15 After the live pipe is positioned through the drilled hole it will eventually be tied into the rest of the gas pipeline.

Tunnelling (Pipe-Jacking and Micro-Tunnelling)

6.4.16 Where auger boring is impractical, then tunnelling may be used as an alternative. Tunnelling can be by manned-entry (pipe-jacking) or un-manned entry (microtunnelling).

Pipe-Jacked Crossing

- 6.4.17 This trenchless crossing method involves digging pits on either side of the crossing to a pre-determined depth. The pits are shored up using interlocking sheet-piles and hydraulic frames.
- 6.4.18 A diesel driven jacking device and running rails are laid in the base of the reception pit and a metal protection shield installed at the rock-face. Jack hammers are used to



jack away at the rock-face with the spoil deposited into a wagon, which is lifted out of the pit. As progress is made, concrete rings are driven forward into the hole using hydraulic jacks. Alignment is maintained by laser beam.

- 6.4.19 Once the hole is complete and the equipment removed, welded pipe on spacers is threaded through the concrete rings, the ends of the tunnel are bricked up and the annulus filled with an alkaline grout.
- 6.4.20 This is shown in Insert 6.11.

INSERT 6.11 – PIPE JACKING (MANNED – ENTRY)



Micro-Tunnelling

- 6.4.21 Micro-tunnelling is similar to pipe-jacking, but a man is replaced by a machine. This method is especially useful for tunnelling beneath crossings where a manned entry is not possible on health and safety grounds.
- 6.4.22 The micro-tunnelling method is shown in Insert 6.12.





INSERT 6.12 – MICRO-TUNNELLING EQUIPMENT

Horizontal Directional Drilling

- 6.4.23 Horizontal Directional Drilling (HDD) is normally used for long crossings at dual carriageways, wide rivers and railways, or at particularly sensitive crossings where alternative trenchless techniques prove to be unfeasible. It can also be used to drill under woodlands. HDD uses a steerable cutting head to bore down under an obstacle and come up on the other side.
- 6.4.24 Detailed site investigation is essential in determining this method's feasibility since not all ground conditions are suitable. In addition, the detailed site investigation will establish the working width needed to accommodate the extra plant and equipment, and to store any additionally stripped topsoil.
- 6.4.25 Powered by a mobile rig, the drill enters the ground at a shallow angle to bore a small pilot hole. It is steered to follow a pre-determined constant radius to achieve the required clearance from the crossing. The drill emerges on the opposite side of the obstacle, normally within the space of a shallow pit. The diameter of the drilled hole is then increased incrementally by subsequent pull-throughs of a reamer or hole-opener, until the hole is of a suitable size for installation of the pipe.
- 6.4.26 A fabricated permanent length of pipe is connected to the end of the drill pipe by means of a swivel bearing, and the drill string rotated and withdrawn. As it is withdrawn it pulls the pipe string into position behind it. This part of the gas pipeline is later tied into the remainder of the gas pipeline system.
- 6.4.27 Bentonite, a naturally occurring fine clay, is normally used as a drilling lubricant. It is pumped from tanks to the head of the drilling bit through the centre of the hollow drill pipe. The lubricant mixes with the drillings, which are forced back along the hole under pressure, and into a recycling plant to recover much of the bentonite.
- 6.4.28 The HDD technique is shown in Insert 6.13.



INSERT 6.13 – HDD RIG PULLING BACK THE PIPE-STRING

Examples of Potential Locations where Special Crossing Techniques may be Required

Hedgerows

- 6.4.29 Wherever possible, the gas pipeline has been routed away from hedgerows. However there are occasions where hedgerows cannot be avoided.
- 6.4.30 Construction techniques require that short sections of hedgerows be removed, although it is often possible to align the pipeline to cross at a naturally "weak" point.
- 6.4.31 For hedgerow crossings, a new hedge incorporating suitably matched indigenous varieties will be planted within a suitable double post and rail or post and wire fence, which is maintained until the new hedge is established.

Cultural Heritage Features

- 6.4.32 Areas of archaeological value, including those having statutory designation, are also treated as special crossings. The construction technique used for these crossings will depend on the nature and sensitivity of the area, but a restricted working width may be adopted. In addition, topsoil stripping may also be reduced, special arrangements for construction traffic may be included and special reinstatement methods required.
- 6.4.33 The approach to crossing these areas would be developed in consultation with the relevant authorities. More details are given in Section 15 (Cultural Heritage).

Existing Pipelines and Other Services

- 6.4.34 Prior to construction work commencing, services crossed by / close to the gas pipeline will be positively located by trial pit excavation and / or by an indirect location method.
- 6.4.35 This work will be carried under the guidance and supervision of the responsible service authorities' inspectors, as required.



6.5 General Pipeline Technical Considerations

- 6.5.1 The pipe material for the gas pipeline will be manufactured from high-grade steel in accordance with internationally recognised standards (C4 Gas PIPO and BS EN 10208-2). Thicker walled ('Heavy Wall' or 'Proximity') pipe will be used where added protection is called for in the pipeline design code IGE/TD/1, for example where the gas pipeline crosses roads and railways or at locations where the gas pipeline is routed close to existing or proposed developments.
- 6.5.2 Pipeline construction will be confined to the fenced-off working width as shown in Inserts 6.1 and 6.2. This is normal practice for pipelines lying across open agricultural land. A site investigation survey will be undertaken before details of pipeline construction and crossing techniques can be finalised in consultation with relevant bodies.
- 6.5.3 A land agent / consenting team will negotiate permanent rights of access for the gas pipeline in the form of a servitude. A servitude is a necessary requirement in order to gain access to the gas pipeline if and when the operator needs to carry out inspection, maintenance and repairs during the lifetime of the gas pipeline. As part of these agreements to be entered into with landowners and occupiers, some land-use controls are necessary to maintain gas pipeline integrity, for example exclusion of building within the servitude area. Normal agricultural activities can continue as before, except for those involving deep workings (over 300 mm) within the servitude area.
- 6.5.4 In agricultural land it is normal practice to provide a depth of cover of not less than 1.2 m over the top of the pipeline. At the road and rail crossings the depth of cover will be increased to meet the specifications of the consenting statutory authority and / or statutory undertaker. Installing a concrete slab and / or increasing the pipe wall thickness may be necessary to increase protection further where design considerations in accordance with the relevant codes and standards dictate.

6.6 Corrosion Protection

- 6.6.1 It is essential to protect the gas pipeline from external corrosion due to biological and chemical activity, or the risk of alternating current (AC) induced corrosion. This is achieved in three ways:
 - By means of a high integrity anti-corrosion coating applied during manufacture of the pipe, with further coatings applied at the welded joints during pipeline construction;
 - By installing an impressed current cathodic protection (CP) system to supplement the corrosion protection afforded to the gas pipeline by the anti-corrosion coating; and
 - By the installation of an AC corrosion mitigation system to mitigate the risk of AC induced corrosion.
- 6.6.2 There will be no significant internal corrosion risk since the treated natural gas to be carried is dry and non-corrosive.
- 6.6.3 In designing the cathodic protection and AC corrosion mitigation system it will be necessary to carry out a soil resistivity survey along the route to obtain data to design the corrosion protection system. Other factors that may influence the design and location of the cathodic protection system are:
 - Availability of a conveniently located power supply;
 - The location of any other cathodic protection systems in the vicinity of the gas pipeline;



- The gas pipeline diameter, wall thickness, coating material; and
- Identified constraints and the recommendations of this ES.
- 6.6.4 The coating applied to the gas pipeline will be inspected and subjected to a 100 per cent holiday testing. The holiday testing is undertaken to test for coating defects / damage immediately before laying. A pre-commissioning and commissioning cathodic protection survey will be carried out and repeated at regular intervals during the lifetime of the gas pipeline as a continuing check on its condition.
- 6.6.5 In the event that full levels of cathodic protection are not to the required level then remedial work will be implemented. This will include ensuring the optimum protection from AC induced corrosion.
- 6.6.6 The impressed current cathodic protection system will involve applying a negative current to the gas pipeline. The local electricity utility will provide mains power to a cathodic protection system transformer rectifier (TR) unit or it may be possible to utilise the cathodic protection system for the existing CECL Power Station gas pipeline, which has spare current capacity and can provide cathodic protection current to the proposed gas pipeline.
- 6.6.7 The TR will allow the direct current for the cathodic protection system to be varied to suit the needs of the cathodic protection system. The ground-bed is a series of anodes laid in a trench which is backfilled. Cables will run from the pipeline to the TR and from the TR to the ground-bed. If the existing CECL Power Station gas pipeline cathodic protection system can be utilised than then there will not be a requirement to install a new ground-bed for the proposed gas pipeline.
- 6.6.8 Cathodic protection test posts will be installed at intervals of about 1 km along the pipeline route, normally beside road crossings for ease of access. Cables will be run from the test post to a welded plate on the pipeline with other cables installed for corrosion monitoring purposes and for connection of the AC corrosion mitigation system.
- 6.6.9 The pipe to soil potential being applied to the pipeline will be regularly monitored by experienced and qualified personnel to confirm the optimum levels of cathodic protection are being achieved.
- 6.6.10 Remote monitoring devices will be employed to regularly record the pipe to soil potential at critical locations.
- 6.6.11 A Close Interval Potential Survey (CIPS) will be carried out on commission of the CP system and at regular intervals throughout the lifetime of the pipeline. The CIP survey will help identify if there any areas where effective levels of cathodic protection are not achieved.
- 6.6.12 A Direct Current Voltage Gradient (DCVG) Survey will be conducted on completion of the pipeline installation to determine if there any coating defects that need to be exposed to carry out coating repairs to the pipeline.
- 6.6.13 An intelligent pig survey will also be carried out on the gas pipeline post construction. The intelligent pig survey will be carried out within a reasonable period of time after commercial operation of the gas pipeline. The intelligent pig survey can only be carried out when there is gas flow in the pipeline.

6.7 Construction Constraints

6.7.1 Specific obligations will be included in the construction contractor's responsibilities to avoid or minimise environmental damage during construction and to avoid public nuisance. These include, as a minimum, the following requirements:



- To obtain construction consent approvals from statutory authorities, statutory undertakers and environmental bodies, in advance of gas pipeline construction;
- To ensure that all work is carried out within the agreed working width, using agreed accesses / egresses;
- To provide adequate notice to landowners / occupiers before commencement of works so that they have time to make any advance preparations;
- To ensure that all public roads affected by construction and / or construction traffic are kept clean and in a good state of repair;
- To maintain essential access for landowners / occupiers including passage of livestock;
- To maintain public paths affected by construction;
- To restore drainage systems, should any be affected by the pipe trench;
- To adhere to restrictions on the felling or lopping of trees;
- To maintain the working width in a clean and tidy condition;
- To store and use materials in an appropriate manner to minimise the potential for accidental spillage;
- To reinstate all land to the condition found, or as otherwise agreed; and
- To abide by any conditions imposed by the approving authorities.
- 6.7.2 Normal working hours for general activities (such as top-soil stripping, welding, and pipe-laying / the movement of vehicles / the running of motorised plant and equipment) are 07:00 to 19:00 hours Monday to Saturday. No work on any Sunday or Bank Holidays is proposed to be undertaken. However, there may be exceptions to these working hours.
- 6.7.3 The exceptions to the working hours could be during non-destructive / pressure testing and commissioning and also in the event of special circumstances that may include HDD operations. These exceptions will be agreed with the Local Planning Authority.

6.8 Supervision of Construction Activities

6.8.1 A project management team will be appointed to oversee construction of the pipeline and all other facilities. This team will ensure that all works are carried out in a safe, efficient and professional manner and in accordance with the requirements of IGE/TD/1. Furthermore, they will insist that all works conform to best construction practice and are carried out in accordance with the requirements of all consents, authorisations or other permissions granted. They will also ensure that the terms of the operating licence are met following satisfactory inspection of construction and completion of pressure testing.

6.9 Operation and Maintenance

- 6.9.1 After the gas pipeline is fully commissioned, it will be operated and maintained in such a manner as to keep it safe and in good condition.
- 6.9.2 Helicopter fly-overs will be required to inspect the gas pipeline route. These fly-overs will be infrequent events (approximately one every two weeks) and will take place at the same time as the existing fly-overs for the existing CECL Power Station gas pipeline.
- 6.9.3 The helicopter fly-overs would be aided by the presence of pipeline markers along the ground. It is currently envisaged that there will be approximately 10 pipeline markers



along the proposed gas pipeline route. The pipeline markers are approximately 2 m high. In addition, there may also be around 15 cathodic protection posts (approximately 1 m high) and 30 M4 mark posts (approximately 0.6 m high) at the special crossings.

6.9.4 Insert 6.14 shows a photograph of a typical pipeline marker and cathodic protection post.



INSERT 6.14 – TYPICAL PIPELINE MARKER AND CATHODIC PROTECTION POST

- 6.9.5 The operation / maintenance of the gas pipeline will be carried out in accordance with the requirements of IGE/TD/1. Protective measures inherent to the gas pipeline design, together with regular monitoring, will ensure that major risk to the gas pipeline is virtually eliminated and so unlikely to cause damage.
- 6.9.6 Monitoring is normally carried out in the following ways:



• Periodic Visual Monitoring

A "care and maintenance["] team will carry out visual monitoring. Their duties will include regular surveillance by road and foot. Their observations will provide a record of changing ground conditions and third party activity along the gas pipeline route and prevent any unauthorised third party activity from compromising its safety. It is likely that the gas pipeline will be observed from the air every two weeks.

• Pigging

"Intelligent pigging" will be part of the standard inspection and maintenance procedure of the gas pipeline, and will be carried out as a baseline run within a reasonable period of time following commercial operation of GEC. The gas pipeline will thereafter be subjected to "intelligent pigging" inspection at 5 yearly intervals, unless it is otherwise confirmed that the inspection interval can be increased. "Intelligent pigs" are special on-line inspection vehicles (OLIVs) which pass through the gas pipeline as an inspection exercise to check on the condition of the gas pipeline and detect any evidence of corrosion or damage.

• CP Monitoring

This consists of monthly checks of the CP station power unit and / or through the electronic monitoring system. At six monthly intervals pipe to soil potential measurements will be taken at the CP test posts.

- 6.9.7 Operation and Maintenance Procedures will be implemented. As part of these procedures an Emergency Plan will be prepared to cover contingency plans and remedial measures. The Emergency Plan will be completed in consultation with the Local Authority.
- 6.9.8 The Emergency Plan shall be prepared in accordance with the requirements of the Pipelines Safety Regulations 1996. In addition, a Major Accident Prevention Document (MAPD) shall be prepared in accordance with the requirements of the Pipelines Safety Regulations 1996, which shall detail the risks associated with the operation of the gas pipeline and describe how the risks would be mitigated during its operational lifetime. The MAPD would be updated as often as deemed necessary during the operational lifetime of the gas pipeline.
- 6.9.9 In summary, the gas pipeline system would be operated and maintained to meet the requirements of the Pipelines Safety Regulations 1996, with the pipe work within the overall AGI operated and maintained to meet the requirements of the Pressure Systems Safety Regulations 2000.

6.10 Decommissioning

- 6.10.1 The gas pipeline will be decommissioned when it reaches the end of its useful life. At that time detailed decommissioning procedures will be produced in line with prevailing best practice.
- 6.10.2 As recommended in the pipeline codes and standards it is likely that the buried pipe will be left in place and stabilised, as lifting the pipeline could cause a greater disturbance to the environment.
- 6.10.3 The AGI will likely be removed and the land reinstated to its original condition.

6.11 Framework for the Environmental Management

- 6.11.1 The EIA for the gas pipeline and associated AGI is a continuing process. It starts with the selection of the proposed pipeline route and passes through the following stages:
 - Identification of impacts in the ES;
 - Development of appropriate mitigation measures;



- Establishment of criteria for crossing sensitive sites;
- Effective management and control of the construction activities;
- Post-construction reinstatement;
- Post-construction auditing; and
- Effective management and control of the operational activities.
- 6.11.2 In order to manage the likely environmental impacts associated with the above stages, Appendix B details a Framework for the Environmental Management for the construction phase of the underground gas pipeline and associated AGI.
- 6.11.3 The primary objective is to ensure full compliance with all safeguards identified as being necessary during the EIA process, as well as any conditions which are likely to be written into the construction contract and any statutory obligations.

SECTION 7

EIA METHODOLOGY AND ES CONTENT



7 EIA METHODOLOGY AND ES CONTENT

7.1 Overview

- 7.1.1 This ES has been prepared to document the findings of the EIA which has been undertaken to determine the potential extent of any likely significant environmental effects with regard to the gas pipeline and associated AGI required in connection with the development of GEC. This ES covers the following impacts: direct, indirect, secondary or cumulative; short, medium or long term; permanent or temporary; and, positive or negative.
- 7.1.2 In accordance with the 1999 EIA Regulations, the ES goes on to identify measures envisaged to avoid, reduce and, if possible, remedy any significant adverse impacts identified. For impacts that cannot be entirely remedied, the ES identifies the residual adverse effects once the mitigation is considered.
- 7.1.3 Monitoring has been recommended in some cases to help demonstrate that the gas pipeline and associated AGI is able to operate in compliance with the performance criteria identified in this ES.

7.2 Environmental Impact Assessment Project Team

7.2.1 GECL has appointed an EIA Project Team to assist in the development of the application for planning permissions and preparation of the ES. The members of the EIA Project Team and their respective roles are presented in Table 7.1.

Company	Role	Input
РВ	Environmental / Engineering Consultants	ES Chapters and Project Management
Dalton Warner Davis	Planning Consultant	Review of ES ES Chapter on Planning Policy Context
THE Consultancy	Traffic and Infrastructure Consultant	ES Chapter on Traffic and Infrastructure
Landmark Chambers	Queen's Counsel	Review of ES
Dr. Patrick Lydon / IACS Corrosion Engineering Limited	Pipeline Engineering	Technical / Review of ES
Pendragon Consulting	Public Relations and Communication	N / A

TABLE 7.1: EIA PROJECT TEAM

- 7.2.2 Additionally, to date, a significant proportion of work has been carried out on the surrounding LG Development by DP World and their Consultants. This work has been used in the ESs (discussed previously) associated with applications made by DP World for the LG Development.
- 7.2.3 Details of the reports used for the purposes of this ES are provided in Appendix C, and information from these reports is referenced and incorporated where appropriate.

7.3 Purpose of the Environmental Impact Assessment

7.3.1 The purpose and objective of an EIA is to report objectively on the environmental impacts of a project, in this case the development of the gas pipeline and associated



AGI (required in connection with the development of GEC), to determine whether the environmental impacts are considered to be within acceptable limits.

7.3.2 Additionally it serves to inform the design to ensure that, wherever possible, environmental impacts are minimised in the design itself.

7.4 Content of the Environmental Statement

Information required by the 1999 EIA Regulations

- 7.4.1 The required content of the ES is set out in Schedule 4 of the 1999 EIA Regulations.
- 7.4.2 Table 7.2 presents these requirements and indicates where these requirements are met in the different Sections of this ES.
- 7.4.3 Further information on the methodology and presentation of the EIA is provided in the following sub-sections.



TABLE 7.2: INFORMATION REQUIRED IN AN ES AS SET OUT IN SCHEDULE 4 OF THE 1999EIA REGULATIONS

Required Information		Section of this ES		
PARTI				
1	 A description of the development, including in particular: a) A description of the physical characteristics of the whole development and the land-use requirements during the construction and operation phases; b) A description of the main characteristics of the production processes, for instance, nature and quantity of the materials used; c) An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc) resulting from the operation of the development. 	Section 4 to 6, and Impact Assessment Sections 9 to 16		
2	An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	Section 5		
3	A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.	Impact Assessment Sections 9 to 16 Section 18		
4	 A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from: a) The existence of the development; b) The use of natural resources; c) The emissions of pollutants, the creation of nuisances and the elimination of waste, and d) The description by the applicant of the forecasting methods used to assess the effects on the environment. 	Impact Assessment Sections 9 to 16 Section 18		
5	A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Impact Assessment Sections 9 to 16 Section 18		
6	A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.	Non-Technical Summary		
7	An indication of any difficulties (technical deficiencies of lack of know-how) encountered by the applicant in compiling the required information.	Impact Assessment Sections 9 to 16		
PART II				
1	A description of the development comprising information on the site, design and size of the development.	Section 4 to 6		
2	A description of the measures envisaged in order to avoid, reduce, and if possible remedy significant adverse impacts.	Impact Assessment Sections 9 to 16 Section 18		
3	The data required to identify and assess the main effects which the development is likely to have on the environment.	Impact Assessment Sections 9 to 16		
4	An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice taking into account the environmental effects.	Section 5		
5	A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	Non-Technical Summary		



7.5 Methodology of the Environmental Impact Assessment

- 7.5.1 In accordance with the 1999 EIA Regulations, the assessment process for the gas pipeline and associated AGI required in connection with the development of GEC has included the following:
 - Discussions with consultees on the key issues on which the EIA should focus (scoping of the EIA);
 - Identification of any alternatives;
 - Establishing baseline environmental conditions through desk-top research and site-surveys;
 - Identifying the potential environmental impacts;
 - Determining how the potential environmental impacts will be avoided or reduced through design or mitigation;
 - Assessing the significance of cumulative environmental impacts;
 - Describing how likely significant residual impacts will be monitored; and
 - Reporting the process, results and conclusions of the EIA in an ES.
- 7.5.2 A brief description of these steps is provided here.

Scoping of the EIA

- 7.5.3 A Scoping Study, which described the key environmental issues that would require detailed evaluation as part of the EIA process, was submitted to TTGDC in November 2010. The Scoping Study is included in Appendix D.1.
- 7.5.4 The results of the Scoping Study are discussed in Section 8.

Identification of Alternatives

7.5.5 The identification of alternatives has previously been discussed in Section 5.

Identification of Environmental Baseline

- 7.5.6 In undertaking an EIA for any project it is important to identify the environmental baseline at the site being considered. This allows the impacts of the proposed project to be seen in the light of the existing environment and allows for better identification of the most appropriate mitigation, which could be employed to minimise these impacts.
- 7.5.7 To establish the baselines, a wide range of data on the environment has been used and has been gathered from a combination of sources. This has included:
 - Documentary information, including that available from the previous environmental work at the LG Development;
 - Field survey information, including: ecological features; landscape character; background noise levels; and traffic levels on the road network; and
 - Data from Statutory and Non-Statutory Consultees.
- 7.5.8 The identified baseline environmental conditions are then used to assess the potential impacts of the gas pipeline and associated AGI against the potential construction / operation dates. These are as follows¹³:
 - Start of Construction:

around 2013

¹³ It is to be noted that these dates have been selected to tie in with the proposed dates for the construction / connection and commissioning / operation of GEC.

Connection and Commissioning:

around 2014 around 2015

Full Operation

Description of the Proposed Development and Identification of Potential Impacts

7.5.9 A full description of the gas pipeline and associated AGI required in connection with the development of GEC is provided in Section 5. Background details on GEC and the GEC site are provided in Section 4.

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7.5.10 Further details on specific aspects of the gas pipeline and associated AGI are included in respective Sections of this ES as required.

Evaluation and Quantification of Potential Impacts

- 7.5.11 To help evaluate and quantify the likely significant environmental effects of the gas pipeline and associated AGI, environmental significance criteria can be employed to ensure that the identified impacts are within acceptable limits.
- 7.5.12 The identified impacts may be direct, indirect, secondary or cumulative. Within these categories they may be short, medium or long-term, permanent or temporary, and, positive or negative.
- 7.5.13 Direct impacts are changes to the baseline arising directly from activities that form part of the development. For example, direct impacts may include localised increases in noise during construction. Direct impacts are assessed individually in Sections 9 to 16 of this ES.
- 7.5.14 Indirect and secondary impacts are those which arise as a result of a direct / primary impact. For example, deterioration of water quality in a watercourse due to an effluent discharge (which would be a direct impact) could have an indirect / secondary impact on aquatic biodiversity. Cumulative impacts occur when a receptor is subject to multiple impacts. Indirect / secondary and cumulative impacts are assessed in Section 18 of this ES.
- 7.5.15 Environmental significance criteria are important as they inform the determination by the competent authority of the overall acceptability of the proposal.
- 7.5.16 The environmental significance criteria are determined by considering both the character of change (i.e. the size and duration of the impact) and the value / sensitivity of the receptor. The environmental significance criteria used in this ES reflect the specific impact under consideration and wherever possible are based on recognised methodologies such as those identified by the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA).

Mitigation Measures and Monitoring Philosophy

- 7.5.17 Full consideration is then given to the potential mitigation measures which could be used to ensure that the adverse significant environmental impacts of the development of the gas pipeline and associated AGI are minimised.
- 7.5.18 In the hierarchy of mitigation, likely significant adverse effects should in the first instance be avoided altogether, then reduced and finally offset.
- 7.5.19 Significant adverse effects are best avoided through the design. As such the iterative nature of the EIA can help to inform the development of the design process.
- 7.5.20 The gas pipeline and associated AGI has and will continue to be developed in such a way that reduction and, wherever possible, elimination of any associated adverse significant environmental impacts are an integral component to the overall design.



7.5.21 Where it is not possible to avoid adverse significant environmental effects, plans have been prepared to help compensate for the impact identified.

7.6 Presentation of the Environmental Impact Assessment

7.6.1 Sections 9 to 16 assess the likely direct impacts associated with the development of the gas pipeline and associated AGI. These Sections have been broken down to include a number of sub-sections. These are:

Introduction

This sub-section will provide details of the key issues with regard to the specific environmental impacts being considered.

• Key Planning Policies

This sub-section will provide a summary of the National, Regional and Local Planning Policies which are relevant to the topic being assessed.

• Assessment Methodology and Significance Criteria

This sub-section will provide details of the assessment methodology adopted for the purposes of the EIA. The assessment methodology chosen reflects the relevant guidelines and legislative standards. In addition, significance criteria to be used to quantify the extent of the environmental impact of the proposed gas pipeline and associated AGI will be identified.

Baseline Conditions and Receptors

This sub-section will present discussion on the environmental baseline conditions, and provide discussion on the features of the environmental baseline which could potentially be impacted on by the gas pipeline and associated AGI.

• Potential Impacts

This sub-section will discuss the findings of the EIA studies, and will take in to consideration the potential construction / operation timeline for the gas pipeline and associated AGI as discussed above. Potential environmental impacts are identified as being: direct and indirect; long, medium or short term; and, positive, neutral or negative. In undertaking this assessment both quantitative and qualitative evaluations are necessary, in varying degrees, depending on the nature of the environmental impact being assessed. The significance of the environmental impacts identified is addressed as appropriate with reference to the significance criteria established.

• Mitigation Measures

This sub-section will provide details of the mitigation measures that have been identified to ensure that any potential adverse environmental impacts are either minimised or, wherever possible, avoided altogether. In some cases, monitoring is identified to allow it to be demonstrated that the mitigation measures employed are effective.

• Assessment of Residual Effects

This sub-section identifies any residual, post-mitigation, effects likely to be caused by the gas pipeline and associated AGI.

• Assessment of Cumulative Impacts This sub-section provides a link to Section 18 which describes the indirect / secondary and cumulative impacts associated with the development of the gas pipeline and associated AGI.

7.6.2 Section 18 assesses the likely indirect / secondary and cumulative impacts associated with the development of the gas pipeline and AGI.

SECTION 8



8.1 Overview

- 8.1.1 In undertaking the EIA and the associated supporting studies, GECL and their consultants have undertaken consultations with a variety of stakeholders. These have included TTGDC, governmental and non-governmental organisations, and local residents.
- 8.1.2 A summary of consultations undertaken to date and planned future consultations that will be carried out are provided below.

8.2 Scoping

- 8.2.1 A Scoping Study, which described the key environmental issues that would require detailed evaluation as part of the EIA process, was submitted to TTGDC in November 2010. The Scoping Study was forwarded to the following organisations:
 - British Pipeline Agency;
 - Buglife;
 - Castle Point Borough Council;
 - Civil Aviation Authority;
 - Corringham and Fobbing Community Forum;
 - Department of Energy and Climate Change;
 - Department for Transport;
 - East of England Development Agency;
 - East of England Regional Assembly;
 - English Heritage;
 - Environment Agency;
 - Essex Amphibian and Reptile Group;
 - Essex and Suffolk Water;
 - Essex Badger Protection Group;
 - Essex County Archaeological Advice;
 - Essex County Fire and Rescue Service;
 - Essex Mammal Group;
 - Essex Police;
 - Essex Wildlife Trust;
 - Government Office for the East of England;
 - Health and Safety Executive;
 - Highways Agency;
 - London Gateway / DP World;
 - Ministry of Defence;
 - Natural England;

- National Grid Property Ltd;
- Network Rail;
- NERL Safeguarding;
- Port of London Authority;
- Royal Society for the Protection of Birds;
- Shellhaven Project Environmental Action Committee (SPEAC);

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- Stanford Community Forum;
- Thurrock Biodiversity Action Group;
- Thurrock Council;
- Thurrock Thames Gateway Development Corporation (TTGDC); and
- Thurrock Wildlife Society.
- 8.2.2 The Scoping Study and Scoping Responses can be seen in Appendix D.1 and Appendix D.2 respectively. Table 8.1 provides a summary of the Scoping Responses, and the subsequent actions taken. Links to where this ES addresses the Scoping Responses are also provided.



Consultee	Heading	Summary of Comments	Action / Link
Castle Point Borough Council (CPBC)	Development of the gas pipeline and associated AGI	After consideration of the Scoping Study, CPBC has no comments to make.	None
Civil Aviation Authority (CAA)	Development of the gas pipeline and associated AGI	Note that, regardless of route, the gas pipeline will be predominately below the surface, and that any above the surface development would be only a few metres in height. This being the case, the CAA advises that there may be a requirement for the relevant planning authorities to check any safe-guarding maps which are lodged with them.	Request sent to relevant planning authorities to check any safe-guarding maps which are lodged.
East of England Development Agency	Socio-Economics		Information and assessment is provided in: Section 16 – Socio-Economics
Environment Agency	Flood Risk	It is noted that the proposed gas pipeline route has a number of water crossings.	Information is provided in:
			Section 13 – Land Use / Geology, Hydrology and Hydrogeology
	Impact on Water Levels	Assessment is required on the impact on and mitigation of water levels along the proposed gas pipeline route.	Information and assessment is provided in: Section 13 – Land Use / Geology, Hydrology and Hydrogeology

TABLE 8.1: SUMMARY OF SCOPING RESPONSES



Consultee	Heading	Summary of Comments	Action / Link
	Contaminated Land	PPS 23 required consideration of the potential impacts of the proposed development on groundwater / surface water quality, together with mitigation measures to eliminate / minimise potential impacts.	Information and assessment is provided in: Section 13 – Land Use / Geology, Hydrology and Hydrogeology
	Pollution Control	A detailed Pollution Prevention Plan, including an Emergency Plan, will be required. This should also include an agreed Construction Environmental Management Plan.	Information is provided in: Section 17 – Safety Appendix B – Framework for the Environmental Management
	Ecology	Assessment is required on the impacts of the proposed gas pipeline and AGI on designated nature conservation areas and individual protected species.	Information and assessment is provided in: Section 12 – Ecology



Consultee	Heading	Summary of Comments	Action / Link
Essex County Council ¹⁴ (Environment, Sustainability and Highways)	Specialist Archaeology Advice	The proposed gas pipeline route bisects an area extensively studied in recent years – not only by the LG Development, but also with the development of a new wetland site to the west and the proposed Calor Gas Pipeline ¹⁵ . In addition to the above, a programme of aerial survey has been undertaken by ECC in the last two years, which has identified extensive archaeological cropmarks in the western area of the proposed gas pipeline route. Any EIA would need to collate all of the above information.	Information and assessment provided in: Section 15 – Cultural Heritage
		Although the Scoping Study stated that no intrusive investigations are proposed for archaeological purposes, this should be reconsidered due to some of the archaeological deposits likely to be affected by the gas pipeline.	Due to the extensively amount of Studies in the area, no intrusive investigation is proposed for use in the EIA. Prior to construction, a plan of archaeological works will be developed in conjunction with the Essex County Archaeologist. It is proposed that this forms part of the planning conditions for the development of the gas pipeline and associated AGI.

¹⁴ It should be noted that Essex County Council (Environment, Sustainability and Highways) have provided Specialist Advice to TTGDC on matters relating to archaeology / cultural heritage. ¹⁵ Canvey Terminal to Stanford-le-Hope Gas Pipeline – Environmental Statement (June 2006) [undertaken by RPS Ltd].



Consultee	Heading	Summary of Comments	Action / Link
Essex Wildlife Trust	Ecology	Assessment is required on the impacts of the proposed gas pipeline and AGI on designated nature conservation areas and individual protected species. Furthermore, during construction, it is crucial that on site ecologists are present to ensure works are carried out at the correct times / in accordance with the agreed methodologies.	Information and assessment provided in: Section 12 – Ecology
Health and Safety Executive	Development of the gas pipeline and associated AGI	HSE have no comments to provide on the Scoping Study.	None
Ministry of Defence (MOD)	Development of the gas pipeline and associated AGI	MOD confirms that they have no safeguarding objections.	None



Consultee	Heading	Summary of Comments	Action / Link
Natural England	Air Quality	The Scoping Study states that the emissions of nitrogen oxides (NO _x) and sulphur dioxide (SO ₂) from traffic movements on site and in the area will be minor and should have no impact on local air quality. While it is accepted that the emissions associated with the development of the proposed gas pipeline and associated AGI are minor, it is the cumulative impact of this and other sources of air pollution which are contributing to the exceedance of NO _x levels / loads. Assessment of air quality should also take account of data and thresholds for ecological receptors held on the UK Air Pollution information System website (www.apis.ac.uk).	Information provided in: Section 18 – Indirect / Secondary and Cumulative Impacts It should also be noted that the majority of the issues relating to air quality will arise from the development of GEC. GEC ES Volume 1 provides an assessment showing that the contribution of GEC towards NOx levels / loads is below the 'threshold of significance'. However, InterGen and GECL also note the "unfavourable but recovering" state of a number of ecological receptors in the area. As such, InterGen and GECL have agreed an Involvement in Management Schemes with Natural England. Full details are provided in the ES FID.
	Landscape and Visual	An assessment of the permanent visible features of the proposed development (i.e. the AGI) should be undertaken.	Information and assessment provided in: Section 11 – Landscape and Visual
	Ecology	Assessment should not only include Protected Species, but also Biodiversity Action Plan Species and Habitats.	Information and assessment provided in: Section 12 – Ecology
	Geology	An assessment of any impacts arising from excavation / construction of the proposed gas pipeline and associated on solid and drift geology should be undertaken.	Information and assessment provided in: Section 13 – Land Use / Geology, Hydrology and Hydrogeology



Consultee	Heading	Summary of Comments	Action / Link
Port of London Authority	Development of the gas pipeline and associated AGI	The proposed gas pipeline route would impact on the Port of London Authority's estate and, as such, consent would be required.	Prior written consent from the Port of London Authority will be sought for any works within their estate.
		Full technical details need to be provided for the proposed method for crossing Mucking Creek, including the depth that it is proposed the gas pipeline would be.	These details will be provided and agreed during the detailed design stage.
Shellhaven Project Environmental Action Committee (SPEAC)	Infrastructure Connections – Electrical Connection	Note that they generally support the development of GEC, but have reservations as to the potential impacts of the connection requirements. In terms of gas connection, note that it is a transitory problem and once completed will present no problems to the community. Support the selected gas pipeline route option. In terms of the electrical connection, note that potential routes / impacts have not been discussed.	Information provided in: Section 4.3 – Infrastructure Connections Section 18 – Indirect / Secondary and Cumulative Impacts
Thurrock Council (Highways)	Development of the gas pipeline and associated AGI	Thurrock Council (Highways) has no objections to the proposed gas pipeline route. A Transport Statement will be required to detail the traffic impacts / proposed traffic management measures / Travel Plan.	Information and assessment provided in: Section 14 – Transport and Infrastructure
SECTION 8 STAKEHOLDER CONSULTATIONS AND ADDITIONAL STUDIES



Consultee	Heading	Summary of Comments	Action / Link
Thurrock Council (Pollution Control)	Development of the gas pipeline and associated AGI	Note that the methodology in the Scoping Study is satisfactory for aspects they would consider, namely Air Quality / Noise and Vibration / Hydrology and Hydrogeology / Geology	Information and assessment provided in: Section 9 – Air Quality Section 10 – Noise and Vibration Section 13 – Land Use / Geology, Hydrology and Hydrogeology
Thurrock Thames Gateway Development Corporation	Air Quality	Please note comments made by Natural England regarding cumulative impacts of air pollution.	Information and assessment provided in: Section 9 – Air Quality
	Landscape and Visual	Please note comments made by Natural England.	Information and assessment provided in: Section 11 – Landscape and Visual
		Please note comments made by Natural England regarding BAP species and habitats, the sources of data for biological records and the timing of the ecological surveys.	Information and assessment provided in: Section 12 – Ecology
	Ecology	Please note comments made by Essex Wildlife Trust and the Environment Agency regarding the proximity of designated nature conservation areas and individual species.	Information and assessment provided in: Section 12 – Ecology
	Land Use / Geology, Hydrology and Hydrogeology	Please note comments from Natural England regarding the assessment of impacts from trench excavations and open-cut crossings.	Information and assessment provided in: Section 13 – Land Use / Geology, Hydrology and Hydrogeology

SECTION 8 STAKEHOLDER CONSULTATIONS AND ADDITIONAL STUDIES



Consultee	Heading	Summary of Comments	Action / Link
		Please note comments from Environment Agency regarding Flood Risk, Contaminated Land and Pollution Control.	Information and assessment provided in: Section 13 – Land Use / Geology, Hydrology and Hydrogeology
	Traffic and Infrastructure	Please note comments from Thurrock Council's Senior Engineer regarding the need for a Transport Statement to consider potential traffic implications during construction.	Information and assessment provided in: Section 14 – Transport and Infrastructure
	Cultural Heritage	Please note comments / advice from Essex County Council.	Information and assessment provided in: Section 15 – Cultural Heritage
	Socio-Economics	Please note comments from East of England Development Agency (EEDA).	Information and assessment provided in: Section 16 – Socio-Economics



8.3 Community Involvement / Residents Information Days

- 8.3.1 GECL has also informed the public of proposals regarding GEC, the gas pipeline and associated AGI via a number of measures. These have included: meetings; exhibitions (Residents Information Days); newsletters; website and e-mail; free-phone and freepost; advertisements; and, press releases.
- 8.3.2 At the Residents Information Days members of GECL, InterGen and their consultancy teams were available to address the questions and queries of the local community.
- 8.3.3 The Residents Information Days aimed to:
 - Raise awareness of GEC, the gas pipeline and the associated AGI. and their likely impacts;
 - Receive comments on GEC, the gas pipeline and the associated AGI, and the scope of the EIA; and
 - Establish the concerns, whether real or perceived, of stakeholders, in order that these can be addressed and, where practical, mitigated.
- 8.3.4 During the Section 36 Consent application process for GEC, Residents Information Days were held on 9 February 2010 at Corringham Village Hall and 10 February 2010 at East Thurrock Community Association from 14:00 to 20:00. Over the two days, 125 people signed the visitor book. However, it was noted that a small number of people did not sign in, either walking past a congested entrance or declining to do so. A Questionnaire / Feedback Form was available at the Residents Information Days which visitors were encouraged to complete to give their opinion on GEC and ask any questions in writing. A total of 85 Questionnaires / Feedback Forms were completed or partially completed. From these:
 - 53 per cent of people were very positive / positive;
 - 34 per cent of people were neutral;
 - 8 per cent of people were negative / very negative; and
 - 5 per cent of people did not provide a response.
- 8.3.5 During the development of this ES for the gas pipeline and associated AGI, a second set of Residents Information Days were held on 1 December 2010 at East Thurrock Community Association and 2 December 2010 at the Pegasus Club (Corringham) from 14:00 to 20:00.
- 8.3.6 Additionally, in part reflecting the lower than expected turn-out due to the adverse weather conditions experienced on 1 and 2 December 2010, a further set of Residents Information Days were held on 24 February 2011 at East Thurrock Community Association and 25 February 2011 at the Corringham Village Hall from 14:00 to 20:00.
- 8.3.7 Prior to the Residents Information Days advertisements were published in two local newspapers, and individual invitations and newsletters were sent to over 8700 households in the vicinity of the site, in addition to over 300 stakeholders.
- 8.3.8 Over the first set of Residents Information Days (December 2010), 17 people signed the visitor book (a much lower number than the previous GEC Residents Information Days which was more than likely due to the adverse weather conditions at the time of the exhibitions). Over the second set of Residents Information Days (February 2011), 76 people signed the visitor book.
- 8.3.9 As before, a Questionnaire / Feedback Form was available which visitors were encouraged to complete to give their opinions on GEC, the gas pipeline and the associated AGI, and ask any questions in writing. A total of 12 questionnaires were



fully completed during the first set of Residents Information Days (December 2010), and 44 questions were fully completed during the second set of Residents Information Days (February 2011).

8.3.10 From the complied questionnaires (December 2010 and February 2011), Table 8.2 shows the percentages of people expressing an opinion on the various aspects of the proposed development of GEC.



TABLE 8.2 – OUTCOME OF THE DECEMBER 2010 RESIDENTS INFORMATION DAYS

	% of People			
	Very Positive / Positive	Neutral	Negative / Very Negative	No Response
Development of GEC	73	18	7	2
Development of Gas Pipeline	71	22	7	0
Development of Associated AGI	42	36	20	2

8.4 Future Consultations

- 8.4.1 Consultation with interested parties has continued throughout the EIA process for the gas pipeline and associated AGI through meetings and correspondence.
- 8.4.2 Accordingly, throughout the determination process, GECL will continue to address any questions or concerns raised by stakeholders.

SECTION 9

AIR QUALITY



9 AIR QUALITY

9.1 Introduction

- 9.1.1 This Section addresses the potential air quality impacts associated with the development of the gas pipeline and associated AGI.
- 9.1.2 The potential air quality impacts considered in this Section include:
 - Dust produced during the construction works;
 - Emissions from construction plant on site / road traffic during construction; and
 - Emissions during commissioning / operation.
- 9.1.3 Additionally, the proposed mitigation measures are detailed, where appropriate.

9.2 Key Planning Policies

- 9.2.1 Section 3 provides the Planning Policy Context.
- 9.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

SS1	Achieving Sustainable Development
ENV7	Quality in the Built Environment
ENG1	Carbon Dioxide Emissions and Energy Performance

Draft TCSPMD

PMD1	Minimising Pollution and Impacts on Amenity
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9.3 Assessment Methodology and Significance Criteria

Assessment Methodology

9.3.1 The methodology used to assess the potential air quality impacts compares the baseline ground conditions with the likely conditions during construction, operation and decommissioning of the gas pipeline and associated AGI. This informs a qualitative assessment.

9.3.2 There are a number of pollutants considered in the assessment. These are:

- Accumulated Dust / Suspended Particulates (PM₁₀ and PM_{2.5});
- Emissions of NO₂; and
- Natural Gas.

Description of Pollutants Considered

9.3.3 Within the assessment of dust produced during construction works, the main pollutant of concern is suspended particulate matter (PM) (PM₁₀ and PM_{2.5}) and accumulated (soiling / deposition) dust. In common usage, the terms 'particulate matter' and 'dust' are interchangeable. However, for the purpose of this assessment, particulate matter less than 10 μ m and 2.5 μ m in diameter are referred to as PM₁₀ and PM_{2.5}, respectively. The term dust is considered to be those particles greater than 30 μ m in diameter.



- 9.3.4 Within the assessment of construction plant on site / road traffic during construction, NO_2 emissions have also been considered¹⁶.
- 9.3.5 Within the assessment of emissions during commissioning / operation, natural gas has been considered. Natural gas is primarily composed of methane (approximately 86 per cent) with proportions of ethane and higher derivatives (approximately 10 per cent). The remaining 4 per cent is composed of nitrogen, helium and carbon dioxide. Natural gas is non-toxic, has no irritating effects to the skin and eyes, and is not accumulated in the body.

Significance Criteria

- 9.3.6 The significance of impacts on air quality / human health is assessed by comparing the baseline conditions with the likely conditions during construction, operation and decommissioning of the gas pipeline and associated AGI.
- 9.3.7 The following significance criteria have been used to assess the magnitude of potential impacts on air quality / human health:
 - Beneficial: A beneficial impact on existing ambient air quality / human health.
 - *Negligible*: Imperceptible impact on existing ambient air quality / human health.
 - Adverse: A detrimental impact on existing ambient air quality / human health.
- 9.3.8 Where beneficial or adverse impacts have been identified, these have been assessed against the following scale:
 - *Minor*: An impact on the integrity and / or value of a receptor, but recovery is expected in the short term and no permanent impacts are predicted.
 - *Moderate*: An impact on the integrity and / or value of a receptor, but recovery is possible in the medium term and no permanent impacts are predicted.
 - *Major*: An identified significant impact at the point of exposure for a specific receptor / a permanent or long term impact on the integrity and value of a receptor.

9.4 Baseline Conditions and Sensitive Receptors

Baseline Conditions

- 9.4.1 The baseline air quality conditions in the vicinity of the gas pipeline and associated AGI are influenced by a combination of background air quality (representative of the general levels of pollution in the area away from busy roads and industry) and added emissions from local emission sources. The principal existing local emission sources are the existing CECL Power Station, Coryton Oil Refinery and agricultural activity.
- 9.4.2 The baseline air quality conditions can be determined by examining Local Authority ambient air quality data. Local Authorities have duties under Part IV of the Environment Act 1995 to assess air quality within their administrative areas. Full details of the duties are set out in the National Air Quality Strategy (NAQS).
- 9.4.3 Once Local Authorities have performed an assessment of air quality, if they find that pollutant levels are likely to exceed statutory objectives they must declare an Air Quality Management Area (AQMA) and draft an Action Plan to achieve statutory objectives.

¹⁶ SO₂ emissions from vehicles are considered to be insignificant since the introduction of low sulphur diesel and the negligible sulphur content of petrol fuels. Lead has not been included in the current assessment as it is no longer added to petrol fuels and emissions from vehicles are therefore not considered significant at a national level.



- 9.4.4 The Department of Environment Transport and the Regions (DETR) (now Department for Transport) have issued technical guidance to the Local Authorities to assist in undertaking this task. The process comprises three stages:
 - Stage 1 is intended to assist the Local Authority in determining which existing and proposed sources may have a significant impact on air quality.
 - Stage 2 is intended to provide additional screening of pollutant concentrations in the area and determine the risk of non-compliance with the air quality objective by the relevant future year.
 - Stage 3 entails a detailed and accurate appraisal of the potential impacts of the outcome of Stages 1 and 2. From this appraisal, the authority is required to determine both the magnitude and the geographical extent of any likely exceedences of the objectives.
- 9.4.5 At the end of the three stage process the Local Authority should have identified areas where there are likely exceedences of the statutory objectives and for each pollutant calculate:
 - How great an improvement is needed to meet the objectives; and
 - The extent to which different sources contribute to the problem.
- 9.4.6 This gives the Local Authority a clear picture of the sources which can be controlled or influenced, and aid the Local Authority to target more effectively the relative contributions of industry, transport and other sectors and ensure that the solutions are cost effective and proportionate when producing their Action Plan.
- 9.4.7 As part of the ongoing review and assessment process of AQMAs, a phased approach has been adopted to ensure that the level of assessment is commensurate with the risk of an air quality objective being exceeded. Therefore, each Local Authority is required to undertake an Updating and Screening Assessment (USA) of the AQMAs in their administrative area in order to identify changes which have occurred since the previous review and assessment and which could potentially lead to a risk of an air quality objective being exceeded. Where a risk has been identified the local authority is required to undertake a more detailed assessment to determine the likelihood of an exceedance and revise the AQMA as appropriate. The last USA, undertaken by Thurrock District Council, was published in April 2009¹⁷.
- 9.4.8 Detailed in the April 2009 USA were15 AQMAs in the Thurrock District Council area. These are detailed in Table 9.1.

	Pollutant	Description
1	NO ₂	Grays Town Centre and London Road Grays
2	NO ₂	London Road South Stifford and adjoining roads
3	NO ₂	East side of Hogg Lane and Elizabeth Road
4	NO ₂	West of Chafford Hundred Visitor Centre
5	NO_2 and PM_{10}	Warren Terrace, A13 and A1306
7	NO_2 and PM_{10}	Hotels next to M25
8	NO ₂ and PM ₁₀	Hotel next to Junction 31 of M25

TABLE 9.1: SUMMARY OF THURROCK DISTRICT COUNCIL AQMA

¹⁷ Thurrock Council – Updating and Screening Assessment (April 2009) Available from: <u>http://www.thurrock.gov.uk/environment/pollution/content.php?page=local_air_quality</u>



9	NO ₂	Hotel next to Junction 31 of M25
10	NO ₂ and PM ₁₀	London Road Purfleet near to Jarrah Cottages
12	NO ₂	Watts Wood estate next to A1306
13	NO ₂	London Road Averley next to A1306
15	NO ₂	Near to M25 on edge of Irvine Gardens, South Ockendon
16	NO ₂	Next to M25 off Dennis Road
21	NO ₂	Hotel on Stonehouse Lane
23	NO ₂	London Road West Thurrock

- 9.4.9 As can be seen from the Table, the AQMAs lie along the routes of busy roads in the area. As such, the areas designated are fairly small and will primarily be the result of pollution from road traffic.
- 9.4.10 There are a number of automatic monitoring stations that are or have been operated on behalf of DEFRA in the UK. The results from the monitoring sites are available on the Internet. There are four monitoring stations in the vicinity of the gas pipeline and associated AGI. These monitoring stations have been in operation for a number of years and have been recording data, which will include contributions from both the existing CECL Power Station and the Coryton Oil Refinery.
- 9.4.11 The locations of the automatic monitoring stations in relation to the gas pipeline and associated AGI are shown in Figure 9.1. Table 9.2 provides the concentrations of pollutants (noted above to be considered) which have been measured at these automatic monitoring stations¹⁸. Data is taken as an average from 2009 which represents the latest available data.
- 9.4.12 Additionally, Table 9.3 provides the concentrations of pollutants estimated for Thurrock District Council by NETCEN for 2009 and for 2014 (the proposed year of completion to coincide with connection and commissioning of GEC)¹⁹.

¹⁸ Data downloaded from <u>http://www.airquality.co.uk/data_and_statistics.php</u>

¹⁹ Data downloaded from http://lagm1.defra.gov.uk/review/tools/background-maps-info.php?year=2008



TABLE 9.2: AVERAGE CONCENTRATIONS OF POLLUTANTS FROM AUTOMATIC MONITORING STATIONS (2009)

	NAQS Objective	Stanford-le-Hope	Rochester-Stoke	Thurrock	Southend-on-Sea
Туре	-	Kerbside	Rural	Urban Background	Rural
Minimum Distance from Gas Pipeline / AGI (km)	-	0.7	11.6	8.2	13.0
Pollutants Measured	-	NO _x / PM ₁₀ / PM _{2.5} / SO ₂	NO _x / PM ₁₀ / PM _{2.5} / SO ₂	NO _x / PM ₁₀ / SO ₂	NO _x / PM _{2.5}
NO ₂ (μg/m ³)	40	35.2	16.8	31.2	19.9
NO _x (μg/m ³)	30 ²⁰	71.6	21.9	52.3	26.3
PM _{2.5} (µg/m ³)	25	14.5	9.7	-	13.2
PM_{10} (µg/m ³)	40	21.3	20.3	21.3	24.0

TABLE 9.3: PREDICTED ANNUAL AVERAGE CONCENTRATION OF POLLUTANTS FOR 2009 AND 2014

	NAQS Objective	2009	2014
NO ₂ (μg/m ³)	40	20.7	16.7
NO _x (μg/m ³)	30 ²¹	31.6	24.2
PM _{2.5} (μg/m ³)	25	12.8	11.9
PM ₁₀ (μg/m ³)	40	19.2	18.2

 ²⁰ Represents the National air quality objectives for the protection of vegetation and ecosystems
 ²¹ Represents the National air quality objectives for the protection of vegetation and ecosystems



9.4.13 Tables 9.2 and 9.3 show that, save for NO_x , the background concentrations measured in 2009 and predicted for 2014 comply with NAQS objectives. Tables 9.2 and 9.3 indicate that the concentrations of NO_x exceed the NAQS objective for NO_x which is designated entirely as a protection for vegetation and ecosystems.

Dust Deposition Rates / Conditions for Dust Nuisance

- 9.4.14 Dust nuisance is related to the dust deposition rate and to some extent perception of the receiving surfaces.
- 9.4.15 There are no universally applicable standards relating nuisance effects to deposition rate. Nevertheless, in the UK a level of 200 mg/m²/day is commonly used to define a level above which nuisance is likely to arise. Table 9.4 shows the typical dust deposition rates for various UK sites²². The majority of the 'site' proposed for the gas pipeline and associated AGI falls in the 'open country' category.

TABLE 9.4: DUST DEPOSITION RATE FOR VARIOUS UK SITES

Type of Site	Deposition Rate (mg/m²/day)
Industrial Area	208
Commercial Town Centre	120
Outskirts of Town	77
Open Country	71

- 9.4.16 The occurrence and significance of dust nuisance is also related to particle size. Dust particles (i.e. those over 30 µm in diameter) will generally fall within 60 to 90 m of the emission source. Experience of dust nuisance episodes for comparable operations suggests that such problems do not usually extend beyond 250 m from their source and only very rarely beyond 500 m.
- 9.4.17 The construction phase of the Development is anticipated to commence in 2013 and will last approximately 9 to 12 months. The occurrence and significance of dust during this period will be heavily dependent upon the meteorological conditions at the time and location of the work. Prolonged dry weather coupled with windy conditions is most favourable to dust formation.
- 9.4.18 Table 9.5 presents recorded average monthly rainfall taken for the years 1999 to 2009. Data is taken from the Met Office website for the station at Manston²³ (approximately 62 km from the gas pipeline and associated AGI).

TABLE 9.5:AVERAGE MONTLY RAINFALL FOR 1999 TO 2009 FROM METOFFICE STATION AT MANSTON

Month	Rainfall (mm)
January	42.2
February	43.6
March	41.7
April	37.8
Мау	48.8
June	33.4
July	57.0
August	27.5
September	44.9

²² Taken from West Burton Gas Pipeline Environmental Statement (Table 11.2), EDF Energy (2006)

²³ <u>http://www.metoffice.gov.uk/climate/uk/stationdata/</u>

9.4.19



Month	Rainfall (mm)
October	57.6
November	28.2
December	42.4

During the EIA for GEC, meteorological data was taken from Southend Airport (approximately 16 km from the gas pipeline and associated AGI). Analysis of this information indicated that the predominant wind direction was from the south west, therefore blowing north east. The wind rose for 2008 can be seen in Insert 9.1.

INSERT 9.1: WIND ROSE FOR 2008



Sensitive Receptors

- 9.4.20 Following a review of the Ordnance Survey (OS) Map, a number of larger residential receptors (identified via large residential areas) have been identified within the vicinity of the gas pipeline and associated AGI.
- 9.4.21 The residential receptors that may experience perceptible dust migration are detailed in Table 9.6 and are shown in Figure 9.2.

TABLE 9.6: LARGER RESIDENTIAL RECEPTORS / RESIDENTIAL AREAS

Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
1	East Tilbury	1700
2	Linford	1100
3	Mucking (All residents)	200
4	Stanford-le-Hope	200



Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
5	Corringham	150
6	Fobbing	650

9.4.22 There are also a number of smaller, individual receptors (i.e. local farms / industries / individual houses) within the gas pipeline route corridor. These are detailed in Table 9.7 and are shown in Figure 9.3.

9.4.23 TABLE 9.7: INDIVIDUAL RECEPTORS

Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
7	Mucking (all residents)	200
8	Stanford-le-Hope (residents on St. Margaret's Avenue and Broadhope Road)	170
9	Stanford-le-Hope (residents on Fairview Avenue)	240
10	Stanford-le-Hope (residents on Wharf Road, Cabborns Crescent, Grove Road and King Edwards Road)	90
11	Stanford-le-Hope (residents on Corringham Road, Burgess Avenue, Billet Lane, Adams Road, Conrad Road and Rainbow Lane)	150
12	Stanhope Industrial Park	230
13	Great Garlands Farm	50
14	Oak Farm	250
15	Old Hall	100
16	Corringham (residents on Church Road and Rookery Hill)	20
17	Corringham (residents on Herd Lane)	180
18	LG Development (West)	500
19	LG Development (North West)	290
20	LG Development (North)	290
21	LG Development (North East)	160

9.5 Potential Impacts

Construction

Dust produced during the Construction Works

- 9.5.1 Movement of soils from construction activities is anticipated to lead to the generation of some short-term airborne soil dust. The following construction activities (previously described in Section 6) involving earthmoving operations have the potential to create dust:
 - The clearing of the working width (26 to 30m) with topsoil removed and stockpiled;
 - Trench excavation, with the subsoil stockpiled adjacent to the trench;
 - Vehicle movements around the site associated with the construction activities;
 - Pipe stringing and bending where the pipe will be laid out in preparation for welding;



- Shot-blasting operations associated with field joint coatings;
- Pipe placement in the trench (lowering in and laying); with trench spoil backfilled and compacted; and
- Restoration once construction is complete, which will involve removal of construction material, surface re-contouring, fence repair / replacement, respreading of topsoil and vegetation seeding / re-vegetation.
- 9.5.2 The nature of the construction procedures means that any dust created will be localised. In addition, the gas pipeline route corridor consists mainly of agricultural land and the amount of dust production associated with construction will be similar to that of existing agricultural practices. As part of the construction, topsoil stripping in particular will have the same impact on local air quality as agricultural field preparation / ploughing. Dust generated by the proposed operations would mostly consist of particles emitted at or close to ground level and as such should be deposited at relatively short distances downwind.
- 9.5.3 As discussed above, the emission and dispersion of dust is particularly weather dependent with prolonged dry and windy conditions the most likely to cause appreciable dust migration. The rainfall data in Table 9.5 indicates no long periods of dry conditions during the 9 12 month construction phase, which will reduce the potential for dust migration. The prevailing wind during the construction phase is expected to be from the south west, which suggests that sensitive receptors (which would be most vulnerable to dust migration) are located to the north and east of the gas pipeline route.
- 9.5.4 If prolonged dry and windy weather conditions are encountered, sensitive receptors within 500 m of the working width could be subjected to an adverse impact. However, at any one location, the construction activities will only occur for a short period of time as the active working width moves along the gas pipeline route. In some locations the impact will be no greater than that experienced by existing dust producing agricultural activity and therefore the significance can be considered as minor.

Emissions from Construction Plant On Site / Road Traffic during Construction

- 9.5.5 Emissions will also occur due to the use of diesel powered generators for the provision of site electricity supplies. Generators will be required to supply a range of essential equipment, including: welding; pumps; lights; and, testing equipment. The generators will not generate sufficient emissions to compromise air quality goals and the impact is therefore predicted to be negligible.
- 9.5.6 Details regarding the impacts on Transport and Infrastructure are discussed in Section 14. The increase in traffic experienced as a result of the construction phases of the gas pipeline and associated AGI is considered to be insignificant. Accordingly, traffic movements during the construction period will have a negligible impact on existing local air quality as traffic movements are not expected to generate sufficient vehicle exhaust emissions to compromise air quality goals (principally PM₁₀, PM_{2.5} and NO₂).

Emissions during Commissioning

- 9.5.7 Ambient air and nitrogen gas will be vented off from the gas pipeline during precommissioning testing and commissioning.
- 9.5.8 Pre-commissioning testing will involve venting off ambient air when the gas pipeline is filled with water in order to hydrostatically test it. This test will be done in stages and will comply with HSE requirements.
- 9.5.9 Due to the inert nature of the ambient air emissions there will be no impact on local air quality and human health.



Gas Pipeline Purging

- 9.5.10 If there is a significant period between the construction and commissioning of the gas pipeline, it is possible that the pipeline may be filled with nitrogen for safety and to prevent any corrosion occurring for the period until commissioning takes place.
- 9.5.11 When commissioning commences, this nitrogen gas will be released to the atmosphere and the pipe would be filled with natural gas. The natural gas will be slowly introduced into the gas pipeline from the NTaS Number 5 Feeder pipeline with the nitrogen / natural gas interface moving along the pipeline. The nitrogen will be vented from the gas pipeline at the GRF within the confines of the GEC site.
- 9.5.12 The nitrogen and natural gas do not generally become mixed and therefore only a small amount of natural gas is released when it reaches the end of the gas pipeline. The pipeline must be purged in this way to ensure that the gas introduced to the new CCGT units is of a known and reliable composition for safety reasons. Due to the inert nature of the majority of the emissions there will be no impact on local air quality and human health.

Operation

<u>AGI</u>

- 9.5.13 Following commissioning there will be occasional, controlled releases of natural gas at the AGI for maintenance purposes. The volumes of natural gas released will be small and will dissipate quickly. Therefore, any emissions will have a negligible impact on existing local ambient air quality and human health.
- 9.5.14 The potential for areas in which explosive mixtures will be present will be established during the detailed design of the pipeline for both manual and automatic venting operations.

Inspection and Maintenance

- 9.5.15 "Intelligent pigging" will be part of the standard inspection and maintenance procedure of the gas pipeline, and will be carried out as a baseline run within a reasonable period of time following commercial operation of GEC. The gas pipeline will thereafter be subjected to "intelligent pigging" inspection at 5 yearly intervals, unless it is otherwise confirmed that the inspection interval can be increased. When this occurs the pig trap at the AGI will be depressurised. This will involve the release of a limited quantity of natural gas and can be regarded as a controlled emission of negligible impact.
- 9.5.16 There will be emissions from the vehicles used for the inspection and maintenance of the gas pipeline, and regular aerial surveillance is envisaged. However considering the frequency of such activities the impact on local ambient air quality will be negligible.

Decommissioning

- 9.5.17 Upon cessation of operation, the gas pipeline and associated AGI will be disconnected from the NTaS Number 5 Feeder pipeline. It is currently proposed that the gas pipeline would be left buried under ground. The gas pipeline will be decommissioned in accordance with prevailing best practice. This may involve the release of a limited quantity of natural gas and can be regarded as a controlled emission of negligible impact.
- 9.5.18 It is possible that upon decommissioning, the AGI would be dismantled and removed. No major civil works would be required and therefore dust migration and emissions from on-site equipment and associated vehicles would be no greater than the predicted impacts during construction. The removal of the AGI would therefore have a negligible impact on local air quality and human health.



