ENVIRONMENTAL STATEMENT

NEW POWER STATION, NORTH MOLE, GIBRALTAR

JULY 2015

VOLUME 1: MAIN REPORT

New Power Station, North Mole, Gibraltar:

Environmental Statement

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CONTENTS

GLOSSARY AND ABBREVIATIONS I

1 INTRODUCTION 2

Requirement for an Environmental Impact Assessment 2
Content and Purpose of the Environmental Statement 3
Structure of the Environmental Statement Main Report 3
The Environmental Assessment Team 5

2 NEED FOR THE NEW POWER STATION 7

Existing Power Supply in Gibraltar 7
Temporary Augmentation of Power Supply 8
Future Energy Requirements 8
Renewable Energy 2020 9
New Dual-Fuel Power Station 9

3 SITE LOCATION 11

Overview 11
Historical Land Use 11
Current Land Use 12
Topography and Geology 13
Future Land Use and Development Baseline 13

4 PLANNING AND REGULATORY CONTEXT 16

International Law and Guidance 16
National Law and Planning Guidance 19

5 PROJECT DESCRIPTION 23

Summary of the Proposed Development Concept Design 23
Fuel Supply and Storage System 28
Construction Process 29
Equipment and Materials 30
Construction Health, Safety and Environmental Management 30
Site Maintenance, Management and Compliance 32
Precautionary Environmental Measures 33
Aeronautical Study 33
Electromagnetic Interference 34

6 ALTERNATIVES 36

The 'No Development' Option 36
Alternative Power Technologies 37
Alternative Fuel Strategies 38
Alternative Locations 39
Preferred Arrangement 39

7 ENVIRONMENTAL IMPACT ASSESSMENT APPROACH 42

General Approach to the EIA Process 42
Identifying and Evaluating Impacts and Effects 43
Defining Significance 44
Approach to Mitigation 45
Inherent Design Mitigation 45

8 SCOPE OF THE ASSESSMENT 47

Cumulative Effects 48
Transboundary Effects 48
Consultation 48
Limitations of the Study and Assumptions 49
Public Participation and Advertising 50
Technical Assessments 51

9 AIR QUALITY AQ

10 COASTAL PROCESSES AND WATER QUALITY CP

11 CONTAMINATED LAND CL

12 ECOLOGY AND NATURE CONSERVATION EC

13 LANDSCAPE AND VISUAL AMENITY LV

14 LAND USE AND COMMUNITY LC

15 NOISE AND VIBRATION NV

16 TRAFFIC AND TRANSPORTATION TT

17 WASTE AND MATERIAL RESOURCES WM

18 CUMULATIVE EFFECTS 53

Construction 53
Operation 54

19 SUMMARY OF POTENTIAL SIGNIFICANT EFFECTS, MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS 56

Approach to Mitigation 56

20 REFERENCES 72

APPENDICES

APPENDIX 1 LIST OF CONSULTEES AND CONSULTATION LOG

APPENDIX 2 SCOPING REPORT

APPENDIX 3 SCOPING DIRECTORY, SCOPING OPINION AND SCOPING RESPONSES

APPENDIX 4 CONSTUCTION SCHEDULE

APPENDIX 5 OUTLINE ENVIRONMENTAL MANAGEMENT PLANS

Outline Construction Environmental Management Plan
Outline Operational Environmental Management Plan

LIST OF FIGURES

Figure 1.1 - Indicative Site Location Volume 2
Figure 2.1 - Photographs of Existing Power Supply Volume 2
Figure 3.1 - Site Visual Volume 2
Figure 5.1 - Layout of the Proposed Power Station Volume 2
Figure A4.1 - Environmental Organisational Chart for CEMP implementation Volume 1
Figure A4.2 - Environmental Organisational Chart for OEMP implementation Volume 1

LIST OF TABLES

Table 19.1 - Summary of Significant Effects and Mitigation during Construction
Table 19.2 - Summary of Significant Effects and Mitigation during Operation
Table A4.1 - CEMP Planning Actions
Table A4.2 - Outline Construction Environmental Management Plan
Table A4.3 - Outline Operational Environmental Management Plan

GLOSSARY AND ABBREVIATIONS

CDM	Construction and Design Management
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CO_2	Carbon dioxide
DOE	Department of the Environment and Climate Change
DPC	Development and Planning Commission
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GDP	Gross Domestic Product
GEA	Gibraltar Electricity Authority
GJBS	Gibraltar Joinery and Building Services
GONHS	Gibraltar Ornithological & Natural History Society
ha	Hectare
HM	Her Majesty's
IEMA	Institute of Environmental Management and Assessment
IPPC	Integrated Pollution Prevention and Control
ISGS	Inter-Services Generating Station
MOD	Ministry of Defence
MW	Megawatt
MW(e)	Megawatt of electricity
m	Metre
m^2	Metre squared
m^3	Metre cubed
NO_2	Nitrogen dioxide
NOx	Nitrous oxides
NTS	Non-technical summary
NEEAP	National Energy Efficiency Action Plan
OD	Ordnance datum. The mean sea level as defined for Ordnance Survey.
OEMP	Operational Environmental Management Plan
OESCO	Ormrod Electricity Supply Company Limited
OWS	Oily water separator
$PM_{2.5}$	Particulate matter up to 2.5 micrometres in size
PM_{10}	Particulate matter up to 10 micrometres in size

SCR	Selective Catalytic Reduction
SEA	Strategic Environmental Assessment
SO_2	Sulphur dioxide
UK	United Kingdom

CHAPTER 1

INTRODUCTION

1 INTRODUCTION

1.1 This Environmental Statement (ES) sets out the findings of an Environmental Impact Assessment (EIA) for a proposed power station at North Mole, Gibraltar (see Figure 1.1, Volume 2: Figures, for an indicative site location).

1.2 The EIA has been undertaken on behalf of Bouygues Energies and Services who is the Contractor. This is a public development, undertaken on behalf of Her Majesty's (HM) Government of Gibraltar (the government) who is the "Applicant" for an EIA Certificate.

1.3 The ES reports the potential significant environmental effects of the proposed development and describes measures to mitigate these, which the Applicant has committed to.

1.4 The ES is submitted to the Development and Planning Commission (DPC) to assist in its consideration of the project. The ES is submitted in accordance with the requirements of the Gibraltar Town Planning (Environmental Impact Assessment) Regulations 2000 (The Gibraltar EIA Regulations) and the European Union (EU) EIA Directive 2011/92/EU (amended 2014/52/EU).

Requirement for an Environmental Impact Assessment

1.5 An EIA is required where it is deemed that a proposal may have significant effects on the environment. There is no definitive interpretation of what constitutes a 'significant effect' but there are three main criteria to consider: the physical scale of the proposal; whether it is situated in or near a particularly sensitive location (a residential area or adjacent land uses for example); and whether it could give rise to complex or adverse environmental effects.

1.6 The government has considered that this development proposal requires assessment under the EIA Regulations.

1.7 The proposed power station corresponds most closely to an EU EIA Directive Annex II energy industry project ('*3. Energy Industry (a) industrial installations for the production of electricity, steam and hot water (projects not included in Annex I*)'), and Schedule 2 of Gibraltar's EIA Regulations. The government is proposing the project, therefore, as a public development, it requires an EIA Certificate under regulation 16 of Gibraltar's EIA Regulations.

Content and Purpose of the Environmental Statement

1.8 The Gibraltar EIA Regulations require that an ES must include a description of the project and its likely significant effects on the environment, together with a summary in non-technical language. This ES includes:

- A Non-Technical Summary (NTS) that summarises the proposed power station, the assessment findings and any required mitigation.
- A Main Report providing:
    - A description of the site area for the proposed power station and description of the proposed power station;
    - Details of the need for the proposed power station;
    - An outline of the main alternative power options considered;
    - Details of the assessment process and the scope of the EIA;
    - An evaluation of the existing environmental conditions in the area of the proposed power station;
    - The identification of likely impacts from the proposed works;
    - Technical assessments of the potential significant effects of the proposals, including cumulative effects and any transboundary effects;
    - Proposed mitigation measures to prevent, reduce and where possible remedy any significant adverse environmental effects;
    - Any predicted remaining (or residual) significant effects after mitigation.
- A volume presenting the accompanying maps and figures to the assessment.

1.9 A glossary of terms and abbreviations is provided for this report.

1.10 The ES is available to view at the Gibraltar Town Planner's office, Department of Trade, Industry and Communications, Suite 631, Europort, Gibraltar. Additional electronic copies may be purchased from Environmental Gain Limited (Engain).

Structure of the Environmental Statement Main Report

1.11 This document is the ES Main Report. It includes a description of the proposed power station, including design, construction and operation, and it discusses the main alternatives (including other power options and locations) that were considered by the government. The report details the approach to the EIA and provides a list of statutory and third parties consulted as part of the EIA

process (Appendix 1). Appendix 2 provides the Scoping Report submitted to the DPC, which sets out the considerations for the inclusion or exclusion of various issues from the assessment process. The Scoping Opinion of the Town Planner is also appended here (Appendix 3), which records the responses from the statutory consultees to the Scoping Report.

1.12 The location of the proposed development is described in terms of historic, current and future use of the site as well as including an assessment of development plans and planning policies affecting the area (Chapter 3 and 4 respectively).

1.13 Chapters 9-17 of this report provide assessments for the nine specific environmental issues identified as being relevant to the proposed power station development. These chapters set out the findings for each of the identified environmental issues by describing the methodology and scope for each issue; a full evaluation of the current conditions; specific technical assessments (using current and recognised guidelines, and professional judgement); and proposed mitigation.

1.14 A summary of potential significant effects, mitigation and residual significant effects is provided in Chapter 18.

1.15 There is limited reference to documents not forming part of this ES to prevent a ‘paper chase’ for the reader. The ES is also required to be a stand alone or self-contained document, as far as is practicable.

1.16 Relevant material helpful in demonstrating the details of the assessment is provided in the appendices. Most figures, if they cannot be included in the main text of this volume, are provided in a separate volume (Volume 2: Figures) for ease of reference when reading the text. The numbering of figures comprises the section of the ES in which the figure is referred to and is followed by the order in which they are referred to in that section (e.g. Figure 2.1 is associated with Chapter 2 of the ES and is the first figure to be referenced in that chapter).

The Environmental Assessment Team

1.17 This EIA has been managed and coordinated by Engain and follows current guidance, such as that provided by the United Kingdom (UK) Department of the Environment Planning and Research Programme and Institute of Environmental Management and Assessment (IEMA) (IEMA, 2004 as updated).

1.18 Engain is an independent environmental consultancy providing environmental and project management services and is a corporate member of the IEMA. Its personnel specialise in the application of EIA, environmental risk management and environmental mitigation delivery for infrastructure and development projects.

1.19 The EIA has included technical contributions from the following consultants:

- Air quality – Air Quality Consultants Ltd
- Coastal processes and water quality - Engain
- Contaminated land – GeoConsulting Engineers Ltd and Engain
- Ecology and nature conservation– Engain
- Land use and community - Engain
- Landscape and visual amenity – Bell Fischer Landscape Architects
- Noise and vibration – DKN Acoustics Ltd
- Traffic and transportation – FMW Consultancy Ltd and Engain
- Waste and material resources – Engain.

CHAPTER 2

NEED FOR THE NEW POWER STATION

2 NEED FOR THE NEW POWER STATION

2.1 Gibraltar requires a new power station to provide for growing electrical energy needs and to replace Gibraltar's three existing power stations, which are reaching the end of their operational lives (Gibraltar Development Plan, 2009).

2.2 Gibraltar requires an energy source that is reliable, secure and sustained. However, all three existing power stations are being considered for decommissioning in the near future due to operational concerns connected to their age and condition, and environmental concerns arising from the operation of very old generators in close proximity to populated areas.

2.3 In order to meet the projected demand and allow for closing down of the existing power station at Waterport and for the removal of the temporary gensets, a new power station is required to supply no less than 80 MW(e) of installed capacity, and up to 96 MW(e) in the future. Installed capacity provides for the energy demand and daily or annual fluctuations, and includes contingency, i.e. for engines to be on stand-by or in maintenance. The operation of the power station is described in more detail in Chapter 5 – Project Description. In summary, six engines (of 7 to 14 MW capacity) will be installed initially with only four in operation at any time as two engines will always be on stand-by for contingency. This scenario therefore meets the forecast demand.

Existing Power Supply in Gibraltar

2.4 Power is currently supplied from one diesel-fired power station and temporary generating sets (Figure 2.1, Volume 2: Figures). These power supplies are:

- Waterport Power Station, which is owned and operated by Gibraltar Electricity Authority (GEA) and is situated at North Mole;
- A set of generating units temporarily located at North Mole and another at the Ormrod Electricity Supply Company Limited (OESCO) radiator farm area on the south side of Gibraltar, which are operated by GEA. The OESCO Power Station conventional units have been decommissioned;
- The Inter-Services Generation Station (ISGS) has not been operated since 1st April 2015, and is presently on stand-by mode.

2.5 Since the three existing power stations were commissioned, Gibraltar has experienced a steady increase in population and increasing requirement for

residential and other public or commercial land uses. Consequently, all three power stations are now in close proximity to populated areas.

2.6 The current total available generating capacity of these generating facilities is approximately 60.2 megawatts of electricity (MW(e)), which is made up of:

- GEA Waterport 5 MW(e);
- Temporary supply 55.2 MW(e).

2.7 The current fuel supply for all power in Gibraltar is provided by diesel fuel, which is delivered by road, tanker or ship.

Temporary Augmentation of Power Supply

2.8 Gibraltar has been granted a time extension by the EU for nitrogen dioxide (NO_2) ground level concentrations (Government of Gibraltar, 2011a) allowing for the use of small Caterpillar generating units (gensets) to augment power supply, following the shut down of one of the engines at Waterport Power Station. There are approximately 40 gensets (including 16 at North Mole, under the management of Sparks Energy Ltd.) that operate on a demand basis with Waterport Power Station.

