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# **GATEWAY ENERGY CENTRE UPDATED ENVIRONMENTAL STATEMENT FURTHER INFORMATION DOCUMENT**

### Revision History

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## **LIST OF ABBREVIATIONS**

ACC	Air Cooled Condenser
AGI	Above Ground Installation
AOD	Above Ordnance Datum
AQMA	Air Quality Management Area
AQS	Air Quality Standard
BAT	Best Available Techniques
BS	British Standard
CAA	Civil Aviation Authority
CCGT	Combined Cycle Gas Turbine
CCR	Carbon Capture Ready
CCS	Carbon Capture and Storage
CDM	Construction (Design and Management)
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Centre
CHP	Combined Heat and Power
CO <sub>2</sub>	carbon dioxide
COMAH	Control of Major Accident Hazards
COSHH	Control of Substances Hazards to Health
CTMP	Construction Transport Management Plan
dB	Decibels
DCS	Distributed Control System
DECC	Department of Energy and Climate Change
DEFRA	Department of Environment, Food and Rural Affairs
DEMP	Decommissioning Environmental Management Plan
DLN	Dry Low NO <sub>x</sub>
EIA	Environmental Impact Assessment
ER	Environmental Report
ES	Environmental Statement
ES FID	Environmental Statement Further Information Document
GCN	Great Crested Newts
GEC	Gateway Energy Centre
GECL	Gateway Energy Centre Limited
ha	Hectares
HDD	Horizontal Directional Drill
HEO	Harbour Empowerment Order
HGV	Heavy Good Vehicle

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HMP	Health Management Plan
HRSG	Heat Recovery Steam Generator
HSE	Health and Safety Executive
HV	High Voltage
IED	Industrial Emissions Directive
IEEM	Institute of Ecology and Environmental Management
LCPD	Large Combustion Plant Directive
LDO	Local Development Order
LHV	Lower Heating Value
LVIA	Landscape and Visual Impact Assessment
MHI	Mitsubishi Heavy Industries
MW	Megawatts
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	oxides of nitrogen
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptors
OAU	Oxford Archaeology Unit
OPC	Outline Planning Consent
OS	Ordnance Survey
PCB	Poly-Chlorinated Biphenyl
SAC	Special Area of Conservation
SO <sub>2</sub>	sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
TMP	Transport Management Plan
TTGDC	Thurrock Thames Gateway Development Corporation
USA	Updating and Screening Assessment
VER	Valued Ecological Receptors

## **SUMMARY OF THE UPDATED ENVIRONMENTAL STATEMENT FURTHER INFORMATION DOCUMENT**

### **Overview**

In February 2010, Gateway Energy Centre Limited (GECL) submitted an application for Consent under Section 36 of the Electricity Act 1989 (the Original Consent Application) to the Secretary of State for Energy and Climate Change (the Secretary of State) via the Department of Energy and Climate Change (DECC) to construct a 900 megawatt (MW) 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 1990 was also sought.

Amongst other documents / studies, the Original Consent Application was accompanied by an Environmental Statement (ES) (the February 2010 ES).

Following submission of the Original Consent Application, consultation responses were received and meetings were held with key consultees from which clarifications were sought and supplementary information requested. In December 2010, GECL submitted the clarifications and supplementary information to DECC.

Amongst other documents / studies, the supplementary information to support the Original Consent Application submitted in December 2010 included an Environmental Statement Further Information Document (ES FID) (the December 2010 ES FID).

On 4 August 2011, Consent under Section 36 of the Electricity Act 1989 and deemed planning permission under Section 90 of the Town and Country Planning Act 1990 was granted (the Original Consent).

### **Purpose of this Document**

This document is an Updated Environmental Statement Further Information Document (this August 2014 ES FID), which accompanies an application by GECL to the Secretary of State for the Original Consent to be varied so as to allow an increase in the permitted generation capacity of GEC from about 900 MW<sup>1</sup> to up to 1250 MW (the Variation Application). The increase in permitted generation capacity would enable the use of the latest turbine technologies, including the Alstom GT26 (Amended), General Electric (GE) Flex 50, Mitsubishi Heavy Industries (MHI) 701 F5 and the Siemens SGT5-8000H machines. InterGen has selected Siemens as its preferred supplier and is expected to install two SGT5-8000H machines on the GEC site.

The above mentioned latest turbine technologies have net efficiencies of around 60 per cent, and carbon dioxide (CO<sub>2</sub>) emissions of approximately 350 gCO<sub>2</sub>/kWh. In comparison, the earlier turbine technologies assumed in the February 2010 ES and the December 2010 ES FID had net efficiencies of around 55 per cent, and CO<sub>2</sub> emissions of approximately 390 gCO<sub>2</sub>/kWh.

To accompany the Variation Application, GECL is providing the following information to DECC:

- This August 2014 ES FID, which includes (amongst other items):
  - A comparison between the turbine technologies considered, and thus the rationale for proposing that the Original Consent is varied;

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<sup>1</sup> As per the Original Consent, a tolerance of up to 5% is permitted.

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- An assessment of whether the likely significant effects on the environment of the Proposed Development differ from those described in the February 2010 ES and the December 2010 ES FID; and,
- Where there is potential for the likely significant effects on the environment of the Proposed Development to differ from those described in the February 2010 ES and the December 2010 ES FID, an updated impact assessment has been undertaken. Where there is no potential for the likely significant effects to differ, an explanation and / or supporting information has been provided.
- An Updated Carbon Capture Readiness (CCR) Feasibility Study, and an accompanying report by Imperial College London.

Accordingly, this August 2014 ES FID (taken together with the February 2010 ES and December 2010 ES FID) assesses the likely significant effects, as described in Schedule 4 of the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 as amended by the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013, of the Proposed Development (being the generating station which GECL would be authorised to construct under the Original Consent if this is varied requested in the Variation Application).

**Structure of this Document**

This August 2014 ES FID follows the sequence of the February 2010 ES (and also December 2010 ES FID) providing additional and supplementary information / assessment where necessary. Where no changes or supplementary information / assessment are deemed necessary, this is stated at the beginning of the Section.

**Relationship between this August 2014 FID and the February 2010 ES and December 2010 ES FID**

The following Table identifies the information provided in this August 2014 ES FID, and its relationship with the information provided in the February 2010 ES and December 2010 ES FID. References to N / A (not applicable) signify that there are no changes to that Section.



**RELATIONSHIP BETWEEN THIS AUGUST 2014 FID AND THE FEBRUARY 2010 ES AND DECEMBER 2010 ES FID**

February 2010 ES	December 2010 ES FID	This August 2014 FID
Section 1 – Introduction	N / A	<p>This Section provides a Consenting History of GEC, the underground gas pipeline and associated AGI, and the HV underground electrical connection and associated extension of the existing Coryton Substation. The relevant environmental information is also described.</p> <p>This Section also refers to the statutory provisions for a Variation Application under Section 36C of the Electricity Act 1989, including the requirements under the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013.</p>
Section 2 – Rationale for Development	N / A	<p>The information in the February 2010 ES and December 2010 ES FID has been supplemented to reflect current national policy on the need for new energy infrastructure included in the National Policy Statements approved by Parliament in July 2011.</p> <p>This Section also provides the rationale for proposing that the Original Consent is varied.</p>
Section 3 – Planning Policy Context	This Section was updated to reflect the changes in energy and planning policy between February 2010 and December 2010.	<p>This Section has been updated to reflect the changes in energy and planning policy between December 2010 and August 2014. This includes discussion on the National Policy Statements (as approved by Parliament in July 2011), the National Planning Policy Framework (March 2012) and the approved Local Development Plan policies (December 2011).</p>
Section 4 – Description of GEC	This Section was updated to note that the Construction Environmental Management Plan (CEMP) will be submitted for approval to Thurrock Borough Council prior to commencement of construction works.	<p>This Section has been updated to provide a description of GEC (i.e. the Proposed Development) which GECL would be authorised to construct under the Original Consent if this is varied as per the Variation Application.</p>

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February 2010 ES	December 2010 ES FID	This August 2014 FID
Section 5 – Description of the GEC Site and its Surroundings	This Section was updated to provide information on the proposed Tilbury C CCGT power plant. However, this Section noted that the "localised effect from GEC and the separation distance (10 km) is considered to be too great to have any cumulative impacts, and therefore the development of Tilbury C [CCGT power plant] is not considered further".	This Section has been updated to provide information on the clearance, remediation and levelling works at the DP World® London Gateway® Port and London Gateway® Logistics Park.
Section 6 – Alternatives	This Section was updated to provide information on the proposals for the underground gas pipeline and associated AGI / HV underground electrical connection based on the information available at the time.	This Section has been updated to provide information on the applications and planning permissions for the underground gas pipeline and associated AGI / HV underground electrical connection and associated extension of the existing Coryton Substation.
Section 7 – Environmental Impact Assessment Methodology and Environmental Statement Content	N / A	This Section has been updated to provide details on the Environmental Impact Assessment (EIA) methodology and ES content for this August 2014 ES FID based on the requirements of the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 updated by Regulation 7 of the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013.
Section 8 – Stakeholder Consultations and Additional Studies	This Section provided a summary of the written responses to the Original Consent Application. The subsequent actions taken, and links to where the additional information or additional environmental assessment was presented was also provided.	This Section provides a summary of the pre-application consultation and responses in relation to the Variation Application. The subsequent actions taken, and links to where the additional information or additional environmental assessment is presented is also provided. This Section also provides summary information on the Updated CCR Feasibility Study.

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February 2010 ES	December 2010 ES FID	This August 2014 FID
Section 9 – Air Quality	This Section provided discussion on the impact of emissions of carbon dioxide (CO <sub>2</sub> ) from GEC on Thurrock's carbon footprint.	This Section has considered the potential effects of GEC on air quality, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.  In terms of air quality, an updated assessment has been provided.
Section 10 – Noise and Vibration	N / A	This Section has considered the potential noise and vibration effects of GEC, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.  In terms of noise and vibration, an updated assessment has been provided.
Section 11 – Landscape and Visual	This Section provided an update of the landscape and visual impact assessment (LVIA) presented in the February 2010 ES, including additional photomontages with the DP World® London Gateway® Port / London Gateway® Logistics Park, and also a supplementary LVIA to include additional receptors.	This Section has considered the potential landscape and visual effects of GEC, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
Section 12 – Ecology	This Section provided clarification on the impact on Site of Special Scientific Importance (SSSIs) due to air quality.	This Section has considered the potential effects of GEC on ecology, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.  Updated supporting assessment is provided in Section 9 (Air Quality) and Section 10 (Noise and Vibration).
Section 13 – Water Quality	This Section provided an update of the mitigation and monitoring measures to take account of the flood risks associated with the site.	This Section has considered the potential effects of GEC on water quality, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

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February 2010 ES	December 2010 ES FID	This August 2014 FID
Section 14 – Geology, Hydrology and Land Contamination	This Section provided an update of the clearance, remediation and levelling works at the DP World® London Gateway® Port and London Gateway® Logistics Park, and also an update of the mitigation and monitoring measures to take account of the Site Waste Management Plan (SWMP).	This Section has considered the potential effects of GEC on geology, hydrology and land contamination, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
Section 15 – Traffic and Infrastructure	This Section provided a summary of the Transport Report which provided assessment of the peak construction traffic impact (agreed with the Highways Agency and Thurrock Council (Highways) to present a worse case) upon a number of links and junctions within the traffic and infrastructure study area.	This Section has considered the potential effects of GEC on traffic and infrastructure, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
Section 16 – Cultural Heritage	This Section provided a summary of additional information presented in reports produced by the Oxford Archaeology Unit (OAU) for the DP World® London Gateway® Port and London Gateway® Logistics Park. This additional information did not change the assessment reported in the February 2010 ES.	This Section has considered the potential effects of GEC on cultural heritage, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
Section 17 – Socio-Economics	This Section presented a summary of the support planned by GECL for the local communities surrounding the GEC site.	This Section has considered the potential socio-economic effects of GEC, identifying whether the likely significant impacts on the environment from the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
Section 18 – Summary of Mitigation and Monitoring	N / A	This Section has provided a Consolidated Summary of Mitigation and Monitoring, including reference (wherever relevant) to the Conditions associated within the Original Consent.
Not Included	Section 19 – Cumulative Impacts.	This Section has been updated to provide information on the applications and planning permissions for the underground gas pipeline and associated AGI / HV underground electrical connection and associated extension of the existing Coryton Substation.

## **1 INTRODUCTION**

### **1.1 Consenting History**

#### ***Gateway Energy Centre***

- 1.1.1 In February 2010, Gateway Energy Centre Limited (GECL) submitted an application for Consent under Section 36 of the Electricity Act 1989 (the Original Consent Application) to the Secretary of State for Energy and Climate Change (the Secretary of State) via the Department of Energy and Climate Change (DECC) to construct a 900 megawatt (MW) 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 1990 was also sought.
- 1.1.2 In terms of environmental documentation / studies, the Original Consent Application was accompanied by:
- An Environmental Statement (ES) (the February 2010 ES) comprising:
    - A Non-Technical Summary;
    - Volume 1: Main Text;
    - Volume 2: Appendices; and,
    - Volume 3: Figures.
  - A Carbon Capture Readiness (CCR) Feasibility Study;
  - A Combined Heat and Power (CHP) Assessment; and,
  - A Design and Access Statement.
- 1.1.3 Following submission of the Original Consent Application, consultation responses were received and meetings were held with key consultees from which clarifications on the application were sought and supplementary information requested. In December 2010, GECL submitted the clarifications and supplementary information to DECC.
- 1.1.4 In terms of environmental documentation / studies, the supplementary information to support the Original Consent Application submitted in December 2010 included:
- An Environmental Statement Further Information Document (ES FID) (the December 2010 ES FID) comprising:
    - A Non-Technical Summary;
    - Volume 1: Main Text; and,
    - Volume 2: Figures.
  - A Supplementary Combined Heat and Power (CHP) Assessment;
  - A Supplementary Design and Access Statement;
  - A Supplementary Flood Risk Assessment; and,
  - A Transport Report.
- 1.1.5 On 4 August 2011, Consent under Section 36 of the Electricity Act 1989 and deemed planning permission under Section 90 of the Town and Country Planning Act 1990 was granted (the Original Consent).
- 1.1.6 The February 2010 ES, CCR Feasibility Study, CHP Assessment, December 2010 ES FID and Supplementary CHP Assessment are provided on the CD accompanying this Variation Application.
- #### ***Underground Gas Pipeline and Associated AGI***
- 1.1.7 In March 2011, GECL submitted an application for planning permission under the Town and Country Planning Act 1990 to Thurrock Thames Gateway Development Corporation

(TTGDC) to construct an underground gas pipeline and associated Above Ground Installation (AGI) required in connection with the development of GEC.

- 1.1.8 In terms of environmental documentation / studies, the application was accompanied by:
- An Environmental Statement (the March 2011 ES) comprising:
    - A Non-Technical Summary;
    - Volume 1: Main Text;
    - Volume 2: Appendices; and,
    - Volume 3: Figures.
  - A Design and Access Statement.
- 1.1.9 Following submission of the March 2011 application for planning permission under the Town and Country Planning Act 1990, consultation responses were received and meetings were held with key consultees from which clarifications on the application were sought and supplementary information requested. In July 2011, GECL submitted the clarifications and supplementary information to Thurrock Thames Gateway Development Corporation (TTGDC).
- 1.1.10 In terms of environmental documentation / studies, the supplementary information submitted in July 2011 included:
- An Environmental Statement Further Information Document (ES FID) (the July 2011 ES FID) comprising:
    - A Non-Technical Summary; and,
    - Volume 1: Main Text.
- 1.1.11 On 8 March 2012, planning permission (Reference: 11/50286/TTGFUL) for the underground gas pipeline and associated AGI was granted.
- 1.1.12 The March 2011 ES and July 2011 ES FID are provided on the CD accompanying this Variation Application.

***HV Underground Electrical Connection and Associated Extension of the Coryton Substation***

- 1.1.13 In November 2012, GECL submitted an application for planning permission under the Town and Country Planning Act 1990 to Thurrock Borough Council to construct a High Voltage (HV) underground electrical connection and associated extension of the existing Coryton Substation at the Coryton CCGT power plant required in connection with the development of GEC.
- 1.1.14 In terms of environmental documentation / studies, the application was accompanied by:
- An Environmental Report (ER) (the November 2012 ER) comprising:
    - Volume 1: Main Text; and
    - Volume 2: Ecological Surveys Volume.
- 1.1.15 On 27 February 2013, planning permission (Reference: 12/01085/FUL) for the HV underground electrical connection and associated extension of the existing Coryton Substation was granted.
- 1.1.16 The November 2012 ER is provided on the CD accompanying this Variation Application.

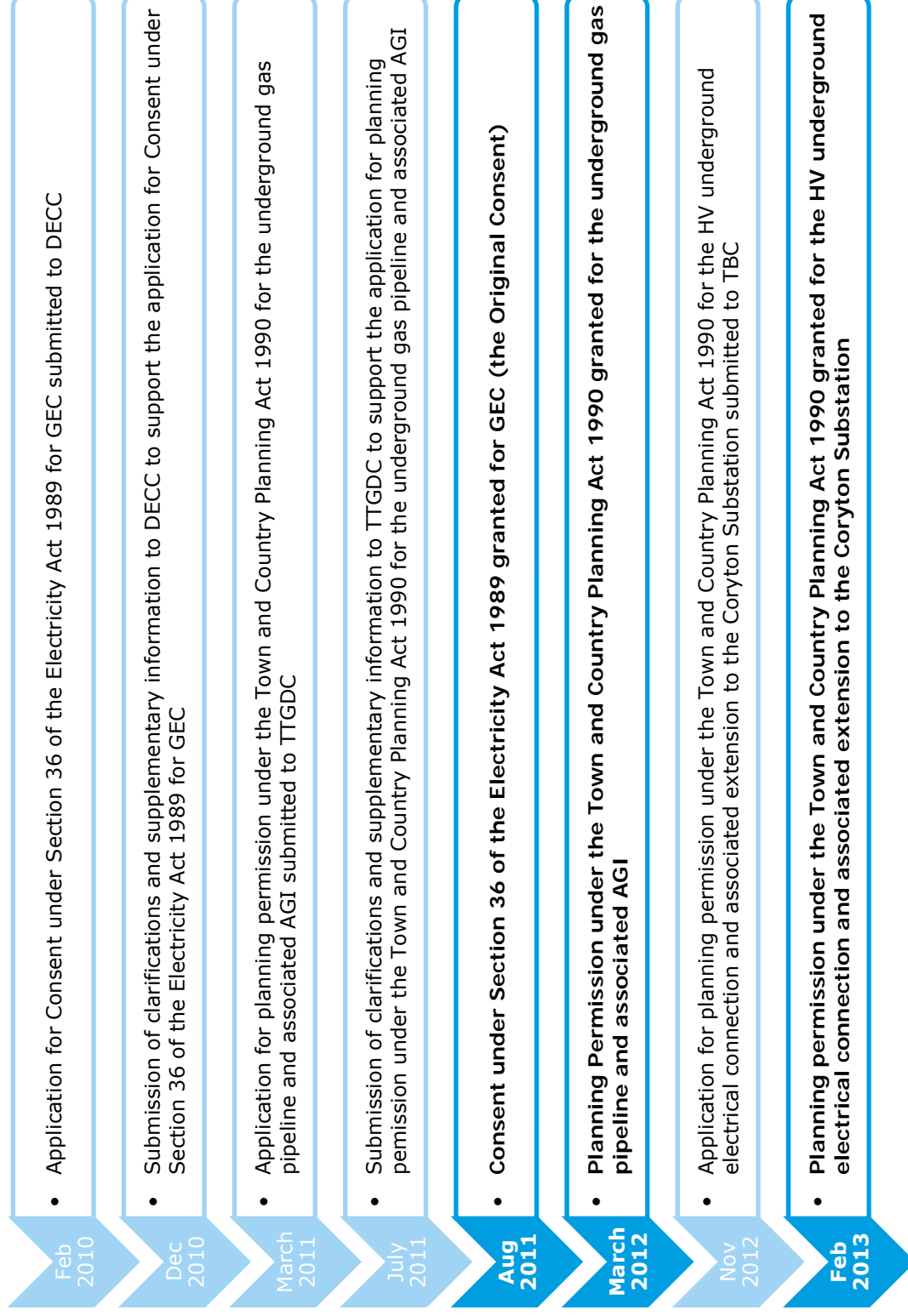
***Summary / Availability of Applications***

- 1.1.17 A summary of the above information is presented chronologically in the consenting history roadmap shown in Insert 1.1.

- 1.1.18 Electronic versions of the applications and associated documents can be downloaded free of charge from the GEC website:

[www.intergeneurope.com/development-projects/gateway-energy-centre](http://www.intergeneurope.com/development-projects/gateway-energy-centre)

**INSERT 1.1: CONSENTING HISTORY ROADMAP**





**1.2 Overview of the Consenting Process [Update to Section 1.4 of the February 2010 ES]**

- 1.2.1 On 4 August 2011, the Original Consent was granted.
- 1.2.2 GECL is submitting an application to the Secretary of State for the Original Consent to be varied so as to allow an increase in the permitted generation capacity of GEC from about 900 MW<sup>2</sup> to up to 1250 MW (the Variation Application). The increase in permitted generation capacity would enable the use of the latest turbine technologies, including the Alstom GT26 (Amended), General Electric (GE) Flex 50, Mitsubishi Heavy Industries (MHI) and the Siemens SGT5-8000H machines. InterGen has selected Siemens as its preferred supplier and is expected to install two SGT5-8000H machines on the GEC site.
- 1.2.3 To accompany the Variation Application, GECL is providing information to DECC including this Updated Environmental Statement Further Information Document (this August 2014 ES FID).

***Content of a Variation Application***

- 1.2.4 The required content of a Variation Application is detailed at Regulation 3 of the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013 (the Variation Regulations). This is provided in Table 1.1, along with a description of GECL's compliance.

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<sup>2</sup> As per the Original Consent, a tolerance of up to 5% is permitted.

**TABLE 1.1: REQUIRED CONTENT OF A VARIATION APPLICATION AS SET OUT IN REGULATION 3 OF THE VARIATION REGULATIONS**

<b>Reg. 3</b>	<b>Requirement</b>	<b>GECL's Compliance</b>
(1)	A variation application must –	
(a)	be made in writing;	Two hard copies and two CDs containing the Variation Application have been submitted to the Secretary of State.
(b)	describe the location of the proposed development by reference to a map;	The Covering Letter describes the location as "the Gateway Energy Centre (GEC) at The Manorway, Stanford-le-Hope, Essex (shown outlined red on FIGURE 63114-PBP-0025)". FIGURE 63114-PBP-0025 accompanies the Variation Application.
	state –	
(c)	(i) why it is proposed that the relevant section 36 consent should be varied;	Section 2 (Rationale for Development) of this August 2014 ES FID describes the rationale for proposing that the Original Consent is varied.
	(ii) what account has been taken of views expressed by persons who have been consulted by the applicant about the proposed variation;	Section 8 (Stakeholder Consultation and Additional Studies) provides a description of the pre-application consultation responses, and details the subsequent actions taken and a link to where the additional assessment or additional information is presented.
	include –	
(d)	(i) a draft of the variations which the applicant proposes should be made to the relevant section 36 consent; and	The draft of the proposed variation to the Original Consent is contained within the 'Section 36 Consent and Deemed Planning Permission Variation – tracked changes document' which accompanies this Variation Application.
	(ii) copies of any maps or plans not referred to in the relevant section 36 consent but which the applicant proposes that the relevant section 36 consent should refer to after it is varied; and	Not relevant to this Variation Application.
(e)	if the application relates to an offshore generating station, identify which of the bodies referred to in paragraph (b) of the definition of "relevant planning authority" in regulation 2(1) are, in the applicant's opinion, likely to have an interest in the variation application.	Not relevant to this Variation Application.
(2)	A variation application must include particulars of—	
(a)	the relevant section 36 consent, and, if that consent was not granted to the applicant, how the applicant has the benefit of that consent;	The Covering Letter states: "Gateway Energy Centre Limited (GECL) is applying to the Secretary of State for Energy and Climate Change (the Secretary of State) to vary both the consent (Ref: 01.08.10.04/462C) granted on 4 August 2011 under Section 36 of the Electricity Act 1989 (the Section 36 Consent) ..."  A copy of the Original Consent (i.e. the relevant Section 36 Consent (Ref: 01.08.10.04/462C)) accompanies the Variation Application.  The Original Consent was granted to the applicant, GECL.

<b>Reg. 3</b>	<b>Requirement</b>	<b>GECL's Compliance</b>
(b)	where the appropriate authority is the Secretary of State, any section 90 direction given on granting the relevant section 36 consent;	A copy of the relevant Section 90 Direction (Ref: 01.08.10.04/462C) accompanies the Variation Application.
(c)	any permit, licence, consent or other authorisation (other than the relevant section 36 consent) given in connection with the construction or operation of the proposed development (a "relevant authorisation"), including any variation or replacement of a relevant authorisation; and	This Variation Application is accompanied by: <ul style="list-style-type: none"> <li>The planning permission (Reference: 11/50286/TTGFUL) for the underground gas pipeline and associated AGI; and,</li> <li>The planning permission (Reference: 12/01085/FUL) for the HV underground electrical connection and associated extension to the Coryton Substation.</li> </ul>
(d)	any application that has been made for a relevant authorisation or variation of a relevant authorisation.	An application for an Environmental Permit under the Environmental Permitting (England and Wales) Regulations 2010 has been made to the Environment Agency. This application is currently being processed.
(3)	Where the appropriate authority is the Secretary of State and the applicant requests the Secretary of State to make a section 90 direction on varying the relevant section 36 consent, the application must –	
(a)	identify the section 90 development in respect of which that request is made and describe its location by reference to a map;	The Covering Letter states: "Gateway Energy Centre Limited (GECL) is applying to the Secretary of State for Energy and Climate Change (the Secretary of State) to vary both the consent (Ref: 01.08.10.04/462C) granted on 4 August 2011 under Section 36 of the Electricity Act 1989 (the Section 36 Consent) and the direction under section 90(2) of the Town and Country Planning Act 1990 (Section 90 Direction) to construct and operate a 900MW combined cycle gas turbine generating station, known as the Gateway Energy Centre (GEC) at The Manorway, Stanford-le-Hope, Essex (shown outlined red on FIGURE 63114-PBP-0025)". FIGURE 63114-PBP-0025 accompanies the Variation Application.
	state –	
	(i) why it is proposed that the direction should be made; and	Section 2 (Rationale for Development) of this August 2014 ES FID describes the rationale for proposing that the Original Consent (including the Direction) is varied.
(b)	(ii) what account has been taken of views expressed by persons who have been consulted by the applicant about the proposed direction; and	Section 8 (Stakeholder Consultation and Additional Studies) provides a description of the pre-application consultation responses, and details the subsequent actions taken and a link to where the additional assessment or additional information is presented.
	include –	
(c)	(i) a draft of the proposed direction; and	The draft of the proposed variation to the Section 90 Direction is contained within the 'Section 36 Consent and Deemed Planning Permission Variation – tracked changes document' which accompanies this Variation Application.

<i>Reg. 3</i>	<i>Requirement</i>	<i>GECL's Compliance</i>
	<p>(ii) copies of any maps or plans to which it is proposed that the section 90 direction should refer which are not—</p> <p>(aa) referred to in the relevant section 36 consent or any section 90 direction given on granting the relevant section 36 consent; or</p> <p>(bb) included in the application in accordance with paragraph (1)(d)(ii).</p>	Not relevant to this Variation Application.
(4)	<p>If, under the EIA Regulations as modified by Regulation 7, an Environmental Statement has been prepared, or is required to be prepared, in relation to the proposed development, the environmental statement must accompany the application.</p>	<p>The Environmental Statement for GEC comprises the following documents:</p> <ul style="list-style-type: none"> <li>• The February 2010 ES, including: <ul style="list-style-type: none"> <li>○ Non-Technical Summary;</li> <li>○ Volume 1: Main Text;</li> <li>○ Volume 2: Appendices; and,</li> <li>○ Volume 3: Figures.</li> </ul> </li> <li>• The December 2010 ES FID, including: <ul style="list-style-type: none"> <li>○ Non-Technical Summary;</li> <li>○ Volume 1: Main Text; and,</li> <li>○ Volume 2: Figures.</li> </ul> </li> <li>• This August 2014 ES FID, including: <ul style="list-style-type: none"> <li>○ Non-Technical Summary; and,</li> <li>○ Volume 1: Main Text.</li> </ul> </li> </ul>

### **1.3 Environmental Statement [Update to Section 1.5 of the February 2010 ES]**

#### ***Information to be provided in an Environmental Statement for Consent under Section 36 of the Electricity Act 1989***

- 1.3.1 When applying for Consent under Section 36 of the Electricity Act 1989, the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 (as amended) (the EIA Regulations) require an Environmental Impact Assessment (EIA) to be undertaken where the development of a thermal power plant with a heat output of 300 MWth, or more, is proposed.
- 1.3.2 As GEC exceeds this threshold, the Original Consent Application was accompanied by the February 2010 ES and the December 2010 ES FID.
- 1.3.3 When applying for Consent under Section 36 of the Electricity Act 1989 to be varied, the Variation Regulations provides that the EIA Regulations apply with certain specified modifications. In particular:
- Variation Regulation 2(1) states that the Proposed Development means “*the generating station, or extension of a generating station, which the applicant would be authorised to construct under a relevant Section 36 Consent if that consent were varied as requested in a variation application*”; and,
  - Variation Regulation 7(6) states that Part 2 of Schedule 4 of the EIA Regulations (Content of an Environment Statement) is to be read as requiring the Environment Statement to include:
    - [A description of] “*the main respects in which the applicant considers that the likely significant effects on the environment of the Proposed Development would differ from those described in any Environmental Statement prepared in connection with the relevant Section 36 Consent; and,*
    - *A Non-Technical Summary of the differences*”.

#### ***The Environmental Statement***

- 1.3.4 This August 2014 ES FID has been prepared to accompany the Variation Application.
- 1.3.5 This August 2014 ES FID is to be used in combination with the February 2010 ES and the December 2010 ES FID. In combination, these documents detail the results of a comprehensive and independent study of the likely significant effects on the environment of GEC (i.e. the Proposed Development), and the mitigation and monitoring measures designed to minimise any identified significant effects on the environment.

## **2 RATIONALE FOR DEVELOPMENT**

### **2.1 National Policy for Energy Infrastructure now covered under the Planning Act 2008 [Update to Section 2 of the February 2010 ES]**

- 2.1.1 Current national policy for energy infrastructure (including the construction / extension of a generating station with a generating capacity of more than 50 MW) is provided in the Overarching National Policy Statement (NPS) for Energy (EN-1) (NPS EN-1), and the technology-specific NPSs. These were approved by Parliament in July 2011. Used together, and in accordance with the provisions of Section 104 of the Planning Act 2008, the NPSs form the primary policy basis for decisions made by the Secretary of State for Energy and Climate Change on applications for energy infrastructure comprising Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008.
- 2.1.2 In terms of the applicability of the NPSs to applications under different consenting regimes, in a letter dated 9 November 2009 from the Department for Communities and Local Government it is stated (at paragraph 17) that: *"NPSs may specifically set out policies which will need to be taken into account by decision-makers other than the [Planning Inspectorate / Secretary of State for Energy and Climate Change]. ... LPAs and other decision-makers should therefore take account of those policies when determining applications for consent"*.
- 2.1.3 Accordingly, it is considered that the NPSs form a material consideration for the Proposed Development, and thus national policy for energy infrastructure in NPS EN-1 (in particular Part 3: 'The Need for New Nationally Significant Energy Infrastructure Projects') and the technology-specific NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (NPS EN-2) provides supplementary rationale for the development of GEC.

#### ***The Need for New Energy Infrastructure***

- 2.1.4 In particular, NPS EN-1 states (at paragraph 2.1.2) that: *"Energy is vital to economic prosperity and social well-being and so it is important to ensure that the UK has 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 scale"*.
- 2.1.5 Furthermore, NPS EN-1 states (at paragraphs 3.1.1 to 3.1.4) that:

*"The UK needs all the types of energy infrastructure covered by this NPS 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 [relevant authority] should therefore assess all applications for [...] consent for the types of infrastructure covered by the energy NPSs on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part.*

*The [relevant authority] should give substantial weight to the contribution which projects would make towards satisfying this need when considering applications for [...] consent"*.

#### ***The Need for New Fossil Fuelled Power Plant***

- 2.1.6 In terms of fossil-fuelled power plant, NPS EN-1 states (at paragraphs 3.6.1) that: *"fossil fuel power stations play a vital role in providing reliable electricity supplies: they can be operated flexibly in response to changes in supply and demand, and provide diversity in our energy mix. They will continue to play an important role in our energy mix as the UK makes the transition to a low carbon economy, and Government policy is that they must be constructed, and operate, in line with increasingly demanding climate change goals"*.
- 2.1.7 Furthermore, NPS EN-1 states (at paragraphs 3.6.8) that: *"a number of fossil fuel generating stations will have to close by the end of 2015. Although this capacity may be*

*replaced by new nuclear and renewable generating capacity in due course, it is clear that there must be some fossil fuel generating capacity to provide back-up for when generation from intermittent renewable generating capacity is low and to help with the transition to low carbon electricity generation. It is important that such fossil fuel generating capacity should become low carbon, through development of [Carbon Capture and Storage] CCS, in line with carbon reduction targets. Therefore, there is a need for CCR fossil fuel generating stations".*

***Rationale for the Development of GEC***

- 2.1.8 On 4 August 2011, DECC issued the Original Consent. The letter accompanying the Original Consent stated (at paragraph 6.1) the Secretary of State's view that: *"gas fired-power stations play a vital role in providing reliable electricity supplies; they can be operated flexibly in response to changes in supply and demand, and provide diversity in our energy mix. They will continue to play an important role in the energy mix as the UK makes the transition to a low carbon economy, and they must be constructed in line with climate change goals".*
- 2.1.9 On the matter of CCR, the Secretary of State's stated (at paragraph 6.6) that: *"the Company has demonstrated that the proposed Development, to the extent that CCR policy so requires, will be able to retrofit carbon capture plant and equipment as and when carbon capture and storage becomes both technically and economically viable".*
- 2.1.10 The Secretary of State's decision to grant the Original Consent, listed (at paragraph 8.1(viii)) particular issues he considered material to the merits of the application. Among these he referred to *"a continuing need for new electricity generating infrastructure (including, for the reasons given above, CCGT plant, provided that it is constructed so as to be "carbon capture ready)", given that some 22 GW of existing electricity generating capacity is scheduled to close by 2020".*

***Summary***

- 2.1.11 Based on this information, it is clear that fossil-fuelled power plants will play a key role in providing reliable and flexible capacity to provide back-up and maintain the safety margin<sup>3</sup>. The development of GEC is therefore an appropriate candidate to contribute to the need for new energy infrastructure.

**2.2 Rationale for Proposing that the Original Consent is Varied**

***CCGT Power Plant Technology Availability supporting Original Consent Application (as reported in the February 2010 ES and the December 2010 ES FID)***

- 2.2.1 In February 2010, GECL submitted their Original Consent Application to construct a 900 MW CCGT power plant. The Original Consent Application was based on CCGT power plant 'F-class' technology available at that time from the four main manufacturers. Namely: Alstom; GE; MHI; and, Siemens.
- 2.2.2 Accordingly, the electrical output of 900 MW within the Original Consent Application was based on the information shown in Table 2.1.

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<sup>3</sup> The safety margin is an amount of spare capacity which is able to accommodate unexpectedly high demand and mitigate risks (such as unexpected power plant closures or extreme weather events). The larger the difference between available electricity generating capacity and electricity demand (i.e. the larger the safety margin), the more resilient the system will be.

**TABLE 2.1: SUMMARY OF CCGT POWER PLANT F CLASS TECHNOLOGY OPTIONS (AVAILABLE IN FEBRUARY 2010 AT THE TIME OF THE ORIGINAL CONSENT APPLICATION)**

<i>Gas Turbine Manufacturer and Technology</i>	<i>Net Output for CCGT Power Plant configuration at Gateway Energy Centre (i.e. 2 Units)</i>
Alstom GT26	860 MW
GE 9FB.03	880 MW
MHI 701F4	935 MW
Siemens SGT5-4000F	870 MW

- 2.2.3 The Original Consent issued provided for a permitted generation capacity of GEC of about 900 MW with a tolerance of up to 5%. This would give a total permitted generation capacity of up to 945 MW. Therefore, the Original Consent allowed for the technology of each of the above manufacturers to be constructed at the GEC site.