9.6 Mitigation Measures

Construction

- 9.6.1 The impacts of construction activities on air quality will be managed through implementing best practice procedures to reduce air emissions as part of the Environmental Management Plan (EMP). Full details of the EMP are provided in Section 18.
- 9.6.2 In order to control dust during construction operations, the following measures will be taken:
 - A mobile spray tanker and water bowser(s) will be used during long periods of dry weather to damp down dust;
 - Road sweeping vehicles will clean public roads in the vicinity of road crossings if and when necessary;
 - Wheel wash facilities will be provided at the working width access / egress points;
 - Vehicle speeds on the working width will be controlled;
 - Site management procedures, which will include monitoring of intensity and location of potential dust generating activity on site, and monitoring of weather conditions, particularly the periods when dust emission and dispersal could affect the sensitive receptors; and
 - Cleaning of the ends of the steel pipes prior to welding and field joint coating will be carried out using either shot blasting or needle guns but dust extraction equipment is used which will ensure that any dust produced is not dispersed significantly.
- 9.6.3 In addition, the following mitigation measures will be instigated to control the emissions generated from construction plant / construction traffic:
 - Trucks and construction plant entering the working width will be maintained in accordance with the manufacturer's specification to comply with all relevant regulations;
 - Unnecessary idling for trucks and plant will be avoided with engines turned off during periods of inactivity;
 - Delivery of pipe sections will be planned and coordinated to avoid congestion and excessive truck queuing / idling of trucks; and
 - Trips and trip distances will be controlled and reduced where possible.

Operation

- 9.6.4 The gas pipeline has no means of producing any emissions during normal operation and therefore no mitigation measures are required.
- 9.6.5 Emissions associated with the AGI and inspection and maintenance of the gas pipeline will be negligible. Therefore no mitigation is proposed.

Decommissioning

- 9.6.6 Any emissions to air during the decommissioning of the gas pipeline will be negligible and therefore no mitigation measures are proposed.
- 9.6.7 For the removal of the AGI, dust impacts will be negligible. However similar mitigation measures will be implemented to those detailed for construction.



9.7 Assessment of Residual Impact

9.7.1 The residual impact associated with the gas pipeline and associated AGI are not predicted to be significant at any of the identified sensitive receptors.

TABLE 9.8: SUMMARY OF RESIDUAL IMPACTS

	Description	Nature of Impact	Geographic Scale
	Dust emissions during construction works	Minor Adverse, Short Term	Local
Ormation	Emissions from construction plant	Negligible	Local
Construction	Emissions from construction traffic	Negligible	Local
	Pre-commissioning testing	No impact	Local
	Pipeline purging (if required)	No impact	Local
	Emissions at AGI	Negligible	Local
Operation	Inspection and Maintenance (Emissions at AGI)	Negligible	Local
	Inspection and Maintenance (Emissions from traffic)	Negligible	Local
Decommissioning	Emissions at AGI	Negligible	Local
Decommissioning	Removal of AGI	Negligible	Local

9.8 Assessment of Cumulative Impact

9.8.1 Indirect / Secondary and Cumulative Impacts are assessed in Section 18.

SECTION 10

NOISE AND VIBRATION



10 NOISE AND VIBRATION

10.1 Introduction

- 10.1.1 This Section addresses the potential noise and vibration impacts associated with the development of the gas pipeline and associated AGI.
- 10.1.2 The potential noise and vibration impacts considered in this Section include:
 - Temporary noise and vibration from construction activities;
 - Noise and vibration from operational activities;
 - Noise and vibration from any increases to road traffic attributed to the development of the gas pipeline and associated AGI; and
 - Potential noise and vibration from decommissioning.

10.2 Key Planning Policies

- 10.2.1 Section 3 provides the Planning Policy Context.
- 10.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

<u>East of England Plan</u>

ENV7 Quality in the Built Environment		
Draft TCSPMD		
PMD1	Minimising Pollution and Impacts on Amenity	

10.3 Assessment Methodology and Significance Criteria

10.3.1 The assessment methodology and significance criteria used to assess each type of noise and vibration impact is based on the application of a number of British Standards and Guidance Documents. These determine the types of data to be collected and assessment methodology to be applied in addition to determining the significance / compliance criteria to be used.

British Standards and Guidance Documents

- 10.3.2 The British Standards used in the assessment include:
 - BS 7445 (2003): Description and Measurement of Environmental Noise which defines parameters, procedures and instrumentation required for noise measurement and analysis.
 - BS 5228 (2009): Noise and Vibration Control on Construction and Open Sites which provides an industry-accepted guide for noise and vibration control, and includes sound power level (SWL) data and measured noise data at 10 m for individual plant. It also includes a calculation methodology for determining the noise from construction activities. The document also provides practical information on noise reduction measures, suggested noise limits and promotes a *'best practicable means'* approach to control noise.
 - BS 6472 (2008): Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hertz (Hz) to 80 Hz) which presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration), above which adverse comment is likely to occur in residential properties.



- BS 7385 (1993): Evaluation and Measurement for Vibration in Buildings which presents guide values or limits for transient vibration, above which there is a likelihood of cosmetic damage.
- BS 4142 (1997): Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas which can be used for assessing the impact of noise from mechanical services plant. The method compares the difference between the *'rating level'* of the new noise with the *'background level'* at the receptor position.
- 3.3 Other Guidance used in the assessment includes:
 - The Department of Transport (Welsh Office Memorandum) Calculation of Road Traffic Noise (CRTN) (1998) which describes procedures for traffic noise calculations and is suitable for environmental assessments of schemes where road traffic noise may have an impact.
 - The Design Manual for Roads and Bridges (DMRB), produced by the Highways Agency (Volume 11, Section 3, Part 7, HA 213/08) which provides guidance on the assessment of road traffic noise. The guidance presents a means of assessing road traffic noise, and provides advice on appropriate methodologies for assessment and potential impacts. The DMRB states "*in the period following a change in traffic flow, people may find benefits or dis-benefits when the noise changes are as small as 1 dB(A) equivalent to an increase in traffic flow of 25 per cent or a decrease in traffic flow of 20 per cent".*
 - The World Health Organisation (WHO) Guidelines for Community Noise (1999) which discusses noise impacts generally and recommends guideline noise limits for community noise. In particular, it recommends a maximum external noise level at dwellings (to reduce the impacts of the internal noise on sleep) of 45 decibels (dB) equivalent average sound level (dB LAeq) (for the 8 hours between 23:00 and 07:00).
 - The Environment Agency Document Horizontal Guidance for Noise (H3) Part 2 Noise Assessment and Control (2002) which provides detailed guidance on the prediction, standards, assessment, measurement and control of noise by design, by operational, and management techniques and abatement technologies.

Assessment Methodology / Significance Criteria for Construction

Assessment Methodology

- 10.3.4 During construction, assessment of noise and vibration impacts has been undertaken in accordance with BS 5228.
- 10.3.5 BS 5228 provides practical information on noise and vibration reduction measures and promotes a 'best practicable means' approach to control noise and vibration. The calculation method provided in BS 5228 is based on the number and types of equipment operating, their associated sound power levels, and the distance to receptors, together with the effects of any screening.
- 10.3.6 There are no current national standards or guidelines that give noise limits for construction sites. However, BS 5228 does provide several examples of possible noise limits for construction activities.
- 10.3.7 It should be noted that the noise calculations do not include a correction for barriers or other mitigation measures. Therefore the noise prediction methodology aims to model the "*worst case*" noise impact, as this is when all identified plant items operate simultaneously in close proximity without attenuation.
- 10.3.8 Vibration from construction activities may impact on adjacent buildings. The criteria used in this assessment relate to the potential for cosmetic damage, not structural

10.3.3



damage. The principal concern is generally transient vibration due to impact piling. Cosmetic damage is most likely to occur within the first 20 m of piling activities; damage is less likely to occur at greater distance. Likely levels of vibration at given distances can be predicted from existing piling vibration data.

10.3.9 BS 7385 establishes the basic principles for carrying out vibration measurements and processing the data with regard to evaluating vibration impacts on buildings. Table 10.1 provides recommended Peak Particle Velocity (PPV) vibration limits for transient excitation for different types of buildings (as set out in BS 7385: Part 2, 1993).

TABLE 10.1: PEAK PARTICLE VELOCITY (PPV) LIMITS FOR COSMETIC DAMAGE¹

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse		
	4 Hz to 15 Hz	15 Hz and above	
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above		
Un-reinforced or light framed structures. Residential or light commercial type buildings ²	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above	

1 Values referred to are at the base of the building.

2 At frequencies below 4 Hz a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Significance Criteria

10.3.10 Table 10.2 sets out the construction noise significance thresholds taken from BS 5228 for day, evening, night and weekend periods.

TABLE 10.2: 0	CONSTRUCTION NOISE SIGNIFICANCE THRESHOLD LEVELS
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Period	Period Classification	Threshold Level (dB LAeq,T)
Night-time	23:00 - 07:00	45
Evening & Weekends	19:00 – 23:00 Weekdays 13:00 – 23:00 Saturdays 07:00 – 23:00 Sundays.	55
Daytime	07:00 – 19:00 07:00 – 13:00 Saturdays	65

Assessment Methodology / Significance Criteria for Operation

Assessment Methodology

- 10.3.11 During operation, assessment of noise and vibration impacts has been undertaken in accordance with BS 4142.
- 10.3.12 BS 4142 provides guidance as to the likely community response to new fixed noise sources affecting sensitive residential receptors. The rating method detailed within this standard is widely accepted by local authorities as a means of assessing building plant noise. BS 4142 requires separate analysis for day and night time periods. It compares the 'rating level' of the new noise with the existing 'background level'. The greater this difference the greater the likelihood of complaints. This is shown in Table 10.3.

TABLE 10.3: LIKELIHOOD OF COMPLAINTS BASED ON RATING IN BS 4142



Difference between Rating Level ¹ and Background Level ²	Rating in BS 4142	
-10 dB(A) or Less	Positive indication that complaints are unlikely	
+5 dB(A)	Marginal significance	
+10 dB(A) or more	Indicates complaints are likely	

1 The Rating Level is the noise level attributable to the new source(s), plus a 5 dB(A) penalty if the new source has tonal or intermittent characteristics

2 The Background Level is taken as the LA90; this is the ambient noise level, which is exceeded for 90% of the time.

- 10.3.13 Where existing background noise levels are particularly low, it is appropriate to assess the overall noise level from proposed developments in terms of appropriate fixed limits. These noise limits should reflect reasonable levels in accordance with relevant guidance. For example, a fixed external noise limit of 45 dB LAeq at the façades of neighbouring receptors would limit noise levels to below that considered adequate to protect against sleep disturbance. This is equivalent to a free-field noise level of 42 dB LAeq.
- 10.3.14 This is also referenced within Appendix 2 of the Environment Agency Document Horizontal Guidance for Noise (H3) Part 2 Noise Assessment and Control.

Significance Criteria

10.3.15 Based on the above, Table 10.4 sets out the operational noise significance levels derived from BS 4142.

Significance Level	Description
Negligible	Night-time noise rating level 10 dB below the existing background noise.
Minor Adverse	Night-time noise rating level not more than 5 dB(A) above existing background noise (marginal significance).
Moderate Adverse	Night-time noise rating level between 5 and 10 dB(A) above existing background noise.
Major Adverse	Night-time noise rating level more than 10 dB above the existing background noise.

TABLE 10.4: OPERATIONAL NOISE SIGNIFICANCE LEVELS

Assessment Methodology / Significance Criteria for Traffic

Assessment Methodology

- 10.3.16 Construction and operational traffic noise has been assessed by considering the increase in traffic flows. The assessment methodology and significance criteria for potential traffic noise impacts have been adapted from the following:
 - Assessment principles set out in the CRTN guidance;
 - The DMRB, which states, "In the period following a change in traffic flow, people may find benefits or dis-benefits when the noise changes are as small as 1 dB(A) equivalent to an increase in traffic flow of 25 per cent or a decrease in traffic flow of 20 per cent. These effects last for a number of years"; and
 - PPG 24 which advises that a change of 3 dB(A) is the minimum perceptible under normal conditions and a change of 10 dB(A) subjectively is perceived as roughly halving or doubling the loudness of a sound.



Significance Criteria

10.3.17 Based on the above Table 10.5 sets out the traffic noise significance levels.

TABLE 10.5: TRAFFIC NOISE SIGNIFICANCE LEVELS

Significance Level	Noise Change Band	Perception of Change
Negligible	0 to 0.9 dB(A)	Below minimum threshold for perception of change
Minor	1 to 2.9 dB(A)	Benefits / dis-benefits may be perceptible
Moderate	3 to 4.9 dB(A)	Generally perceptible change in noise
Major	5 to 9.9 dB(A)	Increased perception of noise change
Severe	10 dB(A) or more	Subjectively perceived as a doubling or halving of noise

Limitations

- 10.3.18 The construction noise calculations do not include any reductions in relation to barriers or noise mitigation measures.
- 10.3.19 The construction noise calculations are based on the candidate equipment for the development of the gas pipeline and associated AGI. Availability and suitability of equipment may lead to substitute plant being employed, which may have different noise levels. For the purpose of a robust assessment an upper limit for noise levels has been assumed.

10.4 Baseline Conditions and Sensitive Receptors

Baseline Conditions

- 10.4.1 The route of the gas pipeline will pass to the south of Stanford-le-Hope. The area passed through is mostly open fields, with some light industrial activity interspersed with residential properties. Heavy industrial activity is focused on the area south east of Stanford-le-Hope, which contains the existing CECL Power Station, Shell Aviation Fuel Storage Farm and Petroplus' Coryton Oil Refinery. However, existing noise emissions do not significantly impact the survey area.
- 10.4.2 The following noise sources do impact some or all of the survey locations:
 - Road traffic flows along A1014 (The Manorway) and other local roads;
 - The Passenger Railway Line; and
 - The Mucking Tip.

Background and Existing Noise

- 10.4.3 A Baseline Noise Survey has been undertaken to quantify the existing noise levels at nearby selected Noise Sensitive Receptors (NSRs) within and around the Route Study Corridor. The Baseline Noise Survey quantified all noise sources that could impact on the NSRs. A copy of the Baseline Noise Survey is provided in Appendix E.1.
- 10.4.4 PB has previously undertaken an ambient noise survey in the area, the data from which fed into the ES for GEC (February 2010). The name of the initial noise survey report is 'Gateway Energy Centre Ambient Noise Survey Report (January 2010)' (GEC Baseline Noise Survey). A copy of this report is provided in GEC ES



Volume 2²⁴. Measured data from this initial noise survey combined with the Baseline Noise Survey has fed into the assessment.

- 10.4.5 A number of short-term attended measurements were used to quantify the ambient noise climate and to verify the nature of noise sources using applicable guidance. The short-term sampling method was undertaken at the nearest NSRs to the gas pipeline route and at key locations within and around the Route Study Corridor. Weekday measurements were taken during the day, evening and at night.
- 10.4.6 In the GEC Baseline Noise Survey, measurements were undertaken at six locations. These are identified in Table 10.6. Measurements took place on typical weekdays between the 27th and 28th of January 2010.
- 10.4.7 In the more recent Baseline Noise Survey, measurements were undertaken at four locations. These are also identified in Table 10.6. Measurements took place on a typical weekday: Thursday 13th January 2011.
- 10.4.8 Further to this, Table 10.7 summarises the measured existing daytime and evening background noise levels at the NSRs.

²⁴ This is available to download at: <u>http://www.gatewayenergycentre.co.uk/</u>



TABLE 10.6: SELECTED NOISE MONITORING LOCATIONS WITHIN 500 M OF THE GAS PIPELINE ROUTE

GEC Baseline Noise Survey (January 2010)				
GEC BNS (Jan 2010) Monitoring Location	Location	Approximate Distance from Indicative Gas Pipeline Route (m)	Approximate Distance from AGI (m)	
1	Corner of Billet Lane and Rainbow Lane	400	800	
2	Oak Farm, High road	500	1000	
3	Corringham Primary School, Herd Lane	550	1700	
4	End of Wharf Road, Corringham	600	2000	
5	Oozedam Farm, The Manorway	450	2500	
6	New Residential Development, Haven Road, Canvey Island	3500	4500	
Baseline Nois	e Survey (January 2011)			
BSN (Jan 2011) Monitoring Location	Location	Approximate Distance from Indicative Gas Pipeline Route (m)	Approximate Distance from AGI (m)	
1A	St. Cleres School, Butts Lane, Stanford-Le-Hope	280	400	
2A	Mucking Wharf Road, Mucking, Stanford-Le-Hope	150	250	
3A	Wharf Road, Stanford-Le-Hope	200	550	
4A	Rockery Hill, Corringham, Stanford-Le-Hope	230	1500	



NSR Number	Measurement Position	Lowest Day Time Recorded LA90 (dB(A))	Lowest Night Time Recorded LA90 (dB(A))	
NSR 1	Corner of Billet Lane and Rainbow Lane	44	41	
NSR 2	Oak Farm, High road	45	37	
NSR 3	Corringham Primary School, Herd Lane	45	37	
NSR 4	End of Wharf Road, Corringham	38	31	
NSR 5	Oozedam Farm, The Manorway	54	38	
NSR 6	New Residential Development, Haven Road, Canvey Island	43	38	
NSR 1A	St. Cleres School, Butts Lane, Stanford-Le-Hope	56	36	
NSR 2A	Mucking Wharf Road, Mucking, Stanford-Le-Hope	41	30	
NSR 3A	Wharf Road, Stanford-Le-Hope	40	33	
NSR 4A	Rockery Hill, Corringham, Stanford-Le-Hope	38	30	

TABLE 10.7: BASELINE NOISE SURVEY RESULTS



10.5 Potential Impacts

Construction

Gas Pipeline

- 10.5.1 Individual assessment of each identified construction equipment / plant item has been undertaken in order to assess the likely noise level at the NSR's. Typical sound power levels for each item of construction equipment / plant has been taken from the historic sound level data contained within BS 5228.
- 10.5.2 Table 10.8 provides a summary of predicted noise levels at each identified NSR during construction of the gas pipeline.



TABLE 10.8: PREDICTED NOISE LEVELS AT EACH NSRs DURING CONSTRUCTION OF THE
GAS PIPELINE

Construction	LAeq at 10 m from Plant	Cumulative Calculated Sound Pressure Level, Leq (10h), dB(A) at Individual NSR Distances									
Activity / Associated Plant		150m from Plant	200m from Plant	230m from Plant	280m from Plant	400m from Plant	450m from Plant	500m from Plant	550m from Plant	600m from Plant	3500 m from Plant
Site Preparation											
Bulldozer	79										
Tracked Excavator / Loader	77										
Water Pump	63										
Cumulative		55	53	52	50	47	46	45	44	43	28
Excavation	-	-									
Tracked Excavator	73										
Dump Truck	71										
Hdd Rig	73										
Tractor Side Boom	74										
Wheeled Lorries	84										
Cumulative		57	55	54	52	49	48	47	46	45	30
Rolling Compa	action										
Roller	81										
Roller Vibratory Plate	49										
Cumulative		55	53	52	50	47	46	45	44	43	28
Welding / Cutt	ing steel										
Welder	73										
Generator	81										
Steel Cutter	76										
Cumulative		57	55	54	52	49	48	47	46	45	30
Other	I	I		I	I		I	I	I	I	
Tracked Excavator	73										
Concrete Pump	77										
Tractor	72										
Cumulative		53	51	50	48	45	44	43	42	41	26
BS 5228 Total Construction Noise at NSR		63	61	59	58	55	54	53	52	51	36



- 10.5.3 The sound pressure levels shown are worst-case estimates based on propagation attenuation only, and do not consider any mitigation from screening, directivity or absorptive effects.
- 10.5.4 Table 10.8 shows that none of the identified NSRs are likely to experience construction noise levels above the weekday significance threshold level of 65 dB LAeq.
- 10.5.5 The construction noise calculations can be found in Appendix E.2.

AGI

- 10.5.6 The nearest NSR to the proposed AGI is NSR 2A: Mucking Wharf Road, Mucking. This is at a distance of approximately 250 m.
- 10.5.7 Based on the above construction noise calculations, noise from the construction phase of the AGI is predicted to have no significant impact.

Vibration Assessment

- 10.5.8 Surface plant such as cranes, excavators, compressors and generators are not recognised as sources of high levels of vibration. Even at a close distance of 10 m, PPV levels significantly less than 5 mm/s are generated.
- 10.5.9 For example, a bulldozer would generate a PPV of approximately 0.6 mm/s and a 'heavy lorry on poor road surface' would generate a PPV of less than 0.1 mm/s. These values are well below limits at which cosmetic building damage becomes likely (15 mm/s).

Traffic Assessment

- 10.5.10 There may be noise associated with construction traffic. Strategic roads will be used by such traffic as far as possible, although minor roads may also have to be used for access to the working width. Further details on Transport and Infrastructure impacts are provided in Section 14.
- 10.5.11 Noise arising from the construction traffic will increase noise levels on the local roads, although the impact will be in the short term restricted to the duration of the construction period, and will vary day to day as progression is made along the gas pipeline route.
- 10.5.12 An assessment of the change in noise associated with increased construction traffic along existing local roads has been undertaken in accordance with the guidance contained within the CRTN.
- 10.5.13 Table 10.9 presents a summary of the construction traffic noise. It should be noted that information relating to the exact location of the construction compound / pipe storage yard is not yet available and therefore a worse case assessment is provided. Maximum daily construction traffic movements are taken from Table 14.4. In providing the worst case assessment, Table 10.9 considers the maximum daily construction traffic movements to be a combined figure for the mobilisation / construction / demobilisation periods (therefore to total approximately 319 vehicles) with all construction traffic movements travelling down each of the roads listed.
- 10.5.14 However, in reality the daily construction traffic movements will be spread across the mobilisation / construction / demobilisation periods (as shown in Table 14.4) with construction traffic movements dispersed across the road network (i.e. all construction traffic movements will not affect all roads listed).



Road Name	Average Annual Daily Transport ²⁵	Maximum Daily Construction Traffic Movements	Percentage Change		
A13 (M25 to A126)	77347	319	0.4		
A13 (A126to A1012)	72247	319	0.4		
A13 (A1012 to A1089)	82509	319	0.4		
A13 (A1089 to A128)	75449	319	0.4		
A13 (A128 to A1014)	61352	319	0.5		
A1014 (A13 to Southend Rd)	24553	319	1.3		
A1014 (Southend Rd to Sorells)	11819	319	2.7		
A1014 (Gate 2 to Gate 3)	4062	319	7.9		

TABLE 10.9: SUMMARY OF THE CONSTRUCTION TRAFFIC NOISE

10.5.15 The DMRB states, "In the period following a change in traffic flow, people may find benefits or dis-benefits when the noise changes are as small as 1 dB(A) – equivalent to an increase in traffic flow of 25 per cent or a decrease in traffic flow of 20 per cent".

10.5.16 As the predicted increase in traffic flow is below 25 per cent, it can be concluded that noise increase from construction traffic will be negligible.

Pre-Commissioning

- 10.5.17 Pre-commissioning testing at the Butts Lane AGI will involve venting off ambient air when the pipeline is filled with water during hydrostatic testing. Venting will occur over a few daylight hours, and noise is created as air is vented off until the pipeline is clear of water vapour.
- 10.5.18 Noise from venting will be controlled by the pressure at which air / nitrogen is introduced by opening and closing small venting valves. Noise will be limited to a sound pressure level of 86 dBA at source by means of attaching a portable silencer stack to the exhaust system.
- 10.5.19 If further measures are necessary, then temporary straw bale screening walls will be built to act as an acoustic enclosure around the venting stack. With the identified mitigation measures in place, noise levels at the nearest NSRs from gas venting at the AGI are predicted to be below the existing background noise level.
- 10.5.20 Therefore, in terms of impact they are not considered to be significant.

Operation

Gas Pipeline

10.5.21 Apart from infrequent maintenance activity, the gas pipeline will not give rise to audible noise under normal operating conditions and consequently is not assessed further.

<u>AGI</u>

²⁵ Flows taken from the *Gateway Energy Centre Transport Report (December 2010).*



- 10.5.22 Operational noise levels from the AGI would be confined to scheduled maintenance work or when small volumes of gas may need to be vented or re-compressed. Such operations will be infrequent and would normally be carried out during the daytime. The AGI's distance to the nearest NSR is predicted to result in a negligible impact.
- 10.5.23 BS 4142 prescribes that a 5 dB correction should be added to the specific noise levels if the noise contains either a distinguishable discrete continuous note, distinct impulses, or is irregular enough to attract attention. Noise from the venting of gas could be described as irregular and tonal, as such the 5 dB penalty has duly been applied to this source.
- 10.5.24 Table 10.10 summarises the predicted noise levels (constant A-weighted Sound Pressure Level, LA) from the AGI, at each of the identified NSR locations. The measured background noise levels (LA90) are also shown and compared to the BS 4142 rating level.



TABLE 10.10: OPERATIONAL NOISE ASSESSMENT BASED ON BS 4142

NSR Location No.	NSR 1	NSR 2	NSR 3	NSR 4	NSR 5	NSR 6	NSR 1A	NSR 2A	NSR 3A	NSR 4A
Predicted AGI Noise Level, LAeq	30	28	23	22	20	15	36	40	33	24
Rating Penalty, dB	5	5	5	5	5	5	5	5	5	5
Rating Level, dB(A)	35	33	28	27	25	20	41	45	38	29
Lowest Daytime Background Level, LA90	44	45	45	38	54	43	56	41	40	38
Difference	-9	-12	-17	-11	-29	-23	-15	4	-2	-9


- 10.5.25 Table 10.10 shows that noise levels from the AGI will be considered as minor adverse at NSR locations 1, 2A, 3A and 4A. It should be noted that NSR locations 1 and 4A are at the margin of being negligible.
- 10.5.26 AGI noise levels at all other NSRs will be negligible.
- 10.5.27 Helicopter fly-overs will be required to inspect the gas pipeline route. During fly-overs noise will be clearly audible at NSRs along the route. However, as these fly-overs will be infrequent events (approximately one every two weeks) and will take place at the same time as the existing fly-overs for the existing CECL Power Station gas pipeline. Therefore they will not create any additional noise impact and are not considered further.

Traffic Assessment

- 10.5.28 Traffic flow (and thus noise) associated with the operation of the gas pipeline and associated AGI compared with that for the existing area is not anticipated to change significantly. This is because the gas pipeline and associated AGI will be operated remotely with only infrequent maintenance required.
- 10.5.29 Noise associated with vehicle movements during the operation is therefore considered to be negligible.

10.6 Mitigation Measures

Construction

Gas Pipeline and AGI

- 10.6.1 As displayed in Table 10.8 there are predicted to be no significant noise impacts at any of the identified NSR's, as such construction noise mitigation measures are not required.
- 10.6.2 Normal working hours for general activities (such as top-soil stripping, welding, and pipe-laying / the movement of vehicles / the running of motorised plant and equipment) are 07:00 to 19:00 hours Monday to Saturday. No work on any Sunday or Bank Holidays is proposed to be undertaken. However, there may be exceptions to these working hours.
- 10.6.3 The exceptions to the working hours could be during non-destructive / pressure testing and commissioning and also in the event of special circumstances that may include HDD operations. These exceptions will be agreed with the Local Planning Authority, and will take into account NSR near to the gas pipeline and associated AGI.
- 10.6.4 Best practice methods to be adopted include combinations of the following as appropriate:
 - Location and orientation of construction equipment / plant away from NSRs wherever possible (i.e. appropriate selection of working width);
 - Where practicable, inherently quiet plant will be selected to provide reduction of noise at source (reducing the number of plant can reduce the intensity of the activity, although this will serve to prolong the period of activity and consequently noise generation);
 - Controlling noise at source by effective silencers on machines;
 - Avoiding unnecessary running of machinery;
 - Use of acoustic covers on machinery wherever practical;
 - Regular maintenance of plant and machinery;



- Use of earth bunds where required (created from soil excavated from trenches) as acoustic barriers; and
- Construction contractors will be required to adhere to the code of practice for construction works given in BS 5228 and the guidance therein for minimising noise emissions from the site.

<u>Traffic</u>

- 10.6.5 The projected slight increase in traffic associated with the construction phase is considered to have a negligible impact. However, to ensure this a number of noise mitigation measures can be applied. These include the following:
 - Scheduling of deliveries to specific times; and
 - Maximising the capacity of any potential haulage trucks such that fewer trips are made.

Operation

- 10.6.6 During operation, the gas pipeline will not give rise to audible noise, therefore no mitigation measures are necessary. Furthermore, the noise levels from the AGI are predicted to be either minor adverse or negligible. Therefore no further mitigation is deemed to be required.
- 10.6.7 The above assessment does not take into account the landscaping to be planted to screen the AGI. It is likely that this landscaping will provide some noise attenuation which may reduce all noise levels to negligible.

10.7 Assessment of Residual Impact

- 10.7.1 During construction, noise and vibration impacts have been predicted to be below the identified significance threshold levels. During operation (mainly associated with the AGI), noise and vibration impacts are not predicted to be significant. As a result, noise and vibration impacts are expected to be negligible.
- 10.7.2 A summary of the residual impacts following mitigation are detailed in Table 10.11.

TABLE 10.11: SUMMARY OF RESIDUAL IMPACTS

Description	Nature of Impact	Geographic scale	Significance
Construction Noise	Predicted impacts less than the 65 dB LAeq noise significance threshold.	Local	Negligible
Construction Vibration	Under typical operating scenario, impact negligible; mitigation measures advised to employ 'best practicable means' to control vibration.	Local	Negligible
Construction Traffic Noise	Traffic increase below 25 per cent following DMRB methodology.	District and Local	Negligible
Operational Noise	Suitable noise limits are defined to control noise within	Local	Negligible



Description	Nature of Impact	Geographic scale	Significance
	acceptable criteria.		
Operational Vibration	No vibration impacts are predicted during the operational phase.	Local	Negligible
Operational Traffic Noise	Negligible increase in traffic movements for maintenance purposes	District and Local	Negligible

10.8 Assessment of Cumulative Impact

- 10.8.1 Indirect / Secondary and Cumulative Impacts are qualitatively assessed in Section 18.
- 10.8.2 In addition, based on the GEC Baseline Noise Survey (January 2010) and the GEC ES, a quantitative cumulative noise impact assessment of the development of the gas pipeline and associated AGI, and the development of GEC can be undertaken. Table 10.12 presents this assessment.

TABLE 10.12: CUMULATIVE NOISE IMPACT ASSESSMENT (CONSTRUCTION ONLY)

NSR	Receptor	GEC Noise Levels at Receptors, dB LAeq	Gas Pipeline / AGI Noise levels at Receptors, dB LAeq	Cumulative Noise Level at Receptor, dB LAeq	Impact
NSR1	Corner of Billet Lane and Rainbow Lane	42*	55	55	Not Significant
NSR2	Oak Farm, High road	43*	53	53	Not Significant
NSR3	Corringham Primary School, Herd Lane	45*	52	53	Not Significant
NSR4	End of Wharf Road, Corringham	46*	51	53	Not Significant
NSR5	Start of track leading up to Oozedam Farm, The Manorway	52*	54	56	Not Significant
NSR6	New Residential Development, Haven Road, Canvey Island	40*	36	42	Not Significant
NSR1A	St. Cleres School, Butts Lane, Stanford-Le-Hope	41	58	58	Not Significant
NSR2A	Mucking Wharf Road, Mucking, Stanford-Le-Hope	42	63	63	Not Significant
NSR3A	Wharf Road, Stanford-Le-Hope	42	61	61	Not Significant
NSR4A	Rockery Hill, Corringham, Stanford-Le-Hope	45	59	59	Not Significant



*Predicted noise levels for NSRs 1 to 6 have been taken from the GEC ES (Table 10.4)

10.8.3 Table 10.12 shows that cumulative noise levels are predicted to be not significant at all NSRs described in this Section.

SECTION 11

LANDSCAPE AND VISUAL



11 LANDSCAPE AND VISUAL

11.1 Introduction

- 11.1.1 This Section of the ES presents the results of the Landscape and Visual Impact Assessment (LVIA) which has been undertaken for the development of the gas pipeline and associated AGI.
- 11.1.2 The LVIA has considered the potential landscape and visual impacts during construction, operation and decommissioning of the gas pipeline and associated AGI. The potential landscape and visual impacts considered in this Section include:
 - Impacts due to the construction works associated with the development of the gas pipeline and associated AGI;
 - Impacts during construction due to the temporary siting of the Construction Contractor's construction compound and pipe storage yard; and
 - Impacts during operation associated with the AGI.

11.2 Key Planning Policies

- 11.2.1 Section 3 provides the Planning Policy Context.
- 11.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

SS7	Green Belt
SS8	The Urban Fringe
ENV1	Green Infrastructure
ENV2	Landscape Conservation
ENV7	Quality in the Built Environment
ETG1	Strategy for the Sub Region

Thurrock Borough Local Plan

BE1	Design of New Development
BE4	Landscaping
GB1	Green Belt in Thurrock
GB2	Design Considerations in the Green Belt
LN2	Landscape Improvement Areas
LN3	Landscapes of Local Importance

Draft TCSPMD

CSSP4	Sustainable Green Belt
CSSP5	Sustainable Greengrid
CSTP18	Green Infrastructure
CSTP23	Thurrock Character and Distinctiveness



PMD2	Design and Layout
PMD6	Development in the Green Belt

11.3 Assessment Methodology and Significance Criteria

Assessment Methodology

- 11.3.1 The LVIA is based on revised guidance set out in 'Guidelines for Landscape and Visual Impact Assessment' published by the Landscape Institute and Institute for Environmental Assessment (2002).
- 11.3.2 The LVIA is set out in a number of stages:
 - <u>Stage 1:</u>

This stage seeks to establish the landscape and visual baseline of the proposed development site (in this case the Route Study Corridor) and the surrounding area.

• <u>Stage 2:</u>

Based on the landscape and visual baseline established in Stage 1, this stage identifies and evaluates the potential landscape and visual impacts associated with the proposed development.

- 11.3.3 The identification of impacts needs to clearly distinguish between those impacts upon the physical landscape resource (landscape impacts) and those associated with visual amenity and views across the site (visual impacts).
- 11.3.4 Landscape and visual impacts can be direct or indirect, positive or negative and permanent (normally associated with the operation phase) or temporary (normally associated with the construction phase).

Significance Criteria

11.3.5 The Guidelines for Landscape and Visual Impact Assessment state (at Paragraph 7.42) that:

"No [quantitative] formal guidance exists for the assessment of significance for landscape and visual effects and the assessor must clearly define the criteria used in the assessment for each project, using his or her skill based on professional judgement".

Assessing Landscape Impacts

11.3.6 The Guidelines for Landscape and Visual Impact Assessment state (at Paragraph 7.14) that:

"The landscape impact assessment describes the likely nature and scale of changes to individual landscape elements and characteristics, and the consequential effect on the landscape character, resulting from the proposed development. When identifying and assessing landscape change, it is important to take into account the existing trends for change within the landscape, which may be due to natural processes or human activities".

Sensitivity of the Landscape Resource and Magnitude of Change

- 11.3.7 Landscape impacts are assessed via a combination of factors. These include:
 - The sensitivity of the landscape resource; and
 - The scale / magnitude of impacts.

Sensitivity of the Landscape Resource



11.3.8 The Guidelines for Landscape and Visual Impact Assessment state (at Paragraph 7.16) that:

"The degree to which a particular landscape type or area can accommodate change arising from a particular development, without detrimental effects on its character, will vary with:

- Existing land use;
- The pattern and scale of the landscape;
- Visual enclosure / openness of views, and distribution of visual receptors;
- The scope for mitigation, which would be in character with the existing landscape;
- The value placed on the landscape".

Furthermore (at Paragraph 7.17):

"The determination of the sensitivity of the landscape resource is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation will reflect such factors and its quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted".

11.3.9 The criteria to be used in the assessment of the sensitivity of the landscape resource are provided in Table 11.1.



TABLE 11.1: CRITERIA TO BE USED IN THE ASSESSMENT OF THE SENSITIVITY OF THE LANDSCAPE RESOURCE

Sensitivity of the Landscape Resource	Criteria	Scale	Examples
High	Landscapes that are: Highly valued / Particularly rare or distinctive / Susceptible to small changes	International National	World Heritage Site / National Park / Area of Outstanding Natural Beauty
Moderate	Landscapes that are: Valued more locally / Tolerant of moderate levels of change	Regional Local	Area of High Landscape Value (AHLV) / Undesignated but value expressed in (for instance) demonstrable use
Low	Landscapes that are: More commonplace / Potentially tolerant of noticeable change / Undergoing substantial development such that their character is one of change		Undesignated

Note that in the above Table:

- High Sensitivity corresponds to a low landscape capacity;
- Moderate Sensitivity corresponds to a moderate landscape capacity; and
- Low Sensitivity corresponds to a high landscape capacity

Where 'landscape capacity' corresponds to the ability of a particular type / area of landscape to accommodate the proposed development of the gas pipeline and associated AGI without unacceptable effects.



Magnitude of Change

11.3.10 The criteria to be used to establish the magnitude of change are provided in Table 11.2.

TABLE 11.2: CRITERIA TO BE USED TO ESTABLISH THE MAGNITUDE OF CHANGE

Magnitude of Change	Criteria
High	A noticeable change to the landscape over a wide area or an intensive change over a limited area
Medium	Minor changes to the landscape over a wide area or noticeable change over a limited area
Low	Very minor changes to the landscape over a wide area or minor changes over a limited area
Negligible	No or minimal perceptible changes to the landscape

Evaluating the Significance of Landscape Impacts

11.3.11 The significance of any identified landscape impacts is then assessed as a combination of the sensitivity of the landscape resource and the magnitude of change. This process is assisted by the use of Table 11.3.

TABLE 11.3: SIGNIFICANCE OF LANDSCAPE IMPACTS

	Magnitude of Change						
		High Medium Low Negl					Negligible
y of pe ce	High	Ν	lajor	Major / Moderate	Мс	derate	Moderate / Minor
sitivit ndsca sourc	Moderate	M Mo	ajor / derate	Moderate	Mo N	derate / /linor	Minor
Sen Lai Ré	Low	Мо	derate	Moderate / Minor	Ν	<i>l</i> inor	Minor / None
	Key:	Significant			Not	Significant	

11.3.12 A further description of the significance of landscape impacts is provided in Table 11.4.

TABLE 11.4: DESCRIPTION OF SIGNFICANCE OF LANDSCAPE IMPACT

Significance	Definition	Description
Major	A fundamental change to the environment	Noticeable change to a highly sensitive or nationally valued landscape, or intensive change to less sensitive or regionally valued landscape
Moderate	A material but non- fundamental change to the environment	Noticeable change to a landscape tolerant of moderate levels of change, or minor change to a highly sensitive or nationally valued landscape
Minor	A detectable but non- material change to the environment	Minor changes to a landscape considered tolerant of change
None	No detectable change to the environment	No discernible change to the landscape



Assessing Visual Impacts

- 11.3.13 Visual impacts are recognised by the Guidelines for Landscape and Visual Impact Assessment as a subset of landscape impacts which are concerned wholly with the effect of the development on views and the general visual amenity.
- 11.3.14 The Guidelines for Landscape and Visual Impact Assessment state (at Paragraph 7.24) that:

"The assessment of visual effects describes:

- The changes in the character of the available views resulting from the development;
- The changes in visual amenity of the visual receptors".
- 11.3.15 Visual impacts are identified for different receptors (people) who will experience views at either: their places of residence; during recreational activities; at work; or, when travelling through the area. Within the visual impact assessment, views are assessed from a number of viewpoints.
- 11.3.16 Viewpoints are chosen based on the following criteria:
 - Viewpoints should be representative of the likely impacts;
 - Viewpoints should show a range of different types of views;
 - Viewpoints should be representative of a range of different receptor groups;
 - Viewpoints should be representative of a range of distances; and
 - Viewpoints should be representative of the varying image of the gas pipeline and associated AGI in the landscape.

Sensitivity of the Visual Receptor and Magnitude of Change

- 11.3.17 Similar to assessing landscape impacts, visual impacts are assessed using a combination of factors. These include:
 - The sensitivity of the visual receptor; and
 - The scale / magnitude of impacts.

Sensitivity of the Visual Receptor

11.3.18 The Guidelines for Landscape and Visual Impact Assessment state (at Paragraph 7.31) that:

"The sensitivity of visual receptors and views will be dependent on:

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor;
- The importance of the view (which may be determined with respect to its popularity or numbers of people affect, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art".
- 11.3.19 The criteria to be used in the assessment of the sensitivity of the visual receptors are described in Table 11.5.



TABLE 11.5: CRITERIA FOR THE ASSESSMENT OF VISUAL RECEPTOR SENSITIVITY

Sensitivity of the Visual Receptor	Criteria	Scale	Examples	
High	Views from: Highly valued landscapes / Residential properties / Long distance or strategic recreational footpaths / Important recreational landscape features, beauty spots and picnic areas	International National	World Heritage Site / National Park / Areas of Outstanding Natural Beauty / National Nature Reserves	
Medium	Views from: Valued areas of landscape / Local and less well used footpaths or tracks <i>Receptors include:</i> Walkers / cyclists / horse riders / road users / rail passengers	Regional Local	Area of High Landscape Value (AHLV) /Areas of Great Landscape Value (AGLV) / Landscapes of County Importance (LCI) / Locally Important Landscapes / Undesignated but value expressed in (for instance) demonstrable use	
Low	Views from: Landscapes of lower value with low footpath or recreational use / Non- designated farmland or moorland / Commercial property / Outdoor recreation areas (e.g. playing fields). <i>Receptors include:</i> People at their place of work or taking part in activities not involving appreciation of the landscape.	Local	Undesignated	



Magnitude of Change

11.3.20 The criteria to be used to establish the magnitude of change are provided in Table 11.6.

TABLE 11.6: CRITERIA TO BE USED TO ESTABLISH THE MAGNITUDE OF CHANGE

Magnitude of Change	Criteria
High	A major change or obstruction of an existing view, with the development being directly visible and appearing as a dominant feature in the foreground.
Medium	A moderate change or partial view of a new element within the existing view that may be readily noticed, with the development being directly or obliquely visible (including glimpsed, partly screened or intermittent views) such that it appears a prominent feature in the middle ground.
Low	A low level of change to the existing view, with the possibility that the development may be obliquely viewed or partly screened such that it appears as a visible feature in the background landscape. This may include the development being viewed when moving at speed.
Negligible	A small or intermittent change to the existing view, with the possibility that the development may be obliquely viewed and mostly screened such that it appears as a minor element in the distant background. This may include the development being viewed at high speed over short periods and capable of being missed by the casual observer.

Evaluating the Significance of Visual Impacts

11.3.21 The significance of any identified visual impacts is then assessed as a combination of the sensitivity of the visual receptors and the magnitude of change. This is a process assisted by the use of Table 11.7.

TABLE 11.7: SIGNIFICANCE OF VISUAL IMPACTS

	Magnitude of Change						
		ŀ	ligh	Medium		Low	Negligible
y of eptor	High	N	lajor	Major / Moderate Moderate		derate	Moderate / Minor
sitivit I Rec	Medium	M Mo	ajor / derate	Moderate	Moo N	derate / <i>I</i> linor	Minor
Sen Visua	Low Moderate Moder		Moderate / Minor	Ν	<i>l</i> inor	Minor / None	
	Key:	Significant			Not	Significant	

11.3.22

A further description of the significance of visual impacts is provided in Table 11.8.

TABLE 11.8: DESCRIPTION OF SIGNIFICANCE OF VISUAL IMPACTS

Significance	Description
Major	A substantial deterioration or improvement to the existing view or situation
Moderate	A moderate deterioration or improvement to the existing view or situation
Minor	A small deterioration or improvement to the existing view or situation
None	No change



Type and Probability of Landscape and Visual Impacts

- 11.3.23 The type and probability of impact are also considered and included at the end of the assessment. These are discussed as per the terms defined below:
 - <u>Temporary / Permanent</u>

The time period over which an impact may occur is referred to as 'temporary' (used to define shorter time scales mainly those associated with construction) or 'permanent' (used to define longer time scales mainly those associated with operation).

• Positive / Negative (Beneficial / Adverse)

The effects may be positive (beneficial), neutral or negative (adverse). In the case of an industrial development it is likely that the most noticeable effects and changes will be those due to landscape and visual impacts. However, the assessment guidelines do not allow for an automatic assumption that all impacts would be negative.

11.3.24 Mitigation measures are considered where there is scope for undertaking works that will assist in preventing, reducing or offsetting any adverse effects of the development of the gas pipeline and associated AGI.

11.4 Baseline Conditions and Receptors

Landscape Baseline

- 11.4.1 Landscape character is what makes an area unique.
- 11.4.2 Natural England define it as²⁶ "a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and / or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse. By understanding how places differ Natural England can ensure that future development in an area is well situated, sensitive to its location, and contributes to environmental, social and economic objectives for the area".

National Landscape Character Areas²⁷

11.4.3 The western section of the Route Study Corridor is located within the Northern Thames Basin Character Area and the eastern section of the Route Study Corridor is location within the Greater Thames Estuary Character Area. National Landscape Character Areas are shown in Figure 11.1.

Northern Thames Basin National Landscape Character Area

- 11.4.4 Key characteristics of the Northern Thames Basin Joint Character Area 111 include:
 - "A diverse landscape with a series of broad valleys containing the major rivers Ver, Colne and Lea and extensive areas of broadleaved woodlands being the principal features of the area. The landform is varied with a wide plateau divided by the valleys.
 - Hertfordshire's large towns, the M25 and M1 motorways, railway line and prominent electricity pylons are also a major influence on character.
 - Floodplain land is commonly arable sub-divided by hedgerow-deficient field boundaries. Open grazing land remains in certain areas.

²⁶ http://www.naturalengland.org.uk/ourwork/landscape/englands/character/default.aspx

²⁷ Discussion taken from http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/southeast.aspx



- Many river valleys have been extensively modified by reservoirs, current and reclaimed gravel pits, landfill sites, artificial wetlands, river realignments and canals.
- Smaller, intimate tree-lined valleys supporting red brick villages provide a contrast to the more heavily developed major river valley floodplains. Within these river valleys, organic field shapes are common, defined by water courses and the legacy of woodland clearances rather than formal enclosure patterns.
- Broader plateau areas are mainly in agricultural use, with field patterns exhibiting the regular shape characteristic of 18th century enclosures."
- 11.4.5 In terms of shaping the future, the following objectives are outlined for the Northern Thames Basin Joint Character Area 111:
 - "The conservation of woodlands and hedgerows partially through promotion of economically viable uses of these features would ensure their continuity.
 - Agri-environmental schemes are needed to help enhance the landscape and nature-conservation value of farmland.
 - The encouragement of appropriate land management in smaller farms would help retain the traditional, hedged, irregular field shapes.
 - An overall strategy would help enhance the character of the landscape within the Green Belt.
 - A coordinated programme of river valley restoration should be considered."
- 11.4.6 As conservation and enhancement form the main objectives for shaping the future, the sensitivity of the Northern Thames Basin Joint Character Area is considered to be moderate (therefore having a corresponding moderate landscape capacity).

Greater Thames Estuary National Landscape Character Area

- 11.4.7 Key characteristics of the Greater Thames Estuary Joint Character Area 81 include:
 - Extensive open spaces dominated by the sky within a predominantly flat, lowlying landscape. The pervasive presence of water and numerous coastal estuaries extend the maritime influence far inland.
 - Pressure on edges, particularly around major estuaries, from urban, industrial and recreational developments together with the associated infrastructure requirements often on highly visible sites against which the marshes are often viewed.
 - The Thames edge marshes are themselves subject to the chaotic activity of various major developments including ports, waste disposal, marine dredging, urbanisation, mineral extraction and prominent power stations plus numerous other industry-related activities such as petrochemical complexes.
- 11.4.8 In terms of shaping the future, the following objectives are outlined for the Greater Thames Estuary Joint Character Area 81:
 - "The restoration of traditional cattle and sheep grazing pasture should be addressed. This might include the conversion of arable land to grazing marsh and pasture and the idea of managed retreat of the coastline.
 - New planting to re-establish tree and shrub cover around farmsteads and other sites on areas of higher ground would help conserve the open character of the Estuary.



- The restoration of mineral and waste sites, including areas of disused industrial land, would offer opportunities to enhance the character of the landscape."
- 11.4.9 As restoration and development form the main objectives for shaping the future, the sensitivity of the Greater Thames Estuary Joint Character Area is considered to be low (therefore having a corresponding high landscape capacity).

Local Landscape Character Areas²⁸

11.4.10 The Route Study Corridor passes through a number of Local Landscape Character Areas (LLCA). These are: Linford / Buckingham Hill Ridge; Stanford Marshes (Marshland Fringe); Fobbing and Corringham; Northern Thames Marshes (Open Coastal Marshes); and, Northern Thames Marshes (Industrial Marsh). Local Landscape Character Areas are shown in Figure 11.2.

Linford / Buckingham Hill Ridge Local Landscape Character Area

- 11.4.11 Key characteristics of the Linford / Buckingham Hill Ridge LLCA include:
 - A visually prominent rounded hill / ridge is the principal unifying feature, comprising a relatively steep escarpment on the south and west side, a flat to gently undulating top, and more moderate or gentle slopes on the north side. This relief makes a marked contrast with the lower parts of the Thames Terraces, and the alluvial marshes adjoining. Two small valleys extend along the base of the hill on its south west side.
 - Sense of elevation with dramatic panoramic views to the south over the alluvial marshlands and the Thames Estuary, and also long views to the north / west to the Langdon Hills, and to Horndon and Bulphan.
 - Contrasting land use / vegetation cover with extensive ancient oak / ask woodland and thick hedgerows clothing the south western part of the hill, with very open grazing/ arable farmland and a large golf course in the east.
 - Derelict pockets of heath land for example near the Durox site.
 - General lack of settlement apart from the mostly modem settlement of Linford and a string of farmsteads at the base of the escarpment.
 - Localised visual disturbance caused by gravel pit workings, a municipal landfill site and the Durox Industrial plant. However regenerating woodland around the Durox site, and the complex terraced landform of some of the gravel pits are features of interest with their own character.
 - Visual / noise intrusion resulting from heavy lorry traffic on Buckingham Hill Road, and power lines visual intrusion in the west and south of the area.
- 11.4.12 In terms of shaping the future, the key landscape objectives are:

"To maintain and enhance the sense of openness with extensive views, the structure and condition of existing woodlands and hedgerows, to establish a framework of new escarpment woodlands and hedgerows and to recreate acid grassland and heathland, and to retain the smaller existing sand / gravel pits as landscape features in their own right."

11.4.13 As maintenance and enhancement form the key objectives for shaping the future, the sensitivity is considered to be moderate (therefore having a corresponding moderate landscape capacity).

Stanford Marshes Local Landscape Character Area

²⁸ Discussion taken from <u>http://www.thurrock.gov.uk/planning/environment/content.php?page=char_assess</u>



- 11.4.14 Key characteristics of the Stanford Marshes (Marshland Fringe) LLCA include:
 - Low lying, mostly flat or very gently sloping land with alluvial clay / peaty soils or sandy loam soils.
 - A mixed character with a mosaic of wet gravel pits with enclosing fringing shrub, rough hedgerowed grazing land and reedbeds in the west of the area, contrasting with very open large arable fields in the east of the area.
 - Water is a prominent feature, including flooded gravel pits, reedbeds, ditches, as well as the estuary itself, providing a range of important habitats for wildlife.
 - A sense of exposure, openness and space in the west with expansive views of the Thames Estuary and its extensive mudflats at low tide, as seen from the slightly elevated sea walls. Feeling of isolation and wildness.
 - Local views of Mucking Creek and village, on slightly raised land outside of the character area, with a foreground of reedbeds provide a strong local sense of place.
 - The vertical chimneys of the Shellhaven Oil Refinery to the west are a dramatic contrast to the flat marshland character.
 - Lack of settlement apart from a few cottages at Wharf Road.
- 11.4.15 In terms of shaping the future, the key landscape objectives are:

"To maintain and enhance the sense of openness / space, isolation and wildness, the structure and condition of the varied existing habitats, to establish new areas of wet grassland, and a variety of other brackish and freshwater wetland habitats."

11.4.16 As maintenance and enhancement form the key objectives for shaping the future, the sensitivity is considered to be moderate (therefore having a corresponding moderate landscape capacity).

Fobbing and Corringham Local Landscape Character Area

- 11.4.17 Key characteristics of the Fobbing and Corringham LLCA:
 - A low ridge (at the south and east edge of the Thames Terraces), with a flat or slightly rounded top, and moderate to very gentle west and south west facing slopes. A more marked steep escarpment with a small narrow dry valley occurs locally around Fobbing Village.
 - An area of elevated relief above the surrounding marshes, with extensive views of the marshes, Shellhaven and the Thames Estuary.
 - Predominantly arable farmland with a fragmented hedge rowed field pattern, but with a localised concentration of smaller grassland fields, copses, scrub and tree groups around Fobbing and Corringham villages.
 - North-west to south-east, and west-east parallel running lanes and tracks providing historic routes to the marshes.
 - Settlement is mainly located on the edge of the area and its higher slopes, with both historic dispersed individual farmsteads and the small villages of Fobbing and Corringham prominent in views from the marshes to the south and providing a distinctive sense of place.



- The harsh urban edge to Stanford and Corringham, C 20th ribbon development along High Road at Fobbing, the Stanford Industrial Estate²⁹ and power lines are localised visually detracting influences.
- 11.4.18 In terms of shaping the future, the key landscape objectives are:

"To maintain and enhance the sense of openness, the structure and condition of existing hedgerows, and to establish new hedgerow / hedgerow tree planting, including softening the urban edge of Corringham."

11.4.19 Whilst maintenance and enhancement form some of the key objectives for shaping the future, the sensitivity is considered to be low (therefore having a corresponding high landscape capacity) as there is a need to establish new planting to soften the urban edge of the surrounding area.

Northern Thames Marshes Local Landscape Character Area

- 11.4.20 Key characteristics of the Northern Thames Marshes LLCA include:
 - A large area of alluvial marshland between the River Thames at its southern boundary, and the rising land to the west and north. It includes Fobbing, Vange, Bowers and Hadleigh marshes.
 - The common characteristics which unite these marshes are their predominantly flat, open, low-lying landscapes dominated by the sky, which gives a strong feeling of remoteness, and allows extensive views both into and out of the area. However, localised variation in landform and land use make this landscape quite fragmented.
- 11.4.21 Characteristics of the Industrial Marsh Sub-Character Area of the Northern Thames Marshes LLCA include:
 - Areas of major industrial or port development are a prominent feature of this subcharacter area and provide contrasting dramatic vertical features in a landscape context which otherwise has a strong horizontal emphasis. The plant, buildings and equipment comprise a variety of large circular tanks ranging in height between 13 and 27 m tall, arranged in clustered grids with road links between them, and a complex of refinery pipes and chimneys up to 112 m tall.
 - The former Shellhaven Refinery³⁰ is also serviced by an existing single-track railway (The Tilbury Branch Line³¹) which links from the Thames Haven Junction and divides into a series of sidings within the south of the refinery site. This rail link has scrub vegetation along most of its length which visually contains it.
- 11.4.22 Due to the proposed re-development of this area, the sensitivity is considered to be low (therefore having a corresponding high landscape capacity).

Visual Baseline

Views from the North

- 11.4.23 Towards the western section of the Route Study Corridor, the views from the north will comprise those of nearby residential receptors. These will be from Stanford-le-Hope, Corringham and Fobbing.
- 11.4.24 Towards the eastern section of the Route Study Corridor, the view from the north of will mainly be of the LG Development (once constructed), and will generally be broad and open due to the flat and relatively un-vegetated nature of the marshes.

²⁹ Note that in this ES the 'Stanford Industrial Estate' is referenced as the Stanhope Industrial Park

³⁰ Note that in this ES the "Shellhaven Refinery' is referenced as the Shell Oil Refinery

³¹ Note that in this ES the 'Tilbury Branch Line is referenced as the Thames Haven branch line



Furthermore, views are often seen in the context of the developed river edge, in particular the Coryton Oil Refinery and the visible overhead power lines. Views are the most significant from Fobbing Marshes where extensive views are possible, especially from footpaths closest to the site. Elevated landforms of Wat Tyler Country Park and the waste disposal site help to screen the site from Viewpoints in Vange Marshes and Bowers Marshes, and views are often seen in the context of the Coryton Oil Refinery.

Views from the West

11.4.25 As the land towards the western section of the Route Study Corridor is elevated, there are extensive views of the storage tanks and chimney structures associated with the existing Shell Aviation Fuel Storage Farm, CECL Power Station and Coryton Oil Refinery. They are especially significant where the hedgerow vegetation, (characteristic of the area and which would otherwise restrict views) is either lost or fragmented.

Views from the South

11.4.26 Due to the open, flat nature of the River Thames, views of the proposed Route Study Corridor are extensive. However, the wooded nature of the Hoo Peninsula means that intervening vegetation screens views, but nevertheless due to its elevated landform there are a number of vantage points at the edges of the woodland, and from more open hilltops.

Views from the East

11.4.27 Views from land to the east are dominated by the existing structures of the CECL Power Station and Coryton Oil Refinery. Views of the site from Hadleigh Marshes are either well screened or insignificant due to the distance from the site and the wider landscape context.

Potential Visual Receptors

11.4.28 Figure 11.3 shows the location of the viewpoints selected on the basis of these being most representative to visual receptors³². In each case the direction of view from the viewpoint is that directly towards the proposed gas pipeline route.

11.5 Potential Impacts

Construction

- 11.5.1 A detailed route description for the gas pipeline, including a description of the AGI (the only visible feature associated with the development during operation), is provided in Section 5.4.
- 11.5.2 Further to the different construction methods which are likely to be used for the gas pipeline and associated AGI, other construction activities likely to cause landscape and visual impacts include:
 - Movement of machinery and large scale equipment;
 - Storage of materials at construction compounds / pipe storage yards;
 - The presence of fencing;
 - The possibility that there may be temporary traffic management between construction sites;
 - The possibility that there may be some temporary closure of some public paths;

³² The locations of the viewpoints has been agreed with TTGDC.



- The possibility that there may be some temporary diversion applied to some public paths;
- The removal of vegetation across the working width;
- The potential removal of small sections of hedgerows / hedgerow trees / trees;
- The construction of and removal of soil storage bunds;
- Soil stripping and excavations; and
- Reinstatement works.
- 11.5.3 The entire construction period for the gas pipeline and associated AGI is expected to last approximately 9 to 12 months.
- 11.5.4 In line with the above, several aspects of the construction and reinstatement / replanting will serve to mitigate adverse landscape and visual impacts, and as such when assessing the potential impacts relating to the construction of the gas pipeline and associated AGI, it has been assumed that several confirmed mitigation measures will be applied. These confirmed mitigation measures include:
 - The identification of and removal of poorer quality sections of hedgerow / hedgerow trees where practical;
 - The avoidance of mature trees, therefore making the best use of gaps in any lines of trees;
 - Using trenchless crossing techniques at tree-lined crossings wherever practical;
 - Avoiding the removal of woodland by using trenchless crossing techniques wherever practical;
 - The retention and protection of existing landscape features and vegetation;
 - The siting of soil storage bunds to screen views from nearby receptors wherever practical;
 - The re-use of materials salvaged from site clearance;
 - The restoration / reinstatement / replanting of working areas to reduce the extent of disturbance;
 - The replacement / replanting of all removed hedgerows / hedgerow trees in the first planting season following construction; and
 - The maintenance of all planting for a period of 5 years to ensure full and successful establishment.
- 11.5.5 The landscape and visual impacts during construction are summarised in Table 11.9. The landscape impacts are described as the first six entries in the Table. The visual impacts are listed with reference to the viewpoints provided in Figure 11.3.

Operation

11.5.6 During operation, there are expected to be landscape and visual impacts associated with the AGI which is the only visible feature of the development during operation.

Confirmed Mitigation Measures

- 11.5.7 In line with the above, when assessing the potential impacts relating to the operation of the gas pipeline and associated AGI, it has been assumed that several confirmed mitigation measures will be applied as follows
 - a) Screening in the form of landscaping will be provided. The details of such screening shall be agreed with TTGDC (in consultation with Thurrock Council)



and are likely to be similar to that implemented at the existing AGI for the CECL Power Station given such landscaping is proven to be effective. Figure 5.2a shows the layout of the proposed AGI, and Figure 5.2b shows the elevations of the proposed AGI. Figure 5.2a includes indications of the likely landscaping that would be incorporated. The land take requirements of the proposed AGI are approximately 0.24 ha, without considering areas for roads and landscaping and 0.44 ha with areas for roads and landscaping.

Immediately following construction, at the beginning of operations, the impacts will be similar to the construction impacts (noted in Table 11.9) as the screening in the form of landscaping will not have had enough time to mature (assuming young specimens are planted). The landscape and visual impacts noted during operations are those which are likely to be experienced after approximately 7 to 15 years of planting, when the landscaping has matured. GECL, in consultation with TTGDC, proposes to inter-plant older with younger specimens with the aim of minimising the time taken for the screening to mature and become fully effective;

- b) Further landscaping and biodiversity works are to be carried out in the vicinity of the proposed AGI. Such works may include hedgerow strengthening and the planting of deciduous native hard wood species, to be undertaken in consultation with local land owners and TTGDC (in consultation with Thurrock Council); and
- c) GECL will discuss and agree an appropriate contribution with TTGDC, towards local Greengrid works. The local Greengrid, as set out in Thurrock Council's draft Core Strategy (February 2010, CSSP 5 – Sustainable Greengrid, paragraph 4.30), is intended to enable multifunctional land use of both public and private space as supported by a physical network of green links for people and wildlife. The Greengrid includes open space, biodiversity and green infrastructure (such as public rights of way).
- 11.5.8 The landscape and visual impacts during operation (after application of the confirmed mitigation measures) are summarised in Table 11.10. The landscape impacts are described as the first six entries in the Table. The visual impacts are listed with reference to the viewpoints provided in Figure 11.3.