Future Energy Requirements

2.9 The GEA forecasted overall maximum energy demand to be 42 MW(e) in 2017 and 51 MW(e) in 2027..

2.10 The government has produced a National Energy Efficiency Action Plan (NEEAP) (Government of Gibraltar, 2014a) in accordance with the Energy Efficiency Directive (2012/27/EU) in order to meet an energy saving target of 20% by 2020. The plan looks at necessary measures for energy efficiency in public, commercial, building and transport sectors, with the aim of reducing energy consumption. It considers Gibraltar's growing population and gross domestic product (GDP) per capita, increasing demand and consumption of air conditioning, and several planned large-scale developments in Gibraltar, which when combined, lead to an increase in energy demand predicted to pass beyond current supply levels. The proposed power station development at North Mole has been factored into the plan as a means to meet the 2020 target.

Renewable Energy 2020

2.11 Gibraltar is committed to providing at least 15% of its energy needs by 2020 from renewable sources (Government of Gibraltar, 2011b) as required under the Directive on Promotion of the Use of Energy from Renewable Sources (2009/28/EC). There are plans for a variety of renewable technology, including micro-wind turbines, solar photovoltaic and solar thermal. Some of these technologies have already been installed. The government is committed to delivering renewable energy, and investigating other pioneering technology such as wave and current power options, as well as the means to interconnect to the national power supply.

New Dual-Fuel Power Station

2.12 The government decision to facilitate a dual-fuel (i.e. diesel and natural gas) power station has been made to allow Gibraltar to diversify from its dependence on diesel fuel to the cleaner and more efficient natural gas fuel, resulting in lower emissions.

2.13 There will be the need to store a short term (approximately 15-20 days) supply of diesel fuel on the power station site, and LNG bunkering may also be required to limit the frequency of shipping supplies. At the time of conducting this EIA, the government was considering options for the location of storage of LNG.

2.14 Storage will be required for LNG. Commercial and environmental issues affect the chosen LNG storage option, and these are being considered by the government. Since the LNG storage option has not been decided upon, it is therefore not assessed under this EIA. It will be consented separately, and will have a separate EIA if necessary. The deliverability of the power station is not wholly dependent upon Gibraltar storing LNG, as LNG can be supplied by ship.

CHAPTER 3

SITE LOCATION

3 SITE LOCATION

3.1 The following section describes the location of the new power station and the historic and current land uses surrounding the site. Detailed information on the current environmental conditions of the area is provided in the technical chapters (Chapters 9-17).

Overview

3.2 Gibraltar has a total area of approximately 640 hectares (ha), with a population of approximately 30,000 people and is classified as a UK Overseas Territory. The majority of the population occupies a relatively limited area to the north and west of Gibraltar, including areas of reclaimed land. Land availability is very restricted due to the steep gradient of the land that forms the Rock.

3.3 The site of the proposed new power station is situated at the northern end of Gibraltar along the North Mole (Figure 3.1, Volume 2: Figures) on previously reclaimed land and to the southwest of the Gibraltar International Airport runway.

3.4 The area required for the development is approximately 1 ha and includes the power station structure, generator units, waste oil and fuel sludge transfer and storage system, air intake and exhaust system, cooling system, natural gas and diesel unloading connector system, electrical switchgear, central control, communication system, site roads, parking, fencing and landscaping. The site will be accessed along the North Mole Road and Emerson's Place/Mons Calpe Road.

Historical Land Use

3.5 The North Mole is a breakwater in the northern section of Gibraltar Harbour, formerly known as the 'Commercial Mole' and a late nineteenth and early twentieth century extension of the Old Mole. In the 1990's, additional reclamation was carried out to extend the reclaimed area. This reclaimed area is the site proposed for the new power station. North Mole's quay has been used for both commercial and defensive needs.

Current Land Use

3.6 The site will be located on land presently occupied by Toyota Gibraltar Stockholdings (TGS); M.H.Bland; GFI Tracing; Sacarellos and a government catering facility, all of which will be relocated elsewhere in Gibraltar. Temporary energy generating turbines also present on site will be removed prior to commencement of works.

3.7 To the east of the site are light industrial units, which are the nearest commercial receptors. These include: Gibraltar Joinery and Building Services Ltd. (GJBS) - yard and workshop; Wiltrans (Gibraltar) Ltd. - warehousing and courier services; and Gibmaroc Group - importers and distributors of fruit, which are mainly accessed from the north via Mons Calpe Road. Sixteen temporary gensets currently under the management of Sparks Energy Ltd. also occupy land to the east of the proposed development site. The existing Waterport Power Station is approximately 400 m to the southeast of the proposed site.

3.8 To the south of the site is North Mole Road, which provides pedestrian access to the cruise liner terminal and vehicular access to Gibraltar Port Authority (both located to the southwest of the site). The road is also used by goods vehicles that require access to small cargo and handling businesses and a pump station located to the south and southeast of the site.

3.9 The nearest residential receptors include Waterport Terraces (approximately 300 m to the east of the proposed site boundary) and the Flying Angel (a missionary hostel opposite to the site on North Mole Road).

3.10 A recently formed concrete breakwater has been installed around the west and north of the existing rock revetment of the historically reclaimed land. This ‘North Mole Reclamation’ was recently subject to EIA and was certified. It provides protection from storm surge and tidal inundation.

3.11 To the north of the site is the coastal entrance to Marina Bay that supports fishing, private and commercial vessels, beyond which, to the north, is located the western runway of the Gibraltar International Airport (operated by the Royal Air Force (RAF), Ministry of Defence (MOD) and Civil Aviation Authority

(CAA)). The harbour to the south of the site is protected from the open waters of the outer Bay of Gibraltar by the harbour walls.

Topography and Geology

3.12 The site lies at the end of North Mole on existing reclaimed land. Site investigations have established the likely makeup of ground below the proposed development site as:

- A 15 m thick layer of reclamation sand, with some small boulders;
- A 10-15 m thick layer of original sea-bed sand;
- A 12-20 m thick layer of compacted (cemented) sea-bed sand with fine gravel;
- Below 20 m is a layer of weathered and cracked shale, overlying limestone rock (approximately 32 m below ordnance datum (OD)).

3.13 The existing ground level of the proposed site for the new power station is estimated to be approximately 3 m above OD.

Future Land Use and Development Baseline

3.14 As part of the overall assessment, it is important to determine likely future baseline conditions against which the potential impacts of the proposed new power station will be investigated. This takes account of changing environmental conditions irrespective of the proposed development taking place. This is relevant where development may not begin for several years. It also takes account of other developments that are in progress or are planned, where sufficient details of these developments are available.

3.15 At the time of conducting this assessment future developments and land use changes have been identified from consultation with the Town Planner. The following are developments within the general area of the site that are now under construction or have planning consent:

- North Mole Tank Farm (Planning reference: BA11849);
- Coaling Island Boats Marina (BA12306) – proposed 700 berth small boat marina with 480 m outer wharf berthing, public promenade and hard boat haulage areas to be located at Mid Harbour;
- North Mole Industrial Park (BA12692) – proposed four storey high quality office development to be built above the existing 'North Mole Business Park' on North Mole Road.

- North Mole Reclamation (BA12714) – placing of concrete caissons along the western and northern perimeter of the existing rock armour revetment to create a basin for the land reclamation of approximately 8,500 metres squared (m^2);
- North Mole Sullage Plant (BA12734) – a marine waste reception facility on the Western Arm of North Mole for the receipt and storage of waste oil and water from cleaning of oil tanks and engine rooms of ships.
- Western Beach Basin for land reclamation (BA13145) – construction of a rock armour revetment along the northern perimeter to create a basin for a land reclamation of 73,200 m^2, and the construction of sports facilities to be located at Western Beach;
- Coaling Island Reclamation (BA13479) – placing of concrete caissons adjacent to Coaling Island to create a basin for the land reclamation of approximately 23,000 m^3;
- Proposed floating oil storage vessel; steel barges to separate the storage vessel from the Detached Mole; a piping network on the Detached Mole; bunkering loading locations (BA13273);
- North Mole Security Upgrades, Ticket Office and Taxi Bay with Canopy (BA13480).

3.16 The Gibraltar Development Plan 2009 (Government of Gibraltar, 2009) provides an indication of changes to future development and land use policy in Gibraltar including the requirement for power supply. This is discussed further in Chapter 4: Planning and Regulatory Context.

CHAPTER 4

PLANNING AND REGULATORY CONTEXT

4 PLANNING AND REGULATORY CONTEXT

4.1 The purpose of this section is to set out the relevant international and national laws, planning policies and guidance that will have implications for the proposed power station in Gibraltar.

4.2 European Union (EU) Directives perform as the overarching legislation for this EIA, as Gibraltar is a UK Overseas Territory and, therefore, part of the EU. Gibraltar has transposed the EU EIA Directive (85/337/EEC) (as amended by Directive 97/11/EC and 2003/35/EC) within the Town Planning (Environmental Impact Assessment) Regulations (2000, amended 2006), which also informs this EIA. The EIA Directive has since been amended further (Directive 2009/31/EC), and all amendments (along with the original Directive), have been codified by Directive 2011/92/EU, which was further amended in 2014 by Directive 2014/52/EU.

4.3 Gibraltar has also transposed other EU Directives, for example: Directive 2002/49/EC relating to the assessment and management of noise which has been transposed to the Environmental (Assessment and Management of Noise) Regulations 2006 (Government of Gibraltar, 2006); Directive 2008/50/EC relating to ambient air quality and cleaner air for Europe which has been transposed to Environment (Control of Dust) Regulations 2010 (Government of Gibraltar, 2010a) and Environment (Air Quality Standards) Regulations 2010 (Government of Gibraltar, 2010b). In the absence of applicable Gibraltar policy and/or guidance, the technical assessments have assessed significant effects against UK or EU policy, guidance and professional judgement. Individual technical chapters (Chapters 9-17) also provide recognition of the specific laws and policies related to each technical subject assessed.

International Law and Guidance

The EIA Directive 2011/92/EU

4.4 The EIA Directive 2011/92/EU (amended 2014/52/EU) sets the criteria for projects that require an ES and outlines the potential impacts on the environment to be assessed within the EIA process. The EIA procedure ensures that environmental consequences of projects are identified and

assessed before authorisation is given. The public can give its opinion and all results are taken into account during the authorisation procedure of the project. The public is informed of the decision afterwards.

Environmental Liability Directive 2004/35/EC

4.5 The EU Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage has been transposed in Gibraltar under the Environmental Liability Regulations 2008 (amended 2009 and 2011, Government of Gibraltar, 2008).

4.6 This Directive imposes obligations to minimise environmental damage.

Large Combustion Plant Directive 2001/80/EC

4.7 The revised Large Combustion Plant Directive (LCPD) 2001/80/EC applies to combustion plants with a thermal input of greater than 50 MW. The aim of the directive is to reduce acidification, ground level ozone and particles throughout Europe by reducing and controlling the levels of emissions of sulphur dioxide (SO_2), nitrous oxides (NOx) and particulate matter ($PM_{2.5}$ or PM_{10}). Gibraltar transposed the LCPD to the Large Combustion Plant Act 2003 (amended 2010 and 2011), which was revoked by Gibraltar Pollution Prevention and Control Regulations 2013 (Government of Gibraltar, 2013).

4.8 However, within the EU LCPD under Article 2 (7) '*plants powered by diesel, petrol and gas engines shall not be covered by this Directive*'. The proposed diesel and natural gas power station does not fall under the relevant criteria, and therefore the LCPD is not relevant to this project.

Integrated Pollution Prevention and Control

4.9 The EU Directive on Integrated Pollution Prevention and Control (IPPC) 2008/1/EC has been transposed in Gibraltar under the Pollution Prevention and Control Act 2004 amended by the Pollution Prevention and Control Regulations 2013 (Government of Gibraltar, 2013). The IPPC is a regulatory system to control environmental impacts of certain industrial activities such as energy production.

4.10 The proposed new power station is covered under the IPPC as it is referred to in Schedule 1 '(*1) Energy industries 1.1 'Combustion installations with a rated input exceeding 50 MW*' (EU, 2008).

4.11 The link between the EIA and IPPC regulations occurs for a new development for which both a planning application and an IPPC application must be made. The two decision making regimes are separate (although the DPC and the Environmental Agency are statutory consultees for each other's regime), but there are considerable overlaps in the information required.

4.12 An IPPC application is primarily focused on releases to air, water and land and includes noise emissions. A holistic approach is taken that considers the energy and resource efficiency of a process or installation as well as the direct releases. The direct releases are also covered in the scope of the EIA, but the energy or resource efficiency is not traditionally addressed. However, EIA does address other issues that would not be considered part of an IPPC application, e.g. landscape and visual amenity. The new power station will require licensing under IPPC and the environmental standards set in this ES will inform the IPPC application.

Habitats Directive 92/43/EEC and Birds Directive 2009/147/EC

4.13 The EU Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) are the principal directives for nature conservation.

4.14 The EU Habitats Directive is aimed at the preservation, protection and improvement of the quality and biodiversity of the European natural environment. The Directive focuses on the conservation of flora, fauna and natural habitats and is built from a strict system of species protection and a list of the Natura 2000 network of special areas of conservation, which includes terrestrial and aquatic areas.

4.15 The Birds Directive (2009, which is a codified version of Directive 79/409/EEC) is legislation for the protection of all wild bird species naturally occurring in the European Union. The directive recognises the impacts of pollution and habitat loss on bird species and the need for international co-operation in conservation efforts because of the migratory habits of many species.

National Law and Planning Guidance

Town Planning (Environmental Impact Assessment) Regulations (2000)

4.16 These regulations transpose the requirements of the EU EIA Directive into Gibraltar law. The Regulations were amended in 2006. Regulation 16 relates to projects that are proposed by a public organisation. It requires a public body to conduct an EIA for an 'EIA project', even though a planning application is not required. A public EIA project requires an EIA certificate.