***CCGT Power Plant Technology Evolution supporting the Variation Application***

Evolution Timeline

- 2.2.4 CCGT power plant 'F class' technology was introduced in the early 1990s, led by GE with the 9F. The average CCGT power plant output at that juncture for two CCGT units was around 800 MW. By the end of the 1990s Alstom, MHI and Siemens had joined GE in developing and installing 'F class' technology that could be used to provide efficiencies around 53 - 54% (based on the Lower Heating Value (LHV)). Thereafter, the manufacturers continued to evolve and improve their 'F class' technology. As a consequence, the performance of the CCGT power plants based on 'F class' technology gradually increased to provide efficiencies around 55 - 56% (based on the LHV) and electrical outputs as per Table 2.1.
- 2.2.5 Over the last two years the key manufacturers of large scale gas turbines have each launched new improved turbine technologies that provide efficiencies around approximately 60% (based on the LHV) and higher electrical outputs. These are set out in Table 2.2. Such details were not available in February 2010, at the time of the Original Consent Application.

**TABLE 2.2: RECENTLY LAUNCHED NEW IMPROVED TURBINE TECHNOLOGIES**

<i>Gas Turbine Manufacturer and Technology</i>	<i>Approximate Net Output for CCGT Power Plant Configuration at Gateway Energy Centre<sup>4</sup> (i.e. 2 Units)</i>
Alstom GT26 (Amended)	1000 MW
GE Flex 50	1200 MW
MHI 701F5	935 MW
Siemens SGT5-8000H	1155 MW

New Turbine Technology Benefits

- 2.2.6 The new turbine technologies are designed to be more efficient than the older 'F class' technologies and address changing market conditions. In particular, the new turbine technologies:

<sup>4</sup> This is the average output, and does not reflect ISO Conditions at the GEC site. The value stated is for indicative purposes only.



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- Improve efficiencies from around 55 – 56% (based on the LHV) to around 60% (based on the LHV). This lowers CO<sub>2</sub> emissions and minimises the cost of gas fired electricity generation. For example, increasing the efficiencies from 55% (reported in the February 2010 ES / December 2010 ES FID) to 60% means that for every MWh of electricity produced, 30kg of CO<sub>2</sub> will be saved;
- Have more flexible operations with low load running, and are able to frequently start and stop to support wind generation as its deployment increases in the UK. For example, when there is sufficient wind generation, CCGT power plants are turned down or off and when there is no wind generation CCGT power plants are turned up or on; and,
- Are designed to be more reliable to help contribute to security of electricity supply.

Gateway Energy Centre: Adoption of New Turbine Technology

- 2.2.7 As a result of the turbine technology improvements and the related key benefits to the UK, as set out above, GECL intends to adopt new turbine technology.
- 2.2.8 In particular, GECL has selected Siemens as its preferred supplier and is expected to install two SGT5-8000H machines on the GEC site. Utilising Air Cooled Condensers (ACC) and operating at a local ambient conditions (not the ISO conditions used as a basis for the performance in Table 2.2), GEC is expected to be able to generate up to 1250 MW at an efficiency of 59.7%.
- 2.2.9 Additionally, allowing an increase in the permitted generation capacity of GEC allows for some improvements in Siemens turbine technology as it continues to further evolve. This is all to be achieved without changing the physical size and appearance of the GEC from what was envisaged in Original Consent Application, as described in the February 2010 and December 2010 ES FID.
- 2.2.10 Allowing an increase in the permitted generation capacity at GEC (alongside the associated performance improvement) will ensure GEC remains commercially viable and does not fall behind competitor projects.

### **3 PLANNING POLICY CONTEXT**

#### **3.1 Introduction**

3.1.1 This Section has been prepared by Dalton Warner Davis.

#### **3.2 Changes to Planning Policy and Other Planning Issues since December 2010**

3.2.1 Since the preparation of the February 2010 ES and the December 2010 ES FID there have been some further changes in energy and planning policy as summarised below:

- On 18.7.11, Parliament approved six National Policy Statements (NPSs) for energy infrastructure; on 19.7.11, the Secretary of State for Energy and Climate Change designated the NPSs under Section 5 of the Planning Act 2008 (PA 2008).
- On 27.3.12, the National Planning Policy Framework (NPPF) was published by the Department for Communities and Local Government (DCLG) as guidance for local planning authorities (LPAs) and decision makers, both in respect of drawing up plans and making decisions about planning applications; the NPPF also lists documents replaced by the NPPF.
- On 21.12.11, Thurrock Borough Council (the Council) adopted its Core Strategy and Policies for Management of Development. On 1.8.13 the Council submitted its Core Strategy and Policies for Management of Development Focused Review – Consistency with National Planning Policy Framework to the Secretary of State for independent examination. On 12.2.14, the Cabinet authorised the preparation of a new Local Plan for Thurrock. Following the examination hearing sessions on 8.4.14, the Council proposed some main modifications on which it has invited representations between 25.7.14 and 5.9.14 (<https://www.thurrock.gov.uk/core-strategy-local-plan/focused-review-consistency-with-national-planning-policy-framework>).
- On 6.12.12, the Secretary of State for Communities and Local Government introduced the Regional Strategy (RS) for the East of England (Revocation) Order 2012 which came into force on 3.1.13. The Order revoked the Regional Strategy for the East of England (2008) and all directions preserving policies contained in structure plans in the corresponding area; the RS is no longer part of the development plan and is therefore not considered further.
- On 4.11.13, at an extraordinary meeting, the Council considered progress on the London Gateway® Logistics Park, at which it agreed to make a Local Development Order (LDO), to simplify the consenting regime and to speed up the delivery of the London Gateway® Logistics Park. The LDO excludes the GEC site and is therefore not considered further.
- On 6.3.14, the DCLG launched its Planning Practice Guidance website <http://planningguidance.planningportal.gov.uk>.

3.2.2 The following parts of this Section explain the above changes in respect of the NPSs, the NPPF the Core Strategy (since the submission of the ES FID December 2010) and Planning Practice Guidance to the extent that this is relevant to the Proposed Development.

#### **3.3 National Planning Policy Framework 2012**

3.3.1 The NPPF, which came into effect on 27.3.12 sets out the Government's planning policies for England and how they are to be applied; Annex 3 lists policy documents revoked and replaced by the NPPF. The NPPF restates the legal position that planning law requires that applications for planning permission must be determined in accordance with the development plan (section 38(6) PCPA and section 70(2) TCPA 1990) unless material considerations indicate otherwise. The NPPF must be taken into account in plan making and is a material consideration in planning decisions (paragraph 2).

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- 3.3.2 There are no specific policies for NSIPs in the NPPF. Such applications are to be determined in accordance with the Planning Act 2008 and relevant NPSs. NPSs “*form part of the overall framework of national planning policy and are a material consideration in decisions on planning applications*” (paragraph 3).
- 3.3.3 On the matter of achieving sustainable development, it is stated that “*policies in paragraphs 18 to 219 taken as a whole, constitute the Government’s view of what sustainable development in England means in practice for the planning system*” (paragraph 6). The three dimensions to sustainable development are defined as “*economic, social and environmental*”; the economic role refers to building a strong, responsive, competitive economy, including the provision of infrastructure; the environmental role includes moving to a low carbon economy; low carbon technologies are defined as those that can help reduce emissions, compared to conventional use of fossil fuels (paragraph 7, Annex 2).
- 3.3.4 The NPPF constitutes guidance for LPAs and decision takers, both in respect of plan preparation and as a material consideration in determining applications (paragraph 13). There is a presumption in favour of sustainable development, which means LPA’s approving development without delay where it accords with the development plan. In cases where the development plan is absent, silent or out of date, permission should be granted unless adverse impacts would significantly / demonstrably outweigh the benefits when assessed against policies in the NPPF, taken as a whole or if specific policies indicate development should be restricted, e.g. sites protected under the Birds and Habitats Directives (paragraph 119), Sites of Special Scientific Interest (SSSI), land designated as Green Belt (paragraph 14, footnote 9).
- 3.3.5 Among twelve core planning principles, these selected matters are relevant to this Application: (paragraph 17):
- development should be genuinely plan led;
  - proactively drive and support economic development to deliver, among others, “*infrastructure*” that the country needs;
  - always seek to secure high quality design and a good standard of amenity;
  - promote vitality of the main urban areas while protecting Green Belt around them;
  - support the transition to a low carbon future in a changing climate, taking full account of flood risk and encouraging the reuse of existing resources;
  - contribute to conserving and enhancing the natural environment and reducing pollution;
  - encourage the effective use of land that has been previously developed;
  - conserve heritage assets appropriate to their significance; and,
  - focus significant development in locations which are / can be made sustainable.
- 3.3.6 Building a strong competitive economy is to be achieved by the following:
- securing economic growth to create jobs and prosperity, building on the country’s inherent strengths and meeting the twin challenges of global competition and a low carbon future (paragraph 18);
  - the planning system doing everything it can to support / encourage sustainable economic growth (paragraph 19); and
  - LPAs planning proactively to meet the development needs of business (paragraph 20).
- 3.3.7 The fundamental aim of Green Belt is to keep land permanently open; the essential characteristics of Green Belt are its openness and permanence (paragraphs 79 / 80):

*"As with previous Green Belt policy, inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances"* (paragraph 87).

However *"Certain...forms of development are also not inappropriate in Green Belt provided they preserve the openness of the Green Belt and do not conflict with the purposes of including land in Green Belt"* (paragraph 90). This category includes engineering operations.

3.3.8 Other policies relevant to the achievement of sustainable development concern:

- meeting the challenge of climate change, flooding and coastal change (paragraphs 93-108);
- conserving and enhancing the natural environment (paragraphs 109-125); and,
- conserving and enhancing the historic environment (paragraphs 126-141).

These items are considered briefly below.

3.3.9 Among its many roles, planning is required to support the delivery of *"renewable and low carbon energy and associated infrastructure"*, which is central to the economic, social and environmental dimensions of sustainable development (paragraph 93). LPA's should have a positive strategy to maximise renewable / low carbon energy and should consider identifying suitable areas (paragraph 97). When determining applications, LPA's should *"not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy"* (NPPF, 98).

3.3.10 On the matter of flood risk, there is advice that *"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere"* and is noted that NPPF Technical Guidance on flood risk sets out how the policy should be implemented (paragraph 100, footnote 19). The NPPF explains that a Sequential Test should first be applied to steer new development to areas with the lowest probability of flooding (paragraph 101); however, if, following application of the Sequential Test it is not possible, consistent with wider sustainability objectives to locate development in zones with a lower probability of flooding, the Exception Test can be applied if appropriate (paragraph 102). This requires that the development must provide wider sustainability benefits to the community which outweigh flood risk, while demonstrating that the development will be safe for its lifetime, taking account of the vulnerability of its uses without increasing flood risk elsewhere (paragraph 102).

3.3.11 The Technical Guidance to the NPPF was archived and replaced by the New Planning Practice Guidance (PPG) launched on 6.3.14. The PPG on Flood Risk includes Table 2 : Flood Risk Vulnerability Classification which defines essential utility infrastructure as that *"which has to located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations...."*

3.3.12 On the matter of conserving and enhancing the natural environment, the planning system is required to contribute to and enhance the natural and local environment; correspondingly, in meeting development needs, the aim in plans should be to, among others, minimise pollution and other adverse effects on the local / natural environment, allocate land for development with the least environmental / amenity value, encourage its effective use by re-using land which has been previously developed, seek to protect wildlife and distinguish between the hierarchy of designated sites so that protection is commensurate with their status (paragraphs 109 – 113) and when determining applications, LPAs should aim to conserve and enhance biodiversity (paragraph 118).

3.3.13 With regard to the historic environment, LPAs should adopt a positive strategy for the conservation and enjoyment of the historic environment, while in determining applications, the level of detail required should be *"proportionate to the assets"* importance (paragraph 128).

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- 3.3.14 There is further advice on the matter of using a proportionate evidence base, such that in plan making, associated with business, LPA's *"should have a clear understanding of business needs within the economic markets operating in and across their area"* (paragraph 160). On the matter of infrastructure, LPAs should assess the quality and capacity of infrastructure such as "energy (including heat)", while taking *"account of the need for strategic infrastructure including nationally significant infrastructure within their areas"* (paragraph 162).
- 3.3.15 Among the documents revoked and replaced by the NPPF in Annex 3 were the following, which were referred to variously in the February 2010 ES and the December 2010 ES FID:
- Planning Policy Statement: Delivering Sustainable Development (31 January 2005)
  - Planning Policy Statement: Planning and Climate Change – Supplement to Planning Policy Statement 1 (17 December 2007)
  - Planning Policy Guidance 2: Green Belts (24 January 1995)
  - Planning Policy Statement 4: Planning for Sustainable Economic Growth (29 December 2009)
  - Planning Policy Statement 5: Planning for the Historic Environment (23 March 2010)
  - Planning Policy Statement 9: Biodiversity and Geological Conservation (16 August 2005)
  - Planning Policy Guidance 13: Transport (3 January 2011)
  - Planning Policy Statement 22: Renewable Energy (10 August 2004)
  - Planning Policy Statement 23: Planning and Pollution Control (3 November 2004)
  - Planning Policy Guidance 24: Planning and Noise (3 October 1994)
  - Planning Policy Statement 25: Development and Flood Risk (29 March 2010)
  - Circular 05/2005: Planning Obligations (18 July 2005)

### 3.4 Planning Practice Guidance

- 3.4.1 On 6.03.14, DCLG launched its Planning Practice Guidance website <http://planningguidance.planningportal.gov.uk>. This replaced numerous previous planning guidance documents. Relevant guidance categories and the relevant sections in the August 2014 ES FID are provided in Table 3.1.

**TABLE 3.1: PLANNING PRACTICE GUIDANCE**

<i>Guidance Category</i>	<i>Relevant ES Section</i>
Air Quality	Section 9 – Air Quality
Conserving and Enhancing the Historic Environment	Section 16 – Cultural Heritage
Flood Risk and Coastal Change	Section 14 – Geology, Hydrology and Land Contamination
Land Affected by Contamination	Section 14 – Geology, Hydrology and Land Contamination
Light Pollution	Section 11 – Landscape and Visual
Natural Environment	Section 12 – Ecology
Noise	Section 10 – Noise and Vibration
Travel plans, transport assessments and statements in decision-taking	Section 15 – Traffic and Infrastructure
Water supply, wastewater and water quality	Section 13 – Water Quality, Section 14 – Geology, Hydrology and Land Contamination

### **3.5 National Energy Policy**

#### ***National Policy Statements for Energy***

- 3.5.1 This section considers four of the six NPSs which are relevant to the proposed GEC from a cumulative perspective of which the first two are of particular significance to this Variation Application.
- Overarching National Policy Statement for Energy (EN-1);
  - National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2);
  - National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4); and
  - National Policy Statement for Electricity Networks Infrastructure (EN-5).
- 3.5.2 Overarching National Policy Statement for Energy (EN-1) sets out national policy for defined energy infrastructure. The NPS combined with the relevant technology specific NPSs, provides the primary basis for decisions (paragraph 1.1.1). Section 1.4 refers to the Planning Act 2008, setting out the threshold for nationally significant infrastructure projects (NSIPs) in the energy sector, namely as including onshore generating stations of more than 50 MW (and 100 MW offshore), produced from fossil fuels, wind, biomass, waste and nuclear (EN-1, paragraph 1.4.2). Other forms of energy NSIPs include electricity lines at or above 132 kV, large gas reception and liquefied natural gas (LNG) facilities, underground gas storage and cross country gas / oil pipelines, subject to specified thresholds.
- 3.5.3 EN-1 concerning Part 2 EN-1 Government policy on energy and energy infrastructure development states that *"energy is vital to economic prosperity and social well-being and so it is important to ensure that the UK has secure and affordable energy"* and that *"producing the energy the UK requires and getting it to where it is needed necessitates a significant amount of infrastructure both large and small"* (EN-1, 2.1.2). It is also stated that *"the role of the planning system is to provide a framework which permits the construction of whatever Government - and players in the market responding to rules, incentives or signals from Government - have identified as the types of infrastructure we need in the places where it is acceptable in planning terms"* (EN-1, 2.2.4).
- 3.5.4 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. To manage the risks, of achieving security of supply we need (EN-1, 2.2.20):
- sufficient electricity capacity (including a greater proportion of low carbon generation) to meet demand at all times, which requires a safety margin of spare capacity to accommodate unforeseen fluctuations;
  - reliable associated fuel supply chains e.g. for power stations, must be able to meet demand as it arises
  - a diverse mix of technologies and fuels, so as not to be reliant on any one technology or fuel; and
  - effective price signals so that market participants have sufficient incentives to react in a timely way to minimise supply / demand imbalances.
- 3.5.5 In the medium term, there are *"challenges"* to be faced, including the replacement of power plants due for closure (EN-1, 2.2.21) and, while an objective is to deliver more power from renewables and nuclear and to deliver carbon capture and storage (CCS), it is accepted that some fossil fuels for electricity generation will still be needed during the transition to a low carbon economy (EN-1, 2.2.23).
- 3.5.6 EN-1, Part 3 considers the need for new NSIP projects; Section 3.1 sets out *"the planning policy"*, stating.



*"The UK needs all the types of energy infrastructure covered by this NPS 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 [relevant authority] should therefore assess all applications for development consent for the types of infrastructure covered by the energy NPSs on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part.*

*The [relevant authority] should give substantial weight to the contribution which projects would make towards satisfying this need when considering applications for... consent...."*

3.5.7 It is explained, with regard to the need for new NSIPs, that electricity meets a significant proportion of our overall energy needs and that the country's reliance on it is likely to increase (paragraph 3.3.1). EN-1 therefore discusses; meeting energy security and carbon reduction objectives; the need to replace 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 by reducing demand more intelligent use of electricity and interconnection of electricity systems (Section 3.3).

3.5.8 The need for new electricity NSIPs expressed in EN-1 is summarised below.

<b>Topic</b>	<b>Explanation</b>
Meeting energy security and carbon reduction objectives (paragraphs 3.3.2-6)	<p>There needs to be sufficient electricity generating capacity to meet maximum peak demand with a safety margin, or spare capacity; the larger the safety margin, the more resilient the system.</p> <p>There are benefits of having a diverse mix of all types of power generation:</p> <ul style="list-style-type: none"> <li>• nuclear is a proven technology, able to provide continuous low carbon generation, capable of responding to variations in demand but it is not as cost efficient used in this way compared to fossil fuel generation;</li> <li>• renewables offer a low carbon and proven source but many are intermittent;</li> <li>• fossil fuel generation is responsive, complementing generation from nuclear and intermittent renewables but without CCS will not be low carbon.</li> </ul> <p>Government would like industry to bring forward many new low carbon developments (renewables, nuclear and fossil fuel generation with CCS) but it is for industry to propose what is viable, while decisions should be in accordance with the policy in Section 3.</p>
Need to replace closing electricity generating capacity (paragraphs 3.3.7-9)	<p>In the UK, at least 22 GW of existing generating capacity must be replaced in the coming years, (particularly to 2020), comprising about 12 GW of coal / oil generating plant due to close as a result of the Large Combustion Plant Directive (LCPD) by 2015 and 10 GW of nuclear over the subsequent 20 years with further closures resulting from the Industrial Emissions (Integrated Pollution Prevention and Control) Directive.</p>
Need for more electricity capacity to support increased supply from renewables (paragraphs 3.3.10-12)	<p>The Government is committed to dramatically increasing the amount of renewable generation; it will help to improve energy security, however, wind, solar, tidal energy are intermittent and cannot be adjusted to meet demand. Increased renewables will require additional back up capacity, requiring increased total electricity capacity; even when electricity supplies are almost entirely decarbonised, fossil fuel power stations may still be required for short periods</p>

<i>Topic</i>	<i>Explanation</i>
Future increases in electricity demand (paragraphs 3.3.13/14)	Increasing the supply of low carbon electricity is an essential pre-requisite for the switch away from fossil fuels, which will further substantially increase demand for electricity consumption (measured in terawatt hours over a year) could double by 2050.
Urgency of the need for new electricity capacity (paragraphs 3.3.15-24)	There is an urgent need for new (and particularly low carbon) energy NSIPs to be brought forward as soon as possible (note fossil fuel generation with CCS can be low carbon (paragraph 3.3.5)). EN-1 refers to a potential larger amount of generating capacity being required, based on the Updated Energy & Emissions Projections (UEP) (June 2010); the "high fossil fuel and carbon price scenario" would indicate that, by 2025, the UK might need around 113 GW of total electricity capacity (compared to around 85 GW now), of which some 59 GW would be new build. It was expected of the majority of new build capacity would be from renewable technologies and the balance from non renewable capacity.
Alternatives to new large scale electricity generation (paragraphs 3.3.26-34)	Government has considered means of reducing demand, more intelligent use of electricity and interconnection of electricity systems as alternatives to new large scale generating capacity. It has found that current policies will reduce electricity demand in certain areas but savings will be offset by increases in other areas; decentralised and community energy systems could lead to some reduction in demand; however, Government does not believe this will lead to significant replacement of larger scale infrastructure, which offers economic and other benefits such as more efficient bulk transfer of power. It is expected that demand side response, storage and interconnection will play important roles in a low carbon electricity system but still envisages backup capacity being necessary to ensure security of supply until other storage technologies reach maturity. Increased investment in interconnection is unlikely to reduce the need for new infrastructure to any great extent. Overall, the Government believes that, while these measures should be actively pursued, their effect on the need for new large scale energy infrastructure will be limited, particularly given the likely increased need for electricity for domestic / industrial heating and transport.

- 3.5.9 Fossil fuel power stations play a vital role in providing reliable electricity supplies; they can be operated flexibly in response to changes in supply / demand, provide diversity in energy mix and continue to play an important role as the UK makes the transition to a low carbon economy (paragraph 3.6.1). Gas will continue to play an important role in the electricity sector; the UK gas market has diversified its sources of supply, supported by investment in LNG facilities (paragraph 3.6.1). Some of the new conventional generating capacity needed, is likely to come from new fossil fuel plants that will provide some of the new capacity to maintain security of supply and to provide flexible backup for intermittent renewable energy from wind. While all fossil fuels generate emissions of carbon dioxide, coal typically produces about twice as much per unit of electricity generated than gas (paragraph 3.6.3).
- 3.5.10 Carbon capture and storage (CCS) offers the potential to reduce CO<sub>2</sub> emissions of up to 90%; the complete chain of CCS has yet to be demonstrated at commercial scale on a power station; there is however a high level of confidence that the technology will be effective but there is less known about the impact of CCS on the economics of power station operation (paragraph 3.6.4-6).
- 3.5.11 EN-1 Part 4 (Assessment Principles) sets out certain general policies with which applications for energy infrastructure are to be decided, other than need (covered in Part 3) or to particular physical impacts (covered in Part 5) and the relevant technology specific NPSs. It is restated that given the level and urgency of need for infrastructure of the types covered by energy NPSs, decision making should start with a presumption in favour of granting consent to energy NSIP applications (paragraph 4.1.2). The decision maker should also take into account potential benefits, including the contribution to meeting the need for energy infrastructure, job creation, long term or wider benefits, also environmental, social and economic benefits, as well as potential adverse impacts



and any measures to avoid, reduce or compensate for such effects (paragraph 4.1.3 / 4.1.4). The matters considered in Part 4 are environmental statement and likely significant effects; the Conservation of Habitats and Species Regulations 2010; alternatives considered; criteria for good design for energy infrastructure; consideration of combined heat and power (CHP); carbon capture and storage (CCS) and carbon capture readiness; climate change adaptation; grid connection; pollution control and other environmental regulatory regimes; safety; hazardous substances; health; common law nuisance and statutory nuisance and security considerations.

- 3.5.12 Of the above; relevant matters have been addressed in the EIA process and presented in the ES and accompanying documents (EN-1, 4.2). In particular, it is advised that the question of whether a project is likely to have a significant effect on a European designated site (or on any site to which the same protection is applied as a matter of policy, either 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 Waddenzee<sup>5</sup> 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".*

- 3.5.13 The NPS does not contain any general policy requirement to consider alternatives, or to establish whether the proposed project represents the best option; however applicants are obliged to include in their ES information about the main alternative studied, including the main reasons for their choice, taking into account the environmental, social and economic benefits, including where relevant technical and commercial feasibility (paragraph 4.4.1 / 4.4.2). In considering design (EN-1, 4.5), the relevant authority needs to be satisfied that the development will produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy, matched by appearance that demonstration good aesthetics as far as possible, although the nature of energy development, will often limit the extent to which it can contribute to the enhancement of the quality of the area. Other considerations are whether the development is as attractive, durable and adaptable as it can be and that the applicant has taken into account both functionality and aesthetics (see Design and Access Statement February 2010 and Revised Design and Access Statement December 2010). CHP is discussed at EN-1, 4.6; it notes that CHP may either supply steam direct to customers or capture waste heat for low pressure steam, hot water or space heating after it has been used to drive electricity generating turbines. Reference is made (paragraph 4.6.6) to existing guidelines issued by DECC 2006 on information required to accompany applications for Section 36 Consent, containing evidence that the possibilities for CHP have been fully explored (see Combined Heat and Power (CHP) Assessment February 2010 and the Supplementary CHP Assessment December 2010).
- 3.5.14 Matters relating to CCR (EN-1, 4.7) are discussed comprehensively in the CCR Feasibility Study February 2010, the Updated CCR Feasibility Study (August 2014) and the accompanying report by Imperial Collage London. There is advice on how applicants and the relevant authority should take the effects of climate change into account when planning the location, design, build, operation and decommissioning of infrastructure; there should be no critical features of the design which may be seriously affected by more radical changes in the climate; any adaptation measures should themselves be assessed (EN-1, 4.8). Grid connection (EN-1, 4.9) is not part of this application (although the implications were considered in the Original Consent Application); planning

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<sup>5</sup> Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris Van Landbouw, Natuurbeheer en Visserij [2005] Env. L.R. 14 at Paragraph 45

permission was granted by the Council in 2013 for a high voltage underground electrical connection. Planning and pollution control systems are separate but complementary (EN-1, 4.10); EN1, 4.10 advises that the relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework and that cumulative effects of pollution would not make the development unacceptable; accordingly, the relevant authority should not refuse consent on the basis of pollution impacts, unless it has good reason to believe that any necessary operational pollution control permits or licences, or other consents will not subsequently be granted (paragraph 4.10.7 / 4.10.8). The EIA process has demonstrated that, in this case, the pollution control matters can be satisfied. Additional considerations of safety, hazardous substances, health, common law nuisance and statutory nuisance and security considerations are not an issue for purposes of this Variation Application.

- 3.5.15 EN-1, Part 5 sets out generic impacts to be considered, namely air quality and 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 space, green infrastructure, Green Belt; noise / vibration; socio-economic; traffic / transport impacts; waste management; water quality / resources. These matters have been addressed in the EIA process where appropriate.
- 3.5.16 National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2) Part 1 states that this NPS, with EN-1, provides the primary basis under the Planning Act 2008 for decisions on applications for nationally significant fossil fuel electricity generating stations as defined at section 1.8 and that applications should be consistent with instructions and guidance in this NPS (EN-1) and any other NPSs relevant to the application in question (paragraphs 1.2.1 / 1.2.2). This NPS covers electricity generating infrastructure over 50 MW, namely coal fired, gas fired, integrated coal gasification combined cycle and oil-fired (paragraph 1.8.1). 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 this NPS has been demonstrated (paragraph 2.1.2). It refers to the factors influencing site selection by developers as land use, transport infrastructure, water resources and grid connection (section 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; CCS (for coal fired generating stations); climate change adaptation; consideration of "*good design*" (section 2.3). Consideration is also given to impacts of fossil fuel generating stations in respect of air quality and emissions; landscape and visual impact; noise / vibration; release of dust (by coal-fired generating stations); residue management (for coal-fired generating stations); water quality / resources (section 2.4). All relevant considerations have been addressed in the EIA process.
- 3.5.17 National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines EN-4 Part 1 states that this NPS, with EN-1 provides the primary basis for decisions under the Planning Act 2008 on applications for gas supply infrastructure and gas and oil pipelines defined in Section 1.8. The underground gas pipeline associated with GEC is not an NSIP, however when the application for planning permission was submitted to Thurrock Thames Gateway Development Corporation reference was made in the application to EN-4 and EN-1 as material considerations; planning permission for the underground gas pipeline and associated AGI was granted on 8.3.12.
- 3.5.18 National Policy Statement for Electricity Networks Infrastructure (EN-5), Part 1 states that this NPS with EN-1, provides the primary basis for applications for electrical networks infrastructure defined at Section 1.8. The HV underground electrical connection associated and associated extension of the Coryton Substation is not an NSIP of itself as the application was to be determined under the Town and Country Planning Act 1990, however when the application was submitted to Thurrock Borough Council reference was made to EN-5 and EN-1 as material considerations; planning permission was granted on 27.2.13.

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- 3.5.19 The National Policy Statement for Ports (NPSP) was designated on 26.1.12. The Government's assessment of the need for new infrastructure is that, despite the then recent recession, it believed that there is a compelling need for substantial additional port capacity (paragraph 3.4.16).

### **3.6 Local Policy**

#### ***Thurrock Core Strategy and Policies for Management of Development 2011***

- 3.6.1 Following an exploratory meeting, held on 22.11.13 and examination hearing sessions held on 8.4.14 the Council proposed some Main Modifications to the Core Strategy and Policies for Management of Development – Focused Review: Consistency with National Planning Policy Framework submission document. However, as these proposed main modifications are subject to consultation at this time, the proposed modifications are not reflected in the text below.
- 3.6.2 On 21.12.11, Thurrock Council formally adopted its Core Strategy and Policies for Management of Development. This replaces the Council's consultation draft referred to in the ES FID at paragraphs 3.1.34-42. It introduces the concept of strategic spatial objectives (SSO); core strategic spatial policies (CSSP) to deliver the spatial vision and objectives; core strategic thematic policies (CSTP) to achieve the best outcomes to themes in the CSSPs and policies for management of development (PMD). The following are relevant to this Application, strategic spatial objectives: SSO2, SSO3, SSO10, SSO11, SSO12, SSO13, SSO14, SSO17, SSO18, spatial policies CSSP2, CSSP3, CSSP4, CSSP5; thematic policies CSTP6, CSTP12, CSTP13, 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 have also been a consideration when planning permission was granted on 8.3.12 by the former Thurrock Thames Gateway Development Corporation for the proposed underground gas pipeline and associated AGI and by Thurrock Borough Council when planning permission was granted on 27.2.13 for the HV underground electrical connection associated and associated extension of the Coryton Substation.
- 3.6.3 Chapter 3 (The Future of Thurrock) 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)). In referring to the five Key Areas of Regeneration and Growth Locations, London Gateway (LG) is identified as *"a major logistics, import-export based employment development"* with 11-13,000 jobs created 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"* and that *"There is also potential scope for large-scale high quality campus style relocation or inward-investment business developments"* (3.38).
- 3.6.4 The Core Strategy Table 3 sets out strategic spatial objectives (SSO), including: SSO2 increasing prosperity and employment growth in the five strategic economic hubs (including London Gateway); SSO3 supporting local businesses, attracting inward investment and high skill jobs, including environmental industries by providing appropriate sites; SSO10 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; SSO11 - sustaining and enhancing the open character of the Green Belt and only allowing development in very special circumstances; SSO12 protecting the natural, historic and built environment; SSO13 developing the Greengrid network of biodiversity sites; SSO14 promoting sustainable development through the prudent use of water and other natural resources, using sustainable design methods and materials, and integration of land-use with the maximum re-use of land; SSO17 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; SSO18 reducing / managing risk of flooding through location, layout and design.

#### Spatial Policies

- 3.6.5 Chapter 4 Spatial Policies - identifies the Thames Gateway South Essex sub-region as one of the “*Engines of Growth*” for the region, in which LG and Tilbury Ports are one of two economic clusters (the other is Lakeside Basin) (paragraph 4.10). The Thurrock Economic Development Strategy 2009 (TEDS) focuses “*future growth upon the existing core economic sectors and the identified growth sectors*” (paragraph 4.11). 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 “*recycling and energy*” (paragraph 4.12). Policy CSSP2 (Sustainable Employment Growth) commits the Council to supporting economic development in the five key strategic economic hubs. For London Gateway, the policy refers to port, logistics and transport as core sectors; it names environmental technologies, recycling and energy as growth sectors and training / innovation / research and business / distribution park as flagship developments, producing an indicative job growth of 11,000-13,000 jobs in the period to 2026. Policy CSSP3 (Sustainable Infrastructure) recognises that essential social and physical infrastructure must be put in place to deliver regeneration in Thurrock; it refers to various infrastructure projects, including transport specific infrastructure at LG and a new power station at Tilbury.
- 3.6.6 Policy CSSP4 (Sustainable Green Belt) in seeking to deliver the objectives of PPG2 (now revoked and replaced by the NPPF), explains that the Council will maintain the permanence of the Green Belt boundaries, resist development where there would be any danger of coalescence and maximise opportunities for increased public access, leisure and biodiversity. It is stated that the Council will seek to reinforce the Green Belt boundary through structural enhancement of landscape and that 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.

#### Thematic Policies

##### *Employment*

- 3.6.7 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 very challenging to deliver by 2026 (paragraph 5.48). The policy advises that the Council will safeguard existing primary and secondary industrial and commercial land but will consider economic development that includes non-B Class uses, provided certain criteria are met. It is noted in CSTP6 10 that the Council will work with partners and developers to enhance the knowledge and skills and local employment opportunities for residents (as GECL has already committed to in a Section 106 agreement).

##### *Socially Inclusive Communities*

- 3.6.8 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 and that proposals for new development will be required to contribute towards education in accordance with Policies CSSP3, PMD16 and the Developer Contribution SPD. Policy CSTP13 (Emergency Services and Utilities) envisages the Council working with partners to ensure adequate provision of emergency services and utilities; this includes ensuring that facilities and services are located and designed to be resilient to flood risk to ensure continuity of services.

*Environment*

- 3.6.9 Policy CSTP18 (Green Infrastructure) is concerned with improving provision of 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. Policy CSTP19 (Biodiversity) encourages measures to contribute positively to overall biodiversity in the Borough; to that end, 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 Employment 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 how adverse impacts are mitigated. Policy CSTP23 (Thurrock Character and 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 Employment Hubs and Green Belt and 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 for the heritage asset and its setting.

*Climate Change*

- 3.6.10 Policy CSTP25 (Addressing Climate Change) evidence base, refers to priorities which include reducing CO<sub>2</sub> and N<sub>2</sub>O 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 and low carbon technologies, passive design, recycling, waste minimisation, mitigation measures to support reductions in CO<sub>2</sub> 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.
- 3.6.11 Policy CSTP26 (Renewable or Low-Carbon Energy Generation) states that the Council will promote and facilitate centralised renewable or low carbon energy schemes at appropriate locations and standards including at Tilbury and London Gateway. This includes the delivery of renewable and low-carbon energy (utilising technologies such as district energy networks, such as CHP, in priority locations, to increase the proportion of energy delivered from renewable and low carbon sources. GECL has already committed in a Section 106 agreement to working with the Council on the potential delivery of CHP.

*Water, Riverside, Coastal*

- 3.6.12 Policy CSTP27 (Management and Reduction of Flood Risk) commits to using land use planning to implement and support flood risk management and working with the EA; ensuring that where necessary, new development contains spaces for water, including naturalisation and environmental enhancement.



Policies for Management of Development

- 3.6.13 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. It states that particular consideration will be given to the location of sensitive land uses such as housing, schools, health facilities and biodiversity sites; where necessary, the Council may require applications to address matters including air / noise pollution, contaminated land, odour, light and 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.
  - 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 where possible.
  - 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 (paragraph 6.46).
  - 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) requires new developments to utilise sustainable construction techniques to minimise water / energy consumption, maximise water efficiency / water recycling, the use of recycled materials and to minimise waste and maximise recycling during construction and after completion.
  - 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.
  - Policy PMD14 (Carbon Neutral Development) requires developers to demonstrate that all viable energy efficiency measures and renewable or low-carbon technology opportunities have been utilised to minimise emissions.
  - Policy PMD15 (Flood Risk Assessment) requires the management of flood risk to be considered at all stages of the planning process. (see Supplementary Flood Risk Assessment December 2010 which accompanied the Original Consent Application).

- 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. (Note: Circular 5/05 has been replaced by NPPF). GECL entered into a Section 106 agreement with the relevant planning authorities prior to the issue of the Original Consent.

## 4 DESCRIPTION OF GEC

### 4.1 Introduction [Update to Section 4 of the February 2010 ES]

- 4.1.1 As noted by Variation Regulation 2(1) the Proposed Development means “*the generating station, or extension of a generating station, which the applicant would be authorised to construct under a relevant Section 36 Consent if that consent were varied as requested in a variation application*”.
- 4.1.2 Accordingly, this Section provides a description of GEC (i.e. the Proposed Development), updating (wherever relevant) Section 4 of the February 2010 ES. In presenting the description of GEC, changes from the original text of the February 2010 ES are shown in *blue italic text*.