TABLE 11.9: SUMMARY OF LANDSCAPE AND VISUAL IMPACTS DURING CONSTRUCTION

Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
N / A	Northern Thames Basin National Landscape Character Area	N / A	Moderate	Views of construction works, including the AGI / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate Temporary Adverse
N / A	Greater Thames Estuary National Landscape Character Area	N / A	Low	Views of construction works / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate / Minor Temporary Adverse
N/A	Linford / Buckingham Ridge Local Landscape Character Area	N / A	Moderate	Views of construction works, including the AGI / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate Temporary Adverse
N / A	Stanford Marshes Local Landscape Character Area	N/A	Moderate	Views of construction works, including the AGI / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate Temporary Adverse
N / A	Fobbing and Corringham Local Landscape Character Area	N/A	Low	Views of construction works / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate / Minor Temporary Adverse



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
N / A	Northern Thames Mashes Local Landscape Character Area	N / A	Low	Views of construction works / potential removal of vegetation, hedgerow or hedgerow trees.	Medium	Moderate / Minor Temporary Adverse
1	St. Clere's Golf Course	Recreational Users	High	From some points, there may be a direct view of construction works, including the AGI, at close proximity. Impact could be partially mitigated by screening.	Medium	Major / Moderate Temporary Adverse
2	Butts Lane	Road Users	Medium	Butts Lane is crossed by the proposed gas pipeline route. Therefore there will be direct views of construction works.	Low	Moderate / Minor Temporary Adverse
3	St. Clere's School	Students	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Negligible	Minor / None
4	Mucking	Residents	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	Moderate	Major / Moderate Temporary Adverse





Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
5	St. Margaret's Avenue / Broadhope Road (Stanford- le-Hope)	Residents	High	From some points, there may be a direct view of construction works. Screening is likely to be afforded by the existing sewage works / Freight Railway Line. Views will be within the context of industrial development with overhead power lines visible.	Low	Moderate Temporary Adverse
6	Fairview Avenue (Stanford- le-Hope)	Residents	High	From some points, there may be a direct view of construction works. Screening is likely to be afforded by the existing Freight Railway Line. Views will be within the context of industrial development with overhead power lines visible.	Low	Moderate Temporary Adverse
7	Wharf Road / Cabborns Crescent / Grove Road / King Edwards Road (Stanford-le-Hope)	Residents	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	Low	Moderate Temporary Adverse



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
8	Shell Angling Lakes	Walkers / Recreational Users	High	North Shell Angling Lake is crossed by the proposed gas pipeline route. A HDD Section will be required. Therefore there will be direct views of construction works, including storage of materials.	Medium	Major / Adverse Temporary Adverse
9	Wharf Road	Road Users	Medium	Wharf Road is crossed by the proposed gas pipeline route. A HDD Section will be required. Therefore there will be direct views of construction works, including storage of materials.	Low	Moderate / Minor Temporary Adverse
10	Corringham Road / Burgess Avenues / Billet Lane / Adams Road / Conrad Road / Rainbow Lane (Stanford- le-Hope)	Residents	High	From some points, there may be a direct view of construction works. Views will be seen within the context of existing overhead power lines, with the backdrop of the Freight Railway Line / Stanhope Industrial Park	Low	Moderate Temporary Adverse



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
11	Allotments (Stanford-le- Hope)	Allotment Users	Medium	There is the potential for the allotments to be crossed by the proposed gas pipeline route. Therefore there will be direct views of construction works.	High	Major Temporary Adverse
12	Stanhope Industrial Park	Workers	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Low	Minor Temporary Adverse
13	Rainbow Lane	Road Users	Medium	Rainbow Lane is crossed by the proposed gas pipeline route. Therefore there will be direct views of construction works.	Low	Moderate / Minor Temporary Adverse
14	Great Garlands Farm	Residents	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	High	Major Temporary Adverse
15	Oak Farm	Residents	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	High	Major Temporary Adverse

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Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
16	Old Hall	Residents	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	High	Major Temporary Adverse
17	Church Road / Rookery Hill (Corringham)	Residents	High	From some points, there may be a direct view of construction works. Screening may be afforded by the existing overhead power lines and The Manorway.	Low	Moderate Temporary Adverse
18	East Thurrock United FC	Recreational Users	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Negligible	Minor / None
19	Herd Lane (Corringham)	Residents	High	From some points, there may be a direct view of construction works. Screening may be afforded by the existing overhead power lines and The Manorway.	Low	Moderate Temporary Adverse



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
20	Corringham Primary School (Corringham)	Students	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Negligible	Minor / None
21	Fobbing	Residents	High	From some points, there may be a direct view of construction works. Screening may be afforded, and views will be in the context of the overhead power lines and The Manorway	Low	Moderate Temporary Adverse
22	The Manorway (West)	Road Users	Medium	The Manorway is crossed by the proposed gas pipeline route. Therefore there will be direct views of construction works.	Low	Moderate / Minor Temporary Adverse
23	Wat Tyler Country Park	Recreational Users	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	Medium	Major / Moderate Temporary Adverse



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
24	Fobbing Marshes	Recreational Users	High	From some points, there may be a direct view of construction works. Impact could be partially mitigated by screening.	Medium	Major / Moderate Temporary Adverse
25	The Manorway (East)	Road Users	Medium	The Manorway is crossed by the proposed gas pipeline route. Therefore there will be direct views of construction works.	Low	Moderate / Minor Temporary Adverse
26	LG Development (West)	Workers	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Low	Minor Temporary Adverse
27	LG Development (North)	Workers	Low	May be a direct view of construction works. Impact could be partially mitigated by screening.	Low	Minor Temporary Adverse



TABLE 11.10: SUMMARY OF LANDSCAPE AND VISUAL IMPACTS DURING OPERATION

Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
N/A	Northern Thames Basin National Landscape Character Area	N / A	Moderate	Views of AGI. Screening will be provided in the form of landscaping.	Negligible, due to the effects of screening to be provided	None
N / A	Greater Thames Estuary National Landscape Character Area	N / A	Low	No view of gas pipeline or associated AGI	Negligible	None
N / A	Linford / Buckingham Ridge Local Landscape Character Area	N / A	Moderate	Views of AGI. Screening will be provided in the form of landscaping.	Negligible, due to the effects of screening to be provided	None
N / A	Stanford Marshes Local Landscape Character Area	N/A	Moderate	Views of AGI. Screening will be provided in the form of landscaping.	Negligible, due to the effects of screening to be provided	None
N / A	Fobbing and Corringham Local Landscape Character Area	N / A	Low	No view of gas pipeline or associated AGI	Negligible	None
N / A	Northern Thames Mashes Local Landscape Character Area	N / A	Low	No view of gas pipeline or associated AGI	Negligible	None
1	St. Clere's Golf Course	Recreational Users	High	Views of AGI. Screening will be provided in the form of landscaping.	Negligible, due to the effects of screening to be provided	None
2	Butts Lane	Road Users	Medium	Views of AGI. Screening will be provided in the form of landscaping.	Negligible, due to the effects of screening to be provided	None
3	St. Clere's School	Students	Low	No view of gas pipeline or associated AGI	Negligible	None





Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
4	Mucking	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
5	St. Margaret's Avenue / Broadhope Road (Stanford- Ie-Hope)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
6	Fairview Avenue (Stanford- le-Hope)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
7	Wharf Road / Cabborns Crescent / Grove Road / King Edwards Road (Stanford-le-Hope)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
8	Shell Angling Lakes	Walkers / Recreational Users	High	No view of gas pipeline or associated AGI	Negligible	None
9	Wharf Road	Road Users	Medium	No view of gas pipeline or associated AGI	Negligible	None
10	Corringham Road / Burgess Avenues / Billet Lane / Adams Road / Conrad Road / Rainbow Lane (Stanford- le-Hope)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
11	Allotments (Stanford-le- Hope)	Allotment Users	Medium	No view of gas pipeline or associated AGI	Negligible	None
12	Stanhope Industrial Park	Workers	Low	No view of gas pipeline or associated AGI	Negligible	None
13	Rainbow Lane	Road Users	Medium	No view of gas pipeline or associated AGI	Negligible	None



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
14	Great Garlands Farm	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
15	Oak Farm	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
16	Old Hall	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
17	Church Road / Rookery Hill (Corringham)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
18	East Thurrock United FC	Recreational Users	Low	No view of gas pipeline or associated AGI	Negligible	None
19	Herd Lane (Corringham)	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
20	Corringham Primary School (Corringham)	Students	Low	No view of gas pipeline or associated AGI	Negligible	None
21	Fobbing	Residents	High	No view of gas pipeline or associated AGI	Negligible	None
22	The Manorway (West)	Road Users	Medium	No view of gas pipeline or associated AGI	Negligible	None
23	Wat Tyler Country Park	Recreational Users	High	No view of gas pipeline or associated AGI	Negligible	None
24	Fobbing Marshes	Recreational Users	High	No view of gas pipeline or associated AGI	Negligible	None
25	The Manorway (East)	Road Users	Medium	No view of gas pipeline or associated AGI	Negligible	None



Viewpoint Reference	Location	Receptor	Sensitivity	Description of Impact	Magnitude	Significance
26	LG Development (West)	Workers	Low	No view of gas pipeline or associated AGI	Negligible	None
27	LG Development (North)	Workers	Low	No view of gas pipeline or associated AGI	Negligible	None



11.6 Mitigation Measures

- 11.6.1 Mitigation can be achieved by avoidance of, reduction of, remedying of or compensation for adverse impacts.
- 11.6.2 In addition to the confirmed mitigation measures discussed above which would be utilised throughout the construction period, further mitigation measures would be included in the Construction Environmental Management Plan (CEMP). Specifically for landscape and visual impacts these would include:
 - Protection of areas with high landscape sensitivity, including the avoidance (wherever possible) of removal of woodland areas;
 - The use of specific construction methods and crossing techniques for vegetation clearance / crossings to minimise the likelihood of impacts to landscape and visual;
 - The use of specific agreed methodology for the stripping, storage and reinstatement of topsoil and subsoil;
 - Agreeing to restrictions on the heights of stockpiles, which themselves would be sited to maximise screening from visual receptors;
 - The reinstatement of trees / hedgerows lost during the construction works with locally occurring native species of local provenance;
 - The effective maintenance and annual replacement of planting (if required, over a period of 60 months) to ensure that planting will establish successfully;
 - The reinstatement of fence walls to match existing features (if required);
 - The proliferation of watercourses and / or ditches to match the adjoining profiles (if required).

Landscaping and Biodiversity Enhancement

- 11.6.3 Any long term landscape and visual impacts associated with the development of the gas pipeline and associated AGI would occur during the operational phase. As such, these impacts relate to the presence of the AGI which is the only visible feature of the development during operation.
- 11.6.4 As noted by the confirmed mitigation measures, screening for the AGI will be provided in the form of landscaping. The landscaping will be agreed with TTGDC, and will aim to provide biodiversity enhancement and supplement the landscaping already present at the existing AGI site which serves the CECL Power Station.
- 11.6.5 The existing landscaping for the existing AGI for the CECL Power Station is effective in ensuring that the AGI blends in with its environment. This is considered to be appropriate given its location.

11.7 Assessment of Residual Impacts

- 11.7.1 Any adverse landscape and visual impacts will reduce progressively following the reinstatement works to be undertaken at the end of the construction phase.
- 11.7.2 The residual impact is summarised in Table 11.11.
- 11.7.3 This overall conclusion is based on the success of the existing landscaping for the existing AGI for the CECL Power Station. This conclusion is also reinforced via the results and images discussed below.

Zone of Theoretical Visibility

11.7.4 To present the likely visibility of the proposed AGI, figures showing the Zones of Theoretical Visibility (ZTV) have been prepared.



- 11.7.5 Figure 11.4 shows the ZTV for the existing AGI and Figure 11.5 shows the ZTV for the proposed AGI. Figure 11.6 shows a combined ZTV for the existing and proposed AGIs.
- 11.7.6 Figure 11.6 suggests that the visibility of the proposed AGI will be limited to areas where the existing AGI is already visible, and therefore already forms part of the visual baseline.

Views of the Existing AGI

- 11.7.7 Figures 11.7 and 11.8 show photographs of the existing AGI for the CECL Power Station taken from the private access track (views from the south) and St Clere's Golf Course (views from the north).
- 11.7.8 These Figures serve to illustrate how the proposed AGI will look from views close up.
- 11.7.9 Inserts 11.9 and 11.10 show photographs of the existing AGI for the CECL Power Station taken from various locations along Footpath 41 (to the south of the existing and proposed AGIs).
- 11.7.10 These Figures illustrate the setting of the existing and proposed AGIs.
- 11.7.11 These Figures also show that the existing landscaping for the existing AGI can be considered to be a success as it ensures that the AGI blends in with its environment. This is considered to be appropriate given its location.

TABLE 11.11: SUMMARY OF RESIDUAL IMPACTS

	Description	Nature of Impact	Geographic Scale
Operation	AGI, west of Mucking and south of Stanford-le-Hope	Negligible	Local

11.8 Assessment of Cumulative Impact

- 11.8.1 Indirect / Secondary and **C**umulative Impacts are assessed in Section 18.
- 11.8.2 In addition, the following proposals for landscaping, which will be developed further with TTGDC, are also noted. Based on the ZTVs presented in Figures 11.4 to 11.6, it can be seen that the visibility of the proposed AGI will be limited to areas where the existing AGI is already visible, and therefore already forms part of the visual baseline.
- 11.8.3 Based on a site walkover and the photographs of the existing AGI presented in Figures 11.7 to 11.10 it is proposed that, as the existing AGI is complemented by landscaping which shields views from the north (e.g. from St Clere's Golf Course) (which would also provide shielding for the proposed AGI), the proposed AGI would be complemented by landscaping to shield views from the south (e.g. from Footpath 41) (which would also provide shielding for the existing AGI).
- 11.8.4 Utilising this proposed approach, the placement of the two AGIs (the existing AGI for the CECL Power Station and the proposed AGI for GEC) is extremely beneficial, as the provision of the landscaping at both AGIs provides mutual screening.
ECOLOGY

SECTION 12



12 ECOLOGY

12.1 Introduction

- 12.1.1 This Section assesses the significant environmental effects associated with the development of the gas pipeline and associated AGI on the existing ecological receptors within the Ecological Route Study Corridor and surrounding areas. In particular it considers the likelihood of significant environmental effects of habitat loss and disturbance on Protected and Biodiversity Action Plan (BAP) Species and Habitats during both the construction and operational phases.
- 12.1.2 This Section therefore presents the Ecological Impact Assessment (EcIA).
- 12.1.3 Where appropriate, measures to prevent / minimise / control / mitigate the effects are presented and residual effects following the adoption of those measures is assessed.
- 12.1.4 This Section (together with Appendix F (Supporting Ecology Studies / Information) is not intended to be read as a stand alone assessment and reference should also be made to the information provided in other Sections of this ES.

12.2 Key Planning Policies

- 12.2.1 Section 3 provides the Planning Policy Context.
- 12.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

SS8	The Urban Fringe
ENV1	Green Infrastructure
ENV3	Biodiversity and Earth Heritage

Thurrock Borough Local Plan

LN12	Development Proposals and Nature Conservation
LN15	Sites of Importance for Nature Conservation
LN16	Areas of Local Nature Conservation Significance and Ecological Corridors

Draft TCSPMD

CSTP19	Biodiversity
PMD7	Biodiversity and Development

12.3 Legislative Framework

12.3.1 The applicable legislative framework in terms of the EcIA is summarised as follows:

International Conventions and Directives

The Bonn Convention 1979

12.3.2 The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention 1979) aims to conserve terrestrial, marine and avian migratory species throughout their range.



12.3.3 Migratory species threatened with extinction are listed on Appendix 1 of the Convention, whilst migratory species that need or would significantly benefit from international co-operation are listed in Appendix 2 of the Convention.

The Bern Convention 1982

- 12.3.4 The Convention on the Conservation of European Wildlife and Natural Habitats (also known as the Bern Convention 1982) imposes legal obligations to protect over 500 wild plant species and more than 1 000 wild animal species.
- 12.3.5 These requirements are implemented in UK law through the Wildlife and Countryside Act (WCA) 1981, as amended.

The Convention on Biological Diversity 1993

- 12.3.6 The Convention on Biological Diversity (CBD) was adopted in 1992 and came into force in 1993. Contracting Parties are required to create and enforce national strategies and action plans to conserve, protect and enhance biological diversity.
- 12.3.7 The UK Government ratified the Convention and published the UK Biodiversity Action Plan (BAP) in 1994.
- 12.3.8 The CBD has three main goals:
 - The conservation of biological diversity;
 - The sustainable use of its components; and
 - The fair and equitable sharing of the benefits arising from the use of genetic resources.

The Habitats Directive / The Birds Directive

- 12.3.9 Natura 2000 consists of a network of ecologically valuable designated areas in Europe. This network is established under the terms of the EU Directive 92/43/EEC Conservation of Natural Habitats and of Wild Fauna and Flora³³ (The Habitats Directive) and EU Directive 79/409/EEC Conservation of Wild Birds³⁴ (the Birds Directive). The network comprises Special Areas of Conservation (SAC) designated under the Habitats Directive, and Special Protection Areas (SPA) designated under the Birds Directive.
- 12.3.10 The main aim of the Habitats Directive is "to promote the maintenance of biodiversity" through the protection of habitats or species. Annex I of the Habitats Directive lists Habitats and Annex II lists Species for which sites are designated.

National Legislation

The Wildlife and Countryside Act 1981

- 12.3.11 The Wildlife and Countryside Act 1981, as amended (WCA), is the principal mechanism for wildlife protection in the UK. It was originally aimed at consolidating and amending previous legislation to implement the requirements of the Bern Convention and the Birds Directive.
- 12.3.12 Of particular relevance are:
 - Schedule 1, which lists birds afforded special protection;
 - Schedules 4 to 6, which protect various wild animal species from injury, killing or disturbance; and,
 - Schedule 8, which confers protection to certain plant species.

³³ Habitats Directive. Available at http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML

³⁴ Birds Directive. Available at <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF</u>



12.3.13 The statutory designation of Sites of Special Scientific Interest (SSSI) is the main site protection measure in the UK established under the WCA.

The Conservation of Habitats and Species Regulations 2010

12.3.14 The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations) place a duty on planning authorities to have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of their functions. The relevant requirements of the Habitats Directive include Article 12 which provides specific protection for European Protected Species.

The Countryside and Rights of Way Act 2000

12.3.15 The Countryside and Rights of Way Act 2000 (CRoW) extends the public's ability to enjoy the countryside whilst also providing safeguards for landowners and occupiers. It gives a statutory right of access to open country and registered common land; modernises the rights of way system; gives greater protection to SSSIs; provides better management arrangements for Areas of Outstanding Natural Beauty (AONBs); and strengthens wildlife enforcement legislation.

The Natural Environment and Rural Communities Act 2006

12.3.16 Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC) required that the Secretary of State produced a list of habitats and species of principal importance for conservation. The list is used to guide decision makers in implementing their duties under Section 40 of the NERC and to have regard to the conservation of biodiversity in England when carrying out their normal functions.

Species Legislation

- 12.3.17 Due to the types of habitats present, the records returned for the Ecological Route Study Corridor (determined during the desk study) and the available ecological survey data for the LG Development, particular consideration was given to the presence of the following Protected Species:
 - Bats;
 - Breeding Birds;
 - Reptiles;
 - Badgers;
 - Great Crested Newts (GCNs); and;
 - Water Voles.
- 12.3.18 The relevant legislation for these species is therefore detailed below:

<u>Bats</u>

- 12.3.19 All species of bat (*Chiroptera spp.*) and their roosts are protected under the WCA and the Habitats Regulations.
- 12.3.20 They are a European Protected Species.
- 12.3.21 As such, it is an offence to:
 - Intentionally or recklessly kill, injure or capture a bat;
 - Intentionally or recklessly disturb a bat ;
 - Intentionally or recklessly damage or destroy its place of shelter; or
 - Possess, transport or sell a bat.



	YEARS
	Birds
12.3.22	All species of wild bird and their nests are protected under the WCA.
12.3.23	As such, it is an offence to:
	 Intentionally kill, injure or capture any wild bird:
	 Intentionally damage or destroy the nest (whilst being built or in use) or eggs:
	 Intentionally disturb the babitat of any breeding bird: or
	 Possess transport or sell any wild birds
12.3.24	Certain species are given further protection by Schedule 1 of the WCA, which prohibits intentional or reckless disturbance to these species during the breeding season.
	Reptiles
12.3.25	In the UK, a number of reptile species are protected under the WCA from intentional or reckless killing / injuring. These include the: common lizard (<i>Zootoca vivipara</i>); slow worm (<i>Anguis fragilis</i>); adder (<i>Vipera berus</i>); and, grass snake (<i>Natrix natrix</i>).
	Badgers
12.3.26	Badgers (<i>Meles meles</i>) are protected under the Protection of Badgers Act 1992 and the WCA. As such it is an offence to wilfully take, kill, injure or ill-treat a badger or to obstruct, destroy or damage a badger sett. Badgers are also protected against disturbance whilst within a sett.
12.3.27	Badgers can only be disturbed under a licence from Natural England (NE).
	Great Crested Newts
12.3.28	Great crested newts (<i>Triturus cristatus</i>) (GCN) are fully protected under Schedule 5 of the WCA and the Habitats Regulations 2010.
12.3.29	They are a European Protected Species.
12.3.30	In accordance with this protection it is illegal to:
	 possess a protected species (alive or dead);
	 Deliberately capture, injure or kill one of these protected species;
	 Intentionally or recklessly disturb these protected species; or;
	Deliberately take or destroy the eggs of these protected species.
12.3.31	It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by these protected species. All life stages of GCN are afforded the same level of protection.
12.3.32	In order to undertake any activity which would otherwise result in any of the above offences being committed, it may be necessary to obtain a European Protected Species (EPS) Licence from the relevant statutory body (NE).
	Water Voles
12.3.33	Water Voles (Arvicola amphibius) are fully protected under the WCA.
12.3.34	As such, it is an offence to:
	 Intentionally kill, injure or take any wild water vole (under Section 9(1));
	 Possess or control any live or dead wild water vole or any part of, or anything derived from, such an animal (under Section 9(2));



- Intentionally or recklessly damage or destroy, any structure or place which any wild water vole uses for shelter or protection (under Section 9(4a));
- Intentionally or recklessly disturb any such animal while it is occupying a structure or place which it uses for that purpose (under Section 9(4b));
- Intentionally or recklessly obstruct access to any structure or place which any wild water vole uses for shelter or protection (under Section 9(4c));
- Sell, offer or expose for sale, or have in possession or transport for the purpose of sale, any live or dead wild water vole, or any part of, or anything derived from, such an animal (under Section 9(5a)); or
- Publish or cause to be published any advertisement likely to be understood as conveying that you buy or sell, or intend to buy or sell, any of those things (under Section 9(5b)).

Non-Statutory Policies

- 12.3.35 The UK Biodiversity Action Plan (UK BAP) was established in response to the global Convention on Biological Diversity, 1992. Individual Action Plans define actions and measures to meet the objectives defined in the strategy, and specify measurable targets. They determine the broad habitats and species that are of value to the natural environment of the UK, and identify actions and projects that could be undertaken to help protect or enhance the national biodiversity.
- 12.3.36 Local Biodiversity Action Plans (LBAPs) are implemented through planning policy, identifying habitats and species of particular value or endangerment at the local or regional level. BAPs in the UK have no statutory status, but provide a framework for implementing conservation requirements. The Ecological Route Study Corridor is covered by the Essex and Thurrock BAP.
- 12.3.37 Locally Important Sites are sites of local conservation interest designated by LPAs that include County Wildlife Sites (CWS). Such sites are afforded a measure of protection in local development plans.
- 12.3.38 Planning Policy Statement 9 (PPS 9): Biodiversity and Geological Conservation, 2005, outlines the Government's vision for conserving and enhancing biological diversity in England, with the aim that planning, construction, development and regeneration should have minimal impacts on biodiversity and enhance it wherever possible.
- 12.3.39 PPS9 states that:

"The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused".

12.3.40 Under PPS 9 the presence of a protected species is a material consideration when a LPA is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat. Further guidance is given in Circular 06/05.





Guidance

- 12.3.41 This Section has been prepared in accordance with published EcIA Guidelines³⁵.
- 12.3.42 This guidance sets out the EcIA process, detailing the methodology to be implemented in undertaking EcIAs for the United Kingdom.

12.4 Assessment Methodology and Significance Criteria

Scope of the Assessment

- 12.4.1 An Ecological Scoping Report was prepared which set out the key ecological constraints associated with the proposed gas pipeline and associated AGI and the further Protected Species Surveys deemed to be required in order to fully inform the EcIA (The Ecological Scoping Report is presented in Appendix F.1).
- 12.4.2 The Ecological Scoping Report identified the following ecological constraints to the development of the gas pipeline and associated AGI that would require detailed assessment as part of the ES:
 - One Statutory Designated Site within 50 m of the gas pipeline route;
 - Two Non-Statutory Designated Sites within the gas pipeline route;
 - UK and Local BAP habitats Grazing Marshes and Reedbeds;
 - LG Development Ecological Receptor Sites (Northern Triangle and Site A³⁶);
 - Bats;
 - Breeding Birds;
 - Reptiles;
 - Badgers;
 - Water Voles;
 - Great Crested Newts; and
 - Flora.
- 12.4.3 The scope of potential significant effects is outlined below.

Site Preparation / Construction

- 12.4.4 The Scope of the EclA is based on the current proposals which may result in potential effects on one Statutory and two Non-Statutory Designated Sites, UK and Local BAP habitats and a range of Protected Species (bats, nesting birds, reptiles, badgers, GCN, water voles and flora). The scope additionally includes effects on other habitats of ecological value.
- 12.4.5 The detailed scope of this assessment of potentially significant effects is set out below:
 - Loss of established habitat assemblages;
 - Loss of foraging, commuting and roosting habitats, habitat fragmentation and potential mortality / injury to bats;
 - Loss of habitat, disturbance and potential mortality/injury to nesting birds;
 - Loss of foraging habitat and hibernacula, fragmentation and disturbance and potential mortality / injury to reptiles;

³⁵ IEEM (2006) Guidelines for Ecological Impact Assessment in the UK. IEEM Winchester

³⁶ Note that Receptor Site A is now called 'Stanford Wharf Nature Reserve'



- Habitat loss / fragmentation, disturbance and potential mortality / injury to badgers;
- Loss of, damage or disturbance to breeding habitats and sites of shelter and rest including hibernacula, and fragmentation, disturbance and potential mortality / injury to GCN;
- Fragmentation, habitat loss, disturbance and potential mortality / injury to water voles; and
- Loss of notable flora and impacts on hedgerows.
- 12.4.6 In order to assess these potentially significant effects a range of dedicated Protected Species Surveys have been carried out. These included Protected Species Surveys for: bats; breeding birds; reptiles; badgers; GCN; and, water voles.
- 12.4.7 Protected Species Surveys were not deemed necessary for: dormice; invertebrates; over-wintering birds; or, rare plants. This is due to the following reasons:
 - A habitat assessment carried out in respect of dormice confirmed: the site does not lie within their known natural range; there was an absence of suitable habitat; and, there was limited connectivity for this species within the site. Therefore no further survey was considered necessary.
 - Previous Protected Species Surveys in respect of invertebrates have been carried out. In conjunction with the existing survey data, the narrow working width anticipated, the small areas of key invertebrate habitat that are likely to be affected and the temporary nature of the works, additional invertebrate surveys were not considered necessary.
 - The works will all be carried out throughout the spring and summer period and thus will not be undertaken during the period within which over-wintering birds would be impacted.
 - The majority of flora within the Ecological Route Study Corridor is considered likely to be limited to common and widespread species. Corringham Marshes SINC does include some rare and scarce species and further survey of this area has been recommended prior to the commencement of construction works (see Appendix F.1, Paragraph 4.1.35). No additional survey at this stage is considered necessary to inform the EcIA.

Operation

12.4.8 Following the installation of the gas pipeline, the trench will be backfilled and the habitats will be reinstated. It is considered that there will therefore be no additional operational activities that will be undertaken which would have potential effects on the ecology and nature conservation of the Ecological Route Study Corridor.

Extent of the Ecological Route Study Corridor

- 12.4.9 Species data for the desk study and details of Non-Statutory Designated Sites were requested within a 2 km radius of the Ecological Route Study Corridor, as recommended in the Institute of Environmental Management and Assessment's (IEMA's) Guidelines for Baseline Ecological Assessment. The desk study included a search for Statutory Designated Sites within 10 km of the Ecological Route Study Corridor.
- 12.4.10 The spatial area subject to the Phase 1 Habitat Survey encompassed a buffer of 250 m either side of the linear route and sub-stations, creating an approximate 500 m Ecological Route Study Corridor. Where necessary, the Ecological Route Study Corridor was extended beyond 500 m to consider any key ecological features, especially transient or mobile species that may be present.



12.4.11 Figure 1 in Appendix F.1 shows the extent of the Ecological Route Study Corridor considered within this EcIA.

Ecological Zone of Influence

- 12.4.12 The Ecological Zone of Influence is an area defined by the assessment in which there may be receptors subject to effects as a result of the development of the gas pipeline and associated AGI. Such receptors are likely to include: Designated Sites; Notable Habitats; and, Protected Species. These receptors could be affected directly (e.g. works affecting a receptor such as removal of a tree occupied by bats) or indirectly (e.g. a designated site downriver of development being affected by sediment deposition).
- 12.4.13 The Ecological Zone of Influence is ascertained through considerations of the construction and operation effects, taking into account: the desk study; an examination of mapping data; responses from consultees; records of Protected Species; and, from the findings of the survey work.

Consultation

- 12.4.14 Information was requested from the Statutory and Non-Statutory Organisations listed below. Their data responses can be found in Section 3.1 of Appendix F.1.
 - Essex Bat Group
 - Essex Small Mammal and Bat County Recorder
 - Essex Bird County Recorder
 - Essex Badger Protection Group
 - Essex Wildlife Trust (Stanford Warren Reserve Manager)
 - Essex Freshwater Invertebrate County Recorder
 - Essex Terrestrial Invertebrate County Recorder
 - Essex Flora County Recorder.
- 12.4.15 Furthermore, the following organisations were contacted regarding the development of the gas pipeline and associated AGI and the potential ecological constraints as part of the EIA Scoping Study (see Section 8 / Appendix D.1 Scoping Study / Appendix D.2 Scoping Responses):
 - Natural England;
 - The Environment Agency; and
 - Essex Wildlife Trust.
- 12.4.16 A further Ecological Scoping Study Response can also be found in Appendix F.2.

Method of Baseline Data Collation

Desk Study

- 12.4.17 The purpose of the desk study was to review existing information available in the public domain and to obtain information held by Statutory and Non-Statutory Consultees. Information was requested for the Site and wider study area.
- 12.4.18 In addition to the consultation process, the following literature was reviewed:
 - Essex and Thurrock Local BAPs.
- 12.4.19 The following meta-databases were searched for protected habitats and species:
 - National Biodiversity Network (NBN) Gateway;



- Multi-Agency Geographic Information for the Countryside (MAGIC); and
- Nature on the Map.

Surveys

- 12.4.20 A range of ecological surveys have been carried out within the Ecological Route Study Corridor and surrounding area both in respect of the development of the gas pipeline and associated AGI, and the adjacent LG Development.
- 12.4.21 In addition to the surveys undertaken by PB, a number of other ecological consultants have carried out these ecological surveys as referred to in the sections below. Plans showing the extent of PB surveys and the extent of areas surveyed by other consultants are provided in, Figures 1 and 5 within Appendix F.1.
- 12.4.22 The Phase I Habitat Survey of the Site was undertaken by PB Ecologists between the 12th and 16th April and on the 18th May 2010. The Phase I Habitat Survey details the habitats present, based on their plant species composition, and classifies according to Phase 1 Methodology developed by the Nature Conservancy Council (now Joint Nature Conservancy Council (JNCC))³⁷. All habitat types present within the Ecological Route Study Corridor were recorded on Phase 1 Maps and dominant plant species were recorded in accordance with standard nomenclature³⁸. Their abundance was assessed on the DAFOR scale where relevant:
 - D Dominant
 - A Abundant
 - F Frequent
 - O Occasional
 - R Rare
- 12.4.23 This Phase I Habitat Survey is provided in Appendix F.1.
- 12.4.24 The Phase I Habitat Survey was extended to include the assessment of these habitats for their potential to support protected and notable species and to look for evidence of such species. Due to the types of habitats present and the results of the desk study, particular consideration was given to evidence of: bats; breeding birds; reptiles; amphibians; badgers; water voles; invertebrates; fish; dormice (*Muscardinus avellanarius*); and, flora. Any invasive species present were also noted.
- 12.4.25 The timing of the Phase I Habitat Survey was suitable for this type of ecological work, as most plant species likely to be present on the Ecological Route Study Corridor are recognisable at this time of year. The desk study also provides records of species that may not be present at the time of survey.

Bats

- 12.4.26 The bat surveys undertaken have included a variety of activity surveys throughout 2001 / 2002, 2008 and 2010. The Phase II Bat Survey Report is presented in Appendix F.3.
- 12.4.27 The bat activity surveys carried out in 2001 / 2002 comprised surveys within the LG Development Site and its immediate surroundings (Thomson Ecology 2008) with update surveys conducted during 2008 and further surveys of additional areas in 2010. As the majority of the gas pipeline route is located in close proximity to the LG Development site much of the habitat considered suitable to support bats within the

³⁷ JNCC (2007) Handbook for Phase 1 habitat survey: A technique for environment audit. Joint Nature Conservancy Committee, Peterborough.

³⁸ Stace, C. (1997) New Flora of the British Isles; Second Edition. Cambridge University Press, Cambridge.



pipeline route has already been surveyed. Therefore further surveys undertaken in 2010 by PB covered additional areas not previously surveyed with the earlier survey data for the LG Development used to form much of the baseline for this assessment). The appropriate survey area plans are shown on Figure 5 in Appendix F.1 and Figure 3 in Appendix F.3.

- 12.4.28 The activity surveys comprised targeted manual and automated activity surveys to observe and record bats within the survey area in order to determine the following:
 - Presence / absence of species;
 - Location of bat activity and / or bat roosts; and
 - The type of activity (foraging, commuting or social).
- 12.4.29 For full details of the methodologies and results of these surveys please see Appendix F.3.

Badgers

- 12.4.30 The Phase 1 Habitat Survey confirmed Badgers were present within the Ecological Route Study Corridor and further dedicated surveys for badgers will be undertaken prior to the commencement of the construction works (See Appendix F.1, Paragraph 4.1.16).
- 12.4.31 Signs of badger activity that were investigated in the field survey included: dung pits; latrines; tracks; runs; foraging areas; and, prints.

Reptiles

- 12.4.32 Ecology Services Limited and Cambridge Ecology completed reptile surveys to inform the LG Development in 2006 / 2007, with more recent surveys being undertaken by Thomson Ecology in 2008 / 2009. A large proportion of the survey area for this assessment has been previously surveyed by Thomson Ecology in 2008 / 2009. It is therefore considered that much of the data collected by Thomson Ecology is relevant to this assessment. As such, it has been possible to use some of the data previously collected by Thomson Ecology to form the baseline of this report. New reptile surveys were undertaken by PB in 2010 in order to provide coverage of any areas not previously surveyed or for areas for which data was not available.
- 12.4.33 All surveys undertaken in 2010 by PB Ecologists were carried out using standard methodologies as recommended in the Herpetofauna Workers' Manual³⁹ and the Draft Reptile Mitigation Guidance⁴⁰. The methodologies also acknowledge Froglife Advice Sheet 10⁴¹. The Phase II Reptile Survey Report is presented in Appendix F.4.
- 12.4.34 During the PB surveys a total of 260 numbered artificial refugia were placed at a density of 20 to 30 per hectare within suitable habitat areas across the site as recommended by Froglife Advice Sheet 10.
- 12.4.35 Each survey area was visited on ten non-consecutive days between 17th May and 2nd July 2010. During each survey, the species, number of individuals, age class, refugia number and where possible the sex were recorded. The weather conditions and temperature during the visits were also noted.
- 12.4.36 Figure 1 within Appendix F.4 shows the areas surveyed.
- 12.4.37 For full details of the methodologies and results of these surveys please see Appendix F.4.

³⁹ Joint Nature Conservation Committee (1998): 'Herpetofauna Workers Manual' Gent, A. & Gibson, S. (eds). JNCC, Peterborough

⁴⁰ Natural England (2010): Herpetofauna Worker's Meeting 2010 Workshop: Reptile Mitigation Guidance

⁴¹ Froglife (2001): Great Crested Newt Conservation Handbook. Froglife, Mansion House, Halesworth, Suffolk



Water Voles

- 12.4.38 The presence of water voles within the local area was first identified by Ecological Services Limited (ESL) in 2001 / 2002. Further targeted water vole surveys were carried out by ESL in 2006, in 2007 by Cambridge Ecology, and most recently by Thomson Ecology in 2008. Thomson Ecology surveyed all land within the LG Development boundary and the habitat enhancement areas at the Northern Triangle (east and west), and Great Garlands Farm.
- 12.4.39 PB undertook water vole surveys on all water bodies within the survey area that had not been previously surveyed, or where no evidence of water voles had been found in the 2008 surveys. The Thomson and PB data combined covers all water bodies located within the Ecological Route Study Corridor. The Phase II Water Vole Survey Report is presented in Appendix F.5. Figures 1 and 4 within Appendix F.5 shows the area surveyed.
- 12.4.40 The water vole surveys undertaken in 2008 by Thomson Ecology and 2010 by PB followed guidance set out in Strachan and Moorhouse⁴².
- 12.4.41 Surveyors walked along the margins of the water bodies within the Ecological Route Study Corridor, looking for signs indicating the presence of water voles. These included:
 - Direct observations;
 - Latrines;
 - Burrows (including those both above and below water level);
 - Footprints;
 - Small mammal runs;
 - Pathways within the vegetation;
 - Feeding remains;
 - The distinctive 'plop' sound of water voles entering the water; and
 - Feeding 'lawns' around tunnel entrances.
- 12.4.42 Field signs were mapped and tallied.
- 12.4.43 For full details of the methodologies and results of these surveys please see Appendix F.5.

Great Crested Newts

- 12.4.44 Ecology Services Limited completed GCN population surveys to inform the associated LG Development in 2001, 2002 and 2006, with more recent surveys being completed by Thomson Ecology in 2008 and 2009. A large number of these previously surveyed water bodies are located within the Ecological Route Study Corridor and have therefore been considered relevant to this assessment. PB undertook GCN population surveys in 2010 on all water bodies within the survey area but not those surveyed by Thomson in the last two years. The Thomson and PB data combined covers all water bodies located within the Ecological Route Study Corridor. The Phase II Great Crested Newt Survey Report is presented in Appendix F.6.
- 12.4.45 In total 118 water bodies were identified within the survey area, all were subject to a Habitat Suitability Index assessment (HSI) to determine their potential for supporting

⁴² Strachan and Moorhouse (2006): Water Vole Conservation Handbook Second Edition, Wildlife Conservation Research Unit, Oxon



GCN. It was concluded that 75 of these water bodies were suitable to support GCN and these were subject to detailed survey.

- 12.4.46 All surveys undertaken complied with standard survey methodologies: Great Crested Newt Mitigation Guidelines⁴³.
- 12.4.47 A combination of egg searches, bottle trapping, and torching was undertaken during the 2010 surveys. The maximum adult count from a given pond in one night (taken as the highest count from the six visits) is used to estimate the population size class present in that pond
- 12.4.48 An assessment of population size was also made where GCNs were found to be present, based on the maximum adult counts of great crested newts at that pond (English Nature, 2001) as follows:
 - Small maximum counts up to 10 GCN;
 - Medium maximum counts between 11 and 100 GCN;
 - Large maximum counts over 100 GCN.
- 12.4.49 For full details of the methodologies and results of these surveys please see Appendix F.6.

Breeding Birds

- 12.4.50 Thomson Ecology undertook surveys within the survey area associated with the LG Development in 2001, 2002 and 2008. PB undertook additional breeding bird surveys in 2010 within those areas not previously surveyed by Thomson Ecology in the last two years. The Phase II Breeding Bird Survey Report is presented in Appendix F.7.
- 12.4.51 The survey methodology involved standard territory (registration) mapping techniques as described in the 'Common Bird Census'⁴⁴. Registrations of birds were recorded and behaviours noted such as: singing; flying; calling; carrying food; nest building; and, aggressive territorial behaviour.
- 12.4.52 A transect line, which ensured all major habitats and land within each survey area would be surveyed was identified prior to the first surveys. During each survey the transect line was walked at a slow pace in appropriate good weather conditions in order to locate and identify all individual birds. Visits were undertaken early in the morning, generally between 05:00 and 09:00. The entire Ecological Route Study Corridor was covered during each visit, using suitable optical equipment to observe bird species and behaviour. Survey routes were walked in opposite directions on each visit, to ensure that all areas were covered at various times across the duration of the survey.
- 12.4.53 For full details of the methodologies and results of these surveys please see Appendix F.7.

Ecological Impact Assessment Significance Criteria

12.4.54 The results from the desk study, and Phase I Habitat and Phase II Protected Species surveys were used in conjunction with the responses from consultees and information on the proposed works to assess the likely significant ecological effects that the development of the gas pipeline and associated AGI could have.

 ⁴³ English Nature (2001): Great Crested Newt Mitigation Guidelines (August 2001 version). English Nature, Peterborough
 ⁴⁴ BTO (2010), <u>http://www.bto.org/survey/complete/cbc.htm</u>



Evaluation of Receptor

- 12.4.55 There are many components considered when evaluating an ecological receptor. Table 12.1 outlines the factors taken into consideration for both habitats and species, adapted from Ratcliffe.
- 12.4.56 In this assessment, a review of legislation, policy and sensitivity of the receptor was undertaken and the value of the receptor was determined within a geographical context on the following basis:
 - International;
 - UK;
 - National;
 - Regional;
 - County (or Metropolitan e.g. London);
 - District (or Unitary Authority, City or Borough);
 - Local or Parish; and
 - Less than local, within the zone of influence only (Site).



TABLE 12.1: SUMMARY OF THE FACTORS TAKEN INTO CONSIDERATION FOR BOTH HABITATS AND SPECIES

Value / Importance	Criteria
International (European)	Habitats An internationally designated site or candidate site (Special Protection Area (SPA), provisional SPA, Special Areas of Conservation (SAC), candidate SAC, Ramsar Site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area that would meet the published selection criteria for designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Species Any regularly occurring population of internationally important species, threatened or rare in the UK (i.e. a UK Red Data Book species categories 1 and 2 of the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring.
National (English)	nationally significant population/number of an internationally important species. Habitats A nationally designated site, Site of Special Scientific Interest (SSSI), National Nature Reserve
	(NNR), Marine Nature Reserve (MNR)) or a discrete area, which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines). A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat essential to maintain wider viability.
	A regularly occurring, regionally or county significant population / number of an internationally/nationally important species. Any regularly occurring population of a nationally important species, threatened or rare in the region or county (see LBAP). A feature identified as of critical importance in the UK BAP.
	Habitats
Regional	Sites that exceed the County-level designations, but fall short of SSSI selection criteria. Viable areas of key habitat identified in the Regional BAP or smaller areas of habitat essential to maintain wider viability.
(East of	Species
England)	Any regularly occurring, locally significant population of a species listed as being nationally scarce, which occurs in 16 of 100 10km ² squares in the UK or in a Regional BAP. A regularly occurring, locally significant population / number of a regionally important species. Sites maintaining populations of internationally / nationally important species that are not threatened or rare in the region or county.
	Habitats
Authority Area (e.g. County or District)	Sites recognised by local authorities, e.g. District Wildlife Sites (DWS) and Sites of Interest for Natural Science (SINS). County/District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR). A viable area of habitat identified in County/District BAP. A diverse and/or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25ha.
	Species
	Any regularly occurring, locally significant population of a species listed in a County/District BAP due to regional rarity or localisation. A regularly occurring, locally significant population of a county/district important species. Sites supporting populations of internationally / nationally / regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. Sites / features scarce in the county / district or that appreciably enrich the county / district habitat resource.



Value / Importance	Criteria
Local	Habitats
	Areas of habitat that appreciably enrich the local habitat resource (e.g. species-rich hedgerows, ponds). Sites that retain other elements of semi-natural vegetation that, due to their size, quality or the wide distribution within the local area, are not considered for the above classifications. Species
	Populations / assemblages of species that appreciably enrich the biodiversity resource within the local context. Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations.
Site	Habitats
(Immediate Local Area or Village importance)	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest.
	Species
	A good example of a common or widespread species.
Less than Local / Site Level	Sites that retain habitats and / or species of limited ecological importance due to their size,
(Limited Ecological Importance)	species composition or other factors.



- 12.4.57 In addition to the above criteria, for breeding birds the JNCC traffic light system of highlighting species of nature conservation concern was also considered (the JNCC criteria).
- 12.4.58 This traffic light system was derived from the review of the population status of 247 bird species that are regularly found breeding within the United Kingdom. It has used data from national monitoring schemes undertaken by leading governmental and non-governmental conservation organisations in the UK.
- 12.4.59 A brief outline of the JNCC criteria is given below in Table 12.2.



TABLE 12.2: AN OUTLINE OF THE JNCC CRITERIA DEFINING THE CONSERVATION STATUS OF BREEDING BIRDS

JNCC Criteria	Status
Red List Criteria	Globally threatened
	Historical population decline in UK during 1800–1995
	Rapid (> or =50%) decline in UK breeding population over last 25 years
	Rapid (> or =50%) contraction of UK breeding range over last 25 years
Amber List Criteria	Historical population decline during 1800–1995, but recovering; population size has more than doubled over last 25 years
	Moderate (25-49%) decline in UK breeding population over last 25 years
	Moderate (25-49%) contraction of UK breeding range over last 25 years
	Moderate (25-49%) decline in UK non-breeding population over last 25 years
	Species with unfavourable conservation status in Europe (SPEC = Species of European Conservation Concern)
	Five-year mean of 1–300 breeding pairs in UK
	> or =50% of UK breeding population in 10 or fewer Sites, but not rare breeders
	> or =50% of UK non-breeding population in 10 or fewer Sites
	> or =20% of European breeding population in UK
	> or =20% of NW European (wildfowl), East Atlantic Flyway (waders) or European (others) non-breeding populations in UK
Green List Criteria	No identified threat to the population's status



Assigning a Threshold Value

12.4.60 In the process of EcIA, it is important to select the appropriate features for inclusion in the assessment. As a result, a threshold value for the Ecological Route Study Corridor has been set and all ecological receptors within the Zone of Influence that are of the threshold value or higher have been included for consideration within the EcIA.

Characterising the Potential Effect

- 12.4.61 Based on an understanding of the baseline conditions and of the works required for the development of the gas pipeline and associated AGI, potential effects to ecological receptors have been considered, taking into account construction and operation stages. Effects have been assessed against the predicted future baseline and have been characterised with reference to ecological structure and function of the feature in question, for instance the fragility / stability of an ecosystem and its connectivity to other features or resources.
- 12.4.62 The following parameters have been referred to in assessing effects on ecological structure and function. Should any of these parameters be unknown, this has been clearly stated:
 - Positive or negative;
 - Magnitude;
 - Extent;
 - Duration;
 - Reversibility; and
 - Timing and frequency.

Assigning Significance

12.4.63 For the purposes of this assessment, an ecologically significant effect is defined as an effect (negative or positive) on the integrity of a defined site or ecosystem and / or the conservation status of habitats or species within a given geographical area. If an effect is found not to be significant at the level at which the resource or feature has been valued, it may however still be significant at a smaller geographical scale. Any effect that is of significance at a level below threshold level has been scoped out of the assessment, unless there are legal implications associated with the effect, in which case these will be clearly stated.

Confidence in Prediction of Effect on Sensitive Receptor

- 12.4.64 The following four point scale has been adopted to describe the degree of confidence in the assessment of the effect on ecological structure and function. This confidence level relates to the likelihood that a construction or operational event or activity will lead to the described ecological effect on a sensitive receptor:
 - Certain / Near-Certain probability estimated at 95 per cent chance or higher;
 - Probable probability estimated above 50 per cent but below 95 per cent;
 - Unlikely probability estimated above 5 per cent but below 50 per cent; or
 - Extremely unlikely probability estimated at less than 5 per cent.



12.5 Baseline Conditions and Valued Ecological Receptors

Desk Study

12.5.1 A search of publicly available information produced the following information concerning the Ecological Route Study Corridor.

Statutory Designated Sites

- 12.5.2 There are 27 Statutory Designated Sites located within 10 km of the gas pipeline route.
- 12.5.3 Of these, the Vange and Fobbing Marshes SSSI and Grove House Wood LNR are located within the Ecological Route Study Corridor. The Thames Estuary and Marshes SPA and RAMSAR site is located approximately 50 m outside of the Ecological Route Study Corridor and an estimated 600 m from the gas pipeline route.
- 12.5.4 Details are provided within Table 3.1 and Figure 2 of Appendix F.1.
- 12.5.5 All Natura 2000 sites and RAMSAR sites are considered to be of International value, SSSI's of National value and Local Nature Reserves of County value (see Table 12.1)

Non-Statutory Designated Sites

- 12.5.6 Nine Non-Statutory Designated Sites are located within 2 km of the gas pipeline route.
- 12.5.7 The proposed gas pipeline route will pass directly through the Corringham Marshes SINC and the Stanford Warren SINC (the Stanford Warren SINC will be bypassed by HDD).
- 12.5.8 Details are provided within Table 3.2 and Figure 3 of Appendix F.1.
- 12.5.9 All SINC's are considered to be District value (see Table 12.1).

Biodiversity Action Plan Habitats

- 12.5.10 The study area contains two UK BAP Habitats:
 - Coastal Grazing Marsh; and
 - Reedbeds
- 12.5.11 These habitats are also listed as priority habitats on the Essex and Thurrock BAPs along with Roadside Verges and Brownfield Wildlife Land (Thurrock BAP only).

Protected or Notable Species Records

- Badgers
- 12.5.12 The desk study revealed records of badgers throughout the Ecological Route Study Corridor. A distance of 3 km between the groups of records indicates that at least two groups of badgers may be present across the search area.
 - Brown Hare
- 12.5.13 Brown hares (*Lepus europaeus*) were recorded as being widespread across the LG Development Site during surveys in 2001, 2001 and 2008 (Thomson Ecology 2008).
- 12.5.14 No additional records for brown hare were provided from the data search.
 - Water Vole
- 12.5.15 The results of the data search for water voles were consistent with the previous water vole surveys undertaken in respect of the LG Development site. Populations are present throughout a number of the LG Development and Ecological Route Study



Corridor areas with activity recorded along 5 500m of the 10 845m of water ways surveyed in 2001 and 2002.

- 12.5.16 An extensive translocation programme was undertaken in respect of the LG Development works, with water voles trapped and relocated to several receptor sites including the Northern Triangle and Great Garlands Farm (both located within the proposed Ecological Route Study Corridor).
 - Otter
- 12.5.17 The desk study did not identify any records of otter (*Lutra lutra*) within the 2 km search area.
 - Dormice
- 12.5.18 The desk study / data search did not reveal any records of dormice within the 2 km search area. However, the Essex BAP did indicate the presence of dormice approximately 10 km north-east of the pipeline route within the past ten years.
 - Bats
- 12.5.19 A variety of records for bats were obtained for the 2 km search area. The species recorded included: pipistrelle species (*Pipistrellus spp.*); noctule (*Nyctalus noctula*); serotine (*Eptesicus serotinus*); Leisler's (*Nyctalus leisleri*); Daubenton's (*Myotis daubentonii*); and, brown long-eared (*Plecotus auritus*).
- 12.5.20 The majority of the historical records obtained through the data search and which are not associated with the LG Development were concentrated around the residential areas of Stanford-le-Hope and along the A1014 (The Manorway). The majority of the recordings comprised sporadic single passes of pipistrelle species and brown longeared bats with only a few records of bats foraging in one area or in groups of two or more individuals.
- 12.5.21 The desk study also included review of previous surveys undertaken of the LG Development site. Surveys were undertaken in 2001 / 2002 and 2008 by Thomson Ecology. The 2001 / 2002 surveys recorded only a few noctules flying along the southern boundary of the LG Development. The 2008 surveys recorded low levels of activity around the LG Development site with Daubenton's, Leisler's, pipistrelles and noctules recorded. The latest survey has ruled out the presence of active bat roosts on the LG Development site⁴⁵.
 - Birds
- 12.5.22 Data reviewed as part of the desk study for birds comprised records from the Stanford Warren Nature Reserve SINC, breeding bird surveys undertaken for the LG Development and over-wintering bird surveys undertaken within Site A⁴⁶ for the LG Development.
- 12.5.23 The list of records for the Stanford Warren SINC included 13 Schedule 1 species recorded within the past ten years in addition to many BAP and Red and Amber listed species of conservation concern.
- 12.5.24 The breeding bird surveys undertaken for the LG Development recorded the presence of three Schedule 1 species, with an additional 11 UK BAP / Red list species recorded breeding within the survey area.
- 12.5.25 The over-wintering surveys undertaken in respect of the LG Development recorded the presence of five species for which the adjacent Thames Estuary and Marshes SPA is designated.

⁴⁵ Personal Communication – Chris Webb (DP World) 31-01-2011

⁴⁶ Note that Receptor Site A is now called 'Stanford Wharf Nature Reserve'



- Great Crested Newts
- 12.5.26 Extensive great crested newt surveys have been undertaken in respect of the LG Development and thus, due to the availability of this survey data, no additional data search / request was undertaken in respect of the GCN desk study.
- 12.5.27 The surveys for the LG Development confirmed the presence of a high metapopulation of GCN within the 2 km search area.
- 12.5.28 The dedicated GCN surveys in respect of the LG Development were undertaken in 2001, 2002 and 2006 and included survey of a total of 320 waterbodies throughout the LG Development, its associated receptor sites, and the farmland located within 500m. Of the 320 waterbodies surveyed GCNs were confirmed present in 44 of them. It was estimated that 39 small populations and five medium populations were present, with an overall large meta-population recorded.
- 12.5.29 Separate surveys of six waterbodies undertaken in 2008 (Thomson Ecology) around the Mucking Village area recorded three small and three medium populations.
- 12.5.30 As part of the LG Development, extensive GCN translocations have been undertaken from the LG Development site to the Northern Triangle (Figure 4 of Appendix F.1).
 - Other Amphibians
- 12.5.31 Incidental records have been provided of smooth newts and palmate newts within the survey area, with anecdotal evidence suggesting the presence of common toad within the Ecological Route Study Corridor.
 - Reptiles
- 12.5.32 Extensive reptile surveys have been undertaken in respect of the LG Development and thus, due to the availability of this survey data, no additional data search / request was undertaken in respect of the reptile desk study.
- 12.5.33 Phased reptile surveys were undertaken in 2007 and 2008 across the LG Development site. The results obtained confirmed the presence of all four common reptile species: grass snake; slow worm; adder; and, common lizard.
- 12.5.34 Low population estimates were recorded intermittently throughout the LG Development area for all species with the exception of common lizard which was recorded in low population estimates throughout the whole LG Development area.
 - Aquatic Invertebrates
- 12.5.35 Data from the surveys undertaken in respect of the LG Development identified 30 different aquatic invertebrate families within and around the LG Development area. One species, the scarce emerald damselfly (*Lestes dryas*) is listed as vulnerable in the UK Red Data Book (Thomson Ecology 2008). Furthermore, four vulnerable, three endangered, 16 rare and 77 nationally scarce species as well as many species of local importance were recorded.
- 12.5.36 The county recorder for Essex held no data for the search area.
 - Terrestrial Invertebrates
- 12.5.37 Data from the surveys undertaken in respect of the LG Development during 2002 and 2003 recorded approximately 470 species of terrestrial invertebrate. Species recorded included two UK BAP species, two nationally vulnerable species, four nationally rare and 34 nationally notable species.
- 12.5.38 The county recorder for Essex held no data for the search area.



Flora

- 12.5.39 Desk study data was obtained from an extensive 2005 and 2006 botanical survey completed within Fobbing Marshes SINC (north of the A1014 (The Manorway)) and dedicated surveys of the LG Development site completed by Ecological Services Ltd in 2002.
- 12.5.40 Further surveys undertaken by Thomson Ecology in 2008, recorded five nationally scarce species within the survey area (within the eastern half of the Site) with an additional 22 species of local importance recorded within the LG Development site.
- 12.5.41 No notable or species rich hedgerows were recorded within the survey area.
- 12.5.42 Japanese knotweed (*Fallopia japonica*) has previously been recorded within the south-eastern corner of the survey area⁴⁷. It is understood that the stands of this species have now been removed as part of the LG Development works.
- 12.5.43 PB does not hold any information regarding TPOs within the Site.

Phase 1 Habitat Survey

- 12.5.44 The survey area was divided into four distinct 'survey areas', each comprising similar habitat types (see Figure 1, Appendix F.1). The Phase 1 Habitat Survey categories present within the survey areas are described below, with further detail provided in Appendix F.1 and with habitats shown on Figure 6.
- 12.5.45 A variety of habitat types were recorded during the Phase 1 Habitat Survey as follows:
 - Improved grassland;
 - Semi-improved grassland;
 - Arable;
 - Continuous and scattered scrub;
 - Hedgerows;
 - Broad-leaved semi-natural woodland;
 - Scattered / broad-leaved trees;
 - Standing water;
 - Running water;
 - Inundation vegetation;
 - Reed bed (swamp);
 - Built structures; and
 - Dry ditches / drains.

Area 1

- 12.5.46 Area 1 lies directly south of Stanford-le-Hope and comprises waterbodies, arable fields, scrub and grassland separated by species-poor hedgerows. The Passenger Railway Line runs south from Stanford-le-Hope directly through the centre of the survey area.
- 12.5.47 The north-western corner of Area 1 is dominated by the St. Clere's Golf Course comprising well managed amenity grassland interspersed with rank semi-improved

⁴⁷ Thomson Ecology (2008) London Gateway Phase 2 Habitat Survey. Thomson Ecology.



grassland. In addition semi-improved grassland was the main habitat type to the east of the Golf Course.

- 12.5.48 In addition to six small waterbodies present within the golf course, several ponds and lakes dominated the eastern side of Area 1. The larger waterbodies are referred to as the Shell Angling Lakes.
- 12.5.49 Stanford Warren Nature Reserve (located within Area 1) comprises a large low lying area of reed beds (swamp) dominated by *Phragmites* species. Recent management had been undertaken in small patches creating open pools of water.
- 12.5.50 The Hassenbrook Stream flows south between Stanford Warren Nature Reserve and the Shell Angling Lakes into the Thames Estuary and Marshes SPA, thereby connecting the nature reserve to the SPA.
- 12.5.51 Grove House Local Nature Reserve is located along the edge of the northern boundary of Area 1, and comprises a fenced area of broad-leaved semi-natural woodland.
- 12.5.52 The south-western end of Area 1 is dominated by arable fields that are separated by earth bank boundaries. In addition areas of continuous and scattered scrub were occasionally recorded throughout this survey area.
- 12.5.53 Directly north of Stanford Warren Nature Reserve lies a large brownfield site utilised by Anglian Water. This site comprises areas of semi-improved grassland and scattered scrub. In addition a number of water tanks and man-made lined ponds are present within the site.

Area 2

- 12.5.54 The majority of Area 2 is located directly to the north of the Passenger Railway Line that runs eastwards from Stanford-le-Hope. The area comprises mostly arable fields and grazed improved grassland, with areas of scattered and continuous scrub present.
- 12.5.55 A network of dry ditches and associated unmanaged species-poor hedgerows form the field boundaries in this area; many of these hedgerows are defunct with large gaps occurring throughout.
- 12.5.56 Within the eastern section of this area were a number of wet ditches with standing water. Many were covered with filamentous algae and also contained submerged vegetation in places.
- 12.5.57 A small area of semi-improved grassland surrounding a patch of bare ground was recorded within the centre of the survey area. This was bordered by mature coniferous trees and scattered scrub.
- 12.5.58 Three farms are present throughout the survey area. These are: Great Garlands Farm; Old Garlands Farm; and Corringham Hall Farm. In addition, Old Hall Farm and Oak Farm are located just outside the survey area boundary. Each farm contained areas of hard-standing, walls, scrub or tall ruderal vegetation and farm buildings. Ponds were also present within four of the farms.
- 12.5.59 Large areas of amenity grassland are present to the west of Area 2, comprising the playing fields of Stanford-le-Hope Primary School and a bowling green.

Area 3

- 12.5.60 Area 3 is dominated by large species-poor, grazed, improved grassland and arable fields, most of which make up the Corringham Marshes SINC.
- 12.5.61 The fields are bordered by wet ditches with associated hedgerows and fences and the ditches contain stagnant or slow-flowing water with a range of marginal vegetation.



- 12.5.62 Approximately 25 ponds are located to the east of this area within a field of speciespoor improved grassland; this area forms part of the Northern Triangle Receptor Site. In addition a large area of open standing water known as 'The Manorway Fleet' is located along the eastern boundary of Area 3. The Manorway Fleet is dominated by reed and rush vegetation.
- 12.5.63 Areas of continuous scrub occur in large patches along the banks of the A1014 (The Manorway) and at the borders of fields to the east of this area. Scattered trees occur sporadically throughout. In addition, linear strips of semi-improved grassland with occasional scattered trees and scrub occur along the verges of the A1014 (The Manorway).

Area 4

- 12.5.64 Area 4 comprises mostly brownfield land dominated by poor semi-improved grassland. Large areas of standing water and inundation wet vegetation are located throughout this area; most of these waterbodies are devoid of submerged or emerging vegetation.
- 12.5.65 An area of continuous scrub is present within the centre of this survey area surrounding a deep pond. In addition scattered and continuous scrub is present in small patches throughout this survey area.
- 12.5.66 The south-eastern section of Area 4 is dominated by the existing CECL Power Station, which predominantly comprises amenity grassland, built structures and areas of hard standing. In addition to the CECL Power Station two other building complexes are present to the north of the area. These are Coryton Commercials and Greystar.

Habitats

- 12.5.67 The nature conservation interest of the habitats in the Ecological Route Study Corridor is evaluated below.
 - Improved Grassland

This habitat is common and widespread throughout the local area and with a low species diversity is considered to be of negligible conservation value. However, Corringham Marshes SINC, located within Area 3 is dominated by improved grassland / coastal grazing marsh. Given its non-statutory designation and the inclusion of coastal grazing marsh as a UK and Local BAP Priority Habitat, the improved grassland located within this SINC is considered to be of District value.

Semi-Improved Grassland

This habitat is well dispersed throughout the survey area and its surroundings, the more diverse and tussocky areas of semi-improved grassland are considered to be of Site value.

• Arable

Due to the low species diversity, arable crops are of little nature conservation interest. There are some arable fields located within Corringham Marshes SINC, however, as the marshes are designated for their grassland and communities and network of drains, arable remain of negligible value.

Continuous and Scattered Scrub

Occasionally present throughout the survey area offering foraging and shelter opportunities to a range of species. This habitat is considered to be of Site value.

Hedgerows



Species poor defunct and intact hedgerows act as potentially valuable wildlife corridors and are limited in presence. This habitat is therefore considered to be of Site value.

Broad-Leaved Semi-Natural Woodland

Rare within the survey area but not the region. Given this habitat's potential to support a range of species it is considered to be of Site value.

• Scattered Broadleaved Trees

Recorded occasionally throughout the survey area, large mature trees could support roosting bats and nesting birds. This habitat is therefore considered to be of Site value. The value of the trees as a habitat to support protected and / or notable species may be greater than that of the survey area this will be informed by further survey and assessed independently.