4.17 Regulation 9 requires the Applicant to publish a notice of the intended development in the Gibraltar Gazette and a local daily and weekly newspaper. Additionally, a notice is required to be placed on site. The ES is also provided to statutory consultees identified by the Town Planner. There is a minimum period of time of 21 days for the ES to be viewed by the public and for any representations to be made to the DPC who must consider them in their assessment of the compliance of the ES.

Nature Protection Act (1991)

4.18 The EU Habitats Directive and the Birds Directive are implemented in Gibraltar legislation through the Nature Protection Act 1991 and the Nature Protection Ordinance 1991 (Government of Gibraltar, 1991a and 1991b respectively). These legislations provide for the protection of flora and fauna and wild birds and for the designation, preservation and conservation of natural environments.

Environmental (Control of Dust) Regulations (2010)

4.19 The Environment Control of Dust Regulations (Government of Gibraltar, 2010) is aimed at increasing ambient air quality and introducing cleaner air for Europe. The regulation applies to any activity that involves: demolition or dismantling of buildings; construction and excavation works; refurbishment works; engineering works; stockpiling/processing of solid bulk materials; operation of machinery; operation on unpaved land; any agricultural or horticultural works; and any other works.

Environmental (Assessment and Measurement of Environmental Noise) Regulations (2006)

4.20 The Environmental Assessment and Management of Noise Regulations (Government of Gibraltar, 2006) is aimed at controlling noise perceived by people in noise sensitive locations. The regulations lay down a common approach to avoiding, preventing or reducing the harmful effects of exposure to environmental noise. The approach is based on utilising common methods to map and reduce noise on local levels.

4.21 Noise assessments also utilise the UK Planning Policy Guidelines (PPG24) Planning and Noise and the noise and vibration standards for significant effect as defined by the British Standards Institute (BS4142).

Gibraltar Development Plan (2009)

4.22 The development of the proposals has considered adopted planning policy from the existing Gibraltar Development Plan (Government of Gibraltar, 2009). Policy ENV1 requires that all development projects take account of the need to protect the environment.

4.23 The site falls within Zone 3 Port and Harbour within the planning policy zones of the Development Plan. No reference is made to power needs within this Zone. Policies relating to Zone 3 includes:

> *Policy Z3.2 – Potential impact on North Mole Road: in considering proposals for new development that front onto, or are visually prominent from, North Mole Road, particular attention shall be paid to:*
>
> *- The architectural character and appearance of the building;*
>
> *- The visual impact of the proposal on North Mole Road.*
>
> (Government of Gibraltar, 2009:99)

4.24 A further policy applicable to the new power station is Policy UW1: New Utility Services "*in considering proposals for new utility services, careful attention should be given to their design and location in order to minimise possible adverse effects on the environment*" (Government of Gibraltar, 2009:79).

4.25 The Development Plan states that the Waterport Power Station is nearing its maximum capacity and with additional developments it is expected that generating capacity will need to be increased. It also states that there is limited

scope to expand the existing stations, and that extra capacity that could be accommodated would be limited. The close proximity to existing and proposed residential areas further constrains expansions. Lathbury Barracks Parade Ground was identified as a potential site for the construction of a new power station.

Strategic Environmental Assessment of the Gibraltar Development Plan

4.26 The Strategic Environmental Assessment (SEA) of the Gibraltar Development Plan (Land Use Consultants, 2009) states that Gibraltar has three electricity generating stations: the Government-owned Waterport Power Station, the private power station (OESCO) near the naval base which supplements the government facility and the separate MOD station within the dockyard. The SEA confirms that supplies from the public and private sources are inadequate to meet Gibraltar's future needs and there are plans to build a new power station.

Gibraltar Environment Charter

4.27 The Environment Charter, agreed in 2001 between the United Kingdom and United Kingdom Overseas Territories was signed by Gibraltar in 2006 and provides broad principles to achieve sustainable development and management of Gibraltar's environment. A key aim of the Charter is to seek solutions that benefit the environment and development.

CHAPTER 5

PROJECT DESCRIPTION

5 PROJECT DESCRIPTION

5.1 The following provides a description of the project proposals that are sufficient for assessing their environmental effects.

5.2 The project design has been influenced by the outcome of the EIA and incorporates mitigation for significant effects.

5.3 The choice of technology meets the requirements of Bouygues Energies and Services contract with the government, providing both natural gas and dual-fired generators.

Summary of the Proposed Development Concept Design

Proposed New Power Station

5.4 Figure 5.1 (Volume 2: Figures) show the layout of the proposed power station.

5.5 The new power station will consist of six generating sets each with a capacity of between 7 and 14 MW, giving a total installed capacity in 2017 of 80 MW(e) at the site. The proposed plant is expected to operate continuously at an output that will be determined by the load on the Gibraltar system. The output is expected to vary between a maximum of 42 MW(e) and minimum of 16-18 MW(e) when the plant is commissioned in 2017, depending on demand.

5.6 The power station will use natural gas, but will have the facility to operate three engines on diesel fuel under abnormal conditions should natural gas supply not be available.

5.7 At any given time during normal operation, only four generating sets will be operating on natural gas. Additional capacity from the two other generators is required to enable operational units to be taken out of service for planned maintenance, and to allow for unscheduled breakdowns. It is also desirable that the number of generators running at any time is such that if one generator fails, the remainder can take the load without any loss of supply to consumers.

5.8 The plant will be designed to have an operational life of 30 years to cater for Gibraltar's power needs, and to replace the existing power stations at

Waterport and ISGS and the temporary gensets. The decommissioning of the existing power station is outside of the scope of this assessment.

5.9 The power station is being designed to allow for the installation of an additional engine, should it be required to meet the potential increase in demand in the future.

Integrated Pollution Prevention and Control

5.10 The proposed power station will comply with the European Directive 2008/1/EC concerning Integrated Pollution Prevention and Control and local regulations covering Pollution Prevention Control (Government of Gibraltar, 2013) and will operate under a permit issued by the Gibraltar Environmental Agency. The IPPC application will be informed by the environmental standards stated in this ES.

Power Station Scope

5.11 The proposed power station development will incorporate the following main elements:

- generator units
- heat recovery system (to improve energy efficiency)
- individual unit and common fuel distribution systems for natural gas and diesel
- air intake and exhaust system
- cooling system
- selective catalytic reduction of air pollutants
- pneumatic system
- electrical system
- control, instrumentation and communication system
- civil works.

5.12 An engine hall will house the engines. Each generating unit will consist of a single engine with auxiliary equipment, cooling systems, lubricating oil systems, waste oil and fuel sludge systems, starting air system, air intake and exhaust systems, control and instrumentation equipment. Individual engines will be mounted on vibration abating baseplates and will be contained within

two-hour fire compartments capable of sustaining accidental fires or abnormal blast loads.

5.13 A heat recovery system is to be installed to recover energy from the exhaust gas of the natural gas engines, in order to produce electricity through an Organic Rankine Cycle (ORC). This involves the use of a turbo-generator to transform thermal energy into mechanical energy. The heat recovery system will operate on the natural gas engines and will recover 3.8 % of thermal energy. ORC uses cyclopentane. This is classified as a hazardous chemical, and is subject to specific risk assessment under the EU Directive concerning equipment and protective systems intended for use in potentially explosive atmospheres (the ATEX Equipment Directive, 94/9/EC). It will be handled and managed under the specific requirements of this legislation.

5.14 Fuel distribution systems within the proposed power station will consist of all appropriate piping, valves, pumps, metres, filters, service tanks and standby diesel and natural gas unloading facilities.

5.15 The engines will operate on natural gas with a minimum methane content of 95%. If the three dual-fuel engines are required to run on diesel, engines will operate on distillate diesel fuel oil with a maximum sulphur content of 0.1% by weight. Diesel fuel will be stored on site in vertical cylindrical double skin steel storage tanks. Temporary servicing tanks will also be located on site. All fuel, oil and chemical tanks will be bunded with an impounding capacity of 110% to contain any leakage.

5.16 Natural gas will be provided at a single point of delivery onto the premises. It is anticipated that storage will be built in close proximity to the power station site, however, this is outside the scope of the current proposed development and this EIA.

5.17 The exhausts from the engines will discharge via stacks with a separate flue for each engine. The stack heights have been optimised to provide adequate dispersion of flue gases whilst minimising visual impact, and abiding to height limits imposed for the operation of the Gibraltar International Airport (Obstruction Limitation Surface (OLS). For further details see Chapter 14 -

Land Use and Community). The stacks will be 25 m in height (28 m above OD).

5.18 The air systems will minimise the environmental impacts arising from the exhaust emissions, and will contain silencers to reduce noise and filters for the reduction particulates. Selective catalytic reduction (SCR) flue gas treatment will be installed to reduce levels of NOx in the exhaust gases.

5.19 The SCR process uses ammonia in the form of aqueous urea in the presence of a catalyst to reduce NOx to nitrogen and water vapour. The volume flow rate of urea in the SCR equipment will be matched automatically to the load on each set, without human intervention, avoiding releases of unreacted ammonia during suboptimal engine operation. The levels of NOx and ammonia in the exhaust will be monitored and alarms provided in case of any malfunction.

5.20 The SCR system shall be designed to achieve better than 85% NOx abatement when operating on natural gas. If natural gas is not available, then, the power station will be able to provide power supply to Gibraltar from diesel.

5.21 This system will be complete with reactor housing, storage tanks, interconnecting pipework, off-loading facilities and pumping facilities for urea solution, prior to injection into the exhaust gas stream.

5.22 The electrical system will consist of switchboards, transformers, circuit breakers and all appropriate equipment to connect to the existing Gibraltar network. There will also be provision for a backup and automatic start-up in case of loss of station supply.

5.23 The power station will be controlled from a central control room but local manual controls will also be provided for testing purposes. Automatic start, synchronizing, fuel changeover and load sharing systems will minimise human intervention, and appropriate monitoring and alarms will be installed in case of an emergency.

5.24 The built structures on the site will include:

- A generation building including structures to contain the engine hall, central control room and employee facilities;
- An administration building for operations;

- Surface water drainage system and oil interceptor traps;
- Security fencing, gates and guard house;
- Surfacing and landscaping;
- On-site roads and parking areas.

5.25 The administration building will be attached to the engine hall and will provide approximately 1000 m^2 to accommodate GEA offices, water closets and kitchen facilities.

5.26 A surface water drainage system will drain the site and discharge into the existing drainage system. The capacity of the surface water drainage system, including perimeter surface water run-off interceptor ditches, is designed in accordance with local drainage authority procedures and storm water parameters.

5.27 An oily wastewater drainage system will drain all areas (including oil unloading areas, oil and fuel storage compound drainage, oil filled transformer compounds, car parking areas) where oil spillages could occur. Any water discharges will be processed through oil interceptor traps that will be regularly maintained and inspected.

5.28 All water potentially containing chemicals and/or oil shall drain through a treatment system before being disposed in the storm water sewer. Sludge removed from the treatment process will be placed in a holding tank with provision for discharge to a road tanker for disposal to an approved facility. This shall include the engine cooling water systems and drainage from the SCR urea system storage and treatment area.

5.29 Bunds provided in transformer compounds, oil storage areas, lube oil tanks and similar will have an impounding capacity 110% of the largest possible oil spillage that could occur. Facilities will be provided to contain oil and protect the environment in the event of a catastrophic failure of the transformer.

5.30 All sewerage and grey water will be segregated from the surface water drainage system and the oily wastewater drainage systems and connected to the existing gravity sewer systems via a new connection to be made. An proposed sewage treatment plant will provide primary, secondary and final

treatment and will be fully compliant with Gibraltar and European environmental authority legislation for final discharge.

5.31 Security fencing, gates and guardhouse will ensure GEA personnel and guests are safely admitted onto the proposed power station plot from the north of the site (Mons Calpe Road). A deliveries gate will be provided on the south side of the site (North Mole Road). Landscaping is being designed by Belilos Consulting Engineers in order to match the landscape character on North Mole Road and new planting along the perimeter of the site has been informed by consultation with the Gibraltar Ornithological & Natural History Society (GONHS). Native plants, such as tamarisk, will be used that can withstand the coastal conditions in the area.

Fuel Supply and Storage System

5.32 The mode of operation is for the plant to be operated solely on natural gas, but with provision for unforeseen interruption of supply with operation of the three dual-fired engines with diesel.

5.33 Natural gas is commonly transported and stored as LNG, for more cost efficient movement and to reduce volume of storage. LNG comprises of predominantly methane which is non-toxic, non-corrosive, odourless and colourless, and has been cooled to -162°C, reducing its volume to 1/600th of its original volume as a gas. This fuel will be transported in double hulled ships or tankers and stored in double skinned and insulated steel, concrete enclosed and bunded containers designed to maintain low temperatures and contain any potential leakages. This fuel is then depressurised before pipeline transfer to the power station. Storage containers will be to high specifications. The present EIA does not include the natural gas storage facility since the government is to make provision of bunkering at a future date.

5.34 Diesel fuel is combustible rather than flammable, due to its high flash point; therefore, it does not pose a particularly high explosion or fire risk. LNG is not explosive and cannot burn unless it has been vaporised in a mix with the correct proportion of air. In the event of a leak, LNG vaporises rapidly, turning into a gas; however, there is only a risk of ignition, fire or explosion if the mixture is within the flammable range. To date, there have been very few

incidents in connection with LNG (P. Bainbridge, 2002). Nonetheless, transportation, gasification, transfer and use of this fuel will be carefully managed under an Operational Environmental Management Plan (OEMP) and specific safety procedures.

5.35 Road tankers will deliver diesel. This fuel will also be stored in double skinned steel, concrete enclosed, bunded containers.