### 4.2 Original Consent Details

- 4.2.1 The Original Consent currently allows about 900 MW<sup>6</sup> generation capacity, and comprises the following main plant / equipment items:

- Up to 2 No. gas turbines;
- Up to 2 No. Heat Recovery Steam Generators (HRSG);
- 1 No. or more steam turbines;
- 1 No. or more auxiliary boilers;
- Up to 2 No. stacks;
- Air cooled condensers (ACC) and auxiliary cooling;
- 2 No. or more transformers;
- Gas Receiving Facility;
- Water Treatment Plant;
- 1 No. or more Demineralised Water Storage Tank / s;
- 1 No. Raw / Firewater Tank;
- 1 No. or more Switchyard / s;
- Buildings (including administration offices, workshop, warehouse, control room, engineering works including contractors temporary laydown areas, vehicle loading / unloading / fencing, roads, storage facilities, lighting);
- Other plant and equipment; and,
- Ancillary plant and equipment.

In addition to the above, landscaping and biodiversity provision and storm water ponds may be incorporated into the scheme.

- 4.2.2 GECL proposes to submit a Variation Application to the Secretary of State. The list of main plant / equipment items does not change.

### 4.3 GEC (i.e. The Proposed Development)

- 4.3.1 GEC will provide up to *1250 MW* of power generation capacity. This will include the provision of up to 150 MW to the London Gateway® Logistics Park, which is expected to meet its long-term electricity requirements.
- 4.3.2 GEC will comprise up to two gas turbine units which will be fuelled by natural gas. Each unit will include a gas turbine and a HRSG which will serve steam turbine equipment.

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<sup>6</sup> As per the Original Consent, a tolerance of up to 5% is permitted.



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- 4.3.3 *Initially, two typical layout options were considered in relation to GEC. These were the single-shaft and the multi-shaft unit layouts. The principal difference between these two layouts was that the multi-shaft unit layout utilised one large steam turbine, whereas the single-shaft unit option utilised two smaller steam turbines. Subsequently, InterGen has selected Siemens as its preferred supplier and is expected to install two SGT5-8000H machines on the GEC site based on the single-shaft unit layout.*
- 4.3.4 *The indicative layout (based on two SGT5-8000H machines) is shown in Figure 4.1 (single shaft), and has been overlaid on the parameter block model layout (Figure 4.3 from the February 2010 ES). However, it should be noted that the indicative layout is still subject to on going design. The exact layout will be agreed with the Thurrock Borough Council prior to the commencement of construction. The requirement to agree the final design of GEC is provided by Condition 5(8) of the Original Consent.*
- 4.3.5 GEC will be capable of operating continuously throughout the year for up to 35 years.
- 4.3.6 The overall application site boundary covers a total area of approximately 29.1 hectares (ha) (71.9 acres). This includes:
- The GEC site, which has a total area of approximately 11.3 ha (28.0 acres) and includes the land to be set aside for the purposes of CCR (the CCS space); and,
  - Land to the north and west which is intended to be used for temporary laydown and storage of plant / equipment during construction.
- 4.3.7 *The Proposed Development will be located within the GEC site (see FIGURE 63114-PBP-0025 associated with the Original Consent). The Proposed Development will be within the areas and heights as described in the February 2010 ES and December 2010 ES FID.*
- 4.3.8 *The requirement for the Proposed Development to be located within the GEC site is provided by Condition 5(2) of the Original Consent.*
- 4.3.9 The GEC site is situated on the north bank of the Thames Estuary, approximately 6 km east of the A13. The A1014 dual carriageway (The Manorway) lies approximately 0.5 km to the north of the site and runs east to west to provide a link with the A13, which in turn connects with the M25 at Junction 30. The Ordnance Survey (OS) Grid Reference of the centre of the GEC site is approximately 573209, 182165.
- 4.3.10 The nearest residential settlements are at Corringham and Fobbing approximately 4 km to the west, Canvey Island approximately 5 km to the east and Basildon approximately 7 km to the north.
- 4.3.11 To the east of the GEC site lies the Shell Aviation Fuel Storage Farm (100 m), existing Coryton CCGT power plant (700 m east), and the existing Thames OilPort / former Petroplus Coryton Oil Refinery (950 m east).
- 4.3.12 GEC will be located on land within the London Gateway® Logistics Park.
- Indicative Programme for Development***
- 4.3.13 *On 4 August 2011, the Original Consent was granted.*
- 4.3.14 *Condition 5(3) of the Original Consent states that: "The commencement of the Development shall take place before the expiry of five years from the date of this permission". Therefore, construction of GEC will be required to commence before 4 August 2016.*
- 4.3.15 The construction period will be of around 28 to 36 months duration, including commissioning. The construction workforce will peak at about 600 personnel.
- 4.3.16 *The target date for full operation of GEC is before 4 August 2019.*
- 4.3.17 The direct operational workforce would be of the order of 15 to 25 personnel if operated in conjunction with the existing Coryton CCGT power plant, or up to 40 personnel if GEC is operated on a stand-alone basis. Furthermore, experience at the existing Coryton CCGT power plant suggests there could be of the order of 10 to 15 additional indirect

jobs at the site. There will also be additional indirect jobs for contracted engineering staff during maintenance shutdowns.

#### **4.4 Construction**

##### ***Temporary Construction Facilities***

4.4.1 Throughout construction, a dedicated temporary laydown and storage area will be provided for construction plant / equipment. This area will either be the land to the north and west or the land to be set aside for the purposes of CCR. The laydown / storage area will be available for any fabrication which may be necessary for construction, and will include space for temporary car parking and office accommodation.

4.4.2 Following construction, all necessary measures will be taken to return the temporary laydown and storage area to its previous state as appropriate.

##### ***Site Preparation***

4.4.3 In advance of any construction works, a program of clearance, remediation and levelling being undertaken across the GEC site. Remediation Validation Reports will be produced as documentation of the works undertaken.

4.4.4 Following the remediation works, studies examining soil properties will be undertaken by the Construction Contractor, building on the results of site investigations carried out for GEC, and the surrounding the DP World® London Gateway® Port and London Gateway® Logistics Park. In addition, as the potential exists for possible off-site contamination to migrate onto the GEC site during construction, the Construction Contractor will conduct a Contaminated Soil Survey and maintain a close watch for possible contamination appearing during construction.

4.4.5 Following the program of remediation and studies / surveys, site preparation work may comprise the raising of the GEC site (potentially further than that undertaken for the surrounding the DP World® London Gateway® Port and London Gateway® Logistics Park), earthworks, and the excavations for foundations. Trenching, installation of underground services and provision of the temporary laydown / storage area and services will then take place.

4.4.6 Furthermore, it is likely that piling will be required for the majority of the heavy equipment items including, but not limited to: the gas turbines; the HRSGs; the steam turbines; and the generators. This is due to their high static or, for rotating plant, dynamic loading, and the tight tolerance requirements for settlement.

##### ***Equipment / Building Construction Works***

4.4.7 The main stages of the equipment / building construction works can be considered in terms of the following activities:

- Equipment / building manufacturing and delivery;
- Equipment / building erection;
- Power plant commissioning;
- Power plant take-over;
- Power plant commercial operation; and,
- Guarantee period.

##### ***Commissioning***

4.4.8 Commissioning of each single shaft CCGT unit will take of the order of 16 weeks. This will be progressive from final equipment / building erection checks, to pre-commissioning and setting to work of individual component parts, through to the overall equipment / building testing. This commissioning will prove the technical acceptance of the equipment / buildings.

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- 4.4.9 Reliability tests will demonstrate the fitness for purpose of the power plant prior to commercial operation.
- 4.4.10 Performance tests will demonstrate that GEC complies with the performance guarantees. Availability and reliability will also be demonstrated by operating GEC under commercial conditions for a period without major repair to any item of plant or equipment.

***Construction Environmental Management Plan***

- 4.4.11 The Construction Contractor will be required to prepare and implement a Construction Environmental Management Plan (CEMP).
- 4.4.12 The purpose of the CEMP is to:
- Ensure that best practices are adopted, where appropriate, and maintained throughout construction;
  - Provide a mechanism for ensuring that measures to prevent, reduce and, where possible, offset potentially adverse environmental impacts are implemented;
  - Provide a framework for mitigating unexpected impacts during construction;
  - Provide assurance to third parties that their requirements with respect to environmental conditions and performance will be met;
  - Provide a mechanism for ensuring compliance with environmental legislation and statutory consents; and,
  - Provide a framework against which to monitor and audit environmental performance.
- 4.4.13 Accordingly, the CEMP to be prepared and implemented for GEC will ensure construction work is completed in accordance with:
- The conditions of consent for GEC;
  - GECL's contractual requirements;
  - Any environmental or other codes of conduct required by InterGen;
  - Relevant GEC-specific mitigation measures; and
  - Current best practice.

- 4.4.14 *The requirement to prepare, agree and implement a CEMP is provided by Condition 5(25) of the Original Consent.*

***Construction Hours***

- 4.4.15 Initially and until the buildings are closed and capable of providing an 'indoor working environment', construction work will only take place during Monday to Saturdays 07:00 – 19:00 hours.
- 4.4.16 No work on any Sunday or Bank Holidays will be undertaken, unless such work is associated with an emergency or does not cause existing ambient noise levels to be exceeded at nearby Noise Sensitive Receptors (NSR).
- 4.4.17 Should a need arise, due to technical constraints or similar, with regard to carrying out certain construction work outside the time indicated above, prior written approval from Thurrock Borough Council (as the Relevant Health Authority) will be sought.
- 4.4.18 *The requirement to adhere to these construction hours is provided by Condition 5(26) of the Original Consent.*

**4.5 Operation**

- 4.5.1 GEC will provide up to *1250 MW* of power generation capacity. This will include the provision of up to 150 MW to the DP World® London Gateway® Port and London

Gateway® Logistics Park, which is expected to meet its long-term electricity requirements.

- 4.5.2 GEC will be capable of operating continuously throughout the year for up to 35 years.

***Process Description***

- 4.5.3 GEC will comprise up to two gas turbine units which will be fuelled by natural gas. Each unit will include a gas turbine and a HRSG which will serve steam turbine equipment.

- 4.5.4 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. The hot exhaust gases still contain recoverable energy and will therefore be used in a HRSG to generate steam, which is in turn used to generate electricity via steam turbine equipment.

- 4.5.5 The use of a combined gas and steam cycle increases the overall fuel efficiency of the power plant, compared with that of simple cycle gas turbines. As such, GEC will be capable of generation in combined cycle mode with an overall electrical generation efficiency of approximately *60 per cent* based on the LCV of the fuel.

- 4.5.6 *If it becomes technically and economically feasible to provide heat and / or power to surrounding facilities / customers (i.e. operate GEC as a CHP CCGT power plant), additional fuel utilisation gains may be achieved.*

- 4.5.7 *Additional information on the feasibility of providing heat and / or power was provided in the CHP Assessment / Supplementary CHP Assessment. More recently, a CHP Readiness Assessment has been undertaken as part of the application for an Environmental Permit.*

- 4.5.8 *Condition 3 of the Original Consent states that "the Development shall be designed so as to have the capability for extracting steam from the electricity generating cycle". In addition, the provision of CHP is included in the Section 106 Agreement. Furthermore, it is currently understood that a Condition of the Environmental Permit will be that GEC will be built CHP-Ready.*

- 4.5.9 The steam exhausting the steam turbine equipment will pass to an ACC where it will be condensed. The resultant condensate will be returned to the HRSGs to continue the steam cycle.

- 4.5.10 The use of ACCs has the potential to eliminate environmental impacts associated with other cooling systems, and is therefore considered to have the following benefits:

- No visible cooling tower plumes;
- Significantly lower water consumption; and
- No surface water abstraction or discharge of heated cooling water to watercourses.

- 4.5.11 The flue gases will be discharged via 75 m high stacks (one per HRSG).

- 4.5.12 GEC will burn natural gas only, which is an inherently clean fuel. Indeed, it does not produce the sulphur or particulate emissions associated with burning coal. As a result, all atmospheric emissions from the power plant will be controlled at the source and no flue gas cleaning equipment is required.

- 4.5.13 The gas turbines to be selected for installation at GEC will be equipped with proven pollution control technology, which will limit the production of oxides of nitrogen (NO<sub>x</sub>) to a maximum of 50 mg/Nm<sup>3</sup> (at reference conditions, when gas turbine outputs are above 70 per cent load). The proven pollution control technology, known as Dry Low NO<sub>x</sub> (DLN) Combustion, represents the Best Available Technique (BAT) for limiting emissions of NO<sub>x</sub> to the atmosphere from gas turbine based power plants. In addition, modern gas firing controls will be used, enabling combustion to be optimised for all operating conditions.

- 4.5.14 The gas turbines will be situated inside integral acoustic enclosures designed to ensure that noise levels generated are within acceptable limits. Additionally, each CCGT unit will

be enclosed in steel framed buildings to further mitigate noise levels emanating from the GEC site.

- 4.5.15 Back-up firing on Distillate Fuel Oil (DFO), or any other oil, is not proposed.

***Summary of Turbine Technology***

- 4.5.16 *A comparison between the original CCGT power plant turbine technology reported in the February 2010 ES and December 2010 ES FID and the proposed CCGT power plant turbine technology is provided in Table 4.1. Further details on the summary of turbine technologies have been provided in Section 2.2 (Rationale for Proposing that the Original Consent is Varied).*

**TABLE 4.2: ESTIMATED MAIN STRUCTURE / PLANT ITEM DIMENSIONS**

	<b>Original</b>	<b>Proposed</b>
<i>Examples</i>	<i>Alstom GT26, GE 9FB.03, MHI 701F4, Siemens SGT5-4000F</i>	<i>Alstom GT26 (Amended), GE Flex 50, MHI 701F5, Siemens SGT5-8000H</i>
<i>Approximate Net Power Output for CCGT Power Plant configuration at GEC (MW)</i>	<i>Up to 945<sup>7</sup></i>	<i>Up to 1250</i>
<i>Approximate Net Efficiency (%)</i>	<i>55 - 56</i>	<i>60</i>
<i>Specific Carbon Dioxide Emission (kgCO<sub>2</sub>/MWh)</i>	<i>389</i>	<i>348</i>

***Power Plant Dimensions***

- 4.5.17 The main structures and plant to be located at the GEC site are provided in Table 4.2, and provides estimates of the expected approximate dimensions.
- 4.5.18 *The proposed layout is shown in Figure 4.1 (single shaft), and has been overlaid on the parameter block model layout. It is important to note that the main structures and plant to be located on the GEC site, and their expected approximate dimensions, do not differ from those described in the February 2010 ES and the December 2010 ES FID.*
- 4.5.19 However, as the detailed design of GEC will not be completed until a formal construction contract is in place, it should be noted that the exact dimensions cannot be identified and therefore a degree of flexibility of these dimensions is required. The exact dimensions will be agreed with the *Thurrock Borough Council* prior to the commencement of construction.
- 4.5.20 *The requirement to agree the final design of GEC is provided by Condition 5(8) of the Original Consent.*
- 4.5.21 The design of equipment / buildings / enclosures will also minimise regular and long-term maintenance requirements. Materials and finishes will be selected to meet this objective and to ensure that the appearance of GEC does not deteriorate materially over its operating lifetime (approximately 35 years). Materials and finishes will be similar to those used on existing CCGT power plants, and will be selected to be sympathetic the appearance of the surrounding DP World® London Gateway® Port and London Gateway® Logistics Park.
- 4.5.22 *This is discussed further in the Design and Access Statement / Revised Design and Access Statement. Furthermore, the requirement to adhere to the principles of the*

<sup>7</sup> The Original Consent issued included provision for a 900 MW CCGT power plant plus up to a 5% tolerance (i.e. a total of 945 MW).

*Revised Design and Access Statement (December 2010) is provided by Condition 5(25) of the Original Consent.*

**TABLE 4.2: ESTIMATED MAIN STRUCTURE / PLANT ITEM DIMENSIONS**

<i>Structure / Plant Item</i>	<i>Height (Up To) (m)</i>	<i>Area (m<sup>2</sup>)</i>
Gas Receiving Facility (Orange Area) <ul style="list-style-type: none"> <li>Gas Receiving Facility</li> </ul>	14	6,080
Water Storage Tanks (Brown Area) <ul style="list-style-type: none"> <li>Demineralised Water Storage Tank</li> <li>Raw / Firewater Tank</li> <li>Water Treatment Plant</li> </ul>	23	11,600
Administration Block (Pink Area) <ul style="list-style-type: none"> <li>Warehouse, Maintenance, Admin and Control Building</li> <li>Car Parking</li> </ul>	17	6,870
Main CCGT Power Plant (Blue Area) <ul style="list-style-type: none"> <li>Gas Turbine Area</li> <li>Heat Recovery Steam Generator</li> <li>Steam Turbine Area</li> <li>Transformers</li> <li>Air Cooled Condensers (ACC)</li> </ul>	42	41,600
Stacks (Black Striped Areas within the Blue Area)	75	Within the Blue Area
Temporary Laydown Area / Land to be set aside for the purposes of CCR	-	47,100

4.5.23 The remainder of GEC will consist of air compressing equipment, electrical switchgear and control equipment. The majority of the remaining plant and equipment will be housed in relatively low buildings, of the order of 5 to 10 m in height.

4.5.24 The GEC site will be surrounded by security fencing.

***Power Plant Performance***

4.5.25 It is expected that for the majority of its life, GEC will operate in various running modes including baseload (maximum continuous rating) and cycling duty.

4.5.26 GEC will occasionally be shut down for periods of essential maintenance and statutory inspections. Minor outages (of the order of 4 days) are expected to occur every year. Major outages (of the order of 4 weeks) are expected to occur every three years, and will be planned on a long-term basis.

4.5.27 Based on operational details from the existing Coryton CCGT power plant, it is likely that in a non-major outage year GEC will have an annual average availability of the order of 96 per cent based on the expected scheduled maintenance regime but not including any forced outage periods.

4.5.28 Power plant performance will be continuously recorded to ensure correct and efficient operation of GEC. Any significant deviations will be alarmed and corrections carried out on occurrence. Records will be maintained of performance and deviation.

4.5.29 GEC will be designed with a view to a high degree of automatic operation. However, operator intervention will be necessary from time to time. Full facilities for interfacing information and control and alarm systems will be installed so that GEC can be operated from the Central Control Room via the Distributed Control System (DCS).



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***Interconnections***

Underground Gas Pipeline and Associated AGI

- 4.5.30 The natural gas used as the fuel will be brought to the GEC site via a new underground gas pipeline to be constructed between the GEC site and the existing National Grid National Gas Transmission System No. 5 Feeder Pipeline.
- 4.5.31 The quality of the natural gas will be the same as that used in domestic properties and will be supplied to a flanged terminal point at a pressure in the range of approximately 30 to 75 bar(g). There will be gas pressure reduction / and potential for compression facilities on the GEC site to regulate the pressure of the incoming gas supply to that required by the gas turbines.
- 4.5.32 With the exception of temperature and pressure regulation, the natural gas will not be treated on site and no natural gas will be stored on the GEC site. An indicative Calorific Value of the natural gas is 36.9 MJ/m<sup>3</sup>.
- 4.5.33 *Further information is provided in the application for planning permission under the Town and Country Planning Act 1990 for the underground gas pipeline and associated AGI. An overview was presented in Section 1.1.*

HV Underground Electrical Connection and Associated Extension of the Coryton Substation

- 4.5.34 The electricity generated at GEC will be dispatched to the National Grid National Electricity Transmission System via a new HV underground cable to be constructed between the GEC site and the existing Coryton Substation.
- 4.5.35 *Further information is provided in the application for planning permission under the Town and Country Planning Act 1990 for HV underground electrical connection and associated extension to the Coryton Substation. An overview was presented in Section 1.1.*

Combined Heat and Power / Carbon Capture Readiness

- 4.5.36 Interconnections and easements may also be required for CHP (for the export of steam / hot water) and CCR (for the export of captured CO<sub>2</sub>). These exports are discussed further in the CHP Assessment / Supplementary CHP Assessment and CCR Feasibility Study respectively.

***Miscellaneous Operating Materials***

- 4.5.37 Miscellaneous operating materials (i.e. oils, greases, chemicals) will be stored in appropriately bunded and secure areas within the on site stores.
- 4.5.38 Lubricating oils will be supplied to the gas turbines, steam turbine equipment and generator bearings. The lubricating oils will also be supplied to the turbine control and hydraulic oil systems. The lubricating oils will be stored on the GEC site within tanks in an impermeable bund sized to contain 110 per cent of the contents of each tank, in line with the Control of Pollution (Oil Storage) (England) Regulations 2001. Used lubricating oils will also be stored on the site for re-use or will be disposed of offsite by an approved and licensed contractor in accordance with applicable regulations for treatment and disposal at an appropriate facility.
- 4.5.39 With respect to chemical usage, small quantities of sodium phosphate, oxygen scavenger, ammonia and other chemicals will be used in HRSG water dosing. All such chemicals will be retained in suitable containment areas on the site, and will be shielded from the atmosphere. Air discharged from the shields will pass through a device (such as a common water seal and an active carbon filter) where appropriate to avoid the uncontrolled release of these chemicals to the atmosphere.
- 4.5.40 Additionally, transformers will be provided on site to allow the export of power and also for the power plant to receive electrical supplies from the wider National Grid National Electricity Transmission System. All major transformers are anticipated to be oil filled and each transformer would be provided with a containment bund / catch pit that will be

capable of containing 110 per cent of the contents of the transformer, in line with the Control of Pollution (Oil Storage) (England) Regulations 2001. In addition, the containment bund / catch pit volume would be sized to accommodate the fire water deluge quantities as required by fire fighting codes and standards for extinguishing a transformer fire. All storage facilities would be designed, situated and used in compliance with the Control of Substances Hazardous to Health (COSHH) Regulations 2002.

- 4.5.41 There will be no substances stored on the GEC site that will make the site notifiable to the Health and Safety Executive (HSE) under the Control of Major Accident Hazards (COMAH) Regulations 1999.

- 4.5.42 Sufficient spares will be held at GEC to ensure reliable operation of the power plant.

***Drainage / Water Systems<sup>8</sup>***

- 4.5.43 There are expected to be four new drainage systems on the GEC site. These will be reviewed by the team behind the London Gateway® Logistics Park, to ensure that they tie in directly to the wider London Gateway® Logistics Park drainage system. The discharges to the London Gateway® Logistics Park drainage system will be controlled by conditions included in the Environmental Permit for GEC under the Environmental Permitting (England and Wales) Regulations 2010, and will also comply with the limits of the London Gateway® Logistics Park Local Development Order (LDO) Design Code<sup>9</sup>.

- 4.5.44 The four new drainage systems on the GEC site are expected to include:

- The surface water drainage system;
- The oily water drainage system;
- The contaminated wastewater system (i.e. purge water from the water treatment plant effluent); and
- The on site sewerage system.

**Surface Water Drainage System**

- 4.5.45 The surface water drainage system will drain areas of the GEC site unlikely to be contaminated with oil and discharge the water to the wider London Gateway® Logistics Park drainage system. Whilst the majority of the surface water drainage will be uncontaminated and typical of surface water run-off from areas of hardstanding and roads, the design of the surface water drainage system will incorporate oil interceptors to ensure that no contaminated waters are released from the site.
- 4.5.46 GEC will not lead to significant quantities of surface water run off as the surface water drainage system will be designed so as to avoid this through slow release of storm waters and the use of oil interceptors.

**Oily Water Drainage System**

- 4.5.47 The oily water drainage system will drain all areas of the GEC site where oil spillages could occur. The design of the oily water drainage system will incorporate oil interceptors and traps. After passing through the oil interceptors and traps, the oily water drainage system will discharge with the surface water drainage system discharge to the wider London Gateway® Logistics Park drainage system. The discharge from each oil interceptor will contain no visible oil or grease. Sample points will be provided on the outlet of the oil interceptors, and in any drains at the GEC site prior to discharge.

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<sup>8</sup> Text taken from the Supplementary Flood Risk Assessment

<sup>9</sup> This is available at: <https://www.thurrock.gov.uk/local-development-order/london-gateway-logistics-park>



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4.5.48 The areas liable to oil spillage are:

- The electrical transformers (which may contain insulating oil, if so this will be polychlorinated biphenyl (PCB) free);
- Unloading, loading areas;
- The areas surrounding the bunded lubricating oil storage tanks (the bunds themselves will not have any drainage connections); and
- Any car parking areas.

4.5.49 Adequate facilities for the inspection and maintenance of oil interceptors / traps will be provided and the interceptors / traps will be emptied as necessary and desludged to ensure efficient operation. Sludge will be tankered offsite by an approved and licensed contractor in accordance with applicable regulations for treatment and disposal at an appropriate facility.

On Site Sewerage System

4.5.50 Any sewage associated with GEC will be piped to the Sewage Treatment Plant.

4.5.51 All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.

Miscellaneous Discharges

4.5.52 Occasionally it will be necessary to wash the blades of the air compressor section of the gas turbines to remove debris that has penetrated the inlet air filters and become lodged on the compressor blades. This will be done at times when the performance of the gas turbines has degraded and will depend upon the air quality in the vicinity of the GEC site.

4.5.53 Washing can be done in two ways, either by:

- On-line washing where a fine spray of water is allowed to pass through the gas turbine; or
- Off-line washing where the compressor blades are rotated slowly through a detergent solution.

4.5.54 In the case of off line washing approximately 15 m<sup>3</sup> per CCGT unit of waste water containing detergent will be retained on-site in a storage tank and subsequently tankered off-site by an approved and licensed contractor in accordance with applicable regulations for treatment and disposal at an appropriate facility.

4.5.55 Flue gas side washing is not anticipated. However, during commissioning and at infrequent intervals during the life of GEC it will be necessary to chemically clean the water side of the HRSG tubes. All effluents will be tankered off site by a licensed contractor for treatment and disposal at an appropriate facility.

4.5.56 During maintenance it may be necessary to drain down the HRSG, the closed circuit cooling water system or parts of these systems. All will be discharged to the wider London Gateway® Logistics Park drainage system. The HRSG water will be high purity water containing traces of ammonia, phosphate and suspended solids. The closed circuit cooling water will be high purity water containing small amounts of corrosion inhibitor (probably nitrite / borate). During the detailed engineering stage, consideration will be given to the storage, recovery and reuse of these effluents to further minimise the impact of the power plant.

4.5.57 No prescribed substances, as described in the Environmental Permitting (England and Wales) Regulations 2010, are generated or used on the GEC site.

4.5.58 Additionally, it has been recommended by the team behind the London Gateway® Logistics Park that additional attenuation be provided by siphoning roof drainage into tanks and then pumped to the drainage channels. In the case of GEC, this roof drainage may also be re-used on site (rain water harvesting). Furthermore, it has also been

recommended by the team behind the London Gateway® Logistics Park that the use of permeable paving will be considered for areas of car parking within plots. This permeable paving will provide attenuation within the sub-base by limiting the discharge using flow control devices such as hydrobrakes. Additional water quality benefits will be provided by permeable paving and bacteria can be introduced within the sub-base to remove oil and other contaminants.

- 4.5.59 Additionally, it is likely that GEC will incorporate boiler blowdown recycling and rain water harvesting, further reducing surface water runoff. It is therefore anticipated that the wider London Gateway® Logistics Park drainage system will be more than able to cope with the small amounts of additional runoff generated by GEC.

#### ***Waste Materials***

- 4.5.60 A feature of the gas turbine technology, on which GEC is based, is that waste materials generated are minimal and typically restricted to the following:

- General office wastes;
- Used gas turbine air intake filters (typically replaced annually);
- Separated oil / sludge from oil / water separators; and,
- Used oil, chemicals or chemical containers.

- 4.5.61 Other wastes would be returned to the original supplier where possible or removed by an approved and licensed contractor in accordance with applicable regulations for treatment and disposal at an appropriate facility.

#### ***Safety and Emergency Plans***

- 4.5.62 The hazards associated with CCGT power plants have been studied over many years and a considerable amount of design and procedural experience has been built up in this area. Accordingly, the design of GEC will incorporate all the features needed to comply with relevant safety regulations. The Health and Safety Executive (HSE) will also be consulted with regard to health and safety issues associated with GEC.

- 4.5.63 GECL will take into account and comply with all UK Statutory Regulations including in particular:

- The Health and Safety at Work Act 1974;
- The Electricity at Work Regulations 1989; and,
- The Construction (Design and Management) (CDM) Regulations 2007.

- 4.5.64 Additionally, GECL will take into account and comply with any other regulations, standards and Codes of Practice relevant to GEC.

- 4.5.65 Access to the GEC site will be strictly controlled. Security of the GEC site will be achieved by providing suitable fencing to the site perimeter and the use of security cameras.

- 4.5.66 It is also noted that there are two sites in the immediately vicinity of the GEC site that give rise to Prenatal Attachment and Healthy Development Intervention (PAHDI) consultation zones. These are the Shell Tank Farm (approximately 150 m to the north east) and the Coryton Oil Refinery (approximately 950 m to the north east). The location of the GEC site is such that whilst the plant and associated buildings do fall within the consultation zones for these sites they are not located within distance that would prohibit the development of the GEC site for the intended use as a power generating facility.

- 4.5.67 *Indeed, as noted in the December 2010 ES FID, the HSE have advised that they would not wish to advise against the siting of the Proposed Development on the grounds of safety.*

#### **Control Systems**

- 4.5.68 Control facilities will be provided throughout the GEC site.

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- 4.5.69 Furthermore, back up systems will be provided to deal with emergency situations, including: electrical power failure; water supply failure; compressed air failure; major equipment failure; and, lightning strikes. In terms of electrical power failure, emergency generators will be installed to provide emergency back-up and enable GEC to be shut down in a safe manner. Under normal circumstances, it is expected that these emergency generators would only be operated for testing purposes and short durations.
- 4.5.70 In addition, GEC will employ conventional protective features, including: detection and alarm systems; emergency relief valves; shut-down sequence interlocks; safety interlocks; fail safes; and, mechanical / electrical protective devices.

Fire Protection and Detection Systems

- 4.5.71 Fire protection and detection systems will be provided throughout the GEC site as is the case with the existing Coryton CCGT power plant. This will cover all equipment on the GEC site that could constitute a fire risk.
- 4.5.72 The fire protection and detection system (which will incorporate heat sensors) will be used in conjunction with automatic spray nozzles, smoke detectors, fire alarms and typical portable appliances. Fire water will be stored in a combined raw water / fire water tank on the GEC site. The volume of water required for fire protection will be reserved such that it can only be used for this purpose.
- 4.5.73 For the protection of the lubricating oil tank, coolers and associated pipeline and steam turbine bearings, an automatic high velocity water spray system (or similar) will be provided. For the protection of equipment within each gas turbine unit where water spray could cause damage, a total flood CO<sub>2</sub> system (or similar equivalent approved gas extinguishing system) will be provided.
- 4.5.74 Continuous natural gas monitoring systems will be provided. Venting systems will be designed to prevent explosion of air / gas accumulations. Ignition sources will be protected from damage through their design. In addition, wherever possible, the equipment and buildings will be made of non-combustible and fire-resistant materials.
- 4.5.75 The testing of the fire protection and detection system will be carried out in accordance with a Safety and Emergency Response Plan.

Leakages / Spillages

- 4.5.76 There will be appropriate drains within the various bunded areas, and all valves / couplings will be within the bunded area. In the event of oil leak / spill from any oil storage tank, any oil will be contained within the bunded area surrounding the storage tank. Any oil found in a bunded area will be removed by an approved and licensed contractor in accordance with applicable regulations for treatment and disposal at an appropriate facility.
- 4.5.77 An oil spill or chemical spill is recognised as being the principal environmental emergency that could arise at the GEC site. As such, a Safety and Emergency Response Plan will be produced for GEC which will include: emergency procedures for leaks / spills from chemical tanks; and, emergency procedures for leaks / spills of lubricating oil.

**4.6 Decommissioning**

- 4.6.1 GEC will be capable of operating continuously throughout the year for up to 35 years.
- 4.6.2 At the end of the useful life of GEC, the power plant will be decommissioned in accordance with legislative guidelines current at that time. Decommissioning is likely to take place over several months.
- 4.6.3 Alternatively, if market conditions and / or electricity supply constraints at that time indicate that it would be appropriate to extend the life of GEC, then decommissioning may be deferred to a later date. In order to ensure continuing adequate plant conditions and environmental performance, GEC would be re-engineered and re-permitted as required, in accordance with the legislative requirements and guidelines at that time.

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- 4.6.4 In terms of decommissioning, independently validated plant closure / demolition methodologies have been developed for power plants that are at the end of their useful life. The methodologies cover demolition of the power plant equipment and buildings and removal of any contaminated and hazardous material from the site.
- 4.6.5 Similar to construction, the Decommissioning Contractor will be required to prepare and implement a Decommissioning Environmental Management Plan (DEMP).
- 4.6.6 *The requirement to prepare, agree and implement a DEMP is provided by Condition 5(56) and Condition 5(57) of the Original Consent.*
- 4.6.7 When decommissioning and demolishing the power plant, it will be a matter of policy to ensure that the site is left with no environmental or safety risks, and the site will be returned to a conditions suitable for re-use. In this regard, the results of the pre-construction studies / surveys will be used as the basis for a decommissioning / demolition study / survey to assess whether or not any contamination of the site has taken place during the operational lifetime of the power plant.
- 4.6.8 In addition, Environmental Audits will be carried out during decommissioning. These will include:
- A Pre-Closure / Demolition Audit – This will examine, in detail, all potential environmental risks existing at the site and make comprehensive recommendations for remedial actions / work to remove such risks.
  - A Post-Closure / Demolition Audit – This will ensure all remedial actions and remedial work has been successfully completed.
- 4.6.9 The Environmental Audit reports will be made available to future users of the GEC site. In addition, the Environment Agency will be notified and the Environmental Audit reports will be submitted.
- 4.6.10 During decommissioning, all reasonable measures required to prevent any future pollution of the GEC site will be carried out. This will include measures such as:
- The emptying / cleaning and removal of storage tanks; and,
  - The removal from site of all materials / liquids liable to cause contamination.
- 4.6.11 In addition, the surface water drainage system for GEC will continue to operate throughout decommissioning. Any areas where oil spillage could occur will continue to drain to an oil interceptor, which will continue to be maintained.
- 4.6.12 In order to facilitate decommissioning, many of the equipment and buildings on site will be made of materials suitable for recycling. For example, a large proportion of the buildings will be constructed of pre-fabricated steel and will therefore also be of interest to a scrap metal merchant. After the removal of the main items of equipment and steel framed buildings, the remaining buildings will be demolished to ground level. All underground structures will either be removed or made safe. All deconstruction material to be removed offsite will be sent to an approved and licensed waste management facility.
- 4.6.13 In addition, it should be noted that decommissioning will be in accordance with the requirements of the Environmental Permit for GEC under the Environmental Permitting (England and Wales) Regulations 2010. Details of the decommissioning will be included in the Site Closure Plan which will be included as part of the application for an Environmental Permit.

## **5 DESCRIPTION OF THE GEC SITE AND ITS SURROUNDINGS**

### **5.1 Introduction**

- 5.1.1 In presenting the description of the GEC site and its surroundings, changes from the original text of the February 2010 ES are shown in *blue italic text*.

### **5.2 The Gateway Energy Centre Site [Update of Section 5.1 to the February 2010 ES]**

- 5.2.1 GEC will be located on the land within the London Gateway® Logistics Park.
- 5.2.2 As part of the agreement between GECL and the team behind the London Gateway® Logistics Park, the GEC site will be cleared, levelled, remediated and provided to GECL in a condition that would allow for construction of GEC.
- 5.2.3 As such, there are two baseline conditions which are used to describe the baseline conditions of the GEC site. These include an existing baseline and a future baseline which describes the conditions post-works for the London Gateway® Logistics Park (i.e. the condition that would allow for the construction of GEC).

#### ***Existing Baseline at the GEC Site***

- 5.2.4 The landform within the London Gateway® Logistics Park is predominately flat and low-lying, with the north western part of the site rising gently toward Corringham and Stanford-le-Hope. Land levels are generally between +2 to +3 m Above Ordnance Datum (AOD), with a high point of +20 m AOD near Corringham.
- 5.2.5 In the south of the London Gateway® Logistics Park (near to the DP World® London Gateway® Port) levels are generally +2.7 m AOD.
- 5.2.6 To the western edge of the existing sea wall within the DP World® London Gateway® Port the land rises to +6.1 m AOD. To the eastern edge of the sea wall within the DP World® London Gateway® Port, the land is approximately +5.0 m AOD.

#### ***Future Baseline at the GEC Site***

- 5.2.7 In advance of any construction works for GEC, a program of clearance, remediation and levelling is being undertaken across the GEC site. This clearance, remediation and levelling is being undertaken under the powers afforded by consents for the DP World® London Gateway® Port and London Gateway® Logistics Park.
- 5.2.8 As such, the future baseline at the GEC site will be ready for use for the purposes of the Proposed Development. Further details of the future baseline at the GEC site which are relevant are provided in the specific Impact Section of this August 2014 ES FID.