• Standing Water

The water bodies, including ponds, lakes and wet drains present in the survey area, particularly those which are permanent features, increase its diversity. The standing water present in all Areas is therefore considered to be of Local conservation value. The value of the standing water as a habitat for protected species may be greater than 'local'; this will be informed by further survey and assessed unrepentantly.

Running Water

Comprising Hassenbrook stream, its marginal vegetation and several of the larger wet drains within Area 2. These habitats are likely to serve as wildlife corridors and will link directly to the nearby Thames Estuary and potentially the SPA. The stream is therefore considered to be of Local conservation value.

• Inundation Vegetation

A less common habitat within the survey area associated with the water bodies and running water but fairly common within the wider surroundings. It supports a low species diversity and is therefore considered to be of Site Value.

Reed Bed (Swamp)

This habitat is abundant throughout the survey area (particularly Stanford Warren Nature Reserve) and comparatively uncommon within the wider surroundings. It is also a UK and Local BAP habitat and is therefore considered to be of District Value.

Built Structures

Located throughout the survey area in various forms. Some buildings, especially the farm buildings could support bats or birds such as the Schedule 1 Barn Owl. This habitat is therefore considered to be of value at the Site level. The value of the buildings as a habitat for protected species may be greater than that of the survey area. This will be informed by further survey and assessed independently.

• Dry Drain

A common habitat both within the survey area and wider area supporting low species diversity and therefore considered to be of negligible conservation value.

Protected Species Surveys

Bats



- 12.5.68 A total of six species of bat were recorded within the proposed pipeline route survey area. Species recorded were common pipistrelle, soprano pipistrelle, noctule, serotine, brown long-eared and Leisler's. In addition to the legal protection afforded to bats, soprano pipistrelle, noctule and brown long-eared bats are UK BAP species. All pipistrelle bats are Essex BAP species; and all bats are Thurrock BAP species.
- 12.5.69 Bats were mainly recorded at low and very low levels throughout the survey area although the results indicate that higher numbers of bats utilise the area to the east of the Stanford Warren Nature Reserve and an area of receptor Site A⁴⁸. In addition during the 2008 surveys⁴⁹, the highest levels of bat activity were recorded around the large area to the southern of Old Hall Farm and Great Garlands Farm.
- 12.5.70 Bats were recorded foraging and commuting during the surveys. No potential roosts were identified as likely to be directly impacted by the proposed development and thus no emergence surveys were carried out. Furthermore, no bat roosts were recorded during the activity / transect surveys. Common pipistrelles and noctule comprised the majority of activity recorded.
- 12.5.71 The Leisler's records were predominantly along the railway which is located within the western end of the pipeline route and continues to the south of the route.
- 12.5.72 The key areas of bat activity / utilisation are concentrated within the central section of the survey area, around the borders of the Stanford Warren Nature Reserve, along hedgerows to the south of Old Farm and within the industrial area to the east of Stanford Warren.
- 12.5.73 Based on the desk study findings and the survey results the site is considered to be of Site Value for bats.

Breeding Birds

- 12.5.74 In total, at least 54 species were recorded during the 2008 and 2010 breeding bird surveys, of which 6 species were confirmed as breeding on the site, 22 species were either likely or possibly nesting on the site. A further 17 species recorded were not breeding but could be potentially using the site for foraging. Approximately 45 per cent (24 of the 54 species) were subject to some degree of conservation interest / concern; a total of five of these species were confirmed or likely breeding within the survey area. Six of the species recorded were listed on Schedule 1 although none of these were confirmed breeding within the survey area.
- 12.5.75 No species recorded were recognised as having a European conservation designation as defined by the EU Birds Directive Annex 1 List.
- 12.5.76 None of the breeding species occurred in nationally significant numbers.
- 12.5.77 The site contains a diversity of habitats suitable for use by a range of breeding birds although the dominant habitats (arable fields, improved grassland and brownfield land) are of less value than the network of hedgerows, ditches, marshy grassland and waterbodies throughout the site. These habitats are included within the JNCC amber and red lists, and within the UK, Essex and Thurrock BAPs. Accordingly a range of species were recorded,
- 12.5.78 Based on the survey results the site is considered to be of Site Value for breeding birds.

Badgers

12.5.79 Three active setts were recorded within the survey area. One main sett was present comprising seven entrances with fresh spoil, bedding, guard hairs and prints recorded

⁴⁸ Note that Receptor Site A is now called 'Stanford Wharf Nature Reserve'

⁴⁹ Thomson Ecology (2008) DP World, London Gateway – Bat Activity Survey Interim Report – 2nd Visit



around the sett. Badger latrines and paths were recorded along field boundaries within the surrounding area.

- 12.5.80 Two outlier setts were present within the survey area, each comprising a single entrance only and both located along field boundaries. Well defined mammal paths led to both setts and badger prints were recorded nearby.
- 12.5.81 In addition to the presence of active setts, the site contains a variety of suitable foraging areas and commuting routes / habitat connectivity throughout.
- 12.5.82 The site is therefore considered to be of Site Value for badgers.
- 12.5.83 Information pertaining to the presence of and locations of badger setts and activity should be treated sensitively. This information should not be published within the public domain.

Water Vole

- 12.5.84 Water voles were recorded along 42 of the 104 waterbodies present within the survey area (including ditches, ponds and transient pools of water). In each of these water bodies, evidence of water vole utilisation such as burrows, nests, latrines, sightings, and feeding remains, was recorded.
- 12.5.85 A further 38 were considered suitable for water voles although no evidence was recorded. These results do not include the water bodies located within Stanford Warren Nature Reserve as this area will be bypassed via HDD.
- 12.5.86 Whilst the water bodies located within the Northern Triangle Receptor Site were not surveyed due to access restrictions they are assumed to support water voles as they are being used as a receptor site.
- 12.5.87 Whilst it was not possible to determine population sizes due to limited access during the 2010 survey, drawing on professional judgement and previous reports it is considered likely that the survey area supports a medium-large meta-population of water voles within a large area of suitable habitat. The areas are highly connected by a network of drainage ditches and hedgerows and this is likely to facilitate water vole migration throughout the area. This assessment has therefore been based on the presence of a medium to large meta-population of water voles.
- 12.5.88 The data upon which this assessment is based has been acquired from surveys undertaken over several years. During these years extensive water vole translocations have commenced as part of the 'London Gateway Ecological Mitigation and Management Plan Water Vole 2008^{,50}. Under these plans water voles are being translocated into the Northern Triangle Receptor Site (west), (Thomson 2009) from the LG Development site and Site A⁵¹ (an area of land that is being enhanced and managed for over-wintering birds, see Figure 4 within Appendix F.1). However, this is not considered to significantly affect the assessment and recommendations given within this report as the locations of the receptor sites are known; the numbers of water voles are not likely to change beyond any natural annual fluctuations; and the recommendations provided below have are based on a precautionary approach.
- 12.5.89 There is currently no water vole fencing surrounding the Northern Triangle Receptor Site (east and west), it is therefore likely that individuals released into the receptor site will migrate into surrounding suitable, connected habitat. A precautionary approach has therefore been adopted, taking into account the possible increase in water vole population within water bodies north of the Manorway.

⁵⁰ Thomson Ecology (2008), London Gateway Ecological Action Plan – Water Vole

⁵¹ Note that Receptor Site A is now called 'Stanford Wharf Nature Reserve'



- 12.5.90 Whilst mink traps were recorded throughout the eastern end of the survey area (understood to have been fitted by Thomson Ecology during the translocation works) no mink have been trapped by LG Development Contractors. Furthermore, no signs of mink have been detected⁵².
- 12.5.91 In addition to the legal protection afforded to water voles, they are a UK, Essex and Thurrock BAP species.
- 12.5.92 The site is considered to be of District Value for water voles.

Great Crested Newts

- 12.5.93 GCN were recorded / confirmed present in 28 of the 75 waterbodies considered suitable for this species. These waterbodies are located across the survey area indicating the presence of GCN throughout the site.
- 12.5.94 The survey results recorded five medium size class populations and 23 small populations. These are considered to form part of one large meta-population throughout the survey area.
- 12.5.95 Suitable terrestrial habitat such as coarse grassland, dense and scattered scrub, hedgerows, marshy grassland, poor semi-improved grassland and broad-leaved woodland occur throughout the site.
- 12.5.96 The data upon which this assessment is based has been acquired from surveys undertaken over a number of years. During this time, extensive GCN translocations have commenced under the 'London Gateway Ecological Mitigation and Management Plans'⁵³. Under these plans, GCN within the LG Development area (Area 5) are being captured, translocated and released in receptor sites including the Northern Triangle, Great Garlands Farm Elbow Receptor Site, and the Northern Landscape Receptor Site, all of which are partially located within the survey area.
- 12.5.97 The receptor sites will be managed for GCN, through the creation and enhancement of suitable aquatic and terrestrial habitat. Therefore it is likely that the data acquired from the 2008 reports may now be different from current conditions with a higher concentration of GCN in and around the receptor sites. However, this is not considered to significantly affect the assessment and recommendations given within this report as the locations of the receptor sites are known, the numbers of GCN are not likely to change beyond any natural annual fluctuations and the recommendations provided below have are based on a precautionary large meta-population.
- 12.5.98 In addition to the legal protection afforded to GCN, they are a UK, Essex and Thurrock BAP species.
- 12.5.99 Based on the survey results and the presence of the receptor sites within the survey area / site, the site is considered to be of Local Value for GCN.

Reptiles

- 12.5.100 Four species of reptile were recorded throughout the survey area; common lizard, slow worm, adder and grass snake. They were recorded in medium to high populations with particularly large populations of all four species recorded north of the Manorway.
- 12.5.101 The surveys recorded sub-adults and juveniles for each species, thus indicating breeding within the site.
- 12.5.102 The proposed pipeline route runs directly through the Northern Triangle Receptor Site. The receptor site has undergone extensive habitat creation and enhancement,

⁵² Personal Communication – Chris Webb (DP World) 31-01-2011

⁵³ Thomson Ecology (2008) Great Crested Newt Ecological Habitat Management and Maintenance Plan. Thomson Ecology for DP World.



primarily for great crested newts. However, the creation of connecting habitat, basking areas, and suitable shelter and hibernation habitat is also significantly beneficial for reptiles. It is understood that at least 3 614 reptiles have been released into the area from Site A⁵⁴ and main LG Development site of which 99 were adders, 13 grass snakes, 1,211 common lizards, and 2,291 slow worms. The site is therefore considered to contain 'large' populations of all four species of reptile.

- 12.5.103 It is likely that the population of reptiles within the Northern Triangle, as well as the Great Garlands Farm Elbow and Boundary receptor sites will continue to increase until 2011, due to the continued translocation of reptiles from the LG Development site⁵⁵. However, it is not considered that any past or present translocations will significantly affect the accuracy of assessment as the locations of the receptor sites and the numbers of reptiles moved or likely to be moved are known. Any recent or future changes can therefore be predicted with reasonable accuracy. Furthermore, the recommendations provided are based on precautionary large population for each species.
- 12.5.104 Suitable habitats for reptiles are present across the survey area and include coarse grassland, dense and scattered scrub, hedgerows and brownfield land. The habitats form a mosaic with good connectivity across the site in the form of ditches, hedgerows, and field boundaries.
- 12.5.105 It is considered that the survey area and surrounding habitat support a large metapopulation of all four species of reptiles. The construction of the pipeline and associated infrastructure are envisaged to result in direct temporary impacts on the local populations of reptile. However, due to the nature and small footprint, the proposed scheme is unlikely to result in long-term negative impacts on local populations of reptiles. To ensure legal compliance it would be essential for mitigation measures to be implemented to reduce the impacts on reptiles associated with the scheme.
- 12.5.106 In addition to the legal protection afforded to reptiles, all native reptiles are UK BAP species, with adder and grass snake also Thurrock BAP species.
- 12.5.107 The results of the surveys and the presence of the receptor sites within the proposed pipeline route are such that overall the site is considered to be of Local Value for reptiles.

Flora

- 12.5.108 The habitats present in the survey area are largely common and representative of the wider landscape; predominantly arable, grazing marsh and brown field. It is considered likely that the majority of the flora on site is limited to common and widespread species. However, a series of nationally rare species and one species scarce in Europe was recorded in Corringham Marshes SINC (Area 3).
- 12.5.109 The hedgerows recorded on site were predominantly species poor and many were also defunct. None were recorded to be of sufficient value to be of importance under the Hedgerow Regulations 1997.
- 12.5.110 No invasive species were recorded on site during the Extended Phase 1 Habitat survey.
- 12.5.111 It is therefore considered that, over and above the value of the Flora within the Corringham Marshes SINC, the flora within the remainder of the site is of value at the Site level only.

⁵⁴ Note that Receptor Site A is now called 'Stanford Wharf Nature Reserve'

⁵⁵ Thomson Ecology (2008) London Gateway – Site A Reptile Mitigation Method Statement for DP World, and; Thomson Ecology (2008) Reptile Ecological Action Plan for DP World.



Invertebrates

12.5.112 No specific surveys were undertaken due to the narrow scale and temporary nature of the development. Initial consultation with Natural England confirmed that the key area in respect of invertebrates is the area to the north of the A1014 (The Manorway). Based on the small / localised area of works and the short timescales for the works, Natural England agreed with the scope of the ecological baseline that invertebrate surveys would not be necessary in respect of this assessment (Appendix F.2). However, for the purposes of this assessment and based on the results of the desk study the site is considered to be of Local Value. The basis for the assessment of effects on invertebrates is therefore based on the results obtained from the desk study and a review of existing information.

Future Baseline

- 12.5.113 The baseline assessment entails the following known changes to the existing situation within the proposed project's construction.
- 12.5.114 Significant changes in the baseline conditions between the present time and the proposed commencement of construction are considered unlikely although the agricultural activities undertaken along the pipeline route may influence the ecological diversity of the site based on the regimes being implemented. It is however, considered that the key baseline conditions along the majority of the proposed pipeline route are likely to remain similar.
- 12.5.115 The only exception will be to the immediate east of Great Garlands Farm where a new access road is planned. The road will link Stanford–le-Hope to the LG Development, located to the south-east and will cross the proposed gas pipeline perpendicularly. It is not known when the development will commence exactly, but it is likely to be after the installation of the gas pipeline.

12.6 Potential Impacts

- 12.6.1 The methodology used to identify and characterise potential impacts, and assess the significance of these impacts is described in Section 12.4 in detail above. In summary, this section identifies the likely significant impacts of the proposed development during construction and operation and characterises the potential ecological impacts that are likely to arise, taking into consideration the following parameters: positive / negative effect, magnitude, extent, duration, reversibility, and timing / frequency.
- 12.6.2 The impacts are assessed on the basis of the results of the desk study data, survey data and details of construction and operation of the proposed development outlined in Section 6.
- 12.6.3 The assessment of impacts is based upon potential impacts on ecological receptors evaluated as being of Site level or above only; no consideration is given to those ecological receptors valued below Site level or those scoped out of this assessment (see Table 12.1).
- 12.6.4 The potential impacts of the proposed pipeline installation are identified as follows:
 - Temporary habitat loss;
 - Temporary habitat fragmentation;
 - Direct mortality and / or injury on notable and protected species and habitats during site clearance and construction;
 - Direct and indirect disturbance to the ecological receptor from construction activities including visual, noise, vibration and lighting; and,



- Pollution caused by use of hazardous materials and incidental release of chemicals, fuels or waste materials.
- 12.6.5 As stated previously following the installation of the pipeline the trench will be backfilled and the habitats will be reinstated. It is considered that there will therefore be no additional operational activities that will be undertaken which would have potential effects on the ecology and nature conservation of the Site and thus operation impacts have not been further considered. See Section 6 for a description of operational activities.

Designated Sites

Thames Estuary and Marshes SPA and Ramsar Site

- 12.6.6 The proposed pipeline route is located approximately 600 m to the north of the Thames Estuary and Marshes SPA and Ramsar Site; no direct impacts are anticipated as a result of the installation of the proposed pipeline due to the distance of the route from the designated site and the temporary nature of the proposed works.
- 12.6.7 There is a risk of indirect effects as a result of the proposed pipeline installation due to the hydrological linkages between the pipeline route and the SPA and Ramsar site. Potential indirect effects include the potential for runoff and pollution, and disturbance as a result of increased human activity, vibration, lighting, noise and dust. In the absence of any mitigation measures it is considered probable that these impacts would be short-medium term, temporary, indirect, of low magnitude and of significance at the Local level.

Grove House Wood LNR

12.6.8 Grove House Wood LNR is located approximately 250m north from the proposed pipeline route at its closest point (HDD works), with the LNR 450m from any open-cut sections of the pipeline. The proposed works will be temporary and highly localised and as such it is considered certain that there will be no significant adverse impacts on this designated site.

Vange and Fobbing Marshes SSSI

- 12.6.9 The SSSI is located approximately 50m to the north of the pipeline route at the closest point. The site is designated for its unimproved coastal grassland and associated dykes and creeks, which support a diversity of maritime grasses and herbs, many of which are nationally rare or uncommon. Due to the narrow construction corridor, the temporary nature of the works and the distance between the pipeline and the SSSI no direct impacts are anticipated as a result of the pipeline installation.
- 12.6.10 There may be some potential for indirect effects to occur as a result of the pipeline installation such as disturbance from lighting, noise, increased human activity and vibration and a risk of runoff from the construction areas. In the absence of mitigation these impacts are anticipated to be probable, short-term, indirect, of low magnitude and significant at the Local level.

Corringham Marshes SINC

12.6.11 The proposed pipeline route will cut through Corringham Marshes SINC resulting in habitat loss and damage to the coastal grazing marsh and a number of ditches and drains within this SINC. The effects will however, be localised and temporary with a relatively narrow working corridor implemented and subsequent re-instatement of all habitats following completion of the pipeline installation. It is therefore considered certain that the proposed works will result in a short-term, direct adverse impact of low magnitude, significant at the District level.

Stanford Warren Nature Reserve and SINC



12.6.12 The nature reserve and SINC will be bypassed by HDD technology and thus will not be directly impacted by the pipeline installation. Neither the drilling head nor the tunnel are envisaged to cause any hydrological impacts (see Section 13). Potential indirect effects include the potential contamination of the reedbed habitat and disturbance due to increased vibration, lighting, noise and dust. In the absence of any mitigation measures it is considered probable that these impacts would be shortmedium term, temporary, indirect, of low magnitude and of significance at the Local level.

BAP Habitats

Coastal Grazing Marsh (UK and Local BAP)

12.6.13 The proposed pipeline route will cut through large areas of coastal grazing marsh resulting in habitat loss and damage to this BAP habitat. The effects will however, be localised and temporary with a relatively narrow working corridor implemented and with subsequent re-instatement of all habitats following completion of the pipeline installation. It is therefore considered certain that the proposed works will result in a short-term, direct adverse impact of low magnitude, significant at the District level.

Reedbeds (UK and Local BAP)

12.6.14 The key area of reedbed is located within Stanford Warren Nature Reserve and SINC; this area is to be bypassed by HDD and therefore no works will directly affect this habitat. It has been assessed that there will be no hydrological impacts resulting from the development of the gas pipeline and associated AGI (See Section 13). The potential indirect effects will be localised and temporary with subsequent re-instatement of all habitats following completion of the pipeline installation. It is therefore considered certain that the proposed works will result in a short-term, direct adverse impact of low magnitude, significant at the District Level.

Roadside Verges (Local BAP)

- 12.6.15 The pipeline route will cross a number of roads. However, the major road crossings will be via HDD Technology.
- 12.6.16 Where the pipeline cross minor roads and tracks in open cut there will be some temporary loss and damage to roadside verge habitat. However, this will be extremely localised and these habitats will be reinstated following the completion of the works.
- 12.6.17 Therefore impacts to this habitat are considered certain to be negligible at the Local level. Therefore no significant affects are envisaged.

Brownfield Wildlife Land (Local BAP)

- 12.6.18 The proposed pipeline route will cut through areas of brownfield habitat resulting in habitat loss and damage to this LBAP habitat. However, the effects will be localised and temporary with subsequent re-instatement of all habitats following completion of the pipeline installation.
- 12.6.19 It is therefore considered probable that the proposed works will result in short-term, direct adverse impacts of low magnitude, significant at the Local level.

<u>Habitats</u>

- 12.6.20 In addition to the impacts on BAP Habitats discussed and assessed above, the proposed works will result in the temporary loss and damage to a range and mosaic of habitat assemblages of ecological value.
- 12.6.21 Whilst the route will comprise a fairly narrow footprint, the length over which habitats will be removed and areas of habitat removal associated with the HDD compounds and entry and exit locations are such that the overall habitat loss will be significant. It



is therefore assessed that overall, the loss of non-BAP habitats generally as a result of the proposed development will be a certain, direct, temporary/short-term effect of low magnitude and significant at the Local level.

Species

Bats

- 12.6.22 The 30 m wide working corridor associated with the construction of the pipeline and reinstatement of the ground is anticipated to take approximately six months to complete. It is understood that installation works are only likely to be carried out at any one point along the route for one to two weeks as the pipeline is laid in stages. During this time the boundary of the pipeline route where works are being undertaken would be fenced, the topsoil stripped, and the trench excavated prior to construction and installation of the pipeline commencing. Increased noise, light and vibration disturbance and an increase in dust deposition are therefore likely to be highly localised and very temporary in nature.
- 12.6.23 No trees or buildings with the potential to be used as bat roosts will be directly affected as a result of the works. Therefore it is considered certain that there will be no significant effects on bat roosts.
- 12.6.24 The proposed works will result in habitat fragmentation; bats use linear features such as rivers, hedgerows and tree lines as commuting routes and the creation of a small gap (approximately 5 m in length) in a hedgerow can restrict bats movements along such corridors. However, the anticipated fragmentation impacts are only envisaged to occur during the construction stage of the pipeline as all habitats will be reinstated to their original condition or better post completion of works.
- 12.6.25 Fragmentation of suitable linear features is envisaged throughout the survey area. The majority of the field boundaries located along the route are delineated by a hedgerow, row of trees, vegetated ditch or fence. An estimated 24 hedgerows (nonimportant under the Hedgerow Regulations), vegetated ditches or tree lines would be affected, some intact and continuous, others defunct. The hedgerows which support the greatest abundance of bats are located directly south of Old Hall Farm. Bats may roost in the buildings and mature trees associated with Great Garlands Farm and Old Farm and use the hedgerows to commute to suitable foraging areas or as foraging habitats themselves.
- 12.6.26 Many of the hedgerows and other linear features within the survey area are already defunct and support large gaps and therefore the temporary creation of additional, similar gaps to facilitate the construction works may not prove as significant as creating gaps in fully intact linear features. It is therefore anticipated that based on the general low levels of bat activity across the site and the temporary and highly localised nature of the works, habitat fragmentation will be a certain, short-term impact on bats of low magnitude, significant at the Site level.
- 12.6.27 The construction works associated with the pipeline installation would result in an increase in human activity, noise, vibration, and dust resulting in the potential for indirect disturbance to bats. The works will be undertaken during day light hours when bats are inactive, at least 30 m from any potential roost (building or tree) and are programmed to take only one to two weeks to complete and thus it is anticipated that impacts will be negligible.
- 12.6.28 The increased levels of artificial lighting associated with the construction works may also indirectly affect bats. Lighting can lead to the fragmentation of commuting corridors as light can act as a barrier which bats will not cross. However, under current plans the normal working hours should be restricted to occur between 07:00 and 19:00, and wherever possible during summer daylight. It is therefore envisaged that only security lighting will be required during the construction phase, reducing the


potential for impacts on bats such that the impacts associated with lighting are anticipated to be a probable, short term impact of low magnitude, significant at the site level for flights lines only.

- 12.6.29 In addition to the open-cut works required for the pipeline installation, under current plans four sections of the proposed pipeline are to be laid using HDD technology; under Stanford Warren Nature Reserve the adjacent railway and road section, under the Fleet and twice under The Manorway.
- 12.6.30 The exact locations of the HDD tunnelling sites are still to be confirmed. It is understood, however, that the HDD bore-holes will be positioned in arable fields which are not considered to be optimal habitats for bats. The temporary loss of such habitat is therefore unlikely to adversely affect bats. Despite this the access tracks required to remove the excavated spoil could fragment or disturb known foraging or commuting routes. The remainder of the HDD route is likely to remain unaffected as the pipeline or cable is laid deep underground. Assuming that existing roads or tracks can be used to access the preferred sites, it is considered certain that there will be no significant direct impacts as a result of the HDD technology.
- 12.6.31 Indirect disturbances from increases in noise, vibration and lighting are expected in association with the HDD tunnelling works. Although any indirect disturbances may continue for longer than the two weeks envisaged for the pipeline excavations as the HDD tunnelling works will be located in one fixed point for a longer period of time, these impacts will still be temporary. Furthermore, although the proposed works are likely to result in increased levels of lighting during the construction phase it is assumed that works will occur only within the hours of 07:00 and 19:00 (as above) and limited security lighting will be required. The resulting impact of increased lighting and disturbance at the HDD access and egress sites is therefore a probable, short term impact of low magnitude, significant at the site level for flights lines only.
- 12.6.32 It is anticipated that any increases in noise, lighting or vibration will not adversely affect any roosting bats as construction works are not currently planned to occur within close proximity to any known roosts.

Breeding Birds

- 12.6.33 The proposed works will result in the temporary loss of habitat from within the 30 m working corridor along the length of the pipeline. The loss of habitats from within this corridor is likely to affect both nesting and foraging birds. Such habitat loss could, in turn, result in the indirect reduction in certain bird territories and the fragmentation of their habitats.
- 12.6.34 The majority of land expected to be bisected by the indicative route comprises large, well managed grassland or arable fields separated by a network of connected drainage ditches and hedgerows. Approximately five hedgerows are expected to be affected within Area 1 (Appendix F.7, Figure 2) where four species listed on the BoCC Red List and UK BAP were recorded (skylark (*Alauda arvensis*), song thrush (*Turdus philomelos*), willow tit (*Poecile montanus*) and starling (*Sturnus vulgaris*)). At least six ditches and no hedgerows will be affected in Area 2 (Appendix F.7, Figure 2) where six BoCC Red List and / or UK BAP species were recorded (cuckoo (*Cuculus canorus*), skylark, song thrush, yellowhammer (*Emberiza citrinella*), yellow wagtail (*Motacilla flava*) and corn bunting (*Emberiza calandra*)). Finally, at least 13 ditches and six hedgerows are likely to be affected in Area 3 (Appendix F.7, Figure 2) where eight BoCC Red List and/or UK BAP species were recorded (lapwing (*Vanellus vanellus*), skylark, song thrush, spotted flycatcher (*Muscicapa striata*), house sparrow (*Passer domesticus*), linnet (*Carduelis cannabina*), yellowhammer and corn bunting).
- 12.6.35 The losses in hedgerows equates to between 300 450 m of temporarily lost hedgerows and between 500 and 700 m of temporarily lost ditches (depending on



exact alignment of the pipeline within the 30 m wide working corridor). The losses of foraging and nesting habitat are considered certain to result in short-term, direct and indirect adverse impacts on breeding birds of low magnitude and significant at the Site level.

- 12.6.36 Of principal nature conservation interest, one Schedule 1 species, barn owl was recorded adjacent to Stanford Warren Nature Reserve flying over arable fields to the north of Mucking village. Given the distance of the proposed works from the nearest possible roosting structure (a derelict barn structure, approximately 130 m to the south), it is anticipated that impacts to this species would only include temporary loss of a small area of foraging habitat. The location of the barn owl breeding site is currently unknown. Under current plans no buildings or potential roosting sites are to be directly affected and due to the temporary nature and small footprint of the scheme it is considered likely that impacts on this species would be negligible.
- 12.6.37 In addition, five other Scheduled 1 species (hobby, little ringed plover, black redstart, Cetti's warbler and bearded reedling) were recorded in Area 3 (Appendix F.7, Figure 2). Breeding status of these species is unknown; however, habitat within the site footprint is suitable for nesting Cetti's warbler and bearded reedling, with some potential suitability for little ringed plover within brownfield habitats. The proposed works therefore have the potential to result in habitat loss and disturbance to these species, considered possible to result in short-term, direct and indirect adverse impacts on these species of high magnitude and significant at the Site level.
- 12.6.38 The general indirect impacts envisaged on site include an increase in noise, light and vibration disturbances and an increase in dust deposition. However, it is understood that many species of bird are adaptable and tolerant to some low levels of disturbance. Following best practice construction methodologies, such as the restriction of works to daylight hours and the sensitive use of lighting, these impacts are likely to be highly localised, temporary in nature and are therefore considered not significant.
- 12.6.39 In addition to the open-cut works required for the pipeline installation, under current plans four sections of the proposed pipeline are to be laid using HDD technology; under Stanford Warren Nature Reserve the adjacent railway and road section, under The Fleet and twice under The Manorway.
- 12.6.40 The exact locations of the HDD tunnelling sites are still to be confirmed. It is understood, however, that the HDD bore-holes will be positioned in arable or grassland fields. The clearance of access tracks required to remove the excavated spoil from the sites may lead to further temporary loss of arable or grassland fields. No hedgerows or ditches are likely to be directly affected. The only envisaged impacts would therefore be at and around the access and egress points of the bore hole.
- 12.6.41 The site footprint for each bore hole and associated traffic access is likely to require a larger area of land than the 30m wide buffer required for the trench excavation; potentially resulting in a larger area of temporary habitat loss. The tunnelling works may also take longer to complete. The HDD works are therefore likely to lead to proportionally greater localised noise and vibration disturbances than those associated with the trench excavation. However, it should be acknowledged that the remainder of the HDD route is likely to remain unaffected as the pipeline or cable is laid deep underground.
- 12.6.42 Very little habitat loss, either temporary or permanent is therefore envisaged given the length of pipeline which will be laid comparative to the area required for the access or egress locations. The habitat loss may directly affect arable grassland or arable species, such as skylarks or reed buntings. Additionally, species present within the surrounding grassland, trees and hedgerows maybe indirectly adversely affected.



12.6.43 Unmitigated, the small scale land take and more wide reaching indirect impacts could adversely affect breeding birds and it is therefore considered certain that impacts resulting from the HDD works on breeding birds will be direct and indirect, short-term and of low magnitude, significant at the Site level.

Badgers

- 12.6.44 Three active badger setts have been recorded within the survey area but are all located at least 50 m from the footprint of the proposed pipeline installation. At the time of writing no active badger setts will be directly or indirectly affected. The impacts on badger setts is therefore certain to be negligible.
- 12.6.45 In addition to the impacts on setts, the proposed pipeline is certain to will result in the loss and damage of areas of foraging and commuting habitat. Habitat losses will be temporary with the construction of the pipeline and reinstatement of the ground anticipated to take approximately six months to complete. In addition, the habitat removal will be along a narrow corridor with significant areas of alternative suitable foraging habitat present in the immediate surrounding area.
- 12.6.46 The proposed pipeline installation will also result in habitat fragmentation with the potential to form a barrier to badger movement throughout the area including potentially blocking movement between setts and foraging areas. Collectively, these indirect impacts are considered certain to be short-term, of low magnitude and significant at the Site level.
- 12.6.47 Direct mortality of badgers during site clearance and pipeline installation is most likely during the early hours of the morning or in the evening when badgers are most active. The increased levels of traffic on site will increase the risk of mortality of badgers in the area. Although considered unlikely, this impact is considered to be short-term, direct, of low magnitude and of significance at the Local level.
- 12.6.48 Direct and indirect disturbance from construction activities including visual, noise, vibration and lighting is envisaged to impact the badgers using the site during construction. In addition to the potential for disturbance to an active sett, the highest level of disturbance anticipated will be disturbance to individual animals whilst foraging or commuting across the site. This will result in a probable impact that will be short-term, direct, of low magnitude and of significance at the Local level.
- 12.6.49 In addition to significant negative effects on badgers at the Site level, the works affecting a badger sett would have the potential to result in a breach of the law.

Water Vole

- 12.6.50 The proposed development works will be likely to result in temporary and localised fragmentation, disturbance and habitat loss where water bodies are crossed. The main works are only likely to be carried out at any one point along the route for a maximum of two weeks at a time as the pipe spread progresses. Increased noise, light and vibration disturbance and an increase in dust deposition are therefore likely to be highly localised and very temporary in nature.
- 12.6.51 The temporary habitat loss is therefore considered certain to result in short-term direct adverse impacts of low magnitude, significant at the District level.
- 12.6.52 In addition to the temporary habitat loss, the works will result in the temporary fragmentation of water vole habitat. Due to the large number of ditches/linear water features that will be crossed the fragmentation associated with these ditch crossings is considered certain to result in short-term, direct and indirect adverse impacts on water voles of medium magnitude and significant at the Site level.
- 12.6.53 The proposed pipeline route will directly bisect approximately 17 water bodies. The water bodies present within Area 5 are to be drained and levelled following the



development within the area as part of the LG Development, these water bodies are therefore unlikely to be present at the time of construction.

- 12.6.54 A number of waterbodies with water vole populations present will be directly bisected by the route thus in addition to habitat loss and fragmentation, the works have the potential to result in disturbance and mortality or injury. In the absence of any mitigation measures it is considered certain that short-term adverse impacts will result of low magnitude and significant at the District level.
- 12.6.55 In addition to significant negative effects on water voles at the Local/District level, the works affecting water voles would have the potential to result in a breach of the law.

Great Crested Newt

- 12.6.56 Construction of the proposed development would result in the temporary loss of approximately 17 water bodies, at least two of which are known to support GCN (Blue 29 and green 179, see Figure 5, Appendix F.6). In addition, there would be loss of optimal and sub-optimal terrestrial habitat and indirect disturbance along the majority of the alignment (including increased lighting, noise and vibration). The temporary habitat loss would result in the fragmentation of the site for approximately six months with numerous water bodies situated on either side. Indirect disturbances are only envisaged at any one point along the route for up to two weeks as the pipe is laid in stages. Increased noise, light and vibration disturbance and an increase in dust deposition are therefore likely to be highly localised and very temporary in nature.
- 12.6.57 Due to the large number of suitable water bodies located within and around the survey area, it is highly likely that GCN will be able to access at least one water body suitable for breeding throughout the construction period, although this may not be the traditional breeding pond of individual GCNs. Additionally, given the large number of water bodies and suitable foraging habitat throughout the survey area it is considered unlikely that GCN will migrate large distances to feed or breed although they may need to migrate further than usual. Due to the short timescale over which the works will be undertaken the temporary obstruction to dispersal is not considered likely to affect breeding or foraging opportunities. Furthermore, as the construction works will be completed during the spring and summer months, fragmentation will not prevent GCN accessing hibernation sites.
- 12.6.58 The proposed development is envisaged to only directly impact two waterbodies known to support small populations of GCN. The direct impacts on the water body would result in direct loss of breeding habitat. The water body would be reinstated post-works and thus the habitat loss is considered to be temporary. The habitat loss is therefore considered certain to be a short-term, direct adverse impact on GCNs of low magnitude and significant at the Site level. In the absence of mitigation however, the works would also have the potential to result in disturbance to, mortality and/or injury of individual GCNs. This would be certain to result in permanent adverse impacts of low magnitude and significant at the Site level.
- 12.6.59 In addition to the loss, damage and disturbance of breeding habitat, the proposed works will result in the loss of terrestrial habitat, although the effects will be temporary with subsequent re-instatement of habitats post-completion. The impacts on terrestrial habitat are therefore considered certain to be short-term, direct and of low magnitude, significant at the Site level.
- 12.6.60 The construction of the proposed development would also lead to temporary fragmentation of the local GCN population. This has the potential to result in disturbance to GCNs and as such is considered certain to give rise to short-term, direct and indirect adverse impacts of low magnitude and significant at the Site level.
- 12.6.61 Although these impacts are not likely to permanently adversely affect the known large meta-population, they would need to be mitigated to ensure the adverse impacts on



the GCN population were reduced to negligible and where possible, that the population is enhanced in the long term.

12.6.62 In addition to significant negative effects on GCNs at the Site level, the works affecting GCNs and their habitats would have the potential to result in a breach of the law. A European Protected Species Licence will therefore be required in order to permit the works to proceed and to allow the implementation of the mitigation measures.

Reptiles

- 12.6.63 The proposed construction works would result in the direct temporary loss and disturbance of suitable reptile habitat along the majority of the route. The HDD technology would also result in temporary habitat loss at the access and egress points and along access routes. Unmitigated, these works are likely result in the mortality or injury of reptiles and therefore a breach of the Wildlife & Countryside Act 1981 (as amended). This would be certain to result in permanent adverse impacts of low magnitude and significant at the Site level.
- 12.6.64 The habitat loss and disturbance will be temporary and will incorporate a relatively narrow footprint within suitable reptile habitat areas, however, the value of the site for reptiles is such that these habitat impacts are considered certain to be short-term, direct and indirect and of low magnitude, significant at the Site level.

Flora

- 12.6.65 Several notable plant species were located within Corringham Marshes SINC. Although the species are not legally protected they are regarded as being scarce on a local, national and European level.
- 12.6.66 At the time of the survey, the survey area was found to be devoid of any diverse and species rich hedgerows or any invasive species, as such and based on the initial assessment, it is not considered necessary to undertake any specific hedgerow or non-native invasive species surveys. It is possible however, that invasive species could become established prior to the commencement of work. Any such occurrences are likely to be recorded during the recommended notable flora surveys (see paragraph 4.1.35 within Appendix F.1) and should be treated accordingly. At this stage any impacts are considered to be possible, short-term, direct and of low magnitude, significant at the Site level.

Invertebrates

- 12.6.67 Six Brownfield sites located within close proximity to the pipeline route have been identified as containing habitat suitable to support important invertebrate populations. Corringham Marshes, which is not one of the sites but is known to support a diverse abundance of terrestrial invertebrates will be temporarily impacted as it overlaps with part of the proposed route. It is considered that impacts from the proposed development will only temporarily affect a comparatively narrow strip of habitat therefore effects on this species group are considered possible to be short term, of low magnitude and of a Site value.
- 12.6.68 The drains present within Area 3 provide potential habitat for diverse assemblages of aquatic invertebrates. However, the surveys previously undertaken as part of the LG Development indicated they do not support any notable or protected species. As these surveys were undertaken in 2008 and are therefore considered to be currently valid. Impacts are therefore considered certain to be negligible.
- 12.6.69 The vegetation clearance required for the pipeline installation will have the potential to result in losses of notable flora, particularly within the Corringham Marshes SINC and in the absence of mitigation these impacts would be certain, short-term, direct, of low magnitude and significant at the site level.



Wintering Birds

12.6.70 The works will be undertaken outside of the bird over-wintering period and therefore there will be no significant impacts on this species group.

Summary

12.6.71 Table 12.3 provides a summary of unmitigated impacts due to the construction phase of the gas pipeline and associated AGI.



TABLE 12.3: SUMMARY OF THE UNMITIGATED IMPACTS

VER	Value	Type of Impact	Magnitude and Extent of Impacts	Confidence, Duration and Reversibility	Significance of Impact
Designated Sites	•		•	·	·
Thames Estuary and Marshes SPA and Ramsar	International	Disturbance Pollution	Low – due to limited presence of pathways, distance between proposed development site and SPA / Ramsar site and the temporary nature of construction	Probable Short-Medium term Temporary	Significant at a Local level
Grove House Wood LNR	County	Disturbance	Low – impacts likely to dissipate over distance	Certain	No significant adverse impacts
Vange and Fobbing Marshes SSSI	National	Disturbance Pollution	Low – impacts likely to dissipate over distance	Probable Short term	Significant at a Local level
Corringham Mashes SINC	District	Habitat Degradation Disturbance Pollution	Low – narrow footprint and post construction landscaping will reduce impact	Certain Short term	Significant at a District level
Standford Warren Local Nature Reserve and SINC	County	Disturbance Pollution	Low – due to lack of pathways	Probable Short – Medium term	Significant at a Local level
Habitats					
Coastal Grazing Marsh	National	Habitat Degradation Disturbance Pollution	Low – narrow footprint and post construction landscaping will reduce impact	Certain Short term	Significant at a District level
Reedbeds	National	Disturbance Pollution	Low	Certain Short term	Significant at a District level
Roadside Verges	County	Habitat Degradation Disturbance	Negligible	Certain	No significant adverse impacts
Brownfield Land	County	Habitat Degradation Disturbance	Low – narrow footprint and post construction landscaping will reduce impact	Probable Short term	Significant at a Local level
Habitats (general – other than BAP habitats)	Local -District	Habitat Degradation Disturbance Pollution	Low – narrow footprint and post construction landscaping will reduce impact	Certain Short term / Temporary	Significant at a Local level

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Species						
Bats	Site	Habitat Fragmentation Disturbance	Low	Certain Short Term	Significant at a Site level	
Breeding Birds	Site	Habitat Loss Disturbance	High	Certain Short term	Significant at a Site level	
Badgers	Site	Habitat Fragmentation Degradation Disturbance	Low	Certain Short term	Significant at a Local level	
Water Vole	District	Habitat Loss Fragmentation Disturbance	Medium – due to the direct fragmentation of approximately 17 linear water bodies.	Certain Short term	Significant at a District level	
Great crested newts	Local	Habitat Loss Fragmentation Disturbance	Low	Certain Short term	Significant at a Site level	
Reptiles	Local	Habitat Loss Disturbance	Low	Certain Short term	Significant at a Site level	
Flora	Site	Disturbance	Low	Possible Short term	Significant at a Site level	
Invertebrates	Local	Habitat Loss Disturbance	Low	Certain Short term	Significant at a Site level	



12.7 Mitigation Measures

12.7.1 A range of mitigation measures have been recommended in order to address the adverse impacts identified within the previous section. A number of general mitigation measures have been recommended in addition to a range of species-specific measures.

Generic Mitigation to Avoid Impacts

- 12.7.2 A Construction and Environmental Management Plan (CEMP) will be implemented by the appointed Contractor; and a Works Method Statement(s) will be developed to illustrate how impacts on ecology will be managed throughout the construction process. Good construction site management will be implemented to avoid/minimise generation of excessive litter, dust, noise and vibration. This will be controlled and monitored through the CEMP. Measures will be implemented to avoid/minimise potential for fuel and chemical spills. There will be no storage of potentially contaminating materials in areas of hydrological sensitivity. A Pollution Incident Response Plan will be included as part of the CEMP to ensure that impacts from any potential accidental spills can be reduced to a minimum. In addition, the following measures will be included in the CEMP:
 - Work compounds and access tracks etc will not be located in, or adjacent to, areas that maintain habitat value or are within areas supporting protected species;
 - Establish site fencing to prevent access to areas outside working areas, particularly in areas adjacent to features of interest/value;
 - Procedures will be implemented to address site safety issues, including storage of potentially dangerous materials;
 - Briefings and instruction will be given to contractors regarding the biodiversity issues associated with the site; and
 - Pollution prevention guidelines provided by the EA will be followed to prevent pollution of water courses by silt or chemicals (also see Section 13.7 for further details on hydrological mitigation).

Generic Mitigation to Reduce Impacts

- Workforce will be restricted to working areas through the erection of fencing, to prevent damage and disturbance of retained habitats;
- Best practice methods will be followed throughout; and
- Protocols and contingency plans will be established to deal with incidents should they arise.
- 12.7.3 It is considered that the establishment of the CEMP with the incorporation of the above key principals will directly offset the construction impacts of the development proposals in terms of disturbance, habitat degradation and pollution for a number of the VERs for which significant impacts have been identified.

Designated Site

Thames Estuary and Marshes SPA and Ramsar Site

12.7.4 The adoption and implementation of the avoidance / reduction / mitigation measures identifies in paragraphs 12.7.2 and 12.7.3 are considered sufficient to remove the potential indirect impacts envisaged on the Thames Estuary and Marshes SPA and Ramsar Site.

Species-Specific Mitigation



Bats

- 12.7.5 In accordance with PPS9 and the NERC Act (2006), linear features such as tree lines and hedgerows should be protected during developments, as they act as important features for commuting and foraging bats. It is understood that the larger the gap in such a feature, the greater the fragmentation. It is therefore recommended that any gaps created in hedgerows, vegetated ditches or any other linear feature are minimised. For example, rather than removing the full width of the working corridor (30 m) it is recommended that only a 10-15 m section of hedgerow is removed, where possible. The retained hedge can be fenced and protected. Existing gaps in hedgerows and vegetated ditches should be utilised or enlarged rather than creating new gaps. This is particularly important in areas surrounding the Stanford Warren Nature Reserve and in areas south-east of Old Farm, where higher levels of bat activity were observed during the surveys.
- 12.7.6 To further avoid any potential fragmentation of important habitats, it is recommended that any key commuting corridors which will be bisected by the indicative route are bridged at night and when not being worked on. The bridge feature will maintain the connectivity along the corridor ensuring bats can move freely across the site. The bridging could simply constitute the fitting of Heras fencing within the newly created gap. The fencing should be covered in a fabric, such as camouflaged netting or simply dust suppressant sheeting to mimic the tree line or hedgerow and encourage bats to continue using the linear features. The temporary fence can be easily moved into place at the end of the day and out of the way when works recommence. Such fences can also be left in situ if the hedgerows are removed weeks or months before they can be reinstated. These fences should be fitted along all bisected linear corridors where possible, but particularly along the hedgerows which support medium or high abundances of bats.
- 12.7.7 A relatively small amount of foraging habitat (between 300 450 m depending on the exact alignment of the pipeline within the 30 m wide working corridor) is likely to be temporarily removed and the majority of this constitutes the hedgerows. It is recommended that following the completion of the pipeline installation suitable habitats that have been bisected during the construction phase be reinstated to at least the same and preferably improved condition as prior to excavation works. Additional planting may be necessary; this should include species that are native to the area and are known to support native and local insect fauna, such as hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), and elder (*Sambucus nigra*). This will be beneficial for bats and for a range of other native wildlife.
- 12.7.8 Trees can provide important roosting sites for certain species of bats, dependant on the size of the internal cavities available. Under the current plans no trees are likely to be directly impacted as a result of the works, however, should the alignment alter or an HDD head site disturb a potential bat roost, it is recommended that a survey is undertaken to confirm the value of the tree or building for bats and mitigation implemented as necessary.
- 12.7.9 Where possible, it is recommended that vegetation clearance is carried out between November to March when bats are hibernating (and thus less likely to be using tree roosts) and thus causing minimum disturbance to them.
- 12.7.10 It is recommended that where possible all artificial lighting should be avoided; where this is not possible low sodium lights should be used as they are known to have less significant effects on some bat species. This is relevant to any operational or security lighting and across the entire length of the survey area. Light spillage onto any of the identified linear corridors or foraging areas should be avoided by the use of sensitive, directional lighting, hoods and/or cowls. Any lighting schemes associated with the



proposed development should be reviewed by an experienced ecologist once the gas pipeline route and associated AGI location have been finalised.

- 12.7.11 It is understood that the construction works will be undertaken under a Construction Environmental Management Plan (CEMP). The CEMP will ensure best practice will be followed and indirect impacts such as increased noise, dust, and vibration are minimised.
- 12.7.12 With the implementation of the above recommendations, the proposed development will not significantly affect any known bat roosts or key foraging or commuting sites, it is not likely that a European Protected Species Development Licence will be required.

Badgers

- 12.7.13 It is recommended that a pre-construction walkover survey of the pipeline route/working corridor and a buffer of 30m either side be undertaken to confirm the status of the badger setts within and adjacent to the site (this should be extended to 50m in locations where pile driving will be carried out). Badgers can leave existing setts and establish new setts at any time and therefore in the period between the current survey and the works changes to the status of badgers within the site may have taken place.
- 12.7.14 In the event that the pre-construction check confirms the existing status of badgers within the site and thus the proximity of the works to an active outlier sett, a development licence from Natural England may be required to allow for the disturbance to the sett or to allow the temporary closure of the sett during the construction works. A detailed method statement will be required and detailed plans for the working corridor will be reviewed to confirm the exact impacts on the sett.
- 12.7.15 In addition following completion of the works the suitable habitats should be reinstated to the same or better quality with all movement corridors re-instated.
- 12.7.16 Throughout construction a number of measures should be implemented to avoid potential injury or mortality to individual badgers, these measures would be detailed in the CEMP and include:
 - Continued liaison with ecologist and site monitoring;
 - Fencing off of construction sites and compounds;
 - Safe storage of any materials and chemicals;
 - Covering of trenches and holes or provision of exit and escape routes such as ramps or mammal ladders; and
 - Covering any open entrances to pipes / pipeline to prevent badger access.

Breeding Birds

- 12.7.17 Based on the proposed pipeline route, no further survey or assessment for Schedule 1 species such as Cetti's warbler or barn owls is considered necessary at this stage as the route avoids directly impacting the areas known to support these species. However, this requirement should be reassessed if the final alignment of the gas pipeline is altered for following the confirmation of the electric cabling and the positioning of the substations, (particularly for Cetti's warbler and bearded reedling).
- 12.7.18 It is recommended that the vegetation is avoided or at least minimised wherever possible, for example, the alignment of pipeline route should use existing gaps in hedgerows or be altered to take advantage of existing gaps in vegetation. This can be achieved at the design stage or on site by moving the pipelines alignment within the 30 m working corridor.
- 12.7.19 Where vegetation must be removed, the following measures should be adhered to;



- All clearance should be undertaken outside the nesting season. This is widely considered to be from March to August inclusive, but can vary depending on the species and / or weather.
- Where vegetation cannot be removed outside of the nesting season, preclearance checks must be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. If a bird nest is found no works can be undertaken in that area (approximately 10 m in all directions for most bird species) until the young birds have fledged the nest site. This may take several weeks and will vary depending on the species.
- Construction activities will be undertaken within the defined 30 m wide working footprint to limit any unnecessary disturbances.
- All construction related lighting should be designed and fitted to minimise any adverse impacts on the retained surrounding vegetation.
- Where possible, all construction works should be restricted to day light hours for example 07:00 to 19:00 to prevent any easily avoidable, adverse impacts on roosting birds at dusk and dawn.
- Should any Schedule 1 species or active Schedule 1 nest sites be identified during construction all works will be suspended within that area and advise sought from a suitably qualified ecologist on the most appropriate course of action.
- Where construction works have the potential to affect active nest sites a suitably qualified ecologist will supervise.
- The footprint of the working corridor will be landscaped post-construction to
 ensure the vegetation removed is replaced, with at least like for like. Where
 possible improved species diversity or increased habitat planting should be
 sought; for example, the filling in of existing gaps in hedgerows and the use of
 species of local province.
- 12.7.20 To provide biodiversity enhancement to breeding birds, and in accordance with PPS9, specific consideration should be given to enhancing the survey area. This could be implemented in addition to the replacement of lost vegetation specifically for those species of conservation interest recorded during the survey, particularly the Schedule 1 species and UK and Essex BAP species. Enhancement measures could include the provision of specific nest boxes for barn owls or the planting of reeds in wetland areas or vegetated ditches for Cetti's warbler and bearded reedlings.

Water Voles

- 12.7.21 The surveys have confirmed the presence of water vole within the site / along the proposed route. The quantity of suitable connective terrestrial and aquatic habitats indicate that a precautionary approach should be adopted that assumes a medium-large water vole meta-population occurring within and immediately surrounding the survey area. The recommendations presented within this report have therefore been designed to account for the expected movement of water voles into the area, originating from the translocation works associated with the LG Development site into the Northern Triangle Receptor Site.
- 12.7.22 It is recommended that where possible water bodies should be avoided and that a 10m buffer zone is put into place in order to minimise direct and indirect impacts on water voles. It is considered that a 10 m buffer zone and other construction best practice methods (including but not limited to adherence to pollution prevention guidance and directional lighting) will provide ample protection from disturbance. If the indicative route and associated construction footprint requires alteration, advice



should be sought from an ecologist regarding the potential requirement for additional mitigation.

- 12.7.23 It is recommended that if possible, where the pipeline route bisects water bodies the working width should be decreased to approximately 10 15 m to reduce the impact of habitat loss and disturbance.
- 12.7.24 Where temporary impacts have been identified, it is considered likely that the most appropriate mitigation technique to avoid killing or injury will be displacement of water voles from lengths of suitable habitat through habitat manipulation. A Natural England licence will be necessary if trapping and translocation of individuals is required.
- 12.7.25 The displacement of water voles through habitat manipulation should occur at the beginning of the breeding season (from mid February, but before April as per standard guidelines). Habitat displacement relies on the area being maintained as unsuitable for water voles throughout the construction period but is also subject to the mitigation requirements of other protected species.
- 12.7.26 All habitats temporarily lost to the pipeline installation would be fully reinstated following the completion of the works. Due to the temporary nature of the works and the lack of any long term or permanent impacts, it is unlikely that any further compensation, such as habitat creation would be required, especially given the large and widespread habitat creation that has been implemented under the LG Development.
- 12.7.27 All water bodies known to support water voles and which will be affected by the indicate route will be subject to the mitigation requirements outlined above. Any water bodies which were considered not suitable for water voles in 2010, should be subject to an update survey prior to the commencement of the construction works to ensure the conditions have not changed. If they are later found to be suitable for water voles they too should be subject to the recommended mitigation.

Great Crested Newts

- 12.7.28 The presence of small and medium populations of GCN throughout the survey area and the quantity of suitable connective terrestrial and aquatic habitats indicate that a large meta-population of GCN is likely to occur within and immediately surrounding the survey area. The recommendations presented below have therefore been designed to avoid and mitigate any envisaged impacts on a 'large' population. They are therefore considered sufficient to account for the expected movement of GCN and increases in population size within and around the receptor sites.
- 12.7.29 Of the 118 water bodies recorded within 250 m of the proposed pipeline, GCN were recorded in 28 of them. Of the 28 water bodies found to support GCN, five supported 'medium' populations and 23 supported 'small' populations. These water bodies are well connected by a network of drainage ditches and hedgerows, it is possible and likely that GCN will colonise other water bodies within the locality. Therefore a precautionary approach is recommended whereby the presence of GCN is assumed and the recommendations are therefore applicable to all ponds and suitable terrestrial habitat within the area.
- 12.7.30 It has been identified that the GCN population would be potentially adversely affected by the proposed works. The disturbance of a European protected species, such as a GCN is illegal unless, the works are completed under a European Protected Species Development Licence. A Development licence will therefore be required to exclude GCN from the working corridor prior to site clearance and excavation. An application would require the submission of a Method Statement for the works. The licence application contains details of the survey results and population size, the proposed mitigation works and will have to clearly demonstrate that there is no satisfactory



alternative. The mitigation measures must show that works will not be of detriment or have a significant impact upon the great crested newt population, which must remain at a favourable conservation status. Alternatives to the proposed development would also need to be considered.

- 12.7.31 It is likely that GCN would need to be temporarily excluded from the working area to maintain legal compliance. This temporary exclusion would require a combination of short-term habitat management and fencing. The application of targeted vegetation clearances during the winter months when GCN are not active would encourage GCN to move naturally into adjacent more suitable habitat during the spring months and away from the proposed development's footprint. Protective GCN fences would also be required around sections where GCN are most likely to occur (along habitat corridors and near breeding ponds) to prevent any excluded GCN from re-entering the works site.
- 12.7.32 Should it not be possible to exclude GCN from the proposed development, it may be necessary to fence the area and use pitfall traps to capture and translocate GCN found within the 30 m wide working corridor. However, this option can be significantly more expensive as more fencing would be required and under licence there would be a requirement to undertake the trapping for between 30 to 90 days, until no GCN are found on five consecutive days of suitable weather.
- 12.7.33 The use of designated receptor sites are not considered necessary at this stage as the survey area supports a large number of alternative, unaffected aquatic and terrestrial habitats, which are suitable to support GCN and would remain unaffected.
- 12.7.34 It is recommended that the two water bodies (Blue 29 and Green 179), which are likely to be directly bisected by the pipeline, are blocked using bunds and that the water carefully drained and any resident GCN (and other amphibians) translocated to suitable habitat outside of the working corridor. On completion of this section of the pipeline, it is recommended that the habitat is restored to an improved condition. It is recommended that no works should take place in the water bodies during the breeding season between March and end of June (and should preferably be undertaken during the winter months when GCN will be absent). Although the other water bodies which will be directly fragmented were not found to support GCN at the time of survey, they are well connected to those that did and may support small populations in the future. Therefore, as a precautionary measure all ditches and drains crossed by the proposed development should also be subject to the same mitigation.
- 12.7.35 The two most important periods within the GCN lifecycle are the hibernation and breeding season, it is recommended that work on areas suitable for hibernating or breeding GCN within this period should be avoided where it affects breeding or hibernation habitat. The timing of the works would dependant on the type of works required. The vegetation clearances of habitat not considered suitable for hibernating GCN should be undertaken during the winter months, where as any translocation must be completed during early spring (February-March) or early autumn (July-October), to coincide with the species most active period.
- 12.7.36 The Northern Triangle Receptor Site is legally protected under a pre-existing Development licence. Following the translocation schedule for the LG Development Site, it is likely that the Northern Triangle would support a large population of GCN with optimal terrestrial and aquatic habitat throughout. It is therefore recommended that the proposed development within or around the immediate vicinity of the Northern Triangle should be undertaken following detailed consultation with and approval from Natural England.
- 12.7.37 It is recommended that where possible water bodies and hedgerows, which provide good terrestrial habitat within the survey area, should be bypassed and retained. The



trench should be moved, where possible, within the 30m corridor to ensure minimum disturbance is caused.

- 12.7.38 In the unlikely event that GCN are discovered within the working corridor once works commence, all works must cease immediately and either the acting Ecologist or Natural England should be contacted for advice.
- 12.7.39 As a measure of best practice, if any smooth newts, common frogs or common toads are found during the development works they should be removed carefully by hand to areas away from the development works, such as hedgerows or woodland not to be affected by the works.
- 12.7.40 All habitats recorded within the working corridor would be fully reinstated following the completion of works. Due to the temporary nature of the works and the lack of any long term or permanent adverse impacts, it is unlikely that any further compensation, such as habitat creation or manipulation would be required, especially given the large and widespread habitat creation that has been implemented under the LG development.
- 12.7.41 The assessment is based on the results of the 2008, 2009 and 2010 surveys in Areas 1-5 (Figure 1, Appendix F.6). It is recommended that a walkover survey should be undertaken to check for significant habitat changes, which may have resulted in previously unsuitable areas becoming suitable for GCN.

Reptiles

- 12.7.42 Where bisection of suitable reptile habitat is unavoidable, measures should be taken to reduce any possible direct impacts. This may include bisecting sections of suitable habitat at their narrowest point or where the suitability is at its lowest point, for example taking advantage of existing gaps in hedgerows.
- 12.7.43 As the envisaged impacts on reptiles are likely to be restricted to within the 30 m wide working corridor, a comparatively narrow area, habitat manipulation is considered suitable to avoid the direct mortality or injury of reptiles. This mitigation technique is based on the displacement of reptiles from the habitat considered suitable to support them. Habitat manipulation aims to make any optimum or sub-optimum habitats as unsuitable for reptiles as possible, this would include coarse grassland, brown field land, hedgerows and so on (Figure 6, Appendix F.1). Once the habitats have been degraded, it is likely that most reptiles will naturally move out of the 30 m wide corridor to more suitable habitats.
- 12.7.44 The displacement of reptiles using habitat manipulation would consist of a gradual removal of suitable habitat prior to the site works, whereby areas of grassland or similar within the footprint of the works is cut using hand held tools, generally a strimmer to approximately 15cm and left for several days to allow reptiles present within the underlying vegetation to disperse naturally to adjacent more suitable habitat. After this dispersal period the area should be inspected by an ecologist and followed by a second vegetation cut, reducing the vegetation to ground height. The vegetation should undergo regular strimming prior to and during the construction works to ensure that no reptiles re-colonise the area.
- 12.7.45 Any hibernacula (piles of wood, stones or dead vegetation) should be taken apart by hand by an experienced ecologist and any reptiles found moved to a safe location off site. Habitat manipulation should be undertaken when reptiles are most active, generally agreed to be between April and June and during September.
- 12.7.46 On completion of the habitat manipulation it may be necessary to erect reptile proof fencing around sections of the works where it cannot be confirmed that reptiles will not try and access or relocate. This will be particularly important where the working



corridor crosses any known or possible commuting corridors, such as the vegetation either side of Rainbow Lane (Area 4).

12.7.47 Habitat manipulation would need to be undertaken with consideration/in accordance with other protected species mitigation such as for GCNs as described above.

Flora

- 12.7.48 It has been established that the floral composition of Corringham Marshes must be surveyed prior to the commencement of works and suitable avoidance and/or mitigation measures implemented. With this in mind the following text accounts for other floral receptors which lie within the 30 m wide working footprint but outside of the Corringham Marshes boundary.
- 12.7.49 It is recommended that a detailed survey is undertaken to map the species' distribution and abundance within the pipeline route alignment's 30 m corridor. This survey should be undertaken shortly prior to the commencement of the construction works to ensure all plants which could be directly affected by the scheme are identified and can be protected accordingly.
- 12.7.50 It is also recommended that a construction work's Method Statement be prepared to confirm how any scarce flora located within the 30 m working corridor will be protected during the construction works. The Method Statement will detail the requirement for any species translocations, adjustments to the pipeline route, habitat reinstatement or habitat creation within the corridor.
- 12.7.51 To ensure continued compliance throughout the construction works, these postconstruction habitat requirements should be incorporated into a Construction Environmental Management Plan (CEMP), which would detail the best practice measures for the protection, re-instatement and long-term gain for wildlife on site. The plan will identify the roles and responsibilities of all stakeholders during the construction phase, determine the location of environmentally sensitive areas and set out the requirements for environmental monitoring and reporting. Furthermore it should specify that all construction staff should be briefed on reptile identification, recording protocol, and emergency handling by a suitably experienced ecologist prior to commencement of any work at the site.

Post-Construction Management

12.7.52 Post-construction all disturbed, damaged and removed habitats should be replaced with at least like for like. As such the landscape would be returned to predevelopment conditions with fragmented hedgerows replanted, grasslands re-seeded and natural refugia reinstated.