Construction Process

5.36 The construction period is estimated to take 24 months after full possession of the site. The key elements of the schedule are as follows:

- Site preparation, e.g. access for construction vehicles, temporary services, construction compound, safety fencing and signage;
- Earthworks and disposal of any waste arising;
- Laying of foundations and piling for the buildings and plant;
- Construction of the permanent site infrastructure: roadways, water supply, etc.;
- Construction of the permanent buildings, including those for housing the power and auxiliary plant and offices;
- Testing and start-up of equipment;
- Removal of all temporary facilities, waste and debris;
- Landscaping work including new planting.

5.37 Working hours will generally be 08:00 to 20:00 Monday to Saturday. There will be an allowance for weekend working where absolutely necessary and for night shifts to minimise disruption of normal traffic in Gibraltar (heavy or very heavy goods transport).

5.38 A site for any offsite construction compound(s) has not yet been identified. Once identified, the Contractor will assess any such temporary storage sites for environmental impacts within their provisions under the Construction Environmental Management Plan (CEMP). They will have a duty to limit environmental effects such as noise, general disturbance, vibration, traffic, air quality, ecology, fragmentation of land and general pollution under the relevant EU Directives and Gibraltar laws protecting the environment.

5.39 An indicative Construction Schedule is provided in Appendix 4.

Equipment and Materials

5.40 The equipment that is likely to be used will depend upon the Contractor, the application of best practicable means and locational constraints in term of the operational airport and port activities. The following is most likely:

- Earthworks will be carried out using conventional construction equipment such as excavators, bulldozers, compactors, dump trucks and tipper lorries;
- Concrete may be produced on site using a batching plant;
- Prefabricated structures will be brought to site by lorries and erected using cranes (restricted by height to adhere to the airport OLS);
- The engines will be brought to site in component parts via barges;
- Welding equipment (with appropriate shielding) will be used for tank and pipe construction;
- Piling, if found to be necessary, will be mainly carried out by crane-mounted rigs (adhering to OLS height restrictions) using large diameter bored piles.

5.41 An estimated 5000 metres cubed (m^3) of concrete will be required for the construction of the power station.

Construction Health, Safety and Environmental Management

5.42 Construction will follow good working practice such as that provided by Construction Industry Research and Information Association (CIRIA, 2005) and UK Construction and Design Management (CDM) Regulations (SI 2007/320). CIRIA is a member based research and information organisation dedicated to improvement in the construction industry and covers building and civil engineering, transport and utilities infrastructure. The CDM Regulations provide health and safety standards in the construction industry.

5.43 The Contractor will provide a site management plan, to be agreed with the government and relevant authorities to manage health, safety and risk. Key stakeholders, statutory authorities and the public will be consulted and kept informed of construction activities that may affect them.

5.44 The Contractor will develop a site specific CEMP, which will be adopted to manage the impact of construction activities on the surrounding environment, including people. The CEMP is part of a framework for satisfying the government that the Contractor is fully aware of the environmental aspects that could affect the existing transport routes (including roads and the airport)

and demonstrates it is able to manage these aspects competently on site. It also provides a system that demonstrates how the Contractor will achieve compliance with environmental standards and legislation, and includes the Contractor's environmental and sustainability policies.

5.45 Appendix 5 of this ES provides an outline CEMP and OEMP, which are both informed by the results of this EIA. The CEMP and OEMP will be developed following the EIA certificate conditions and consultation with statutory organisations.

5.46 Good practice noise and dust suppression will be key aspects of the CEMP, as will construction traffic management, waste management, sourcing and storage of materials, pollution prevention.

5.47 There may be a requirement for limited lighting at night for essential construction activities within and adjacent to the site boundary. Temporary construction lighting will be minimised and directional. Temporary hoarding will be used to prevent light spillage to nearby properties that could be affected.

5.48 The specific level of construction traffic is unknown, although it is anticipated that the worst case scenario will require a maximum of 10 heavy goods vehicle (HGV) movements per day between the initial foundations work and the delivery of equipment to site for installation, a period of approximately 24 months. A construction traffic management plan will be developed, from the principles that have been established at this stage. This will include appropriate signage, dust suppression (e.g. wheel washing and damping or covering of temporary spoil storage areas), and restricted traffic movements during sensitive periods (e.g. at night or during public holidays).

5.49 Water will be disposed of in accordance with the CEMP. Any contaminants whose presence will render water unsuitable for discharge into drains or watercourses external to the site shall be removed prior to discharge and, where appropriate, consents will be sort to transport such extracted contaminants to a licensed disposal site.

Environmental Auditing and Monitoring

5.50 Construction will be audited and monitored against an approved CEMP, and will establish the following:

- The level of impacts arising during construction and the efficiency of best practice measures adopted during construction through the implementation of approved method statements;
- The occurrence of unexpected finds during construction, particularly in relation to ground contamination;
- The potential for unexpected environmental impacts to arise and methods to control pollution or effects;
- The establishment of landscaping and approved planting.

5.51 The monitoring programmes to be implemented during construction will be established in development of the CEMP.

5.52 Regular consultation with statutory organisations and locally affected parties, including residents, the Tourist Board, Ports Authority, and Gibraltar International Airport (RAF, MOD, CAA), will be conducted to inform and agree on specific construction methods. Appropriate method statements for pollution control, dust and noise abatement will require approval from regulatory authorities.

Site Maintenance, Management and Compliance

5.53 The operation of the power station will comply with all relevant environmental legislation, including the EU IPPC Directive (2008/1/EU).

5.54 An appropriate management system will be adopted to manage risk and environmental performance of the proposed power station. Relevant permits will be sought from the Environmental Agency.

5.55 The flue gas will be monitored and controlled using emission monitoring equipment and sampling points. The Environmental Agency will be informed of monitoring regimes and results.

5.56 A comprehensive oil spill contingency plan will be developed for the detailed start up/testing, operation and decommissioning of the power station and related facilities, in consultation with relevant authorities. It will include procedures in the event of an accidental spillage.

Precautionary Environmental Measures

5.57 As stated above, the Contractor is to develop a CEMP which will be adopted to manage the impact of construction activities on the environment including, but not limited to, people, waste, noise and vibration, dust, construction lighting, operational lighting, accidental pollution events, vegetation removal, biodiversity enhancement and invasive species. When the power station is operational, it will be controlled within the limits set under IPPC licence and managed by an OEMP. Operational management will be the responsibility of GEA.

Aeronautical Study

5.58 A specific aeronautical study has been conducted to inform the design, construction and operation of the new power station with respect to operational constraints and requirements of the Gibraltar International Airport.

5.59 The study has been guided by various aviation guidelines, both military and civil, and the Planning Guidance Information Sheet 6 (Government of Gibraltar, 2014b), relating to developments that may impact on the Gibraltar International Airport.

5.60 The aeronautical study has been conducted by a specialist aeronautical consultancy, NACO, and investigates risks from the proposed development to aeronautical safety including:

- physical safeguarding requirements
- the use of cranes
- bird strike hazard
- foreign object debris
- lighting
- obstruction lighting
- wind and turbulence
- reflectivity.

5.61 The operation of Gibraltar's airport has unique characteristics and constraints. Specific issues raised by the RAF/MOD and CAA have been investigated by NACO in their study. The aeronautical study has been provided to the RAF/MOD and CAA, and the details are not made public.

5.62 The conclusions of the NACO aeronautical study have informed this EIA where relevant. The safeguarding of the operation of the airport from both the construction and operation of the proposed power station at North Mole has been significant in the development of the construction strategy and design.

Electromagnetic Interference

5.63 The Contractor has considered the potential for electromagnetic interference to existing adjacent installations, and has included safeguarding for construction staff from harmful radiation. The power station has been designed to relevant standards for electromagnetic radiation.

CHAPTER 6

ALTERNATIVES

6 ALTERNATIVES

6.1 The EIA Directive 2011/92/EU as amended by 2014/52/EU (and associated regulations) requires that an ES should provide:

> *[A]n outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.*
>
> (EU, 2011:Article 5 3(d))

6.2 Although this legislation does not require environmental assessment of alternatives, their early consideration in the design planning process is important in seeking to avoid or reduce potential significant effects.

6.3 The main alternatives are described, for the purposes of this report, as those that will potentially meet operational objectives but are significantly different to the preferred proposals in terms of their functionality, siting etc. Alternatives have been considered by the government during fuel, technology and site selection, and by the Contractor during design development and during the development of the approach for construction.

6.4 This section describes alternatives to the main technology/strategy proposed for the project. It includes a discussion of the siting and technological criteria that were required to ensure a project design that was capable of optimal production efficiency, within defined economic, environmental health and safety constraints. In particular it outlines the following project elements:

- the 'no development' option
- alternative power technologies
- alternative fuels
- alternative locations
- preferred arrangement.

The 'No Development' Option

6.5 The proposed new power station is being developed to provide for Gibraltar's growing electrical energy requirements and to replace the three existing power stations.

6.6 The three existing power stations are intended to be decommissioned due to their age, decreasing operational efficiency, and environmental impacts. Delays to the planned retirement of these older and less efficient power stations could not be sustained for long and will result in worse emissions to the environment.

6.7 The existing Waterport Power Station could not be upgraded or expanded because it does not have the space available to install the required number of engines.

6.8 In addition to the need to close down the existing power stations, there are also several proposed large-scale developments in Gibraltar from which energy demand is calculated to outstrip current supply. Based on known planned developments, the projected electrical load in Gibraltar is calculated to rise to 42 MW(e) by 2017 and 51 MW (e) by 2027.

6.9 A 'no-development' option would threaten Gibraltar's continuous energy supply, which is why the government rejected this proposal from the outset.

6.10 Importation of power from neighbouring countries is not an option for Gibraltar due to its geographic and political setting, which means that it has to be self-reliant in providing its own energy. Any source of energy needs to be reliable, secure and sustained.

Alternative Power Technologies

Renewables

6.11 The government aims to achieve a target of 15% of produced electrical energy to be provided from renewable sources by 2020 (Government of Gibraltar, 2011b). The leading technology of preference being solar photovoltaic, whilst wave and undersea current technologies are also being considered. New 'micro' renewables are already being implemented on some sites, and are encouraged for new development proposals. The government is investigating the best options for interconnection of renewable energy contribution to the national energy supply network.

6.12 Options considered by the government are:

- Solar Photovoltaic and Solar Thermal
    - Due to its Mediterranean location, Gibraltar has long potential sunlight hours, therefore high potential for solar photovoltaic generated power and solar thermal.
    - The government has already commenced installation of panels and thermal systems on a number of public buildings including the Tercentenary Sport Hall and St Bernard's Hospital.
- Wave Technology
    - In 2014, the government entered into an agreement with Eco Wave Power, an international marine energy company, to provide an initial 0.5 MW energy device on the east side of Gibraltar, with the potential for expansion to 5 MW if the device is successful.
- Marine Current Generators
    - Although Gibraltar has a significant potential energy resource in the marine currents through the Straights of Gibraltar, marine current generators are currently at a developmental stage. However, the government is exploring this option and has entered into an agreement with a technology provider to carry out pilot studies.
- Purchase of Renewable Energy from Other Sources
    - The purchase of a proportion of Gibraltar's electricity requirements from renewable resources outside of the country may be feasible without putting security of supply at risk since sufficient firm installed capacity could be retained to cover the peak demand.
    - An international connection is feasible, however, there are a number of commercial and technical issues that will be required to be studied further in order to determine the associated costs so that the price of energy purchased in this manner could be established.

6.13 Renewable options such as these would be supplementary to a main energy supply, as they would not satisfy the future demand; and, based on current technology, would not provide a secure and sustained supply. Renewable sources are being phased into the overall Gibraltar power supply strategy to augment the main supply gradually.

Alternative Fuel Strategies

6.14 The commitment to diesel as the only fuel for electricity generation was deemed by the government to be adverse for both the environment and economy, and therefore not sustainable in the long term. Additionally, developments in natural gas availability and access, lower environmental emissions and lower cost compared to other available fossil fuels, means liquefied natural gas has become a viable option for Gibraltar.

Alternative Locations

6.15 Availability of land in Gibraltar for development and construction purposes will always be an issue due to its small geographical size and population/development needs. The existing power stations at Waterport, OESCO and ISGS were at different periods of time constructed on land reclaimed from the sea and whilst for a period of time these power stations were a reasonable distance from populated areas when constructed, Gibraltar's population growth over the years has meant these stations have been encroached by residential and other land uses.

6.16 The choice of natural gas as the preferred fuel for the future power supply of Gibraltar has influenced the selection of the proposed development site at North Mole; whereas, a previous option study report narrowed the available sites to Lathbury Barracks and did not consider the North Mole Port area.

6.17 The government decided that the benefits of using LNG merited using existing reclaimed land as this siting would allow not only a new power station to be constructed but also the delivery and storage of LNG in close proximity to the power station.

6.18 The alternative would have been the Lathbury Barracks site at Europa Point; however, the technical complication and challenges of storing LNG at this site would be immensely costly. A super cooled pipeline from the port to Lathbury would have to be laid, or alternatively a storage facility in the port area with a natural pressurised gas pipeline to Lathbury would have to be laid.

Preferred Arrangement

6.19 After an options evaluation and selection process, it was considered that the North Mole site offered the most suitable location for the new facility, as it avoids specific access, fuel supply and land use sensitivity problems present at other sites. Additionally, the North Mole site was considered to be the most viable site for Gibraltar's power station when the various planning and consenting issues were evaluated against the required project timescale.

6.20 Natural gas is the preferred fuel of choice available in time for commissioning in 2017, contributing to Gibraltar's reduced greenhouse gas emissions targets,

with diesel intended to be a back-up and supplementary fuel. It is also significantly cleaner than other fuels, such as oil, diesel and coal, and together with the new technology being proposed, should lead to significant improvement in air quality, and a net environmental gain.