#### ***Update on the Clearance, Remediation and Levelling Works<sup>10</sup>***

- 5.2.9 *Remediation works have already commenced at the DP World® London Gateway® Port and London Gateway® Logistics Park and a substantial part of the London Gateway® Logistics Park has been successfully remediated. It is intended that these remediation works will continue in accordance with a programme and in a manner that supports the proposed development of plots. The teams behind the DP World® London Gateway® Port and London Gateway® Logistics Park note that the development of an individual plot would only commence once it has been successfully cleared and remediated.*
- 5.2.10 *Following the remediation, ground levels across the DP World® London Gateway® Port and London Gateway® Logistics Park will be raised to facilitate natural drainage and mitigate flood risk. The material required for raising levels will be obtained from either dredged material from the Thames Estuary (associated with the construction of the DP*

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<sup>10</sup> Information on the Updated Environmental Baseline are taken from: Chapter 4 (Proposals and Construction) and Chapter 8 (Ground Conditions) of the 'London Gateway® Logistics Park Local Development Order Environmental Statement' (June 2013).

*World® London Gateway® Port), site-won materials (i.e. crushed concrete associated with the DP World® London Gateway® Port and London Gateway® Logistics Park) or will be imported. As with the remediation works, the levelling works will be undertaken in accordance with a programme and in a manner that supports the proposed development of the plots.*

- 5.2.11 *It is currently estimated that approximately 80 per cent of the locations across the DP World® London Gateway® Port and London Gateway® Logistics Park sites which are known to require remediation have been successfully remediated.*

## **6 ALTERNATIVES**

### **6.1 Introduction**

- 6.1.1 In presenting the alternatives, changes from the original text of the February 2010 ES are shown in *blue italic text*.

### **6.2 Alternative Infrastructure Connections [Update to Section 6.6 of the February 2010 ES]**

- 6.2.1 As noted in Section 4, there are a number of interconnections that will be required to allow for the operation of GEC. These include:

- A new underground gas pipeline and associated AGI to connect to the National Grid National Gas Transmission System;
- A new HV underground electrical connection and associated extension to the Coryton Substation to connect to the National Grid National Electricity Transmission System; and,
- Potential connections for future CHP / CCR.

#### ***Underground Gas Pipeline and Associated AGI***

- 6.2.2 The natural gas used as the fuel will be brought to the GEC site via a new underground gas pipeline to be constructed between the GEC site and the existing National Grid National Gas Transmission System No. 5 Feeder Pipeline.

- 6.2.3 *Further information is provided in the application for planning permission under the Town and Country Planning Act 1990 for the underground gas pipeline and associated AGI. An overview was presented in Section 1.1.*

- 6.2.4 *At the existing National Grid National Gas Transmission System No. 5 Feeder Pipeline, a new AGI will be constructed, to be known as Butts Lane AGI. The Butts Lane AGI will be located west of Mucking and south of Stanford-le-Hope, adjacent to the existing AGI for the Coryton CCGT power plant.*

- 6.2.5 *From the Butts Lane AGI site to the GEC site, the proposed route (described in the direction of gas flow) would likely:*

- *Head east, crossing Butts Lane and the passenger railway line that runs from Shoeburyness to London Fenchurch Street; then,*
- *Head north east, following the route of the existing over head electricity lines; then,*
- *Turn south east, passing the sewage works and the North Shell Angling Lakes, crossing the Thames Haven Branch Line and Wharf Road (noting that it is highly probable that a Horizontal Directional Drill (HDD) section will be required from the sewage works to the crossing of Wharf Road, underneath the northern most North Shell Angling Lake); then,*
- *Closely follow the existing underground gas pipeline for the Coryton CCGT power plant, crossing Rainbow Lane and passing the south east of Great Garlands Farm; then,*
- *Cross under the A1014 (The Manorway) and continue in east; and then,*
- *Head south, crossing back under the A1014 (The Manorway) and continue to the GEC site following the route of the agreed easement with DP World.*

- 6.2.6 *Whilst an increase in permitted generation capacity of GEC from about 900 MW<sup>11</sup> to up to 1250 MW may increase the diameter of the gas pipeline required, it is not anticipated*

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<sup>11</sup> As per the Original Consent, a tolerance of up to 5% is permitted.



*that there will be any change required to the Route Study Corridor or to the working widths. Furthermore, there will be no potential for the likely significant effects on the environment of the underground gas pipeline and associated AGI to differ from those described in the March 2011 ES and July 2011 ES FID.*

***HV Underground Electrical Connection and Associated Extension to the Coryton Substation***

- 6.2.7 The electricity generated at GEC will be dispatched to the National Grid National Electricity Transmission System via a new HV underground cable to be constructed between the GEC site and the existing Coryton Substation at the Coryton CCGT power plant.
- 6.2.8 *Further information is provided in the application for planning permission under the Town and Country Planning Act 1990 for HV underground electrical connection and associated extension to the Coryton Substation. An overview was presented in Section 1.1.*
- 6.2.9 *From the GEC site to the existing Coryton Substation on the Coryton CCGT power plant, the proposed route (described in the direction of electricity dispatch) would likely:*
- Leave the GEC substation within the GEC site, and exit the GEC site to the east and then turn northwards following the route of the agreed easement with DP World; then,*
  - Cross under the A1014 (The Manorway) via a Horizontal Directional Drill (HDD); then,*
  - Turn eastwards towards the existing Coryton CCGT power plant; then,*
  - Cross back under the A1014 (The Manorway) via a second HDD; and then,*
  - Continue south-eastwards towards the existing Coryton Substation at the Coryton CCGT power plant site.*
- 6.2.10 *Within this route, two Options are have been given planning permission. These are referred to as the 'Preferred Option' and the 'Manorway Fleet / Northern Triangle Option'. The exact route will be determined after the appointment of the HV underground electrical connection Construction Contractor / HDD Specialist who will take into consideration the potential locations of the HDD drilling pits and agreements with Land Owners.*
- 6.2.11 *Under the Preferred Option, to the north of the A1014 (The Manorway), the HV underground electrical connection would be installed under the cycle path. In terms of the HDD, it has been assumed that this would be used for the two crossings of the A1014 (The Manorway), which would also include the crossing of the railway.*
- 6.2.12 *The Manorway Fleet / Northern Triangle Option would be employed in the even that it is not practicable to install the HV underground electrical connection under the cycle path. Under the Manorway Fleet / Northern Triangle Option it may be necessary to extend the working corridor northwards into the Manorway Fleet and Northern Triangle. In terms of HDD, it has been assumed that (in addition to the two crossings of the A1014 (The Manorway) and the crossing of the railway) this would be used for the crossing of the Manorway Fleet and Northern Triangle.*
- 6.2.13 *Based on an increase in permitted generation capacity of GEC from about 900 MW<sup>12</sup> to up to 1250 MW, it is not anticipated that there will be any change required to the Route Study Corridor or to the working widths. Furthermore, there will be no potential for the likely significant effects on the environment of the HV underground electrical connection and associated extension to the Coryton Substation to differ from those described in the November 2012 ER.*

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<sup>12</sup> As per the Original Consent, a tolerance of up to 5% is permitted.



***Combined Heat and Power / Carbon Capture Readiness***

- 6.2.14 Interconnections and easements may also be required for CHP (for the export of steam / hot water) and CCR (for the export of captured CO<sub>2</sub>). These exports are discussed further in the CHP Assessment / Supplementary CHP Assessment and CCR Feasibility Study respectively.

## 7 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY / ENVIRONMENTAL STATEMENT CONTENT

### 7.1 Introduction

- 7.1.1 In presenting the EIA methodology / ES content, changes from the original text of the February 2010 ES are shown in *blue italic text*.

### 7.2 Environmental Statement Content [Update to Section 7.5 of the February 2010 ES]

- 7.2.1 When considering the information to accompany the Variation Application, the Variation Guidance states, at paragraph 36, that *"before an application for variation of the Section 36 Consent is determined by the Secretary of State or MMO, both the decision maker and the applicant must have complied with the relevant requirements of the [Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 (the EIA Regulations) as updated by the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013 (the Variation Regulations)] regarding environmental assessment"*.
- 7.2.2 EIA Regulation 4(1) states that: *"an applicant shall submit in relation to any application for a Section 36 Consent [...] which relates to EIA Development an Environmental Statement which includes:*
- a) at least the information referred to in Part II of Schedule 4; and,*
  - b) such of the information referred to in Part I of Schedule 4 as is reasonably required to assess the environmental effects of the proposed development and which, having regard in particular to current knowledge and methods of assessment, the applicant can reasonably be required to compile, taking into account the terms of any scoping opinion given".*
- 7.2.3 Therefore, based on Schedule 4 of the EIA Regulations, as amended by the Variation Regulations, the required ES content is shown in Table 7.1.
- 7.2.4 This August 2014 ES FID has been prepared to accompany the Variation Application.
- 7.2.5 This August 2014 ES FID is to be used in combination with the February 2010 ES and the December 2010 ES FID. In combination, these documents detail the results of a comprehensive and independent study of the likely significant effects on the environment of GEC, and the mitigation and monitoring measures designed to minimise any identified significant effects on the environment. Accordingly, the link to where the required ES content is presented is also shown in Table 7.1.

**TABLE 7.1: REQUIRED ENVIRONMENTAL STATEMENT CONTENT AS SET OUT IN SCHEDULE 4 OF THE EIA REGULATIONS AS AMENDED BY THE VARIATION REGULATIONS**

Information Required		Section of the February 2010 ES	Section of the December 2010 ES FID	Section of this August 2014 ES FID
<b>PART 1</b>				
1	Description of the development, including in particular – a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases; A description of the main characteristics of the production processes, for instance, natural and quality of materials used; and, 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 proposed development.	Section 4	N / A (Used the information presented in Section 4 of the February 2010 ES)	Section 4 (Updating the information in Section 4 of the February 2010 ES)
2	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 their inter-relationship between the above factors.	Impact Assessment Sections 9 to 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
3	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 – The existence of the development; The use of natural resources; and, The emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.	Impact Assessment Sections 9 to 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
(a)				
(b)				
(c)				

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Information Required		Section of the February 2010 ES	Section of the December 2010 ES FID	Section of this August 2014 ES FID
4	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 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID) Section 19 (Consolidated Summary of Mitigation and Monitoring)
5	A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	Non-Technical Summary of the February 2010 ES	Non-Technical Summary of the December 2010 ES FID	Non-Technical Summary of this August 2014 ES FID
6	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 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
<b>PART 2</b>				
1	A description of the development comprising information on the site, design and size of the development.	Section 4 and Section 5	Section 5 (Used the information presented in Section 4 of the February 2010 ES / Updated, wherever relevant, the information presented in Section 5 of the December 2010 ES FID)	Section 4 and Section 5 (Updating the information in Section 4 and Section 5 of the February 2010 ES / December 2010 ES FID)

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Information Required		Section of the February 2010 ES	Section of the December 2010 ES FID	Section of this August 2014 ES FID
2	A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.	Impact Assessment Sections 9 to 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
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 17	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES)	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
4	An outline of the main alternatives studied by the applicant and an indication of the main reasons for his choice, taking into account the environmental effects.	Section 6	Section 6 (Updating the information in Section 6 of the February 2010 ES)	Section 6 (Updating the information in Section 6 of the February 2010 ES / December 2010 ES FID)
5	A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	Non-Technical Summary of the February 2010 ES	Non-Technical Summary of the December 2010 ES FID	Non-Technical Summary of this August 2014 ES FID
a)	The main respects in which the applicant considers that the likely significant effects on the environment of the proposed development would differ from those described in any Environmental Statement that was prepared in conjunction with the relevant Section 36 Consent; and,	N / A	N / A	Impact Assessment Sections 9 to 18 (Updating, wherever relevant, the information presented in Impact Assessment Sections 9 to 17 of the February 2010 ES / 9 to 18 of the December 2010 ES FID)
b)	A non-technical summary of the differences referred to in paragraph (a) of this Part.	N / A	N / A	Non-Technical Summary of this August 2014 ES FID

### **7.3 Environmental Impact Assessment Methodology [Update to Section 7.4 of the February 2010 ES]**

7.3.1 Based on Schedule 4 of the EIA Regulations, as amended by the Variation Regulations, the EIA methodology has included the following:

- Discussions with consultees on the key issues on which the EIA should focus;
- Identification of any alternatives;
- Establishing baseline environmental conditions through desk-top research and site-surveys;
- Identifying and assessing the likely effects on the environment of the Proposed Development;
- *Within this August 2014 ES FID, identifying and assessing the main respects in which the likely significant effects on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID;*
- Determining how significant effects on the environment will be avoided or reduced through design evolution or mitigation measures;
- Describing, wherever relevant, how significant effects on the environment will be monitored;
- Identifying and assessing the likely cumulative effects on the environment; and,
- Reporting the process, results and conclusions of the EIA in an ES.

7.3.2 A brief description of these steps is provided in this sub-Section.

#### ***Identification of Environmental Baseline***

7.3.3 In undertaking the EIA, it is important to identify the environmental baseline at the site being considered. This allows the potential effects on the environment to be seen in the light of the existing environment and allows for better identification of the most appropriate mitigation / monitoring which could be employed to minimise any significant effects on the environment.

7.3.4 Accordingly, in identifying the environmental baseline for GEC, two scenarios have been considered. These are:

- Existing Baseline

A description of the existing environmental baseline on site.

- Future Baseline

As part of the agreement between GECL and DP World, the GEC site will be cleared, levelled, remediated and provided to GECL in a condition that would allow for construction of GEC.

As such, the future baseline comprises a description of the future baseline on site post-works for the DP World® London Gateway® Port and London Gateway® Logistics Park.

7.3.5 *Of these two scenarios, the future baseline is used as the basis for the various assessments. Within the assessments, the indicative programme for development, in line with the Original Consent, is:*

- *Start of Construction:* After Jan 2012, before 4 August 2016.
- *Connection / Commissioning:* After Jan 2014, before 4 August 2018.
- *Full Operation:* After Jan 2015, before 4 August 2019.

***Description of the Proposed Development***

- 7.3.6 A full description of Proposed Development is provided in Section 4 (as updated from Section 4 of the February 2010 ES).
- 7.3.7 Further details on specific aspects of the Proposed Development / the GEC site and its surroundings are provided in the respective Impact Sections as required.

***Identification and Assessment of the Likely Effects on the Environment***

- 7.3.8 The identified effects may be: direct; indirect or secondary; or, cumulative. Within these categories they may be: short, medium or long-term; permanent or temporary; and, positive or negative.
- 7.3.9 Direct effects are changes to the environmental baseline arising directly from activities that form part of the Proposed Development. For example, direct effects may include localised increases in noise during construction. Indirect and secondary effects are those which arise as a result of a direct effect. For example, deterioration of water quality in a watercourse due to an effluent discharge (which would be a direct effect) could have an indirect / secondary effect on aquatic biodiversity. Cumulative are those that are either combined effects of different types on a single receptor (i.e. dust and noise considered together) or effects from other planned developments combined with those from the Proposed Development (i.e. combined traffic).
- 7.3.10 To help assess the likely effects on the environment, significance criteria can be employed to ensure that identified effects on the environment are within acceptable limits. Significance criteria are important as they inform the determination of the overall acceptability of the Proposed Development. The significance criteria use a combination of the magnitude of change (i.e. the size and duration of the effect) and the value / sensitivity of the receptor.
- 7.3.11 *In accordance with Schedule 4 of the EIA Regulations, as amended by the Variation Regulations, within this August 2014 ES FID there is also identification and assessment of the main respects in which GECL (and their consultant) consider that the likely significant effects on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.*

***Mitigation / Monitoring Philosophy***

- 7.3.12 Full consideration is then given to the potential mitigation and monitoring techniques which could be used to ensure that the significant adverse effects on the environment are minimised.
- 7.3.13 In the hierarchy of mitigation, significant adverse effects on the environment should first be avoided altogether, then reduced and finally offset.
- 7.3.14 *To support the EIA, within this August 2014 ES FID, a consolidated summary of the mitigation and monitoring measures for GEC is provided drawing on the conclusions of the February 2010 ES, the December 2010 ES FID and any additional environmental assessment undertaken as part of this August 2014 ES FID. The consolidated summary of mitigation and monitoring is provided in Section 19.*

**7.4 Environmental Impact Assessment Presentation**

- 7.4.1 Each of the Impact Sections within this August 2014 ES FID have been broken down into a number of key sub-Sections:
- Introduction;  
This sub-Section provides a description of the key issues with regard to the specific aspect of the environment considered.
  - Updated Environmental Baseline / Identification of Need for Additional Assessment;  
This sub-Section provides discussion on the updated environmental baseline.

Following this discussion, this sub-Section presents an exercise undertaken to identify and assess whether the likely significant effects on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

- If necessary, Assessment Methodology and Significance Criteria;

This sub-Section provides details of the assessment methodology adopted, and the significance criteria employed.

- If necessary, Assessment of Potential Impacts;

This sub-Section presents the findings of any additional environmental assessment undertaken for the Proposed Development.

- If necessary, Description of Mitigation and Monitoring;

This sub-Section provides details of any mitigation and monitoring measures identified to ensure that any likely significant environmental effects are avoided, reduced or offset.

- If necessary, Assessment of Residual Impacts.

This sub-Section provides details of any residual environmental effects (i.e. post implementation of mitigation and monitoring).

- Summary

This sub-Section provides a summary of the Impact Section.



## **8 STAKEHOLDER CONSULTATIONS AND ADDITIONAL STUDIES**

### **8.1 Stakeholder Consultations**

- 8.1.1 Before making the Variation Application, GECL undertook pre-application consultation with a variety of stakeholders who were consulted as part of the Original Consent Application. These stakeholders included DECC, the Local Planning Authority, and governmental and non-governmental organisations.
- 8.1.2 This has allowed GECL to be clear about the views of stakeholders, the need for any additional environmental assessment, and whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 8.1.3 A summary of the pre-application consultation responses, in relation to the Variation Application, is provided in Table 8.1. The subsequent actions taken, and a link to where the additional environment assessment (or additional information) is presented is also provided in Table 8.1.

**TABLE 8.1: SUMMARY OF PRE-APPLICATION CONSULTATION**

Consultee	Heading	Summary of Comments	Action / Link
British Pipeline Association	Variation Application	"Thank you for the notice regarding the works at Gateway Energy Centre [...]. We have no objection to the works as they currently stand".	No further action is deemed necessary.
Civil Aviation Authority (CAA)	Variation Application	"Given [Dalton Warner Davis] DWD advise that there is no proposed increase to building (and presumably any associated structure) size, I can advise that the Civil Aviation Authority's (CAA) related position remains as previously described".	No further action is deemed necessary.
Department of Energy and Climate Change (DECC)	Variation Application	Reference should be made to Regulation 3 of the Electricity Generating Stations (Variation of Consents) (England and Wales) Regulations 2013 with regard to the information to be included in a Variation Application.	Compliance with Regulation 3 of the Electricity Generating Stations (Variation of Consents) is shown in Section 1 (Introduction).
	Structure of an ES FID	<p>The criteria used to establish impact magnitude and significance should be clearly defined within the environmental information. Tabular presentation should be used to summarise key direct and indirect impacts. It is important for all mitigating / monitoring measures that:</p> <ul style="list-style-type: none"> <li>• They are clearly stated;</li> <li>• They are fully described with accuracy;</li> <li>• They are assessed for their environmental effects;</li> <li>• They are assessed for their effectiveness;</li> <li>• Their implementation should be fully described;</li> <li>• It is explained how commitments will be monitored and by whom; and</li> <li>• If necessary, it is explained how mitigation or compensatory measures relate to any consents or conditions.</li> </ul>	This method has been used in the preparation of this August 2014 ES FID.
DP World	Variation Application	As part of the agreement between GECL and the team behind the London Gateway® Logistics Park, GECL are required to obtain approval before submission of the Variation Application. The team behind the London Gateway® Logistics Park have had opportunity to view the Variation Application and associated documents and, in principle, do not foresee a problem.	No further action is deemed necessary.

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Consultee	Heading	Summary of Comments	Action / Link
English Heritage	Variation Application	As the main parameters remain unaltered, English Heritage has no comments to make on the Variation Application.	No further action is deemed necessary.
Environment Agency	Application for an Environmental Permit	"[An application for an Environmental Permit] under the Environmental Permitting Regulations 2010 (as amended) has been received by us. Essential information, needed for the application to be "duly made", has been requested from the applicant. Once sufficient information has been received, the application determination can commence".	GECL intends to submit the additional information shortly.
	Carbon Capture Readiness	<p>"The Government has determined that Carbon Capture Ready (CCR) should be assessed during the Electricity Act [1989] consenting process and that no new power station of a type covered by the EU Large Combustion Plant Directive (LCPD) at or over 300 MWe will be consented unless it can be demonstrated to be CCR.</p> <p>[...]</p> <p>Our role is to provide advice to the consenting authority as to whether the applicant has demonstrated they propose to retain sufficient space to accommodate the [CO<sub>2</sub> capture plant] and equipment and that it is technically feasible to retrofit the [CO<sub>2</sub> capture] technology selected. Given [CO<sub>2</sub> capture] technologies have not been demonstrated on a commercial scale the CCR requirements are that "there are no foreseeable barriers" to retrofit.</p> <p>In April 2013, the applicant applied to increase the CCGT [power plant] to 1200 MWe and we consulted by the Department for Energy and Climate Change on the associated carbon capture readiness status of the site. Our conclusion was that, based on the information provided, the applicant had not demonstrated that the area allocated for the future CO<sub>2</sub> capture plant was adequate for a 1200 MWe power station and that the applicant would need to carry out a detailed engineering design to demonstrate enough space was set aside. We are still awaiting this further information from Gateway Energy Centre Limited before we can come to our final decision".</p>	<p>In support of the Variation Application, GECL is providing supporting information to DECC including an Updated CCR Feasibility Study, and accompanying report by Imperial College London.</p>
	Variation Application	"We would advise you that we have no objection to the construction of the proposed [Gateway] Energy Centre".	No further action is deemed necessary.

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Consultee	Heading	Summary of Comments	Action / Link
Highways Agency	Content of the August 2014 ES FID / Traffic and Infrastructure	On the basis only an increase in the permitted generation capacity of GEC from 900 MW to 1250 MW, it is not necessary to update the Transport Assessment.	No further action is deemed necessary. Section 15 (Traffic and Infrastructure) provides supporting information.
Medway Council	Content of the August 2014 ES FID / Air Quality	"Having briefly reviewed the submitted letter and the attached CD ROM, it is my informal opinion that the Local Planning Authority is unlikely to change its stance from the previous comments made of the original submission. As you will be aware, in that response Medway Council, as an adjoining Local Planning Authority, raised no objections but drew attention to potential impacts on Medway's significant and densely populated urban area and outlying settlements and the internationally and nationally protected habitats (Special Protection Areas, RAMSAR sites and Sites of Special Scientific Interest) from changes in air quality as a result of the Proposed Development. Medway Council as the adjoining Local Planning Authority requested that the relevant consultee responses on these matters, including the RSPB, Natural England and the Environment Agency, be taken into consideration in the determination of that submission".	In terms of air quality and ecology, Section 9 (Air Quality) provides supporting information and assessment. Section 12 (Ecology) provides supporting information.

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Consultee	Heading	Summary of Comments	Action / Link
Natural England	Content of the August 2014 ES FID / Air Quality	<p>"Reviewing our file and previous comments on the original [...] application, Natural England previously expressed concerns regarding the contribution of the GEC to high baseline air quality levels, at several nearby Sites of Special Scientific Interest (SSSIs). Through discussions with InterGen UK Ltd (on behalf of GEC), we accepted at that time that the predicted impacts could not be mitigated (in the strict sense of the term), but agreed that a package of conservation measures at these sites was appropriate in this circumstance. These measures are set out within the signed Section 106 Agreement, Schedule 4, dated 7 July 2011.</p> <p>We understand that this [...] variation application seeks to increase the output of the GEC, and therefore is likely to further increase the exceedence of air quality thresholds for these SSSIs. It is not clear within the letter how it has been concluded that "the larger output from the proposed plant will remain within the other parameters of the existing [...] consent" (which we take to include air quality parameters). We therefore advise that any further air quality related impacts are appropriately considered and assessed in the application, and the package of mitigation / compensation measures reviewed accordingly, to ensure it is adequate and fit for purpose".</p>	<p>In terms of air quality and ecology, Section 9 (Air Quality) provides supporting information and assessment.</p> <p>Section 12 (Ecology) provides supporting information.</p> <p>Section 18 provides a Consolidated Summary of Mitigation and Monitoring.</p>
Port of London Authority	Variation Application	"The [Port of London Authority's] comments on the [Original Consent Application] are well documented. It is unclear whether the conditions on the grant of planning permission require the maximisation of the river for the transport of construction and demolition materials. The [Port of London Authority] would welcome the opportunity to vary the extant conditions to cover this matter".	No further action is deemed necessary. Section 15 (Traffic and Infrastructure) provides supporting information.

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Consultee	Heading	Summary of Comments	Action / Link
Shell Haven Project Environmental Action Committee (SPEAC)	HV underground electrical connection and associated extension to the Coryton Substation	"I am grateful for the information on the proposed application for variation of the consent for this development and, in principle, we are fully supportive of the planned increase in output from this facility. One question does arise on which that I hope you may be able to offer some comment. Is it anticipated that this increase in output will necessitate National Grid needing to revisit their previous decision that a substation at this location would not be necessary? I understand that this would be a [National Grid] decision but, presumably, GECL has considered this possibility in their planning. Any [information] that can be supplied would be appreciated".	The electricity generated at GEC will be dispatched to the National Grid National Electricity Transmission System via a new HV underground cable to be constructed between the GEC site and the existing Coryton Substation of the Coryton CCGT power plant site.  Planning permission (Reference: 12/01085/FUL) for the HV underground electrical connection and associated extension of the existing Coryton Substation was granted on 27 February 2013.  No variation is required to the planning permission due to the increase in permitted generation capacity of GEC from about 900 MW <sup>13</sup> to up to 1250 MW.
Stephen Metcalfe MP	Variation Application	No comments to make on the Variation Application.  "I would, however, be most grateful for more information about the high voltage electrical connection. Will it continue to be proposed that it connects to existing infrastructure, as was previously the case, or will a new network be required?"	The electricity generated at GEC will be dispatched to the National Grid National Electricity Transmission System via a new HV underground cable to be constructed between the GEC site and the existing Coryton Substation of the Coryton CCGT power plant site.  On 27 February 2013, planning permission (Reference: 12/01085/FUL) for the HV underground electrical connection and associated extension of the existing Coryton Substation was granted on 27 February 2013.  There is no change to this approach.

<sup>13</sup> As per the Original Consent, a tolerance of up to 5% is permitted.

## **8.2 Carbon Capture Readiness Feasibility Study**

- 8.2.1 As noted above, in terms of the proposed increase in permitted generation, the Environment Agency has stated that *"the applicant had not demonstrated that the area allocated for the future CO<sub>2</sub> capture plant was adequate for a 1200 MWe power station"*. Furthermore, *"the applicant would need to carry out a detailed engineering design to demonstrate enough space was set aside"*.
- 8.2.2 To accompany the Variation Application, GECL is providing information to DECC including an Updated CCR Feasibility Study, and an accompanying report by Imperial College London.
- 8.2.3 To inform the Updated CCR Feasibility Study, GECL commissioned a number of additional studies including a specific engineering investigation by Siemens. The aims of the engineering investigation were to verify whether the land set aside at GEC for the purposes of CCR (the CCS space) is sufficient for the proposed increase in permitted generation capacity.
- 8.2.4 The engineering investigation was based on a Siemens PostCap™ reference project, containing the results of a full process simulation including equipment dimensioning. Within the engineering investigation, the reference project was scaled to represent the proposed increase in permitted generation capacity requested for GEC. The results of this engineering investigation have been independently validated by Imperial College London.
- 8.2.5 The Updated CCR Feasibility Study demonstrates that, with the proposed increase in permitted generation capacity, GEC will remain fully compliant with the conclusions of the February 2010 CCR Feasibility Study.

## 9 AIR QUALITY

### 9.1 Introduction

- 9.1.1 This Section considers the potential effects of GEC on air quality, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 9.1.2 As, during operation, an increase in the permitted generation capacity of GEC would alter the release of pollutants to air from those reported in the February 2010 ES and the December 2010 ES FID, an updated assessment has been provided. The updated assessment is based on 'Gateway Energy Centre: Air Dispersion Modelling Update' (Parsons Brinckerhoff, July 2014).

### 9.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment

#### *Updated Environmental Baseline*

##### Ambient Air Quality Directive

- 9.2.1 Council Directive 96/62/EC on ambient air quality assessment and management (the Air Quality Framework Directive) described the basic principles as to how air quality should be assessed and managed in the Member States. Subsequent Daughter Directives introduced numerical limits, thresholds and monitoring requirements for a variety of pollutants including oxides of nitrogen (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>) to guarantee that there are no adverse effects with regard to human health.
- 9.2.2 Directive 2008/50/EC on ambient air quality and cleaner air for Europe (the Ambient Air Quality Directive) merges the Air Quality Framework Directive with the First, Second and Third Daughter Directives. The Ambient Air Quality Directive identifies desired maximum ground level concentrations and the date by which the objectives should be met.
- 9.2.3 The Ambient Air Quality Directive is transposed in England through the Air Quality Standards Regulations 2010 (the AQS Regulations).

##### Habitats Directive

- 9.2.4 Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) sets out the legal framework requiring EU Member States to protect habitat sites supporting vulnerable and protected species, as listed within Directive 92/43/EEC.
- 9.2.5 The Habitats Directive is transposed in the UK through the Conservation of Habitats and Species Regulations 2010, and requires protection of ecological sites including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites and Sites of Special Scientific Importance (SSSIs).
- 9.2.6 Across the UK, site-specific critical levels (which relate to airborne pollutant concentrations at ground level) and critical loads (which relate to deposition of materials to soils) have been set for a variety of protected habitats and species in order to allow the quantitative assessment of the condition of ecologically sensitive sites and thus the protection of such sites by the relevant competent authorities.
- 9.2.7 The Ambient Air Quality Directive sets ambient air quality guidelines for NO<sub>x</sub> for the protection of ecosystems. This imposes a long-term (annual average) limit for NO<sub>x</sub> of 30 µg/m<sup>3</sup> (critical level). This is mirrored in the AQS Regulations.



#### Air Quality Standards Regulations 2010

- 9.2.8 The AQS Regulations specify a series of objectives and standards for air quality in the UK. The objectives, as relevant to GEC<sup>14</sup>, are summarised in Table 9.1. Previous to the AQS Regulations, objectives and standards for air quality in the UK were implemented through the Air Quality Strategy for England, Wales, Scotland and Northern Ireland (2007).
- 9.2.9 In addition to the AQS Regulations, Appendix B of Annex (F) of the Environment Agency's 'H1 Environmental Risk Assessment for Permits' Guidance (H1 Guidance) also provides an additional objective / standard for the protection of vegetation and ecosystems. This is also provided in Table 9.1.

**TABLE 9.1: OBJECTIVES / STANDARDS FOR AMBIENT AIR QUALITY**

<i>Pollutant</i>	<i>Source</i>	<i>Averaging Period</i>	<i>Objective (Ground Level Concentration) (µg/m<sup>3</sup>)</i>	<i>Number of Permitted Exceedances</i>
Nitrogen Dioxide (NO <sub>2</sub> )	AQS Regulations	Annual	40	-
	AQS Regulations	1 Hour	200	18
Oxides of Nitrogen (NO <sub>x</sub> ) <sup>15</sup>	AQS Regulations	Annual	30	-
	H1 Guidance	24 Hour (Daily)	75	-

#### Local Air Quality Management

- 9.2.10 In addition to the above, as it is important that GEC does not lead to the exacerbation of existing air quality problems encountered in the area, other receptors that must be given special consideration include Air Quality Management Areas (AQMA) as designated by the local authority and areas of poor air quality.
- 9.2.11 In terms of AQMA, the Environment Act 1995 requires local councils / local authorities to review air quality within their district or borough in order to determine where levels of pollutants identified in the Air Quality Framework Directive (now the Ambient Air Quality Directive) may be in excess of the statutory objectives / relevant standards.
- 9.2.12 If pollutant levels in an area are likely to exceed statutory objectives / relevant standards, then local authorities must declare an AQMA and draft an Action Plan to demonstrate the specific measures proposed in order to achieve the statutory objectives / relevant standards.
- 9.2.13 The Department of Environment, Food and Rural Affairs (DEFRA) has issued Technical Guidance<sup>16</sup> to local authorities to assist in undertaking this task. This gives local authorities a clear picture of the emissions sources which can be controlled or influenced, and aid the local authority in targeting more effectively the relative contributions of industry, transport and other sectors. Solutions proposed within an Action Plan are expected to be cost-effective and proportionate.
- 9.2.14 As part of the on-going review and assessment process of AQMA, a phased approach has been adopted to ensure that the level of local authority assessment is commensurate with the risk of an air quality objective / standard being exceeded. Therefore, each local authority is required to undertake an Updating and Screening Assessment (USA) of the air quality within their administrative area and publish annual Progress Reports in order to identify changes that could potentially lead to a risk of an air quality objective / standard being exceeded which have occurred since the previous USA. Where a risk has

<sup>14</sup> GEC will operate on natural gas supplied from the National Grid National Gas Transmission System. Natural gas is an inherently clean burning fuel that does not give rise to significant quantities of sulphur dioxide (SO<sub>2</sub>) or particulate matter during combustion.

<sup>15</sup> For the protection of vegetation and ecosystems.

<sup>16</sup> Local Air Quality Management Policy Guidance (PG09) (February 2009).

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.

- 9.2.15 Therefore, the updated environmental baseline can be determined by examining the Local Authority ambient air quality data. The last USA, undertaken by Thurrock Borough Council, was published in April 2012<sup>17</sup>. Detailed in the USA were 16 AQMAs in the Thurrock Borough Council area. These are detailed in Table 9.2.

**TABLE 9.2: SUMMARY OF THURROCK BOROUGH COUNCIL AQMAs**

<i>AQMA no.</i>	<i>Pollutant</i>	<i>Description</i>
1	NO <sub>2</sub>	Grays Town Centre and London Road Grays
2	NO <sub>2</sub>	London Road South Stifford and adjoining roads
3	NO <sub>2</sub>	East side of Hogg Lane and Elizabeth Road
4	NO <sub>2</sub>	West of Chafford Hundred Visitor Centre
5	NO <sub>2</sub> and PM <sub>10</sub>	Warren Terrace, A13 and A1306
7	NO <sub>2</sub> and PM <sub>10</sub>	Hotels next to M25
8	NO <sub>2</sub> and PM <sub>10</sub>	Hotel next to Junction 31 of M25
9	NO <sub>2</sub>	Hotel next to Junction 31 of M25
10	NO <sub>2</sub> and PM <sub>10</sub>	London Road Purfleet near to Jarrah Cottages
12	NO <sub>2</sub>	Watts Wood estate next to A1306
13	NO <sub>2</sub>	London Road Averley next to A1306
15	NO <sub>2</sub>	Near to M25 on edge of Irvine Gardens, South Ockendon
16	NO <sub>2</sub>	Next to M25 off Dennis Road
21	NO <sub>2</sub>	Hotel on Stonehouse Lane
23	NO <sub>2</sub>	London Road West Thurrock
24	NO <sub>2</sub>	Calcutta Road, Tilbury

- 9.2.16 As can be seen from the Table 9.2, 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. Other neighbouring local authorities (Basildon and Castlepoint) have not declared any AQMAs.
- 9.2.17 Therefore the environmental baseline with respect to AQMAs is the same as that reported in the February 2010 ES (specifically at paragraph 9.5.17).
- 9.2.18 Furthermore, DEFRA operates a number of automatic monitoring stations throughout the UK. The results from these automatic monitoring stations are available on the internet<sup>18</sup>. There are four automatic monitoring stations in the vicinity of the GEC site. These automatic monitoring stations have been in operation for a number of years and have been recording data which will include contributions from both the existing Coryton CCGT power plant and the Thames OilPort / former Petroplus Coryton Oil Refinery. In addition, these four automatic monitoring stations were previously used to establish the environmental baseline in the February 2010 ES.
- 9.2.19 Annual average NO<sub>2</sub> concentrations for the years 2007 to 2011 are shown in Table 9.3, and maximum highest hourly average NO<sub>2</sub> concentrations are shown in Table 9.4.

<sup>17</sup> 'Fifth Round Updating and Screening Assessment for Air Quality' (Thurrock Council, 2012).