12.8 Assessment of Residual Impacts

12.8.1 A summary of the assessment of residual impacts is presented in Table 12.4.



TABLE 12.4: SUMMARY OF RESIDUAL EFFECTS POST MITIGATION

Ecological Receptor	Value	Type of Impact	Phase	Mitigation and Enhancement	Significance of Impact and Confidence Level
Designated Sites			·	·	
Thames Estuary and Marshes SPA and Ramsar Site	International	Potential runoff / pollution and hydrological effects	Construction	Best Practice and implementation of CEMP. Pollution prevention measures	Certain not significant, due to the lack of hydrological impacts (via implementation of CEMP) and the key aquatic pathway, the Hassenbrook stream, is bypassed by HDD.
Vange and Fobbing Marshes SSSI	National	Disturbance, potential runoff / pollution	Construction	Best Practice and implementation of CEMP. Pollution prevention measures	Certain not to have significant effect on conservation status therefore not significant.
Corringham Marshes SINC	County	Habitat loss, damage and disturbance	Construction	Minimise working width, pollution prevention measures, Ecological watching brief, implementation of CEMP, reinstatement of habitats	In short to medium term it is certain there will be low magnitude significant impacts but in the long term it is considered certain that effects will be not significant
Stanford Warren Nature Reserve	County	Potential disturbance and hydrological effects	Construction	Best practice measures, pollution prevention measures	Certain not to have significant effect on conservation status therefore not significant.
Habitats					
Coastal Grazing Marsh	District	Habitat loss and damage	Construction	Minimise working width, ecological watching brief, habitat reinstatement. Flora survey prior to construction	In short to medium term it is certain there will be low magnitude significant impacts but in the long term it is considered certain that effects will be not significant effects will be not significant
Reedbeds	District	Potential disturbance/pollution and hydrological impacts	Construction	Best practice measures, pollution prevention measures	Certain not to have significant effect on conservation status therefore not significant.



Ecological Receptor	Value	Type of Impact	Phase	Mitigation and Enhancement	Significance of Impact and Confidence Level
Brownfield Land	Local	Habitat loss and damage	Construction	Minimise working width where possible, reinstatement of habitats post-completion	Certain no significant effects on BAP status therefore not significant.
Habitats (general – other than BAP habitats)	Local	Habitat loss and damage	Construction	Reinstatement of habitats post-completion	Certain that following implementation of mitigation measures the effect in the long term is not significant.
Species					
Bats	Site	Habitat loss, fragmentation, disturbance	Construction	Minimise habitat loss and hedgerow removal, bridge hedgerow gaps, carry out tree inspection as necessary, clear vegetation between November and March, minimise artificial lighting, reinstate habitats and implement CEMP	Probable low magnitude significant impact in short term. Certain that effect on local population at the Site level in the long term is not significant
. Breeding Birds	Site	Habitat loss, damage and destruction of nests	Construction	Minimise vegetation clearance and carry out outside of nesting season. Implement ecological watching brief, minimise artificial lighting, reinstate habitats and CEMP	Probable low magnitude significant impact in short term. Certain that effect on breeding birds, in the long term is not significant.
Badgers	Site	Habitat loss, fragmentation, disturbance and mortality and injury	Construction	Pre-construction survey, Best Practice measures and CEMP, reinstate habitats.	Probable low magnitude significant impact in short term. Certain that not significant in medium and long term.
Water Voles	District	Habitat loss, fragmentation, disturbance, mortality and injury	Construction	Minimise working width across waterbodies / ditches, habitat manipulation, reinstate habitats, ecological watching brief and CEMP	Probable low magnitude significant impact in short term. Certain that not significant in medium and long term.



Ecological Receptor	Value	Type of Impact	Phase	Mitigation and Enhancement	Significance of Impact and Confidence Level
GCN	Local	Habitat loss, fragmentation, disturbance, mortality and injury	Construction	Obtain EPS and carry out measures in accordance with detailed method statement to include exclusion, capture and relocation, ecological watching brief, minimise working width and avoid suitable habitats where possible, implement CEMP and reinstate habitats	Certain that low magnitude significant impact in short term. Certain that not significant in medium and long term.
Reptiles	Local	Habitat loss, fragmentation, disturbance, mortality and injury	Construction	Habitat manipulation, ecological watching brief, minimise working width and avoid suitable habitats where possible, implement CEMP and reinstate habitats	Probable low magnitude significant impact in short term. Certain that effect on local population at the Site level in the long term is not significant.
Flora (including Corringham Marshes)	District	Losses of notable flora	Construction	Pre-construction survey, method statement, CEMP and ecological watching brief	Probable low magnitude significant impact in short and medium term – dependant on further survey. Certain not significant in long term.
Invertebrates	Local	Habitat loss, fragmentation, disturbance, mortality and injury	Construction	Habitat manipulation, ecological watching brief, minimise working width and avoid suitable habitats where possible, implement CEMP and reinstate habitats	Certain not significant.



12.9 Assessment of Cumulative Impact

12.9.1 Indirect / Secondary and Cumulative Impacts are assessed in Section 18.

LAND USE / GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

SECTION 13



13 LAND USE / GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

13.1 Introduction

- 13.1.1 This Section provides a description of the existing geological, hydrological and hydrogeological conditions within the Route Study Corridor and the surrounding area and details any impacts on these conditions associated with the development of the gas pipeline and associated AGI.
- 13.1.2 Where potentially significant impacts have been identified, mitigation measures have been proposed to reduce the severity of such impacts.
- 13.1.3 The proposed pipeline route is approximately 7.7 km in length and runs between the proposed new Butts Lane AGI, west of Mucking and south of Stanford-le-Hope to GEC in the east. The proposed gas pipeline route passes mainly through marshland and farmland, to the north of the LG Development site and to the south of Corringham and Stanford-le-Hope. The proposed gas pipeline route parallels that of the existing CECL Power Station gas pipeline, and is laid (for the most part) to the north.
- 13.1.4 Historical maps show that the majority of the actual gas pipeline route has not previously been developed (apart from the current CECL Power Station gas pipeline). However, the surrounding area has been heavily industrialised, with developments such as the Shell Oil Refinery (approximately 200 m south of the gas pipeline) and its associated infrastructure, Coryton Oil Refinery, and CECL Power Station. The majority of the infrastructure associated with the Shell Oil Refinery is now principally demolished.
- 13.1.5 The threat from flooding has also been addressed, although due to the nature of the gas pipeline and associated AGI, this is not considered to be a significant concern.

13.2 Key Planning Policies

- 13.2.1 Section 3 provides the Planning Policy Context.
- 13.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

SS1	Achieving Sustainable Development
WAT4	Flood Risk Management

Thurrock Borough Local Plan

BE26	Development of Contaminated Land
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Draft TCSPMD

CSTP21	Productive Land
CSTP25	Addressing Climate Change
CSTP27	Management and Reduction of Flood Risk
PMD15	Flood Risk Assessment

13.3 Assessment Methodology

- 13.3.1 The assessment has been undertaken with a clear understanding of the following:
 - Previous land uses through a review of historical maps;



- Underlying ground conditions through a review of British Geological Survey (BGS) maps and a review of previous site investigations;
- Existing physical baseline conditions;
- Development proposals;
- Importance of receptors;
- Sensitivity to change;
- Magnitude of change; and
- Potential to mitigate impacts resulting from the proposed development of the gas pipeline and associated AGI.
- 13.3.2 The baseline geological, hydrological and hydrogeological conditions of the proposed site have been assessed with reference to the following:
 - British Geological Survey (BGS) 1:50,000 Sheet 258 / 259, Southend and Foulness, Solid and Drift Edition
 - Shell UK Oil Products Limited, Phase II Intrusive Site Investigation: Shell Haven Refinery, Stanford-le-Hope, October 2000 (logs only) [Environmental Resources Management Limited (ERM)];
 - Shell UK Oil Products Limited, Delineation Investigation: Quality Assurance Project Plan, October 2000 [ERM];
 - Shell UK Oil Products Limited, Phase I Remediation Works: Shell Haven Refinery, Delineation Investigation, August 2001 [ERM];
 - DP World, London Gateway, Ground Investigation Wells, Report on Ground Investigation, November 2008 [Fugro Engineering Services Limited];
 - Envirocheck Report⁵⁶, which included the following:
 - Groundwater Vulnerability Map;
 - Historical plans from 1872 to 2006;
 - Details of discharge and waste consents, contaminated land sites and areas of sensitive land use for the site and a 1 km radius of the site boundary;
 - Geological and mining hazards.
 - Environment Agency flood maps, via:

http://maps.environment-agency.gov.uk/wiyby

Significance Criteria

- 13.3.3 Table 13.1 and Table 13.2 have been used to define the importance of the receptor and the magnitude of the impact respectively, and Table 13.3 is used to define the significance of the effect taking into account the importance of the receptor and the magnitude of the impact.
- 13.3.4 In addition, a conceptual site model approach has been used to assess the potential risks posed by contaminants to human health using a source pathway receptor model, based on the following:
 - Source potential source of contamination.

⁵⁶ Envirocheck Order Reference 29109000-1-1



- Pathway means by which contamination can reach and impact upon a receptor.
- Receptor that which may be adversely affected by the presence of contamination.



Beconter	Type of Receptor							
Importance	Geology / Soils	End Users	Construction Workers	Surrounding Land Uses	Controlled Waters	Ecological Systems	Built Environment	
High	Designated SSSI for geology or soils / Grade 1 Agricultural Land / Land supports nationally rare plant species	Residential / allotments / play areas	Extensive earthworks and demolition of buildings	Greenfield site / residential area	Major aquifer or surface water in close proximity to site	Nationally or internationally designated sites	Listed buildings of high historic value or other sensitivity	
Medium	Grade 2 Agricultural Land / Currently used for important crops / Land supports regionally or locally rare plant species	Landscaping or public open space	Limited earthworks	Open space / commercial area	Minor aquifer	Locally designated ecological sites	Buildings, including services and foundations	
Low / Negligible	Brownfield or industrial site / Site of little or no agricultural value	'Hard' end use (e.g. industrial, car parking)	Minimal ground disturbance	Industrial area	No surface water bodies or aquifers close to the site	No sites of ecological importance close by	N / A	

TABLE 13.1: DEFINING IMPORTANCE OF RECEPTORS



Impact Magnitu	de	Description
Major Impact	Adverse	A permanent or long term adverse impact on the integrity and value of an environmental attribute or receptor, or exposure to acutely toxic contaminants. For example, harm to human health, designated habitats or pollution to controlled waters.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate Impact	Adverse	An adverse impact on the integrity and / or value of an environmental attribute or receptor, but recovery is possible in the medium term and no permanent impacts are predicted.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements or improvement of attribute quality.
Minor Impact	Adverse	An adverse impact on the value of an environmental attribute or receptor, but recovery is expected in the short-term and there would be no impact on its integrity. For example, temporary effects on receptors not designated under environmental legislation.
	Beneficial	Minor benefit to, or addition of key characteristics, features or elements; some beneficial impact on attribute or a reduction in the risk of a negative impact occurring.
Negligible impac	t	No impact would be detectable, either positive or negative.

TABLE 13.2: DEFINING THE MAGNITUDE OF IMPACTS

TABLE 13.3: SIGNIFICANCE CRITERIA

		Magnitude of Impact				
		Negligible	Minor	Moderate	Major	
se or	High	Slight	Moderate	Large	Large	
portanc	Medium	Slight	Slight	Moderate	Large	
	Low	Slight	Slight	Slight	Moderate	
of	Negligible	Neutral	Neutral	Slight	Slight	



13.4 Baseline Conditions and Receptors

Site History

- 13.4.1 A review of historical maps dating from 1872 to 2010 was undertaken to establish major land use changes both along the Route Study Corridor and within the surrounding area. The aim was to establish major land use changes which may have had the potential to cause pollution to the proposed gas pipeline route.
- 13.4.2 A summary of the review is provided below:
 - The first edition OS Plan from 1872 (1:10560 scale) shows that the proposed gas pipeline route is situated on undeveloped open fields located on the northern bank of the River Thames. Rugward Fleet flows from west to east south of the proposed gas pipeline route before its confluence with the River Thames, approximately 1 km to the south of the eastern end of the proposed gas pipeline route at Shelly Bay.
 - The first edition OS Plan from 1872 also shows that development of the surrounding area is limited. A railway line runs from west to east approximately 1 km to the south of the proposed gas pipeline route serving the nearby Thames Haven Dock. The small settlements of Reedham and Oilmill Farm are located on the Marshes. A number of marsh lands and many small streams and tributaries of the River Thames are located within the surrounding area.
 - The historical map of 1898 shows no significant changes compared with the previous map of 1872. To the south of the proposed gas pipeline route, a small oil storage installation had been built comprising two large structures with many tanks, railway sidings and a pier. Thames Haven Dock to the southeast of the route has expanded further to the east.
 - No significant changes to the Route Study Corridor and surrounding area have been noted on the historical plans of 1910 and 1922.
 - By the edition of 1924, the southern half of the proposed GEC site has been occupied by numerous tanks associated with Shell Oil Refinery. Further tanks have also been constructed to the south and southeast of the proposed gas pipeline route. While the northern section of the GEC site remains largely free from development, a number of small buildings have been constructed in this area and tanks are also noted adjacent to the northern boundary. The routes of the streams and tributaries onsite appear to have remained unaltered from earlier plans.
 - The historical OS plans from 1938 / 39 no longer show the large number of tanks on the southern area of the GEC site or on the land to the south and west of the GEC site. Only a few smaller buildings are shown along with an area of raised ground where the tanks were previously. The oil works to the east of the GEC site and the developments around Thames Haven Dock are also no longer evident. It is known that potentially sensitive sites were intentionally removed from recorded mapping during this period due to unrest leading up to the Second World War. Therefore it is considered unlikely that the site would have been cleared and that the infrastructure and development would have been similar or further increased, compared to that reflected in the previous edition OS Plan of 1924.
 - The next edition map of 1960 further supports this assumption as it shows development at the GEC site and surrounding area has expanded significantly with tanks, buildings and associated infrastructure. Land surrounding the proposed gas pipeline route also hosts a large number of



tanks and buildings, part of the oil storage facility. The majority of the river frontage land in the vicinity of the site is also occupied with tanks, buildings and associated infrastructure.

- Plans from 1968 to 1986 show no change to the use of the land within the Route Study Corridor and surrounding area, although the layout and position of some structures have been altered and changed over time.
- By 1999, only a few tanks and buildings remain in the south of the proposed GEC site. Large areas of land to the south of the proposed gas pipeline route have also been cleared of the previous structures, although there are still a number of large tanks in place. The Thames Haven area has also undergone a period of clearance and a large area where tanks once stood is now shown as being flooded.
- The 2006 edition reflects the current status of the Route Study Corridor and shows that the majority of the former Shell Oil Refinery land has been cleared of all structures and associated infrastructure. The areas of land to the north, west and south and the Thames Haven area to the southeast are also clear of the majority of structures. The large flooded area shown on the previous edition is no longer shown, having either been in-filled, or allowed to drain. The tanks adjacent to the east of the GEC site remain in place and are detailed as an oil storage depot (Shell Aviation Fuel Storage Farm), beyond which a power station (the existing CECL Power Station) is now shown.
- 13.4.3 In summary, the Route Study Corridor and surrounding area (particularly areas to the south of the proposed gas pipeline route) has a major industrial legacy and has been utilised predominantly for the storage / processing of oil and fuels. Therefore, it is possible that contamination associated with the storage / processing of hydrocarbon based products may have occurred.
- 13.4.4 Based on the discussion provided previously in Section 4, the future baseline of the former Shell Oil Refinery reflects that of the uses proposed as part of the LG Development. In particular for the GEC site, as part of the works for the LG Development, the GEC site will be levelled and provided to GECL in a condition that would allow for the construction of GEC.
- 13.4.5 Despite the above, the majority of land on the proposed gas pipeline route has not previously been developed.

Geology and Soils / Contamination

Geology and Soils

- 13.4.6 BGS 1:50,000 Series, Sheet 258 / 259, (Southend and Foulness), Solid and Drift Edition indicates that the superficial geology across the Route Study Corridor comprises marine or estuarine alluvium (undifferentiated or clay) overlying solid geology of Lower London Tertiaries which comprise Woolwich beds (greenish yellow fine sand with frequent shell beds), Oldhaven Beds (firm yellow to buff fine sand) and Thanet Beds (predominantly silty fine sand). Upper Chalk deposits are also known to underlie much of the Route Study Corridor at significant depth. In the west of the Route Study Corridor, near to Mucking, the alluvial deposits give way to gravel terraces.
- 13.4.7 Shell UK Oil Products Limited, Delineation Investigation: Quality Assurance Project Plan, October 2000 [ERM] detailed the geological succession beneath the Shell Oil Refinery site (now the LG Development site). This is summarised in Table 13.4.



TABLE 13.4: GEOLOGICAL SEQUENCE BENEATH FORMER SHELL OIL REFINERY SITE(NOW THE LG DEVELOPMENT SITE) AS DESCRIBED BY INTRUSIVE INVESTIGATIONS

Geological Strata	Thickness (m)	Description	Age
Marine or Estuarine Alluvium	8 - 16	River Thames flood plain deposit – stiff brown clay overlying soft (dense) grey silty clay or clayey silt	Pleistocene and Recent
Marine or Estuarine Sand and Gravel	10 – 14	River terrace deposits – dense brown sandy fine to coarse gravel	Pleistocene
London Clay	0->25	Stiff high plasticity fissured silty clay	Eocene
Lower London Tertiaries	circa. 50	Woolwich beds – interbedded fine sand, silt and clay with subordinate gravel beds, and Thanet beds – fine sands	Palaeocene
Upper Chalk	-	Fissured limestone with flint bands and some clays	Cretaceous



- 13.4.8 Data relating to soils along the proposed gas pipeline route was taken from Soilscape, a 1:25,000 scale map showing soils types in Britain (Cranfield University). Whilst it should be noted that the soils along the proposed gas pipeline route vary, the soils along the majority of the proposed gas pipeline route are described as '*loamy and clayey soils of coastal flats with naturally high groundwater*'. These soils have moderate fertility and are usually overlain by arable and grassland cover. Soils towards the western end of the proposed gas pipeline route, near Stanford-le-Hope are classified as '*slightly acidic loams and clays with impeded drainage and moderate to high fertility*'.
- 13.4.9 However, it should be noted that the above maps and data only give an indication of the ground conditions beneath the Route Study Corridor at a high level. In actual fact (with further evidence provided by a site walkover), the ground conditions vary markedly and it was seen that some of the Route Study Corridor is characterised by dry, well drained sandy soils with some of the agricultural fields characterised by wetter London Clays.
- 13.4.10 Based on the above information, the importance of soils and geology underlying the Route Study Corridor has been classed as moderate due to their agricultural value and the fact that they have not been designated a Geologically Important SSSI⁵⁷. Additionally, there will only be a limited amount of land take by the proposed gas pipeline and associated AGI.
- 13.4.11 The surrounding area has supported substantial industrial development in the past, although much of the proposed gas pipeline route is greenfield land.

Landscape and Topography

- 13.4.12The site is predominantly flat and low-lying at between approximately 2.1 to 11.0 mAOD. Much of it has been re-claimed from marshland.
- 13.4.13 The ground falls from west to east following a high point around Mucking.
- 13.4.14 The majority of the land within the Route Study Corridor is classified as 'Urban' under the Defra Agricultural Land Classification (ALC). Urban land is classified as "Built-up or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religious buildings, and cemeteries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants".
- 13.4.15 However, it is recognised that the Defra ALC is a high level classification tool, and that the Route Study Corridor passes through agricultural land.
- 13.4.16 Land towards the AGI, in the vicinity of Stanford-le-Hope, is classed as a mixture of Grade 3 and 4 Land. Grade 3 Agricultural Land is classified as "Good to moderate quality land, with moderate limitations that affect the choice of crops, timing and type of cultivation, harvesting or the level of yield". Grade 4 Agricultural Land is classified as "poor quality agricultural land with severe limitations which significantly restrict the range of crops and / or level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land".

Contamination

13.4.17 An assessment of the potential contamination issues along the gas pipeline route has been undertaken through a review of historical maps, a Landmark Envirocheck

⁵⁷ This is different to Ecologically Important SSSI, which are discussed in Section 12.



Report and previous intrusive investigations at the former Shell Oil Refinery site (now the LG Development site). A summary of the review is provided below.

- 13.4.18 A historical landfill site has been identified on the proposed GEC site in the Envirocheck Report. The license holder (Ref: 1500/0014) for this facility is identified as Shell UK Oil and the location is shown as being at the centre of the eastern site boundary. Deposited waste at the landfill included special waste and liquid sludge. The last input date has not been supplied.
- 13.4.19 A further three historical landfill sites have been identified within the vicinity of the proposed gas pipeline route. These are:
 - Landfill Site operated by Shell UK Oil located 23 m east of the GEC site. Deposited waste at the landfill site included special waste and liquid sludge. Last input date September 1989.
 - Landfill Site operated by Shell UK Limited located 100 m south of the eastern end of the proposed gas pipeline route, just to the north of the GEC site. Deposited waste at the landfill site included liquid sludge. Last input date December 1994.
 - Landfill Site operated by Shell UK Limited located 100 m south of the eastern end of the proposed gas pipeline route, just to the north of the GEC site. Deposited waste at the landfill site included liquid sludge. Last input date August 1996.
- 13.4.20 Due to the age of the above landfill sites, it is unlikely that they were constructed using modern engineered containment systems. Wastes accepted at these landfill sites included special waste and liquid sludges. As the landfill sites were unlikely to have been lined, there is a significant potential that leachate and ground gas could migrate off site and potentially contaminate the soils and groundwater within the proposed gas pipeline route.
- 13.4.21 There have been five pollution incidents to controlled waters recorded within the vicinity of the proposed gas pipeline route. These are summarised below:
 - A rail collision lead to a spillage of oil gas in to a freshwater stream / river in May 1994 approximately 500 m to the south of the proposed gas pipeline route, although it is not clear exactly which watercourse this was. The incident was classed as a Category 3 Minor Incident.
 - A pollution incident to controlled waters occurred at Shell UK Oil Refinery 500 m to the south of the proposed gas pipeline route in October 1997. The pollutant was unknown and the incident was classified as a Category 3 Minor Incident.
 - A further Category 3 Minor Incident was recorded in Holehaven, in December 1993. The pollutant was identified as oils.
 - A Category 3 Minor Incident was also recorded 500 m south of the proposed GEC site at Shellhaven with the pollutant identified as oils. This incident occurred in November 1994 but the receiving waters were not identified.
 - A tributary to Holehaven Creek was the receiving water of an unknown pollutant in April 1993. The incident was classified as a Category 3 Minor Incident.
- 13.4.22 Although several of the pollution incidents to controlled waters described above have occurred within the vicinity of the proposed gas pipeline route, considering the distance and time since these incidents occurred, it is unlikely that any of these



incidents would have had a significant and lasting impact on the quality of the land or water quality.

- 13.4.23 The land surrounding the proposed GEC site has also been utilised for the storage / processing of fuel products and the area to the northeast of the GEC site is still occupied by an oil storage depot (Shell Aviation Fuel Storage Farm). The potential therefore exists that contamination from the surrounding land could have migrated on toward the proposed gas pipeline route from the surrounding land.
- 13.4.24 The western end of the proposed gas pipeline route, towards the AGI, passes just south of a disused sewage works in Mucking. There is a low potential for contamination to have impacted on the proposed gas pipeline route from the sewage works (e.g. from asbestos used in the old buildings which were operational since the 1920s).

Ground Investigations

- 13.4.25 Following the original Phase II Intrusive Site Investigation: Shell Haven Refinery, Stanford-le-Hope, October 2000 undertaken by ERM, ERM undertook a Phase I Remediation Works: Shell Haven Refinery, Delineation Investigation in August 2001. A series of trial pits and boreholes were undertaken across the *Sh*ell Oil Refinery site and free product with a hydrocarbon odour was noted in a number of the exploratory holes, especially in the southern area. Laboratory analysis of soil samples from this area also showed elevated levels of hydrocarbons.
- 13.4.26 The Report for the Delineation Investigation highlighted hydrocarbon impact beneath the site with BTEX exceedance and evidence of sub-surface mobile product.
- 13.4.27 PB is unaware of any boreholes which have been excavated directly along the proposed gas pipeline route. Therefore, it has not been established whether the contamination issues at the former Shell Oil Refinery site have impacted on land beneath the proposed gas pipeline route.
- 13.4.28 In summary, there is a moderate potential of contaminated soils and groundwaters beneath the proposed gas pipeline route.

Unexploded Ordnance / UXO

- 13.4.29 The proposed gas pipeline route is also considered to offer a potential to encounter unexploded ordnance (UXO) as a result of its location, close to strategically important bombing targets during the Second World War, which included the Shell Oil Refinery.
- 13.4.30 Therefore appropriate risk management measures and training are recommended during construction.

Hydrology / Surface Water

- 13.4.31 The proposed gas pipeline route is situated between 1 and 1.5 km north of the River Thames Estuary. In the vicinity of the proposed gas pipeline route the River Thames is approximately 2 km wide and is tidally influenced. The River Thames originates near Cirencester in the Cotswolds and flows east through London and past the southern boundary of the proposed GEC site, before discharging into the North Sea, approximately 15 km east of the proposed GEC site.
- 13.4.32 The area around the proposed gas pipeline route is characterised by marshland which is crossed with numerous streams, drains and creeks. The proposed gas pipeline route crosses directly over Corringham Marshes. To the north are Boevers Marshes and Fobbing Marshes, and to the south west are Mucking Marshes. The small drains on these marshes often converge into larger streams and then discharge into the River Thames. The marshes are not hydrologically connected to any large streams in the uplands to the north, nor are they re-charged by groundwater (the



Upper Chalk aquifer is well sealed). Therefore the main source of wetness is from direct rainfall.

- 13.4.33 There are virtually no gradients across the marshes, and summer conditions are generally very dry. As such, water is normally only discharged at certain, restricted times of the year. Water is discharged through a flap in the flood defences, directly into the River Thames and is usually done so to prevent localised flooding on the marshes.
- 13.4.34 Despite this, water levels in the ditches on the marshes are often kept relatively high, in order to aid with grazing and ecological improvements.
- 13.4.35 There will be 28 water crossings along the gas pipeline route. These are summarised below in Table 13.5. Of these water crossings, the following are named:
 - Mucking Creek (RVX 1);
 - North Shell Angling Lake (LX 1); and
 - The Manorway Fleet Drain (RVX 2 and RVX 3).
- 13.4.36 The remaining 24 water crossings are unnamed on the available OS Maps (and are listed as ditch crossings in Table 5.1).
- 13.4.37 There are seven water bodies in the vicinity of the proposed gas pipeline route. Two water bodies are ponds to the south of Great Garlands Farm, approximately 150 m south of the proposed gas pipeline route. The other five water bodies are in between Stanford-le-Hope and Mucking, these are the Shell Angling Lakes. These are known to have been formed from former gravel extraction pits and are fed by the underlying groundwater. The Shell Angling Lakes are designated as a SSSI. It is proposed that the pipeline route will pass beneath the North Shell Angling Lake (LX1). These crossings have been described in Section 5.4 and are shown in Figures 5.3a to 5.3e.

TABLE 13.5: WATERBODIES CROSSED BY THE PROPOSED GAS PIPELINEROUTE

Crossing Number	Approx Grid Reference	Description
RVX1	TQ 687 814	<i>Mucking Creek</i> Relatively large creek which originates to the north of Stanford-le-Hope and discharges directly into the Thames Estuary. Known to have been utilised for gravel extraction in the past.
LX1	TQ 691 813	North Shell Angling Lake Five ponds in between Stanford-le-Hope and Mucking. They are known to have been formed by gravel extraction and are fed by groundwater. Also classed as a Nature Reserve. Proposed gas pipeline route shown to pass beneath the North Shell Angling Lake.
Not Crossed (GGF Ponds 1 and 2)	TQ 707 822 and TQ 706 819	Two large ponds to the south of Great Garlands Farm, although not directly crossed by the proposed gas pipeline route.
All Ditch Crossings (24 in total)	Refer to Figures 5.3a to 5.3e for locations	
RVX2 / RVX3	TQ 731 829 and	<i>The Manorway Fleet Drain</i> Relatively large watercourse, which is fed by



TQ 734 826.	several small tributaries / drains from the
	Fobbing Marshes.

- 13.4.38 The attribute importance of the Manorway Fleet Drain and the Mucking Creek have both been defined as medium as they are large, named watercourses which are potentially ecologically sensitive and they discharge into the Thames Estuary, a major watercourse which is also ecologically sensitive in parts.
- 13.4.39 The Shell Angling Lakes have been classed as being of a medium sensitivity as (although they have been designated as a SSSI) they are known to be fed only by rainwater and small, perched groundwater bodies, and they are not hydrologically connected to any main watercourses.
- 13.4.40 The surface water drainage ponds near Great Garlands Farm have been assessed as being of low sensitivity as although they are likely to support some notable species, they are not a designated site and are located a significant distance from the proposed gas pipeline route.
- 13.4.41 The smaller, unnamed drains and watercourses have been assessed as being of low sensitivity.
- 13.4.42 The ecological sensitivity of the watercourses has been described in more detail in Section 12. However, briefly, the most important ecologically sensitive receptors to consider from a hydrological perspective are as follows:
 - The Thames Estuary and Marshes SPA / RAMSAR Site, which is located approximately 1.5 km south of the proposed gas pipeline route.
 - Mucking Flats SSSI, which is located towards the western end of the proposed gas pipeline route, near the AGI.
 - Corringham Marshes CWS, which is located towards the centre of the Route Study Corridor with the proposed gas pipeline route directly crossing the marshes.
 - Mucking Lakes CWS (Shell Angling Lakes), which is located towards the west of the Route Study Corridor with the proposed gas pipeline route passing underneath the North Shell Angling Lake.
- 13.4.43 The designations above have been taken into consideration in the impact assessment below. The crossing methods for watercourses is also described in more detail, as are the mitigation measures which will be employed to ensure there are no adverse impacts during the crossing of the watercourses.
- 13.4.44 Environment Agency (EA) Indicative Flood Maps indicate that parts of the Route Study Corridor are located in Flood Zone 3a. Developments in this classification are described as being "*at risk of flooding if flood defences are not present*". Land in this zone is assessed as having a 1 in 100 or greater annual probability of river flooding (>1 %) or a 1 in 200 or greater (>0.5 %) annual probability of flooding from the sea. The EA Indicative Flood Map also indicates that the Route Study Corridor is offered protection from existing flood defences. The EA Indicative Flood Maps (together with a line showing the indicative proposed gas pipeline route) are presented in Inserts 13.1 to 13.3.



KEY FOR INSERTS 13.1 TO 13.3



INSERT 13.1: WESTERN SECTION OF ROUTE STUDY CORRDIOR / EA INDICATIVE FLOOD MAP




INSERT 13.2: CENTRAL SECTION OF ROUTE STUDY CORRDIOR / EA INDICATIVE FLOOD MAP





INSERT 13.3: EASTERN SECTION OF ROUTE STUDY CORRDIOR / EA INDICATIVE FLOOD MAP





Hydrogeology

- 13.4.45 The drift geology underlying the proposed route is classified by the EA as a Minor Aquifer (variably permeable). These formations can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers.
- 13.4.46 Previous ground investigations identified three groundwater bodies beneath the LG Development site. These are as follows:
 - Perched Groundwater

The site occupies former marshland, some fleets and waterlogged ground. Therefore there are still remains which give evidence of a shallow groundwater table. These groundwaters are perched upon the low permeability alluvium within its upper strata or made ground, and are principally sourced from rainwater infiltration. The perched groundwater was generally encountered at depths of less than 1.0 m below ground level (bgl) but conditions may vary significantly across the site. These groundwaters are likely to be discontinuous.

• River Terrace Deposits

The River Terrace Deposits comprise the first significantly permeable strata beneath the site. Standing groundwater levels recorded during site investigations varied from between 2.0 to 4.0 m bgl. Within the River Terrace Deposits, tidal influence from the River Thames Estuary was recorded towards the south of the site.

Upper Chalk

The upper chalk deposits are classified as a principal aquifer. These aquifers are layers of rock that have high intergranular and / or fracture permeability, meaning they usually provide high levels of water storage. They may support water supplies and / or river base flow on a strategic scale. However, this groundwater body lies at a significant depth below the site. Although the overlying tertiary deposits may be in hydraulic continuity with the chalk, migration between these aquifers is restricted by the overlying London Clay, and low permeability layers of the Lower London Tertiaries.

- 13.4.47 The Envirocheck Report indicates that there are no licensed groundwater abstractions within 1 km of the proposed gas pipeline route. None of the route crosses a groundwater Source Protection Zone (SPZ).
- 13.4.48 Overall, the importance of the underlying groundwater in the drift deposits has been assessed as medium as it has been classified as a minor aquifer by the EA. Groundwater recorded during site investigations is likely to be a minor, perched and discontinuous groundwater body.
- 13.4.49 In addition, the Upper Chalk Principal Aquifer is classified as being of medium attribute sensitivity. This is due to the fact that, although the Upper Chalk is classified as a Principal Aquifer, it is offered significant protection from the overlying drift deposits and it is understood to be unsuitable as a potable drinking source as it is likely to be impacted by saline intrusions from the Thames Estuary.

Conceptual Site Model (CSM)

13.4.50 Based on information taken from historical maps, the Envirocheck Report, the site walkover and previous intrusive investigations, the following Conceptual Site Model (CSM), shown in Table 13.6, has been developed. The CSM describes the main



potential sources of contamination, likely pathways for migration and most sensitive receptors.



TABLE 13.6: CONCEPTUAL SITE MODEL SHOWING SOURCE, POTENTIAL CONTAMINANTS,PATHWAYS AND POTENTIAL RECEPTORS

Source	Potential Contaminants	Pathway(s)	Receptor(s)		
Old Landfill sites	Landfill Gas, leachate	Granular soils, groundwater, surface water	Current site users, construction workers, future site users, future on site development. Ecologically sensitive receptors.		
Made Ground / Previously Developed Soil	TPH, PAH, Metals	Oral, dermal contact with soils, groundwater	Current site users, construction workers, future site users, future on site development. Ecologically sensitive receptors.		
Former Shell Oil Refinery Site (now the LG Development site)	PAH, TPH, Metals, Asbestos	Oral, dermal contact with soils, groundwater	Current site users, construction workers, future site users. Ecologically sensitive receptors.		



13.5 Potential Impacts

Construction

- 13.5.1 When assessing the potential impacts relating to the construction of the gas pipeline and associated AGI, it has been assumed that several confirmed mitigation measures will be applied. These include adherence to best practice and maintaining safe working practices at all times.
- 13.5.2 Accordingly, the confirmed mitigation measures comprise adherence to the following documents:
 - Protection of Workers and the General Public during the Development of Contaminated Land, HSE, 1991.

This document establishes the key principles to take into account when designing and implementing work on contaminated sites, in order to ensure the proper protection of the health and safety of employees and others who may be affected by such work; and

• A Guide to Safe Working on Contaminated Sites, R132, CIRIA, 1996.

This document is similar to the HSE document, and also includes checklists to help in the preparation of health and safety risk assessments and the development of safe working practices.

Human Health (Construction Workers)

- 13.5.3 During construction, existing soil conditions are not anticipated to negatively impact upon site workers.
- 13.5.4 Although there may be some hotspots of contamination along the proposed gas pipeline route due to the previous industrial setting of the landscape, potential impacts to human health, arising from oral, inhalation or dermal contact with potential contaminants are negated by the implementation of confirmed mitigation measures, including working in accordance with best practice, maintaining safe working practices and the use of correct and appropriate Personal Protective Equipment (PPE) at all times.

Geology and Soils / Contamination

- 13.5.5 The importance of the underlying soils and geology along the Route Study Corridor has been assessed as moderate due to their agricultural value, and the fact that they have not been designated for their geological importance.
- 13.5.6 Although the soils along parts of the Route Study Corridor do support some crops and are important to the wetland environment, it is the waterlogged conditions, watercourses and drains of the marshes which are important and not specifically the soils.
- 13.5.7 The disturbance of underlying deposits will be limited mainly to topsoil and underlying alluvium / river terrace gravels. The development of the gas pipeline and associated AGI is not considered to result in the loss of large amounts of soils or geology when considered in the context of the extent of similar underlying deposits in the surrounding area.
- 13.5.8 Overall, the construction of the gas pipeline and associated AGI will have a major adverse immediate impact on the underlying geology and soils where they are directly excavated as part of the construction works. However this impact is deemed as minor in nature when compared to the overall land take of the proposed gas pipeline route and the attribute sensitivity of the underlying soils. Additionally, the impact will only be short term as following construction the land will be reinstated. The overall significance of effect is therefore deemed as neutral.



Hydrology / Surface Water / Hydrogeology

- 13.5.9 Construction activities on any site may, if uncontrolled, cause changes to surface and water drainage due to:
 - The creation of material stockpiles;
 - Compaction of soil due to the movement of heavy equipment;
 - Removal of vegetated top soil; and
 - Silt laden runoff from excavations entering watercourses.
- 13.5.10 Nearby surface water quality could be affected by increased sediment load of any surface water discharge. Silt can cause damage to surface water biology and can also build-up to cause flooding.
- 13.5.11 There will be 28 water crossings along the gas pipeline route. Both the Mucking Creek and the Manorway Fleet Drain have been classified as being of medium importance due to their size, ecological status and the fact that they are classified as major watercourses. The minor watercourses in Fobbing and Corringham Marshes have been classified as being of low importance, due to their size, the relatively small amounts of water they contain and the fact that they are often dry.
- 13.5.12 The method of water crossings is set out in Figures 5.3a to 5.3e and described in Section 5.4. Detailed construction methods are described in Section 6. It may also be necessary to bridge each watercourse for the passage of vehicles. During bridging of the watercourse, it is proposed to install flume pipes to maintain water flow. Therefore the impact on drains and watercourses is considered to be negligible.
- 13.5.13 For the installation of the gas pipeline using open-cut / trenching techniques across more minor watercourses, surface trenching will be used. This is achieved by damming each channel either side of the trench in two locations and then pumping water out of the section in between, before digging the trench. The pipe would be laid in the trench, which would then be backfilled and the two dams removed, therefore restoring the hydraulic connection. These crossings would be completed as quickly as possible (of the order of one day per watercourse), during summer months. There is still, nevertheless, the possibility to have a minor adverse impact on downstream water levels during periods of low flow. However, depending on the duration of the works and the time of year they are carried out, this impact may be reduced to negligible.
- 13.5.14 In addition, for water crossings, the following will be undertaken:
 - Under the Water Resources Act 1991 and the Land Drainage Byelaws, prior written consent from the Environment Agency will be sought for any proposed works or structures in / under / over / within 9 m of the top of a bank of a "Main River" under their jurisdiction. In addition to this, the Construction Contractor will meet with the Environment Agency at detailed design stage to discuss and agree the crossings;
 - Prior written consent from the Environment Agency will be sought for any proposed works which would affect the flows for ordinary water crossings (not "Main Rivers");
 - Under the Harbour Empowerment Order (HEO) for the LG Port 2008 (Schedule 10), prior written consent from the Environment Agency and LG / DP World will be sought for any water crossings located within the LG Port boundary;



- If required, under the Land Drainage Act 1991 / Water Resources Act 1991, prior written consent from the Environment Agency will be sought for any culverting / works affecting the flow for ordinary watercourses; and
- The water table in the marsh may be lowered during construction of the gas pipeline. This was undertaken for the existing gas pipeline for the CECL Power Station, and led to a reduction in the long term impacts on ecology and sensitive receptors due to the drier working environment.
- 13.5.15 The construction of areas of hardstanding, access tracks and construction laydown areas will result in some interception of natural surface water drainage routes. However, due to the relatively small percentage of land-take of these new areas compared to the baseline conditions, they will have a negligible impact on groundwater recharge and the volume of run-off draining the site.
- 13.5.16 There is the potential for minor adverse impacts due to the interruption to lateral drainage as a result of the installation of the gas pipeline as it could cause a preferential route for the flow of groundwater, although no significant issues in this regard are anticipated. Where excavation or drilling works penetrate the water table there may be a minor change in recharge characteristics. However, this is likely to be insignificant when taking into consideration overall groundwater flows for the Route Study Corridor and surrounding area.
- 13.5.17 A small amount of water will be required each day for the general construction works and hygiene. This water will be brought in by bowser or a temporary connection to water mains network will be arranged with the appropriate stakeholder. The water used during the construction period would be for the construction of access roads, dust suppression and wheel-washing facilities.

Water Quality / Hydrostatic Testing of the Pipeline

- 13.5.18 Prior to operation, the gas pipeline will be cleaned internally using a "pig" which will be driven through the pipe by water or compressed air. A "gauging pig" is then driven through to check the internal diameter of the gas pipeline so as to enable irregularities to be detected and, if necessary, rectified. In addition, a "calliper pig" will be employed to confirm the pipe geometry, and deem that the pipe dimensions are suitable to accommodate an "intelligent pig" at a later date.
- 13.5.19 The gas pipeline will be hydrostatically tested by closing off the ends, filling it with water and increasing the pressure to a pre-determined level higher than the pressure at which it is designed to operate. Water used for this purpose may be drawn from a suitable local watercourse and will subsequently be discharged in accordance with approved method statements and EA requirements.
- 13.5.20 The potential impact on water quality is considered low at present, as the water may be slightly contaminated with particles such as small metal fragments, dust or welding deposits which could be expected from flushing water through the gas pipeline at high pressure. This low impact on a receptor of medium importance results in an overall significance category of low.

Operation

Human Health

- 13.5.21 The development of the gas pipeline will comprise a buried, welded steel pipe.
- 13.5.22 Following construction, the gas pipeline route will also be backfilled and re-instated as close as possible to tie in with surrounding baseline conditions. No pollutant substances will be able to escape from the gas pipeline and no contaminated soils will be used for covering the gas pipeline.



13.5.23 As a result there will be no potential pollutant pathways between any ground contaminants and site users / off site properties. It is therefore considered that the potential for direct (dermal, oral or inhalation) contact with any remaining contaminants present beneath the surface is insignificant.

Geology and Soils / Contamination

13.5.24 During operation, no potentially hazardous substances will be stored and used at the AGI site. Therefore there will be no impact.

Hydrology / Surface Water / Hydrogeology

- 13.5.25 If the construction trench had been lined with sands, this could create a preferential pathway for groundwater during operation. However, the impacts are predicted to be negligible as small quantities of groundwater are likely to be present under the pipeline infrastructure. It is also likely that there are already granular drift deposits underlying the proposed gas pipeline route.
- 13.5.26 During operation, the gas pipeline will be buried significantly beneath all watercourses which it has crossed. The impact on these watercourses will therefore be negligible.

Flood Risk

13.5.27 A formal Flood Risk Assessment (FRA) is not considered necessary for the development of the gas pipeline and the associated AGI. This is due to the following reasons:

For the Gas Pipeline

- During operation, the gas pipeline will consist of a welded steel pipe which will be buried along the majority of its length;
- The area where the pipeline is to be buried is known to be well protected by existing flood defences (Although it is possible that if the existing flood defences fail then the eastern part of the Route Study Corridor would be inundated by water, the gas pipeline will be completely sealed along its length, and will also be constructed with negative buoyancy. Therefore, water would neither penetrate the gas pipeline, nor would the gas pipeline be able to break free and float away);
- If the area is flooded, there will be no staff on site (It should be noted that the gas pipeline will be maintained by infrequent service visits by maintenance staff. However, the gas pipeline will not be serviced if there is a potential of a significant flooding event (as warned by the EA));
- Following construction, the land will be reinstated with similar cover to the baseline conditions, and water will drain away normally such that there is no increase risk of flooding elsewhere; and
- River crossings will be carefully designed such that they do not increase the risk
 of flooding.

For the Associated AGI

- The associated AGI is not situated within a Flood Zone which would require a formal Flood Risk Assessment to take place; and
- The area of development for the associated AGI is less than 1 ha.

Decommissioning

13.5.28 Upon cessation of operation, the gas pipeline and associated AGI will be disconnected from the NTaS Number 5 Feeder pipeline. It is currently proposed that the gas pipeline would be capped at both ends, filled with nitrogen and left buried



under ground. The gas pipeline will be constructed of material to withstand degradation from the soil and water environment, and therefore there will be a negligible impact on water and soil quality.

13.5.29 Should it be decided that the gas pipeline is to be removed, the impacts relating to human health, geology and soils, water use / hydrology and UXO during decommissioning will be temporary and moderate in nature and would be similar to those described above for construction.

13.6 Mitigation Measures

13.6.1 The construction of the gas pipeline and associated AGI has the potential to create impacts relating to human health, geology and soils, water use / hydrology and UXO. However, providing the confirmed mitigation measures are adhered to (detailed at Section 13.5), in addition to more specific mitigation measures as set out below, no significant residual impacts are anticipated.

Construction

Construction Workers

- 13.6.2 During construction, dust suppression measures will be put in place to minimise dust levels on the site (working width or at the AGI location) and in the surrounding area. These measures are detailed in Section 9 (Air Quality) and include dowsing or covering of stockpiles during dry and windy weather.
- 13.6.3 Any additional soil materials that are to **b**e imported to site will be required to have certification of their chemical concentrations to ensure that contaminated materials are not being introduced to the area.
- 13.6.4 The construction site will be cordoned off and access will be limited to construction workers and official vehicles. This will prevent any members of the public from entering the construction site.
- 13.6.5 Further to the above, a detailed Risk Assessment of the ground conditions shall be carried out by the Construction Contractor to comply with the requirements of the Construction Design and Management Regulations 2007.

Geology and Soils / Contamination

- 13.6.6 In order to further limit disturbance, the site access tracks will be constructed first to allow movement of vehicles around the site on areas of soft-standing. Any vegetation, topsoil and subsoil will be removed to expose a suitable sub-grade. Any topsoils, subsoils or aggregate suitable for reuse will be stockpiled on impermeable liners to the side of the working width. Soils which are to be reused on site will be tested for contamination. This will form part of a site waste management plan (SWMP) which will be drafted prior to construction and will focus on the re-use, recycling and reduction of waste spoil.
- 13.6.7 Speed restrictions will be imposed on site to minimise disturbance of bare surfaces and the amount of disturbed surfaces left exposed for significant time periods will be minimised. Stockpiles of loose, fine materials will be damped down or covered over if necessary, again to reduce erosion and the production of dust.

Contamination

- 13.6.8 The possibility of encountering unexpected contamination during excavations will be continually addressed throughout the development of the underground gas pipeline and associated AGI. In particular, borehole surveys will be carried out on the gas pipeline route during the detailed design phase.
- 13.6.9 If contaminant hotspots are discovered during excavation / construction works, the following procedure will be applied:



- Work will be stopped immediately;
- The discovery will be reported to the Construction Manager;
- The area will be sealed off to contain the spread of contaminants;
- The area will be cleared to ensure there is nothing that could cause fire and / or explosion;
- The Regulator / Local Authority will be contacted once it is confirmed that contamination is found;
- Arrangements for testing to be carried out will be made and changes to the existing contamination strategy will be agreed; and
- The details of the incident (including photos and relevant information) will be recorded on an Environmental Incident Report Form.
- 13.6.10 Any soils which are considered to be contaminated (either identified through testing or through visual / olfactory evidence) will be stockpiled separately on site and then disposed of off site. This procedure will be defined in a Site Waste Management Plan (SWMP).
- 13.6.11 Any contaminated groundwater encountered will be collected, transferred to tankers and disposed of off site (with any necessary treatment also conducted off site). No groundwater will be discharged back into the ground or controlled waters without prior consent from the Environment Agency / other Regulatory Bodies.

Unexploded Ordinance / UXO

- 13.6.12 Given the level of previous bombing in the area, the threat of UXO at the site will be further addressed through additional survey at the post-consent stage.
- 13.6.13 In addition, on site briefings from an explosives safety engineer will be undertaken to inform Construction Contractors of the risks and contingency plans should UXO be encountered.

Hydrology / Hydrogeology / Water Quality

- 13.6.14 The access roads will be constructed to manage drainage of surface water and a temporary wheel washing facility will be installed to prevent transfer of soil onto nearby public roads.
- 13.6.15 Surface water, perched waters or groundwater from dewatering operations will not be discharged to surface water, foul or surface water drains without the appropriate consents from the local Water / Sewage Company and / or the EA. The disposal of this effluent will be the responsibility of the Construction Contractor. If necessary this water will be tanked off-site for disposal at a suitable facility.
- 13.6.16 Temporary drainage routes and silt fences, constructed of geotextile, will be constructed if deemed necessary. Any pumping will be undertaken using an appropriately sized pump at such a rate in order to avoid disturbance or erosion of stream banks. The location of dewatering pipework will be carefully positioned. The Construction Contractor will regularly inspect all dewatering pumps, pipe work and connections.
- 13.6.17 As far as possible, any open-cut / trenching work at watercourses will be undertaken during the late summer when water levels are expected to be at their lowest.
- 13.6.18 When it is not possible to undertake work over a very short period, then any significant change in water levels should be corrected by re-establishing hydraulic connectivity across the two separated part of the ditch (if separated by dams). This



could be achieved via the use of a pipe which allows water to pass between the two ditch sections.

- 13.6.19 An ongoing strategy for water quality monitoring could be established throughout the construction period in order to identify potential impacts on water quality arising from the construction phase in a timely manner and mitigate their effects.
- 13.6.20 It should be further noted, that detailed groundwater risk assessments (covering hydrology / hydrogeology / water quality) will be carried out during the detailed design stage for special crossings.

Operation

- 13.6.21 Following construction, the gas pipeline route will also be backfilled as close as possible to tie in with surrounding baseline geological and soil strata so as not to present a preferential pathway for groundwater migration.
- 13.6.22 The gas pipeline and any associated underground infrastructure will be specified to resist chemical attack from soils or groundwater.

Decommissioning

- 13.6.23 Upon cessation of operation, the gas pipeline and associated AGI will be disconnected from the NTaS Number 5 Feeder pipeline. It is currently proposed that the gas pipeline would be capped at both ends, filled with nitrogen and left buried under ground.
- 13.6.24 A decommissioning plan will be prepared in compliance with best practice methods, approximately 12 months prior to decommissioning.
- 13.6.25 If the gas pipeline and associated AGI are to be removed, the decommissioning area would be delineated and measures taken to avoid vehicle use outside the working boundary. In order to further limit disturbance, the site access tracks will be taken out last.

13.7 Assessment of Residual Impacts

13.7.1 Provided the confirmed and specific mitigation measures are strictly followed, it is not anticipated that there will be any residual impacts arising from the development of the gas pipeline and associated AGI relating to human health, geology and soils, water use / hydrology and UXO. Therefore, the residual impact associated with the gas pipeline and associated AGI are not anticipated to be significant at any of the identified sensitive receptors.

13.8 Assessment of Cumulative Impact

13.8.1 Indirect / Secondary and Cumulative Impacts are assessed in Section 18.

SECTION 14

TRANSPORT AND INFRASTRUCTURE



14 TRANSPORT AND INFRASTRUCTURE

14.1 Introduction

- 14.1.1 This Section considers the impact of the construction and operation of the gas pipeline and associated AGI upon the transport network and the impact of traffic generated by the proposals upon the surrounding environment.
- 14.1.2 Matters to be considered in this Section include:
 - Highway Capacity;
 - Highway Safety;
 - Amenity of Highway Users; and
 - Impacts upon other Rights of Way / Access Routes / Transport Facilities.
- 14.1.3 Where a potential impact is identified over the existing baseline situation, suitable mitigation is defined with a view to minimising or, where possible, eliminating that impact. Where it is not possible to eliminate the impact entirely, residual impacts following mitigation are assessed and reported.

14.2 Key Planning Policies

- 14.2.1 Section 3 provides the Planning Policy Context.
- 14.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

T1	Regional Transport Strategy Objectives and Outcomes
T2	Changing Travel Behaviour
Т6	Traffic Management
Т9	Walking, cycling and other non motorised transport

Thurrock Borough Local Plan

T1	Balanced Transport Strategy
Т6	Traffic Management
Т8	Existing and New Footpaths
T11	Cycleways

Draft TCSPMD

PMD9	Road Network Hierarchy
PMD10	Transport Assessments and Travels Plans

14.3 Assessment Methodology and Significance Criteria

Assessment Methodology

14.3.1 Qualitative assessment is provided of the impact of the development proposals over the existing baseline situation. The assessment methodology and consideration of suitable mitigation is informed by, and consistent with, the following guidance:



- Guidance on Transport Assessment (Department for Transport, March 2007); and
- Circular 02/07: Planning and the Strategic Road Network (Department for Transport, 2007).
- 14.3.2 In addition to the above, the existing baseline situation and impact thereto is assessed and defined with reference to the following documentation:

Thurrock Transport Strategy 2008 – 2021

- 14.3.3 This sets out the long-term strategy for transport provision within Thurrock and the delivery of the strategic objectives set out within the emerging Local Development Framework. The Thurrock Transport Strategy 2008 2021 replaces the Thurrock Local Transport Plan 2 (2006 2011) (LTP2) and will provide the main strategic focus for LTP3 (2011 2016) and LTP4 (2016 2021). The Thurrock Transport Strategy sets out the following five strategic objectives:
 - Delivering accessibility;
 - Tackling congestion;
 - Improving air quality and climate change;
 - Safer roads; and
 - Facilitating regeneration.

Thurrock Route Hierarchy Map

14.3.4 This defines the classification of roads (Level 1 / Level 2 / Level 3) within Thurrock and informs the application of policy PMD9 of the Core Strategy and Policies for Management of Development Proposed Submission Draft (February 2010). Policy PMD9 sets out the Council's policy regarding the provision of new accesses or intensification of use of existing accesses onto the highway network.

The Design Manual for Roads and Bridges

14.3.5 The Design Manual for Roads and Bridges (DMRB) comprises a series of technical advice notes, which provide guidance relating to the design of motorways and trunk roads in the UK.

Essex Design Guide (November 2005)

14.3.6 This document provides guidance regarding the design, layout and use of residential and mixed-use areas including highways and public rights of way.

Manual for Streets (2007)

14.3.7 The Manual for Streets (MfS) provides technical guidance, predominantly in relation to lightly trafficked residential streets, although it is acknowledged that the key principles therein may be applicable to other types of street, such as lightly trafficked lanes in rural areas. The MfS seeks to make a clear distinction between streets and roads and in this respect the document moves away from the approach reflected within previous guidance, whereby emphasis was placed on the function of a highway for the movement of traffic. Instead the MfS recognises the role of some highways (streets) in creating a sense of place.

Gateway Energy Centre Transport Report (December 2010)

14.3.8 This report is supplemental to the ES (February 2010) submitted in support of the application for consent pursuant to Section 36 of the Electricity Act 1989 relating to the construction and operation of GEC. The Transport Report provides assessment of the impact of traffic associated with the construction of the GEC upon the strategic



trunk road network and local strategic non-trunk routes including the A13 and A1014 (The Manorway).

14.3.9 In providing this assessment the Transport Report includes extensive information regarding baseline traffic flows.

Significance Criteria

- 14.3.10 The following significance criteria have been used to assess the magnitude of potential impacts:
 - Beneficial: Advantageous / positive impact upon the transport network or surrounding environment.
 - Negligible: Imperceptible impact upon the transport network or surrounding environment.
 - Adverse: Detrimental / negative impact upon the transport network or surrounding environment.
- 14.3.11 Where beneficial or adverse impacts have been identified, these have been assessed against the following scale:
 - *Minor*. Slight impact (by extent / duration / magnitude) of no significant consequence.
 - *Moderate*: Limited impact (by extent / duration / magnitude) which may be considered significant.
 - Major: Considerable impact (by extent / duration / magnitude) of more than local significance.

14.4 Baseline Conditions and Sensitive Receptors

Baseline Conditions

- 14.4.1 Potential impacts resulting from the gas pipeline and associated AGI fall into one of the following two general categories:
 - Potential conflicts between the route of the gas pipeline and the route of existing / planned transport links ('pipeline crossings'); and
 - Potential impact resulting from traffic generated as a result of the development proposals and the associated routing and access arrangements.
- 14.4.2 As discussed within Section 5, the route of the gas pipeline is indicated by Figures 5.3a to 5.3b. These Figures also indicate conflicts with the routes / positions of existing roads, railways, public rights of way, tracks, pipes, ditches, rivers and lakes. These are summarised within Table 5.1.
- 14.4.3 Table 14.1 distils Table 5.1 to consider transport links in isolation.

TABLE 14.1:PIPELINE ROUTE CROSSINGS - ROADS, RAIL LINES AND
TRACKS

Figure	Crossing Number	Location	Crossing Technique
	TLX 1	Track to Existing CECL Gas Pipeline AGI / Access Road to proposed AGI	Auger
5.3a	RDX 1	Butts Lane	Auger
	RLX 1	Passenger Railway Line	Micro-Tunnel
	RLX 2	Thames Haven Branch Line (Freight	HDD1



		Railway Line)	
	RDX 2	Wharf Road	HDD1
	DX 3 / PROW 1	Footpath Number 38	Open Cut
	RDX 3 / PROW 2	Rainbow Lane / Bridleway 39	Open Cut
5.3b	RDX 4	Proposed New DP World / LG development Access Road (yet to be constructed). To include the proposed bridleway line (BR189) (also yet to be constructed).	Auger
	TLX 2	Manorway Track	Open Cut
5.3c	TLX 3	Track crossing to the South of Old Hall Farm	HDD2
	RDX 5	A1014 (The Manorway)	HDD2
5.3d	TLX 4 / PROW 3	Old Railway Track Crossing / Footpath Number 143	HDD3
	RDX 6	A1014 (The Manorway)	HDD5
5.3e	RDX 7	LG Development Gate 3 access	Tunnel
	RLX 3	Proposed DP World Common User Siding (yet to be constructed)	Tunnel

- 14.4.4 It is to be noted that, in respect of crossings RDX 4, PROW 2 and RLX 3, the transport link with which the pipeline route is in conflict is not yet constructed and may be implemented post construction of the gas pipeline. Examination of the relevant strategic planning or transportation policies and documentation or committed development proposals does not highlight any other proposed transport links which are in conflict with the pipeline route.
- 14.4.5 As discussed in Section 6, points of access to the working width are undefined at this time and will be agreed with the Local Planning Authority and landowners / occupiers prior to commencement of construction. However, in terms of the routing of traffic, vehicles seeking access to the Mucking / Stanford-le-Hope / Corringham area are likely to utilise the strategic road network of the A13 and A1014 (The Manorway). In terms of direct access from the strategic road network to the gas pipeline route working width (WW) or AGI site, potential access points and access routes are summarised within Table 14.2.
- 14.4.6 Figure 14.1 indicates the road network in the vicinity of the gas pipeline route (working width) and AGI site.

Access To	Access Via	Potential Route From Strategic Network
WW	A1014	Direct access from strategic network
AGI / WW	Existing AGI Access Track / FP41	A1013 – London Road – Butts Lane – FP41
AGI / WW	Existing AGI Access Track / FP41	A1013 – Buckingham Hill Road – Waltons Hall Road – Butts Lane – FP41
WW	Mucking Wharf	A1013 – London Road – Butts Lane – Mucking Wharf

TABLE 14.2: POTENTIAL ACCESS ROUTES TO WORKING WIDTH OR AGI SITE

14.4.7



	Road	Road
WW	Mucking Wharf Road	A1013 – Buckingham Hill Road – Waltons Hall Road – Mucking Wharf Road
WW	Wharf Road	Corringham Road – Wharf Road
WW	Wharf Road	A1013 – London Road – Church Hill – Wharf Road
WW	Rainbow Lane / BR39	Corringham Road – Rainbow Lane – BR39
WW	Manorway Track	High Road – Manorway Track
WW	Manorway Track	Corringham Road – Rainbow Lane – High Road – Manorway Track
WW	LG Gate 1 Access Road	Accessed directly from A1014
WW	Rookery Hill	Church Road - Rookery Hill
WW	Rookery Hill	Southend Road (B1420) – Lampits Hill – Church Road – Rookery Hill
WW	Rookery Hill	High Road, Fobbing – Lion Hill – Fobbing Road – Church Road – Rookery Hill
WW	LG Gate 3 Access Road	Accessed directly from A1014

Table 14.3 provides a summary of the character and use of each of the roads, public rights of way and tracks discussed within Table 14.1, Table 14.2 and the above paragraphs.



TABLE 14.3 - SUMMARY OF ROADS / PUBLIC RIGHTS OF WAY / TRACKS POTENTIALLY IMPACTED BY GAS PIPELINE AND ASSOCIATED AGI PROPOSALS

Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
A13	Rural	2 x 7.3 m	No	No	Yes	70 mph	App. full capacity during peak periods	Urban Clearway	No	Movement of Traffic	None	Strategic Trunk Road	24 Hour two-way flows between approx. 72 000 (2 lane) to 91 000 (3 lane) ¹
A1014 (The Manorway)	Semi Rural / Rural	2 x 7.3 m	1 x 2.5 m	Off-Road	No	50 mph	None	Urban Clearway	No	Movement of Traffic	None	Level 1 - Strategic Non Trunk	24 Hour two-way flows between approx. 29 000 (2 lane) to 5 000 (1 lane) ¹



Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
Butts Lane	Urban / Rural (Part Res.)	5.5 m to 6.7 m	1 x 1.8 m	No	On Urban Section	30 / 60 mph	School	Double Yellow Lines Outside School	Slight	Movement of Traffic	Part 7.5 tonne weight limit	Level 2 - Rural Road	Lightly trafficked save for the northern section during school pick up / drop off hours when traffic flows are relatively high
Mucking Wharf Road	Rural	5.8 m	No	No	No	60 mph	Level crossing / HGV Traffic ass. with Mucking Tip	No	No	Movement of Traffic	None	Level 3 - Access Road	Lightly trafficked
Wharf Road	Urban / Rural (Part Res.)	5.5 m to 7.3 m	1 x 2 m and 1 x 1.8 m	No	Yes	30 / 60 mph	Rail Bridge height restriction	Double Yellow Lines to northern section	Mod.	Place setting to north / movement of traffic to south	Part 7.5 tonne weight limit	Level 2 - Rural Road	Mod. trafficked north of King Edwards Road. Lightly trafficked south of King Edwards Road



Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
Rainbow Lane	Semi Rural / Res.	6.0 m reducing to 3.0 m south of Billet Lane	1 x 1.7 m	No	Yes	30 / 60 mph	Unmade Road south of High Road	No	Mod.	Place setting	Part 7.5 tonne weight limit	Level 3 – Res. Rd	Lightly trafficked
LG Proposed Access Road	Rural	2 x 7.3 m	3.5 m shared use and 3 m shared use	Yes	Yes	TBD	None	No	N / A	Movement of Traffic	None	Private	Unlikely to be in operation until after cons. Once in operation up to approx. 17 000 two-way flows per day.
LG Proposed Bridleway 190	Rural	N / A	5 m shared use	Yes	No	N / A	None	N / A	N/A	N / A	N / A	N / A	Lightly trafficked – Peds. / Cycle / Equest. Use Only
LG Gate 1 Road	Ind.	7.3m	No	No	No	20 mph	None	No	No	Access	N / A	Private	Likely to remain lightly trafficked during cons.



Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
LG Gate 3 Road	Ind.	7.3 m	No	No	No	20 mph	None	No	No	Access	N / A	Private	Likely to remain lightly trafficked during cons.
A1013	Semi Rural	9.5 m	1 x 2.2 m shared use	Off Road	Yes	50 / 40 / 30 mph	None	No	No	Movement of Traffic	None	Level 1 - Rural Dist.	Relatively heavily trafficked during peak periods
London Rd, Stanford-le- Hope	Urban / Res	6.7 m	2 x 1.8 m	No	Yes	30 mph	Level crossing / High Level of Peds	Some Double Yellows	In Laybys	Place setting	7.5 tonne weight limit	Level 2 - Urban Road	Relatively heavily trafficked – Exp. significant cong. as a result of Level Crossing
Buckingham Hill Road	Rural	7.3 m	No	No	No	50 mph	None	No	No	Movement of Traffic	None	Level 1 - Rural Dist.	Moderate traffic
Waltons Hall Road	Rural	6.7 m	No	No	No	60 mph	Tight Bends / HGV Traffic	No	No	Movement of Traffic	None	Level 2 - Rural Road	Moderate to lightly trafficked
Corringham Road	Urban / Res.	7.3 m	2 x 1.8 m	No	Yes	30 mph	School / Shops / High Level of Peds.	Some Double / Single Yellows	Mod.	Place setting / Movement of Traffic	7.5 tonne weight limit	Level 2 - Rural Road	Heavily trafficked during peak periods - Moderate traffic outside peaks

GEC Underground Gas Pipeline and Associated Above Ground Installation March 2011

Prepared by Parsons Brinckerhoff for Gateway Energy Centre Limited



Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
Church Hill, Stanford-le- Hope	Urban / Town Centre	5.5 m	1 x 1.5 m / 1 x 0.9 m	No	Yes	30 mph	High Level of Peds.	Double Yellow Lines	Mod.	Place setting	7.5 tonne weight limit	Level 2 - Rural Road	Lightly trafficked
High Road, Stanford-le- Hope	Rural	3.0 m	No	No	No	60 mph	Single Vehicle Width	No	No	N / A	7.5 tonne weight limit	Level 3- Access Road	Very lightly trafficked
Rookery Hill	Rural	6.4 m	1 x 1.3 m	No	No	30 mph	No Through Road	No	No	Place setting	None	Level 3 - Access Street	Very lightly trafficked
B1420 (Southend Road)	Rural	7.3 m to 9.2 m	1 x 1.5 m	On Road	Yes	50 mph	Road narrows over Rail Bridge	No	No	Movement of Traffic	7.5 tonne weight limit	Level 1 - Rural Dist.	Moderate traffic during peak hours - Lightly trafficked outside peaks
B1420 (Lampits Hill)	Urban / Res.	7.3 m	2 x 1.6 m	No	Yes	30 mph	High level of Peds.	Single Yellow Lines	Slight	Place setting / Movement of traffic	7.5 tonne weight limit	Level 2 - Urban Road	Relatively heavily trafficked during peak hours - Moderate traffic outside peaks
High Road, Fobbing	Semi Rural / Res.	6.7 m	1 x 1.6 m	No	Yes	30 / 40 mph	None	None	Slight	Place setting / Movement of traffic	7.5 tonne weight limit	Level 2 - Urban Road	Moderate to lightly trafficked



Title / Designation	Character	Carriageway Width	Footways	Cycleway	Street Lighting	Speed Limit	Special Considerations	Parking Controls	Existence of On-street Parking	Purpose (Manual for Streets Definition)	Other Restrictions to Use	Status	Existing Vehicular Traffic Flows
Lion Hill, Fobbing	Semi Rural / Res.	5.1 m	1 x 1.8 m	No	Yes	30 mph	Tight Bends / Poor Forward Visibility	Double Yellow Lines	Ext.	Place setting	7.5 tonne weight limit	Level 2 - Urban Road	Moderate to lightly trafficked
Fobbing Road	Urban / Res.	5.7 m to 7.9 m	2 x 1.8m	No	Yes	30 mph	School Crossing	None	Ext.	Place setting	7.5 tonne weight limit	Level 2 - Urban Road	Heavily trafficked during school pick up / drop off hours – Moderate traffic at other times
Existing AGI Access Track (FP 41)	Rural	N / A	N / A	N / A	N / A	N / A	Un- surfaced	N / A	N / A	N / A	N / A	N / A	Lightly trafficked – Ped. use only
FP 30	Rural	Narrow Field Track	N / A	N / A	No	N / A	Un- surfaced	N / A	N / A	N / A	N / A	N / A	Lightly trafficked – Ped. use only
FP 143	Rural	3.0 m (un- surfaced)	N / A	N / A		N / A		N / A	N / A	N / A	N / A	N / A	Lightly trafficked – Ped. use only
Manorway Track	Rural	3.0 m	No	No	No	60 mph	Un- surfaced	No	No	N / A	None	Level 3 - Access Road	Very lightly trafficked
Track Crossing South of Old Hall Farm	Rural	3.0 m	No	No	No	60 mph	Un- surfaced	No	No	N / A	None	Level 3 - Access Road	Very lightly trafficked



Sensitive Receptors

- 14.4.8 In terms of transport related impacts, potential sensitive receptors comprise parties utilising the transport network that may be affected by the proposed development or associated traffic generation.
- 14.4.9 Regarding highway / right of way impact, sensitive receptors include drivers / passengers of motor vehicles, pedestrians, cyclists, and equestrians. It should be noted that, particularly in terms of pedestrians, cyclists and equestrians, sensitive receptors include those parties utilising the transport network for leisure / amenity purposes.
- 14.4.10 In addition to highway / rights of way impact, the proposed pipeline crossings have the potential to impact upon the rail network. Therefore additional sensitive receptors include those parties using the rail network for transport such as rail passengers and freight transport.

14.5 Potential Impacts

Impacts of Pipe Crossings

Construction Phase

- 14.5.1 Where the proposed pipeline route conflicts with existing transport / access links potential exists for impact upon the free flow of traffic or the safety / amenity of users during the construction phase. The nature of such impact depends largely upon the character / use of the existing transport / access link and the construction method utilised to install the pipeline crossing.
- 14.5.2 Conflicts between the proposed pipeline route and the routes of existing transport access links are summarised in Table 14.1. The affected links comprise one Strategic Non-Trunk Road, two Level 2 Rural Roads, two bridleways, two public footpaths, two private roads providing access to a strategic employment site and three private access tracks, in addition to one passenger rail line one freight rail line and a proposed rail freight user siding.
- 14.5.3 The Strategic Non-Trunk Route (The A1014) provides the sole access route to significant employment / industrial sites at Coryton and London Gateway, with existing traffic flows in the vicinity of the proposed pipe crossings of approximately 5 000 vehicles per day. As such the construction of the pipe crossings has the potential to result in Major Adverse impact. However, as indicated by Table 14.1, it is the intention to utilise HDD in the construction of these pipe crossings. HDD can be undertaken whilst the conflicting highway route remains fully operational and as such potential impact is reduced to Negligible.
- 14.5.4 The two Level 2 Rural Roads comprise Butts Lane and Wharf Road. Save for a short section to the north of St Clere's school, which passes through a predominantly residential area, Butts Lane is rural in nature providing connectivity between Stanford-le-Hope and the Linford / East Tilbury area. As indicated by Table 14.3, Butts Lane is relatively lightly trafficked save for pick up / drop off times at St Clere's School when traffic flows increase considerably. Whilst alternate access to / from Linford / East Tilbury can be achieved via Buckingham Hill Road and the A1013, temporary part or full closure of Butts Lane to facilitate pipe-crossing works would be likely to result in a Moderately Adverse impact.
- 14.5.5 Wharf Road is a no-through road that, in the vicinity of the proposed pipe crossing, provides access to a handful of residential properties, a small industrial estate (Stanhope), a wood yard, the Shell fishing lakes and a Bridleway (BR190), which provides access to the riverfront. Whilst the roadway is relatively lightly trafficked it provides the sole vehicular access route to these uses and as such temporary, part or



full closure of Wharf Road to facilitate pipe-crossing works is considered to result in a Moderately Adverse impact.

- 14.5.6 Notwithstanding the above conclusions, as indicated by Table 14.1, the intention is for the Butts Lane and Wharf Road crossings to be constructed using Auger and HDD techniques respectively. Therefore construction of these pipe crossings can be undertaken whilst the conflicting highway routes remains fully operational and therefore the potential impact is reduced to Negligible.
- 14.5.7 The two public footpaths (FP38 and FP143) are limited to use by pedestrian traffic only and provide predominantly for limited leisure use, which is noted to be more prevalent during the summer months. Bridleway 39 and proposed replacement Bridleway 189 are limited to use by pedestrians, cyclists and equestrians and provide access to the riverside, linking to BR190 to the east.
- 14.5.8 Crossing of FP143 is proposed to be undertaken by HDD techniques and as such impact will be reduced to negligible. However, crossing of FP38 and BR39 and proposed replacement BR189 (if implemented prior to pipeline construction) are likely to require closure for a period of up to 1 to 2 days each. As such, construction of the pipe crossings will results in a Minor Adverse impact. It is anticipated that in most cases, suitable temporary diversion can be established reducing the impact to Negligible.
- 14.5.9 The London Gateway Gate 3 access road, off the A1014 (The Manorway) provides one of three interim access points (along with Gate 1 and Gate 2) to the London Gateway site for construction and operational traffic. Upon completion of the new LG Development access road use of Gates 1, 2 and 3 will be limited to emergency vehicles and buses only. Given the potential alternate access routes to the LG Development site, the impact of temporary closure of the Gate 3 road is considered to be Minor Adverse. However, as indicated by Table 14.1, the intention is for the pipeline to cross the Gate 3 access road via tunnel allowing the road to remain fully operational. As such the impact is reduced to Negligible.
- 14.5.10 The three private access tracks provide access to the existing AGI, Old Hall Farm and agricultural land respectively. The first of these is proposed to be crossed using Auger construction techniques and as such impact is considered to be negligible. Similarly the track providing access to Old Hall Farm is proposed to be crossed using HDD techniques resulting in negligible impact. The remaining crossing will be constructed using open cut techniques and will therefore require closure of the accessway for 1 to 2 days resulting in minor adverse impact.
- 14.5.11 Regarding the proposed rail crossings, the London (Fenchurch Street) to Shoeburyness line (Passenger Railway Line) provides rail access between London and the South Essex area. Passenger services operate at a frequency of 6 trains per hour at peak times with a high level of patronage, reflecting the high level of commuting into London from areas to the east. As a result the required pipe crossing has the potential to result in a Major Adverse impact. As indicated by Table 14.1 however, the intention exists to utilise micro-tunnelling construction techniques for this pipe crossing which will not affect the operation of the rail line. As such the resulting impact is reduced to Negligible.
- 14.5.12 Following decommissioning of the Shell Haven oil refinery, the Thames Haven Branch Line currently experiences very low levels of usage. However proposals exist to upgrade (including twin tracking) this line to facilitate rail freight movements associated with the LG Development, with up to 30 per cent of all associated freight movements anticipated to utilise rail as a mode of transport. Whilst it is anticipated that the pipeline construction will be completed prior to upgrading of the rail line or significant levels of freight use, the impact of the proposed pipe construction has the potential to be Moderately Adverse. Notwithstanding this, as indicated by Table 14.1,



the intention exists to utilise a HDD pipeline crossing construction technique and as such the resulting impact will be reduced to Negligible.

Operational Phase

14.5.13 During the operational phase the pipe crossings would have no impact upon the conflicting transport links save for instances where it may be necessary to excavate to carry out essential maintenance. However, given the construction and protection techniques adopted in the construction of the pipeline and the ongoing maintenance procedures, excavation should only be required in very exceptional circumstances. Should excavation of a pipeline crossing / highway / public right of way be required it shall be carried out in accordance with the New Roads and Street Works Act. Excavation of operational rail lines would not be permitted and therefore non-intrusive maintenance techniques would be adopted.

Decommissioning Phase

14.5.14 As discussed within Section 6.10, the gas pipeline and associated AGI will be decommissioned when it reaches the end of its useful life in line with prevailing best practices. However it is likely that the buried pipe will be left in place and stabilised. Therefore there is likely to be Negligible impact as a result of pipeline crossings during the decommissioning phase.

Impacts of Site Access Provision

Construction Phase

- 14.5.15 As discussed within Section 6, points of access to the AGI site and working width are unknown at this time and will be determined during the detailed design and prior to commencement of construction by the appointed construction contractor following discussion with the Local Planning Authority and landowners / occupiers. A general assessment of potential access points is however discussed within Paragraph 14.4.5 and Table 14.2.
- 14.5.16 Potential impacts associated with the point of access to the working width are considered to be either (a) 'common impacts' that have the potential to occur at all access points or (b) 'specific impacts' that are related to the character, use or classification of the highway from which access is taken. These common or specific impacts are discussed in turn in the following paragraphs. It is to be noted that the impact of access points is inevitably directly related to the level of traffic using the access and the level of through traffic on the adjacent highway. The impact of traffic flow levels is considered further within paragraphs 14.5.48 to 14.5.68.
- 14.5.17 Common impacts, which have the potential to occur at all / any access points include:
 - The tracking of mud and debris from the construction site onto the adjacent highway or right of way;
 - Parking of construction related vehicles on the adjacent highway or right of way (as a result of an under-provision of on-site parking facilities / over-reliance on transport by private motor vehicle); and
 - Reduction in amenity (including a reduction in capacity and safety) to existing users as a result of additional turning movements or traffic management requirements (such matters may be exacerbated by restricted access geometry (i.e. access radii or sightlines)).
- 14.5.18 The tracking of mud and debris onto the highway network can be a significant problem resulting in conditions detrimental to highway safety and the general amenity of existing users. Additionally such conditions can potentially discourage use of sustainable transport modes such as walking and cycling, resulting in additional motorised trips to the further detriment of highway safety and capacity. In drying



conditions the tracked mud can also result in additional airborne dust particles. Significant impact can be expected where the construction site comprises un-surfaced ground, particularly during poor weather conditions. Given the open countryside / agricultural nature of the land through which the pipe route predominantly passes, and the 9 to 12 month construction programme which will likely cover one winter season, the potential unmitigated impact from tracked mud and debris associated with construction access to the proposed development is considered to be Moderate Adverse.

- 14.5.19 In recent years sustainable transport strategies have brought an amended approach to parking whereby reduced parking provision is utilised as a tool to discourage travel by private motor vehicle. It is important however that parking control forms part of an effective package of wider sustainable transport measures to avoid parking being displaced to roads and streets in the vicinity of the site access. Excessive / inappropriate parking on the highway can result in reduction in the carriageway width and interruption to the two-way flow of traffic. Whilst parking in residential streets can in some cases have a Minor Beneficial impact in providing a degree of traffic calming, such parking can obstruct private accessways, footways, pedestrian crossings and sightlines to the detriment of highway safety, residential amenity and sustainable travel modes such as walking and cycling. Additionally the tendency for drivers to park with two wheels on the footpath or verge to maintain the carriageway width can result in damage to the highway surface. It is therefore considered that the potential unmitigated impact of insufficient on-site parking provision and resulting on-street parking is Moderate Adverse.
- 14.5.20 The provision of any new accessway introduces additional turning movements to the adjacent carriageway. In terms of safety and capacity the degree of impact is somewhat related to the character, use and classification of the highway. This is discussed further within Paragraphs 14.5.22 to 14.5.32 below. Notwithstanding these considerations, where accessways are provided it is important that they are designed and constructed to established geometry standards (as discussed within the DMRB, Manual for Streets and other adopted guidance). Insufficient access geometry can result in the following implications for highway safety, capacity and amenity, particularly where the accessway is being utilised by larger goods / construction vehicles:
 - Overrunning of adjacent footpaths, cycleways or verges resulting in damage to the highway and increased pedestrian / cycle conflict;
 - Vehicles turning left-in having to swing out across the opposing carriageway as a result of insufficient junction radii or width resulting in vehicular conflict;
 - Increased vehicle or vehicle / pedestrian conflicts as a result of insufficient sightlines; and
 - Exacerbation of impact on the free flow of traffic (as turning movements are more contrived where insufficient geometry exists). This is particularly relevant at heavily used accessways where the access width is insufficient to provide for simultaneous access / egress movements.
- 14.5.21 It is to be noted that access radii requirements are related to the carriageway width of the adjacent highway and access road. In general terms where carriageway widths are reduced access radii requirements increase. Wide sweeping access radii or increased access width can have the effect of increasing the overall width of pedestrian crossing points increasing the potential for pedestrian conflict with site traffic. This is particularly relevant given that residential streets, where a higher level of pedestrian movement is likely to exist, often provide relatively narrow carriageway widths. Overall therefore it is concluded that, without sufficient access geometry, the potential impacts of site access provision is Moderate Adverse.



- 14.5.22 As discussed above, in addition to potential 'common impacts', potential impacts of site access provision exist that are specific to the character, use and classification of the highway from which access is being taken. To consider such 'specific impacts' the following road classifications (as defined within Policy PMD9 of the Thurrock Core Strategy and Policies for Management of Development proposed submission draft, February 2010) ('The Core Strategy'), are considered. The Thurrock Route Hierarchy Map (Map 2 of The Core Strategy), which indicates the classification of roads within Thurrock, is provided within Appendix G.1. The classification of roads within Thurrock, based on the Thurrock Route Hierarchy Map is:
 - Level 1 Routes (Corridors of Movement);
 - Level 2 Routes (Urban / Rural Roads / Streets); and
 - Level 3 Routes (Local Roads / Streets).
- 14.5.23 Level 1 Routes are defined as:
 - "Strategic Non-Truck Roads These serve to facilitate traffic movement between major centres within the region. This category would include any roads of regional significance as described in the East of England Plan or later revisions.
 - Rural / Urban Distributors These allow traffic to move freely and safely between local centres and from local centres to the major road network, within some local centres these distributors may be defined as streets".
- 14.5.24 In relation to the potential access points considered within Table 14.2, the A1014 (The Manorway) is classified as a Level 1 (Strategic Non-Trunk) Route. Policy PMD9 indicates a general presumption against new accesses or increased use of existing direct access onto such roads. Furthermore access to a side road connecting to a Level 1 Route will only be permitted where it can be demonstrated that the Level 1 Route would not be adversely affected. The underlying concern is that, given the primary purpose of such routes is the free movement of traffic between major centres, capacity will be detrimentally affected by turning movements. Furthermore, on such routes speeds are generally high and drivers are less likely to expect to encounter turning or manoeuvring traffic, resulting in conditions that are detrimental to highway safety. Exceptions are identified for developments of overriding national importance or strategic developments, as identified in the Local Development Plan, however where such access is permitted it must not impact adversely upon highway safety and capacity, particularly where the roadway provides for inter-urban public transport routes or access to one of the boroughs ports.
- 14.5.25 The A1014 is not currently served by public transport services however significant potential exists for public transport links to be established as the LG Development becomes operational. With regard to the LG Development, in the short term the A1014 east of The Sorrells roundabout junction will provide access to a strategic port facility. Notwithstanding these points, the Gateway Energy Centre Transport Report (December 2010) identified that the A1014 is relatively lightly trafficked in the existing situation with a ratio of flow to capacity of approximately 30 per cent. Furthermore, historical accident information highlights relatively few accidents over the 5-year period to August 2010, despite the existence of a number of direct accessways. Minded by the temporary nature of the construction works, and the points discussed above, the potential specific impact of direct access onto the A1014 is therefore considered to be Minor Adverse.
- 14.5.26 Level 2 Routes are defined as:

"roads that serve as main connections between substantial rural populations and the minor road network and act as through roads to distribute traffic to residential areas within urban conurbations".



- 14.5.27 In relation to the potential access points considered within Table 14.2, in the vicinity of the proposed pipe route Wharf Road is classified as a Level 2 Route. Where Level 2 Routes are rural in nature policy PMD9 sets out a similar presumption against new accessways as discussed within Paragraph 14.5.24, save for where the access is for small scale uses permissible in the green belt which does not adversely affect road safety or capacity. Where accesses are permitted they are required to meet current design standards.
- 14.5.28 In the vicinity of the proposed pipeline route corridor Wharf Road is semi urban in nature being on the immediate fringe of the Stanford-le-Hope residential area. Wharf Road is relatively lightly trafficked in the vicinity of the pipeline route corridor serving to provide access to a limited number of residential properties, the Shell Angling Lakes, a wood yard and a small industrial development at the Stanhope Industrial Park. Minded by the temporary nature of the construction works, providing design standards are met, the potential specific impact of direct access onto a Wharf Road is therefore considered to be Negligible.
- 14.5.29 Level 3 Routes are defined as:
 - "Access Roads / Streets These provide secondary links to villages and large towns forming minor distributors and access to individual properties
 - Residential Estate Roads / Streets The layout and design of estate roads is covered in the Design and Sustainability SPD".
- 14.5.30 In relation to the potential access points considered within Table 14.2, Footpath 41 (access road to existing AGI), Mucking Wharf Road, Bridleway 39 (Rainbow Lane), Manorway Track, Rookery Hill and the Gate 1 and 3 access roads (to LG Development) are all classified as Level 3 Routes.
- 14.5.31 No specific policy is set out within Policy PMD9 in relation to Level 3 Routes however the following overarching general criteria for the formation of new accessways or intensification of use of existing accessways applies:
 - There is no possibility of alternate safe access taken from an existing or proposed lower category road;
 - The design of the development minimises the number of accesses required;
 - The development makes a positive contribution to road safety or road safety is not prejudiced;
 - The development preserves and enhances the quality of the street scene;
 - The development avoids causing congestion as measured by link and junction capacities;
 - Measures are taken to mitigate all adverse air quality impacts in or adjacent to Air Quality Management Areas;
 - The development will minimise adverse impacts on the quality of life of local residents, such as noise, air pollution, and the general street environment; and
 - The development will make a positive contribution to accessibility by sustainable transport.
- 14.5.32 It is to be noted that none of the potential access points discussed within Table 14.2 are adjacent to Air Quality Management Areas. Furthermore, whilst some potential access routes pass through residential areas, none of the roads onto which access may potentially be taken are residential in nature in the vicinity of the pipe route corridor. Given the nature of the development and the temporary nature of the



construction operations it is therefore considered that potential impacts resulting from the character, use and classification of Level 3 routes are Negligible.

Operational Phase

14.5.33 During the operational phase access will only be required for routine maintenance and inspection resulting in only occasional limited traffic movements. As such the impact of accessways during the operational period is considered to be Negligible.

Decommissioning Phase

14.5.34 As discussed within Section 6.10, the gas pipeline will be decommissioned when it reaches the end of its useful life in line with prevailing best practices. Should decommissioning include the demolition and removal of the pipeline and AGI then the potential impacts of accessways will be similar to the construction phase. However, it is likely that the buried pipe will be left in place and stabilised. Therefore the only impact will be a slight intensification of use of the existing access to the existing AGI (Footpath 41). This impact is considered to be Negligible.

Impacts upon Access Routes of Traffic Generated by Proposed Development

Construction Phase

- 14.5.35 Before the impact of traffic generated by the proposed development can be assessed it is first necessary to consider the quantum of traffic likely to be generated. Traffic generated during the construction of the proposed development can be categorised as follows:
 - Construction staff movements;
 - Delivery / movement of materials;
 - Delivery / movement of plant and equipment; and
 - Abnormal loads.

Construction Staff

- 14.5.36 The method of construction of the proposed development is discussed within Section 6. Table 16.8 provides an estimate of the number of staff employed in the construction activities and an indication of the type of jobs undertaken. Whilst approximately 200 staff will be involved over the duration of the construction project it is considered that, at the peak of construction approximately 90 staff shall visit the site on a typical day. These will generally comprise three teams of 30 operatives, with two teams engaged in pipeline construction and the third team carrying out construction of the AGI. During the mobilisation and demobilisation period construction staff numbers are likely to be around half the peak requirement.
- 14.5.37 Construction activities will generally be undertaken using a single shift system with work commencing at 07:00 hours and ending at 19:00 hours. Any exceptions will be agreed with the Local Planning Authority. Construction operatives will generally arrive at the construction / storage yard in the morning before being transferred to their work area either via haul routes alongside the working width or via the public highway network and established accessways.
- 14.5.38 A small proportion of the construction staff will perform management roles or will be involved in the surveying of the route corridor. These staff may be required to undertake some additional movements between the construction / storage yard and different sections of the working width over the course of the working day.

Materials

14.5.39 Materials required to carry out the construction activities may include the following:



- Temporary fencing;
- Surfacing materials;
- Pipe sections;
- Pipe skids;
- Pipe supports and bog mats;
- Bends and valves;
- Instrument kiosk for the AGI;
- Drainage materials;
- Fill / padding material;
- Welding consumables and field joint materials;
- Bentonite; and
- Cathodic protection materials and pipeline markers.
- 14.5.40 The pipeline will likely be delivered to site in 12 m lengths (although the use of some 18 m lengths may be required once the design has been finalised). Approximately 130 HGV trips will be required to deliver the pipe lengths and bends to the pipe storage yard. This will likely take place during an initial two-week mobilisation period resulting in approximately 13 HGV deliveries per day. Pipe lengths will then be taken from the pipe storage yard and transported to the working width as required via haul routes, where possible, or via the public highway.
- 14.5.41 Other materials such as temporary fencing and pipeline construction materials also likely to be delivered to the storage yard during the initial two week mobilisation period (and removed from site during demobilisation) resulting in approximately 5 HGV trips per day. Similar to the pipe lengths, these materials will then be transported from the storage yard to the working width as required.
- 14.5.42 The remaining materials, such as surfacing materials, drainage materials, fill material and bentonite, will all likely be delivered directly to the working width as required over the 9 to 12 month construction period. Given the construction techniques intended to be utilised (See Section 6) the requirements for such materials will likely be limited to no more than 10 HGV movements per day.

Equipment

- 14.5.43 An indication of the type and quantity of equipment required to carry out the construction activities is as follows:
 - 5 x Dozers;
 - 13 x Excavators;
 - 1 x Pipe bender and mandrel;
 - 9 x Side booms;
 - 3 x Welding sets and habitats;
 - 1 x Pipe carrier;
 - 1 x Auger;
 - 2 x Drainage machines; and,
 - 1 x Road sweeper.



14.5.44 Such equipment will generally be delivered to the construction yard or working width on the back of a low loader during the initial two week mobilisation period (and removed from site during demobilisation) resulting in approximately 3 HGV trips per day. During the construction period the equipment will be retained at the working width overnight however there will be some occasions where it is necessary to transfer equipment by road to other areas of the working width (for example where haul routes are severed by rail lines). It is anticipated that up to five transfers will be required over the construction period each comprising up to 30 HGV (low loader) trips approximately spread over a 6-day period.

Abnormal Loads

14.5.45 In addition to the equipment discussed above, some specialised equipment shall be utilised in association with horizontal directional drilling. It is likely that such equipment shall be delivered to site as and when required. It is considered that this is likely to result in approximately 10 abnormal load visits (5 for delivery and 5 for collection) over the 9 to 12 month construction period. Other equipment associated with the specialised crossing equipment will give rise to approximately 4 HGV trips per crossing.

Summary of Predicted Traffic

14.5.46 Table 14.4 provides a summary of the predicted daily trips as discussed within Paragraphs 14.5.36 to 14.5.44.

		Predicted Daily Trips ¹						
Туре	Detail	Mobilisation Period	Construction Period	Demobilisation Period				
Construction	To Yard (person trips)	50	90	50				
Staff	Yard to site (vehicle trips)	15 ³	40 ^{2,3}	15 ³				
	Pipe lengths / bends (HGV trips)	13	5 ³	-				
Materials	Fencing and Other Materials (HGV trips)	5	5 ³	5				
	Other (HGV trips)	-	10	-				
Equipment	Low loader	3	5 ³	3				
	Abnormal load	-	1	-				
HDD crossings	HGV	-	4	-				
Total	Strategic Network	71	105	58				
	Overall (Local)	86	160	73				

TABLE 14.4: PREDICTED PEAK DAILY TRIPS

¹One trip equals two movements (one inbound and one outbound)

²Including trips between yard and site by surveyors and inspection personnel

³Local trips only

14.5.47 It is to be noted that the construction staff trips to the construction yard indicated within Table 14.4 are person trips. This is likely to equate to a lower number of private vehicle trips as some staff utilise sustainable travel alternatives or car share with colleagues. However as a worst case scenario the following impact assessment assumes all staff travel individually to the yard each day by private motor vehicle.



Assessment of Potential Impacts

- 14.5.48 As discussed within Section 6 and elsewhere within this section, the location of the construction / storage yard and access points to the working width are unknown at this stage. These details shall be determined and agreed by the appointed construction contractor in consultation with the relevant local authorities and stakeholders during the detailed design phase and prior to commencement of construction. As the general location of the proposed AGI and gas pipeline route is known potential access and route options can be considered. Such access and route options are summarised within Table 14.2.
- 14.5.49 In terms of traffic generated by the construction activities, vehicular trips can generally be categorised as follows:
 - a) Trips / deliveries from the wider area to the construction / storage yard or site; and
 - Trips / deliveries between the construction / storage yard and the construction site (AGI site or working width) or between different sections of the working width
- 14.5.50 Trips within Category (a) will predominantly utilise the strategic road network as construction staff, materials and equipment are transported to the development location from their place of origin. Given the nature of such strategic routes (M25, A13 and A1089) the principal impacts are likely to be upon highway capacity and safety.
- 14.5.51 Vehicle flows on the strategic road network in the vicinity of the development location are indicated within Table 14.3. Assessment provided in support of the application pursuant to Section 36 of the Electricity Act 1989 (Transport Report, December 2010) indicates that areas of the strategic road network are approaching or operating above capacity in the baseline situation. Such assessment is supported by evidence provided within Thurrock Council's draft LTP3 Implementation Plan 2011/12 to 2013/14, Map 3 of which indicates that sections of the A13 within Thurrock are approaching desired capacity and the junction of A13 and M25 (M25 Junction 30) is above capacity. However the A1014 is noted to be operating significantly within capacity in the baseline situation.
- 14.5.52 As indicated within Table 14.4, daily vehicle trips on the strategic road network associated with construction of the proposed pipeline and AGI are likely to be a maximum of 50 light vehicles and 21 HGV's in the mobilisation period and peak at a maximum of 90 light vehicles and 15 HGV's during the construction period.
- Light vehicle movements are likely to take place generally during the hours 06:00 to 14.5.53 07:00 (inbound) and 19:00 to 20:00 (outbound), although it is noted that management staff may depart site around 17:00. Those originating from the west of the site location will generally oppose the tidal flow utilising the lesser-trafficked carriageway of the A13. It is considered that potential exists to significantly reduce the number of vehicle trips by encouraging sustainable transport choices such as use of public transport or car sharing. Furthermore, potential exists for a number of the construction staff to be employed from or based within the local area during the construction phase, further reducing the number of movements on the wider strategic network. HGV movements will predominantly take place outside of the peak periods during the hours of 10:00 to 16:00 and will be spread over the working day resulting in an average of approximately 3 inbound and 3 outbound trips per hour. Given the level and timing of construction traffic the potential unmitigated impact upon the capacity of the strategic road network is considered to be Minor Adverse
- 14.5.54 Historical accident information for the 5-year period to 31st August 2010 was reported within Section 13 of the GEC Transport Report (December 2010) as follows:



History	Total Number of Accidents							
підпімаў	Slight	Serious	Fatal					
A13*	388	63	8					
A1014*	15	5	1					

TABLE 13.1: SUMMARY OF 5-YEAR ACCIDENT HISTORY

* Including associated junctions

"Of the total 480 accidents that have occurred in the assessment period 73 (approximately 15 per cent) have involved 1 or more vehicles over 7.5 tonnes. In relation to the fatal incidents, only one involved a vehicle over 7.5 tonnes.

From the information provided it is evident that the vast majority of accidents are focused around junctions, either within the junction itself in the vicinity of the give-way or within the weaving area on the main carriageway proximate to the entry or exit of slip roads. These accidents appear to account for between 80 to 90% of all accidents that occurred during the assessment period.

Of the nine fatal accidents, six involved only one vehicle, including four loss of controls and two pedestrian strikes. The pedestrian strikes were unusual in that they occurred in locations where pedestrians would not be expected to pass. On one of these occasions a driver had exited his vehicle to retrieve debris from the M25 slip road. Of the remaining three accidents one involved a stolen vehicle colliding with a motorcycle and one involved a vehicle that had parked on the slip road to the A126."

- 14.5.55 The accident information does not exhibit any trends that would highlight particular concerns regarding construction traffic and it is noted that the proportion of accidents involving vehicles in excess of 7.5 tonnes is not particularly high. As such, and given the relatively low levels of traffic generated during the construction of the proposed development, the impact upon highway safety within the strategic road network is considered to be Negligible.
- 14.5.56 Category (a) trips (see Paragraph 14.5.49) will also involve movement along local roads between the strategic road network (A13 and A1014) and the construction / storage yard or construction site. Additionally local roads will be utilised for category (b) movements, involving transfers of staff and materials between the construction / storage yard and the construction site, or for transfers of equipment between different parts of the working width.
- 14.5.57 Such movements along local roads by construction staff vehicle and HGV's give rise to a number of considerations, which can generally be categorised as follows:
 - Highway capacity;
 - Highway safety;
 - Highway amenity;
 - Geometric suitability;
 - Suitability of highway for type of vehicle; and
 - Impacts upon vulnerable road users.
- 14.5.58 Table 14.3 provides an indication of the level of traffic / congestion on local roads in the baseline situation and suggests that most local roads along the potential access routes are light to moderately trafficked. The exception to this is the A1013 and sections of the B1420 during the peak periods and roads within the Stanford-le-Hope town centre (Church Hill / London Road) throughout the day. The latter are particularly influenced by congestion associated with the level crossing adjacent to Stanford-le-Hope rail station. Additionally, the free flow of traffic on Corringham Road


and Fobbing Road is significantly and detrimentally affected during school pick up / drop off periods, as is the northern section of Butts Lane. Given the existing traffic levels on local roads it is considered that without careful route selection and timing of movements, particularly in relation to HGV movements, development related traffic has the potential to result in Moderate Adverse capacity impacts.

- 14.5.59 Suitable carriageway width for HGV traffic is somewhat dependent upon traffic speed. Highway design guidance suggests that two-way flow of HGV traffic requires a minimum of 5.5 m rising to 7.3 m for higher speed roads, whilst one-way HGV flow, in combination with opposing light vehicle flow, may be accommodated by road widths as low as 4.8 m. The suitability of carriageway width for HGV traffic is also dependent upon factors such as the level of cycle use, bend radius, the level of on-street parking and the presence of localised road narrowing. Where such factors exist the use of narrow roads by HGV traffic should be avoided. Suitable junction geometry and visibility requirements are also factors in the choice of suitable HGV routes.
- 14.5.60 It is apparent that a number of roads along the potential access routes require careful consideration in terms of highway geometry before being utilised for HGV traffic. In particular it may be necessary to avoid or minimise the use of routes, which pass along the roads discussed within Table 14.5.

Road	Constraint
Lion Hill, Fobbing	Narrow carriageway / tight bends / limited forward visibility / cycle use / extensive on street parking
Fobbing Road, Corringham	Extensive on street parking
Butts Lane, Mucking	Narrow carriageway / high traffic speed / presence of cycles and extensive on street parking during schools start and finish times
Church Hill, Stanford-le-Hope	Narrow carriageway / tight bends / limited forward visibility
Wharf Road, Stanford-le-Hope	Rail bridge height if accessing south of Thames Haven Branch Line

TABLE 14.5: ROADS WITH SIGNIFICANT GEOMETRIC CONSTRAINT

- 14.5.61 In addition to the roads identified within Table 14.5 it is noted that High Road, Stanford-le-Hope and the adjoining Manorway Track and Track running south of Old Hall Farm will require widening before they are suitable to accommodate HGV movements. Use of these roads is likely to require one-way routing of construction traffic. Furthermore, whilst in the baseline situation Walton Hall Road provides for a significant level of HGV movement associated with Mucking Tip, it is noted that sections of this roadway are subject to narrow carriageway width corresponding with tight bends.
- 14.5.62 Overall, on the basis of geometric considerations it is considered that, without careful route selection, the proposed development has the potential to result in Moderate Adverse impact upon highway capacity, safety and amenity.
- 14.5.63 Vulnerable road users include equestrians, cyclists and pedestrians and in particular persons with physical impairments such as the partially sighted. Particular consideration should be taken when routing construction traffic through areas where vulnerable road users are expected to be prevalent. Such areas include residential areas, town or local centres and areas around schools or along school routes. In the vicinity of the proposed development site such roads include Butts Lane, Wharf Road, Rainbow Lane, London Road, Corringham Road, Church Hill, Lampits Hill and Fobbing Road. Increased interaction between construction traffic and vulnerable



roads users is likely to result in a detrimental impact upon highway safety and amenity in addition to potentially discouraging use of sustainable travel modes. As such the potential impact upon vulnerable road users is considered to be Moderate Adverse. Given the level of traffic generated by the construction activities potential impact upon community severance is considered to be Negligible.

- 14.5.64 In assessing the impact upon highway amenity regard should be had to the purpose that the highway serves. In relation to potential access routes to the AGI or working width, the purpose of highways along potential access routes is indicated within Table 14.3. The routing of construction traffic, and in particular HGV's, via highways considered to serve predominantly to provide a sense of place or setting (streets) should be avoided where possible in favour of corridors of movement (roads). The potential amenity impact of construction traffic upon streets is considered to be Moderately Adverse.
- 14.5.65 A further consideration is the suitability of a highway to accommodate the type of traffic proposed in terms of its design and construction. Highway design is often led by the highways intended use and some highways may be unsuitable in design terms for HGV traffic, the impact being that the surface of the highway is damaged to the detriment of safety and amenity. This is particularly relevant when seeking to achieve access via un-surfaced roads or public rights of way. Routing of traffic along unsuitable highways or public rights of way has the potential to result in a Moderately Adverse impact.
- 14.5.66 As discussed within Paragraph 14.5.45, construction of the proposed development is likely to give rise to no more than 10 abnormal load trips (10 inbound and 10 outbound) over the entire construction period. Whilst these movements are relatively infrequent and will be carefully planned and controlled, movement of abnormal roads via any category of public highway has the potential to result in significant delays and implications for highway safety. Where such movements are required to utilise local roads, impacts are further significantly exacerbated by reduced highway geometry. It is therefore considered that without adequate mitigation abnormal load movements have the potential to result in Major Adverse impact.

Operation

14.5.67 During the operational phase traffic generation will be limited to occasional site visits for the purpose of inspection and maintenance. Predominantly such visits will be via private motorcar or light goods vehicle. As such the potential impacts resulting from traffic generation during the operational phase are considered to be Negligible.

Decommissioning

14.5.68 Should both the AGI and pipeline be decommissioned and removed at the end of their useful life then potential impacts during demolition would be as for the construction phase. However, it is likely that the buried pipe will be left in place and stabilised and as such potential impacts resulting from traffic generation will be significantly reduced.

14.6 Mitigation Measures

Construction Phase

Pipe Crossings

14.6.1 As indicated by Table 14.1, the majority of the proposed pipeline crossings are to be undertaken using construction techniques that have no impact upon the surface of the transport link, do not prevent the link from performing its function, and do not impact upon the free flow of traffic. The remaining links, for which intrusive open cut construction techniques are proposed, comprise Footpath 38, Bridleway 39 (Rainbow Lane), proposed Bridleway 189 (if implemented prior to pipeline), and Manorway



Track. During the construction of the pipeline these transport / access links shall require temporary closure / diversion for approximately 1 to 2 days.

- 14.6.2 In relation to the public rights of way temporary closure / diversion shall be promoted in partnership with the Local Highway Authority and will be subject to appropriate Traffic Regulation Orders (TRO's). The promotion of such TRO's includes a period of public consultation. Efforts shall be made to ensure that the length and duration of any diversion is minimised and temporary routes will be inspected and maintained throughout the period that the diversion is in place. Closures and diversion routes shall be signed and guarded to established standards.
- 14.6.3 The pipeline crossing of Manorway Track shall be undertaken following consultation with affected landowners and parties with private access rights. Where necessary diversion or alternate access routes shall be agreed with affected parties, implemented prior to commencement and maintained throughout the period of construction.

Site Access Strategy

- 14.6.4 Site access points shall be selected in accordance with the Site Access Strategy, which includes the following criteria:
 - Selection of site accessways to the working width shall seek to minimise the total number of accessways required. Where possible haul routes shall be provided along the working width to assist in reducing the number of required accessways.
 - Existing accessways shall be utilised in preference to the formation of new accessways, provided that they otherwise meet the criteria of the Site Access Strategy.
 - Selection of accessways shall give preference to achieving site access from lower category roads where otherwise feasible and acceptable.
 - Access points shall only be chosen where it can be demonstrated that the proposed access is capable of meeting established design standards, with particular regard to geometric requirements. Where necessary proposed access design shall be tested with swept path analysis.
- 14.6.5 In addition to the above selection strategy for the location of accessways, the Site Access Strategy will include the following operational criteria:
 - Advance signing shall be provided to all accessways in accordance with Chapter 8 of the Traffic Signs Manual and the code of practice pursuant to Sections 65 and 124 of the New Roads and Street Works Act 1991.
 - Wheel wash facilities shall be provided within the site in the immediate vicinity of the site access point. Access roads between the wheel wash facility and the highway from which access is taken shall be hard surfaced with bound material and shall be kept clean of mud and debris at all times whilst the access is in operation.
 - Prior to departure all vehicles shall be inspected by an Access Supervisor. Should the Access Supervisor not be satisfied that the vehicle will not deposit mud and debris onto the highway then he shall direct that the vehicle returns to the wash facility.
 - A road sweeper shall be kept on standby at all times whilst the access is operational as a precautionary backup measure and shall be utilised should mud or debris be observed on the highway or initial length of the access road.
 - The Access Supervisor (acting as a banksman) shall supervise all egress movements onto the highway.



- Where necessary to achieve geometric requirements or otherwise beneficial, one-way access routes shall be developed and utilised. A Left-In / Left-Out access arrangement shall be utilised where this is considered beneficial and appropriate.
- Where geometric requirements result in wide accessways, central pedestrian refuges shall be constructed and maintained. The requirement for central pedestrian refuges shall be determined in accordance with Department for Transport circular 1/95 (The Assessment of Pedestrian Crossings) and 2/95 (The Design of Pedestrian Crossings).
- No site access shall become operational until the Parking Management Strategy (see Paragraph 14.6.15) has been implemented. Access Supervisors shall carry out periodic inspection of adjacent streets and report on-street parking by construction staff to the Transport Coordinator.
- On-site food delivery / collection services shall be encouraged to minimise the use of site accessways during lunchtime periods.
- 14.6.6 The construction contractor shall be required to submit an Access Report to the Local Planning Authority (LPA) which discusses all required access points and demonstrates suitable consideration of the matters discussed above. No accessway to the AGI site or working width shall be implemented until the Access Report has been approved by the LPA in consultation with the Local Highway Authority.
- 14.6.7 Once operational use of the accessway has ceased (save for where the access provides shared use or is required to be retained for pipeline inspection and maintenance) the accessway shall be decommissioned with particular regard to the avoidance of future misuse (including fly-tipping).

Construction Transport Management Plan

- 14.6.8 The approach to mitigating the impacts of traffic generated as a result of the construction of the proposed pipeline and AGI will be in accordance with the Construction Transport Management Plan (CTMP). The CTMP is developed in accordance with the following objectives:
 - Minimising the need to travel;
 - Where travel is unavoidable, maximising the use of sustainable modes;
 - Ensuring that residual vehicular movements avoid sensitive access routes;
 - Ensuring that residual vehicular movements avoid sensitive (peak) periods of the day; and
 - Ensuring that residual vehicular movements result in nil detriment to highway safety.
- 14.6.9 These objectives will be delivered through the implementation of a series of measures, which are discussed in the following paragraphs.

Minimising the need to Travel

- 14.6.10 Where possible materials derived from site operations will be re-used to reduce import of construction materials and export of waste materials. Potential re-use of site derived materials include the following:
 - Stockpiling of excavated subsoil or topsoil for re-use in trench reinstatement;
 - Removal, protection and reinstatement of plants and hedgerows where practical;



- Where appropriate water required for hydrostatic testing to be sourced from a suitable local watercourse;
- Use of excess subsoil or topsoil for grading or landscaping; and
- Stone dykes to be dismantled, stored and reinstated following construction.
- 14.6.11 Whilst a number of the materials required for construction of the pipeline and AGI will be specialised in nature, the construction contractor shall use reasonable endeavours to source imported materials locally where otherwise practical and viable. Examples of materials that may be sourced locally include fencing and drainage materials, plus temporary pipe supports.
- 14.6.12 At the outset of construction within the working width temporary boundary fencing will be erected and haul routes will be established. Where practicable all movements between areas of the working width shall take place via these haul routes thus minimising the need to travel along the public highway. Depending upon the agreed location of the construction / storage yard, it may also be possible for some movements between the construction / storage yard and the working width or AGI site to utilise, or part utilise, haul routes.

Sustainable Transport

- 14.6.13 Prior to commencement of construction a Transport Manager will be employed. The responsibilities of the Transport Manager will include:
 - The promotion of sustainable transport opportunities relating to both staff travel (public transport, walking and cycling) and the movements of materials and equipment;
 - Provision and management of a car share database;
 - Implementation and management of the Parking Management Strategy (see Paragraph 14.6.13); and
 - Parking monitoring and enforcement of the 'no parking on the highway' rule.
- 14.6.14 As part of the promotion initiative the Transport Manager will ensure that all staff inductions incorporate discussion of sustainable transport opportunities.
- 14.6.15 A Parking Management Strategy will be implemented within the construction / storage yard and construction site areas with the objective of providing a demand management tool. This will be achieved via the following initiatives:
 - The implementation of a parking permit system whereby operatives wishing to park private vehicles will be required to demonstrate that alternative sustainable travel modes have been considered and are not viable;
 - Operatives wishing to obtain a parking permit will be required to sign up to the car share database and will be targeted by the Transport Manager as and when new car share opportunities arise;
 - Preferential parking for cars carrying more than one occupant; and
 - Parking restrictions on all areas outside of specified designated parking zones.
- 14.6.16 The construction site will be set out to include the following facilities:
 - Secure cycle parking;
 - Shower facilities; and
 - Secure lockers.



- 14.6.17 The amount of such facilities will be suitable to meet demand however as a guide a minimum of 1 cycle parking space / locker should be provided for every 20 construction workers.
- 14.6.18 Where feasible and economically viable the construction contractor shall use reasonable endeavours to transport materials and equipment to site via sea or rail transport. Where such modes of transport are not feasible of viable and transport by road is required the following management strategies will be implemented:
 - Consideration of suppliers proximate to the development site;
 - Consideration of vehicles which generate reduced pollution;
 - Consideration of efficient delivery management protocols;
 - Optimisation of vehicle loading; and
 - Route Strategy (see Paragraph 14.6.20 to 14.6.25).
- 14.6.19 The transfer of construction teams between the construction / storage yard and the AGI site or working width shall achieve a high proportion of vehicle sharing, in the order of 4 persons per vehicle. Potential use of minibuses may increase this ratio.

Route Strategy

- 14.6.20 Site access routes shall be selected in accordance with the Route Strategy detailed in Paragraphs 14.6.21 to 14.6.25 below.
- 14.6.21 Initially route selection shall be considered on the basis of the following information, which shall be obtained by the construction contractor:
 - Highway capacity assessment (may be qualitative);
 - Assessment of pedestrian / cycle / equestrian use (may be qualitative);
 - 3-year historical accident information;
 - Details of highway / junction geometry (including the identification of geometric constraints); and
 - Details of and traffic regulation orders (for example weight restrictions).

Where necessary consideration of highway/junction geometry shall utilise tracking software to investigate suitability for the type of vehicles proposed.

- 14.6.22 In selecting access routes, highways exhibiting the following characteristics, which are listed in the order of decreasing priority, shall be avoided where possible:
 - Schools or high use school access routes;
 - A high number of vulnerable road users;
 - Highways classified as 'streets' (as defined within Manual for Streets);
 - Residential areas;
 - Highways demonstrating a poor accident history (particularly where accidents involve a high proportion of vulnerable road users);
 - Routes experiencing substandard geometry for the type of vehicle proposed (bend radius, forward visibility, junction geometry);
 - Highways experiencing congestion in the baseline situation;
 - Highways experiencing a high level of on-street parking; and
 - Highways subject to weight restrictions.



In all circumstances routing of construction traffic past schools during school start finish times or lunch periods shall not be permitted. It is to be noted that none of the potential access routes identified pass in the vicinity of hospitals.

- 14.6.23 As a general rule, highways along HGV access routes should provide the following carriageway width:
 - 5.5 m (\leq 30 mph traffic speed)
 - 6.5 m (\leq 40 mph traffic speed)
 - 7.3 m (\leq 60 mph traffic speed)

Where the above cannot be achieved one-way routing of HGV traffic should be considered. The requirement for additional carriageway width (in excess of the standards specified above) should be considered where HGV traffic is directed along routes utilised by relatively high levels of pedestrian or cycle traffic, particularly where cycles share the carriageway. Highway widening or the provision of passing places should be considered where HGV traffic is routed along carriageways providing less than 4.8 m width.

- 14.6.24 The suitability, in terms of design and construction, of highways along proposed HGV routes shall be discussed with the relevant highway authority prior to commencement of construction. Where routes are identified to be unsuitable for HGV traffic improvement works shall take place prior to use by traffic associated with the proposed development.
- 14.6.25 The strategic road network shall be utilised where possible for HGV deliveries to the site vicinity (i.e. the Stanford-le-Hope, Corringham, Mucking area).
- 14.6.26 The construction contractor shall be required to submit a Route Selection Report, alongside the Access Report discussed within Paragraph 14.6.6, to the LPA. The Route Selection Report shall discuss all proposed access routes and demonstrate suitable consideration of the matters discussed within the Route Strategy. No mobilisation or construction associated with the proposed pipeline or AGI shall take place until the Route Selection Report and Access Report has been approved by the LPA in consultation with the Highways Agency and Local Highway Authority.

Timing of Traffic Movements

- 14.6.27 It is anticipated that the construction of the GEC will incorporate a single daily working shift commencing at 07:00 hours and ending at 19:00 hours. As such staff movements will predominantly take place outside of the traditional peak periods when baseline highway flows are reduced.
- 14.6.28 Construction contracts will include requirements for contractors to schedule deliveries of plant, equipment and materials between the hours of 10:00 and 16:00. No deliveries shall take place outside these times without the prior consent of the Highways Agency and the Local Highway Authority. This provision shall relate to both deliveries to site from the wider area and transfers of materials from the construction / storage yard to the AGI site or working width.

Safety Awareness

14.6.29 Any safety considerations identified during the selection of access routes shall be brought to the attention of construction staff and delivery drivers within site inductions. Where the construction contractor does not directly employ delivery drivers, such information shall be provided as part of the procurement process of plant or materials.

Abnormal Load Strategy

SECTION 14 TRANSPORT AND INFRASTRUCTURE



14.6.30 Where possible abnormal loads will be transported in accordance with the strategy detailed within Paragraph 14.6.18. Where transport via the highway network is unavoidable contractors will be required to adhere to the protocols set out in the Highways Agency's "Aide Memoire for notification requirements for the movement of Abnormal Indivisible Loads or vehicles when not complying with The Road Vehicles (Construction and Use) Regulations 1986", a copy of which is provided within Appendix G.2, or the requirements of the Local Highway Authority.

Operational Phase

14.6.31 During the operational phase access will only be required for routine maintenance and inspection resulting in only occasional limited traffic movements. Notwithstanding this, selection of accessways for operational use will follow the general criteria set out within the Site Access Strategy. Traffic generated during the operational phase will be negligible and therefore operational mitigation of traffic generation is not required. Pipeline crossings of transport or access routes will have negligible impact during the operational phase however, should intrusive works be required in association with the maintenance of the pipeline, they shall be carried out in accordance with the requirements of the New Roads and Street Works Act and the Local Highway Authority.

Decommissioning Phase

14.6.32 As discussed within Section 6.10 the gas pipeline and associated AGI will be decommissioned when it reaches the end of its useful life in line with prevailing best practices. Mitigation during the decommissioning phase shall be as discussed for the construction of the proposed development.

14.7 Assessment of Residual Impacts

14.7.1 Table 14.6 provides an assessment of residual impacts following the implementation of the mitigation measures discussed within Section 14.6. The residual impacts are detailed for the construction phase only.



Description	Detail	Unmitigated Impact	Proposed Mitigation Residu		Geographic Scale
	A1014	Major Adverse	Horizontal Direction Drilling	Negligible	Local
	Butts Lane	Moderate Adverse	Auger	Negligible	Local
	Footpath 30	Minor Adverse	Temporary closure/diversion (under Traffic Regulation Order)	Negligible to Minor Adverse	Local
	Wharf Road	harf Road Moderate Horizontal Direction Neglic Adverse Drilling Neglic		Negligible	Local
	Rainbow Lane (Bridleway 39)	Minor Adverse	Temporary closure/diversion (under Traffic Regulation Order)	Negligible to Minor Adverse	Local
Pipe Crossing	Manorway Track	Minor Adverse	Temporary closure in consultation with landowner and parties with access rights	Minor Adverse	Local
Conflicts	Track crossing south of Old Hall Farm	Minor Adverse	Horizontal Direction Drilling	Negligible	Local
	Footpath 143	Minor Adverse	Horizontal Direction Drilling Negligible		Local
	LG Development Gate 3 access road	Minor Adverse	Tunnel	Negligible	Local
	Passenger Railway Line	Major Adverse	Micro-Tunnel	Negligible	Local
	Thames Haven Branch Line	Moderate Adverse	Horizontal Direction Drilling	Negligible	Local
Site Access - Common Impacts	Mud and Debris	Moderate Adverse	Wheel wash facilities - Surfacing of access adjacent to highways - Road sweeper on standby - Access supervisor	Negligible	Local
	On-street parking	Moderate Adverse	Parking Management Strategy - Enforcement by Transport Manager	Negligible	Local
	Insufficient access geometry	Moderate Adverse	Site Access Strategy	Negligible to Minor Adverse	Local
Site Access -	Level 1 routes	Minor Adverse	Site Access Strategy	Negligible	Local
Specific	Level 2 routes	Negligible	Site Access Strategy Negligible		Local
πιρασιο	Level 3 routes	Negligible	Site Access Strategy	Negligible	Local

TABLE 14.6: RESIDUAL IMPACTS

SECTION 14 TRANSPORT AND INFRASTRUCTURE



Description	Detail	Unmitigated Impact	Proposed Mitigation	Residual Impact	Geographic Scale
	Capacity (strategic road network)	Minor Adverse	CTMP	Negligible	Regional
	Safety (Strategic road network)	Negligible	CTMP	Negligible	Regional
	Capacity (local access routes)	Moderate Adverse	CTMP (including Route Strategy)	Minor Adverse	Local
	Insufficient highway geometry	Insufficient highway geometry Moderate Adverse CTMP (including Route Strategy)		Minor Adverse	Local
Traffic Generation	vulnerable road users	Moderate Adverse	CTMP (including Route Strategy)	Minor Adverse	Local
	Severance	Negligible	CTMP (including Route Strategy)	Negligible	Local
	Highway Amenity	Moderate Adverse	Moderate CTMP (including Route Adverse Strategy)		Local
	Unsuitable highways	Insuitable Moderate CTMP (including Rom highways Adverse Strategy)		Negligible	Local
	Abnormal Loads	Major Adverse	CTMP (including Route Strategy) - Movements as agreed with Highway Authorities in accordance with established protocols	Minor Adverse	Regional



14.8 Assessment of Cumulative Impacts

14.8.1 Indirect / Secondary and Cumulative Impacts are assessed in Section 18.

SECTION 15

CULTURAL HERITAGE



15 CULTURAL HERITAGE

15.1 Introduction

- 15.1.1 This Section provides a description of the existing archaeological and cultural heritage assets within the Route Study Corridor and the surrounding area, and details any impacts on these archaeological and cultural heritage assets associated with the development of the gas pipeline and associated AGI. This Section has been completed with detailed reference to an Archaeological Desk Based Assessment (DBA) which has been undertaken for the development of the gas pipeline and associated AGI.
- 15.1.2 The objectives of this Section are to:
 - Describe the survival and extent of known or potential archaeological or cultural heritage assets within the Route Study Corridor which may be disturbed by the development of the gas pipeline and associated AGI;
 - Provide an assessment of the importance of these assets; and
 - Assess the likely scale of any impacts on cultural heritage assets in the surrounding area posed by the development of the gas pipeline and associated AGI.
- 15.1.3 Additionally, the proposed mitigation measures are detailed, where appropriate. A summary of the any residual impacts after implementation of the proposed mitigation measures is also provided.
- 15.1.4 Given that there has already been extensive work undertaken of the Route Study Corridor and the surrounding area in the past the archaeological / cultural heritage assets in the area are very well understood.

15.2 Key Planning Policies

- 15.2.1 Section 3 provides the Planning Policy Context.
- 15.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

East of England Plan

ENV6	The Historic Environment
ETG1	Strategy for the Sub Region

Draft TCSPMD

CSTP24 Historic Assets and the Historic Environment			
PMD4		Historic Environment	

15.3 Assessment Methodology and Significance Criteria

Assessment Methodology

- 15.3.1 A Desktop Study of documentary, photographic and cartographic sources has been undertaken in order to determine the likely nature, extent, importance and state of preservation of any archaeological / cultural heritage assets that may be present within the Route Study Corridor and surrounding area.
- 15.3.2 Additionally, a site walkover survey was undertaken to identify any potential archaeological features which may be impacted by the development of the gas



pipeline and associated AGI, but which have not been previously identified and recorded.

- 15.3.3 The following studies have been referenced in this Section of the ES.
 - Archaeological Desk Based Assessment compiled for the GEC development (January 2010) [undertaken by PB];
 - ES for the Section 36 Consent application for GEC (February 2010) [undertaken by PB];
 - The OPA Environmental Statement for the development of the LG Logistics and Business Park and associated facilities (compiled version 2004) [archaeology information provided by Oxford Archaeology Unit (OAU) Ltd];
 - Archaeological monitoring of contamination test pits at the former Shell Oil Refinery site (February and March 2001) [undertaken by OAU Ltd];
 - Site walkover at the Shell Oil Refinery site (August 2001 and October 2002) [undertaken by OAU Ltd];
 - Sub-surface Deposit Model (October 2001) [undertaken by OAU Ltd];
 - Assessment of past effects within the former Shell Oil Refinery (October 2002 February 2003) [undertaken by OAU Ltd];
 - Canvey Terminal to Stanford-le-Hope Gas Pipeline Environmental Statement (June 2006) [undertaken by RPS Ltd];
 - A Geophysical Assessment of Sub-Surface Stratigraphy at the Shell Haven Site (April 2009) [undertaken by OAU Ltd];
 - Archaeological Investigation Report London Gateway Access Road (May 2010) [undertaken by OAU Ltd]; and
 - The PP Environmental Statement for the LG Development 'Refined Access Road Design' (June 2010).

Significance Criteria

- 15.3.4 Determining the magnitude of any potential impact is based on an understanding of how and to what extent the proposed development would impact on the archaeological / cultural heritage assets.
- 15.3.5 Any potential impacts of the proposed development on archaeological / cultural heritage assets are rated as high, moderate, low, negligible or uncertain, depending on both the magnitude of the change and the sensitivity of the receptor.
- 15.3.6 Determining the sensitivity of the receptor is based on the consideration of whether the archaeological / cultural heritage assets are considered to be of international, national, regional, local or negligible importance.
- 15.3.7 There can also be direct and indirect impacts to sites of archaeological / cultural heritage significance, as described below:
 - Direct

Aspects of the development which may cause direct disruption or damage to a site of archaeological / cultural heritage significance, for example foundations which could penetrate through a known site of earthworks and historical activity.

Indirect

Indirect impacts are concerned with the impacts such as air quality / noise and vibration / landscape and visual on sites of cultural heritage significance and their



setting. For example, a visually dominating development built in close proximity to a Scheduled Ancient Monument (SAM).

15.3.8 The following matrices (Table 15.1 to Table 15.3) set out the criteria for assessing the magnitude of impacts on archaeological / cultural heritage assets of varying degrees of value.



TABLE 15.1 CRITERIA FOR ESTABLISHING RELATIVE ARCHAEOLOCIAL / CULTURAL HERITAGE VALUE / IMPORTANCE

Cultural Value	Criteria				
	World Heritage Sites				
International	Iconic Sites and Monuments				
	Some Scheduled Ancient Monuments				
	Some Scheduled Ancient Monuments				
National	All Grade 1 and some Grade 2* and Grade 2 Listed Buildings				
	English Heritage Registered Parks and Gardens				
	Some Grade 2 and 2* Listed Buildings				
	Remains of national importance which have been partially damaged				
Regional	Historic (unlisted) buildings that have exceptional qualities in their fabric or historical associations				
	Conservation Areas containing buildings that contribute significantly to its historic character				
	Archaeological sites and remains which are of low potential or minor importance				
	 Historic (unlisted) buildings of modest quality in their fabric or historical association 				
Local	Crop marks of indeterminate origin				
	Remains of regional importance that have been partially damaged or remains of national importance which have been substantially damaged				
	Sites which contribute to local or cultural understanding of the area				
	Relatively numerous types of remains, of some local importance.				
	Remains of local importance that have been largely damaged.				
Negligible	Isolated findspots with no context				
	 Areas in which investigative techniques have revealed no, or minimal, evidence of archaeological remains, or where previous large scale disturbance or removal of deposits can be demonstrated 				
Uncertain	 Potential archaeological sites for which there is little information. It may not be possible to determine the importance of the site based on current knowledge. Such sites are likely isolated findspots or cropmarks only identified on aerial photographs. 				