CHAPTER 7

ENVIRONMENTAL IMPACT ASSESSMENT APPROACH

7 ENVIRONMENTAL IMPACT ASSESSMENT APPROACH

General Approach to the EIA Process

7.1 The EIA process is designed to enable good decision-making based on the best possible information about the environmental and social implications of a proposed development. It involves the compilation, evaluation and presentation of the potential significant environmental effects of the proposed development in order to assist the appropriate authority (the DPC) in considering the project.

7.2 The approach to the study has taken into consideration the relevant national and international legislation on EIA and good practice guidance, including UK Department for Environment, Transport and the Regions (DETR, 2000), IEMA (IEMA, 2004), and UK Department of the Environment guidance for EIA (Department of the Environment, 1995).

7.3 The EIA process is based upon evaluating the current environment, identifying the impacts (or activities) of the proposed development, and assessing the extent or significance of the effect.

7.4 It is considered that sufficient technical information to describe the design has been provided to conduct a compliant EIA. Where there has been any uncertainty, a worst-case scenario has been tested to help show the worse impacts that could result from the proposals, and where these can be avoided it is demonstrated that the resulting effects are likely to be less severe than those predicted.

7.5 A project can have potential effects on a wide range of environmental receptors. The importance or significance of these effects depends upon a number of factors, mainly the severity of the impact and the sensitivity of an environmental resource or receptor to be affected.

7.6 It is therefore important to identify those processes or actions that lead to an **impact** (i.e. a change in the environment), evaluate the magnitude of this change and then identify any environmental **resources** or **receptors** upon which the impacts may act. It is this product of the impact acting on the resource/receptor that produces an environmental **effect**. The significance of

the effect is then determined by comparison with national or international standard. If no standards are available then it is necessary to develop project specific parameters.

7.7 Such standards or parameters are referred to as the **significance threshold**. The threshold standards used for the assessments within this study are provided in the technical assessments (Chapters 9-17).

7.8 Specific methodologies for each technical environmental issue are explained in the relevant sections of the ES.

Identifying and Evaluating Impacts and Effects

7.9 The assessment identifies environmental impacts on resources and receptors and their consequential effects.

7.10 A resource is defined as a biophysical feature or item of 'environmental capital'. Examples include ecosystems, heritage interest, access routes and community facilities. Receptors comprise habitats, species and human beings, either individually or collectively, and the socio-economic systems on which they depend and may include for example residents, employees, communities and local or regional economies.

7.11 An effect results from impacts acting upon a resource or receptor. In order to identify such a change, it is essential to have as complete as is practicable an understanding of the nature of the existing environment prior to its interaction with the proposed development. This translates into the need to characterise the existing environmental baseline including establishing prevailing conditions for a range of environmental media, such as air, water, soil, groundwater, flora, fauna, noise and the human environment.

7.12 In some instances, it is useful to establish a 'future baseline' in order to take account of any environmental changes predicted to occur by the time the proposed development is complete. In this case, a 'future baseline' would provide a more realistic and appropriate baseline against which to gauge the impacts of the proposed power station when it is anticipated to become operational in 2017.

7.13 The primary objective of the assessment is to identify 'significant' effects, since these must be reported in the ES. This is achieved by firstly assessing the magnitude of the impact and then by reviewing the extent (both in time and space) to which it affects the receptors or resource.

Defining Significance

7.14 A significant effect may be broadly defined as one that should particularly be brought to the attention of those involved in the decision-making process. This definition will be prescribed to varying degree by statute (including EU and national guidelines and standards) and influenced by the precedents established in previous EIAs.

7.15 Guidance on significance has been mainly of a generic nature and practitioners have been obliged to develop definitions for specific topics and projects. It is generally accepted, however, that significance reflects the relationship between two factors:

- The magnitude (or severity) and duration of an impact (i.e. the actual change taking place to the environment);
- The sensitivity, importance or value of the affected resource or receptor.

7.16 The magnitude of an impact is often quantifiable, in terms of, for example, air quality emissions. The sensitivity, importance or value of the resource or receptor is normally derived from factors such as:

- Its designated status within the land use planning system;
- The number of individual receptors affected;
- An empirical assessment on the basis of characteristics such as rarity or condition;
- Its ability to absorb change.

7.17 Significant adverse effects occur where valuable or sensitive resources, or numerous receptors, are subject to impacts of considerable magnitude and duration. Some effects will be temporary, whilst others are permanent in nature. Effects are unlikely to be significant where low value or non-sensitive resources, or a small number of receptors, are subject to minor or short-term impacts. Where an effect is considered to be significant, its magnitude will generally be classified as high, medium or low, with these descriptions being based on precedent or current guidance.

7.18 Terminology can vary for describing the level of significance, often based on specific guidance provided by recognised institutions (e.g. the Landscape Institute), and in this ES the use of low or minor and the use of medium or moderate are interchangeable. In this way the level of significance can be compared across environmental issues.

Approach to Mitigation

7.19 Where a significant effect has been identified, mitigation measures have been considered wherever possible, taking into account the practicability, engineering feasibility and cost effectiveness of the mitigation and the efficiency in reducing the environmental effects.

7.20 Mitigation falls into three general categories for this project:

- Measures incorporated into the design;
- Additional design measures which have emerged during the course of the EIA;
- Construction/operation control procedures.

7.21 The mitigation described or proposed has the commitment of the Applicant.

Inherent Design Mitigation

7.22 The aim of any EIA process must be to identify potential impacts on the environment and, if possible, alter the design of the project to remove the potential impact. This is termed inherent mitigation and through this iterative process of impact identification and design review it is possible to minimise potential impacts of any project.

7.23 Every attempt has been made during the EIA process to include inherent mitigation in the design of the proposed power station. In addition, the Contractor will commit to environmental management during construction and operation, through such tools as a CEMP and OEMP.

CHAPTER 8

SCOPE OF THE ASSESSMENT

8 SCOPE OF THE ASSESSMENT

8.1 This ES includes all relevant information to adequately describe the proposals. The scoping process for the EIA was undertaken through meetings and written consultation with key organisations. These organisations were identified by the Town Planner. The individual scope of each issue has been agreed with the relevant statutory organisation where possible. A list of the organisations consulted and the Town Planner's Scoping Opinion is provided in Appendix 3.

8.2 The scope of the assessment sets out the issues that have the potential to cause significant effects on the receiving environment.

8.3 Engain, on behalf of the Applicant, provided an Environmental Scoping Report in March 2015 to the DPC, which set out the main elements of the proposed development and the initial identified scope of the EIA. The Environmental Scoping Report is provided in Appendix 2.

8.4 The Town Planner provided a formal Scoping Opinion in May 2015 that included statutory responses (see Appendix 3). The Scoping Opinion broadly concurred with the EIA scope proposed but also provided additional recommendations for the EIA, including an assessment of water quality.

8.5 Impact assessment is an iterative process. As the investigations and assessment have progressed it has become apparent that some issues would not lead to a significant effect and other issues previously not identified could have potential significant effects. The scope has therefore been refined to focus on the relevant issues. The final scope of the EIA is:

- air quality
- coastal processes and water quality
- contaminated land
- ecology and nature conservation
- land use and community
- landscape and visual amenity
- noise and vibration
- traffic and transportation
- waste and material resources.

Cumulative Effects

8.6 It is recognised that it is difficult to assess individual project-based cumulative effects. Assessment of these is now more effectively included in Strategic Environmental Assessment (SEA) at the early stages of the planning process.

8.7 Cumulative effects, for the purposes of this assessment, are defined as:

- the combined effect of individual impacts from the proposed development on resources and receptors;
- incremental impacts caused by separate developments within a defined study area including the proposed development.

8.8 Other proposed, intended or consented development projects identified by the Town Planner on the 7th April 2015 and considered as potentially leading to cumulative significant effects are identified below:

- North Mole Reclamation (BA12714)
- North Mole Sullage Plant (BA12734)
- North Mole Tank Farm (BA11849)
- Coaling Island Boats Marina (BA12306)
- North Mole Industrial Park (BA12692)
- Coaling Island Reclamation (BA13479)
- Western Beach Basin for land reclamation (BA13145)
- Proposed floating oil storage vessel; steel barges to separate the storage vessel from the Detached Mole; a piping network on the Detached Mole; bunkering loading locations (BA13273)
- North Mole Security Upgrades, Ticket Office and Taxi Bay with Canopy (BA13480).

Transboundary Effects

8.9 Each of the technical assessments has considered the potential for significant transboundary effects, given the proximity of the proposed power station to Spain. The majority of the assessments scoped transboundary effects out due to the nature and scale of the proposals and the distance to Spain.

Consultation

8.10 Throughout the assessment there has been ongoing consultation with statutory organisations and affected parties, which has informed the scope of the EIA. Consultation has been an important part of gathering information to

understand the existing environmental baseline for the site. Consultation has comprised meetings and written communication to explain the approach to environmental assessment and to identify key issues and information.

8.11 A list of those consulted, the key issues raised and how they have been considered for this EIA is provided in Appendix 1 and 3 and reference to consultation is included in this main report or in the technical chapters, where relevant. The main contributors to consultation have been:

- Civil Aviation Authority
- Department of the Environment and Climate Change
- Department of Town Planning and Building Control (Town Planner)
- Environmental Safety Group
- GEA
- Gibraltar Environmental Agency
- Gibraltar Heritage Trust
- GONHS
- Gibraltar Port Authority
- Gibraltar Tourist Board
- Minister for the Environment
- MOD
- Ministry of Sports, Culture, Heritage and Youth
- RAF
- Technical Services Department of HM Government of Gibraltar.

8.12 Review of relevant papers, guidance documents and legislation was undertaken in order to inform the assessment. These are listed in References of this report.

Limitations of the Study and Assumptions

8.13 A key limitation to any EIA is the inherent requirement for the design to evolve and change as the EIA progresses. It is important to audit changes to the design so that the EIA can capture the 'alternatives' considered and that the assessment is based on the up to date design submitted. Every attempt has been made to ensure that all technical assessments are consistent in assessing the same final elements of the design.

8.14 Another key limitation is the time taken from submission of the planning application to final decision on planning. This can affect indicative timescales for construction and, therefore, affect predicted future scenarios that have to be assessed. It is possible that these future timescales may change. However, this assessment has been based upon reasonable judgements about future timings for construction and other matters; where possible a precautionary approach has been taken. The technical chapters assess the specific limitations or assumptions for each environmental issue, where relevant.

8.15 Although the planning application is for a detailed scheme, it is not possible to anticipate and then assess every potential environmental effect; some issues, therefore, will be necessarily dealt with via EIA certificate conditions. However, following the EIA Directive, EIA Regulations, guidelines and agreed assessment methodologies, the assessment is considered to be robust and compliant for the purposes of informing the application and decision-making process.

8.16 The assessment is based on project design, construction and operational information provided by the Contractor and its team of project consultants. It also relies on information on the current conditions at the site provided by third parties. Engain can take no liability for incomplete or inaccurate information provided for the basis of the assessment, although information has been checked across several sources where possible.

Public Participation and Advertising

8.17 Under Regulation 9 of the Gibraltar EIA Regulations the Applicant is required to publish a notice of the intended development in the Gibraltar Gazette and a local daily and weekly newspaper. Additionally, a notice is required to be placed on the site of the proposed power station. This provides a designated period of time for the ES to be viewed by the public and comments to be put forward to the DPC. Such comments may be considered by the DPC in their assessment of the compliance of the ES.

Technical Assessments

8.18 The following chapters provide assessments for the nine specific environmental issues identified as being relevant to the proposed power station development.

CHAPTER 9

AIR QUALITY

CONTENTS

ABBREVIATIONS **AQi**

1 INTRODUCTION **AQ1**

2 LEGISLATIVE CONTEXT **AQ2**

Air Quality Limit Values AQ2
Air Quality Objectives AQ4
Critical Loads AQ4
Habitats Directive AQ4
The Gibraltar Development Plan AQ5
Control of Dust Regulations AQ5

3 SCOPE AND METHODOLOGY **AQ6**

Scope AQ6
Assessment Methodology (Construction Phase) AQ8
Assessment Methodology (Operational Phase) AQ8
Significance AQ10
Assumptions and Limitations AQ11

4 EXISTING CONDITIONS **AQ13**

Site Description AQ13
Reported Exceedences of the Limit Values AQ13
Natura 2000 in Gibraltar AQ14
Air Quality Monitoring AQ14

5 FUTURE BASELINE **AQ18**

6 POTENTIAL IMPACTS **AQ19**

Construction AQ19
Operation AQ22

7 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS **AQ29**

Construction AQ29
Operation AQ29
Transboundary AQ29

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS **AQ30**

Construction Mitigation AQ30
Operational Mitigation AQ30
Residual Significant Effects AQ31