<sup>18</sup> <http://uk-air.defra.gov.uk/data/>

**TABLE 9.3: ANNUAL AVERAGE NO<sub>2</sub> CONCENTRATIONS FROM AUTOMATIC MONITORING STATIONS (µg/m<sup>3</sup>)**

	<i>Stanford-le-Hope (TK3)</i>	<i>Rochester-Stoke</i>	<i>Thurrock (TK1)</i>	<i>Southend-on-Sea (SD1)</i>
Type	Roadside	Rural	Urban Background	Urban Background
Distance from GEC Site (km)	3.9	11.6	12.9	13.2
2013	28.3	14.1	27.2	20.3
2012	33.0	18.2	28.7	23.9
2011	34.9	19.0	28.2	22.4
2010	35.4	19.2	29.3	16.0
2009	35.2	16.8	31.2	19.9
2008	37.2	17.8	32.0	22.8
2007	-	18.4	34.0	24.8
<b>AQS</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>

**TABLE 9.4: MAXIMUM HIGHEST HOURLY AVERAGE NO<sub>2</sub> CONCENTRATIONS FROM AUTOMATIC MONITORING STATIONS (µg/m<sup>3</sup>)**

	<i>Stanford-le-Hope (TK3)</i>	<i>Rochester-Stoke</i>	<i>Thurrock (TK1)</i>	<i>Southend-on-Sea (SD1)</i>
Type	Roadside	Rural	Urban Background	Urban Background
Distance from GEC Site (km)	3.9	11.6	12.9	13.2
2013	125.0	75.6	143.0	87.0
2012	145.0	90.3	143.0	99.0
2011	166.0	83.3	134.0	97.0
2010	164.0	66.1	138.0	113.0
2009	147.0	83.1	113.0	105.0
2008	168.0	88.1	164.0	111.0
2007	-	113.3	264.0	168.0
<b>AQS</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>

- 9.2.20 In addition, DEFRA produces background maps in order to assist local councils / local authorities in performing their duties in accordance with the Environment Act 1995<sup>19</sup>.
- 9.2.21 Details of the maximum annual ground level NO<sub>2</sub> concentrations estimated for Thurrock Borough Council, by DEFRA, including projections for the years 2020 and 2025 are provided in Table 9.5. It should be noted that the projections for around 2020 are especially relevant given the projected date for commercial operation (i.e. before 4 August 2019). As can be seen from Table 9.5, the projections indicate an expected general improvement in ground level NO<sub>2</sub> concentrations over the coming years.

<sup>19</sup> <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

**TABLE 9.5: ANNUAL GROUND LEVEL NO<sub>2</sub> CONCENTRATIONS ESTIMATED FOR THURROCK BOROUGH COUNCIL BY DEFRA (µg/m<sup>3</sup>)**

<i>Pollutant</i>	<i>Year</i>	<i>Thurrock Borough Council</i>	
		<i>Maximum</i>	<i>Average</i>
NO <sub>2</sub>	2011	40.6	22.0
	2014	38.2	20.2
	2020	35.8	16.4
	2025	34.6	15.3

- 9.2.22 The above Tables demonstrate that ground level NO<sub>2</sub> concentrations within the Thurrock Borough Council area are, generally, not close to exceeding either the long-term or short-term objectives / standards of the AQS Regulations. Therefore the environmental baseline with respect to ground level NO<sub>2</sub> concentrations is the same as that reported in the February 2010 ES (specifically at paragraph 9.5.27).

***Identification of the Need for Additional Assessment***

- 9.2.23 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 9.2.24 In terms of air quality, this is determined via the use of Table 9.6.

**TABLE 9.6: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (AIR QUALITY)**

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Will the Proposed Development release pollutants or any hazardous / toxic / noxious substances to air which differ from those reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air to those reported in the February 2010 ES and the December 2010 ES FID.	An updated air quality impact assessment (during operation) is required.
Are there any areas on or around the site which are already subject to pollution / environmental damage (e.g. where existing legal environmental standards are exceeded) which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air to those reported in the February 2010 ES and the December 2010 ES FID.  Therefore, there may be areas on or around the GEC site which are already subject to pollution / environmental damage which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	An updated air quality impact assessment (during operation) is required.

9.2.25 Therefore, based on the use of Table 9.6, an updated air quality impact assessment (during operation) is required.

### **9.3 Assessment Methodology and Significance Criteria**

#### ***Assessment Methodology***

9.3.1 The air dispersion models available and accepted by the Environment Agency, for point sources, are AERMOD and ADMS. Both are second generation models developed in the US and the UK respectively.

9.3.2 ADMS is developed by Cambridge Environmental Research Centre (CERC), and was selected for the modelling of GEC in order to provide consistency with the February 2010 ES. The latest version of ADMS (ADMS 5.0, Service Pack 1) has been used.

9.3.3 Accordingly, using ADMS, the air dispersion modelling follows the following assessment methodology:

- Establishment of the existing air quality baseline within the study area<sup>20</sup>;
- Identification and quantification of potential sources of air pollution from GEC;
- Assessment of potential impacts of sources of air pollution from GEC, including evaluation of their significance; and,
- Where necessary, suggestion of mitigation and monitoring measures.

#### ***Significance Criteria***

##### Used in Assessment of Potential Impacts – Normal Operation of CCGT Power Plant

9.3.4 The significance criteria adopted have been derived from the criteria suggested in 'Development Control: Planning for Air Quality' (Environmental Protection UK).

9.3.5 Firstly, the magnitude of potential impact is determined via Table 9.7.

**TABLE 9.7: MAGNITUDE OF THE POTENTIAL IMPACT – DURING OPERATION**

<i>Magnitude</i>	<i>Increase in Annual Mean NO<sub>2</sub> (µg/m<sup>3</sup>)</i>	<i>Increase in Hourly NO<sub>2</sub> Exceedances &gt;200 µg/m<sup>3</sup> *<sup>21</sup></i>
Very Large	N / A	>14
Large	>4	8 – 14
Medium	2 – 4	5 – 8
Small	0.4 – 2	3 – 5
Very Small	N / A	1 – 3
Extremely Small	<0.4	<1

\* Note: 18 exceedances are permitted under the NAQS in any one year

9.3.6 Then, the magnitude of the potential impact is then compared against the absolute concentration relative to relevant objective / standard to determine the significance via Table 9.8.

<sup>20</sup> The study area has been defined in accordance with the provisions of Annex (F) of the Environment Agency's 'H1 Environmental Risk Assessment for Permits' Guidance. This includes the identification of specific receptors for the air dispersion modelling study.

<sup>21</sup> Retained from 'Development Control: Planning for Air Quality' (2006 Update) as no standard is included in 'Development Control: Planning for Air Quality' (2010 Update).

**TABLE 9.8: SIGNIFICANCE CRITERIA – DURING OPERATION**

<i><b>Absolute Concentration in Relation to Objective / Standard</b></i>	<i><b>Magnitude</b></i>					
	<i><b>Very Large</b></i>	<i><b>Large</b></i>	<i><b>Medium</b></i>	<i><b>Small</b></i>	<i><b>Very Small</b></i>	<i><b>Extremely Small</b></i>
Above Standard without Project	Severe	Severe	Major	Major	Minor	Minor
Below Standard without Project and above with Project	Severe	Severe	Major	Major	Moderate	Minor
Below Standard with Project, but not well below**	Major	Moderate	Moderate	Minor	Minor	Negligible
Well below Standard with Project	Moderate	Minor	Minor	Minor	Negligible	Negligible
	Significant			Not Significant		

\* 'Standard' relates to the specific objective / standard

\*\* Note: Well below the Standard is equivalent to less than 75 per cent of the objective / standard level

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- 9.3.7 It should be noted that this significance criteria are applied for the purposes of this assessment, and this method does not distinguish between processes or the extent of the area of impact. Therefore it is important that the results are interpreted qualitatively as well as quantitatively.

Used in Assessment of Potential Impacts to Ecological Receptors

- 9.3.8 For the purposes of assessment, Annex (F) of the H1 Guidance has been applied.
- 9.3.9 Firstly, initial screening is undertaken based on Annex (F) of the H1 Guidance which states that: *"process contributions can be considered insignificant [i.e. Not Significant] if:*
- *The long term process contribution is <1 per cent of the long term environmental standard; and,*
  - *The short term process contribution is <10 per cent of the short term environmental standard".*
- 9.3.10 Where process contributions cannot be initially screened out, secondary screening is undertaken. Within Annex (F) of the H1 Guidance, it is noted that:
- The long term process contribution may potentially be significant if the long term process contribution added to the existing long term background concentration (i.e. the Predicted Environmental Concentration or Predicted Total Deposition) is >70 per cent of the long term environmental standard; and,
  - The short term process contribution may potentially be significant if the short term process contribution is >20 per cent of the difference between the short term environmental standard and the existing short term background concentration.
- 9.3.11 Following the secondary screening, process contributions are still not screened out significance is described via the methodology described in Section 12.4 (Assessment Methodology and Significance Criteria) of the February 2010 ES. In summary, this methodology identifies the likely effects on Valued Ecological Receptors (VERs) from GEC via characterisation of the potential ecological impacts that are likely to arise, taking into consideration magnitude of the effect (i.e. the size or intensity of the effect in relevant terms. For example: the number of individuals lost or gained; area of habitat lost or created; or, the degree of change to existing conditions). The magnitude of the effect is underpinned by the following parameters:
- Extent;
  - Duration;
  - Reversibility;
  - Timing; and,
  - Frequency.
- 9.3.12 Specifically in terms of duration, consideration is given to the length of time over which the effect occurs. Specifically in terms of reversibility, consideration is given to the extent to which effects are reversible, either spontaneously or through active mitigation.
- 9.3.13 The magnitude of the effect is then characterised via the use of Table 9.9.

**TABLE 9.9: CRITERIA USED IN ESTABLISHING THE MAGNITUDE OF POTENTIAL IMPACTS**

<i>Magnitude</i>	<i>Criteria / Definition</i>
High	Change is likely to cause a direct adverse permanent or long term impact (over more than 10 years) on the integrity / value of the receptor.
Medium	Change is likely to cause an adverse impact on the integrity / value of the receptor, but recovery is predicted in the medium term (5 to 10 years). It is predicted there are no permanent impacts on the integrity of the receptor.
Small	Change is likely to cause an adverse impact on the integrity / value of the receptor, but recovery is predicted in the short term (1 to 4 years), or recovery is within the bound of likely natural variation.
Negligible	The change is likely to be well within the bounds of natural variation or recovery from the negligible impact is likely to occur within an extremely short term (< 1 year). No impact is detectable.

9.3.14 Following determination of the magnitude of effect, and in accordance with guidance issued by the Institute of Ecology and Environmental Management (IEEM), there is determination of the significance of the effect. An ecologically significant impact is defined as an impact (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.

9.3.15 It should be noted that in line with the guidance issued by IEEM, an impact which has been considered as Significant in ecological terms is the same as Significant in EIA terms.

#### **9.4 Assessment of Potential Impacts (During Operation)**

##### ***Air Dispersion Modelling***

9.4.1 Air dispersion modelling can predict the ground level concentrations that occur due to the emissions from an elevated stack point source such as the stacks to be incorporated as part of GEC. This sub-Section describes the key aspects of the air dispersion modelling process undertaken.

9.4.2 The flue gases discharged from a stack have two sources of momentum. The first source of momentum is related to the velocity of discharge. This is usually designed to be in excess of 15 m/s as this value has been found to be sufficient to avoid immediate downwash of the plume. Immediate downwash of a plume would not allow for adequate dispersion of the emissions from the stack and could result in significantly elevated ground level concentrations of pollutants in the immediate vicinity of the stack. However, the momentum of the velocity of discharge is soon dissipated. The second source of momentum is much more significant and is related to the discharge temperature of the flue gases. The flue gases, being warmer than the surrounding atmosphere into which they are discharged, have buoyancy and thus rise. This process continues until the flue gases have cooled to the same temperature as the surrounding air.

9.4.3 Mathematical models are used to calculate the effects of these two sources of momentum and determine the height to which the flue gases will rise. This height plus the height of the stack gives an 'effective stack height'.

9.4.4 The mathematical model then determines the dispersion of the flue gases from this effective stack height. Note that the effective height can be many times greater than the actual stack height as constructed due to the large amount of heat present in the flue gases.

9.4.5 Dispersion occurs as a result of turbulence, and turbulence can result from both buoyancy effects and wind shear (also called mechanical) effects. As an example of buoyancy effects, on a sunny day, solar heating creates turbulence by heating the ground and the air near the ground. The buoyancy of the heated air causes it to rise, creating



turbulence. Such turbulence can rapidly disperse a plume in the surrounding air. At night, during stable conditions, the buoyancy effect is to suppress rather than cause or enhance turbulence. Wind shear effects, important to air pollution modelling, result from high (several metres per second) wind speeds near the ground. Since the wind speed at the ground is zero, any high wind speeds result in substantial wind shear. Wind shear dominates over buoyancy effects not only under high wind conditions, but also near the ground under any conditions.

- 9.4.6 As a result of this, two parameters are used to define the “stability” of the atmosphere. The first parameter is the friction velocity which is a measure of wind shear. The second parameter is a stability term called the Monin-Obukhov length.

Conversion of NO<sub>x</sub> to NO<sub>2</sub>

- 9.4.7 NO<sub>x</sub> emissions from GEC will consist of NO and NO<sub>2</sub>. Whilst it is only NO<sub>2</sub> that is of concern in terms of direct human health effects, NO is a source of NO<sub>2</sub> in the atmosphere and therefore should be considered.
- 9.4.8 The gases are in equilibrium in the air, with NO predominating at the stack exit. The equilibrium changes as the plume disperses and is exposed to oxidants, such as atmospheric ozone. The rate of conversion of NO to NO<sub>2</sub> increases with rising ozone concentration and wind speed (turbulence and mixing effects), whilst the rate of dissociation of NO<sub>2</sub> to NO increases with the level of solar radiation.
- 9.4.9 Therefore, for assessing the impacts of emissions to atmosphere from sources such as CCGT power plants, it is important that realistic estimates are made of how much NO would be converted to NO<sub>2</sub> at all receptors considered.
- 9.4.10 The rate of conversion of NO to NO<sub>2</sub> depends on both the chemical reaction rates and the dispersion of the plume in the atmosphere (i.e. a number of factors including: the prevailing concentration of ozone; the wind speed; and, the atmospheric stability).
- 9.4.11 Between 1975 and 1985 about 60 sets of measurements were taken of the concentrations of NO and NO<sub>2</sub> in plumes from a variety of power plants<sup>22</sup>. These measurements were carried out under widely varying weather conditions at altitudes between 200 m and 700 m. From the data collected, an empirical relationship for the percentage conversion (oxidation) in a power plant plume based on downwind distance, season of the year, wind speed and ambient ozone concentration may be described by the following equation (which is sometime referred to as Janssen’s equation):

$$\frac{NO_2}{NO}_x = A(1 - \exp(-\alpha x))$$

Where: x is the distance downwind (km) of the emission point and α and A are constants dependent on time of year and derived from the measurements of wind speed and ozone concentrations.

- 9.4.12 For a typical power plant, the peak ground level NO<sub>x</sub> concentration will occur within a few kilometres. Calculations have been undertaken using the above methodology in order to determine the ratios of NO to NO<sub>2</sub> using meteorological data from Southend Airport<sup>23</sup>. In order to present a worst case, it is assumed that there is sufficient ozone present in order to fully oxidise NO to NO<sub>2</sub>.

<sup>22</sup> A Classification of NO Oxidation Rates in Power Plant Plumes based on Atmospheric Conditions (Janssen et al, 1987)

<sup>23</sup> In preparing the February 2010 ES, GECL sought consultation with the Environment Agency in respect of the air dispersion modelling that was undertaken as part of the air quality impact assessment. Part of the results of the consultation was an agreement that meteorological data from Southend Airport should be used. The data periods considered were the years 2004 to 2008. The same data periods have been used in this updated assessment for the purposes of consistency.

- 9.4.13 Table 9.10 shows the minimum, maximum and annual average estimates of NO<sub>2</sub> in the plume for selected distances downwind of the plume. The figure takes into account the ratio of NO to NO<sub>2</sub> in the plume on exit from the stack.

**TABLE 9.10: ESTIMATES OF THE PERCENTAGE OF NO<sub>2</sub> IN NO<sub>x</sub>**

<i>Downwind Distance (km)</i>	<i>Percentage NO<sub>2</sub></i>		
	<i>Lowest One Hour Average</i>	<i>Highest One Hour Average</i>	<i>Annual Average</i>
1	5.9	16.0	9.3
2	11.4	29.0	17.5
3	16.5	39.7	24.7
5	25.7	55.6	36.5
10	43.8	76.1	56.1

Air Dispersion Modelling Inputs – CCGT Power Plant

- 9.4.14 A conservative view of the operation of GEC has been adopted in the air dispersion modelling so that a likely “worst case” is presented. The purpose of using this approach is to ensure that the upper parameter of predicted impacts within the potential operating regime of GEC is considered. This ensures that there is a “factor of safety” built into the air quality assessment.
- 9.4.15 The air dispersion modelling inputs for the CCGT power plant firing on natural gas are shown in Table 9.11.

**TABLE 9.11: AIR DISPERSION MODELLING INPUTS – CCGT POWER PLANT**

<i>Parameter</i>	<i>Units</i>	<i>Modelling Details (per Unit)</i>
Actual Flue Gas Volume	m <sup>3</sup> /s	844.1
Flue Gas Velocity	m/s	17.6
Equivalent Stack Diameter	m	8.0
Stack Height	m	75
Flue Gas Temperature	°C	81.0
Oxygen Content	% v/v	11.8
Moisture Content	% v/v	8.9
Normalised Flue Gas Volume*	Nm <sup>3</sup> /s	917.1
NO <sub>x</sub> Emission Level	mg/Nm <sup>3</sup>	50
NO <sub>x</sub> Flow Rate	g/s	45.9
CO Emission Level	mg/Nm <sup>3</sup>	100
CO Flow Rate	g/s	95.8

\* Corrected to 15% v/v O<sub>2</sub>, dry, 1 atm, 0°C

- 9.4.16 In addition, it is noted that the two stacks are to be located at the following national grid references:
- CCGT Power Plant Stack 1 – 573079, 182022; and,
  - CCGT Power Plant Stack 2 – 573079, 181911.

Air Dispersion Modelling Inputs (Stack Height Sensitivity) – Auxiliary Boiler System

- 9.4.17 In addition to the principal stacks described above, GEC will include a small auxiliary boiler system to provide steam during start-up. As such, the small auxiliary boiler system would only operate for a few hours at a time, at intermittent intervals. The system is expected to consist of two boilers (one for each CCGT unit) each rated at approximately 6.5 MWth (input). The auxiliary boilers will be fired on natural gas and share a common stack.
- 9.4.18 The emissions parameters for the auxiliary boiler system presented in the February 2010 ES considered a large boiler for the purposes of providing a back-up system of steam generation in the event that GEC was developed as a full Combined Heat And Power (CHP) CCGT power plant from the outset. Therefore, the back-up system would provide steam to heat off-takers in the event that steam was not available from the GEC steam turbines.
- 9.4.19 However, the results of the CHP Assessment / Supplementary CHP Assessment show that the most currently realistic scenario is that the GEC will provide heat to the London Gateway® Logistics Park only. In this regard, more detailed information regarding the specific tenant heat requirements is needed in order to undertake an accurate assessment of the feasibility (economic and technical) of the provision of CHP. Therefore GEC will be designed and built to be CHP-Ready. As such, the previously envisaged large boiler system will not, initially, be implemented. GECL intends to re-consult at a later date with specific tenants once their detailed heat requirements are known.
- 9.4.20 However, given the reduced capacity of the auxiliary boiler system, a new stack height sensitivity study has been undertaken. The stack height sensitivity study considered:
- The emissions from the common stack;
  - Operation of a single boiler unit;
  - Operation of both boiler units; and,
  - Stack heights ranging from 10 m to 50 m (inclusive), in 5 m intervals.
- 9.4.21 The air dispersion modelling inputs for the auxiliary boiler stack are presented in Table 9.12.

**TABLE 9.12: AIR DISPERSION MODELLING INPUTS – AUXILIARY BOILER SYSTEM**

<i>Parameter</i>	<i>Units</i>	<i>Modelling Details (one Unit in operation)</i>	<i>Modelling Details (both Units in operation)</i>
Actual flue gas volume	m <sup>3</sup> /s	3.0	6.0
Flue gas velocity	m/s	15	30
Equivalent stack diameter	m	0.5	
Flue gas temperature	°C	198	
Oxygen content	% v/v	2.0	
Moisture content	% v/v	9.1	
Normalised flue gas volume*	Nm <sup>3</sup> /s	1.7	3.3
NO <sub>x</sub> emission level**	mg/Nm <sup>3</sup>	100	
NO <sub>x</sub> flow rate	g/s	0.17	0.33

\* Corrected to 15% v/v O<sub>2</sub>, dry, 1 atm, 0°C

\*\* Emissions level taken from 'Process Guidance Note 1/03 (12) Statutory Guidance for Boilers and Furnaces 20-50MW thermal input' (June 2012)

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9.4.22 In addition, it is noted that the common stack is to be located at the following national grid reference:

- Auxiliary Boiler System Common Stack – 573061, 182039.

**Building Downwash**

9.4.23 Building downwash is created by structures in the vicinity of an emissions source and subjects the plume from the stack to wake effects. The effect is generally to pull the plume down to the ground at locations closer to the stack thereby restricting the dispersion of the plume and increasing the ground level concentration of pollutants and, potentially, the environmental impact.

9.4.24 Potential downwash structures are those which are located within 5L of the stack, where L is the lesser of either the height of the building or the maximum projected width of the building. An additional point to note is that if a stack is higher than the height of the building plus 1.5L, then the building is not classed as a downwash structure.

9.4.25 Accordingly, a list of the buildings included in the air dispersion modelling, together with their assumed dimensions, is presented in Table 9.13. The height of each building has been taken as the maximum (i.e. worst case) height permitted under the conditions of the Original Consent (i.e. as reported in Table 4.2).

**TABLE 9.13: BUILDING DATA INCLUDED IN THE AIR DISPERSION MODELLING**

<i><b>Building</b></i>	<i><b>Height (m)</b></i>	<i><b>Angle</b></i>	<i><b>Dimension (m)</b></i>		<i><b>Location (Centre)</b></i>	
			<i><b>X</b></i>	<i><b>Y</b></i>	<i><b>Easting</b></i>	<i><b>Northing</b></i>
Turbine Hall 1	42	0	55	70	573151	182019
Turbine Hall 2	42	0	55	70	573151	181908
HRS G 1	42	0	20	40	573079	182022
HRS G 2	42	0	20	40	573079	181911
ACC (assumed 1 Block)	42	0	125	80	573235	181958

**Study Area, Receptors and Additional Air Dispersion Modelling Data**

**Study Area**

9.4.26 The study area for the air dispersion modelling has been defined in accordance with the provisions of Annex (F) of the Environment Agency's 'H1 Environmental Risk Assessment for Permits' Guidance. This includes the identification of specific receptors for the air dispersion modelling study.

9.4.27 The air dispersion modelling study has considered two areas covered by a Cartesian Grid. These include:

- A Low Resolution Grid comprising a 20 km x 20 km area centred on the midpoint between the two CCGT power plant stacks (national grid reference – 573079, 181967). The modelled domain has been considered using a gridded receptor spacing of 200 m; and,
- A Higher Resolution Grid comprising a 10 km x 10 km area also centred on the midpoint between the two CCGT power plant stacks. The modelled domain has been considered using a gridded receptor spacing of 100 m.

9.4.28 The Higher Resolution Grid provides the coverage required by Annex (F) of the H1 Guidance of 10 km from the principal emissions sources of GEC, and therefore is in accordance with the recommendations of using a receptor spacing of less than 1.5 times the stack height.

*Receptors for the Protection of Human Health*

- 9.4.29 No AQMAs have been designated within the study area therefore no such discrete receptors have been included in the air dispersion modelling. No other specific receptors for the protection of human health have been included in the air dispersion modelling.
- 9.4.30 The assessment of potential impacts across the study area has been undertaken using the NO<sub>2</sub> background mapping data obtained from DEFRA.

*Receptors for the Protection of Vegetation and Ecosystems*

- 9.4.31 For consistency with the February 2010 ES<sup>24</sup> and current guidance from Annex (F) of the H1 Guidance, the following sites have been considered:
- Thames Estuary and Marshes SPA and Ramsar Site, which is located within 2 km of the GEC site. As the site is located to the south / south west of GEC, this site has been included as two discrete receptor locations. These are:
    - Thames Estuary and Marshes SPA and Ramsar (North): This comprises the area of the site on the north bank of the River Thames. The discrete receptor point for this site is NGR: 571318, 181188; and,
    - Thames Estuary and Marshes SPA and Ramsar (South): This comprises the area of the site on the south bank of the River Thames. The discrete receptor point for this site is NGR: 573289, 179799. This area also includes South Thames Estuary and Marshes SSSI.
  - Benfleet and Southend Marshes SPA and Ramsar Site, which is located approximately 6.5 km away from the GEC. The discrete receptor point for this site is NGR: 578611, 185382. This area also includes Benfleet and Southend Marshes SSSI;
  - Vange and Fobbing Marshes SSSI (1.5 km north);
  - Mucking Flats and Marshes (2 km south west);
  - Holehaven Creek SSSI (2.5 km north west);
  - Canvey Wick SSSI (3 k north)
  - Pitsea Marsh SSSI (4 km north);
  - Northward Hill SSSI (7 km south east);
  - Chattenden Woods SSSI (8.5 km south);
  - Thundersley Great Common SSSI (10 km north east);
  - Corringham / Fobbing Marsh Local Wildlife Site (LWS); and,
  - Manorway Fleet Reedbed LWS.
- 9.4.32 Each of the above sites has been considered as a receptor within the atmospheric dispersion modelling. However, their proximity to the GEC site and their extent are such that the Higher Resolution Grid has been used to derive the maximum Process Contributions from operation of GEC.

*Meteorology / Surface Characteristics*

- 9.4.33 For each year (2004 to 2008), the predominant wind direction was south west.
- 9.4.34 The Higher Resolution Grid consists of a mixture of urban and rural topography, including the London Gateway® Logistics Park. The surface roughness for the modelled domain

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<sup>24</sup> The assessment within the February 2010 ES was based on the requirements of the Environment Agency's Technical Guidance Note AGTAG 6. Based on this, all Natura 2000 sites and SSSIs within 10 km of the proposed site are taken into account.

has therefore been set to 0.5 (parkland, open suburbia) in order to provide a worst case assumption of the average surface roughness across the domain.

- 9.4.35 It is noted that the River Thames contributes a large stretch of open water to the topography within the modelled domain. However, given that the predominant wind direction was south west and, therefore, maximum Process Contributions are likely to occur north east of GEC, the River Thames has not been considered in respect of determining a suitable value for the surface roughness.

*Terrain and Building Effects*

- 9.4.36 Terrain effects generally occur when ground levels within 1 km of the stack vary by more than a third of the stack height. For the purposes of GEC (and this air dispersion modelling study), this would be a variation in ground levels by 25 m. Terrain data for the study area shows that, within 1 km (and indeed closer to 2 km) of GEC, the terrain does not vary by more than 5 m. Therefore, terrain data has not been included in the air dispersion modelling study.

***Assessment of Potential Impacts - Normal Operation of CCGT Power Plant***

Summary of Previous Assessment of Potential Impacts (Normal Operation of CCGT Power Plant) from the February 2010 ES and the December 2010 ES FID

- 9.4.37 Table 9.14 presents a summary of the previous assessment of potential impacts during operation.

Updated Assessment of Potential Impacts

- 9.4.38 Table 9.15 presents the likely worse case maximum annual average ground level NO<sub>2</sub> concentrations / maximum 19<sup>th</sup> hourly average ground level NO<sub>2</sub> concentrations predicted by the detailed atmospheric dispersion modelling of GEC considered in isolation. Table 9.15 also shows the relevant objectives / standards and reports the distance and direction from GEC of the maximum predicted NO<sub>2</sub> concentration.

**TABLE 9.15: WORST CASE MAXIMUM GROUND LEVEL NO<sub>2</sub> CONCENTRATIONS**

<i><b>Averaging Period</b></i>	<i><b>Increment to Ground Level NO<sub>2</sub> Concentration (µg/m<sup>3</sup>)</b></i>	<i><b>Objective / Standard (µg/m<sup>3</sup>)</b></i>	<i><b>Distance (km)</b></i>	<i><b>Direction (°)</b></i>
Annual Average (Long Term)	1.0	40	0.6	90
19th Highest Hourly Average (Short Term)	14.0	200	0.4	90

- 9.4.39 Isopleths have been prepared to show the increments for the maximum annual average ground level NO<sub>2</sub> concentration and the maximum 19th highest hourly average NO<sub>2</sub> concentration. These isopleths are presented in Figure 9.1 and Figure 9.2 respectively. Table 9.16 presents a summary of the updated assessment of potential impacts during operation.

**TABLE 9.14: SUMMARY OF PREVIOUS ASSESSMENT OF POTENTIAL IMPACTS (NORMAL OPERATION OF CCGT POWER PLANT)  
 FROM FEBRUARY 2010 ES / DECEMBER 2010 ES FID**

Averaging Period	PC ( $\mu\text{g}/\text{m}^3$ )	Assumed Background ( $\mu\text{g}/\text{m}^3$ ) *	PEC ( $\mu\text{g}/\text{m}^3$ )	AQS Objective ( $\mu\text{g}/\text{m}^3$ )	Percentage of Objective / Standard	Interpretation **
Annual Average (Long Term)	0.3 (Small Magnitude, based on use of Table 9.7)	19.0	19.3	40	48.3	Minor (and therefore Not Significant)
19th Highest Hourly Average (Short Term)	12.0	38.0**	50.0 (Extremely Small Magnitude, based on use of Table 9.7)	200	25.0	Negligible (and therefore Not Significant)

\* Taken from Defra Background Mapping (2015) at the point of maximum PC. 2015 was selected to correspond with the first year of operation.

\*\* In accordance with best practice, the annual average (long-term) background concentration has been doubled for the assessment of 19<sup>th</sup> hourly average (short term) concentrations.

\*\*\* Based on the use of Table 9.8.

**TABLE 9.16: SUMMARY OF ASSESSMENT OF POTENTIAL IMPACTS (NORMAL OPERATION OF CCGT POWER PLANT)**

Averaging Period	PC ( $\mu\text{g}/\text{m}^3$ )	Assumed Background ( $\mu\text{g}/\text{m}^3$ ) *	PEC ( $\mu\text{g}/\text{m}^3$ )	AQS Objective ( $\mu\text{g}/\text{m}^3$ )	Percentage of Objective / Standard	Interpretation **
Annual Average (Long Term)	1.0 (Small Magnitude, based on use of Table 9.7)	19.2	20.2	40	50.5	Minor (and therefore Not Significant)
19th Highest Hourly Average (Short Term)	14.0	38.4**	52.4 (Extremely Small Magnitude, based on use of Table 9.7)	200	26.2	Negligible (and therefore Not Significant)

\* Taken from Defra Background Mapping (2014) at the point of maximum process contribution to provide a worst case assessment. As indicated in Table 9.5 the DEFRA Background Mapping projections indicate an expected general improvement in ground level NO<sub>2</sub> concentrations.

\*\* In accordance with best practice, the annual average (long-term) background concentration has been doubled for the assessment of 19<sup>th</sup> hourly average (short term) concentrations.

\*\*\* Based on the use of Table 9.8.



### Summary

- 9.4.40 In comparing the results of the air dispersion modelling with the relevant objectives / standards, the key findings are:
- In both the previous assessment and this updated assessment, GEC will not give rise to high level concentrations of NO<sub>2</sub>;
  - In the previous assessment, the maximum increase in annual average (long-term) ground level NO<sub>2</sub> concentration is 0.3 µg/m<sup>3</sup>. This is well within the long-term objective / standard of 40 µg/m<sup>3</sup>.
  - In this updated assessment, the maximum increase in annual average (long-term) ground level NO<sub>2</sub> concentration is 1.0 µg/m<sup>3</sup>. This occurs approximately 0.6 km to the east of GEC. This is also well within the long-term objective / standard of 40 µg/m<sup>3</sup>.
  - In both the previous assessment and this updated assessment, the potential impacts due to an increase in annual average (long-term) ground level NO<sub>2</sub> concentration are considered to be not significant.
  - In the previous assessment, the maximum increase in 19<sup>th</sup> highest hourly average (short term) ground level NO<sub>2</sub> concentration is 12.0 µg/m<sup>3</sup>. This is approximately 6 per cent of the short term objective / standard of 200 µg/m<sup>3</sup>.
  - In this updated assessment, the maximum increase in 19<sup>th</sup> highest hourly average (short term) ground level NO<sub>2</sub> concentration is 14.0 µg/m<sup>3</sup>. This occurs approximately 0.4 km to the east of GEC. This is approximately 7 per cent of the short term objective / standard of 200 µg/m<sup>3</sup>.
  - In both the previous assessment and this updated assessment, the potential impacts due to an increase in 19<sup>th</sup> highest hourly average (short-term) ground level NO<sub>2</sub> concentration are considered to be not significant.
- 9.4.41 Therefore, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

### ***Assessment of Potential Impact – Stack Height Sensitivity of Auxiliary Boiler System***

#### Summary of Previous Assessment of Potential Impacts (Stack Height Sensitivity of Auxiliary Boiler System) from the February 2010 ES and the December 2010 ES FID

- 9.4.42 The previous assessment of stack height sensitivity of the auxiliary boiler system noted that the predicted maximum hourly ground level NO<sub>2</sub> concentration decreases with increasing stack height up to a point where the concentration begins to increase again. It was considered that this was due to the downwash interactions with some of the larger items of plant / equipment.
- 9.4.43 The previous assessment concluded that, based on the predicted maximum hourly ground level NO<sub>2</sub> concentration, a stack height of 15 m should be employed for the auxiliary boiler system.

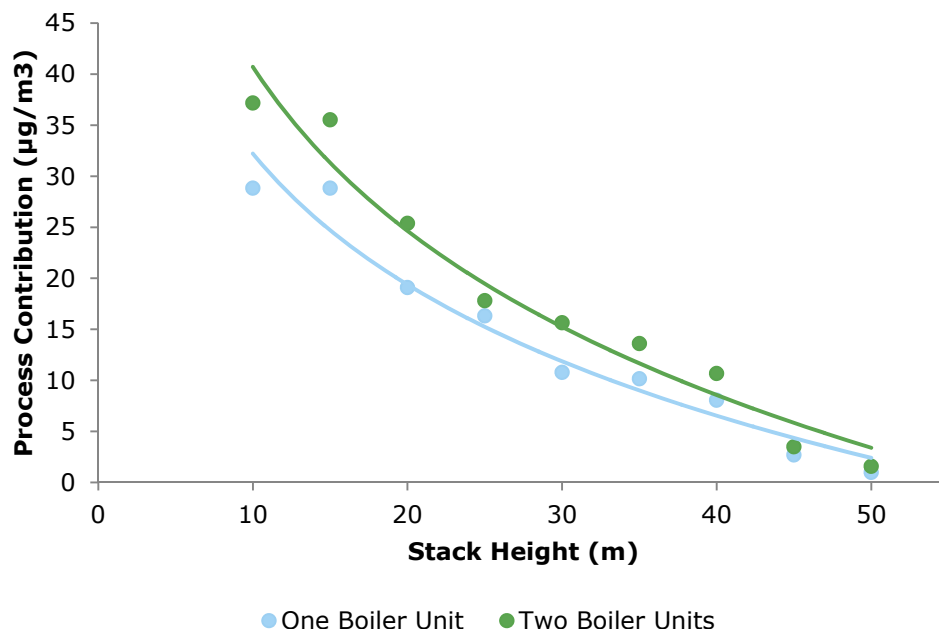
#### Updated Assessment of Potential Impacts

- 9.4.44 Given the proposed operating regime for the auxiliary boilers (i.e. only operating for a few hours at a time, at intermittent intervals), short-term process contributions were considered within the stack height sensitivity.
- 9.4.45 The results of the stack height sensitivity are shown in Insert 9.1. Insert 9.1 shows a general reduction in the short-term process contribution as the stack height of the auxiliary boiler system is increased. It is noted that this is not a smooth trend and that Insert 9.1 shows a more 'stepped' progression. This is likely to be explained by the influence of the principal buildings on the dispersion of the flue gases from the auxiliary boiler system.



- 9.4.46 The results of the stack height sensitivity shown in Insert 9.1 indicate that the short-term process contributions from the auxiliary boiler system are predicted to be lower than  $20 \mu\text{g}/\text{m}^3$  (i.e. 10 per cent of the relevant short-term AQS Objective) for stack heights of approximately 25 m and greater for operation of a single boiler or approximately 20 m and greater for operation of a both boiler units.

**INSERT 9.1: STACK HEIGHT SENSITIVITY OF AUXILIARY BOILER SYSTEM**



- 9.4.47 However, in examining the figures it is important to note that as the auxiliary boiler system will only operate for a few hours at a time, at intermittent intervals, the potential for the auxiliary boiler plant to operate at the same time as the worst case meteorological conditions occur is slight, and the predicted impacts represent a significantly conservative estimate.
- 9.4.48 Indeed, at a stack height of 15 m for the auxiliary boiler system the maximum short term process contribution is  $35.5 \mu\text{g}/\text{m}^3$ . Assuming a short term background concentration of  $76.4 \mu\text{g}/\text{m}^3$  (i.e. twice the maximum long term background shown in Table 9.5 for 2014) this would equal a short term predicted environmental concentration of  $111.9 \mu\text{g}/\text{m}^3$ . This is still well within the relevant objective / standard of  $200 \mu\text{g}/\text{m}^3$ .
- 9.4.49 Accordingly, a stack height of at least 15 m for the auxiliary boiler system is therefore considered appropriate and the potential impacts will be negligible.