TABLE 15.2: CRITERIA FOR CLASSIFYING MAGNITUDE OF IMPACT

Impact	Criteria			
	 Complete removal of an archaeological site Severe transformation of the setting or context of an archaeological monument or 			
	significant loss of key components in a monument group			
High	 Complete removal or transformation of palaeo-environmental deposits leading to complete loss of research knowledge 			
	 Direct and substantial visual impact on a significant sightline to or from a ritual monument or prominent fort 			
	Removal of a major part of an archaeological site			
	 Potential transformation of the setting or context of an archaeological site or partial loss of key components in a monument group. 			
	Partial removal or transformation of palaeo-environmental deposits			
Moderate	 Introduction of significant noise, vibration or visual impact to an archaeological monument leading to changes in amenity use, accessibility or appreciation of an archaeological site. 			
	 Oblique visual impact on an axis adjacent to a significant sightline to or from a ritual monument, but where the significant sightline of the monument is not obscured 			
	 Removal of an archaeological site where a minor part of its total area is removed, but the site still retains a significant future research potential 			
Low	Minor removal of palaeo-environmental deposit			
	• Change to a historic building or feature, resulting in a small change in the resource and its historical context and setting			
	Peripheral visual impact on a significant sightline to or from a ritual monument			
	 No perceptible change in the setting, context or physical impact to a building or feature 			
Negligible	No impact on changes in use, amenity or access			
	 No real change in the ability to understand and appreciate the resource and its historical context and setting 			
Uncertain	The magnitude of the impact cannot be predicted			



TABLE 15.3: METHOD OF RATING OVERALL SIGNIFICANCE OF IMPACT ON ARCHAEOLOGICAL / CULTURAL HERITAGE ASSETS

		Value / Importance					
		Uncertain	Negligible	Local	Regional	National	International
Magnitude of Impact	High	Unknown	Low	Moderate	Major	Major	Major
	Moderate	Unknown	Low	Low	Moderate	Major	Major
	Low	Unknown	Negligible	Low	Low / Moderate	Moderate / Major	Major
	Negligible	Unknown	Negligible	Negligible	Low	Moderate	Moderate
	Uncertain	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown



15.4 Baseline Conditions and Receptors

Geology

15.4.1 British Geological Survey (BGS) maps and data from previous intrusive investigations indicate the geological sequence of the Route Study Corridor. Towards the western end, near Mucking and above the 10 m AOD contour, gravel underlies a thin layer of alluvial clay. Towards the eastern end, roughly below the 10 m AOD contour, topsoil and made ground overlies marine or estuarine alluvium (undifferentiated or clay) overlying solid geology of Lower London Tertiaries.

Topography

- 15.4.2 The site is predominantly flat and low-lying at between approximately 2.1 to 11.0 m AOD.
- 15.4.3 The ground falls from west to east following a high point around Mucking.

Sub-Surface Deposit Model

- 15.4.4 A sub-surface deposit model of the north bank of the Thames surrounding the proposed pipeline route has been undertaken by OAU in 2001 and refined using geophysics in 2009. The deposit model revealed two main historic land surfaces in the area, relating to the periodic flooding and drying out of the land.
- 15.4.5 A gravel terrace is present on higher ground (above approximately 10 m AOD) and below this are less fertile alluvial deposits. The deposit model has indicated that there is a clear line which separates the deposits which runs in a south west to north east direction from Linford towards Fobbing. Therefore, only the western end of the gas pipeline, towards Stanford-Ie-Hope, and the AGI would be constructed on the higher gravel terraces.
- 15.4.6 The sub surface deposit model has also revealed that the marshes area would have experienced up to five periodic episodes of flooding and subsequent drying out, as a result of marine transgressions and regressions. These changes in sea and river levels are responsible for the (often stratified) alluvial silts, which underlie much of the surrounding area.
- 15.4.7 It is the gravel terraces which would have supported most of the occupation during prehistory, as it is more fertile, free draining land which would have been less prone to flooding. Despite this, it is also possible that some waterlogged remains are also present in the alluvial marshy deposits over which much of the pipeline is situated.

Archaeological Potential

15.4.8 Figure 15.1 indicates the locations of the finds referenced below (e.g. Ref 1, Ref 2, etc).

Prehistoric

- 15.4.9 There is little evidence for prehistoric archaeology within the Route Study Corridor or in the surrounding area. No documentary or cartographic evidence of this period could be attained and hence research was limited to SMR or NMR entries.
- 15.4.10 It is likely that prehistoric occupation of the area was limited to the gravel terrace, as much of the banks for the Thames below 10 m AOD would have been flooded. Other archaeological reports undertaken for the LG Development (referenced in Section 15.3) have identified that the site of the former Shell Oil Refinery and surrounding area has a high potential of having supported human occupation from the prehistoric period onwards. Of particular importance is thought to be a sequence of buried landscapes within the layers of alluvium and gravel, as discovered by the sub-surface modelling study (October 2001, undertaken by OAU Ltd).



- 15.4.11 The earliest evidence for human occupation in the south east of England comes in the form of flint tools dated to approximately 440 000 BC, found in Hillingdon in West London. However, continuous occupation of the Thames Valley probably didn't occur until much later (approximately 13 000 BC) when changes in climate and land cover would have been more favourable to settlement. Several sources have sited evidence for occupation of the Thames Valley in the Palaeolithic period. In particular, gravels in the River Thames Estuary at Purfleet and Grays have yielded many finds of Palaeolithic flint tools.
- 15.4.12 The following prehistoric artefacts have been found within the Route Study Corridor and the surrounding area:
 - A watching brief, undertaken during the development of the Coryton Bypass, revealed a Palaeolithic scraper (Ref. 1) approximately 500 m north of the proposed gas pipeline route near to Corringham. A large number of Palaeolithic implements were also found in a gravel pit in Mucking in the 19th Century, towards the western end of the Route Study Corridor.
 - In the early Mesolithic period, sea levels fell (Sub-surface Deposit Model (October 2001) [undertaken by OAU Ltd]) and land around the eastern section of the pipeline would have been more favourable to occupation as it would have been covered in dry, dense forest close to the River Thames. Mesolithic flints have been found on several occasions during quarrying approximately 500 m north of the proposed gas pipeline route on the Corringham Marshes (findspots Ref. 2, Ref. 3, Ref. 4 and Ref. 5).
 - Work for the Mucking Gas Pipeline revealed two Palaeolithic hand axes (Ref. 6) in Mucking and a ditch containing prehistoric pottery (Ref. 7). Both of these sites are approximately 100 m from the western end of the proposed gas pipeline route.
- 15.4.13 It is likely that by the Neolithic period (4 000 BC), much of the eastern end of the Route Study Corridor, towards the GEC site was submerged under rising sea and river levels. However, some areas of higher ground near the central and western parts of the Route Study Corridor, identified as the gravel terrace in the sub-surface deposit model, did support occupation. Three flint axes, assumed to be from the Neolithic were discovered during a watching brief near the western end of the Route Study Corridor (Ref. 8). Neolithic flint axes have also been found within the LG Development site, to the south of the proposed gas pipeline route (Ref. 9), 100 m to the north of the north of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route (Ref. 12). At the western end of the proposed gas pipeline route, evidence of Neolithic activity in the form of pits, pottery and flint has been found at Mucking and West Thurrock. This evidence of occupation shows that by the Neolithic there was most likely continuous occupation of the surrounding area.
- 15.4.14 During the Bronze Age, London would have started to grow as an important economic centre for the trade and production of metal objects. Bronze Age artefacts found within the surrounding area include: a flint implement found in the north west of the former Thames Haven Oil Refinery in 1970 (Ref 13); a Bronze Age flint implement found in the northern part of the Shell Oil Refinery (Ref. 14); and a cropmark of a possible Bronze Age ring ditch (Ref. 15). Crop marks and ring ditches thought to date from the Bronze Age have also been discovered immediately to the south of the western end of the proposed gas pipeline route near Mucking. A ditch containing Bronze Age pottery, which was possibly an old field boundary, is also recorded in Mucking (Ref. 16).
- 15.4.15 Iron Age occupation in the surrounding area is likely to have been more extensive than in the Bronze Age due to the more settled groups. For example, evidence of



Iron Age occupation has been found near to the proposed gas pipeline route adjacent to Mucking (Ref. 17). Iron Age pottery has also been found in a gravel pit 500 m south west of the former Shell Oil Refinery site (approximately 500 m south of the proposed gas pipeline route) (Ref. 18) and a shard of Iron Age pottery was found just to the north of this in 1970 (Ref. 19).

<u>Roman</u>

- 15.4.16 The south east of England, and in particular London and the Thames Valley, are known to have been extensively occupied during the Roman period, as the area was strategically placed with excellent links to the continent and was already becoming a large, established trade centre in the late Bronze Age and early Iron Age. London quickly grew in size during the Roman occupation and was later established as the provincial capital in Roman Britain's communication system. Riverside development also increased substantially during the Roman period, suggesting that the River Thames increased in importance as a trade route.
- 15.4.17 Despite this, occupation in the Roman period within the Route Study Corridor and the surrounding area, as with prehistoric occupation, is also likely to have been centred on the gravel terraces, due to the much more fertile soils. Therefore the majority of finds are from these terraces.
- 15.4.18 The following roman artefacts have been found within the Route Study Corridor and the surrounding area:
 - Five findspots of Roman Pottery were found by chance on the foreshore of Mucking mudflats, approximately 500 m south of the proposed gas pipeline route and dated to 1000 AD (Ref. 20).
 - Roman burials have been found near Mucking (Ref. 21) and on the Corringham Marshes (Ref. 22).
 - Pottery, brick, wood and animal bones have been recovered from a flint-lined pit 200 m west of the former Shell Oil Refinery landholding (Ref. 23). Roman pottery has also been found immediately to the north of the Route Study Corridor (Ref. 24 and Ref. 25) during excavations undertaken for construction of the A1014 (The Manorway). A number of finds of Roman pottery have also been discovered between the former Shell Oil Refinery landholding and Mucking by OAU (Ref. 26, Ref. 27, Ref. 28 and Ref. 29). Further Roman pottery has been found in gravel pits around Mucking Church.

Medieval

- 15.4.19 London and the surrounding area would have continued as an important commercial centre in the medieval period. By the 11th Century, it is likely that the marshlands in the area around Fobbing and Corringham were being intensively grazed by sheep, something which is recorded in the Domesday Book. The marshes would have therefore been divided up into landholdings with sections owned by different farmers. Although these marshes were being used for livestock, they would still not have been permanently occupied until widespread drainage and flood defences were constructed in the later medieval period.
- 15.4.20 There are several buildings recorded by the Essex HER in the medieval period in the surrounding area including;
 - St. Mary's Church (Ref. 30) which is recorded to date from the 11th Century;
 - Hall Farm Cottages (Ref. 31) located in the south of Corringham, approximately 200 m north of the proposed gas pipeline route and date from the 16th Century;



- The Church of St. Margaret of Antioch in Stanford-le-Hope which dates from the 12th and 14th Centuries; and
- 'Old Hall' (Ref. 32) was built in the 16th Century, but was constructed on foundations of an earlier building, dating from the 15th Century. Old Hall is recorded in the SMR and also in the Essex HER.
- 15.4.21 Further details of listed buildings in the surrounding area are given below.
- 15.4.22 The site of Oozedam House is recorded on the Essex HER (Ref. 33), approximately 500 m north of the proposed gas pipeline route and is shown on maps from 1872. Oozedam House is raised above the surface of the marsh and was probably done so to prevent it being destroyed by floods. Oozedam House is thought to date from medieval times originally, but was then modified during the post-medieval and Tudor periods.
- 15.4.23 Previous investigations by OAU and RPS have identified further medieval remains in the surrounding area. The Essex HER records the findspots of medieval pottery found during the construction of the A1014 (The Manorway), approximately 500 m north of the proposed gas pipeline route (Ref. 34 and Ref. 35). A pit and ditch were also excavated adjacent to Butts Lane, near the proposed AGI which recorded finds of 14th and 15th Century pottery including a medieval beaker (Ref. 36).
- 15.4.24 An area of medieval activity was also discovered in the west of the LG Development site during a watching brief on the excavation of a gas pipeline route in 2001. Finds included: burnt material; floor surfaces; pottery; carved animal bone; postholes and gullies; a kiln; an enclosure; and, several boundary ditches. It is possible that these finds may represent a large medieval settlement, only part of which was recorded by the limited extent of excavations undertaken as part of the gas pipeline project.
- 15.4.25 Just to the west of the proposed gas pipeline route, a watching brief during the construction of St. Clere's Golf Course uncovered tile built medieval hearths, and traces of medieval (ridge and furrow) farming.

Post Medieval / Modern

- 15.4.26 The first available OS Map of 1872 shows raised banks crossing the marshes on the north bank of the River Thames. It is likely that these banks would have been used for protection against flooding from the sea. In places they would also serve as boundaries and by the post medieval period there are clearly defined parcels of land on the Corringham and Fobbing Marshes. Several developments are shown within the Route Study Corridor, including Oil Mill Farm (just to the south of the proposed gas pipeline route).
- 15.4.27 An early form of small scale industry on the Thames Marshes was the production of salt. This practice was probably started during Roman times (several 'Red Hills' or Roman salt mounds have been recorded across the Fobbing and Corringham Marshes). However, it seems to be much more widespread in the early 20th Century, with saltings shown approximately 1 km east of the GEC site and on maps dating from 1910 and 1924 (although outside of the Route Study Corridor). The crushing of locally grown flax to produce linseed oil was also undertaken on marshes surrounding the GEC site, and it is this process which probably lends its name to Oil Mill Farm (as noted above).
- 15.4.28 In 1838 works were started on the Thames Haven Dock. As part of the Thames Haven Dock construction, two rows of cottages were built for the workforce, as no suitable housing existed in the area (OPA Environmental Statement for the development of the LG Logistics and Business Park and associated facilities (compiled version 2004)). However, the cottages are not shown on maps from 1872 and therefore may have been demolished by then.



- 15.4.29 The construction of the Thames Haven Dock was thwarted by money issues and was stopped several times and never completed (although it is labelled on the 1872 Map). However, a railway line, built to support the dock was completed and is shown on the OS Map of 1872. It runs east-west through the LG Development site, down to a station and pier. Adjacent to the east siding of the station were a set of cattle pens and a cattle holding area. The railway is labelled on OS Maps as the Thames Haven Branch of the London, Tilbury and Southend Railway (the Freight Railway Line).
- 15.4.30 The railway line was not only used to transport passengers, but also for importing cattle, which had been shipped in from the continent and delivered to Thames Haven Dock. Between 1864 and 1866 cattle imports peaked in activity. In 1866 the Thames Haven Company was established and the construction of a new pier, steam trains, cattle pens and other buildings were introduced in the vicinity of the Thames Haven Dock, approximately 500 m from the GEC site. However, due to outbreaks of disease in cattle and subsequent government legislation, the cattle trade at Thames Haven Dock suffered and the Thames Haven Company was eventually closed down in 1884. The railway line was still used for importing cattle after this date, on a smaller scale than before, but further outbreaks of disease meant that the cattle importation business was finally stopped altogether in 1895. Cattle pens are however still shown on OS Maps of 1898. Very little evidence of the cattle importation infrastructure still exists at the site, although the railway line is still present in situ.
- 15.4.31 Further industrialisation of the area occurred in the latter part of the 19th Century with the construction of the Miners Safety Explosives Factory (Borley Farm), which was subsequently taken over and expanded as the Kynoch explosives factory. Both the OS Maps of 1898 and 1924 show the explosives factory as several widely spaced buildings in the western part of Curry Marsh, although this is significantly outside of the Route Study Corridor.
- 15.4.32 Due to the lack of housing and amenities an associated village was set up for workers called Kynochtown. The first few houses were built in 1897, and the village rapidly grew to more than 40 houses, a school, an institute and a shop, all of which are shown on the 1924 OS Map, although again outside this is significantly outside of the Route Study Corridor. In order to transport more workers to the explosives factory from Corringham and Fobbing, the Corringham Light Railway (Ref. 37) was opened in 1901. The railway line is shown on OS Maps of 1924 to pass from Corringham to connect with the Thames Haven Branch of the London, Tilbury and Southend Railway. It passes just to the north of the proposed gas pipeline route.
- 15.4.33 In 1876 the first small oil storage installation was built at the Shell Oil Refinery site by the Petroleum Storage Company (PSC). Although the PSC experienced financial difficulties and was wound up in 1881, the site was subsequently taken over by a number of companies, including the London and Thames Haven Petroleum Wharf Limited and the London and Thames Haven Oil Wharves Limited (LATHOL).
- 15.4.34 The Thames Haven Petroleum Wharf is first shown on OS Maps of 1898, approximately 250 m south of the GEC site.
- 15.4.35 During the early 1900's the oil storage depot expanded significantly. Boosted by this rapid expansion, the depot quickly developed a monopoly on the London oil trade. By the outbreak of the First World War there was reported to be a relatively extensive network of pipelines, pump houses and storage buildings, which handled some 400 000 tonnes of refined products per year.
- 15.4.36 In 1912, the Asiatic Petroleum Company Limited (a sales company formed by Royal Dutch Petroleum and the Shell Transport and Trading Company, prior to their merger as Royal Dutch Shell later to become Shell Oil) a license was obtained in 1912 to store petroleum at Shell Haven, and refinery operations began on a 40 ha site in 1916 with a distillation plant which produced fuel oil for the Admiralty. In 1919 the



distillation plant was converted to manufacture bitumen for road surfacing. In 1925, a new plant was erected for the manufacture of lubricating oils and the first high viscosity oils were produced in 1937.

World War 2 and Later

- 15.4.37 During World War 2, all of the refinery plants in the Shell Oil Refinery landholding expanded significantly, due to the trend towards refining oil in the UK rather than relying on pre-refined products from abroad.
- 15.4.38 Increased wartime demand also led to the construction of a new unit at the Shell Oil Refinery for the production of paraffin waxes.
- 15.4.39 Subsequent development in 1946 saw the commission of plant producing high grade paraffin for candles. In 1947, expansion began on a 400 ha site to the west of the original refinery which saw the construction of a distillation unit designed for Middle East crude oil. This began operations in 1950 with crude oil being pumped into tanks before being distilled to produce butane, methane, petrol, kerosene, gas oil and bitumen.
- 15.4.40 Subsequent to this various units were added to produce valuable hydrocarbons from the distillation residue, including a new bitumen plant which began production in 1981.
- 15.4.41 OS Maps from 1976 show no further development to the oil storage depots. The OS Map of 1999 shows the Shell Haven Oil Refinery has scaled down operations, and almost the entire GEC site has been cleared of tanks and over ground structures.
- 15.4.42 OS Maps from 2006 and 2009 show that almost all the infrastructure associated with the Shell Oil Refinery has been cleared.
- 15.4.43 During World War 2, the surrounding area also supported numerous defences to protect the oil refineries from bombing raids. These defences include anti-aircraft ditches 50 m east of the pipeline route (Ref. 38), 200 m north of the GEC site on the proposed gas pipeline route (Ref. 39) and 500 m north west of the proposed gas pipeline route (Ref. 40). The site of a World War 2 Pillbox (Ref. 41) is recorded 200 m south of the proposed gas pipeline route. The site of a World War 2 bomb crater (Ref. 42) is recorded approximately 5 m north of the proposed gas pipeline route.

Aerial Photography / Determination of the Extent of Crop Marks

- 15.4.44 Several sites of cropmarks have been recorded adjacent to the proposed gas pipeline route.
- 15.4.45 Aerial photographs of some of these sites have been made available by Essex County Council⁵⁸, and an estimate has been made of whether they are likely to be impacted by the development of the gas pipeline.
- 15.4.46 Ref 15, shown on Figure 15.1, records the site of cropmarks to the south of Stanfordle-Hope. These are recorded as SMR Number 14702 as "*Cropmarks of a trackway, various linear features and a possible ring-ditch*". These are shown on Insert 15.1.
- 15.4.47 These cropmarks extend approximately 200 m north of the proposed gas pipeline route and are therefore not considered to be at risk of being impacted upon.

⁵⁸ Available on <u>http://unlockingessex.essexcc.gov.uk/</u>





INSERT 15.1: CROPMARKS (SMR NUMBER 14702)



- 15.4.48 SMR Number 14700, near to Listed Building Ref 8 shown on Figure 15.1, records the presence of further cropmarks around Ivy Wall Farm. These are recorded as *"Cropmarks of a possible trackway, a possible enclosure (rectilinear) and various linear features, probably former field boundaries".* The full extent of these cropmarks has not been able to be identified through aerial photography. The extent of the cropmarks will be the subject of further archaeological works prior to construction. This is detailed discussed further in Section 15.7.
- 15.4.49 SMR Number 194197, around Listed Buildings Ref 2, Ref 3 and Ref 4 on Figure 15.1, records further cropmarks around Great Garlands Farm as *"An enclosure measuring 9 m x 6 m consisting of a rectangular grid of gullies cut through natural clay. The gullies and slots were between 0.6 m and 0.75 m wide".*
- 15.4.50 It is known that these cropmarks were encountered during excavation works for the existing CECL Power Station gas pipeline. Terram was laid over the cropmarks to protect them from damage during construction works and they was therefore preserved in situ.
- 15.4.51 They may be an animal enclosure, perhaps sheep or pig pens. The cutting of the CECL Power Station gas pipeline revealed an occupation area, comprising a gravelled yard and adjoining rectangular building or enclosure, measuring 9 m by 6 m. The pottery dates the occupation of this area to the mid-13th to 16th Century.
- 15.4.52 It is suggested that this site may be the original site of Old Garlands Farm, as recorded in 1248 and 1599 (see below). It is difficult to ascertain from aerial photographs the exact extent of the cropmarks, although the gas pipeline route passes to the south of Great Garlands Farm and will not directly impact on the grounds in the immediate vicinity.
- 15.4.53 SMR Number 17169, next to Listed Building Ref 1 on Figure 15.1, records cropmarks of numerous rectilinear features at Old Garlands, just to the north of Great Garlands Farm. This includes two sub-rectangular enclosures. Further features were recorded in 2009 including a possible section of trackway. These cropmarks are shown in Insert 15.2.
- 15.4.54 While there is a cropmark plot of these features they have not been verified in extent or date. Despite this, the gas pipeline route is expected to pass approximately 200 m to the south of the cropmarks and will therefore unlikely have any direct impact upon them. The extent of the cropmarks will be the subject of further archaeological works prior to construction. This is detailed discussed further in Section 15.7.





INSERT 15.2: CROPMARKS (SMR NUMBER 17169)



- 15.4.55 Alongside Great Garlands Farm there are also large areas of burning and burnt clay from several contexts which may indicate the possibility of the former existence of a Kiln site. It is not thought to be a pottery kiln as there is not enough pottery or any kiln wasters / furniture.
- 15.4.56 The blackened areas around the possible kiln are dated to the 15th to 16th Centuries. While the small amount of pottery found over the kiln itself was of 14th Century date this may not be a reliable as the feature was not actually excavated.
- 15.4.57 During construction of the CECL Power Station gas pipeline, terram was laid over the area to protect it from damage and it was therefore preserved in situ. The extent of this site is fairly well defined and it is visible on aerial photographs (see Insert 15.3). Therefore it will be avoided during construction of the gas pipeline and preserved in situ.
- 15.4.58 Aerial photographs are also available for the western end of the gas pipeline route, near the proposed AGI site. An example is shown in Insert 15.4 The majority of the sites and cropmarks identified have already been recorded during the construction of the existing CECL Power Station gas pipeline and the existing AGI.
- 15.4.59 Should any cropmarks and ditches be encountered during construction of the gas pipeline and associated AGI, they will be protected and preserved in situ, with the gas pipeline being re-routed to avoid them.





INSERT 15.3: CROPMARKS NEAR GREAT GARLANDS FARM

INSERT 15.3: CROPMARKS NEAR PROPOSED AGI SITE





Scheduled Ancient Monuments

15.4.60 There are no Scheduled Ancient Monuments within the Route Study Corridor or the immediate surrounding area.

Listed Buildings

- 15.4.61 There are several listed buildings in surrounding area. These are mainly situated in Fobbing (approximately 1 km north of the gas pipeline route) and Corringham, (between 250 m and 1 km north of the gas pipeline route near the Manorway).
- 15.4.62 There are also other, scattered listed buildings which pass closer towards the western end of the proposed route (e.g. Manor Farm, Ivy Wall House, Great Garlands Farm and Old Garlands).
- 15.4.63 The position of these listed buildings is shown on Figure 15.1.

Site Walkover

- 15.4.64 A site walkover was also conducted. The aim of the site walkover was to identify any potential archaeological remains present within the Route Study Corridor which have not been previously recorded by excavations, the National Monuments Record or the Historic Environment Record.
- 15.4.65 Site topography was noted, as were any areas of exposed geology and soils. Particular attention was paid to patterns and distribution of spoil mounds, changes in vegetation or any other interesting features. A photographic record of the site was conducted and a sketch of the site was drawn to record any interesting features.
- 15.4.66 The site walkover did not reveal any remains of archaeological or cultural heritage significance which had not been previously recorded by other sources.

Other Intrusive Investigations

Canvey Terminal to Stanford-le-Hope Gas Pipeline (ES, June 2006, RPS Ltd)

- 15.4.67 As part of this ES, a borehole survey was undertaken along the proposed gas pipeline route. This borehole survey also covers the Route Study Corridor of this ES (i.e. covers the proposed route of the gas pipeline and location of associated AGI).
- 15.4.68 Although two transects were excavated along the route, only the most western transect covers the Route Study Corridor. The transect was located to the east of the A1014 (The Manorway) at approximate OS Grid Reference TQ 713 830.
- 15.4.69 The transect consisted of drilling 25 boreholes to a depth of 3 m below ground level (bgl). The boreholes found a sequence of estuarine deposits and blue silt containing organic inclusions. Evidence of former drainage channels were also recorded by the presence of brown, sandier silt.
- 15.4.70 The transect recorded no evidence of gravel deposits or archaeological activity even though it is close to the estimated interface of gravel and alluvium.
- 15.4.71 Three trial trenches were also dug as part of the investigations. One was located in the same area as the borehole transect described above and two were excavated across a banked enclosure to the north of Oozedam Farm at approximate OS Grid Reference TQ 738 832. No archaeological finds were recorded in any of the trial trenches.

The PP Environmental Statement for the LG Development 'Refined Access Road Design' (June 2010)

15.4.72 A refined access road layout has been approved for the LG Development. This access road will be a new dual carriageway which will link the LG Development with Sorrell Roundabout on the A1014 (The Manorway).



- 15.4.73 The location of the access road is shown in Figure 1 of the original 'Archaeological Investigation Report – London Gateway Access Road' (May 2010) [undertaken by OAU Ltd] and a more detailed description of the access road (e.g. length, width and depth of material) is provided in the PP Environmental Statement (June 2010).
- 15.4.74 As part of the further intrusive investigation at the access road corridor, a total of 36 trial trenches were excavated. The location of these trenches was agreed with Essex County Council and English Heritage and was based on previous Desk Based Assessment / non-intrusive site investigations (e.g. magnetometer surveys).
- 15.4.75 The Desk Based Assessment / non-intrusive site investigations had identified limited potential for archaeological remains within the access road corridor. However, the trial trenches were excavated to investigate a small number of anomalies and also to gain an understanding of archaeological potential of both the floodplain deposits and gravel terrace.
- 15.4.76 Overall, the results of these investigations revealed few finds of archaeological significance. These are described below with reference to trench numbers. A plan showing all trenches is shown in Figure 2 of the original 'Archaeological Investigation Report London Gateway Access Road' (May 2010) [undertaken by OAU Ltd].
 - Trenches 1 and 2, located on the gravel deposits, revealed clusters of undated features including ditches and gullies. One of the ditches contained a clay pipe of post medieval origin.
 - Trenches 6 and 9, also on the gravel deposits, revealed a series of ditches, none of which contained any artefacts or dating evidence.
 - Trench 10, also on the gravel deposits, revealed a ditch containing animal bone, tile and 16th / 17th Century pottery.
 - Trench 11, also on the gravel deposits, contained three ditches, a posthole and a gully, none of which contained artefacts or dateable evidence.
 - Trench 15, on the boundary between gravel and alluvial deposits, contained a single ditch containing shards of post medieval tile.
 - Trench 20, in the alluvial deposits, contained a series of features containing medieval and post-medieval pottery.
 - Trench 21, also in alluvial deposits, recorded 3 ditches and a posthole with small amount of animal and fish bone and burn stone as well as a large amount of 13th / 14th Century pottery.
 - Trench 26 contained 13th / 14th Century pottery.
 - Trench 28 contained a selection of Iron Age pottery.
- 15.4.77 The results of the intrusive investigations on the access road corridor indicate that both the alluvial deposits and the gravel bed deposits have the potential of harbouring archaeological findspots. Despite this, in a total of 36 trial trenches, excavated over a large area, no significant archaeological remains were discovered, particularly in the alluvial deposits.

15.5 Potential Impacts

Construction

15.5.1 In terms of buried archaeology (unknown assets), the excavation of the trench and the construction of the AGI and site access tracks have the potential to cause direct impacts. In terms of upstanding archaeological and cultural heritage assets, indirect impacts are more likely.



- 15.5.2 The crossing point of the A1014 (The Manorway) and the Old Railway Track Crossing (Footpath Number 143) is known to have been a significant junction of early causeways across the marsh. There is therefore potential in this area to impact upon unknown buried archaeological remains of a local significance. Despite this, it is likely that the existing CECL Power Station gas pipeline, A1014 (The Manorway) and Freight Railway Line have all significantly impacted buried archaeological remains in this area already.
- 15.5.3 The proposed gas pipeline route passes extremely close to the buildings and remains found at Great Garlands Farm and Old Garlands. These are both sites associated with medieval activity and the archaeological activity extends from the farms to the south towards the Thames. Additionally, the proposed gas pipeline route passes close to cropmarks and findspots at Ivy Wall House, where there is evidence for prehistoric buried archaeology. If these deposits extend further to the south, then there is the potential that these will be impacted upon by the proposed gas pipeline route.
- 15.5.4 Previous work has also indicated significant archaeological remains dating from the prehistoric, medieval and Roman periods on the gravel terrace around Mucking and at St. Clere's Golf Course.
- 15.5.5 Additionally, it is likely that the alluvial plains (below the 10 m AOD contour) would have experienced periodic flooding throughout their history, leaving fertile agricultural land during dry periods and preserving remains in waterlogged soils during wet periods. The sub-surface deposit model has indicated that there may be peat deposits underlying some of the proposed gas pipeline route. Any such deposits would have the potential to preserve palaeoecological remains, which may be valuable in reconstructing past environments.
- 15.5.6 In summary, the proposed gas pipeline has the potential to impact on unknown archaeological remains / assets, given the density of findspots and sequence of buried landscapes in the Route Study Corridor and surrounding area. However, even if there are impacts, these are likely to be minor in nature and the impact will be limited to sites of regional and local importance, such as cropmarks.
- 15.5.7 Additionally it should be noted that there has already been a significant amount of investigation undertaken in the area during construction of the existing CECL Power Station gas pipeline and AGI, therefore covering some of the area surrounding the proposed gas pipeline route and associated AGI location. As such, there is a general understanding of cultural heritage / archaeological potential in the area and much of the archaeological remains / assets have been mapped and recorded.
- 15.5.8 As with the construction of the existing CECL Power Station gas pipeline and AGI, mitigation measures will be applied to limit any potential impacts on known archaeological remains / assets once the detailed design stage has been completed. The results of previous studies would be overlaid onto this route and the best form of mitigation (if required) would be decided upon, such as limiting the working width.

Listed Buildings

- 15.5.9 There are not likely to be any direct impact on any of listed buildings (e.g. impacts due to the removal of any building features or the destruction of any parts of the buildings). Therefore, in this sense, none of the architectural or historical significance of the buildings will be lost.
- 15.5.10 There are likely to be minor adverse indirect impacts on the setting of several listed buildings during construction of the gas pipeline and associated AGI. These will be limited to those buildings in Corringham (e.g. Corringham Hall, Bell House, Bush House and Rose Cottage) and those towards the western end of the proposed gas pipeline route (e.g. Manor Farm, Ivy Wall House, Great Garlands Farm and Old



Garlands). Additionally, the construction period is likely to be of a relatively short duration (of the order of 12 months for the entire pipeline) and the actual time spent for construction works adjacent to listed buildings will be significantly shorter than this. Furthermore, the listed buildings already sit in an altered setting which has changed significantly throughout history (e.g. with the development and subsequent decommissioning of the Shell Oil Refinery, and the proposed LG Development).

15.5.11 Following construction, the gas pipeline will be buried, covered and reinstated to a similar condition as prior to construction. Therefore any construction impacts on the setting of listed buildings will be reversible.

Operation

- 15.5.12 During operation, the gas pipeline will be buried along the majority of its length and the land reinstated to a similar condition as it was prior to any works commencing. Therefore there are not anticipated to be any impacts on archaeological / cultural heritage assets.
- 15.5.13 The AGI consists of a series of small above ground structures, shown in Figure 5.2b. The highest of these small above ground structures will be of the order of 2.7 m. The AGI will be surrounded by a security fence and screening in the form of landscaping will be provided to limit the visibility of the AGI to the surrounding landscape.
- 15.5.14 The AGI will be sited in an area which contains similar structures, including the existing AGI for the CECL Power Station gas pipeline. It is not considered that the AGI will give rise to any negative impacts on the setting of historic buildings or remains or a cultural heritage significance. The setting of existing buildings in the vicinity of the proposed AGI site are characterised by a semi-industrial landscape which has undergone rapid and significant changes in recent times. The presence of several dominating over ground structures will mean that any change in the landscape caused by construction / operation of the AGI is further limited, particularly when taking in account the positive effects of the screening in the form of landscaping to be applied.
- 15.5.15 Based on this it is considered that the AGI will have a negligible impact on the change of landscape and thus the setting of archaeological / cultural heritage features.

Decommissioning

- 15.5.16 Upon cessation of operation, the gas pipeline and associated AGI will be disconnected from the NTaS Number 5 Feeder pipeline. It is currently proposed that the gas pipeline would be capped at both ends and left buried under ground.
- 15.5.17 Therefore, there will be limited ground disturbance and no additional ground will be impacted other than that which was already excavated during construction.
- 15.5.18 The decommissioning phase is likely to be shorter and have a lower overall impact compared to construction, therefore there are considered to be no impacts archaeological / cultural heritage assets.

15.6 Mitigation Measures

Construction

- 15.6.1 Prior to construction, a plan of archaeological works will be developed in conjunction with the Essex County Archaeologist⁵⁹. It is proposed that this forms part of the planning conditions for the development of the gas pipeline and associated AGI.
- 15.6.2 This will be based on the following:

⁵⁹ It should be noted that Essex County Council (Environment, Sustainability and Highways) have provided Specialist Advice to TTGDC on matters relating to archaeology / cultural heritage.



- In accordance with Policy HE 12 of PPS 5 a Written Scheme of Investigation (WSI) will be developed, in conjunction with the Essex County Archaeologist. The WSI which will ensure that the archaeological record is studied in further detail which will advance understanding of the significance of any cultural heritage / archaeological asset. The content of the WSI will ensure the following:
 - The proper identification and evaluation of the extent, character and significance of archaeological remains within the application area;
 - Successful implementation of proposals for the preservation in situ, or for the investigation, recording and recovery, of archaeological remains and the publishing of the findings (it being understood that there shall be a presumption in favour of their preservation in situ where practicable); and
 - Archaeological work is completed either before development takes place or during development.
- The WSI is likely to specify the following:
 - All parts of the gas pipeline trench excavation will be subject to an archaeological watching brief. This will include a detailed programme of archaeological observation, investigation and recording by a suitably qualified archaeologist.
 - Wherever the gas pipeline has the potential to cross historic earthworks, in sensitive areas (such as in the vicinity of Great Garlands Farm or gravel terraces) these should firstly be surveyed by a qualified archaeologist. Details of the extent of the earthworks will be recorded, any associated finds will be noted, and then it will subsequently be determined whether the remains should be preserved in situ (e.g. by a slight amendment to the gas pipeline route or limiting the working width) or if the remains cannot be preserved in situ, they will be surveyed and recorded.
 - Works will comprise firstly careful topsoil stripping by an experienced JCB driver under supervision from a suitably qualified archaeologist, using a wide, toothless ditching blade. The earthwork remains would be excavated, dated and recorded through photography and GIS mapping. Any remains found after stripping of topsoil will be recorded, after which geotextile will be laid on the stripped surface to protect any archaeological remains which may exist. Material will be placed on the geotextile to prevent compaction. Following topsoil stripping, if significant remains are recorded, further targeted excavation may be required.
 - Where the gas pipeline passes near to listed buildings (e.g. Great Garlands and Old Garlands Farm), the construction corridor will be reduced, in order to limit the impact on the known features in the area. Stripping of topsoil as described above will also take place, and works will be the subject of an archaeological watching brief.
- 15.6.3 If, on review by the Essex County Archaeologist, some further previously undeveloped areas of the proposed gas pipeline route are considered to have the potential for underground remains, it may be possible to steer construction away from these areas and preserve remains in situ, as is recommended by PPS 5 (Planning for the Historic Environment). Alternatively, the gas pipeline construction method used could be changed.


- 15.6.4 In addition, prior to construction a range of best practice guidance will be established between the Construction Contractor, GECL and the relevant Local Authorities.
- 15.6.5 Furthermore, mitigation outlined in other Impact Sections of this ES will limit the potential for indirect impacts (such as those due to dust (air quality) and noise) to archaeological / cultural heritage assets.

Operation

- 15.6.6 During the operational phase of the pipeline, no adverse impacts to archaeology or cultural heritage are anticipated. As such, no mitigation is required.
- 15.6.7 Landscaping and screening will be provided at the AGI to mitigate any potential landscape and visual impacts on the settings of archaeological / cultural heritage assets (See Section 11 for further details).

Decommissioning

15.6.8 No additional mitigation is considered necessary during decommissioning.

15.7 Assessment of Residual Impacts

- 15.7.1 There is the potential that the construction of the gas pipeline will impact upon the buried archaeological resource of the area. However, providing the mitigation listed above is applied correctly, it is anticipated the residual impacts on archaeological / cultural heritage assets or Listed Buildings in the Route Study Corridor or the surrounding area will be minor in nature.
- 15.7.2 The mitigation measures listed above are believed to be sufficiently extensive to comply with PPS 5 and ensure the following:
 - The proper identification and evaluation of the extent, character and significance of archaeological remains within the application area;
 - Proposals for the preservation in situ, or for the investigation, recording and recovery of archaeological remains and the publishing of the findings (it being understood that there shall be a presumption in favour of their preservation in situ where practicable); and
 - Archaeological work is completed either before development takes place or during development.
- 15.7.3 Where remains are discovered these will either be recorded or preserved in situ. Where they are preserved in situ, there will be no residual impacts. Where they are recorded and recovered, there may be minor impacts in the form of small areas of local or regionally important earthworks being removed.
- 15.7.4 As the pipeline route will be reinstated following construction to a condition similar to pre-development, there will be no residual impacts on the setting of Listed Buildings.
- 15.7.5 As the AGI will be screened by landscaping and is set in an area already characterised by the existing AGI for the CECL Power Station (which is itself screened by landscaping) and other urban and industrial development, there will be no residual impacts relating to the setting of Listed Buildings.

15.8 Assessment of Cumulative Impact

15.8.1 Indirect / Secondary and Cumulative Impacts are assessed in Section 18.

SECTION 16

SOCIO-ECONOMICS



16 SOCIO-ECONOMICS

16.1 Introduction

- 16.1.1 This Section assesses the potential socio-economic impacts associated with the development of the gas pipeline and associated AGI.
- 16.1.2 In particular, this assessment considers how the development of the gas pipeline and associated AGI (in isolation) will impact on:
 - Local Economy, including employment impact on the labour market and additional local spending;
 - Land Use and Open Space; and
 - Leisure and Recreation / Tourism.
- 16.1.3 Additionally, the proposed mitigation measures are detailed, where appropriate.
- 16.1.4 In addition, it is important to note the wider long-term major positive socio-economic benefits which would be offered by InterGen / GECL following the overall combined development of GEC, the gas connection and the electrical connection. These are also discussed in this Section.

16.2 Key Planning Policies

- 16.2.1 Section 3 provides the Planning Policy Context.
- 16.2.2 The policies listed below have informed the assessment process, to which reference has been made in Section 3. A full transcript of these policies is contained in Volume 2, Appendix A.

SS1	Achieving Sustainable Development
SS5	Essex Thames Gateway
E1	Job Growth
E2	Provision of Land for Employment
E3	Strategic Employment Sites
E4	Clusters
ETG1	Strategy for the Sub Region
ETG5	Employment Generating Development

East of England Plan

Draft TCSPMD

CSSP2	Sustainable Employment Growth
CSSP3	Sustainable Infrastructure
CSTP6	Strategic Employment Provision
CSTP12	Education and Learning



16.3 Assessment Methodology and Significance Criteria

Assessment Methodology

- 16.3.1 The following assessment seeks to establish the potential social and economic impacts of the gas pipeline and associated AGI, and assesses the expected impacts against the current baseline conditions.
- 16.3.2 Therefore, it is necessary to fully determine the current baseline conditions of the affected areas of the socio-economy. Accordingly a Desk Study was undertaken to establish the existing situation for the region in line with the defined significance criteria. This included using a range of available data sources, including NOMIS Official Market Labour Statistics⁶⁰.
- 16.3.3 The likely impact of the development of the gas pipeline and associated AGI were then considered within the context of these conditions and the appropriate local authority objectives for social and economic development.
- 16.3.4 The assessment focussed on the District of Thurrock as a whole. Comparisons have been made with the present positions of Essex, the East of England and the rest of Great Britain.

Significance Criteria

- 16.3.5 The significance of impacts on the socio-economy is assessed by comparing the baseline conditions with the likely conditions during construction, operation and decommissioning of the gas pipeline and associated AGI.
- 16.3.6 The following significance criteria have been used to assess the magnitude of potential impacts:
 - Beneficial: Advantageous / positive impact on the socio-economy.
 - Negligible: Imperceptible impact to the socio-economy.
 - Adverse: Detrimental / negative impact on the socio-economy.
- 16.3.7 Where beneficial or adverse impacts have been identified, these have been assessed against the following scale:
 - *Minor*. Slight impact (by extent / duration / magnitude) of no significant consequence.
 - *Moderate*: Limited impact (by extent / duration / magnitude) which may be considered significant.
 - *Major*: Considerable impact (by extent / duration / magnitude) of more than local significance.

16.4 Baseline Conditions and Receptors

- 16.4.1 The gas pipeline and associated AGI is entirely within the administrative area of Thurrock. This sub-section establishes the current baseline in the Thurrock area with regard to the following characteristics deemed relevant to the development of the gas pipeline and associated AGI:
 - Population;
 - Skills and Education;
 - Labour Force and Employment;
 - Occupational Profile;

⁶⁰ <u>https://www.nomisweb.co.uk/default.asp</u> (Data downloaded for Thurrock was accessed December 2010)



- Results of 'English Indices of Deprivation 2007 Thurrock Analysis';
- Land Use and Open Space; and
- Leisure and Recreation / Tourism.
- 16.4.2 Potential impacts arising from the gas pipeline and associated AGI are assessed relevant to the current baseline.

Population

- 16.4.3 The local population of Thurrock stands at approximately 157 200. The populations of the East of England and Great Britain stand at approximately 5 766 600 and 60 003 100 respectively.
- 16.4.4 Over the 10 year period 1999 to 2009 the populations of Thurrock, the East of England and Great Britain increased by approximately 12.7 per cent, 8.0 per cent and 5.3 per cent respectively.

Skills and Education

- 16.4.5 Approximately 36.3 per cent of people in Thurrock are qualified to at least National Vocational Qualification (NVQ) Level 3. This is lower than the percentages for both the East of England and Great Britain. Additionally, the percentage of people within Thurrock with no qualifications is higher than that for both the East and Great Britain.
- 16.4.6 This information is shown in Table 16.1.

TABLE 16.1: COMPARISONS OF QUALIFICATIONS

Qualifications	Thurrock		East	Great Britain
	Number	%	%	%
NVQ4 and above	18 700	18.6	27.3	29.9
NVQ3 and above	36 600	36.3	46.9	49.3
NVQ2 and above	54 800	54.4	64.2	65.4
NVQ1 and above	75 300	74.7	79.9	78.9
Other Qualifications	8 500	8.4	8.8	8.8
No Qualifications	17 000	16.9	11.3	12.3

Labour Force and Employment

- 16.4.7 The working age population (16 to 64 year olds) of Thurrock is approximately 103 700. Of this, approximately 79 500 (77.3 per cent) are economically active. This is slightly lower than the rates in the East of England which are 78.9 per cent, but higher than those of Great Britain which are 76.5 per cent.
- 16.4.8 Of the economically active population, which is defined as people who are either in employment or unemployed, the number of people who are in employment is 73 700. This is also slightly lower than the rates in the East of England which are 73.5 per cent, but higher than those of Great Britain which are 70.3 per cent.
- 16.4.9 Employment in Thurrock has varied over the last few years with employment rates fluctuating more so than both the averages for the East of England and Great Britain. Nevertheless, whilst local employment has been lower than the averages for the East, it has been higher than the average for Great Britain. This is shown in Table 16.2.

TABLE 16.2: EMPLOYMENT RATES (% 16 – 64 YEAR OLDS)

Year Thurro	k East	Great Britain
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Year	Thurrock		East	Great Britain
	Number	%	%	%
(Jan – Dec) 2004	74 100	76.1	76.8	72.6
(Jan – Dec) 2005	73 600	74.7	76.3	72.7
(Jan – Dec) 2006	72 900	73.4	75.2	72.5
(Jan – Dec) 2007	74 900	75.3	75.2	72.5
(Jan – Dec) 2008	74 300	73.5	75.0	72.2
(Jan – Dec) 2009	74 200	71.8	74.3	70.7

16.4.10

Recently, the global economic recession has resulted in a sharp and significant increase in unemployment numbers. The increase in unemployment numbers is shown in Table 16.3.



Year	Thurrock		East	Great Britain
	Number	%	%	%
(Jan – Dec) 2004	3 100	4.0	3.7	4.8
(Jan – Dec) 2005	3 500	4.5	4.0	4.9
(Jan – Dec) 2006	3 900	5.1	4.6	5.4
(Jan – Dec) 2007	3 500	4.4	4.3	5.2
(Jan – Dec) 2008	4 600	5.9	4.9	5.7
(Jan – Dec) 2009	6 400	8.0	6.3	7.7

TABLE 16.3: UNEMPLOYMENT NUMBERS (MODEL BASED)

Occupational Profile

- 16.4.11 Based on information from Thurrock Council⁶¹, the occupational profile in Thurrock is very similar to the profiles of the East and England albeit with slight variances.
- 16.4.12 The largest proportion of the population are employed in distribution, hotels and restaurants (22.1 per cent) followed by public administration, education and health (20.8 per cent) and banking, finance and insurance (15.5%).

Occupation	Thurrock	England
	%	%
Agriculture and Fishing	0.3	1.1
Energy and Water	1.0	0.8
Manufacturing	13.9	14.0
Construction	10.5	7.6
Distribution, Hotels and Restaurants	22.1	19.6
Transport and Communications	10.8	7.0
Banking, Finance and Insurance	15.5	16.1
Public Administration, Education and Health	20.8	27.4
Other Services	4.7	6.1

TABLE 16.4: EMPLOYMENT BY INDUSTRY, OCCUPATION AND SECTOR

16.4.13 The mean gross weekly income by workplace in Thurrock is £470.60, which is similar to the mean gross weekly income by workplace of both the East and Great Britain which are £479.10 and £490.20 respectively.

Results of English Indices of Deprivation 2007 – Thurrock Analysis

- 16.4.14 Further to the above statistics, the results in '*The English Indices of Deprivation 2007* – *Thurrock Analysis*' (January 2008)⁶² present the ranking of LSOAs (Lower Level Super Output Areas)⁶³ based on their IMD2007 (Index of Multiple Deprivation measured in 2007). The IMD2007 is a measure of 'multiple deprivation' which is based on the idea of distinct dimensions of deprivation which can be recognised and measured separately. These are combined to provide a measure of 'multiple deprivation'.
- 16.4.15 The IMD2007 reported in '*The English Indices of Deprivation 2007 Thurrock Analysis*' are made up of seven domains (and two supplementary domains), which are then combined to provide the measure of 'multiple deprivation'. The seven

⁶¹ <u>http://www.thurrock.gov.uk/i-know/profile/content.php?page=dd_labour</u> (Employment by Industry and Occupation)

⁶² <u>http://www.thurrock.gov.uk/i-know/profile/pdf/rm_deprivation_200801.pdf</u>

⁶³ LSOA are geographical units made up of Census output areas for collecting, aggregating and reporting statistics. They contain an average of 1500 people and nest within wards.



domains are: income deprivation; employment deprivation; health deprivation and disability; education skills and training deprivation; barriers to housing and services deprivation; living environment deprivation; and crime. The two supplementary domains are: income deprivation affecting children; and, income deprivation affecting older people.

- 16.4.16 The IMD2007 reports at LSOA, Ward and Local Authority level. Within Thurrock (the Local Authority), there are 20 Wards and 96 LSOAs.
- 16.4.17 Based on the findings of the '*The English Indices of Deprivation 2007 Thurrock Analysis*' it is concluded that:
 - Thurrock remains less deprived than the national average using the IMD2007 overall measure, and indeed has improved from Position 122 in 2004 to Position 131 in 2007 (out of 354 authorities)⁶⁴.
 - In terms of LSOA, over half of the LSOAs (58 per cent) in Thurrock are below the median level, meaning that they are more deprived than average.
 - Five LSOAs fall within the top 10 per cent most deprived areas in England (these are Grays Riverside, Tilbury St. Chads (6010), Tilbury Riverside and Thurrock Park, Tilbury St. Chads (6007) and Belhus);
 - 12 LSOAs are within the top 20 per cent most deprived areas in England;
 - The most deprived LSOA in Thurrock is Grays Riverside which is ranked as the 930th most deprived LSOA in England (out of 32 454); and
 - Highlighted of particular concern is that 21 LSOAs in Thurrock (which equates to 22 per cent of the LSOAs in Thurrock) are in the top 10 per cent of the most deprived areas in the Education domain.
 48 LSOAs (which equates to 51 per cent) are in the worst quartile in the Education domain.
 - At Ward level, the most deprived are Belhus, Chadwell St Mary, Tilbury Riverside and Thurrock Park, Tilbury St. Chads, and West Thurrock and South Stifford.

Land Use and Open Space

- 16.4.18 The gas pipeline route crosses varying land surfaces associated with different land uses and past activities.
- 16.4.19 The new AGI west of Mucking and to the south of Stanford-le-Hope will be constructed south of the existing AGI which serves CECL Power Station. The new AGI will require a land take of approximately 0.44 ha, including areas for roads and landscaping.
- 16.4.20 The residential receptors that may experience impacts connected with the gas pipeline and associated AGI are detailed in Table 16.5, and have previously been shown in Figure 9.2.

TABLE 16.5: LARGER RESIDENTIAL	RECEPTORS / RESIDENTIAL AREAS
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Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
1	East Tilbury	1700
2	Linford	1100
3	Mucking (All residents)	200

⁶⁴ Move in ranking shows that Thurrock has become less deprived (Higher Positions are more deprived).



Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
4	Stanford-le-Hope	200
5	Corringham	150
6	Fobbing	650

16.4.21 There are also a number of smaller, individual receptors (i.e. local farms / industries / individual houses) within the gas pipeline route corridor. These are detailed in Table 16.6, and have previously been shown in Figure 9.3.

Receptor Number	Sensitive Receptor	Shortest Distance to the Route (m)
7	Mucking (all residents)	200
8	Stanford-le-Hope (residents on St. Margaret's Avenue and Broadhope Road)	170
9	Stanford-le-Hope (residents on Fairview Avenue)	240
10	Stanford-le-Hope (residents on Wharf Road, Cabborns Crescent, Grove Road and King Edwards Road)	90
11	Stanford-le-Hope (residents on Corringham Road, Burgess Avenue, Billet Lane, Adams Road, Conrad Road and Rainbow Lane)	150
12	Stanhope Industrial Park	230
13	Great Garlands Farm	50
14	Oak Farm	250
15	Old Hall	100
16	Corringham (residents on Church Road and Rookery Hill)	20
17	Corringham (residents on Herd Lane)	180
18	LG Development (West)	500
19	LG Development (North West)	290
20	LG Development (North)	290
21	LG Development (North East)	160

TABLE 16.6: INDIVIDUAL RECEPTORS

Leisure and Recreation / Tourism

- 16.4.22 In terms of local tourist attractions, the majority of the land along the gas pipeline route is privately owned and as such formal recreational areas are limited. The main tourist attractions are mainly situated in the local communities in the vicinity. These are listed in Table 16.5.
- 16.4.23 Additionally, a larger amount of land surrounding the route of the gas pipeline and associated AGI is designated for Landscape and Nature Conservation and contains a high number of Statutory Ecological Designated sites.
- 16.4.24 The Statutory Ecological Designated sites include:
 - Thames Estuary and Marshes SPA and RAMSAR site;
 - South Thames Estuary and Marshes SSSI;



- Benfleet and Southend Marshes SSSI;
- Vange and Fobbing SSSI;
- Mucking Flats and Marshes SSSI;
- Holehaven Creek SSSI;
- Pitsea Marsh SSSI;
- Basildon Meadows SSSI;
- Northward Hill SSSI;
- Chattenden Woods SSSI;
- Dalham Farm SSSI;
- Thundersley Great Common SSSI;
- Canvey Wick SSSI;
- Leigh NNR;
- High Halstow Northward Hill NNR;
- Linford LNR;
- Grove House Wood LNR;
- Vange Hill LNR;
- Canvey Lake LNR; and
- Belton Hills LNR.
- 16.4.25 Non-Statutory Ecological Designated sites include:
 - Wat Tyler Country Park;
 - Northlands Wood Country Park; and
 - Corringham Marshes SINC.
- 16.4.26 Specific impacts to these sites have been described in Section 12. This Section considers the impacts to the users of these sites for leisure and recreational purposes.
- 16.4.27 The proposed pipeline route will cross 56 features as listed in Table 16.7 and shown in Figures 5.3a to 5.3e.
- 16.4.28 It should be noted that there are no motorways crossed by the gas pipeline route. However, there are three Public Right of Ways crossing to be noted. These are referenced as TLX 4 (Old Railway Track Crossing / Footpath Number 143), DX3 (Footpath Number 38) and RDX 3 (Bridleway 39) in Table 5.1.

TABLE 16.7: SIGNIFICANT CROSSINGS

Type of Crossing	Number of Crossings
Ditch Crossings (DX)	24
Lake Crossings (LX)	1
Pipeline Crossing (PLX)	14
Road Crossings (RDX)	7
Railway Crossings (RLX)	3
River Crossings (RVX)	3



Track Crossings (TLX)	4

16.5 Potential Impacts

- 16.5.1 This sub-section analyses the scale, permanence (short, medium and long-term) and significance of the socio-economic impacts of the gas pipeline and associated AGI relative to the baseline established. The potential socio-economic impacts, particularly during construction, will be felt in the following areas:
 - Local economy via procurement of local supplies / employment;
 - Land use; and
 - Leisure / recreation.

Construction

Local Economy

- 16.5.2 In terms of procurement, specialist materials (such as steel line pipe, and plant and equipment for the AGI) will be sought from qualified suppliers to match the high specification required. Whilst this 'specialist' procurement is not expected to have a great impact on the local economy due to the specialised nature of the materials sought, there may be 'local additional' procurement opportunities. For example, provided such markets are available and prices are competitive, it is possible that there may be 'local additional' procurement opportunities for materials / services associated with: fencing; drainage; re-instatement materials; fuel; consumables; aggregates; seed; and, other materials. Additionally, it is possible that some plant may be hired from local farmers and plant companies. The 'local additional' procurement opportunities are therefore expected to lead to a moderate beneficial short-term impact on the local economy.
- 16.5.3 In the short-term, employment will increase during the construction phase. The labour force required to construct the gas pipeline and associated AGI will consist of a combination of skilled and semi-skilled staff. GECL will encourage the Construction Contractor to use local labour where possible. The skilled staff will include welders and plant operators, inspectors, supervisors and management staff. The semi-skilled staff will include drivers, plant operators and labourers. At the peak of construction, the total labour workforce is expected to total approximately 90, spread along the gas pipeline route.
- 16.5.4 However, over the entire construction period up to the total labour workforce could total approximately 200. A typical labour workforce for a gas pipeline is shown in Table 16.8⁶⁵. It should be noted that a number of the workforce will double up on various activities. For example, the top soil crew of excavator drivers could move on to reinstatement works, and the fencing crew could double up on pipe-bending and permanent fencing. The peak time when most activities shall be in action is during April and May.

Workforce	Job Description	Number
GECL's Management Team	Construction Manager, Assistants and Inspectors	20
Construction Contractor's Management Team	Site Manager, Construction Manager, Engineering Manager, HSE Team, Inspection Team and	20

TABLE 16.8:TYPICAL DIRECT GAS PIPELINE CONSTRUCTION WORKFORCELEVELS

⁶⁵ Taken from West Burton Gas Pipeline Environmental Statement (Table 10.3), EDF Energy (2006)



Workforce	Job Description	Number
	Departmental Staff	
	Fencing Crew, Operators and Supervisor	10
	Top-soil Stripping Team, Banksmen and Foreman	20
	Stringing Team and Supervisor	6
	Pipe Bending and Supervisor	6
	Crossing Team comprising of several sub contractors, Sheet Piling, Boring, etc	25
	Welding Team and Supervisor	25
Construction Contractor's	Pipe Coating Team and Supervisor	12
Workforce	Non-Destructive Testing Team and Supervisor	3
	Pipe Trenching Team, Banksmen and Supervisor	15
	Pipe Laying Team, Tie-in Crew, Banksmen and Supervisor	15
	Land Drainage Team and Supervisor	10
	Reinstatement Team, Fencing, Hedging, Wall Building, etc	20
	General Delivery, Fuel, Materials, etc	5

- 16.5.5 Overall, in terms of employment, the construction of the gas pipeline and associated AGI is expected to have a minor beneficial short-term impact on the local economy.
- 16.5.6 Temporary living accommodation will be required locally, such as Bed and Breakfasts, hotels, and self-catering facilities during the construction period. The requirements for temporary living accommodation and the likely associated use of local services by the workforce will contribute to the local economy, providing a moderate beneficial short-term impact.

Land Use

- 16.5.7 The land take required for the Development will affect those landowners who are farmers, through direct or indirect effects on their land during construction.
- 16.5.8 The direct effects will be confined to the location of the AGI, the working width and the site access points. Direct impacts to agricultural activities in these identified areas are unavoidable, and therefore there is a short-term effect on agricultural production. The land take for the proposed gas pipeline route may cause different levels of impact on production, but is expected to be mostly negligible as the construction activity is only expected to last one season. If there are adverse weather conditions reinstatement may be postponed to the following year to ensure optimum reinstatement.

Leisure / Recreation

16.5.9 The public roads / paths detailed in Table 5.1 will be directly affected by the construction of the gas pipeline.



16.5.10 The construction contract specification will oblige the construction contractor to ensure that a safe means of crossing the working width is available at all times. With this measure in place the disruption to the affected public roads / paths is considered negligible.

Operation

Local Economy

- 16.5.11 The gas pipeline and associated AGI will be remotely operated with any staff visiting for maintenance purposes likely to be based at GEC (or the CECL Power Station).
- 16.5.12 There is the potential for some maintenance work to be sourced locally, for example the work in connection with the reinstated hedgerows affected by the gas pipeline / landscaping at the AGI. Therefore, this maintenance work may provide specialist skilled employment for local personnel.
- 16.5.13 Therefore, overall the gas pipeline and associated AGI is likely to have a minor beneficial long-term impact on the local economy.

Land Use

- 16.5.14 Following construction, the working width and other affected land will be reinstated. A servitude will be secured from landowners along the gas pipeline route for the necessary rights for construction, which will include the right to take access for future inspection / maintenance activities. These activities will have a negligible impact on land use.
- 16.5.15 The operation of the new AGI will not affect the use of the existing AGI (which serves the existing CECL Power Station) and therefore there will be no impact on the current land use during operation.

Leisure / Recreation

16.5.16 No public roads / paths will be permanently affected by the gas pipeline and associated AGI. Furthermore, all such temporary effects will cease soon after completion of the construction / reinstatement operations. The operation of the gas pipeline and associated AGI is therefore expected to have no impact on leisure and recreation.

Decommissioning

- 16.5.17 Upon cessation of operation, the gas pipeline and associated AGI will be disconnected from the NTaS Number 5 Feeder pipeline. It is currently proposed that the gas pipeline would be left buried under ground. The gas pipeline will be decommissioned in accordance with prevailing best practice.
- 16.5.18 It is possible that upon decommissioning, the AGI would be dismantled and removed. Therefore, there may be a number of related impacts similar to those encountered during the construction of the AGI.

Local Economy

16.5.19 The removal of the AGI once operations have ceased may present opportunities for the local economy similar to those experienced during construction. However, these impacts are considered to be negligible.

Land Use

16.5.20 If the AGI was removed, the land would be reinstated to its former use and therefore there would be will be minor beneficial long-term impact on land use.

Leisure / Recreation



16.5.21 During the removal of the AGI, there would be negligible impacts on local facilities, leisure and recreational areas.

16.6 Mitigation Measures

Construction

- 16.6.1 The working width will be fenced off and no work will be carried out outside of these previously agreed boundaries to prevent any damage to adjacent land. Topsoil will be stripped and stacked separately within the working width for replacement on completion. The period of construction will be limited to one spring / summer season thereby minimising the loss of agricultural activity directly affected by the gas pipeline. However, if there are adverse weather conditions reinstatement may be postponed to the following year to ensure optimum reinstatement.
- 16.6.2 To minimise nuisance and disruption during the construction phase works, all public road crossings will be constructed in accordance with the best method applicable and in agreement with the relevant Local Highways Authority / Highways Agency. Details related to traffic management (and how this will be achieved) are provided in Section 14. In terms of the public paths affected, the construction contract specification will oblige the Construction Contractor to ensure that a safe means of crossing the working width is available at all times.

Operation

16.6.3 Helicopter flyovers will mainly be used to inspect the gas pipeline route. Onsite inspection / maintenance is also required, and workers will adhere to the terms of the servitude agreement to avoid any impact on land use at that particular time.

Decommissioning

- 16.6.4 Considering the negligible impact of the gas pipeline during decommissioning, no mitigation is considered to be necessary.
- 16.6.5 Mitigation of impacts associated with the removal of the AGI would be similar to those used during construction.

16.7 Assessment of Residual Impact

16.7.1 The residual impacts associated with the gas pipeline and associated AGI are not predicted to be significant at any of the identified sensitive receptors.

	Description	Nature of Impact	Geographic Scale
	'Local additional' procurement opportunities	Moderate Beneficial, Short Term	Local
Construction	Employment opportunities	Minor Beneficial, Short Term	Local
	Impact to land / agricultural activities	Negligible	Local
	Impact on public roads / paths	Negligible	Local
Operation	Employment opportunities / GECL community engagement	Minor Beneficial Long Term	Local
	Servitudes for inspection / maintenance activities	Negligible	Local

TABLE 16.9: SUMMARY OF RESIDUAL IMPACTS



	Use of land associated with the AGI	No Impact	Local
	Impact on public roads / paths	Negligible	Local
	Employment opportunities	Negligible	Local
Decommissioning	Impact to land / agricultural activities	Minor Beneficial Long Term	Local

16.8 Assessment of Cumulative Impact

- 16.8.1 Full discussion of Indirect / Secondary and Cumulative Impacts are assessed in Section 18.
- 16.8.2 In addition, it is important to note the wider long-term major positive socio-economic benefits which would be offered by InterGen / GECL following the overall combined development of GEC, the gas connection and the electrical connection.
- 16.8.3 These benefits would be realised through a number of activities, which would be formally agreed with the Local Authority, and could include the following:
 - Development of Relationships with local Further / Higher Education Institutions

The aim of developing these relationships would be to identify qualifications and potential sources of funding to support InterGen / GECL's continuous professional development of staff.