9 CONCLUSION **AQ32**

10 REFERENCES **AQ33**

APPENDICES

APPENDIX AQ1 GIBRALTAR AIR QUALITY ACTION PLAN AND ACTION PLAN UPDATE

APPENDIX AQ2 CONSTRUCTION DUST ASSESSMENT PROCEDURE

APPENDIX AQ3 MODELLING METHODOLOGY

APPENDIX AQ4 CONSTRUCTION MITIGATION

LIST OF FIGURES

Figure AQ3.1: Locations of Specific Receptor ..... Volume 2
Figure AQ4.1: Locations of Automatic Monitoring Sites ..... Volume 2
Figure AQ4.2: Locations of Diffusion Tubes Monitoring Sites ..... Volume 2
Figure AQ6.1: Distance Bands from the Site Boundary ..... Volume 2
Figure AQ6.2: Distance Bands from Roads Used by Construction Traffic Within 50 m of the Site Boundary ..... Volume 2
Figure AQ6.3: Predicted Annual Mean Nitrogen Dioxide Process Contributions Associated With North Mole Power Station in 2017 (µg/m^3) ..... Volume 2
Figure AQ6.4: Predicted Annual Mean Nitrogen Dioxide Process Contributions Associated With North Mole Power Station in 2027 (µg/m^3) ..... Volume 2
Figure AQ6.5: Isopleths of where significant impacts from Annual Mean $PM_{2.5}$ Process Contributions (µg/m^3) Associated With North Mole Power Station in 2017 and 2027 cannot be discounted ..... Volume 2
Figure AQ6.6: Isopleths of where significant impacts from Annual Mean PM_{10} Process Contributions (µg/m^3) Associated With North Mole Power Station in 2017 and 2027 cannot be discounted ..... Volume 2
Figure AQ6.7: Isopleths of where significant impacts from Daily Mean PM_{10} Process Contributions Associated With North Mole Power Station cannot be discounted in 2017, 2027 and in the diesel backup scenario ..... Volume 2
Figure AQ6.8: Isopleths of where significant impacts from Hourly and Daily Mean Sulphur Dioxide Process Contributions Associated With North Mole Power Station cannot be discounted in the diesel backup scenario. ..... Volume 2
Figure AQ6.9: Area within the Rock of Gibraltar SAC/SPA where significant impacts from annual mean nitrogen oxides process contributions associated with North Mole Power Station cannot be discounted in 2017 ..... Volume 2
Figure AQ6.10: Area within the Rock of Gibraltar SAC/SPA where significant impacts from annual mean nitrogen oxides process contributions associated with North Mole Power Station cannot be discounted in 2027 ..... Volume 2
Figure AQ-A3.1: Wind Roses (2012-2014) ..... Volume 2

LIST OF TABLES

Table AQ2.1: Relevant Air Quality Limit Values and Critical Levels
Table AQ2.2: Relevant Critical Loads
Table AQ4.1: Summary of Automatic Monitoring Data in Gibraltar (µg/m^3)
Table AQ4.2: Summary of Annual Mean Nitrogen Dioxide Diffusion Tube Results (µg/m^3)
Table AQ5.1: Baseline Pollutant Concentrations (2017 and 2027)
Table AQ6.1: Summary of Dust Emission Magnitude
Table AQ6.2: Summary of the Area Sensitivity
Table AQ6.3: Summary of Risk of Impacts without Mitigation
Table AQ6.4: Predicted Pollutant Process Contributions (2017, 2027 and Diesel Backup)
Table AQ6.5: Predicted Pollutant Total Concentrations (2017, 2027 and Diesel Backup)

Table AQ6.6: Predicted Maximum Pollutant Concentrations and Deposition associated with Power Station Emissions, Relevant to Impacts on Vegetation and Ecosystems
Table AQ6.7: Predicted Maximum Pollutant Concentrations and Deposition rates relevant to vegetation resulting from Power Station Emissions Combined with Background
Table AQ-A2.1: Examples of How the Dust Emissions Magnitude Class May be Defined
Table AQ-A2.2: Principles to Use When Defining Receptor Sensitivity
Table AQ-A2.3: Sensitivity of the Area to Effects on People and Property from Dust Soiling
Table AQ-A2.4: Sensitivity of the Area to Human Health Effects
Table AQ-A2.5: Sensitivity of the Area to Ecological Effects
Table AQ-A2.6: Defining the Risk of Dust Impacts
Table AQ-A3.1: Waterport Power Station - Model Input Parameters (at 100% load)
Table AQ-A3.2: Proposed Power Station - Modelled Scenarios

ABBREVIATIONS

CEMP	Construction Environmental Management Plan
CO	Carbon monoxide
EC	European Commission
EU	European Union
EIA	Environmental Impact Assessment
hr	Hour
ISGS	Inter Services Generating Station
km	Kilometre
m	Metre
$\mu g/m^3$	Micrograms per cubic meter
NASA	National Aeronautics and Space Administration (United States)
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
OESCO	Ormrod Electricity Supply Company Limited
PM_{10}	Particulate matter up to 10 micrometres in size
$PM_{2.5}$	Particulate matter up to 2.5 micrometres in size
SAC	Special Area of Conservation
SPA	Special Protection Area
SO_2	Sulphur dioxide
TEN	Time Extension Notice
UK	United Kingdom

1 INTRODUCTION

1.1 This chapter describes the potentially significant air quality effects associated with the proposed North Mole Power Station. It considers both operational and construction impacts.

1.2 The chapter discusses the legislative background to air quality and sets out the scope of work and methodology. It also identifies the principal sources of pollutant emissions, assesses the potentially significant air quality effects, and describes the measures that will be employed to minimise such effects. Any residual effects after mitigation are also identified.

1.3 In air quality terms, the pertinent aspects of the proposals are:

- The proposed power station will provide an initial output capacity of 42 MW and will comprise three natural gas-fired generating units and three dual-fired generating units (natural gas as the primary fuel with diesel as back-up). Additional generating unit may be installed increasing output capacity to 51 MW;
- It is anticipated that the power station will become operational in 2017;
- The gas and diesel fuels will be stored off-site, with some short-term storage on site and delivery of diesel by truck to the site boundary.

2 LEGISLATIVE CONTEXT

2.1 This section sets out the air quality legislation in Gibraltar that is relevant to this assessment.

Air Quality Limit Values

2.2 The European Commission (EC) has set a number of air quality limit values for the protection of human health and critical levels for the protection of vegetation (Directive 2008/50/EC). This Directive has been transposed into Gibraltar law within the Environment (Air Quality Standards) Regulations 2010 (Government of Gibraltar, 2010a). The limit values and critical levels of relevance to this assessment are set out in Table AQ2.1.

2.3 Directive 2008/50/EC (Annex III) provides guidance on the location of sampling points for the protection of vegetation and natural ecosystems. These criteria have been interpreted by the Government of Gibraltar such that, due to the small spatial extent of Gibraltar, there are no defined vegetation or ecosystem areas that are relevant to the critical levels defined in the Directive, and they do not strictly apply in Gibraltar.

2.4 In addition to the limit value for $PM_{2.5}$, the Directive 2008/50/EC also sets exposure-reduction obligations and target reductions for this pollutant. However, these exposure-reduction obligations are not applicable to individual developments, and the obligations and targets only apply to agglomerations over 100,000 people (and are therefore not applicable to Gibraltar).

2.5 Directive 2008/50/EC also recognises that Member States cannot control contributions to particulate matter from natural sources such as Saharan dust and sea salt which both affect measured concentrations in Gibraltar. The Directive makes provision to account for these contributions when assessing compliance, where they can be quantified appropriately. The Government thus takes account of these sources separately when assessing against the limit values.

Limit Value Time Extensions

2.6 The limit values for particulate matter up to 10 micrometres in size (PM_{10}) and nitrogen dioxide (NO_2) came into force in 2005 and 2010 respectively. Where

they could not be achieved by these dates, Directive 2008/50/EC allowed Member States to apply for time extensions. Postponements were granted on the condition that air quality action plans were established with the aim of meeting the limit values.

2.7 In 2010, the Government of Gibraltar formally applied to the EC for time extensions to achieve the 24-hour (hr) mean PM_{10} and annual mean nitrogen dioxide limit values. The Gibraltar Air Quality Plan sets out how the Government intends to improve nitrogen dioxide and PM_{10} concentrations with the aim of meeting the limit values. The Action Plan is summarised in Appendix AQI, together with recent progress on the Action Plan measures.

2.8 The EC granted the time extension for the annual mean nitrogen dioxide limit value; this expired on 1st January 2015. In terms of PM10, the EC rejected the time extension on the grounds that once natural sources were removed, the limit value was not exceeded in 2009.

2.9 Consideration to the current position with regard to limit value exceedences, including the evidence base for the Government's time extension notifications, is provided in Section AQ4.

Table AQ2.1: Air Quality Limit Values and Critical Levels

Pollutant	Limit Values for the Protection of Human Health	Measured as
Nitrogen dioxide	40 µg/m^3	Annual mean
	200 µg/m^3, not to be exceeded more than 18 times per year	1 hour mean
Particles (PM_{10})	40 µg/m^3	Annual mean
	50 µg/m^3, not to be exceeded more than 35 times per year	Daily mean
Particles ($PM_{2.5}$)	25 µg/m^3	Annual mean [a]
Sulphur dioxide	350 µg/m^3 not to be exceeded more than 24 times per year	1 hour mean
	125 µg/m^3 not to be exceeded more than 3 times per year.	24 hour mean
Carbon monoxide	10 mg/m^3 not to be exceeded	Running 8 hour mean
Critical Levels for the Protection of Vegetation		
Nitrogen oxides	30 µg/m^3	Annual mean
Sulphur dioxide	20 µg/m^3	Annual mean and Winter mean

[a] This limit value for $PM_{2.5}$ was to be met by 1 January 2015. There is also an indicative Stage 2 limit value of 20 µg/m^3 to be achieved by 2020.

Air Quality Objectives

2.10 Gibraltar has also adopted a number of air quality objectives. These are based on the Public Health (Air Quality Limit Values) Rules 2002 (Government of Gibraltar, 2002) as amended by the Public Health (Air Quality Limit Values) (Amendment) Rules 2003 (Government of Gibraltar, 2003) and the Public Health (Air Quality) (Ozone) Rules 2004 (Government of Gibraltar, 2004). The air quality objectives have the same numerical values as the limit values in Table AQ2.1.

Critical Loads

2.11 Critical loads are the deposition fluxes (e.g. expressed as kg Nitrogen/hectare/year) below which significant harmful effects to sensitive ecosystems are unlikely to occur.

2.12 The potential for exceedences of the critical loads is typically considered in the context of the level of protection afforded to the ecological site as a whole. The critical loads relevant to this assessment are set out in Table AQ2.2. No estimate was available for an acid deposition critical load, and this has thus not been assessed.

Table AQ2.2: Relevant Critical Loads

Pollutant	Critical Load	Measured as
Nutrient Nitrogen Deposition Calcareous rocky slopes with chasmophytic vegetation	5	Annual mean
Olea and ceratonia forests	10	
Aborescemt matorral	15	
Acid Deposition	No estimate available	Annual mean

2.13 It must be emphasised that exceedence of the critical load does not provide a quantitative estimate of damage to an ecosystem, but only the potential for damage to occur. In addition, exceedence of the critical load may not be manifest in terms of actual ecosystem damage, as the timescales for effects to occur may be very long (10-100 years).

Habitats Directive

2.14 EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the “Habitats Directive”) requires member states to introduce

a range of measures for the protection of habitats and species. The Directive requires member states to provide the Commission with a list of sites which are important for the habitats or species; the Commission then designates worthy sites as Special Areas of Conservation. Directive 79/409/EEC on the Conservation of Wild Birds requires a similar designation of Special Protection Areas. Together, these sites for the "Natura 2000" network.

The Gibraltar Development Plan

2.15 The Gibraltar Development Plan (Government of Gibraltar, 2009) confirms the Government's objective to ensure that proposed developments do not have a significant adverse effect on Gibraltar's air quality. Policy ENV7 of the Plan requires that:

> *"Planning permission will only be granted for development proposals that could potentially have a significant adverse effect on air or water quality if it can be demonstrated, to the satisfaction of the competent authority, that appropriate mitigation measures can be implemented to minimise such effects."*
>
> (Government of Gibraltar, 2009:29)

Control of Dust Regulations

2.16 The Environment (Control of Dust) Regulations (Government of Gibraltar, 2010b) provides powers to control dust from construction sites and other similar activities. The Regulations note that before any of a list of activities (including demolition and construction) takes place, the Chief Environmental Health Officer must provide a certificate of approval. These regulations are accompanied by a Dust Best Practice Guide (Government of Gibraltar, 2010c), which sets out how dust emissions may be managed.

3 SCOPE AND METHODOLOGY

Scope

3.1 The scope of the assessment has been determined through a formal scoping process. An Environmental Scoping Report was prepared, and responses received from the Department of the Environment and Climate Change, the Gibraltar Environmental Agency and the Environmental Safety Group have been taken into consideration within this assessment.

3.2 The scope of work has been informed by:

- a review of existing air quality data for the area surrounding the site;
- a desk study to confirm the locations of receptors that may be sensitive to changes in local air quality.

3.3 During the construction phase, the assessment considers the potential for dust being generated by on-site works and from material tracked along local roads. During the operational phase the assessment considers the potential impacts of exhaust emissions from the power station on local air quality.

3.4 During the construction phase, there will be no more than 20 additional HGV movements per day. During the operational phase, there will be no additional HGV movements (associated with the delivery of fuel to the site) than exist at present. Guidance issued by Environmental Protection UK and the Institute of Air Quality Management (Moorcroft and Barrowcliffe et al, 2015) indicates that any increase in HGV movements below 25 per day can be screened out as insignificant. No further consideration is therefore given to HGV movements.

Pollutants of Concern

3.5 The principal pollutants of concern in relation to construction activities are dust and PM_{10}. The principal pollutants of concern in relation to the operation of the power station are ambient concentrations of nitrogen oxides (NOx), nitrogen dioxide (NO_2), fine particles (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2) and carbon monoxide (CO), and deposition rates (fluxes) of nitrogen and sulphur. The assessment therefore focuses on these pollutants.

Assessment Scenarios

3.6 The proposed power station will consist of six generating units: three fuelled by natural gas, and three duel-fuelled units, operating primarily on natural gas with diesel as back-up fuel. All engines will run on gas unless there are abnormal conditions during which diesel has to be used. There will not be a combination of fuels used at any one time. A maximum of four generating units will operate at any one time, with one generating set on standby, and the other available for routine maintenance.

3.7 'Normal' operation in 2017 onwards is assumed to consist of one dual-fuelled and three gas-fired generators operating on natural gas to produce up to up to 42 MW. The future 'normal' operation is assumed to consist of two gas fired and three duel-fuelled generators operating on natural gas to produce up to 51 MW.

3.8 During abnormal conditions when the generators are run on diesel fuel, it has been assumed that all three dual-fuelled units will operate at 100% load.