Summary

- 9.4.50 It is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

***Assessment of Potential Impacts to Ecological Receptors***

- 9.4.51 The surrounding Natura 2000 sites and SSSIs (collectively named surrounding ecological receptor sites in this assessment) are designated for their ecological interest, and therefore may be vulnerable to increased  $\text{NO}_x$  and nitrogen deposition. Nitrogen deposition can be of concern as the process may lead to acidification effects on soils and ecosystems.
- 9.4.52 Therefore, to examine the impacts of  $\text{NO}_x$  and nitrogen deposition, the critical level (of  $\text{NO}_x$ ) and critical loads (of nitrogen) at the various surrounding ecological receptor sites

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have been identified and the increase in deposition (due to the operation of GEC) has been expressed as a percentage of the critical level / critical load.

- 9.4.53 Existing ground level NO<sub>x</sub> concentrations, critical levels, critical loads and exceedances are taken from the Air Pollution Information Service (APIS).

Ground Level NO<sub>x</sub> Concentrations / Assessment against Critical Levels

- 9.4.54 Based on the use of Table 9.1, the critical levels for NO<sub>x</sub> are 30 µg/m<sup>3</sup> (annual average) and 75 µg/m<sup>3</sup> (daily average). The predicted maximum ground level NO<sub>x</sub> concentrations are presented in Table 9.17 (annual average) and Table 9.18 (daily average). Within Table 9.17 and Table 9.18, the following coloured criteria are applied:

	Not Significant		Potentially Significant
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- 9.4.55 Where the process contribution has been initially screened out as being Not Significant (based on the use of Annex (F) of the H1 Guidance), secondary screening not been undertaken. However, the figures are provided for completeness.

**TABLE 9.17: MAXIMUM ANNUAL AVERAGE PROCESS CONTRIBUTIONS OF NO<sub>x</sub>**

Site	Assumed NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )	Critical Level of NO <sub>x</sub> (µg/m <sup>3</sup> )	Assumed NO <sub>x</sub> Concentration as a % of Critical Level	Process Contribution (µg/m <sup>3</sup> )	Process Contribution as a % of the Critical Level	Predicted Environmental Contribution (µg/m <sup>3</sup> )	Predicted Environmental Contribution as a % of the Critical Level
Thames Estuary and Marshes SPA and Ramsar (North)	20.12	30	67.1	0.81	2.7	20.9	69.8
Thames Estuary and Marshes SPA and Ramsar (South) <sup>25</sup>	19.84		66.1	0.80	2.7	20.6	68.8
Benfleet and Southend Marshes SPA and Ramsar <sup>26</sup>	19.33		64.4	0.73	2.4	20.1	66.9
Vange and Fobbing Marshes SSSI	20.35		67.8	0.55	1.8	20.9	69.7
Mucking Flats and Marshes SSSI	20.53		68.4	0.18	0.6	20.7	69.0
Holehaven Creek SSSI	26.18		87.3	2.12	7.1	28.3	94.3
Canvey Wick SSSI	26.18		87.3	1.39	4.6	27.6	91.9
Pitsea Marsh SSSI	20.35		67.8	0.46	1.5	20.8	69.4
Northward Hill SSSI	19.19		64.0	0.31	1.0	19.5	65.0
Chattenden Woods SSSI	18.52		61.7	0.26	0.9	18.8	62.6
Thundersley Great Common SSSI	19.33		64.4	0.53	1.8	19.9	66.2
Corringham / Fobbing Marsh LWS	40.08		66.8	5.15	17.2	25.2	84.0
Manorway Fleet Reedbed LWS	40.08		66.8	5.15	17.2	25.2	84.0

<sup>25</sup> Including South Thames Estuary and Marshes SSSI.

<sup>26</sup> Including Benfleet and Southend Marshes SSSI.

**TABLE 9.18: MAXIMUM DAILY AVERAGE PROCESS CONTRIBUTIONS OF NO<sub>x</sub>**

Site	Assumed NO <sub>x</sub> Concentration (µg/m <sup>3</sup> ) *	Critical Level of NO <sub>x</sub> (µg/m <sup>3</sup> )	Assumed NO <sub>x</sub> Concentration as a % of Critical Level	Process Contribution (µg/m <sup>3</sup> )	Process Contribution as a % of the Critical Level	Predicted Environmental Contribution (µg/m <sup>3</sup> )	Predicted Environmental Contribution as a % of the Critical Level
Thames Estuary and Marshes SPA and Ramsar (North)	40.24	75	53.7	22.40	29.9	62.6	83.5
Thames Estuary and Marshes SPA and Ramsar (South) <sup>27</sup>	39.68		52.9	17.77	23.7	57.5	76.6
Benfleet and Southend Marshes SPA and Ramsar <sup>28</sup>	38.66		51.5	5.40	7.2	44.1	58.7
Vange and Fobbing Marshes SSSI	40.70		54.3	13.83	18.4	54.5	72.7
Mucking Flats and Marshes SSSI	41.06		54.7	5.41	7.2	46.5	62.0
Holehaven Creek SSSI	52.36		69.8	21.28	28.4	73.6	98.2
Canvey Wick SSSI	52.36		69.8	11.14	14.9	63.5	84.7
Pitsea Marsh SSSI	40.70		54.3	6.93	9.2	47.6	63.5
Northward Hill SSSI	38.38		51.2	4.07	5.4	42.5	56.6
Chattenden Woods SSSI	37.04		49.4	5.95	7.9	43.0	57.3
Thundersley Great Common SSSI	38.66		51.5	6.06	8.1	44.7	59.6
Corringham / Fobbing Marsh LWS	40.08		53.4	57.89	77.2	97.97	130.6
Manorway Fleet Reedbed LWS	40.08		53.4	57.89	77.2	97.97	130.6

\* In accordance with best practice, the annual average (long term) background concentration has been doubled for the assessment of daily (short term) concentrations.

<sup>27</sup> Including South Thames Estuary and Marshes SSSI.

<sup>28</sup> Including Benfleet and Southend Marshes SSSI.

*Maximum Annual Average Process Contributions of NO<sub>x</sub>*

- 9.4.56 For Mucking Flats and Marshes SSSI and Chattenden Woods and Lodge Hill SSSI, Table 9.17 indicates that the long term process contribution can be initially screened out (i.e. is less than 1% of the relevant objective / standard). Therefore, the long term process contribution of GEC at these ecological receptors sites is not significant.
- 9.4.57 For Thames Estuary and Marshes SPA and Ramsar (both North and South), Benfleet and Southend Marshes SPA and Ramsar, Vange and Fobbing Marshes SSSI, Pitsea Marsh SSSI, Northward Hill SSSI and Thundersley Great Common SSSI, Table 9.17 indicates that although the long term process contribution cannot be initially screened out, the predicted environmental contribution will be less than 70% of the relevant objective / standard. Therefore, the long term process contribution of GEC at these ecological receptors sites is not significant.
- 9.4.58 For Holehaven Creek SSSI, Canvey Wick SSSI, Corringham / Fobbing Marsh LWS and Manorway Fleet Reedbed LWS the long term predicted environmental concentration is still within the relevant objective / standard. Therefore, in line with Table 9.9, it is considered that at these sites the long term process contribution represents an effect with a small / negligible magnitude. Furthermore, as the predicted environmental concentration is still within the relevant objective / standard, the long term process contribution of GEC at these ecological receptors sites is not significant.
- 9.4.59 In summary, the long term process contribution of GEC at all ecological receptor sites is not significant. Therefore, overall, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID in terms of long term process contributions of NO<sub>x</sub>.

*Maximum Daily Average Process Contributions of NO<sub>x</sub>*

- 9.4.60 For Benfleet and Southend Marshes SPA and Ramsar, Mucking Flats and Marshes SSSI, Pitsea Marsh SSSI, Northward Hill SSSI and Chattenden Woods and Lodge Hill SSSI, Table 9.18 indicates that the maximum daily average process contribution can be initially screened out (i.e. is less than 10% of the relevant objective / standard). Therefore, the maximum daily average process contribution of GEC at these ecological receptors sites is not significant.
- 9.4.61 For Thundersley Great Common SSSI, Table 9.18 indicates that although the maximum daily average process contribution cannot be initially screened out, the predicted environmental contribution will be less than 70% of the relevant objective / standard. Therefore, the maximum daily average process contribution of GEC at this ecological receptors site is not significant.
- 9.4.62 For Thames Estuary and Marshes SPA and Ramsar (both North and South), Vange and Fobbing Marshes SSSI, Holehaven Creek SSSI and Canvey Wick SSSI the predicted environmental concentration is still within the relevant objective / standard. Therefore, in line with Table 9.9, it is considered that at these sites the maximum daily average process contribution represents an effect with a small / negligible magnitude. Furthermore, as the predicted environmental concentration is still within the relevant objective / standard, the maximum daily average process contribution of GEC at these ecological receptors sites is not significant.
- 9.4.63 For Corringham / Fobbing Marsh LWS and Manorway Fleet Reedbed LWS the maximum predicted environmental contribution is in exceedance of the relevant daily mean objective / standard. For these sites, the air dispersion modelling indicated that for the entire five-year study period assuming full load operation of GEC, there would be 43 exceedances within the Corringham / Fobbing Marsh LWS and 51 exceedances within Manorway Fleet Reedbed LWS. This corresponds to exceedances occurring a maximum of 2.8 per cent of the time at Corringham / Fobbing Marsh LWS and 2.4 per cent of the time at Manorway Fleet Reedbed LWS. Therefore, GEC may not be in operation, or could be operating at a reduced load, during hours where the prevailing meteorological conditions may result in an exceedance of the relevant daily mean objective / standard.

However, it is important to note that this air modelling study has been undertaken based on the worst case assumption of full load (i.e. baseload) operation for 100 per cent of the year. Therefore, the modelled operating regime is an overestimate of the actual operating regime of GEC, with UK Government figures suggesting an average capacity factor for CCGT power plant of approximately 75 per cent. Indeed, using a more typical average capacity factor for CCGT power plant of approximately 75 per cent, the exceedences are expected to reduce to less than 1 per cent of the time at both LWS sites. In line with Table 9.9, due to the timing and likely frequency of the maximum daily average process contributions occurring, it is considered that at these sites the maximum daily average process contribution represents an effect with a small magnitude. In addition, the overall environmental risk (i.e. balancing the potential hazard with the probability of its occurrence) is considered to be low. Therefore, the maximum daily average process contribution of GEC at these ecological receptors sites is considered to be not significant.

- 9.4.64 In summary, the maximum daily average process contribution of GEC at all ecological receptor sites is not significant.

Deposition of Nutrient Nitrogen / Assessment against Critical Loads

- 9.4.65 The critical loads for deposition of nutrient nitrogen vary for different types of ecological receptor sites (typically between 5 and 30 kgN/ha/yr). APIS provides site specific information for the ecological receptor sites considered in this updated assessment. For the purposes of this updated assessment, critical loads are considered to be the lowest thresholds for all habitat types within each site, for both nutrient nitrogen and acidity due to nitrogen. A list of the critical loads for deposition of nutrient nitrogen for the ecological receptor sites is provided in Table 9.19. References to N / A within Table 9.19 indicates that the APIS habitat is not sensitive to deposition of nutrient nitrogen.
- 9.4.66 The predicted maximum annual depositions of nutrient nitrogen are presented in Table 9.20. The annual depositions of nutrient nitrogen have been calculated in accordance with AQTAG 06 (2010). Table 9.20 also presents a comparison between the current proposals for GEC (i.e. up to 1250 MW of power generation capacity) and those predicted in the February 2010 ES. Within the Table 9.20, the following coloured criteria are applied:

	Not Significant		Potentially Significant
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**TABLE 9.19: CRITICAL LOADS FOR THE DEPOSITION OF NUTRIENT NITROGEN**

<i>Site Name</i>	<i>Feature / Habitat*</i>	<i>APIS Habitat**</i>	<i>Critical Load Nutrient Nitrogen (kg N/ha/yr)</i>	<i>Minimum Critical Load (kg N/ha/yr)</i>
Thames Estuary and Marshes SPA and Ramsar (North)	Mudflats	Littoral Sediment	N / A	N / A
Thames Estuary and Marshes SPA and Ramsar (South) <sup>29</sup>	Mudflats	Fen, Marsh and Swamp	15 – 30	15
Benfleet and Southend Marshes SPA and Ramsar <sup>30</sup>	Saltmarsh	Littoral Sediment	20 – 30	20
Vange and Fobbing Marshes SSSI	Coastal and Floodplain Grazing Marsh	D5: Sedge and Reedbeds, normally without Freestanding Water	N / A	N / A
Mucking Flats and Marshes SSSI	Mudflats	Littoral Sediment	N / A	N / A
Holehaven Creek SSSI	Mudflats	Littoral Sediment	N / A	N / A
Canvey Wick SSSI	Lowland Dry Acid Grassland***	Boundary and Linear Features	N / A	N / A
Pitsea Marsh SSSI	Deciduous Woodland	Lowland Mixed Deciduous Woodland	10 – 20	10
Northward Hill SSSI	Deciduous Woodland	Lowland Mixed Deciduous Woodland	10 – 20	10
Chattenden Woods and Lodge Hill SSSI	Deciduous Woodland	Lowland Mixed Deciduous Woodland	10 – 20	10
Thundersley Great Common SSSI	Lowland Dry Acid Grassland	Lowland Heathland	10 – 20	10
Corringham / Fobbing Marsh LWS	Coastal and Floodplain Grazing Marsh	Fen, Marsh And Swamp	15 – 30	15
Manorway Fleet Reedbed LWS	Reedbed	Improved Grassland	15 – 30****	15

\* Taken from Natural England, Priority Habitats Inventory data, supplied January 2014.

\*\* Transposed using NBN Dictionary Excel Tool

\*\*\* Assumed habitat, Natural England, Priority Habitats Inventory data states "No Main Habitat".

\*\*\*\* APIS reports no critical load is available for this site, therefore critical load for 'Fen, Marsh and Swamp' has been assumed.

<sup>29</sup> Including South Thames Estuary and Marshes SSSI.

<sup>30</sup> Including Benfleet and Southend Marshes SSSI.

**TABLE 9.20: MAXIMUM ANNUAL DEPOSITION OF NUTRIENT NITROGEN**

Site	Assumed Nitrogen Deposition (kg N/ha/yr)	Critical Load of Nitrogen (kg N/ha/yr)	Assumed Nitrogen Deposition as a % of Critical Load	Process Contribution (kg N/ha/yr)	Process Contribution as a % of the Critical Load	Feb 2010 Process Contribution (kg N/ha/yr)	Feb 2010 Process Contribution as a % of the Critical Load*
Thames Estuary and Marshes SPA and Ramsar (North)							
Thames Estuary and Marshes SPA and Ramsar (South) <sup>31</sup>	19.46	15	129.7	0.12	0.77	0.03	0.20
Benfleet and Southend Marshes SPA and Ramsar <sup>32</sup>	17.64	20	88.2	0.11	0.53	0.04	0.20
Vange and Fobbing Marshes SSSI							
Mucking Flats and Marshes SSSI							
Holehaven Creek SSSI							
Canvey Wick SSSI							
Pitsea Marsh SSSI	56.98	10	569.8	0.07	0.66	0.03	0.30
Northward Hill SSSI	30.38	10	303.8	0.04	0.45	0.03	0.30
Chattenden Woods SSSI	35.14	10	351.4	0.04	0.37	0.02	0.20
Thundersley Great Common SSSI	17.36	10	173.6	0.08	0.76	0.04	0.40
Corringham / Fobbing Marsh LWS	14.98	15	99.87	0.74	4.9	-	-
Manorway Fleet Reedbed LWS	14.98	15	99.87	0.74	4.9	-	-

\* The Feb 2010 process contributions have been compared against the current minimum critical loads to provide a more direct comparison of impacts.

<sup>31</sup> Including South Thames Estuary and Marshes SSSI.

<sup>32</sup> Including Benfleet and Southend Marshes SSSI.



- 9.4.68 Table 9.20 shows that all SPA / Ramsar sites and SSSIs, the predicted total deposition is well below the initial screening threshold of 1% (based on Annex (f) of the H1 Guidance). Therefore, the potential impacts at all SPA / Ramsar sites and SSSIs sensitive to deposition of nutrient nitrogen are not significant.
- 9.4.69 Furthermore, whilst Table 9.20 shows that at the LWSs the predicted total deposition is above the initial screening threshold of 1% (based on Annex (f) of the H1 Guidance), for both LWSs the critical load is between 15 – 30 kgN/ha/yr. Therefore, the predicted environmental concentration will be well within this range (19.88 kgN/ha/yr for both sites).
- 9.4.70 Therefore, in summary, the potential impacts at all the ecological receptor sites sensitive to deposition of nutrient nitrogen are not significant. Therefore, overall, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID in terms of deposition of nutrient nitrogen.

Deposition of Acidity due to Nitrogen (and Sulphur) / Assessment against Critical Loads

- 9.4.71 Deposition of nitrogen, as nitrate, ammonium and nitric acid, can cause acidification. Therefore deposition of nitrogen (as nitrate, ammonium and nitric acid) must be taken into account when assessing acidification. Deposition of sulphur also needs to be taken into account.
- 9.4.72 For the purposes of determining links between critical loads and atmospheric emissions of nitrogen and sulphur, critical loads are used to produce a minimum critical load for nitrogen (CLminN), a maximum critical load for nitrogen (CLmaxN) and a maximum critical load for sulphur (CLmaxS).
- 9.4.73 These components define the critical load function and, when compared with deposition data for nitrogen and sulphur, can be used to assess critical load exceedances.
- 9.4.74 Table 9.21 shows the details of the critical load functions for acid deposition for SSSIs that are sensitive to increased deposition of acidity, together with the existing (maximum) deposition within each of these sites. References to N / A within Table 9.21 indicates that the APIS Habitat is not sensitive to deposition of acidity, and therefore no assessment is required.
- 9.4.75 In terms of the assessment against critical loads, there is a suite of deposition calculations which are used to calculate an exceedance (or otherwise) of the critical load function and the respective percentage of the critical load function (i.e. to determine significance). The calculations are dependent on the existing and anticipated (as appropriate) deposition levels when compared to the respective critical load function line<sup>33</sup>.
- 9.4.76 Table 9.22 provides details this assessment against the critical loads.

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<sup>33</sup> Information is available on: <http://www.apis.ac.uk/clf-guidance>

**TABLE 9.21: CRITICAL LOAD FUNCTIONS FOR ACID DEPOSITION AND EXISTING CONDITIONS**

<i>Site Name</i>	<i>Critical Load Function (keq/ha/yr)</i>			<i>Existing (Maximum) Deposition (keq/ha/yr)</i>	
	<i>CLminN</i>	<i>CLmaxN</i>	<i>CLmaxS</i>	<i>Nitrogen</i>	<i>Sulphur</i>
Thames Estuary and Marshes SPA and Ramsar (North)	N / A	N / A	N / A	N / A	N / A
Thames Estuary and Marshes SPA and Ramsar (South) <sup>34</sup>	N / A	N / A	N / A	N / A	N / A
Benfleet and Southend Marshes SPA and Ramsar <sup>35</sup>	N / A	N / A	N / A	N / A	N / A
Vange and Fobbing Marshes SSSI	0.438	2.048	1.610	2.0900	0.1900
Mucking Flats and Marshes SSSI	N / A	N / A	N / A	N / A	N / A
Holehaven Creek SSSI	N / A	N / A	N / A	N / A	N / A
Canvey Wick SSSI	N / A	N / A	N / A	N / A	N / A
Pitsea Marsh SSSI	0.357	2.890	2.533	4.0700	0.2300
Northward Hill SSSI	0.142	1.278	1.136	2.1700	0.2400
Chattenden Woods and Lodge Hill SSSI	0.142	1.307	1.165	2.5000	0.2600
Thundersley Great Common SSSI	0.499	1.359	0.860	1.2400	0.1900

<sup>34</sup> Including South Thames Estuary and Marshes SSSI.

<sup>35</sup> Including Benfleet and Southend Marshes SSSI.

**TABLE 9.22: DEPOSITION OF ACIDITY DUE TO NITROGEN AND SULPHUR**

Site Name	Existing Exceedance (keq/ha/yr)	Existing Exceedance (as % of Minimum Critical Load)	Process Contribution (Nitrogen Deposition Only) (keq/ha/yr)	Predicted Environmental Concentration Nitrogen (keq/ha/yr)	Predicted Environmental Concentration Sulphur (keq/ha/yr)	Total Predicted Environmental Concentration (keq/ha/yr)	Total Process Contribution Exceedance (as % of Minimum Critical Load)
Thames Estuary and Marshes SPA and Ramsar (North)							
Thames Estuary and Marshes SPA and Ramsar (South) <sup>36</sup>							
Benfleet and Southend Marshes SPA and Ramsar <sup>37</sup>							
Vange and Fobbing Marshes SSSI	0.23	111.3	0.0040	2.0940	0.1900	0.2360	0.20
Mucking Flats and Marshes SSSI							
Holehaven Creek SSSI							
Canvey Wick SSSI							
Pitsea Marsh SSSI	1.41	148.8	0.0066	4.0766	0.2300	1.4166	0.23
Northward Hill SSSI	1.13	188.6	0.0045	2.1745	0.2400	1.1365	0.35
Chattenden Woods and Lodge Hill SSSI	1.45	211.2	0.0037	2.5037	0.2600	1.4567	0.28
Thundersley Great Common SSSI	0.07	105.2	0.0038	1.2438	0.1900	0.0748	0.28

<sup>36</sup> Including South Thames Estuary and Marshes SSSI.

<sup>37</sup> Including Benfleet and Southend Marshes SSSI.

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- 9.4.78 Table 9.22 shows that all ecological receptor sites that are sensitive to deposition of acidity are currently experiencing conditions that are in exceedance of the relevant minimum critical load function. Table 9.22 also presents the results of the calculations for the total maximum process contribution to deposition of acidity and the resulting predicted environmental concentration.
- 9.4.79 Table 9.22 shows that the predicted maximum total process contribution as a result of operation of GEC at the ecological receptor sites sensitive to deposition of acidity is well below the initial screening threshold of 1% (based on Annex (F) of the H1 Guidance) of the minimum critical load function. Therefore, the potential impacts at the ecological receptor sites sensitive to deposition of acidity are not significant.

## **9.5 Summary**

- 9.5.1 Based on the updated environmental baseline and additional assessment, it is considered that:
- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
  - During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID (i.e. the operational air quality impacts are predicted to be not significant).

## **10 NOISE AND VIBRATION**

### **10.1 Introduction**

10.1.1 This Section considers the potential noise and vibration effects of GEC, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

10.1.2 As, during operation, an increase in the permitted generation capacity of GEC would alter the emission of noise and vibration from that reported in the February 2010 ES and the December 2010 ES FID, an updated assessment has been provided. The updated assessment is based on 'Gateway Energy Centre Environmental Permit Application (Appendix D): Updated Noise Modelling' Parsons Brinckerhoff, May 2014). In addition, supplementary information has been taken from the 'London Gateway® Logistics Park Local Development Order Environmental Statement' (June 2013).

### **10.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

10.2.1 Section 10.5 of the February 2010 ES detailed the results of a Baseline Noise Survey which considered a number of Noise Sensitive Receptors (NSRs). The Baseline Noise Survey was completed over 27 and 28 January 2010, and followed the principles and legislative guidance of BS 7445:2003 (Description and Measurement of Environmental Noise – Parts 1 to 3). A summary of the NSR locations from January 2010 is shown in Table 10.1.

**TABLE 10.1: NOISE SENSITIVE RECEPTOR LOCATIONS USED IN JANUARY 2010**

<b>NSR Location</b>		<b>NSR Location Coordinates</b>	
1	Corner of Billet Lane and Rainbow Lane	569601	182396
2	Oak Farm, High Road	570197	182606
3	Corringham Primary School, Herd Lane	571184	183516
4	End of Wharf Road, Corringham	571945	183792
5	Start of track leading to Oozedam Farm, A1014 (The Manorway)	573835	182782
6	New Residential Development, Haven Road, Canvey Island	577300	182242

10.2.2 Since the preparation of the February 2010 ES and the December 2010 ES FID, a subsequent Baseline Noise Survey has been undertaken as part of Chapter 14 (Noise and Vibration) of the 'London Gateway Logistics Park® Local Development Order Environmental Statement' (June 2013). The Baseline Noise Survey was completed over 16 to 18 January 2013. A summary of the NSR locations from January 2013 is shown in Table 10.2.

**TABLE 10.2: NOISE SENSITIVE RECEPTOR LOCATIONS USED IN JANUARY 2013**

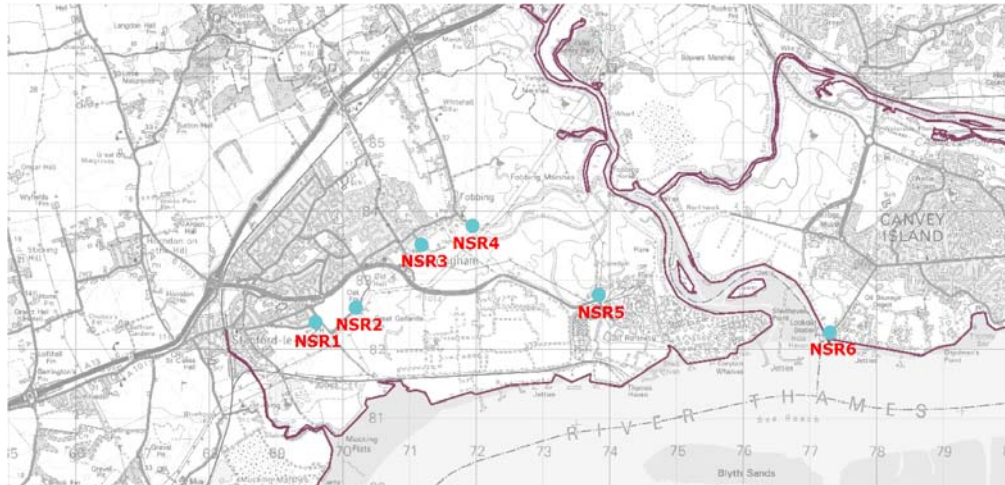
<b>NSR Location</b>		<b>NSR Location Coordinates</b>	
1	Great Garlands Farm	570235	182627
2	Oak Farm	570235	182415
3	10 The Sorrels	569688	182817
4	249 Corringham Road	569871	182883
5	11 Thames Haven Road (Attended Only)	570394	183235
6	Haven, Wharf Road	571954	183765
7	Oozedam Farm	573790	183221

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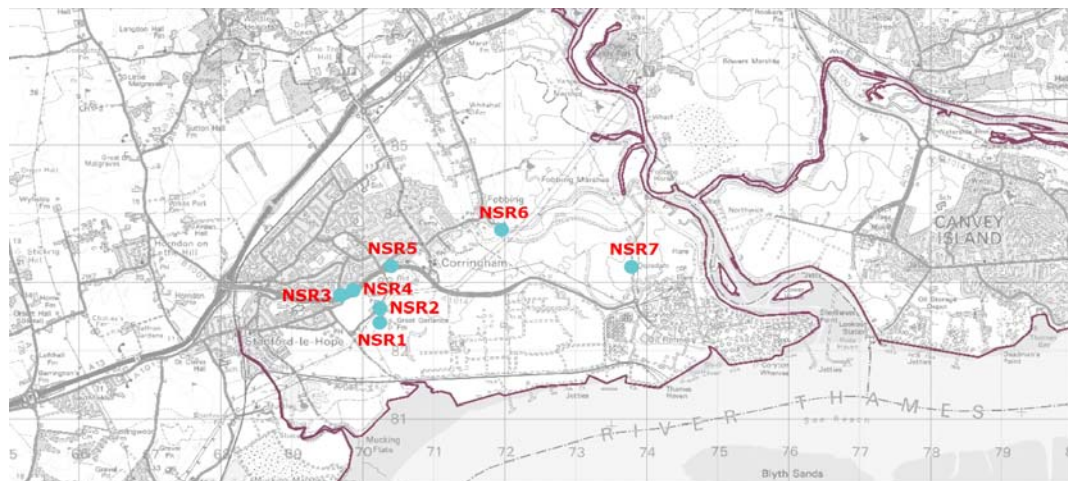
10.2.3 A comparison of the two sets of Noise Sensitive Receptor locations is shown in Insert 10.1.

**INSERT 10.1: COMPARISON OF NOISE SENSITIVE RECEPTOR LOCATIONS**

Noise Sensitive Receptors used in January 2010



Noise Sensitive Receptors from used in January 2013



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- 10.2.5 Based on the use of Insert 10.1, it can be seen that a number of the NSR locations used in January 2010 and January 2013 are geographically similar. Therefore, the updated noise monitoring can be used to update the environmental baseline at these specific NSR locations. These NSR locations are shown in Table 10.3.

**TABLE 10.3: COMPARISON OF NOISE SENSITIVE RECEPTOR LOCATIONS**

<i>NSR Location used in January 2010</i>		<i>NSR Location used in January 2013</i>	
1	Corner of Billet Lane and Rainbow Lane	N / A	
2	Oak Farm, High Road	2	Oak Farm
3	Corringham Primary School, Herd Lane	N / A	
4	End of Wharf Road, Corringham	6	Haven, Wharf Road
5	Start of track leading to Oozedam Farm, A1014 (The Manorway)	7	Oozedam Farm
6	New Residential Development, Haven Road, Canvey Island	N / A	

- 10.2.6 Table 10.4 presents a summary of the noise monitoring (daytime) from January 2010, alongside more recent levels (where applicable, based on Table 10.3) from the noise monitoring (daytime) from January 2013.

**TABLE 10.4: SUMMARY OF LOWEST RECORDED  $L_{A90}$  AT EACH NOISE SENSITIVE RECEPTOR (DAYTIME)**

<i>NSR Location</i>		<i>January 2010</i>	<i>January 2013</i>
1	Corner of Billet Lane and Rainbow Lane	44	N / A
2	Oak Farm, High Road	45	40.7
3	Corringham Primary School, Herd Lane	45	N / A
4	End of Wharf Road, Corringham	38	43.2
5	Start of track leading to Oozedam Farm, A1014 (The Manorway)	54	41.1
6	New Residential Development, Haven Road, Canvey Island	43	N / A

- 10.2.7 Table 10.5 presents a summary of the noise monitoring (night time) from January 2010, alongside more recent levels (where applicable, based on Table 10.3) from the noise monitoring (night time) from January 2013.

**TABLE 10.5: SUMMARY OF LOWEST RECORDED  $L_{A90}$  AT EACH NOISE SENSITIVE RECEPTOR (NIGHT TIME)**

<i>NSR Location</i>		<i>January 2010</i>	<i>January 2013</i>
1	Corner of Billet Lane and Rainbow Lane	41	N / A
2	Oak Farm, High Road	37	39.7
3	Corringham Primary School, Herd Lane	37	N / A
4	End of Wharf Road, Corringham	31	35.9
5	Start of track leading to Oozedam Farm, A1014 (The Manorway)	38	N / A
6	New Residential Development, Haven Road, Canvey Island	38	N / A

- 10.2.8 Based on the use of Table 10.4 and Table 10.5, it can be seen that although there have been some changes in background noise levels, these are only marginal and are likely due to the changing nature and location of construction activities in the surrounding area.

***Identification of the Need for Additional Assessment***

- 10.2.9 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on



the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

10.2.10 In terms of noise and vibration, this is determined via the use of Table 10.6.

**TABLE 10.6: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (NOISE AND VIBRATION)**

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Will the Proposed Development cause noise and vibration or the release of light / heat energy / electromagnetic radiation which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC may alter the emission of noise and vibration to that reported in the February 2010 ES and the December 2010 ES FID.	An updated noise and vibration impact assessment (during operation) is required.
Are there any areas on or around the site which are already subject to pollution / environmental damage (e.g. where existing legal environmental standards are exceeded) which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC may alter the emission of noise and vibration to that reported in the February 2010 ES and the December 2010 ES FID. Therefore, there may be areas on or around the GEC site which are already subject to pollution / environmental damage which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	An updated noise and vibration impact assessment (during operation) is required.

10.2.11 Therefore, based on the use of Table 10.6, an updated noise and vibration impact assessment (during operation) is required.

### **10.3 Assessment Methodology and Significance Criteria**

10.3.1 Based on the principles and legislative guidance in BS 4142:1997 (Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas), the following assessment methodology and significance criteria is applied.

10.3.2 BS 4142:1997 proposes an assessment methodology which compares the existing background noise levels with the 'rating level', which is the predicted noise output of the proposed plant corrected to account for any acoustic features such as tonal or impulsive noises. In terms of GEC, the noise output will not contain any acoustic features. As such, no acoustic feature corrections been applied.

10.3.3 BS 4142:1997 proposes significance criteria based on the likelihood of complaints due to the introduction of a new noise source. These significance criteria are based on a subtraction of the background level with the 'rating level', with a greater difference creating a greater likelihood of complaints. In terms of significance criteria:

- A difference of around +10 dB or more indicates a greater likelihood of complaints (i.e. is significant);
- A difference of up to +5 dB is of marginal significance; and



- A difference of -10 dB or more positively indicates complaints are unlikely.

**Noise Model**

- 10.3.4 A three dimensional noise model has been created to predict the 'rating levels' from GEC at the nearest NSRs. The noise model has been created using CadnaA, a computer-based noise propagation modelling package which incorporates the calculation procedure set out in ISO 9613 (Attenuation of Sound During Propagation Outdoors - Parts 1 and 2). CadnaA provides an accurate visual representation of the spread of noise levels.
- 10.3.5 The noise model has been created to calculate the worst case contribution and overall 'rating level' at each NSR location of each major identified noise source, based on typical sound power levels for the type of plant / equipment proposed at GEC.
- 10.3.6 The noise model has been created using a number of assumptions with regards to the noise control likely to be installed on major plant / equipment items. These assumptions are:
- Gas turbines to be housed in individual acoustic enclosures, of heavy construction, specified at 85 dB(A) Sound Pressure Level at 1 m;
  - Gas turbine filter and ventilation apertures are to be fitted with high performance silencers, and designed such that they face towards the existing plant / equipment or towards new plant / equipment such that all sensitive receptors benefit from screening and/or directivity corrections;
  - Low noise ACCs will be used. Low noise ACCs are defined as units that run at the same duty as standard ACCs but with a noise level reduced to between 5 dB to 10 dB lower;
  - Due to the impracticality of screening stack noise, discharge noise will be controlled using high performance silencers tuned to attenuate low frequencies from the gas turbine exhausts;
  - Unit transformers and generator transformers to be housed in appropriate enclosures or three sided pens;
  - All plant / equipment items will be controlled to minimise noise of an impulsive or tonal nature, such that the 'rating level' as defined in BS 4142 is equal to the specific noise level; and,
  - The noise model considers normal operational noise. As such, non-normal operation plant / equipment items (such as black start generators and emergency steam venting) have not been considered.

**10.4 Assessment of Potential Impacts (During Operation)**

***Summary of Previous Assessment of Potential Impacts (During Operation) from February 2010 ES and December 2010 ES FID***

- 10.4.1 Table 10.7 presents a summary of the previous assessment of potential impacts during operation. As per the above assessment methodology and significance criteria, the Table presents a comparison of the existing noise levels with the calculated 'rating level'.