<u>Contribution to Local School's Curriculum</u>

InterGen / CECL currently hold workshops designed for primary school pupils. If links could be found with the Local School's curriculum, contributions to it could be made.

In addition, it could be possible to write and deliver a programme of workshops suitable for Key Stage 3 (for pupils aged between 11 and 14) which would follow on from the workshops designed for primary school children.

Furthermore, it could be possible to have further workshops suitable for Key Stage 4 (for pupils aged between 14 and 16) once pupils have selected their options. This may include involvement with Local Schools that have expertise in Technology and Engineering where vocational programmes could be designed for pupils that may benefits from work placement opportunities, work experience, and coaching and mentoring of apprentices.

Membership to a Sector Skills Council

As a member, InterGen / GECL could become responsible for designing qualifications relevant to the energy sector and mapping progression pathways.

 <u>Development of Public Relations Plan to Promote Community Investment /</u> <u>Involvement</u>

This could include a summary of existing staff training and development needs, and the opportunities available such that these are realised.

 Development of a Working Relationship with the National Skills Academy for <u>Construction</u>

The aim of developing this relationship would be to provide solutions for InterGen / GECL such that they could maximise training and development opportunities without jeopardising the construction of the overall development.

16.8.4 Therefore it is important to note that without any aspect of the overall combined development, it will not be possible for the above benefits to be realised.



SECTION 17

SAFETY



17 SAFETY

17.1 Introduction

- 17.1.1 Safety is of fundamental importance during every stage of the planning, routing, design, construction and subsequent operation of a high pressure gas pipeline. This Section provides a brief description of the appropriate safety considerations to ensure compliance with the requirements of the HSE and ensure the safe operation of the gas pipeline and associated AGI.
- 17.1.2 GECL will only select construction contractors with detailed experience of the design and construction of gas pipelines to UK Gas Industry Codes and Standards. The selection process will use safety as one of the main criteria to pre-qualify suitable contractors for the development of the gas pipeline and associated AGI.

17.2 Pipeline Routing and Design Criteria

- 17.2.1 Safety is one of the key factors considered in the choice of route for a gas pipeline. From an operational point of view it is clearly important that the gas pipeline is designed, built and tested in such a way that its integrity is not compromised during its life time. The objective is to ensure that if a failure were to occur then the consequences would be within set parameters which the HSE define in its "*broadly acceptable category*".
- 17.2.2 The HSE have been notified about the proposed gas pipeline and associated AGI, and will be issued with a list of technical data, and a Safety Evaluation Report if deemed necessary.
- 17.2.3 The gas pipeline and associated AGI will be designed and constructed in accordance with the latest editions of the following principal Codes of Practice, Standards, Recommendations, and Statutory Legislation, where appropriate:
 - Institute of Gas Engineers (IGE) Code IGE/TD/1 Edition 5: Steel Pipelines for High Pressure Gas Transmission⁶⁶;
 - The Pipelines Safety Regulations, 1996;
 - The Pressure Systems Safety Regulations, 2000;
 - The Construction (Design and Management) Regulations, 2007;
 - The Construction (Health, Safety and Welfare) Regulations, 1996;
 - The Gas Safety Management Regulations, 1996;
 - The Provision of Use and Work Equipment Regulations, 1998;
 - Control of Substances Hazardous to Health Regulations (COSHH), 2002;
 - Dangerous Substances and Explosive Atmosphere Regulations (2002);
 - The Noise at Work Regulations, 1989;
 - Manual Handling Guidance on Regulations 1992;
 - Institution of Gas Engineers Code IGE/TD/13: Off-takes and pressure-regulating installations for inlet pressures between 7 and 100 bar; and
 - ASME B 31.3: Process Piping.
- 17.2.4 All measures will be taken to ensure the long-term safety of the gas pipeline. During manufacture all gas pipeline and AGI components will be subjected to rigorous

⁶⁶ This is the code to which the majority of the UK's high pressure gas pipelines are designed, built and operated.



inspection and testing before being certified fit for use and incorporated into the gas pipeline and AGI. At road, rail and watercourse crossings and any other areas where additional protection might be required, heavier walled pipe will be installed.

- 17.2.5 During the design of the gas pipeline system, Hazard Identification (HAZID), Hazardous Conditions (HAZCON), and Hazards and Operability (HAZOP) Studies shall be conducted to ensure that all hazards in the design, construction and operation of the gas pipeline system are identified and mitigated.
- 17.2.6 The construction of the gas pipeline and associated AGI will be carried out to comply with the requirements of the Construction (Design and Management) Regulations 2007. Safe working practices will be developed for all aspects of construction. In addition, a detailed Project Safety Plan will be developed to ensure safety during construction and testing.
- 17.2.7 As part of the initial Outline Design of the gas pipeline system a Population Density Survey has been carried out in accordance with the requirements of IGE/TD/1. The survey demonstrates that the gas pipeline route will be classed as a Type R rural route in accordance with IGE/TD/1. A detailed Population Density Survey shall be carried out as part of the detailed design, utilising the latest information from census and route surveys once the detailed design has finalised the gas pipeline route.
- 17.2.8 Typical safety measures employed during and after construction of a gas pipeline and AGI consist of the following:
 - 100 per cent AUT inspection of all field welds (where AUT is not possible or practical, radiographic / phased array inspection may be required);
 - 100 per cent visual and Non-Destructive Testing (NDT) inspection of all welds;
 - 100 per cent coating holiday detection to ensure the integrity of the pipeline coating systems;
 - 100 per cent inspection of all pipe lowering and backfill operations;
 - Hydrostatic pressure testing of the completed pipeline to comply with the requirements of IGE/TD/1 (in the case of this gas pipeline the test pressure has been calculated to be 159.4 bar, which is 2.12 times the maximum pipeline operating pressure)
 - The use of 'pigging' operations to ensure that the gas pipeline dimensions are correct and that there are no dents or defects in the gas pipeline; and
 - The installation of an impressed current cathodic protection (CP) system and alternating current (AC) corrosion mitigation system which, together with the factory and site-applied anti-corrosion pipe coatings, will ensure that no external corrosion of the gas pipeline occurs.
- 17.2.9 During the operational life of the gas pipeline system, routine maintenance will be carried out to ensure its continued fitness for purpose and continued compliance with the requirements of IGE/TD/1 and the relevant Statutory Legislation. Typical maintenance measures will consist of:
 - Routine pipe to soil potential checks to ensure the impressed current CP system, which prevents external corrosion, is operating satisfactorily;
 - Routine inspection of the AC corrosion mitigation system to ensure it is operating satisfactorily;
 - Frequent routine surveillance of the gas pipeline route to mitigate the risk of inadvertent damage from third parties;



- Close Interval Potential (CIP) surveys to verify the effectiveness of the current CP system / AC corrosion mitigation system / pipe coatings and confirm the absence of pipe coating defects;
- Direct Current Voltage Gradient (DCVG) survey along the entire gas pipeline route to identify areas of pipe coating defects, if any;
- "Intelligent pigging" with an initial baseline run within a reasonable period of time following the commercial operation of GEC, followed by "intelligent pigging" inspection at 5 yearly intervals, unless it is otherwise confirmed that the inspection interval can be increased;
- Inclusion of the gas pipeline route in the National Linesearch Database so that all Third Party Utilities who use the Database will know of its existence;
- Installation of aerial markers and M4 markers at all field boundaries;
- Routine maintenance at the associated AGI; and
- The installation of CCTV and intruder detection alarms at the AGI.
- 17.2.10 These measures are designed to ensure the gas pipeline is designed, built and maintained to the highest of standards. This will afford a safe and efficient means of meeting the requirements of transporting natural gas safely from the existing National Grid National Transmission System Number 5 Feeder Pipeline to the GEC site.
- 17.2.11 The Emergency Plan for the gas pipeline will be prepared in accordance with the requirements of the Pipelines Safety Regulations 1996 by the Local Authority with the assistance of GECL. The Emergency Plan will detail all the measures to be followed in the event of an emergency on the gas pipeline system.
- 17.2.12 In addition, a Major Accident Prevention Document (MAPD) shall be prepared in accordance with the requirements of the Pipeline Safety Regulations 1996, which shall detail the risks associated with the operation of the gas pipeline and describe how the risks will be mitigated during its operational lifetime. The MAPD will be updated as often as deemed necessary during the operational lifetime of the gas pipeline.
- 17.2.13 In summary, the gas pipeline system would be operated and maintained to meet the requirements of the Pipelines Safety Regulations 1996, with the pressure pipe work within the overall AGI operated and maintained to meet the requirements of the Pressure Systems Safety Regulations 2000 and the requirements of IGE/TD/13.
- 17.2.14 As a result of the inherent in-built safety measures aforementioned, the high pressure gas pipeline and associated AGI will provide an acceptably safe means of transporting gas to the GEC site.

SECTION 18

INDIRECT / SECONDARY AND CUMULATIVE IMPACTS



18 INDIRECT / SECONDARY AND CUMULATIVE IMPACTS

18.1 Introduction

- 18.1.1 This Section assesses the likely indirect / secondary and cumulative impacts associated with the development of the gas pipeline and AGI. In undertaking this assessment, this Section draws on the assessment of direct impacts provided in Sections 9 to 16, in addition to information relating to other developments in the area.
- 18.1.2 Indirect / secondary impacts are impacts on the environment which are not a direct consequence of a proposed development, and are often produced far away from the site of a proposed development (e.g. when they are a consequence of an ancillary activity rather than a main development activity).
- 18.1.3 Cumulative impacts can be either:

• Type 1 Cumulative Impacts; or

These are combined effects of different types of impact on a single receptor. For example: noise, dust and visual impacts resulting from construction and operation of the development and other planned developments.

• Type 2 Cumulative Impacts.

These are impacts from other planned developments (considered together with the proposed development) which individually may be insignificant, but when considered together could form a significant cumulative impact. For example: combined traffic impacts from two or more proposed developments.

- 18.1.4 It should be noted that there is an inherent uncertainty in the range of cumulative impacts which may arise, although the assessment in this Section seeks to identify the likely significant effects in a qualitative manner.
- 18.1.5 For each of the identified indirect / secondary or cumulative impacts, an assessment has been undertaken to determine when the impact is significant or not significant based on the methodologies outlined in this ES.
- 18.1.6 In addition and as noted previously, GEC will be designed so as to be CCR, with space made available in the design to allow for the retrofitting of a carbon capture plant in the future. This is discussed further in the CCR Feasibility Study which has been submitted in support of the Section 36 Consent application for GEC (February 2010) (Available at http://www.gatewayenergycentre.co.uk/).
- 18.1.7 Based on this information this Section also assesses the likely significant environmental effects in respect of CCR and Carbon Capture and Storage (CCS). However, due to the likely delay in the implementation of CCS there is a greater level of uncertainty associated with the development details. Details which are known at this stage are set out in the CCR Feasibility Study.
- 18.1.8 In terms of Guidance on the assessment of CCR / CCS, the DECC November 2009 CCR Guidance⁶⁷ states that the reasons that an EIA is not required for CCS at the CCR are because

"given the inevitable uncertainty about the precise route [for the CO_2 pipeline] and what might by CCS stage in the future be the safety and environmental requirements, we do not envisage any formal environmental impact assessment (EIA) being undertaken. This will however need to be done when an operator wishes to fit CCS to the plant".

⁶⁷ Carbon Capture Readiness (CCR): A Guidance Note for Section 36 Electricity Act 1989 Consent Applications. URN 09D/810, DECC, November 2009.



18.2 Description of Developments Considered

- 18.2.1 The developments considered within this Section are:
 - GEC;
 - The new underground cable / over ground transmission line / combination of both to connect GEC to the HV National Grid System (electrical connection);
 - Potential CHP connections associated with the development of GEC; and
 - The LG Development.
- 18.2.2 It should be noted that as the preferred routes of the infrastructure connections (electrical connection and CHP connection) are still to be confirmed (and are the subject of ongoing assessment), it is not possible to detail the potential environmental impacts in a specific manner. However, information relating to the potential environmental impacts which may arise is provided so as to allow the likely significant effects to be assessed. In order to ensure that a robust assessment is made, where uncertainties exist the potential worst case indirect / secondary and cumulative impacts are discussed (i.e. in terms of the electricity connection, it is assumed that an entirely new overhead line is constructed).
- 18.2.3 Additionally, consents (in the form of wayleaves / leases / etc) will be sought from every land owner / occupier of land crossed by the infrastructure connections. This will permit the developer to enter onto land in order to construct, operate and maintain the infrastructure connections.

GEC

Information on GEC is provided in Section 4 of the ES which accompanied the Section 36 Consent application (Available at <u>http://www.gatewayenergycentre.co.uk/</u>). Brief details are provided in Section 4.2 of this ES.

Electrical Connection

- 18.2.4 Details of the most likely connection options are provided in Section 4.3. It is noted that these routes and substation locations are the subject of on going studies. Therefore, in light of the uncertainties surrounding the connection options, and in order to ensure that the likely significant effects are assessed, a worst case scenario is adopted (e.g. an entirely new overhead line is assessed).
- 18.2.5 It should be noted that should an underground electrical connection be used the potential impacts during construction and operation would be similar to those for the gas connection.

Construction of the Electrical Connection

- 18.2.6 In order to construct the over ground electrical connection, it will be necessary to construct new access tracks to each tower site. Accordingly, access for construction would be gained wherever feasible from existing main roads along the route of the over ground transmission line, with tracks being provided (wherever necessary) from the road network to the tower sites. The majority of the new tracks that would be needed would be temporary. However, there is the possibility that some may be retained.
- 18.2.7 Following construction of the access tracks, the foundations for each tower would be installed. At winch sites (tower sites which would be used for stringing the conductors between towers) a larger working area could be required on each side of the tower.
- 18.2.8 Excavations would be undertaken for each leg of the tower. The dimensions of the excavation would vary depending on the tower type constructed. A typical leg excavation would be between 64 to 125 m³. Some rock breaking might be needed to



achieve the required depths for the tower foundations depending on the ground conditions below.

- 18.2.9 Once the concrete has been poured and set, the excavations would be back-filled using the original materials, if suitable, and compacted in layers. Steelwork for each tower would be delivered to each tower location. The towers would be part assembled at ground level and the tower would be erected using a crane.
- 18.2.10 Once a number of sections of towers have been erected, conductors would be strung between them using a winch at one end of the section and a tensioner at the other end. First, a pilot wire would be flown by a helicopter through the section between the winch and the tensioner, placed in blocks on the suspension and tension towers and connected around the winch and tensioner at either end. Using the winch to pull the pilot wires, the conductor would then be drawn through the section under constant tension, allowing the conductor to be controlled without touching the ground.

CHP Infrastructure Connections

- 18.2.11 GEC may also require the installation of an on site CHP plant and off site CHP connections to the LG Development / other customers in the area. Further details on the CHP opportunities are presented in the CHP Assessment and the Supplementary CHP Assessment (Available at <u>http://www.gatewayenergycentre.co.uk/</u>).
- 18.2.12 The results of the two assessments are that the provision of CHP from a CCGT specifically designed for such a purpose would be technically feasible. The installation and operation of CHP infrastructure could therefore take place as part of the construction of GEC, and therefore assessment of the potential impacts is covered by the original ES submitted to accompany the Section 36 Consent application.
- 18.2.13 In terms of off site CHP infrastructure, it should be noted that the installation of these (e.g. installation of pipes) may fall to the CHP user, and also are considered similar to the impacts of installing / upgrading utility services. These types of works are not considered to have the potential for significant environmental effects within the LG Development, and therefore the off site CHP infrastructure works are excluded from this Section. The potential CHP infrastructure connections are therefore not considered further here.

The LG Development

18.2.14 GEC will be located on land within the LG Development. Details of the LG Development are provided in Section 4.5. A visualisation of the potential appearance and scale of the completed LG Development, including GEC, is available to view on:

http://www.londongateway.com/portal/page/portal/LONDON_GATEWAY/Home.

18.3 Developments Scoped Out of Assessment

Tilbury C CCGT

- 18.3.1 Tilbury C CCGT is located approximately 10 km south west of the GEC site. Information on the development is contained in the 'Environmental Impact Assessment Scoping Report – Proposed Tilbury C Combined Cycle Gas Turbine Power Station (RWE npower, July 2010)⁶⁸.
- 18.3.2 Tilbury C CCGT will have a main plant capacity of approximately 2000 MW. There may also be up to 400 MW of open cycle gas turbine (OCGT) capability. Tilbury CCGT is expected to achieve an efficiency of up to 59 per cent, in line with other new CCGT plants that are being developed with the higher efficiency the result of using

⁶⁸ The Tilbury C CCGT Scoping Study can be downloaded from:

http://infrastructure.independent.gov.uk/wp-content/uploads/2010/07/Tilbury-Scoping-Report.pdf



latest proven technology coupled with direct sea cooling. The OCGT plant will have a lower efficiency.

- 18.3.3 Tilbury C CCGT will be built to Best Available Techniques (BAT) and will be designed such that it is Carbon Capture Ready (CCR), such that it is configured to allow for the installation of Carbon Capture and Storage (CCS) technology in the future when this becomes technically available and commercially feasible.
- 18.3.4 The proposal also includes:
 - A new gas pipeline spur (approximately 3 km long) to connect Tilbury C to the existing NTaS Number 5 Feeder pipeline located to the east of the site; and,
 - The removal of the overhead lines which connect the EDF Networks substation in the north west of the site to the existing Tilbury B Power Station and the installation of underground cables to replace them.
- 18.3.5 However it is noted that these proposals are at an early stage and an application is yet to be made. Indeed the EIA is yet to be developed. Therefore Tilbury C CCGT is not considered to be committed development.
- 18.3.6 Tilbury C CCGT is therefore not considered further in this ES.

18.4 Indirect / Secondary Impact Assessment

18.4.1 The following sub-section identifies the main likely indirect / secondary impacts during the construction and operation of GEC and the electrical connection. It should be noted that indirect / secondary impacts have been considered on the basis that GEC would not operate without a gas connection and electrical connection. However, it could be more properly said that the gas connection (proposed gas pipeline and associated AGI) and electrical connections are indirect / secondary impacts of the development of GEC.

Indirect / Secondary Impacts – Construction

<u>GEC</u>

18.4.2 Table 18.1 summarises the likely indirect / secondary impacts of GEC.

Electrical Connection

- 18.4.3 Table 18.2 summarises the likely indirect / secondary impacts of an over ground electrical connection. Should an underground electrical connection be used the potential impacts would be similar to those for a gas connection.
- 18.4.4 It should be noted that an EIA has not yet been undertaken on the electrical connection. Therefore, the assessment is based on an understanding of the likely construction processes and assumptions on timing, duration and knowledge of baseline conditions.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Air Quality	During construction, there is the potential for impacts on air quality due to the nature of construction work (dust emissions arising from activities such as excavating / earth moving operations) and the additional traffic generated at this time.	Dust emissions will be managed and controlled through a Construction Environmental Management Plan (CEMP).	The residual impact is assessed as not significant.	CEMP.
Noise	During construction, there is the potential for noise impacts due to the nature of construction work (the use of noise generating plant) and the additional traffic generated at this time.	Construction plant and activities will be managed and controlled through a CEMP.	The residual impact is assessed as not significant.	CEMP.
Landscape and Visual	During construction, it is unlikely that there will be any impacts on Local Landscape Character due to construction. However, visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc.	Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.	Although mitigation measures will reduce potential visual impacts, it is likely that significant adverse landscape and visual impacts will arise during the construction phase. These impacts will be temporary in nature, and as such the residual impact is assessed as not significant.	CEMP.
Ecology	Due to the nature of site, and the program of remediation being undertaken, there is limited potential for impacts on ecological receptors.	A full program of remediation is being undertaken. Habitat surveys and protected species surveys will be undertaken prior to construction works commencing on site. Measures to introduce biodiversity enhancements on and off site will be identified.	The residual impact is assessed as not significant.	Remediation to take place as part of the LG Development / CEMP.

TABLE 18.1 – LIKELY IMPACTS OF THE CONSTRUCTION OF GEC

GEC Underground Gas Pipeline and Associated Above Ground Installation March 2011



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Water Quality	There is the potential for impacts on controlled waters to arise.	This impact will be managed and controlled through a CEMP and drainage strategy. No untreated water will be allowed to drain to controlled waters.	The residual impact is assessed as not significant.	CEMP.
Geology and Land Contamination	Due to the location of the site, and the historical land uses, there is a high potential for contamination to be present on site. However, there is a program of remediation being undertaken such that there is limited potential for existing contamination to be present on site prior to construction. Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages.	A full program of remediation is being undertaken. A risk assessment will be carried out prior to the commencement of construction. This will be managed and controlled through a CEMP. Procedures will be put in place to deal with any pollution spills.	The residual impact is assessed as not significant.	Remediation to take place as part of the LG Development / CEMP.
Traffic	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	Traffic will be managed and controlled through a Construction Transport Management Plan (CTMP).	The residual impact is assessed as not significant.	CEMP / CTMP.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Cultural Heritage	The cultural heritage in the area is well understood from the work undertaken for the LG Development. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood. A program of remediation being undertaken, and it is unlikely that there will be impacts on archaeological remains of significance during construction.	An assessment of the likelihood of archaeological remains of significance at the GEC site will be undertaken. If it is discovered that archaeological remains are present, an archaeological watching brief will be used during construction.	The residual impact is assessed as not significant.	CEMP.
Socio-Economics	Short term employment opportunities during the construction works.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Residual positive impact, albeit short term.	None Required.



TABLE 18.2 – LIKELY MPACTS OF THE ELECTRICAL CONNECTION CONSTRUCTION

Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Air Quality	During construction, there is the potential for impacts on air quality due to the nature of construction work (dust emissions arising from activities such as excavating / earth moving operations) and the additional traffic generated at this time.	Dust emissions will be managed and controlled through a CEMP.	The residual impact is assessed as not significant.	CEMP.
Noise	During construction, there is the potential for noise impacts due to the nature of construction work (the use of noise generating plant) and the additional traffic generated at this time.	Construction plant and activities will be managed and controlled through a CEMP.	Although all construction works will be undertaken in accordance with a CEMP, it is still likely that there may be minor, temporary local noise impacts at receptors located between 100 m and 300 m from the electrical connection route. The residual impact is assessed as not significant.	CEMP.
Landscape and Visual	Landscape impacts may arise on Local Landscape Character due to construction. Visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc.	Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.	Although mitigation measures will reduce landscape and visual impacts, and the magnitude of change would be minimized in areas where the electrical connection follows the existing over head transmission lines, it is likely that significant adverse landscape and visual impacts will arise during the construction phase. These impacts will be temporary in nature, and as such the residual impact is assessed as not significant.	CEMP.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Ecology	There is the potential for impacts on ecology to arise during the construction phase.	Habitat surveys and protected species surveys will be undertaken prior to construction works commencing on site. Areas where protected species are known to occur or areas with the potential to support ecological habitat will be avoided where possible, and removal of habitat will not occur during the breeding season.	Post-construction, any habitat which was removed will be re-instated. Therefore the residual impact is assessed as not significant.	CEMP.
Water Quality	There is the potential for impacts on controlled waters to arise. Water quality impacts may arise due to: surface run-off from the working width to the local watercourses; permeation of pollutants to local aquifers; increased sedimentation from open-cut crossings of streams and rivers; and, drainage of any under grounded parts of the electrical connection, its trenches and the working width to local watercourses or land for natural soak away.	This impact will be managed and controlled through a CEMP and drainage strategy. No untreated water will be allowed to drain to controlled waters. Any water crossings will be designed to reduce impacts on water bodies.	The residual impact is assessed as not significant.	CEMP.
Geology and Land Contamination	Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages. Unidentified 'hot spots' of pollution could be encountered.	This impact will be managed and controlled through a CEMP. Procedures will be put in place to deal with any pollution spills. Where hot spots are encountered, these will be remediated as necessary, in the appropriate manner.	The residual impact is assessed as not significant.	CEMP.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Land Use	Temporary loss of productive agricultural land.	The land used temporarily for laydown / occupation will be subject to protection measures during the construction works, and re-instated after. Productive agricultural land required will be minimised during electrical connection route selection.	All land will be re-instated post construction. Therefore, the residual impact is assessed as not significant.	CEMP.
Traffic	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	Traffic will be managed and controlled through a CTMP.	Construction traffic associated with the electrical connection will be less concentrated, as it will not be necessary for all vehicles accessing the working width to do so via one site entrance. Therefore this spreads the traffic across the proposed access network and limits the impact on any one particular road. However, this may affect the smaller local roads in the area, and result in potential nuisance for nearby residents. Due to the low level of construction traffic generation and existing traffic on these roads, the residual impact is assessed as not significant.	CEMP / CTMP.


Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Cultural Heritage	The cultural heritage in the area is well understood from the work undertaken for GEC and the LG Development. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood. It is unlikely that there will be impacts on archaeological remains of significance during construction.	An assessment of the likelihood of archaeological remains of significance along the proposed electrical connection route will be undertaken. If it is discovered that archaeological remains are present, the construction works will avoid such an area if possible. In addition, an archaeological watching brief will be used during construction.	The works will predominately be taking place in an environment that is subject to regular disturbance from agricultural activities. Any archaeological remains will be recorded and described as part of the archaeological watching brief. The residual impact is assessed as not significant.	CEMP.
Socio-Economics	Short term employment opportunities during the construction works.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Residual positive impact, albeit short term.	None Required.



Indirect / Secondary Impacts – Operation

GEC

- 18.4.5 It is expected that the main indirect / secondary impacts will be associated with air quality, noise and vibration, and landscape and visual.
- 18.4.6 Furthermore, it is expected that there will be negligible indirect / secondary impacts on ecology, geology, hydrogeology and land contamination, traffic, cultural heritage or socio-economics during operation of GEC.
- 18.4.7 Table 18.3 summarises the likely indirect / secondary impacts of GEC.

Electrical Connection

- 18.4.8 It is expected that the main indirect / secondary impacts will be associated with landscape and visual, and land use.
- 18.4.9 Furthermore, it is expected that there will be no indirect / secondary impacts on air quality, ground contamination, water resources, ecology, socio-economics and archaeology during operation of the over ground electrical connection.
- 18.4.10 Additionally, indirect / secondary impacts associated with traffic, noise, and electromagnetic fields are not considered significant, and therefore no mitigation is proposed. This is due to the following reasons:
 - *Traffic* Traffic will be limited to infrequent maintenance checks and emergency situations. Due to the infrequent nature of this trip, this is not considered to present an impact.
 - Noise There is the potential for low level noise associated with the over ground electrical connection, especially during damp / wet weather conditions. However, this is not expected to be a significant source of noise.
 - Electro-magnetic Fields There is the potential for electric and magnetic fields to be associated with the transmission lines. However, NGET and their predecessors have carried out extensive studies into the effects of these fields. The advice provided by NGET suggests that fields normally encountered by people living and working in their vicinity do not have an adverse health impact. Similarly it is advised that electric and magnetic fields are unlikely to have any impacts on farming or related activities.
- 18.4.11 Table 18.4 summarises the likely indirect / secondary impacts of an over ground electrical connection. Should an underground electrical connection be used the potential impacts would be similar to those for a gas connection.



TABLE 18.3 – LIKELY IMPACTS OF THE OPERATION OF GEC

Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Air Quality	During operation, there will be emissions of nitrogen oxides (NO _x).	GEC will be equipped with proven pollution control technology, which will limit the production of NO_x to a level below that required by the LCPD.	The residual impact is assessed as not significant.	By Design / Condition of Consent / Permit.
Noise	During operation, there may be continuous low level noise from GEC.	GEC will feature integral acoustic enclosures designed to ensure that noise levels generated are within the acceptable limits.	The residual impact is assessed as not significant.	By Design / Condition of Consent / Permit.
Landscape and Visual	It is likely that there will be landscape and visual impacts associated with GEC.	GEC will be situated on land within the LG Development. Materials and finishes will be selected to minimise maintenance requirements, and be sympathetic to the appearance of the surrounding LG Development.	Due to the likely use of the surrounding land, the likely appearance of GEC and the screening afforded by the LG Development, the residual impact is assessed as not significant.	By Design.



TABLE 18.4 – LIKELY IMPACTS OF THE ELECTRICAL CONNECTION OPERATION

Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Landscape and Visual	There will likely be landscape and visual impacts associated with the operation of an over ground electrical connection solution.	Careful route selection and consideration of alternatives, taking into account the guidance in Revised Draft EN-5 (on routing and over ground electrical connections versus those under grounded) and the Holford Rules. The landscape and visual impact of the over ground electrical connection will influence the final decision on the route selection.	In terms of an over ground electrical connection, it is likely that there will be significant adverse landscape impacts (where the proposed route diverges from the existing transmission lines) and visual impacts (primarily in areas where the route passes in relatively close proximity to residential receptors which have a view of the proposed route).	Careful route selection / consideration of alternatives. Legal agreement with the relevant landowners.
Land Use	Permanent occupation of agricultural land by transmission towers.	The landowner will be compensated by financial means for the permanent occupation of land.	It is not anticipated that the transmission towers will pose any threat to the viability of any farm on which they will be located. Therefore, the residual impact is assessed as not significant.	Legal agreement with the relevant landowners.



18.5	Cumulative Impact Assessment
18.5.1	The following Section identifies the main likely cumulative impacts during the construction and operation of GEC, the electrical connection and the LG Development.
	Cumulative Impacts – Construction
	GEC
18.5.2	Table 18.1 summarises the cumulative impacts resulting from the construction of GEC.
18.5.3	Electrical Connection
18.5.4	Table 18.2 summarises the cumulative impacts resulting from the construction of the electrical connection.
	LG Development
18.5.5	Table 18.5 summarises the likely cumulative impacts resulting from the construction of the LG Development.
	Cumulative Impacts – Operation
	GEC
18.5.6	Table 18.3 summarises the cumulative impacts resulting from the operation of GEC.
	Electrical Connection
18.5.7	Table 18.4 summarises the cumulative impacts resulting from the operation of the electrical connection.
	LG Development
18.5.8	Table 18.6 summarises the likely cumulative impacts resulting from the operation of the LG Development.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
		Outline Planning Application (OPA) Conditions ⁶⁹ 67 (wheel cleansing), 69 (management of dust) and 76 (CEMP).		
Air Quality	During construction, there is the potential for dust emissions to arise.	A Framework Construction Management Strategy (FCMS), which includes provisions for air quality mitigation during the construction period, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders.	Following implementation of the mitigation, LG Development ES states that there will be no residual impact.	OPA Conditions / Construction Management Strategy.
		All contractors employed at the LG Development will be required to submit detailed proposals which comply with the FCMS.		
Noise and Vibration	Noise generating plant will be used during the construction phase. LG Development ES states that there will be changes to the baseline noise levels at a number of identified receptors.	OPA Conditions 68 (control of noise) and 76 (CEMP). A Framework Construction Management Strategy (FCMS), which includes provisions for noise mitigation during the construction period, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders. All contractors employed at the LG Development will be required to	Following implementation of the mitigation, LG Development ES states that the residual impact will range between none (night time) and moderate adverse (day time).	OPA Conditions / Construction Management Strategy.
Noise and Vibration	LG Development ES states that there will be changes to the baseline noise levels at a number of identified receptors.	period, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders. All contractors employed at the LG Development will be required to submit detailed proposals which comply with the FCMS.	states that the residual impact will range between none (night time) and moderate adverse (day time).	

TABLE 18.5 – LIKELY IMPACTS OF THE LG DEVELOPMENT CONSTRUCTION

⁶⁹ The OPA Conditions for the LG Logistics and Business Park are attached in Appendix H.1. It should be noted that similar provisions exist in the HEO Conditions for the LG Port, and therefore the OPA Conditions are considered to reflect the general required conditions over the LG Development.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Landscape and Visual	Landscape and visual impacts associated with the construction of the LG Development.	Aside from the measures discussed in the LG Development ES, DP World – London Gateway are not required to provide any construction mitigation.	 The LG Development ES states that the residual impacts will vary depending on development and receptor. The findings are summarised here: LG Logistics and Business Park Landscape Impacts – Negligible / None to Moderate Adverse Visual Impacts – Negligible / None to Moderate Adverse Visual Impacts – Negligible / None to Moderate Adverse Landscape Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse Landscape Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse Visual Impacts – Negligible / None to Major Adverse 	Mitigation only as described in LG Development ES ⁷⁰ .

⁷⁰ 'OPA Environmental Statement' (Complied Version 2004)



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Ecology	Despite the nature of the site, and the program of clearance and remediation being undertaken, there is potential for impacts on ecological receptors.	 OPA Conditions 73 (Ecological Management and Mitigation Plans), 74 (Ecological Action Plans), 75 (Ecological Advisory Group) and 76 (CEMP). Habitat surveys (and, if required, protected species surveys) are being undertaken prior to construction works commencing on site. Measures to introduce biodiversity enhancements on and off site are being identified. Ecology clearance and relocation of species are being undertaken under licenses pursuant to the Conservation (Natural Habitats and c. Regulations 1994 (as amended). The Ecological Management and Mitigation Plans for the LG Port and Logistics and Business Park detail the proposed mitigation as a result of the LG Port HEO. 	 Following implementation of the mitigation, LG Development ES⁷¹ states that the residual impact will vary for individual ecological receptors, including: Plants – Negligible Badger – Negligible Bats – Minor Adverse Brown Hare – Minor Adverse Water Vole – Negligible to Moderate Adverse Birds – Minor Adverse Invertebrates – Negligible Reptiles / Amphibians – Minor Adverse 	OPA Conditions

⁷¹ 'OPA Environmental Statement' (Complied Version 2004)



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
		OPA Conditions 29 (temporary drainage scheme), 30 (monitoring of outfalls) and 76 (CEMP).		
Water Quality	There is the potential for impacts on controlled waters to arise.	A Framework Construction Management Strategy (FCMS), which includes provisions for drainage and water quality mitigation during the construction period, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders.	Following implementation of the mitigation, LG Development ES ⁷² states that the residual impacts may be minor adverse.	OPA Conditions / Construction Management Strategy.
		All contractors employed at the LG Development will be required to submit detailed proposals which comply with the FCMS.		

⁷² 'OPA Environmental Statement' (Complied Version 2004)



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Geology and Land Contamination	Due to the location of the LG Development site, and the historical land uses, there is a high potential for contamination to be present on site. Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages.	OPA Conditions 83 (earthworks), 84 (testing of imported materials), 89 (ground condition assessment and remediation scheme), 90 (stripping and storage of topsoil) and 76 (CEMP). A Framework Construction Management Strategy (FCMS), which includes provisions for ground contamination mitigation during the construction period, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders. All contractors employed at the LG Development will be required to submit detailed proposals which comply with the FCMS.	 Following implementation of the mitigation, LG Development ES⁷³ states that the residual impacts will be: None – on solid and drift geology; Minor Beneficial due to the reduction in residual contamination and reduction in potential for unexploded ordnance; and Minor Adverse due to generation of wastes that cannot be treated for use on site. 	OPA Conditions / Construction Management Strategy.

⁷³ 'OPA Environmental Statement' (Complied Version 2004)



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
		OPA Conditions 63 (parking management scheme), 61 (notification of preferred routes), 62 (preferred routes) and 76 (CEMP).		
Traffic	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	A Framework Construction Management Strategy (FCMS), which includes provisions construction traffic mitigation, has been submitted and approved by the Local Planning Authority in consultation with relevant stakeholders.	Due to the low levels of construction traffic expected, the residual impact is assessed as not significant.	OPA Conditions / Construction Management Strategy.
		All contractors employed at the LG Development will be required to submit detailed proposals which comply with the FCMS.		
Cultural Heritage	Due to the nature of the site, and its historical uses, there is potential for impacts on cultural heritage and archaeology.	OPA Conditions 91 (programme of archaeological work), 92 (archaeological method statement) and 76 (CEMP).	Following implementation of the mitigation, LG Development ES states that the residual impact will vary between none and minor adverse.	OPA Conditions
Socio-Economics	Short term employment opportunities during the construction works.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Residual positive impact, albeit short term.	None Required.



TABLE 18.6 – LIKELY IMPACTS OF THE LG DEVELOPMENT OPERATION

Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Air Quality	LG Development ES states there may be local air quality effects and greenhouse gas effects associated with the operation of the LG Development.	OPA Conditions 57. 58 and 59.	 Following implementation of the mitigation, LG Development ES states: No residual impacts to local air quality Moderate adverse impacts due to greenhouse gas effects 	OPA Conditions.
Noise and Vibration	LG Development ES states there may be traffic and industrial noise associated with the operation of the LG Development which will increase the baseline noise levels.	OPA Conditions 51, 54, 55, 70 and 71 all deal with requirements for acoustic barriers. OPA Condition 56 requires low noise surfacing on The Manorway (A1014). OPA Condition 72 restricts the placing of plant machinery on walls or roofs of buildings without prior approval.	 Following implementation of the mitigation, LG Development ES states the post mitigation residual impacts are an increase in the baseline noise levels. A summary of the residual impacts with and without the development of the proposed rail improvements associated with the LG Logistics and Business Park are: Impacts due to daytime operational traffic – not significant Impacts due to night time operational traffic – minimal adverse Impacts due to night time industrial activities – minor adverse 	OPA Conditions.



Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Landscape and Visual	Landscape and visual impacts associated with the operational LG Development.	The LG Development has been designed to minimize any landscape and visual impacts. OPA Conditions 77 (strategic landscaping), 78 (landscape scheme), 79 (landscape management plan), 80 (hard and soft landscape works), 81 (hard and soft landscape works), 82 (dead or damaged trees) and 83 (earthworks). OPA Condition 72 restricts the placing of plant machinery on walls or roofs of buildings without prior approval.	 Following implementation of the mitigation, LG Development ES states that the residual impacts will vary depending on development and receptor. The findings are summarised here: LG Logistics and Business Park Landscape Impacts – Moderate Benefit to Minor Adverse Visual Impacts – Minor Benefit to Minor Adverse Landscape Impacts – Minor Benefit to Minor Adverse Visual Impacts – Negligible / None to Minor Adverse Visual Impacts – Negligible / None to Minor Adverse 	OPA Conditions.



Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Ecology	Despite the nature of the site, and the program of clearance and remediation being undertaken, there is potential for impacts on ecological receptors.	OPA Conditions 73 (Ecological Management and Mitigation Plans), 74 (Ecological Action Plans), and 75 (Ecological Advisory Group). The Ecological Management and Mitigation Plans for the LG Port and Logistics and Business Park detail the proposed mitigation as a result of the LG Port HEO.	 Following implementation of the mitigation, LG Development ES states that the residual impact will vary for individual ecological receptors, including: Plants – Negligible Badger – Negligible to Minor Adverse Bats – Minor Adverse Water Vole – Minor Adverse Birds – Minor Adverse Invertebrates – None Reptiles / Amphibians – Negligible to Minor Beneficial 	OPA Conditions
Traffic	There may be large traffic volumes and movement associated with the operation of the LG Development. The potential for cumulative impacts of this operational traffic with GEC will be determined by the timing of the uptake of sites within the LG Development. Construction traffic associated with the GEC will be small in comparison to the total anticipated trip generation of the LG Development. However, it is feasible that the construction of GEC could be completed prior to the generation of any significant LG Development operational traffic.	OPA Conditions and Obligations include: highway improvement schemes; Travel Plans; Travel Plan Committee; and, Section 106 contributions towards highway mitigation.	There will be no significant cumulative impact on the local road network as a result of GEC and the LG Development.	OPA Conditions and Obligations.



Assessment of Cumulative Impacts

Type 1 Cumulative Impacts

18.5.9 The cumulative effects of different types of impact or impact interactions from the proposed developments on particular receptors have been considered both during the construction stage and the operation stage.

Type 1 Cumulative Impacts – Construction

- 18.5.10 It is considered that the greatest likelihood of impact interaction, and hence significant impacts, would occur during the construction phase. Indeed, construction impacts are generally more adverse (albeit on a temporary basis) than operational impacts.
- 18.5.11 Details of the construction phases of the developments are given in Table 18.7.



TABLE 18.7 – DETAILS OF CONSTRUCTION FOR THE VARIOUS DEVELOPMENTS

	Gas Connections	GEC	Electrical Connection	LG Development
Construction Activities	 Route preparation and installation of temporary access routes and crossings (if required) Top-soil stripping Trench excavation Pipe laying Backfilling Pressure testing Installation of off take AGI Restoration 	 Site preparation and enabling works Installation of plant, associated sub-buildings and the sub-station Commissioning 	 Route preparation and installation of temporary access routes and crossings (if required) Relocation of existing facilities (if required) Construction of tower foundations Erection of towers Conductor stringing Restoration 	 Site preparation and enabling works Construction of the LG Development and associated infrastructure
Construction Area / Corridor	Approximately 23 ha	11.3 ha (includes 4.7 ha of land reserved for CCR / CCS)	Approximately up to 36 ha	607 ha (approximately)
Programme Dates	Between 2013 and 2014	2012 to 2015	Between 2013 and 2015	2010 – Construction ongoing.
Duration	9 to 12 months	28 to 36 months	18 months	Ongoing



- 18.5.12 Rather than undertaking an assessment of the potential for significant impacts on each possible receptor, groups of sensitive receptors have been chosen which are likely to be the most sensitive to Type 1 Cumulative Impacts. The criteria for identifying those receptors which are considered likely to be sensitive has included existing land uses, proximity to construction works and likely duration of exposure to impacts.
- 18.5.13 For the purposes of the assessment, and in order to ensure that likely significant effects are assessed, a worst case scenario has been assumed, namely that receptors will be subject to construction impacts throughout the duration of the construction works. However, it is likely that construction of the gas pipeline (and also the electrical connection) would be in stages, and the construction activities would travel along the line of the route as sections are completed.
- 18.5.14 Table 18.8 presents the likely Type 1 Cumulative Impacts that may be felt during construction of the developments. However, there is the potential for some construction to occur at a later date. If this is the case the environmental impacts may continue for a longer time, but the cumulative impacts may be reduced.

Sensitive Receptor	2012	2013	2014	2015		
Nearby residential properties	D/N/V/T	D/N/V/T	D/N/V/T	Very minor impacts		
Adjacent commercial users	D/N/T	D/N/T	D/N/T	Very minor impacts		
Land owners	D/N/L/T	D/N/L/T	D/N/L/T	No impacts		
Protected species	D/N	D/N	D/N	No impacts		
Surface water / agricultural drainage systems	D / N / T	D / N / T	D / N / T	No impacts		
Agricultural land	D/N	D/N	D/N	No impacts		
D – Temporary, local, adverse dust impacts						
N – Temporary, local, adverse noise impacts						
V – Temporary, local, adverse visual impacts						
L – Temporary	loss of land					
T – Temporary	/, local, adverse tra	ffic impacts				

TABLE 18.8 – LIKELY TYPE 1 CUMULATIVE IMPACT INTERACTIONS DURINGCONSTRUCTION OF THE DEVELOPMENTS

- 18.5.15 As shown in Table 18.8, the majority of the impacts arise from activities such as: dust from plant and vehicles; noise and vibration for construction plant and vehicles; landscape and visual impact of the works; and passing HGVs.
- 18.5.16 However, as described in Section 18, a CEMP will be implemented during the construction phase of the gas pipeline and associated AGI, likely secured by an appropriate planning condition. As it is assumed that similar CEMPs will be in place for the other developments, a mechanism will be in place to minimise construction impacts 'at source' in order to reduce the likely impacts on surrounding receptors.
- 18.5.17 As a result, overall it is considered that any impact interactions occurring will generally be temporary and short term in nature. Furthermore these can be mitigated to a large extent by the control measures set out the appropriate CEMPs.



18.5.18 Therefore the likely Type 1 Cumulative Impacts predicted to occur during construction are likely to be not significant.

Type 1 Cumulative Impacts – Operation

- 18.5.19 Similar to the approach used above, rather than undertaking an assessment of the potential for significant impacts on each possible receptor, groups of receptors have been chosen which are considered likely to be the most sensitive to Type 1 Cumulative Impacts. In addition, for the purposes of the assessment a worst case scenario has been assumed, namely that receptors will be subject to all operational impacts.
- 18.5.20 Table 18.9 presents the likely Type 1 Cumulative Impacts that may be felt during the operation of the developments.

TABLE 18.9 – LIKELY TYPE 1 CUMULATIVE IMPACT INTERACTIONS DURING OPERATION OF THE DEVELOPMENTS

Sensitive Receptor	Operational Lifetime of Developments	
Nearby residential properties	V/T	
Adjacent commercial users	Т	
Land owners	L	
V -Visual impactsL -Permanent loss of landT -Traffic impacts		

18.5.21 The mitigation measures, as have been described previously, will reduce the likely Type 1 Cumulative Impacts during operation. Therefore the likely Type 1 Cumulative Impacts predicted to occur during operation are largely assessed to be not significant.

Type 2 Cumulative Impacts

18.5.22 An initial screening exercise was undertaken to identify which aspects of the environment may be subject to Type 2 Cumulative Impacts as a result of the construction and operation of the developments.

Type 2 Cumulative Impacts – Construction

18.5.23 Table 18.10 summarises the likely Type 2 Cumulative Impacts which could be encountered during construction. In addition, Table 18.10 summarises the proposed mitigation and determines the significance of the likely Type 2 Cumulative Impacts.

Type 2 Cumulative Impacts – Operation

18.5.24 Table 18.11 summarises the likely Type 2 Cumulative Impacts which could be encountered during operation. In addition, Table 18.11 summarises the proposed mitigation and determines the significance of the likely Type 2 Cumulative Impacts.



TABLE 18.10 – LIKELY TYPE 2 CUMULATIVE IMPACTS DURING CONSTRUCTION OF THE DEVELOPMENTS⁷⁴

Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Air Quality	During construction, there is the potential for dust emissions to arise. Dust impacts will be managed and controlled through a CEMP.	During construction, there is the potential for dust emissions to arise. Dust impacts will be managed and controlled through a CEMP.	During construction, there is the potential for dust emissions to arise. Dust impacts will be managed and controlled through a CEMP.	During construction, there is the potential for dust emissions to arise. Mitigation included in OPA Conditions and Construction Management Strategy (see Table 18.5 for details)	Cumulative impacts are likely to be insignificant. Mitigation as described.
Noise	Noise generating plant will be used during the construction phase. Construction plant and activities will be managed and controlled through a CEMP.	Noise generating plant will be used during the construction phase. Construction plant and activities will be managed and controlled through a CEMP.	Noise generating plant will be used during the construction phase. Construction plant and activities will be managed and controlled through a CEMP.	Noise generating plant will be used during the construction phase / changes in baseline noise levels at a number of sensitive receptors. Mitigation included in OPA Conditions and Construction Management Strategy (see Table 18.5 for details)	Cumulative impacts are likely to be insignificant. Mitigation as described.

⁷⁴ Reference should be made back to Tables 18.1, 18.2 and 18.5



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Landscape and Visual	Landscape impacts may arise on Local Landscape Character due to construction. Visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc. Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.	It is unlikely that there will be any impacts on the landscape character. It is likely that visual impacts will occur. Construction works will be screened by hoarding, where practical, to mitigate and landscape and visual impacts near to sensitive receptors.	Landscape impacts may arise on Local Landscape Character due to construction. Visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc. Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.	Landscape impacts vary from Negligible / None to Major Adverse. Visual impacts vary from Negligible / None to Major Adverse. Aside from the measures discussed in the LG Development ES, DP World – London Gateway are not required to provide construction mitigation.	Likely temporary significant adverse cumulative impacts during construction. Mitigation as described. These impacts will be temporary in nature, and as such the residual impact is assessed as not significant.
Ecology	There is the potential for impacts on ecology to arise during the construction phase. Habitat surveys and protected species surveys will be undertaken prior to construction works commencing on site. Areas where protected species are known to occur or areas with the potential to support ecological habitat will be avoided where possible, and removal of habitat will not occur during the breeding season.	Due to the nature of the site, and the program of clearance and remediation being undertaken, there is limited potential for impacts on ecological receptors. Habitat surveys (and, if required, protected species surveys) will be undertaken prior to construction works commencing on site. Measures to introduce biodiversity enhancements on and off site will be indentified.	There is the potential for impacts on ecology to arise during the construction phase. Habitat surveys and protected species surveys will be undertaken prior to construction works commencing on site. Areas where protected species are known to occur or areas with the potential to support ecological habitat will be avoided where possible, and removal of habitat will not occur during the breeding season.	Despite the nature of the site, and the program of clearance and remediation being undertaken, there is potential for impacts on ecological receptors. Mitigation included in OPA Conditions (see Table 18.5 for details).	Cumulative impacts are likely to be insignificant. Mitigation as described.



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Water Quality	There is the potential for impacts on controlled waters to arise. This impact will be managed and controlled through a CEMP and drainage strategy. No untreated water will be allowed to drain to controlled waters. Any water crossings will be designed to reduce impacts on water bodies.	There is the potential for impacts on controlled waters to arise. This impact will be managed and controlled through a CEMP and drainage strategy.	There is the potential for impacts on controlled waters to arise. This impact will be managed and controlled through a CEMP and drainage strategy. No untreated water will be allowed to drain to controlled waters. Any water crossings will be designed to reduce impacts on water bodies.	There is the potential for impacts on controlled waters to arise. Mitigation included in OPA Conditions and Construction Management Strategy (see Table 18.5 for details).	No cumulative impacts identified.

SECTION 18 INDIRECT / SECONDARY AND CUMULATIVE IMPACTS



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Geology, Hydrogeology and Land Contamination	Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages. This impact will be managed and controlled through a CEMP. Procedures will be put in place to deal with any pollution spills / hotspots encountered.	Due to the location of the site, and the historical land uses, there is a high potential for contamination to be present on site. Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages. A full program of remediation will be undertaken prior to the commencement of construction. A risk assessment will be carried out prior to the commencement of construction work on site. This impact will be managed and controlled through a CEMP. Procedures will be put in place to deal with any pollution spills.	Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages. This impact will be managed and controlled through a CEMP. Procedures will be put in place to deal with any pollution spills / hotspots encountered.	Due to the location of the LG Development site, and the historical land uses, there is a high potential for contamination to be present on site. Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of spillages. Mitigation included in OPA Conditions and Construction Management Strategy (see Table 18.5 for details).	No cumulative impacts identified.



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
	Temporary loss of productive agricultural land.		Temporary loss of productive agricultural land.		
Land Use	The land used temporarily for laydown / occupation will be subject to protection measures during the construction works, and re-instated after. Productive agricultural land required will be minimized during pipeline	No impacts anticipated.	The land used temporarily for laydown / occupation will be subject to protection measures during the construction works, and re-instated after. Productive agricultural land required will be minimized during pipeline	No impacts anticipated.	No cumulative impacts identified.
	route selection.		route selection.		
Traffic	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	Cumulative impacts are likely to be insignificant. Mitigation as described.
	Traffic will be managed and controlled through a CTMP.	Traffic will be managed and controlled through a CTMP.	Traffic will be managed and controlled through a CTMP.	Mitigation included in OPA Conditions (see Table 18.5 for details).	





Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Cultural Heritage	The cultural heritage in the area is well understood from the work undertaken for GEC and the LG Development. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood. It is unlikely that there will be impacts on archaeological remains of significance during construction. An assessment of the likelihood of archaeological remains of significance along the pipeline route will be undertaken and prior to construction, a plan of archaeological works will be developed in conjunction with the Essex County Archaeologist. If it is discovered that archaeological remains are present, the construction works will avoid such an area if possible. In addition, an archaeological watching brief will be used.	The cultural heritage in the area is well understood from the work undertaken for GEC and the LG Development. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood. It is unlikely that there will be any archaeological remains of significance. An assessment of the likelihood of archaeological remains of significance on the proposed site will be undertaken and prior to construction, a plan of archaeological works will be developed in conjunction with the Essex County Archaeologist. If it is discovered that archaeological watching brief will be used during construction.	The cultural heritage in the area is well understood from the work undertaken for GEC and the LG Development. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood. It is unlikely that there will be impacts on archaeological remains of significance during construction. An assessment of the likelihood of archaeological remains of significance along the pipeline route will be undertaken and prior to construction, a plan of archaeological works will be developed in conjunction with the Essex County Archaeologist. If it is discovered that archaeological remains are present, the construction works will avoid such an area if possible. In addition, an archaeological watching brief will be used.	Due to the nature of the site, and its historical uses, there is potential for impacts on cultural heritage and archaeology. Mitigation included in OPA Conditions and Construction Management Strategy (see Table 18.5 for details).	No cumulative impacts identified.

GEC Underground Gas Pipeline and Associated Above Ground Installation March 2011



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Socio-Economics	Short term employment opportunities during the construction works.	Short term employment opportunities during the construction works.	Short term employment opportunities during the construction works.	Short term employment opportunities during the construction works.	Positive cumulative impacts identified. No mitigation required.
	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	



TABLE 18.11 – LIKELY TYPE 2 CUMULATIVE IMPACTS DURING OPERATION OF THE DEVELOPMENTS⁷⁵

Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Air Quality	No impacts identified.	Emissions of nitrogen oxides (NO _x). Impacts will not be significant.	No impacts identified.	There may be local air quality effects and greenhouse gas effects associated with the operation of the LG Development. Mitigation included in OPA Conditions (see Table 18.6 for details).	Cumulative impacts are likely to be insignificant. Mitigation as described.
Noise	There is the potential for low level noise associated with the off take Above Ground Installation (AGI). High specification, low noise plant will be specified during the design phase. Regular maintenance checks will be carried out to ensure plant is working efficiently. Broken or faulty plant will be repaired or replaced.	During quiet periods, the operation of GEC may generate low level noise. Impacts will not be significant.	No impacts identified.	There may be traffic and industrial noise associated with the operation of the LG Development which will increase the baseline noise levels. Mitigation included in OPA Conditions (see Table 18.6 for details).	Cumulative impacts are likely to be insignificant. Mitigation as described.

⁷⁵ Reference should be made back to Tables 18.3, 18.4 and 18.6



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Landscape and Visual	It is likely that there will be landscape and visual impacts associated with the off take AGI. The landscape and visual impact of the off take AGI will be screened by planting to reduce visual impacts.	Limited Local Landscape Character Impact. It is likely that visual impacts will occur.	There will likely be landscape and visual impacts associated with the operation of an over ground electrical connection solution. The landscape and visual impact of the over ground electrical connection will influence the final decision on the route selection.	Landscape impacts vary from Moderate Benefit to Minor Adverse. Visual impacts vary from Minor Benefit to Moderate Adverse. The LG Development has been designed to minimize any landscape and visual impacts. Mitigation included in OPA Conditions (see Table 18.6 for details).	Likely significant adverse cumulative impacts during operation. Mitigation as described.
Ecology	No impacts identified.	Limited potential for ecological impacts.	No impacts identified.	Despite the nature of the site, and the program of clearance and remediation being undertaken, there is potential for impacts on ecological receptors. Mitigation included in OPA Conditions (see Table 18.6 for details).	Cumulative impacts are likely to be insignificant. Mitigation as described.
Water Quality	No impacts identified.	Increase in water consumption.	No impacts identified.	No impacts identified.	No cumulative impacts identified.
Geology, Hydrogeology and Land Contamination	No impacts identified.	Post-mitigation, there are no potential risks associated with the GEC site	No impacts identified.	The geology, hydrogeology and land contamination impacts are deemed to be positive due to the regeneration of a contaminated site.	No cumulative impacts identified.



Impact	Gas Connection	GEC	Electrical Connection	LG Development	Likely Cumulative Impacts and Mitigation
Land Use	Permanent occupation of agricultural land by off take AGI. Productive agricultural land required will be minimised.	No impacts identified.	Permanent occupation of agricultural land by transmission towers. Productive agricultural land required will be minimised.	No impacts identified.	Cumulative impacts are likely to be insignificant. Mitigation as described.
Traffic	No material impacts identified.	No material impacts identified.	No material impacts identified.	Large traffic volumes and movement associated with the operation of the Port and Business and Logistics Park. Mitigation included in OPA Conditions and Obligations (see Table 18.6 for details).	Following mitigation, cumulative impacts are likely to be insignificant.
Cultural Heritage	No impacts identified.	It is unlikely that there will be any archaeological remains of significance.	No impacts identified.	No impacts identified.	No cumulative impacts identified.
Socio-Economics	No impacts identified.	Employment opportunities during the operation of GEC. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	No impacts identified.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Positive cumulative impacts identified. No mitigation required.



18.6 Discussion of CCR / CCS Impacts

Carbon Capture Readiness / Carbon Capture and Storage

- 18.6.1 GEC will be designed so as to be CCR, with space made available in the design to allow for the retrofitting of a carbon capture plant in the future. This is discussed further in the CCR Feasibility Study which has been submitted in February 2010 in support of the Section 36 Consent application for GEC.
- 18.6.2 In accordance with the DECC November 2009 CCR Guidance it should be noted that:

"At the CCR stage, given the inevitable uncertainty about the precise route [for the CO_2 pipeline] and what might by the CCS stage in the future be the safety and environmental requirements, we do not envisage any formal environmental impact assessment being undertaken. This will however need to be done when an operator wishes to fit CCS to the plant".

Therefore:

"In order to retrofit CCS, Government has made it clear that a further Section 36 Consent application will be required, in addition to the consents and licences necessary for CO_2 transport and storage. At this point an EIA covering the impacts arising from CCS at the power station will be conducted".

18.6.3 Nevertheless, in addition to the high level assessment included in the CCR Feasibility Study, the likely significant environmental effects associated with the implementation of CCS at GEC are assessed. However, due to the likely delay in the implementation of CCS there is a greater level of uncertainty associated with the development details. Therefore, the following assessment is based on an understanding of the likely construction processes and assumptions on timing, duration and knowledge of baseline conditions.

CCR / CCS Impacts – Construction

18.6.4 Table 18.12 summarises the likely impacts resulting from the construction of a CCS solution at GEC.

CCR / CCS Impacts - Operation

18.6.5 Table 18.13 summarises the likely impacts resulting from the operation of a CCS solution at GEC.



TABLE 18.12 – LIKELY INDIRECT / SECONDARY IMPACTS OF GEC RESULTING FROM CCS SOLUTION CONSTRUCTION

Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Air Quality	During construction, there is the potential for dust emissions to arise.	Dust emissions will be managed and controlled through a CEMP.	The residual impact is assessed as not significant.	CEMP.
Noise	Noise generating plant will be used during the construction phase.	Construction plant and activities will be managed and controlled through a CEMP.	Although all construction works will be undertaken in accordance with a CEMP, it is still likely that there may be minor, temporary local noise impacts at receptors located between 100 m and 300 m from the construction site.	CEMP.
			The residual impact is assessed as not significant.	
Landscape and Visual	Landscape Impacts may arise on Local Landscape Character due to construction. Visual Impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc.	Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.	Although mitigation measures will reduce landscape and visual impacts, and the magnitude of change would be minimized due to the context of the development, it is likely that significant adverse landscape and visual impacts will arise during the construction phase. These impacts will be temporary in nature, and as such the residual impact is assessed as not significant.	CEMP.
Ecology	Due to the nature of the site, and the program of clearance and remediation being undertaken, there is limited potential for impacts on ecological receptors.	Habitat surveys (and, if required, protected species surveys) will be undertaken prior to construction works commencing on site. Measures to introduce biodiversity enhancements on and off site will be identified.	The residual impact is assessed as not significant.	CEMP.



Impact Type	Construction Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Water Quality	There is the potential for impacts on controlled waters to arise.	This impact will be managed and controlled through a CEMP and drainage strategy. No untreated water will be allowed to drain to controlled waters.	The residual impact is assessed as not significant.	CEMP.
Geology and Land Contamination	Due to the location of the site, and the historical land uses, there is a high potential for contamination to be present on site. Contaminants (such as fuels and concrete) will be used on site. There is the potential for land contamination to occur as a result of	A full program of remediation will be undertaken prior to the commencement of construction. A risk assessment will be carried out prior to the commencement of construction work on site. This impact will be managed and controlled through a CEMP.	The risk assessment will identify the risks on site, and the likelihood of significant impacts / significant harm. If necessary, further remediation and mitigation measures will be undertaken to reduce the likelihood of significant impacts / significant harm.	CEMP.
Traffic	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	Procedures will be put in place to deal with any pollution spills. Traffic will be managed and controlled through a CTMP. It is proposed that the construction of the CCS Solution will be similar in scale to the construction of GEC. Therefore the assessment of traffic importance in specific the provider of the construction.	The residual impact is assessed as not significant.	CEMP / CTMP.
Cultural Heritage	No impacts are anticipated.	As assessment of the likelihood of archaeological remains of significance on the proposed site will be undertaken. If it is discovered that archaeological remains are present, an archaeological watching brief will be used during construction.	Any archaeological remains will be recorded and described as part of the archaeological watching brief. The residual impact is assessed as not significant.	CEMP.



Impact Type	Construction Impacts	Mitigation	Residual Effects	<i>Means by which Mitigation will be Delivered</i>
Socio-Economics	Short term employment opportunities during the construction works.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Residual positive impact, albeit short term. The residual impact is assessed as not significant.	None Required.



TABLE 18.13 – LIKELY INDIRECT / SECONDARY IMPACTS OF GEC RESULTING FROM CCS SOLUTION OPERATION

Impact Type	Operation Impacts	Mitigation	Residual Effects	Means by which Mitigation will be Delivered
Noise	Continuous noise from the operation of the CCS Solution.	The CCS Solution will generate noise which will be a similar type and character to GEC. As with GEC, appropriate noise emissions limits will be set for any noise emitting elements to ensure that the standard and criteria for the GEC site are achieved for both the individual and cumulative development.	It is unlikely that there will be any significant residual impacts.	Condition of Consent.
Landscape and Visual	Limited landscape impacts. Visual impacts associated with the proposed CCS Solution.	The CCS Solution will be designed to minimize any landscape and visual impacts. Planting will be instated to screen low level impacts.	It is likely that there will be significant adverse visual impacts, primarily on close proximity residual receptors where they have views towards the CCS Solution. The views will be mainly of the tall elements of the development due to local screening.	Condition of Consent.
Traffic	Negligible traffic movements.	No mitigation proposed.	The residual impact is assessed as not significant.	Condition of Consent.