3.9 The following worst-case assessment scenarios have been considered:

- 'Scenario 1' assumes a realistic worst-case scenario of one gas-fired and three dual-fuelled generators operating on natural gas at 75% capacity.
- 'Scenario 2' assumes a realistic worst-case scenario of two gas-fired and three dual-fuelled generators operating on natural gas at 75% capacity when an additional engine will be installed.
- 'Scenario 3' assumes worst-case scenario of all three dual-fuelled generators operating on diesel at 100% capacity.

3.10 An assessment of normal operation on diesel fuel has not been undertaken as this type of operation has been reserved for abnormal situations only (when gas is not available), and will only be short lived. Thus, Scenario 3 is only considered with regard to the short-term pollutant concentrations (e.g. the 1-hour and 8-hour means).

Waterport Power Station

3.11 The existing power station at Waterport (located approximately 400 metres (m) to the southeast of the site) will cease operations once the North Mole Power Station has completed its testing phase. Emissions from this power station contribute to the existing baseline conditions. To account for the Waterport

Power Station, the emissions have been explicitly modelled and removed from the future baseline.

Assessment Methodology (Construction Phase)

3.12 The construction dust assessment considers the potential for impacts within 350 m of the site boundary; or within 50 m of roads used by construction vehicles. The assessment methodology is that provided by the IAQM (Institute of Air Quality Management, 2014). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant effects. Appendix AQII explains the approach in more detail.

Assessment Methodology (Operational Phase)

3.13 The approach used to assess the potential air quality impacts of the proposed scheme has been based on methodologies that are widely used in the UK and elsewhere.

Sensitive Locations

3.14 Pollutant concentrations have been predicted at a number of sensitive receptor locations where impacts of emissions from the power station stacks are expected to be the greatest. Consideration has also been given to exposure at height, for example within the upper floors of the Waterport Terraces apartment blocks. The receptor locations are shown in Figure AQ3.1.

3.15 Concentrations have also been predicted across a Cartesian grid of receptors positioned 1.5 m above ground to represent a typical outdoor breathing height and a typical height from which deposition fluxes are typically calculated. The results have been used to plot isopleths of concentrations in the vicinity of the proposed power station and within the Rock SAC/SPA.

3.16 In addition to these existing receptors, there are a number of consented or proposed developments in the vicinity of the proposed power station. A number of these (e.g. the North Mole Industrial Park, North Mole Sullage Plant) are related to commercial or industrial use and do not represent relevant exposure for the air quality criteria for the protection of human health. For others (e.g. the Coaling Island Boats Marina, North Mole Reclamation, Western Beach Basin and Coaling Island Reclamation) there is insufficient detail regarding the timelines or precise nature of the developments to warrant inclusion of specific receptors, but all of these areas are included within the gridded outputs (shown as the pollutant isopleths) and are thus explicitly considered in the assessment.

Modelling Methodology

3.17 The impacts of emissions from the proposed power station and Waterport power station have been modelled using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. It is widely used by the UK regulatory agencies for assessments of industrial processes. The effects of complex terrain (based on calculation of flow field and turbulence field), as well as entrainment of the plume into the wake of adjacent buildings have been simulated within the model. Further details of the model set up, including the model input parameters, are provided in Appendix III.

3.18 Deposition fluxes have been calculated from the predicted concentrations of NO_2. Details on the method for calculating the deposition rates are provided in Appendix III.

Background Pollutant Contributions

3.19 The dispersion model predicts the contributions from the emissions sources that are explicitly included in the model. It is also necessary to take account of the concentrations due to other sources, which are represented in the local background. These background concentrations must be added to the process contributions to provide the total 'with scheme' concentrations.

3.20 Background concentrations of NOx, NO_2, SO_2, PM_{10} and $PM_{2.5}$ have been derived from local monitoring carried out by the Environmental Agency. These data are described in Section 4. In terms of the critical loads, there are no data to describe existing deposition rates across The Rock SAC/SPA, and this necessarily remains unquantified.

3.21 In order to avoid double counting the contribution of the existing Waterport Power Station, when predicting total concentrations, the modelled contribution from Waterport at each monitoring site has been removed from the measurements.

3.22 Predicted annual mean and long-term (24-hour mean) process concentrations have been added directly to the assumed annual mean background concentration. For the short-term process concentrations, the approach recommended in Environment Agency EPR H1 (Environment Agency, 2002) has been used, which adds the relevant process contribution to twice the annual mean background.

3.23 As can be seen from the data in Section 4, there is very little evidence of a downward trend in pollutant concentrations, and it has been assumed that concentrations in 2017 are unchanged from current levels. Pollutant concentrations in 2027 are also assumed to remain unchanged, but it should be recognised that this represents a very conservative assumption, as emissions are expected to decline in future years.

3.24 The assessment of the baseline has been agreed by the government's air quality monitoring consultant and approved by the Department of the Environment and Climate Change.

Significance

3.25 It is important to differentiate between the terms impact and effect with respect to the assessment of air quality. The term impact is used to describe a change in pollutant concentration or deposition rate at a specific location. The term effect is used to describe an environmental response resulting from an impact, or series of impacts. Within this chapter, the air quality assessment has used published guidance and criteria to determine the likely air quality impacts at a number of sensitive locations. The potential significance of effects has then

been determined by professional judgement, based on the frequency, duration and magnitude of predicted impacts and their relationship to appropriate air quality criteria, taking account of the extent of any worst-case assumptions.

3.26 Guidance from the United Kingdom (UK) Environment Agency (Environment Agency, 2002) suggests that process source contributions are unlikely to have significant environmental impacts where the source contribution is:

- Less than 1% of the long-term criterion;
- Less than 20% of the short-term criterion.

3.27 Where potential environmental impacts are indicated, it is then recommended that account be taken of the estimated background contribution. However, this does not imply that significant effects would necessarily occur at higher process contributions.

3.28 The following significance criteria have been applied to this assessment:

- No significance - predicted concentrations are below relevant criteria and there will be no significant effects;
- Medium significance - potential to exceed relevant criteria, depending on existing background concentrations. Not considered likely that significant effects will occur; and
- High significance - predicted concentrations exceed the relevant criteria, and there are expected to be significant effects.

Assumptions and Limitations

3.29 In the course of carrying out this air quality assessment, it has been necessary to make various assumptions regarding existing and future air quality conditions, and the operations of the proposed emissions sources. Wherever possible, this has been based on worst-case assumptions, such that any predicted impacts are likely to be overstated.

3.30 In the absence of any automatic monitoring stations in the vicinity of the site, reliance has necessarily been placed on diffusion tubes to describe NO_2 concentrations, which are subject to greater uncertainty; in addition, monitoring carried out by diffusion tubes does not meet the Data Quality Objectives cited in the Directive, and concentrations measured using this method cannot be used to determine compliance with the limit value. Background concentrations of other pollutants are based on the Rosia Road automatic monitoring station,

which is a roadside site; this is likely to overestimate the pollution climate in the North Mole area. In the absence of suitable mechanisms to forecast background pollutant concentrations in future years, it has been assumed that levels remain unchanged, although in practice they are likely to decline, especially by 2027.

3.31 There are many components that contribute to the uncertainty of modelling predictions. For industrial point-source releases it is generally possible to quantify the emissions releases with greater accuracy than is the case for many other source types. The emissions releases have been based on information provided by Bouygues Energies and Services.

3.32 There will be additional uncertainties introduced because the model simplifies real-world processes into a series of algorithms. Where there are complex topographical features and buildings, this will introduce additional uncertainty, as it is not possible to accurately represent the complex wind field patterns with Gaussian-type models.

3.33 Whilst the model has been extensively validated, it has not been possible to undertake any detailed local verification studies, and it not possible to quantify the uncertainty of the predictions beyond that normally expected for this type of study.

4 EXISTING CONDITIONS

Site Description

4.1 The quay on North Mole is used for cruise ships, cargo handling and bunkering. Currently, the western part of the proposed development site is occupied by five (5.1MW), temporary diesel-fuelled generators that were installed in December 2012. The eastern part of the proposed development site is occupied by a further 16 diesel fuelled Caterpillar (1.4MW) temporary generating sets. This generating capacity will contribute to existing pollutant concentrations, but it is not known at what capacity these units are operating. Decommissioning of these units will improve baseline air quality conditions in future years, but it is not practicable to qualify the impact. To account for this, monitoring data in 2014 (after the 16 Caterpillar units were commissioned) have been discounted from the assessment.

Reported Exceedences of the Limit Values

4.2 The HM Government of Gibraltar applied to the EC for time extensions to achieve the 24-hr mean PM_{10} and annual mean NO_2 limit values. The 24-hr mean PM_{10} was rejected on the grounds that the EC did not believe that the limit value was being exceeded (once the appropriate corrections were applied). The annual mean NO_2 limit extension was granted, but has now expired.

4.3 In 2011, the Government submitted an update to its Time Extension Notification (TEN) (Government of Gibraltar, 2011). This explained that the 24-hour mean PM_{10} and annual mean NO_2 limit values were both exceeded in 2010. It pointed out that wind-blown dust from a construction site represented the major source driving the measured PM_{10} exceedence and that, whilst policy measures have been put into effect to control this source (see Appendix I), unavoidable delays in implementing the main policy measure caused the 2010 exceedence.

4.4 In terms of NO_2, the 2011 TEN update predicted that the anticipated closure of the Ormrod Electricity Supply Company Limited (OESCO) Power Station and Inter Services Generating Station (ISGS) would result in compliance with the

Directive (but no account was taken of the replacement power plant assessed within this ES Chapter).

Natura 2000 in Gibraltar

4.5 Gibraltar currently has two sites within the Natura 2000 network, covering a total of 5,687 ha. Both of these sites have been classified as an SPA and SAC.

Air Quality Monitoring

4.6 Information on existing air quality has been derived from monitoring carried out by the Environmental Agency in Gibraltar. There are three continuous (automatic) monitoring stations, at Rosia Road, Withams Road, and Bleak House (Figure AQ4.1).

4.7 Rosia Road is a roadside site within the commercial centre of Gibraltar, approximately 2 kilometres (km) southeast of the proposed North Mole Power Station. Withams Road is also a roadside site, within the urban area 2.5 km southeast of the proposed power station. Bleak House is a background site close to the southern tip of Gibraltar, approximately 4 km southeast of the proposed power station.

4.8 A summary of air quality monitoring data for 2008 to 2014 is provided in Table AQ4.1. The PM_{10} data reported have been adjusted by the Government of Gibraltar to take account of natural source contributions. HM Government of Gibraltar has not yet published this correction for 2014, and so the 2014 PM_{10} data are not shown.

Table AQ4.1: Summary of Automatic Monitoring Data in Gibraltar (µg/m^3)

Site	Name	2008	2009	2010	2011	2012	2013	2014
Annual Mean Nitrogen Dioxide								
A	Bleak House	25.7	26.4	25.6	27.0	27.3	22.3	24.6
B	Rosia Road	**44.7**	**47.7**	**48.1**	**48.8**	**45.5**	**43.6**	**54.4**
C	Withams Road	**52.6**	**56.6**	**54.7**	**56.2**	**53.9**	**48.6**	**46.9**
Number of 1-hour Nitrogen Dioxide Exceedences								
A	Bleak House	0	0	0	0	0	0	0
B	Rosia Road	0	0	3	0	0	3	3
C	Withams Road	na	0	0	0	0	0	0

Site	Name	2008	2009	2010	2011	2012	2013	2014
Annual Mean Nitrogen Oxides								
A	Bleak House	39.2	41.8	38.3	42.1	43.1	33.9	38.2
B	Rosia Road	89.1	97.5	94.7	96.2	94.3	85	111.6
C	Withams Road	149.0	153.5	148.5	149.7	152.7	131.3	126.3
Annual Mean PM_{10}								
A	Bleak House	27-	24[a]	29[a]	28[a]	21[a]	25[a]	na
B	Rosia Road	35[a]	35[a]	39[a]	34[b]	26[b]	30[b]	na
Number of 24-hour PM_{10} Exceedences								
A	Bleak House	3[a]	0[a]	7[a]	2[a]	3[a]	1[a]	na
B	Rosia Road	**36[a]**	15[a]	**55[a]**	25[b]	5[b]	12[b]	na
Annual mean $PM_{2.5}$								
B	Rosia Road	15.8	16.0	14.6	14.8	15.3	14.6	14.7
Annual Mean Sulphur Dioxide								
B	Rosia Road	11.5	14.1	8.9	9	9.6	7	10.2
Number of 1-hour Sulphur Dioxide Exceedences								
B	Rosia Road	0	0	0	0	0	0	0
Number of 24-hour Sulphur Dioxide Exceedences								
B	Rosia Road	0	0	0	0	0	0	0
Maximum Running 8-hour Mean CO								
B	Rosia Road	5,500	4,600	3,600	3,700	5,000	3,800	4,100

Limit value exceedences shown in bold. Nitrogen oxides, dioxide, sulphur dioxide and carbon monoxide data downloaded from the http://www.gibraltarairquality.gi/ website. PM_{10} data taken from the series of reports detailing the quantification and correction of natural particulate matter in Gibraltar (AEA, 2009 – 2012 and Ricardo-AEA, 2013 and 2014). na = not available.

[a] Corrected mass concentration after application of African dust correction factor.

[b] Corrected mass concentration after application of African dust and sea salt correction factor.

4.9 The limit value for annual mean NO_2 concentrations has been exceeded in each year at both roadside automatic monitors. Concentrations at Withams Road in 2013 and 2014 were marginally lower than in previous years, but the measured concentration at Rosia Road in 2014 was higher than any of the other years reported. There continue to be no reported exceedences of the 1-hour mean limit value. Measured concentrations at Bleak House are much lower reflecting its suburban location.

4.10 While the measured annual mean NOx concentrations were above the critical level at all three monitoring sites, as set out in Section 2, the critical level does not strictly apply in Gibraltar.