**TABLE 10.7: SUMMARY OF IMPACT ASSESSMENT RESULTS (DAYTIME)**

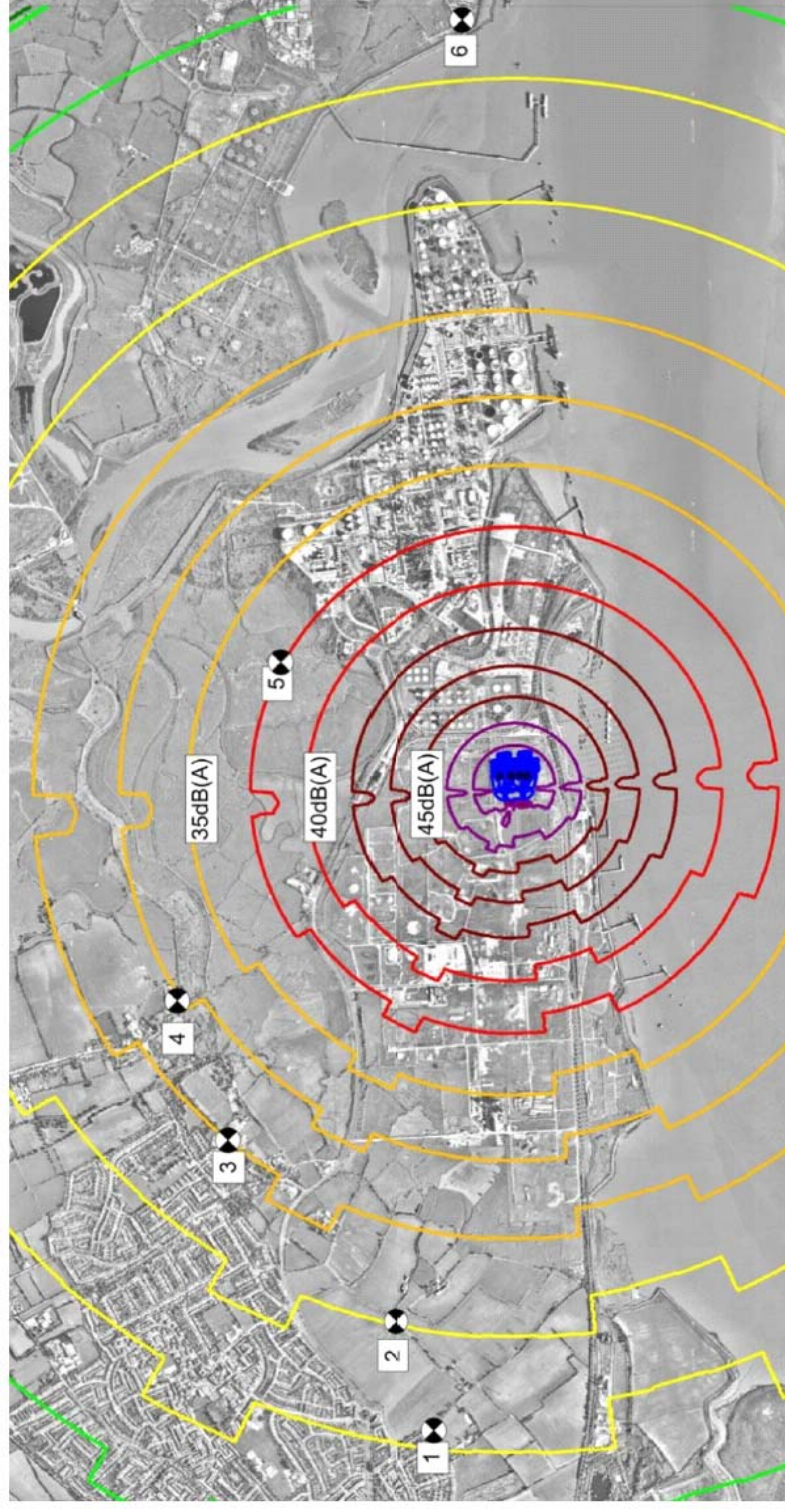
<i>NSR Location</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Daytime	-23	-22	-22	-12	-23	-24
Night time	-20	-14	-12	-5	-7	-19

- 10.4.2 Considering the daytime noise monitoring, at all NSRs the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC.
- 10.4.3 Considering the night time noise monitoring, at all NSRs (with the exception of NSR 4 and NSR 5), the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC. At NSR 4 and NSR 5, the difference between the 'rating level' and the background level is considered to be of less than marginal significance.
- 10.4.4 Therefore, it is considered unlikely that noise levels from GEC would be audible at any identified NSR location. Therefore, during both the daytime and the night time, the impact of operational noise levels was predicted to be not significant.

***Updated Assessment of Potential Impacts (During Operation)***

- 10.4.5 Insert 10.2 presents the predicted noise contours of GEC based on the noise model.
- 10.4.6 Table 10.8 presents a summary of the comparison of the existing noise levels (daytime) with the calculated 'rating level'. Table 10.9 presents a summary of the comparison of the existing noise levels (night time) with the calculated 'rating level'.

INSERT 10.2: PREDICTED NOISE CONTOURS OF GEC BASED ON THE NOISE MODEL



*Daytime*

**TABLE 10.8: SUMMARY OF IMPACT ASSESSMENT RESULTS (DAYTIME)**

<b>NSR Location</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Predicted Noise Level (L <sub>Aeq</sub> , dB)	27.3	29.1	31.0	32.9	36.9	25.8
Acoustic Feature Correction (dB)	0	0	0	0	0	0
'Rating Level' (L <sub>Aeq</sub> , dB)	27.3	29.1	31.0	32.9	36.9	25.8
Background Level (January 2010)	44	45	45	38	54	43
<b><i>Difference between 'Rating Level' and Background Level (January 2010)</i></b>	<b><i>-16.7</i></b>	<b><i>-15.9</i></b>	<b><i>-14</i></b>	<b><i>-5.1</i></b>	<b><i>-17.1</i></b>	<b><i>-17.2</i></b>
Background Level (January 2013)	N / A	40.7	N / A	43.2	41.1	N / A
<b><i>Difference between 'Rating Level' and Background Level (January 2013)</i></b>	<b><i>N / A</i></b>	<b><i>-11.6</i></b>	<b><i>N / A</i></b>	<b><i>-10.3</i></b>	<b><i>-4.2</i></b>	<b><i>N / A</i></b>

- 10.4.7 Based on the monitoring from January 2010, at all NSRs (with the exception of NSR 4) the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC. At NSR 4, the difference between the 'rating level' and the background level is considered to be of less than marginal significance.
- 10.4.8 Based on the monitoring from January 2013, at NSR 2 and NSR 4 the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC. At NSR 5, the difference between the 'rating level' and the background level is considered to be of less than marginal significance.
- 10.4.9 Therefore, it is considered unlikely that noise levels from GEC would be audible at any identified NSR location (using both background levels from January 2010 and January 2013). Therefore, during the daytime, the impact of operational noise levels is predicted to be not significant.

*Night time*

**TABLE 10.9: SUMMARY OF IMPACT ASSESSMENT RESULTS (NIGHT TIME)**

<b>NSR Location</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Predicted Noise Level (L <sub>Aeq</sub> , dB)	27.3	29.1	31.0	32.9	36.9	25.8
Acoustic Feature Correction (dB)	0	0	0	0	0	0
'Rating Level' (L <sub>Aeq</sub> , dB)	27.3	29.1	31.0	32.9	36.9	25.8
Background Level (January 2010)	41	37	37	31	38	38
<b><i>Difference between 'Rating Level' and Background Level (January 2010)</i></b>	<b><i>-13.7</i></b>	<b><i>-7.9</i></b>	<b><i>-6.0</i></b>	<b><i>1.9</i></b>	<b><i>-1.1</i></b>	<b><i>-12.2</i></b>
Background Level (January 2013)	N / A	39.7	N / A	35.9	N / A	N / A
<b><i>Difference between 'Rating Level' and Background Level (January 2013)</i></b>	<b><i>N / A</i></b>	<b><i>-10.6</i></b>	<b><i>N / A</i></b>	<b><i>-3.0</i></b>	<b><i>N / A</i></b>	<b><i>N / A</i></b>

- 10.4.10 Based on the monitoring from January 2010, at NSR 1 and NSR 6 the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC. At the remaining NSRs, the difference between the 'rating level' and the background level is considered to be of less than marginal significance.
- 10.4.11 Based on the noise monitoring from January 2013, at NSR 2 the difference between the 'rating level' and the background level is greater than -10 dB. This represents a positive indication that complaints are unlikely due to the operation of GEC. At NSR 4, the difference between the 'rating level' and the background level is considered to be of less than marginal significance.
- 10.4.12 Therefore, it is considered unlikely that noise levels from GEC would be audible at any identified NSR location (using both background levels from January 2010 and January 2013). Therefore, during the night time, the impact of operational noise levels is predicted to be not significant.

## **10.5 Summary**

- 10.5.1 Based on the updated environmental baseline and additional assessment, it is considered that:
- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
  - During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID (i.e. the impact of operational noise levels is predicted to be not significant).

## **11 LANDSCAPE AND VISUAL**

### **11.1 Introduction**

- 11.1.1 This Section considers the potential landscape and visual effects of GEC, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **11.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 11.2.1 Whilst it is noted that works have commenced on the DP World® London Gateway® Port and London Gateway® Logistics Park, and works have been completed on the London Gateway® Logistics Park access road and revised Sorrells roundabout, these works were considered in the landscape and visual baseline presented in the February 2010 ES and December 2010 ES FID. Indeed as part of the December 2010 ES FID, the update of the LVIA included additional photomontages with the DP World® London Gateway® Port / London Gateway® Logistics Park. Therefore, it is not considered that there have been any material changes to the landscape and visual baseline as presented in the February 2010 ES and the December 2010 ES FID.

#### ***Identification of the Need for Additional Assessment***

- 11.2.2 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 11.2.3 In terms of landscape and visual, this is determined via the use of Table 11.1.

**TABLE 11.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (LANDSCAPE AND VISUAL)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Is the Proposed Development located in an area which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development is located wholly within the area reported in the February 2010 ES or the December 2010 ES FID	N / A
Do the structures associated with the Proposed Development differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The structures associated with the Proposed Development do not differ from those reported in the February 2010 ES or the December 2010 ES FID. These are shown in Table 4.1.	N / A



<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any areas on or around the site which are protected under international / national / local legislation for their landscape value which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas on or around the GEC site which are protected under international / national / local legislation for their landscape value which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Are there any areas or features of high landscape / scenic value on or around the site which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas or features of high landscape / scenic value on or around the GEC site which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Is the Proposed Development in a location where it is likely to be highly visible to people in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development would not be visible to people in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

### **11.3 Summary**

11.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:

- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
- During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

## **12 ECOLOGY**

### **12.1 Introduction**

- 12.1.1 This Section considers the potential effects of GEC on ecology, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **12.2 Updated Environmental Baseline<sup>38</sup> / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 12.2.1 It is not considered that there have been any material changes to the future ecological baseline as presented in the February 2010 ES and the December 2010 ES FID.
- 12.2.2 Indeed, as noted previously, as part of the agreement between GECL and DP World, the GEC site will be cleared, levelled, remediated and provided to GECL in a condition that would allow for construction of GEC.
- 12.2.3 Since the preparation of the February 2010 ES and the December 2010 ES FID, there have been significant changes across the DP World® London Gateway® Port and London Gateway® Logistics Park sites. These changes are largely as a result of the ecological mitigation and compensation works required for the DP World® London Gateway® Port Harbour Empowerment Order (HEO) and the London Gateway® Logistics Park Outline Planning Consent (OPC) which involved the licenced translocation of protected species (i.e. adders, Great Crested Newts (GCN)) to nearby receptor locations.
- 12.2.4 It has recently been confirmed that the ecological clearance of the GEC site (and wider DP World® London Gateway® Port and London Gateway® Logistics Park sites) has been completed.
- 12.2.5 In addition, significant ground preparation works have been undertaken across the DP World® London Gateway® Port and London Gateway® Logistics Park sites such that it is largely bare ground.

#### ***Identification of the Need for Additional Assessment***

- 12.2.6 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 12.2.7 In terms of ecology, this is determined via the use of Table 12.1.

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<sup>38</sup> Information on the Updated Environmental Baseline are taken from: Chapter 11 (Ecology) of the 'London Gateway® Logistics Park Local Development Order Environmental Statement' (June 2013).



**TABLE 12.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (ECOLOGY)**

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any areas on or around the site which are protected under international / national / local legislation for their ecological value which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air / may alter the emission of noise and vibration to those reported in the February 2010 ES and the December 2010 ES FID. Therefore, there may be areas on or around the GEC site which are protected under international / national / local legislation for their ecological value which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	An updated air quality impact assessment (during operation) and an updated noise and vibration impact assessment (during operation) are required.
Are there any other areas on or around the site which are important / sensitive for reasons of their ecology (e.g. wetlands / watercourses / other water bodies / coastal zone / mountains / forests or woodlands) which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air / may alter the emission of noise and vibration to those reported in the February 2010 ES and the December 2010 ES FID. Therefore, there may be areas on or around the GEC site which are important / sensitive for reasons of their ecology which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	An updated air quality impact assessment (during operation) and an updated noise and vibration impact assessment (during operation) are required.

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any areas on or around the site which are used by protected / important / sensitive species of fauna or flora (e.g. for breeding / nesting / foraging / resting / overwintering / migration) which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	Y	During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air / may alter the emission of noise and vibration to those reported in the February 2010 ES and the December 2010 ES FID. Therefore, there may be areas on or around the GEC site which are used by protected / important / sensitive species of fauna or flora which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	An updated air quality impact assessment (during operation) and an updated noise and vibration impact assessment (during operation) are required.

### **12.3 Summary**

12.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:

- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
- During operation, an increase in permitted generation capacity of GEC would alter the release of pollutants to air / emission of noise and vibration to those reported in the February 2010 ES and the December 2010 ES FID. Therefore, an updated air quality impact assessment (during operation) and an updated noise and vibration assessment (during operation) have been undertaken. These are presented in Section 9 (Air Quality) and Section 10 (Noise and Vibration). In terms of operation, both the updated air quality impact assessment and updated noise and vibration assessment have shown that the likely effects on the environment would not differ from those described in the February 2010 ES and the December 2010 ES FID (i.e. the operational impacts on ecology are predicted to be not significant).

## **13 WATER QUALITY**

### **13.1 Introduction**

- 13.1.1 This Section considers the potential effects of GEC on water quality, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **13.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 13.2.1 It is not considered that there have been any material changes to the future water quality baseline as presented in the February 2010 ES and the December 2010 ES FID.

#### ***Identification of the Need for Additional Assessment***

- 13.2.2 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 13.2.3 In terms of water quality, this is determined via the use of Table 13.1.

**TABLE 13.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (WATER QUALITY)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Are there any inland / coastal / marine / underground waters on or around the site which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no inland / coastal / marine / underground waters on or around the GEC site which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

### **13.3 Summary**

- 13.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:
- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
  - During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

## **14 GEOLOGY, HYDROLOGY AND LAND CONTAMINATION**

### **14.1 Introduction**

- 14.1.1 This Section considers the potential effects of GEC on geology, hydrology and land contamination, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **14.2 Updated Environmental Baseline<sup>39</sup> / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 14.2.1 It is not considered that there have been any material changes to the future geological and hydrological baseline as presented in the February 2010 ES and the December 2010 ES FID.
- 14.2.2 Indeed, as noted previously, as part of the agreement between GECL and DP World, the GEC site will be cleared, levelled, remediated and provided to GECL in a condition that would allow for construction of GEC. In terms of the status of these works, it is currently estimated that approximately 80 per cent of the locations across the DP World® London Gateway® Port and London Gateway® Logistics Park sites which are known to require remediation have been successfully remediated.

#### ***Identification of the Need for Additional Assessment***

- 14.2.3 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 14.2.4 In terms of geology, hydrology and land contamination, this is determined via the use of Table 14.1.

**TABLE 14.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT  
(GEOLOGY, HYDROLOGY AND LAND CONTAMINATION)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Will the Proposed Development involve actions causing physical changes in the locality (i.e. topography / land use / changes in water bodies) which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not involve any additional actions causing physical changes to the locality to those reported in the February 2010 ES or the December 2010 ES FID.	N / A

<sup>39</sup> Information on the Updated Environmental Baseline are taken from: Chapter 8 (Ground Conditions) of the 'London Gateway® Logistics Park Local Development Order Environmental Statement' (June 2013).

<i><b>Questions to be Considered</b></i>	<i><b>Y / N, Briefly Describe</b></i>		<i><b>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</b></i>
Are there any areas on or around the site which contain important / high quality / scarce resources (e.g. ground waters / surface waters / forestry / agriculture / fisheries / minerals) which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas on or around the GEC site which contain important / high quality / scarce resources which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Will the Proposed Development use natural resources (such as: land; water; materials / energy) in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not use any significant amounts of additional natural resources to those reported in the February 2010 ES or the December 2010 ES FID.	N / A
Is the site susceptible to earthquakes / subsidence / landslides / erosion / flooding or extreme or adverse climatic conditions (e.g. temperature inversions / fogs / severe winds) which could cause the Proposed Development to present environmental problems which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not present any additional environmental problems to those reported in the February 2010 ES or the December 2010 ES FID.	N / A
Will the Proposed Development use / store / transport / handle / produce substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not use / store / transport / handle / produce any additional substances or materials to those reported in the February 2010 ES or the December 2010 ES FID.	N / A
Will the Proposed Development produce solid wastes which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not produce any additional solid wastes to those reported in the February 2010 ES or the December 2010 ES FID.	N / A

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Will the Proposed Development lead to risks of contamination to land or water from releases of pollutants onto the ground or into surface waters / ground waters / coastal waters / seas which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not lead to any additional risks of contamination to land or water from releases of pollutants to those reported in the February 2010 ES or the December 2010 ES FID.	N / A
Will there be any risk of accidents during construction / operation / decommissioning of the Proposed Development which could affect human health or the environment which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not lead to any additional risks of accidents which could affect human health or the environment to those reported in the February 2010 ES or the December 2010 ES FID.	N / A

### **14.3 Summary**

14.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:

- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
- During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

## **15 TRAFFIC AND INFRASTRUCTURE**

### **15.1 Introduction**

- 15.1.1 This Section considers the potential effects of GEC on traffic and infrastructure, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID (including the Transport Report).

### **15.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment<sup>40</sup>**

#### ***Updated Environmental Baseline***

- 15.2.1 It is not considered that there have been any material changes to the assumed future transport and infrastructure baseline as presented in the February 2010 ES and the December 2010 ES FID. Indeed, it is noted by the team behind the London Gateway® Logistics Park that there is now committed investment in the A13 Link 5 3-lane widening, and also the M25 J30 improvements.

#### ***Identification of the Need for Additional Assessment***

- 15.2.2 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 15.2.3 In terms of transport and infrastructure, this is determined via the use of Table 15.1.

**TABLE 15.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT  
(TRAFFIC AND INFRASTRUCTURE)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Are there any routes or facilities on or around the site which are used by the public for access to recreation / other facilities which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no routes or facilities on or around the GEC site which are used by the public for access to recreation / other facilities which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

<sup>40</sup> Information is taken from: Chapter 12 (Traffic and Transport) of the 'London Gateway® Logistics Park Local Development Order Environmental Statement' (June 2013).

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<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any transport routes on or around the site which are susceptible to congestion / which could cause environmental problems which could be affected by the Proposed Development in a way which differs from that reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no transport routes on or around the GEC site which are susceptible to congestion / which could cause environmental problems which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

- 15.2.4 Further to Table 15.1, Condition 5(3) of the Original Consent states that “*The commencement of the Development shall take place before the expiry of five years from the date of this permission*”. Hence, construction of GEC will be required to commence before 4 August 2016. This is consistent with the Variation Application.
- 15.2.5 Furthermore, since the preparation of the February 2010 ES and the December 2010 ES FID, subsequent assessment has been undertaken as part of Chapter 12 (Traffic and Transport) of the ‘London Gateway Logistics Park® Local Development Order Environmental Statement’ (June 2013).
- 15.2.6 The Local Development Order would (if made) supplant the Outline Planning Consent on the basis that it will largely authorise the same development as the Outline Planning Consent, but will be administratively simpler and more efficient.
- 15.2.7 The ‘London Gateway Logistics Park® Local Development Order Environmental Statement’ (June 2013) states (at paragraph 12.140) that: “*The transport assessment which informed the [Outline Planning Consent] considered only a small proportion of synergy with the related [DP World® London Gateway® Port] and as such the [Outline Planning Consent] was permitted on the understanding of significantly higher traffic flows that are now contemplated. However, it is considered that, were the [London Gateway® Logistics Park] to proceed under the [Outline Planning Consent] this would benefit from the same synergy with the [DP World® London Gateway® Port] as benefits the [Local Development Order]. On the basis it is concluded that the impact of the traffic generated as a result of the [Outline Planning Consent] would be in the order of that generated by the [Local Development Order] development, the difference between the schemes in terms of impact would be negligible*”.
- 15.2.8 On this basis, as the traffic generation reported in the February 2010 ES and December 2010 ES does not differ from the traffic generation required for the Proposed Development, it is also considered that the difference in terms of likely effects on the environment would be negligible.

### **15.3 Summary**

- 15.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:
- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
  - During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.



## **16 CULTURAL HERITAGE**

### **16.1 Introduction**

- 16.1.1 This Section considers the potential effects of GEC on cultural heritage, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **16.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 16.2.1 It is not considered that there have been any material changes to the assumed future cultural heritage baseline as presented in the February 2010 ES and the December 2010 ES FID.

#### ***Identification of the Need for Additional Assessment***

- 16.2.2 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 16.2.3 In terms of cultural heritage, this is determined via the use of Table 16.1.

**TABLE 16.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (CULTURAL HERITAGE)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Are there any areas on or around the site which are protected under international / national / local legislation for their cultural heritage value which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas on or around the GEC site which are protected under international / national / local legislation for their cultural heritage value which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Are there any areas or features of historic / cultural importance on or around the site which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas or features of historic / cultural importance on or around the GEC site which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

### **16.3 Summary**

- 16.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:
- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,

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- During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

## **17 SOCIO-ECONOMICS**

### **17.1 Introduction**

- 17.1.1 This Section considers the potential socio-economic effects of GEC, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

### **17.2 Updated Environmental Baseline / Identification of the Need for Additional Assessment**

#### ***Updated Environmental Baseline***

- 17.2.1 It is not considered that there have been any material changes to the future socio-economic baseline as presented in the February 2010 ES and the December 2010 ES FID.

#### ***Identification of the Need for Additional Assessment***

- 17.2.2 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.
- 17.2.3 In terms of socio-economics, this is determined via the use of Table 17.1.

**TABLE 17.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (SOCIO-ECONOMICS)**

<b><i>Questions to be Considered</i></b>	<b><i>Y / N, Briefly Describe</i></b>		<b><i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i></b>
Will the Proposed Development result in social changes (i.e. in demography / traditional lifestyles / employment) which differ from those reported in the February 2010 ES and the December 2010 ES FID?	N	The Proposed Development will not result in social changes which differ from the February 2010 ES or the December 2010 ES FID.	N / A
Are there land uses on or around the site (e.g. homes / gardens / other private property / industry / commerce / recreation / public open space / community facilities / agriculture / forestry / tourism / mining or quarrying) which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no land uses on or around the GEC site which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any areas on or around the site which are occupied by sensitive land uses (e.g. hospitals / schools / places of worship / community facilities) which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas on or around the GEC site which are occupied by sensitive land uses which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Are there any areas on or around the site which are densely populated / built-up which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	It is considered that there are no areas on or around the GEC site which are densely populated / built-up which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A

### **17.3 Summary**

17.3.1 Based on the updated environmental baseline and the identification of the need for additional assessment, it is considered that:

- During construction / decommissioning, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID; and,
- During operation, it is not considered that the likely effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

## **18 CONSOLIDATED SUMMARY OF MITIGATION AND MONITORING**

### **18.1 Overview**

- 18.1.1 As noted in the February 2010 ES, December 2010 ES FID and this August 2014 ES FID, there are a number of mitigation and monitoring measures which have been proposed as part of the way in which GEC is constructed / operated / decommissioned.
- 18.1.2 This Section provides a consolidated summary of these mitigation and monitoring measures. The methodology for preparing this consolidated summary comprised the following:
- Identification of the key direct and indirect effects on the environment reported in the February 2010 ES, December 2010 ES FID and this August 2014 ES FID;
  - Identification of the associated proposed mitigation / monitoring measure; and,
  - Identification of the method of implementation for the mitigation / monitoring measure.

### **18.2 Consolidated Summary of Mitigation and Monitoring**

- 18.2.1 The consolidated summary of the mitigation and monitoring for construction is provided in Table 18.1. As the likely impacts of for decommissioning are expected to be similar (and of an equal or lower significance), the mitigation and monitoring for decommissioning is also expected to be similar.
- 18.2.2 Similarly the consolidated summary of the mitigation and monitoring for operation is provided in Table 18.2.

**TABLE 18.1: CONSOLIDATED SUMMARY OF MITIGATION AND MONITORING DURING CONSTRUCTION**

Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Air Quality	During construction there is the potential for dust emissions to arise.	<p>A Dust Suppression Plan will be included in the CEMP. This will include the following measures:</p> <ul style="list-style-type: none"> <li>• Assessment of materials for moisture content;</li> <li>• If material is dry, application of water spray onto the working area to suppress dust or treatment with a suitable dust suppressant;</li> <li>• Where excavation faces / trenches are not being worked, they will be, if required, sheeted or treated with a suitable dust suppressant; and,</li> <li>• Where finely ground materials are delivered, there may be a requirement that these are in bag form or stockpiled in specified locations where the material can be suitably covered;</li> <li>• Areas utilised by traffic will be monitored, and if they are dry, application of water by water bowzers;</li> <li>• All operatives working in areas of potential dust emission will be provided with paper type face masks; and,</li> <li>• A road sweeping vehicles will be employed when required to remove dust and dirt from public roads.</li> </ul>	<p>The requirement to implement a CEMP is provided by Condition 5(25) of the Original Consent.</p> <p>The requirement to implement a Dust Suppression Plan is provided by Condition 5(6) of the Original Consent.</p> <p>In terms of decommissioning, the requirement to implement a Decommissioning Environmental Management Plan (DEMP) is provided by Condition 5(56) and Condition 5(57) of the Original Consent.</p>
		<p>A Wheel Washing Facility will be provided adjacent to the GEC site exit which will be used by all heavy commercial vehicles leaving the GEC site. This will prevent the transmission of soils / dusts from the GEC site to public roads.</p>	<p>The requirement to implement a Wheel Washing Facility is provided by Condition 5(4) and Condition 5(5) of the Original Consent.</p>
		<p>All vehicles carrying bulk materials into or out of the GEC site should be covered to prevent dust emission.</p>	<p>The requirement for vehicles to be covered is provided by Condition 5(7) of the Original Consent.</p>
Noise and Vibration	Noise generating plant will be used during the construction phase.	<p>All construction activities would be carried out in accordance with the recommendations of BS 5228:2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 (Noise) and Part 2 (Vibration).</p>	<p>The requirement for construction activities would be carried out in accordance with the recommendations of BS 5228 is provided by Condition 5(29) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
		<p>Initially and until the buildings are closed and capable of providing an 'indoor working environment', construction work will only take place during Monday to Saturdays 07:00 – 19:00 hours.</p> <p>No work on any Sunday or Bank Holidays will be undertaken, unless such work is associated with an emergency or does not cause existing ambient noise levels to be exceeded at nearby Noise Sensitive Receptors (NSR).</p> <p>Should a need arise, due to technical constraints or similar, with regard to carrying out certain construction work outside the time indicated above, prior written approval from Thurrock Borough Council will be sought.</p>	<p>The requirement to adhere to specified construction hours is provided by Condition 5(26), Condition 5(27) and Condition 5(28) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
		<p>Suitable mitigation will be included in the CEMP. This will include the following measures:</p> <ul style="list-style-type: none"> <li>• All construction plant / equipment will be fitted with customary exhaust silencers, and regularly maintained;</li> <li>• All construction plant / equipment will be used where appropriate. All major compressors will be sound-reduced models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;</li> <li>• All ancillary construction plant / equipment (such as generators, compressors and pumps) will be positioned so as to cause minimum noise disturbance. If necessary, temporary acoustic barriers or enclosures would be provided; and,</li> <li>• To the extent required by Thurrock Borough Council, specific method statements and risk assessments would be produced for night working. In order to minimise the likelihood of noise complaints in such eventualities, the Construction Contractor will inform and agree the works in advance with the Environmental Health Officer (EHO) at Thurrock Borough Council, informing affected residents of the works to be carried out outside normal hours.</li> </ul>	<p>The requirement to implement a CEMP is provided by Condition 5(25) of the Original Consent.</p>
		<p>The residents would be provided with a point of contact for any queries or complaints.</p>	<p>The requirement to implement Noise Complaints Procedure is provided by Condition 5(33) of the Original Consent.</p>



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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Landscape and Visual	It is unlikely that there will be any impacts on the landscape character. It is likely that visual impacts will occur.	Suitable mitigation will be included in the CEMP. This will include the following measures: <ul style="list-style-type: none"> <li>Careful placement of the temporary storage of topsoil and any other material considered of value for retention; and,</li> <li>Careful design and layout of site construction areas including the location and type of temporary security fencing and lighting.</li> </ul>	The requirement to implement a CEMP is provided by Condition 5(25) of the Original Consent.  In terms of decommissioning, the requirement to implement a DEMP is provided by Condition 5(56) and Condition 5(57) of the Original Consent.
Ecology	Due to the nature of the site, and the program of clearance, remediation and levelling being undertaken, there is limited potential for impacts on ecological receptors.	Mitigation and management measures have already been implemented as part of the respective CEMPs for the DP World® London Gateway® Port / London Gateway® Logistics Park.  The relationship between these CEMPs and the CEMP for GEC should be established to ensure that any requirements within the GEC site can be delivered.  Establishing the relationship between the respective CEMPs for the DP World® London Gateway® Port / London Gateway® Logistics Park and the CEMP for GEC will also ensure opportunities for co-ordination are identified and exploited.	The requirement to implement a CEMP is provided by Condition 5(25) of the Original Consent.
Water Quality	There is the potential for impacts on controlled waters to arise.	Suitable mitigation will be included in the CEMP. This will include the following measures: <ul style="list-style-type: none"> <li>Any oil storage tanks to be located on an impervious base provided with bund walls to give a containment capacity of at least 110 per cent of the tank volume;</li> <li>All valves and couplings to be contained within the bunded area;</li> <li>Refuelling of construction vehicles and equipment to be restricted to a designated area with properly designed fuel tanks and bunds and proper operating procedures.</li> </ul> <p>In preparing the CEMP, consideration shall be given to BS 6031:1981: Code of Practice for Earthworks (which contains methods that should be considered for the general control of drainage on construction sites) and BS 8004:1986: Code of Practice for Foundations.</p>	The requirement to implement a CEMP is provided by Condition 5(25) of the Original Consent.

Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
		<p>A Drainage Scheme will be developed. For construction, this will include the following measures:</p> <ul style="list-style-type: none"> <li>Any surface water contaminated by hydrocarbons, which are used during the construction phase, to be passed through oil / grit interceptor(s) prior to discharge;</li> <li>Concrete gullies, dewatering ponds and other similar measures will be used to ensure that no leachate or any surface water that has the potential to be contaminated is allowed to enter directly or indirectly into any water course, underground strata or adjoining land.</li> <li>Provisions to be made so that all existing drainage systems continue to operate. These will include visual inspections and corrective measures as appropriate.</li> <li>The use of lining materials, good housekeeping techniques and control to minimise water inflows to excavated areas to prevent the contamination of ground water.</li> <li>Site personnel to be made aware of the potential impact on ground and surface water associated with certain aspects of the construction works to further reduce the incidence of accidental impacts.</li> </ul>	<p>The requirement to implement a drainage scheme (to prevent contamination of water courses) is provided by Condition 5(35), Condition 5(36), Condition 5(37), Condition 5(38), Condition 5(39) and Condition 5(40) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Geology, Hydrology and Land Contamination	<p>Due to the location of the site, and the historical land uses, there is a high potential for contamination to be present on site.</p> <p>Contaminants (such as fuels and concrete) will be used on site.</p> <p>There is the potential for land contamination to occur as a result of spillages.</p>	<p>In advance of any construction works, a program of clearance, remediation and levelling being undertaken across the GEC site. Remediation Validation Reports will be produced as documentation of the works undertaken.</p> <p>Following the remediation works, studies examining soil properties will be undertaken by the Construction Contractor, building on the results of site investigations carried out for GEC, and the surrounding the DP World® London Gateway® Port and London Gateway® Logistics Park. In addition, as the potential exists for possible off-site contamination to migrate onto the GEC site during construction, the Construction Contractor will conduct a Contaminated Soil Survey and maintain a close watch for possible contamination appearing during construction. This way any hotspots identified can be appropriately addressed.</p> <p>Following the program of remediation and studies / surveys, site preparation work may comprise the raising of the GEC site (potentially further than that undertaken for the surrounding the DP World® London Gateway® Port and London Gateway® Logistics Park), earthworks, and the excavations for foundations. Trenching, installation of underground services and provision of the temporary laydown / storage area and services will then take place.</p>	<p>These requirements are provided by Condition 5(45), Condition 5(46), Condition 5(47), Condition 5(48) and Condition 5(49) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Traffic and Infrastructure	There may be additional construction traffic in the form of HGVs and construction personnel vehicles.	All vehicle movements associated with the construction of GEC will be monitored to ensure the impact is as described in the Transport Report (December, 2010) as reported in the December 2010 ES FID.	The requirement for vehicle movement monitoring is provided by Condition 5(14) of the Original Consent.
		All vehicle movements associated with the construction of GEC will operate under a Transport Management Plan. The purpose of the Transport Management Plan will be to provide a basis for the active management of all potential issues relating to additional vehicle movements associated with the construction of GEC. The Transport Management Plan will include details of the approved routes to and from the GEC site. The Transport Management Plan will also incorporate a Green Travel Plan to encourage the use of sustainable transport methods. A Framework for the Transport Management Plan was provided in Section 14 of the Transport Report (December, 2010).	The requirement for a Transport Management Plan is provided by Condition 5(23) of the Original Consent. The requirement to adhere to approved routes is provided by Condition 5(24) of the Original Consent. Additionally, the requirement to implement a Travel Plan is provided by Condition 5(13).
		All vehicle movements associated with the construction of GEC will be in accordance with the construction hours.	This requirement for all vehicle movements associated with the construction of GEC will be in accordance with specified agreed hours is provided by Condition 5(19), Condition 5(20), Condition 5(21), Condition 5(22)
		To further minimise potential issues relating to additional vehicle movements associated with the construction of GEC, alternative means of transport to site will be investigated.	The requirement to investigate the use of water for the delivery of materials and plant is provided by Condition 5(15) and Condition 5(16) of the Original Consent. The requirement to investigate the use of rail for the delivery of materials and plant is provided by Condition 5(17) and Condition 5(18) of the Original Consent.

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Cultural Heritage	<p>The cultural heritage in the area is well understood from the work undertaken for GEC, the DP World® Port London Gateway® Port and London Gateway® Logistics Park. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood.</p> <p>It is unlikely that there will be any archaeological remains of significance.</p>	<p>Prior to construction, a programme of archaeological field evaluation works will be developed in conjunction with the Essex County Archaeologist.</p>	<p>The requirement to implement a programme of archaeological field evaluation works is provided by Condition 5(42), Condition 5(43) and Condition 5(44) of the Original Consent.</p>
Socio-Economics	<p>Short term employment opportunities during the construction works.</p>	<p>No specific mitigation or monitoring is deemed necessary due to the positive socio-economic impacts of GEC.</p>	<p>N / A</p>

TABLE 18.2: CONSOLIDATED SUMMARY OF MITIGATION AND MONITORING DURING OPERATION

Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Air Quality	During operation there will be emissions of NO <sub>x</sub> .	<p>The following measures have been included in the design of GEC:</p> <ul style="list-style-type: none"> <li>The use of Dry Low NO<sub>x</sub> Combustion Technology, which ensures NO<sub>x</sub> levels will be in accordance with requirements of Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants (the Large Combustion Plant Directive (LCPD)) and Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (the Industrial Emissions Directive (IED));</li> <li>The use of a fuel inherently low in sulphur; and</li> <li>A use of a stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion.</li> </ul>	<p>The emissions of NO<sub>x</sub> from GEC will be controlled through the Environmental Permit for GEC which will be granted under the Environmental Permitting (England and Wales) Regulations 2010.</p> <p>To ensure the emissions of NO<sub>x</sub> from GEC are meeting the limits in the Environmental Permit, the requirement for air pollution monitoring are provided by Condition 5(55) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Noise and Vibration	During quiet periods, the operation of GEC may generate low level noise.	<p>The following measures will be included in the design of GEC:</p> <ul style="list-style-type: none"> <li>• Silencers will be fitted to achieve noise attenuation on specific plant / equipment items, including gas turbine and HRSG inlets and ductwork;</li> <li>• Acoustic lagging and low noise trims will be fitted to specific pipework and noise generating steam valves where required;</li> <li>• Acoustic enclosures will be considered, and provided where required, for all plant / equipment items where practicable, including for smaller plant items such as compressors and pumps;</li> <li>• Where required, internal surfaces within the turbine hall should be treated to control internal reverberant noise levels. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, or a spray on cellulose fibre treatment;</li> <li>• Although 'normally-off' plant / equipment items have not been included in the modelling of normal operation, these will be afforded the same level of noise control as all other plant / equipment items as appropriate; and,</li> <li>• As tonal or impulsive noises are considered more annoying than continuous noise sources, plant / equipment items will be silenced or otherwise controlled through regular maintenance.</li> </ul>	<p>These measures will be included in the tender specifications for GEC.</p> <p>In particular, the gas turbines will be situated inside integral acoustic enclosures designed to ensure that noise levels generated are within acceptable limits. Additionally, each CCGT unit will be enclosed in steel framed buildings to further mitigate noise levels emanating from the GEC site.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
		<p>Shortly following the commissioning the requirements for an updated Noise Assessment will be agreed with Thurrock Borough Council. The aim of the updated Noise Assessment shall be to ensure that plant / equipment noise levels as measured at the agreed NSR locations do not exceed the noise limits agreed with Thurrock Borough Council.</p> <p>The updated Noise Assessment will be undertaken in accordance with BS 4142:1997: Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas.</p> <p>At the detailed design stage, a computer model of the final plant / equipment items will be produced to calculate the predicted noise levels at the NSR locations, and to ensure that limits are adhered to. The detailed design will ensure that operational noise is mitigated as far as possible, through site layout and orientation of noisy plant items.</p>	<p>The requirements are provided by Condition 5(30) and Condition 5(31) of the Original Consent.</p>
		<p>In the interest of maintaining neighbourly relations and residential amenity, GECL will give a reasonable period of notice to residents and Thurrock Borough Council prior to any planned non-normal operations that would lead to an increase in noise levels.</p> <p>Wherever possible, these planned events will be carried out between 09:00 and 17:00 hours on weekdays.</p>	<p>The requirements for planned non-normal operations are provided by Condition 5(32) of the Original Consent.</p>
		<p>The residents would be provided with a point of contact for any queries or complaints.</p> <p>In the event of a complaint by a local resident relating to noise levels during operation, an investigation shall be carried out to determine the likely cause of the complaint, and if necessary any available remedial measures.</p> <p>Where it is deemed necessary by Thurrock Borough Council, a written report detailing these remedial measures and their effectiveness will be provided.</p>	<p>The requirement to implement Noise Complaints Procedure is provided by Condition 5(33) of the Original Consent.</p>



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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Landscape and Visual	Limited impacts on landscape character. It is likely that visual impacts will occur.	<p>The final architectural design of GEC will be sensitive to the suggestions of Thurrock Borough Council and the team behind the London Gateway® Logistics Park. Furthermore, the final architectural design of the buildings will be carefully considered to provide a high standard of visual amenity, given practical and economic constraints.</p> <p>The external structures will be designed such that there will be minimal deterioration in the appearance of GEC over its operational lifetime. Furthermore, a limited combination of materials will be used in the construction of the external structures at GEC to give it a cohesive appearance. At upper levels, it is likely that a colour coated profiled sheeting will be used. At lower levels, including low level buildings, it is likely that facing brickwork or dense concrete masonry will be used, where appropriate.</p> <p>A recessive colour scheme will be used in order to break up the impact of the built structures. The final colour scheme will be agreed with Thurrock Borough Council and the team behind the London Gateway® Logistics Park.</p>	<p>The requirement to agree the final design of GEC is provided by Condition 5(8) of the Original Consent.</p> <p>The requirement to agree any variation to the final design of GEC is provided by Condition 5(12) of the Original Consent. Furthermore, the requirement to adhere to the principles of the Revised Design and Access Statement (December, 2010) is provided by Condition 5(9) of the Original Consent.</p> <p>The requirement for GEC to achieve a CEEQUAL rating of ("very good") (or equivalent) is provided by Condition 5(10) of the Original Consent.</p>
		<p>GEC will include the following lighting systems: site lighting; emergency lighting; road lighting; and, area floodlighting.</p> <p>Lighting systems will be designed to be similar to those used on the London Gateway® Logistics Park.</p> <p>Lighting systems will comply with current best practice and industry standards in order to minimise light spread and glare off site.</p>	<p>The requirements for the lighting systems are provided by Condition 5(11) of the Original Consent.</p>
		<p>GEC will, in the future, likely benefit from a landscaping scheme implemented as part of the surrounding London Gateway® Logistics Park that will help to minimise the impact of lower lying plant items such as the water tanks, administration building, stores and other such buildings.</p>	<p>The requirements for the landscaping scheme for GEC are provided by Condition 5(50), Condition 5(51), Condition 5(52) and Condition 5(53) of the Original Consent.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Ecology	During operation, there will be limited potential for ecological impacts.	<p>Whilst no significant adverse impacts on ecology have been identified due to the operation of GEC, following discussion with Natural England, InterGen / GECL has agreed to:</p> <ul style="list-style-type: none"> <li>• Provide an ecologist for 1 – 2 days per year over a 5 year term to monitor mitigation works to regenerate acid grassland at Thundersley Great Common SSSI; and,</li> <li>• Participate in a new Project to increase the population of Least Lettuce (<i>Lactuca saligna</i>) species at Vange and Fobbing Marshes SSSI.</li> </ul>	The requirement to implement these measures is provided by Condition 5(54) of the Original Consent.
		<p>The landscaping scheme for GEC shall consider:</p> <ul style="list-style-type: none"> <li>• The provision of additional ponds on site. These could be designed in particular for amphibians and aquatic invertebrates but would also provide value for a variety of bird species.</li> <li>• The use of a locally appropriate species-rich grass seed mix for the grassland surrounding the GEC.</li> <li>• The provision of Landscape planting, in particular any screen planting, which would provide new habitat for nesting birds and terrestrial invertebrate species as well as providing new features of value to foraging and commuting bats.</li> <li>• The provision of bird nesting boxes on buildings within the area to immediately increase the availability of nesting habitat on site.</li> </ul> <p>The associated landscaping management plan shall also consider:</p> <ul style="list-style-type: none"> <li>• Low frequency, ecologically sensitive grass cutting to allow grass and flora species to flower and set seed.</li> <li>• Recommendations for the drainage features and any ponds provided on site.</li> </ul>	The requirements for the landscaping scheme for GEC are provided by Condition 5(50), Condition 5(51), Condition 5(52) and Condition 5(53) of the Original Consent.

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Water Quality	<p>During operation there will be an increase in water consumption.</p>	<p>There are expected to be four new drainage systems on the GEC site. These will be reviewed by the team behind the London Gateway® Logistics Park, to ensure that they tie in directly to the wider London Gateway® Logistics Park drainage system.</p> <p>The four new drainage systems on the GEC site are expected to include:</p> <ul style="list-style-type: none"> <li>• The surface water drainage system;</li> <li>• The oily water drainage system;</li> <li>• The contaminated wastewater system (i.e. purge water from the water treatment plant effluent); and</li> <li>• The on site sewerage system.</li> </ul>	<p>The requirement to implement a drainage scheme (to prevent contamination of water courses) is provided by Condition 5(35), Condition 5(36), Condition 5(37), Condition 5(38), Condition 5(39) and Condition 5(40) of the Original Consent.</p> <p>In addition, the requirement to implement a scheme for a Sustainable Drainage Scheme (SuDS) is provided by Condition 5(34) of the Original Consent.</p> <p>Furthermore, the discharges to the London Gateway® Logistics Park drainage system will be controlled by conditions included in the Environmental Permit for GEC under the Environmental Permitting (England and Wales) Regulations 2010, and will also comply with the limits of the London Gateway® Logistics Park Local Development Order (LDO) Design Code<sup>41</sup>.</p>

<sup>41</sup> This is available at: <https://www.thurrock.gov.uk/local-development-order/london-gateway-logistics-park>

Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
		<p>The following measures will be included in the design of GEC:</p> <ul style="list-style-type: none"> <li>• All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank.</li> <li>• Permanently fixed taps, filler pipes, pumping equipment, vents and piping will be located through the wall of the bund with normally locked valves.</li> <li>• Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bund and its composition will be verified through appropriate analysis prior to disposal.</li> </ul>	<p>These measures will be included in the tender specifications for GEC.</p>
	<p>GEC will be designed to take into account the flood risks associated with the site.</p>		<p>The requirement for GEC to be designed to take into account the flood risks of the site is provided by Condition 5(41) of the Original Consent.</p> <p>This includes the requirements to adhere to the measures contained in the Flood Risk Assessment (February 2010) and Supplementary Flood Risk Assessment (December 2010). In addition, there are requirements to provide safe routes into and out of the site, and for any place of refuge to be of a minimum 3.7 m AOD.</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Geology, Hydrology and Land Contamination	During operation (i.e. post the program of clearance, remediation and levelling), there are no potential risks associated with the GEC site	<p>The following measures will be included in the design of GEC:</p> <ul style="list-style-type: none"> <li>• All foundations will be appropriately specified to resist chemical attack from soils or groundwater; and,</li> <li>• All foundations will be designed so as not to present a preferential pathway for contamination migration.</li> </ul>	These measures will be included in the tender specifications for GEC.
Traffic and Infrastructure	<p>No material impacts during normal operation identified.</p> <p>There may be additional traffic during a major outage period.</p>	<p>All vehicle movements associated with the operation of GEC will be monitored to ensure the impact is as described in the Transport Report (December, 2010) as reported in the December 2010 ES FID.</p> <p>All vehicle movements associated with outages of GEC will operate under a Transport Management Plan. The purpose of the Transport Management Plan will be to provide a basis for the active management of all potential issues relating to additional vehicle movements associated with the outages of GEC.</p> <p>The Transport Management Plan will include details of the approved routes to and from the GEC site.</p> <p>The Transport Management Plan will also incorporate a Green Travel Plan to encourage the use of sustainable transport methods.</p> <p>A Framework for the Transport Management Plan was provided in Section 14 of the Transport Report (December, 2010).</p>	<p>The requirement for vehicle movement monitoring is provided by Condition 5(14) of the Original Consent.</p> <p>The requirement for a Transport Management Plan is provided by Condition 5(23) of the Original Consent.</p> <p>The requirement to adhere to approved routes is provided by Condition 5(24) of the Original Consent.</p> <p>Additionally, the requirement to implement a Travel Plan is provided by Condition 5(13).</p>
Cultural Heritage	It is unlikely that there will be any archaeological remains of significance.	<p>All vehicle movements associated with outages of GEC will in accordance with specified agreed hours.</p> <p>No specific mitigation or monitoring is deemed necessary.</p>	<p>This requirement is provided by Condition 5(20), Condition 5(21), Condition 5(22)</p> <p>N / A</p>

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Section	Potential Effect on the Environment	Mitigation and Monitoring Measure	Implementation
Socio-Economics	Employment opportunities during the operation of GEC.	<p>No specific mitigation or monitoring is deemed necessary due to the positive socio-economic impacts of GEC.</p> <p>However, the December 2010 ES FID states (at paragraph 17.1.18) that “there may [...] be additional socio-economic benefits which could be associated with the development of GEC where GECL could engage with local communities. This engagement, which may be tailored more specifically to educational and skills benefits, could include:</p> <ul style="list-style-type: none"> <li>• Visits to GEC (or the existing [Coryton CCGT power plant]) for members of the local community;</li> <li>• Linking with local schools / colleges to provide educational engagement in energy related knowledge; and,</li> <li>• Providing role modelling / mentoring or outreach programmes”.</li> </ul> <p>In addition, GECL is committed to the delivery of CHP which will be included within the development of GEC.</p>	<p>Local engagement during operation of GEC.</p> <p>In terms of CHP, the requirement for GEC to be designed so as to have the capability of extracting steam from the electricity generating cycle is provided by Condition 3 of the Original Consent. In addition, the provision of CHP is included in the Section 106 Agreement.</p> <p>Furthermore, it is currently understood that a Condition of the Environmental Permit will be that GEC will be built CHP-Ready.</p>

## **19 CUMULATIVE IMPACTS**

### **19.1 Introduction**

19.1.1 This Section considers the potential cumulative effects of GEC, providing a summary of the exercise undertaken to identify and assess whether the likely significant impacts on the environment of the Proposed Development would differ from those described in the February 2010 ES and the December 2010 ES FID.

19.1.2 Cumulative environmental impacts can be either:

- Type 1 Cumulative Impacts; or

These are combined effects of different types on a single receptor. For example: dust and noise considered together.

- Type 2 Cumulative Impacts.

Effects from other planned developments combined with those from the Proposed Development. For example: combined traffic.

19.1.3 Where the likely significant impacts on the environment would differ, an updated assessment has been provided.

### **19.2 Updated Environmental Baseline (Description of Associated Infrastructure and Developments) / Identification of the Need for Additional Assessment**

19.2.1 Section 19.3 of the December 2010 ES FID stated (at paragraph 19.3.4): *"it should be noted that as the preferred routes of the various infrastructure connections [...] are still to be confirmed (and are currently the subject of on going 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 due to the construction and operation of the infrastructure connections is provided so as to allow the likely significant effects to be assessed. In order to ensure the likely significant effects are assessed, where uncertainties exist, the potential worst case [...] impacts are assessed (e.g. in terms of the HV electricity connection, it is assumed that an entirely new overhead electricity line is required)".*

19.2.2 Subsequent to the February 2010 ES and the December 2010 ES FID, planning permission for both the underground gas pipeline and associated AGI / HV underground electrical connection and associated extension to the Coryton Substation has been obtained. As part of the applications for planning permission, full and comprehensive environmental assessments, including cumulative assessments, were undertaken. Therefore, detailed information relating to the potential environmental impacts which may arise due to the construction and operation of the infrastructure connections is available.

19.2.3 To inform the need for any additional environmental assessment required for the Variation Application, it is necessary to determine whether the likely significant effects on the environment would differ from those described in the February 2010 ES and the December 2010 ES FID.

19.2.4 In terms of indirect / secondary and cumulative effects, this is determined via the use of Table 19.1.

**TABLE 19.1: IDENTIFICATION OF THE NEED FOR FURTHER ASSESSMENT (CUMULATIVE IMPACTS)**

<i>Questions to be Considered</i>	<i>Y / N, Briefly Describe</i>		<i>Is Additional Environmental Assessment Necessary? (Y / N, Briefly Describe)</i>
Are there any plans for future land uses on or around the site which could be affected by the Proposed Development in a way which differs from those reported in the February 2010 ES and the December 2010 ES FID?	N	There are no plans for future land uses on or around the site which could be affected by the Proposed Development in a way that differs from the February 2010 ES or the December 2010 ES FID.	N / A
Are there any other factors, additional to those reported in the February 2010 ES and the December 2010 ES FID, which should be considered as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing / planned projects / developments?	Y	Subsequent to the February 2010 ES and December 2010 ES FID, planning permission for the underground gas pipeline and associated AGI / HV underground electrical connection and associated extension to the Coryton Substation has been obtained.  As part of the applications for planning permission, full and comprehensive environmental assessments, including cumulative impact assessments, were undertaken.	No additional environmental assessment is necessary. However, a consolidated cumulative impact assessment should be presented.

19.2.5 Therefore, based on the use of Table 19.1, a consolidated cumulative impact assessment should be presented. Within the consolidated cumulative impact assessment, in addition to GEC, the developments considered are:

- The new underground gas pipeline and associated AGI;
- The HV underground electrical connection and associated extension to the Coryton Substation; and,
- The DP World® London Gateway® Port and London Gateway® Logistics Park.

### **19.3 Consolidated Assessment of Type 1 Cumulative Impacts**

19.3.1 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 sensitive receptors included: existing land uses; proximity to construction works; and, likely duration of exposure to impacts.

#### ***Type 1 Cumulative Impacts during Construction***

19.3.2 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 new underground gas pipeline / HV underground electrical connection would be in stages, and the construction activities would travel along the line of the route as sections are completed.



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19.3.3 Table 19.2 presents the likely Type 1 Cumulative Impacts that may be experienced 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 would be reduced.

**TABLE 19.2: LIKELY TYPE 1 CUMULATIVE IMPACT INTERACTIONS DURING CONSTRUCTION OF THE DEVELOPMENTS**

<i>Sensitive Receptor</i>	<i>2016<sup>42</sup></i>	<i>2017</i>	<i>2018</i>	<i>2019<sup>43</sup></i>	<i>2020</i>
Nearby Residential Properties	D / N / V / T	D / N / V / T	D / N / V / T	D / N / V / T	Very minor impacts <sup>44</sup>
Adjacent Commercial Users	D / N / T	D / N / T	D / N / T	D / N / T	Very minor impacts <sup>45</sup>
Land Owners	D / N / L / T	D / N / L / T	D / N / L / T	D / N / L / T	No impacts
Protected Species	D / N	D / N	D / N	D / N	No impacts
Surface Water / Agricultural Drainage Systems	D / N / T	D / N / T	D / N / T	D / N / T	No impacts
Agricultural Land	D / N	D / N	D / N	D / N	No impacts
D – Temporary, local, adverse dust impacts N – Temporary, local, adverse noise and vibration impacts V – Temporary, local, adverse visual impacts L – Temporary loss of land T – Temporary, local, adverse traffic impacts					

19.3.4 As shown in Table 19.2, the majority of the Type 1 Cumulative Impacts are likely to arise from construction activities which are likely to produce: dust; noise and vibration; landscape and visual impacts; and, traffic impacts.

19.3.5 However, Construction Environmental Management Plans (CEMPs) will be implemented during the construction phase, which have been secured by appropriate planning conditions (associated with the Original Consent (for GEC) and the planning permissions (for the underground gas pipeline and associated AGI / HV underground electrical connection and associated extension to the Coryton Substation / DP World® London Gateway® Port / London Gateway® Logistics Park). The respective CEMPs minimise construction impacts 'at source' in order to reduce the likely impacts on surrounding receptors.

19.3.6 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 in the respective CEMPs.

<sup>42</sup> Assuming construction of GEC commences on 4 August 2016. If construction of GEC commences before 4 August 2016, cumulative impacts would be the same as reported for 2016.

<sup>43</sup> Assuming operation of GEC commences on 4 August 2019. If operation of GEC commences before 4 August 2019, cumulative impacts would reduce.

<sup>44</sup> Due to the on going construction of the DP World® London Gateway® Port and London Gateway® Logistics Park.

<sup>45</sup> Due to the on going construction of the DP World® London Gateway® Port and London Gateway® Logistics Park.

- 19.3.7 Therefore the likely Type 1 Cumulative Impacts predicted to occur during construction are likely to be not significant.

***Type 1 Cumulative Impacts during Operation***

- 19.3.8 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.
- 19.3.9 Table 19.3 presents the likely Type 1 Cumulative Impacts that may be felt during the operation of the developments.

**TABLE 19.3: LIKELY TYPE 1 CUMULATIVE IMPACT INTERACTIONS DURING OPERATION OF THE DEVELOPMENTS**

<b><i>Sensitive Receptor</i></b>	<b><i>Operational Lifetime of Developments</i></b>
Nearby Residential Properties	V / T
Adjacent Commercial Users	T
Land Owners	L
V – Visual impacts L – Permanent loss of land T – Traffic impacts	

- 19.3.10 Respective mitigation and monitoring measures will reduce the likely Type 1 Cumulative Impacts during operation.
- 19.3.11 Therefore the likely Type 1 Cumulative Impacts predicted to occur during operation are likely to be not significant.

**19.4 Consolidated Assessment of Type 2 Cumulative Impacts**

***Type 2 Cumulative Impacts during Construction***

- 19.4.1 Table 19.4 summarises the likely Type 2 Cumulative Impacts which could be encountered during construction. The likely Type 2 Cumulative Impacts which could be encountered during decommissioning are expected to be similar, and of an equal or lower significance. In addition, Table 19.4 summarises the proposed mitigation and determines the significance of the likely Type 2 Cumulative Impacts.

***Type 2 Cumulative Impacts during Operation***

- 19.4.2 Table 19.5 summarises the likely Type 2 Cumulative Impacts which could be encountered during operation. In addition, Table 19.5 summarises the proposed mitigation and determines the significance of the likely Type 2 Cumulative Impacts.

**TABLE 19.4: LIKELY TYPE 2 CUMULATIVE IMPACTS DURING CONSTRUCTION OF THE DEVELOPMENTS<sup>46</sup>**

Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	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. For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
Noise and Vibration	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. For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.

<sup>46</sup> The likely Type 2 Cumulative Impacts which could be encountered during decommissioning are expected to be similar, and of an equal or lower significance

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Landscape and Visual	<p>It is unlikely that there will be any impacts on the landscape character.</p> <p>It is likely that visual impacts will occur.</p> <p>Construction works will be screened by hoarding, where practical, to mitigate and landscape and visual impacts near to sensitive receptors.</p>	<p>Landscape impacts may arise on Local Landscape Character due to construction.</p> <p>Visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc.</p> <p>Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.</p>	<p>Landscape impacts may arise on Local Landscape Character due to construction.</p> <p>Visual impacts will arise from the presence of cranes, machinery, excavations and temporary structures, etc.</p> <p>Construction works will be screened by hoarding, where practical, to mitigate landscape and visual impacts near to sensitive receptors.</p>	<p>Landscape impacts vary from Negligible / None to Major Adverse.</p> <p>Visual impacts vary from Negligible / None to Major Adverse.</p> <p>Aside from the measures discussed in the Environmental Statements, the teams behind the DP World® London Gateway® Port and London Gateway® Logistics Park are not required to provide construction mitigation.</p>	<p>Based on the implementation of the mitigation, cumulative impacts likely to be temporary, significant and adverse during construction.</p> <p>The cumulative impacts will be temporary in nature, and as such the residual impact is assessed as not significant.</p>

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Ecology	Due to the nature of the site, and the program of clearance, remediation and levelling 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.	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.	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.	Based on the program of clearance, remediation and levelling being undertaken, there is potential for impacts on ecological receptors.  For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
	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.  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.  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.  For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
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.	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.  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.  For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Geology, Hydrology and Land Contamination	<p>Due to the location of the site, and the historical land uses, there is a high potential for contamination to be present on site.</p> <p>Contaminants (such as fuels and concrete) will be used on site.</p> <p>There is the potential for land contamination to occur as a result of spillages.</p> <p>A full program of clearance, remediation and levelling is being undertaken prior to the commencement of construction.</p> <p>A risk assessment will be carried out prior to the commencement of construction work on site.</p> <p>This impact will be managed and controlled through a CEMP.</p> <p>Procedures will be put in place to deal with any pollution spills.</p>	<p>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.</p> <p>This impact will be managed and controlled through a CEMP.</p> <p>Procedures will be put in place to deal with any pollution spills / hotspots encountered.</p>	<p>Contaminants (such as fuels and concrete) will be used on site.</p> <p>This impact will be managed and controlled through a CEMP.</p> <p>Procedures will be put in place to deal with any pollution spills / hotspots encountered.</p>	<p>Due to the location of the DP World® London Gateway® Port and London Gateway® Logistics Park sites, and the historical land uses, there is a high potential for contamination to be present on site.</p> <p>Contaminants (such as fuels and concrete) will be used on site.</p> <p>There is the potential for land contamination to occur as a result of spillages.</p> <p>For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.</p>	<p>Based on implementation of the mitigation, cumulative impacts are likely to be not significant.</p>

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Land Use	No impacts anticipated.	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.	Land required will be minimised during eventual HV underground electrical connection route selection (i.e. Preferred Option or Manowry Fleet / Northern Triangle Option). The land used temporarily for laydown / occupation will be subject to protection measures during the construction works, and re-instated after.	No impacts anticipated.	No cumulative impacts identified.
Traffic and Infrastructure	There may be additional construction traffic in the form of HGVs and construction personnel vehicles. Traffic will be managed and controlled through a TMP.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles. Traffic will be managed and controlled through a CTMP.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles. Traffic will be managed and controlled through a CTMP.	There may be additional construction traffic in the form of HGVs and construction personnel vehicles. For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Cultural Heritage	<p>The cultural heritage in the area is well understood from the work undertaken for GEC, the DP World® London Gateway® Port and London Gateway® Logistics Park. As such, the existence and whereabouts of any existing cultural heritage features which have the potential to be impacted upon are already well understood.</p> <p>It is unlikely that there will be any archaeological remains of significance.</p> <p>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.</p> <p>If it is discovered that archaeological remains are present, an archaeological watching brief will be used during construction.</p>	<p>The cultural heritage in the area is well understood from the work undertaken for GEC, the DP World® London Gateway® Port and London Gateway® Logistics Park / undertaking of agricultural activities.</p> <p>There is a potential for the setting of cultural heritage features (i.e. Listed Buildings) to be subject to landscape and visual impacts.</p> <p>There is also a potential for unknown cultural heritage features to be impacted upon.</p> <p>Depending on the understanding of the cultural heritage potential, a range of mitigation measures can be implemented.</p> <p>These range from using a targeted Archaeological Watching Brief to alteration of the construction technique.</p> <p>The residual impact is assessed as minor adverse / not significant depending on whether any unknown cultural heritage features are encountered.</p>	<p>The cultural heritage in the area is well understood from the work undertaken for GEC, the underground gas pipeline and associated AGI, and the DP World® London Gateway® Port and London Gateway® Logistics Park.</p> <p>There is a potential for the setting of cultural heritage features (i.e. Listed Buildings) to be subject to landscape and visual impacts.</p> <p>There is a potential for unknown cultural heritage features to be impacted upon.</p> <p>Depending on the understanding of the cultural heritage potential, a range of mitigation measures can be implemented.</p> <p>The residual impact is assessed as not significant.</p>	<p>Due to the nature of the site, and its historical uses, there is potential for impacts on cultural heritage and archaeology.</p> <p>For the London Gateway® Logistics Park, mitigation included in the Local Development Order Code of Construction Practice.</p>	<p>Based on implementation of the mitigation, cumulative impacts are likely to be not significant.</p>



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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated Extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Socio-Economics	Short term employment opportunities during the construction works. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Short term employment opportunities during the construction works. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Short term employment opportunities during the construction works. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Short term employment opportunities during the construction works. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Positive cumulative impacts identified. No mitigation required.
Safety	GEC will be designed and constructed in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	The gas connection will be designed and constructed in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	The HV underground electrical connection will be designed and constructed in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	N / A	No cumulative impacts identified.
Health	The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a Health Management Plan (HMP). The residual impact is assessed as not significant.	The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a HMP. The residual impact is assessed as not significant.	The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a HMP. The residual impact is assessed as not significant.	N / A	No cumulative impacts identified.

**TABLE 19.5: LIKELY TYPE 2 CUMULATIVE IMPACTS DURING OPERATION OF THE DEVELOPMENTS**

Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Air Quality	During operation there will be emissions of NO <sub>x</sub> . Impacts will not be significant.	No impacts identified.	No impacts identified.	There may be local air quality effects and greenhouse gas effects associated with the operation of the London Gateway® Logistics Park. Mitigation included in operational conditions for the DP World® London Gateway® Port / London Gateway® Logistics Park.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
Noise and Vibration	During quiet periods, the operation of GEC may generate low level noise. Impacts will not be significant.	There is the potential for low level noise associated with the associated 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.	No impacts identified.	There may be traffic and industrial noise associated with the operation of the London Gateway® Logistics Park which will increase the baseline noise levels. Mitigation included in operational conditions for the DP World® London Gateway® Port / London Gateway® Logistics Park.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Landscape and Visual	Limited impacts on landscape character. It is likely that visual impacts will occur. GEC will be designed to minimise any landscape and visual impacts.	During operation, the only visible feature of the development will be the associated AGI. It is likely that there will be landscape and visual impacts with the associated AGI. The landscape and visual impact of the associated AGI will be screened by planting to reduce visual impacts.	During operation, the only visible feature of the development will be the extension to the existing Coryton South Substation at the Coryton CCGT power plant. The existing Coryton South Substation will likely be screened by the existing development in the area.	Landscape impacts vary from Moderate Benefit to Minor Adverse. Visual impacts vary from Minor Benefit to Moderate Adverse. The DP World® London Gateway® Port and Logistics Park has been designed to minimise any landscape and visual impacts.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
Ecology	During operation, there will be limited potential for ecological impacts.	No impacts identified.	No impacts identified.	Based on the program of clearance, remediation and levelling being undertaken, there is potential for impacts on ecological receptors. Mitigation included in operational conditions for the DP World® London Gateway® Port / London Gateway® Logistics Park.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
Water Quality	During operation there will be an increase in water consumption.	No impacts identified.	No impacts identified.	No impacts identified.	No cumulative impacts identified.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Geology, Hydrology and Land Contamination	During operation (i.e. post the program of clearance, remediation and levelling), there are no potential risks associated with the GEC site	No impacts identified.	No impacts identified.	The geology, hydrology and land contamination impacts are deemed to be positive due to the regeneration of a contaminated site.	No cumulative impacts identified.
Land Use	No impacts identified.	Permanent occupation of agricultural land by associated AGI. Productive agricultural land required will be minimised.	Permanent occupation of land by extension of existing Coryton South Substation at the Coryton CCGT power plant. Productive agricultural land required will be minimised.	No impacts identified.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.
Traffic and Infrastructure	No material impacts during normal operation identified. There may be additional traffic during a major outage period. Traffic will be managed and controlled through a TMP.	No material impacts identified.	No material impacts identified.	Large traffic volumes and movement associated with the operation of the DP World® London Gateway® Port / London Gateway® Logistics Park. Mitigation included in operational conditions for the DP World® London Gateway® Port / London Gateway® Logistics Park, and associated obligations.	Based on implementation of the mitigation, cumulative impacts are likely to be not significant.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Cultural Heritage	It is unlikely that there will be any archaeological remains of significance.	No impacts identified.	No impacts identified.	No impacts identified.	No cumulative impacts identified.
Socio-Economics	Employment opportunities during the operation of GEC. The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	No impacts identified.	No impacts identified.	The socio-economic impacts are deemed to be positive, therefore no mitigation is required.	Positive cumulative impacts identified. No mitigation required.
Safety	GEC will be operated in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	The gas connection will be operated in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	The HV underground electrical connection will be operated in line with the latest editions of the relevant Codes of Practice, Standards, Recommendations and Statutory Legislation. The residual impact is assessed as not significant.	N / A	No cumulative impacts identified.

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Impact	GEC	Underground Gas Pipeline and Associated AGI	HV Underground Electrical Connection and associated extension to the Coryton Substation	DP World® London Gateway® Port / London Gateway® Logistics Park	Likely Cumulative Impacts and Mitigation
Health	<p>The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a HMP.</p> <p>The residual impact is assessed as not significant.</p>	<p>The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a HMP.</p> <p>The residual impact is assessed as not significant.</p>	<p>The aspects of the environment most likely to cause impacts on health will be subject to mitigation measures. Therefore no specific additional mitigation is required. However, applicable mitigation measures may be drawn together in a HMP.</p> <p>The residual impact is assessed as not significant.</p>	N / A	No cumulative impacts identified.

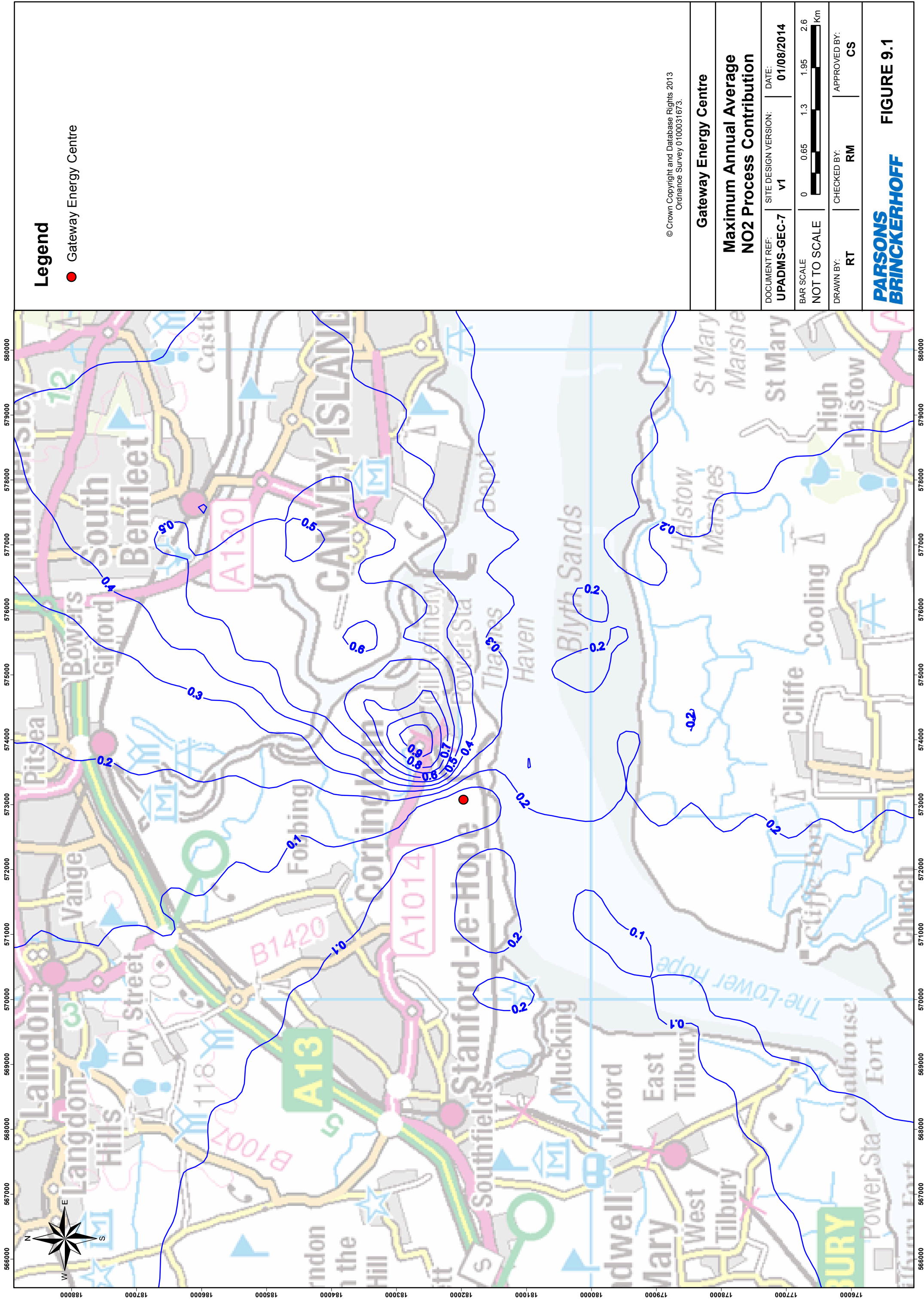
## **FIGURES**





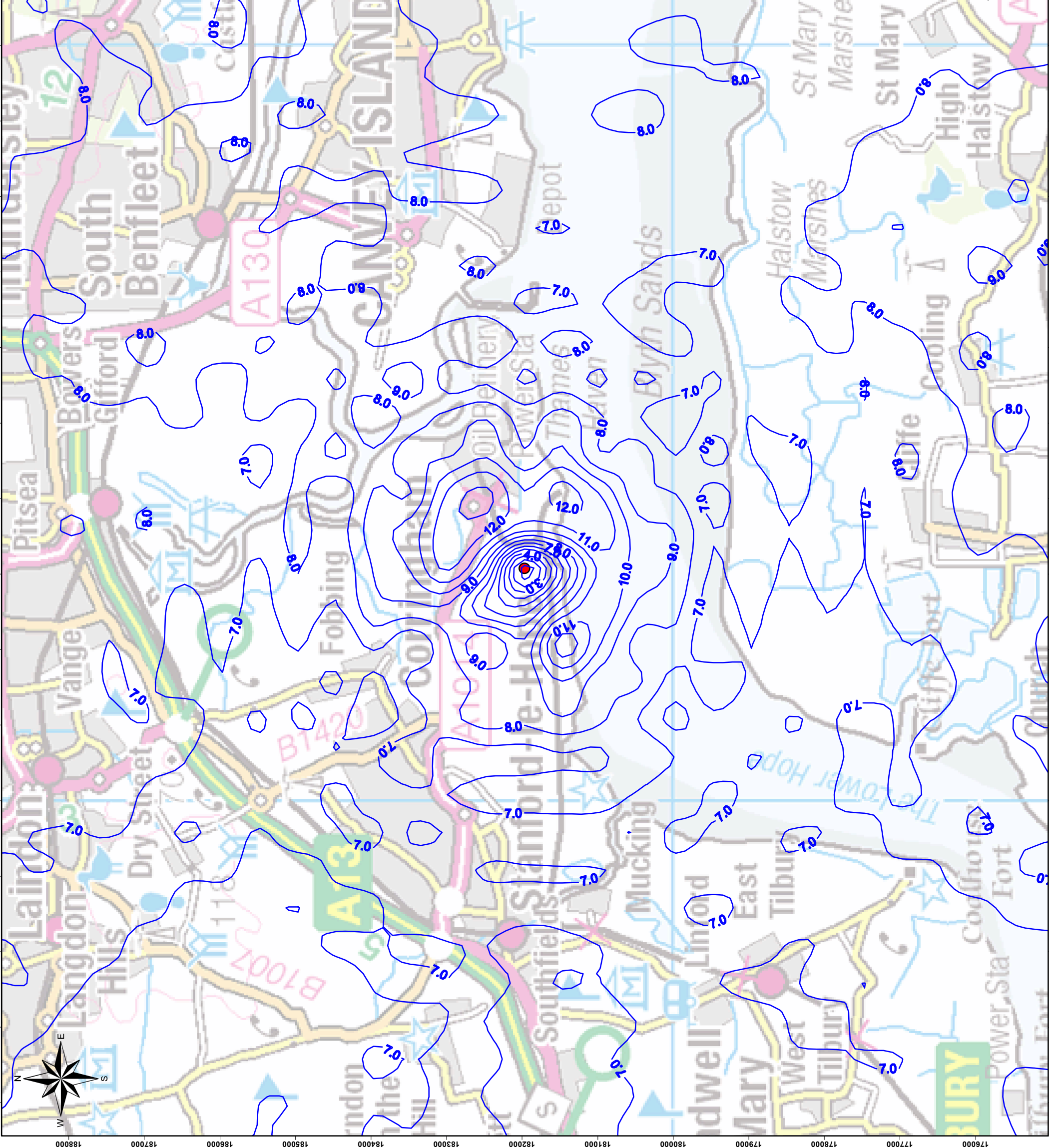












**Legend**

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Gateway Energy Centre			
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