4.11 Recent measured annual mean PM_{10} concentrations have been below the limit value, and there have been no reported exceedences of the 24-hour mean PM_{10} limit value since 2010 (at Rosia Road), once corrections for natural sources are applied.

4.12 Measured SO_2 concentrations have been consistently below both the limit values and the critical level. Measured CO concentrations have remained well below the running 8-hour mean limit value.

4.13 The Environmental Agency also operates a network of passive NO_2 diffusion tubes across Gibraltar. The locations of these monitors are shown in Figure AQ4.2. Recent measurements from these sites are summarised in Table AQ4.2. Widespread exceedences of the annual mean NO_2 limit value have been recorded over a number of years.[a] The nearest diffusion tube monitor to the proposed North Mole power station is Site 12 'Harbour Views', where concentrations increased in 2014 to 50.9 µg/m^3, and exceeded the limit value by a considerable margin; as set out in Section 3, this increase in measured concentrations is likely to be strongly influenced by the commissioning of the temporary generators, and will not reflect baseline conditions in the future.

Table AQ4.2: Summary of Annual Mean NO_2 Diffusion Tube Results (µg/m^3)

Site	Name	2008	2009	2010	2011	2012	2013	2014
1	Alameda Gardens Access Road	36.6	39.3	39.7	42.7	41.0	35.1	42.0
2	Alameda Gardens Theatre	36.7	40.9	42.1	44.1	41.7	34.5	42.0
3	Anchorage Rosia Road	51.8	52.1	51.1	52.4	52.5	46.7	59.6
4	Bleak House	34.8	26.2	25.7	25.7	27.3	21.8	24.6
5	Churchill House	58.5	63.7	60.1	69.9	59.4	52.7	58.1
6	Devils Tower Road	47.7	47.8	57.1	49.9	43.2	36.2	43.8
7	Dockyard Road	52.5	59.3	59.5	66.8	56.3	50.5	60.2
8	Gardiners Road	36.5	42.3	41.9	43.2	42.1	36.2	45.8
9	George Don House	39.2	43.7	43.9	40.7	44.7	39.0	52.1
10	Glacis Road	55.1	58.8	59.2	53.0	57.1	52.9	67.3

[a] Whilst passive diffusion tubes provide additional information on spatial variation of NO_2 concentrations, the method does not comply with the Data Quality Objectives of Directive 2008/50/EC, and so the data cannot strictly be used to assess exceedences of the limit value.

[2] For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from large sites,

Site	Name	2008	2009	2010	2011	2012	2013	2014
11	Governors Meadow House	49.5	56.0	55.4	60.2	52.8	45.5	55.9
12	Harbour Views	39.0	39.4	42.2	38.8	38.9	34.0	50.9
13	Jumpers	61.1	63.8	63.7	66.2	61.0	56.4	65.9
14	Lathbury Industrial Park	34.2	27.6	26.3	27.2	27.6	21.0	23.1
15	Lime Kiln Road	41.1	45.3	46.6	45.2	43.0	38.8	51.2
16	Main Street	37.2	38.1	36.9	36.7	39.0	34.1	45.8
17	Prince Edwards Road	43.0	47.1	48.2	45.8	47.7	40.3	56.7
18	Queensway	37.2	40.6	39.3	41.3	46.7	41.3	56.8
19	Red Sands Road	48.6	51.8	52.7	54.2	48.7	45.3	55.2
20	Rock Hotel	53.9	55.7	53.7	58.3	55.3	49.4	59.0
21	Rosia Promenade	44.8	48.3	50.1	50.6	48.5	43.0	59.4
22	Rosia Road	45.6	45.6	48.3	47.6	48.6	42.2	53.8
23	South Barracks Road	53.0	61.3	61.1	58.6	54.3	57.0	64.0
24	Sundial Roundabout	52.9	57.2	59.5	55.4	55.1	47.1	60.1
25	Upper Withams Entrance	51.5	57.4	56.6	60.6	54.7	49.6	56.8
26	Water Gardens	44.6	49.1	48.6	46.8	51.5	45.7	61.7
27	Woodford Cottage	52.0	56.8	57.8	61.4	54.5	51.0	57.5

[a] All data downloaded from the http://www.gibraltarairquality.gi/ website.

5 FUTURE BASELINE

5.1 The baseline pollutant concentrations assumed for both 2017 and 2027 are shown summarised in Table AQ5.1.

Table AQ5.1 Baseline Pollutant Concentrations (2017 and 2027)

Pollutant	Metric	Value	Derivation [a]
Nitrogen dioxide	Annual Mean	38.1	Harbour View Diffusion Tube[b]
Nitrogen oxides	Annual Mean	92.6	Rosia Road[c]
PM_{10}	Annual Mean	33.2	Rosia Road[c]
$PM_{2.5}$	Annual Mean	15.3	Rosia Road[c]
Sulphur dioxide	Annual Mean	9.8	Rosia Road[c]
Carbon monoxide	Maximum running 8-hour mean	4,367	Rosia Road[c]

[a] The derivation includes the subtraction of predicted concentrations associated with the Waterport Power Station.

[b] Average concentration measured over 2009-2013

[c] Average concentration measured over 2009-2013

6 POTENTIAL IMPACTS

Construction

6.1 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. The construction works are expected to last for a period of 24 months.

Potential Dust Emission Magnitude

Demolition

6.2 There is no requirement for demolition on site.

Earthworks

6.3 The site covers some 12,500 m^2 and most of this will be subject to earthworks, involving removing the foundations of the old buildings and breaking up of paved areas. The earthworks will be carried out using conventional construction equipment. Dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials. The soil at the development site mainly consists of concrete over sandy subsoil. It is considered that, when dry, this soil has the potential to be slightly dusty. Based on the example definitions set out in Table AQ-A2.1, the dust emission class for earthworks is considered to be medium.

Construction

6.4 Construction will involve the power station building, an administration building and associated infrastructure. The building structures will be prefabricated, to help minimise dusty activities onsite. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. The construction may include piling and concrete batching. Based on the example definitions set out in Table AQ-A2.1, the dust emission class for construction is considered to be medium.

Trackout

6.5 The number of vehicles accessing the site, which may track out dust and dirt is currently unknown, but is expected that there will be a maximum of 10 outward

heavy vehicle movements per day. Based on the example definitions set out in Table AQ-A2.1, the dust emission class for trackout is considered to be small.

6.6 Table AQ6.1 summarises the dust emission magnitude for the proposed development.

Table AQ6.1 Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Earthworks	Medium
Construction	Medium
Trackout	Small

Sensitivity of the Area

6.7 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

Sensitivity of the Area to Effects from Dust Soiling

6.8 The IAQM guidance explains that residential properties are 'high' sensitivity receptors to dust soiling, while the industrial properties are a 'low' sensitivity receptor (Table AQ-A2.2). There is one residential property within 20 m of the site (see Figure AQ6.1). Using the matrix set out in AQ-A2.3, the area surrounding the onsite works is of 'medium' sensitivity to dust soiling. Table AQ6.1 shows that dust emission magnitude for trackout is 'small' and AQ-A2.3 thus explains that there is a risk of material being tracked 50 m from the site exit. There is one residential property within 20 m of the roads along which material could be tracked (see Figure AQ6.2), and AQ-A2.3 thus indicates that the area is of 'medium' sensitivity to dust soiling due to trackout (Table AQ6.2).

Sensitivity of the Area to any Human Health Effects

6.9 Residential properties are also classified as being of 'high' sensitivity to human health effects. The matrix in Table AQ-A2.4 requires information on the baseline annual mean PM_{10} concentration in the area. It is considered that the

baseline PM_{10} concentration in Table AQ5.1 will best represent conditions near to the site. Using the matrix in AQ-A2.4, the area surrounding the onsite works and the area surrounding roads along which material may be tracked from the site, are of high' sensitivity to human health effects (Table AQ6.2).

Sensitivity of the Area to any Ecological Effects

6.10 The guidance only considers designated ecological sites within 50 m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50 m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

Table AQ6.2 Summary of the Area Sensitivity

Effects Associated With:	Sensitivity of the Surrounding Area	
	On-site Works	Trackout
Dust Soiling	Medium Sensitivity	Medium Sensitivity
Human Health	High Sensitivity	High Sensitivity

Risk and Significance

6.11 The dust emission magnitudes in Table AQ6.1 have been combined with the sensitivities of the area in Table AQ6.2 using the matrix in Table AQ-A2.5, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table AQ6.3. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 8.

Table AQ6.3 Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Earthworks	Medium Risk	Medium Risk
Construction	Medium Risk	Medium Risk
Trackout	Negligible	Low Risk

6.12 The IAQM does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear

that the residual effect will normally not be significant (Institute of Air Quality Management, 2014).

Operation

Health

6.13 Concentrations have been predicted at 24 specific receptor locations representing the façades of local properties at a range of heights, and for a gridded area covering all of Gibraltar and part of Spain.

6.14 The predicted pollutant contributions associated with emissions from the power station are shown in Table AQ6.4. The maximum contributions at the specific receptor locations and within the gridded area are provided, for any of the three meteorological years considered.

Table AQ6.4 Predicted Pollutant Process Contributions (2017, 2027 and Diesel Backup) [a]

Pollutant / Metric	Maximum Process Contribution						Limit
	Scenario 1		Scenario 2		Scenario 3[c]		
	µg/m^3	% of Limit	µg/m^3	% of Limit	µg/m^3	% of Limit	
Specific Receptor Locations							
Nitrogen dioxide annual mean	1.8	**4.6**	1.7	**4.1**	n/a	n/a	40
Nitrogen dioxide 99.8th percentile of 1-hour means	18.7	9.4	18.2	9.1	17.4	8.7	200
PM_{10} annual mean	1.2	**3.1**	1.6	**4.0**	n/a	n/a	40
PM_{10} 90.4th percentile of 24-hour means	3.2	6.4	4.2	8.4	14.4	**28.9**	50
$PM_{2.5}$ annual mean	1.2	**4.9**	1.6	**6.4**	n/a	n/a	25
Sulphur dioxide 99.7th percentile of 1-hour means	1.1	0.3	1.4	0.4	37.8	**10.8**	350
Sulphur dioxide 99.2nd percentile of 24-hour means	0.8	0.6	1.0	0.8	17.3	**13.9**	125
Carbon monoxide 100th percentile of daily maximum running 8-hour means	196.1	2.0	206.3	2.1	35.4	0.4	10,000
Gridded Area							
Nitrogen dioxide	1.9	**4.7**	1.9	**4.6**	n/a	n/a	40

Pollutant / Metric	Maximum Process Contribution						Limit
	Scenario 1		Scenario 2		Scenario 3[c]		
	µg/m^3	% of Limit	µg/m^3	% of Limit	µg/m^3	% of Limit	
annual mean							
Nitrogen dioxide 99.8th percentile of 1-hour means	n/a [b]	n/a [b]	n/a [b]	n/a [b]	n/a [b]	n/a [b]	200
PM_{10} annual mean	1.4	**3.4**	1.8	**4.4**	n/a	n/a	40
PM_{10} 90.4th percentile of 24-hour means	5.1	**10.1**	6.4	**12.7**	25.3	**50.7**	50
$PM_{2.5}$ annual mean	1.4	**5.5**	1.8	**7.0**	n/a	n/a	25
Sulphur dioxide 99.7th percentile of 1-hour means	2.2	0.6	2.9	0.8	60.3	**17.2**	350
Sulphur dioxide 99.2nd percentile of 24-hour means	1.6	1.3	2.0	1.6	43.6	**34.9**	125
Carbon monoxide 100th percentile of daily maximum running 8-hour means	344.4	3.4	407.6	4.1	52.1	0.5	10,000

[a] Values above the screening criteria shown in bold.

[b] It is not possible to generate this statistic for the entire gridded area

[c] Predicted concentrations have not been compared to the annual mean assessment criteria as emissions from Scenario 3 will only be for a limited period of the year under abnormal conditions.

6.15 These predicted maximum concentration can be compared with the screening criteria recommended by the Environment Agency, as previously described in Section 2.

Scenario 1

6.16 The predicted maximum sulphur dioxide, carbon monoxide and 1-hour mean nitrogen dioxide concentrations are below the screening criteria. Significant impacts from the power station can thus be discounted for these pollutants in 2017.

6.17 The predicted maximum annual mean nitrogen dioxide, annual mean $PM_{2.5}$, annual mean PM_{10} and 24-hour mean PM_{10} concentrations are above the screening criteria. These pollutants therefore require further assessment.

Scenario 2

6.18 The predicted maximum sulphur dioxide, carbon monoxide and 1-hour mean nitrogen dioxide concentrations are below the screening criteria. Significant impacts from the power station can thus be discounted for these pollutants in 2027.

6.19 The predicted maximum annual mean nitrogen dioxide, annual mean $PM_{2.5}$, annual mean PM_{10} and 24-hour mean PM_{10} concentrations are above the screening criteria. These pollutants therefore require further assessment.

Diesel Backup – Scenario 3

6.20 The predicted maximum nitrogen dioxide and carbon monoxide concentrations are below the screening criteria. Significant impacts from the power station can thus be discounted for of these pollutants if the diesel backup is used.

6.21 The predicted maximum 24-hour mean PM_{10} concentrations as well as the 1-hour and 24-hour mean sulphur dioxide concentrations are above the screening criteria. These pollutants therefore require further assessment.

Further Assessment

6.22 The predicted process contributions of nitrogen dioxide associated with the power station are presented in Figure AQ6.3 and Figure AQ6.4 for 2017 and 2027, respectively. These show that contributions are greatest to the east and west of the power station, following the predominant wind directions in Gibraltar (see Figure AQ-A3.1). The predicted process contributions of nitrogen dioxide are above the screening criterion across most of Gibraltar and part of Spain.

6.23 Figure AQ6.5 shows those areas where the process contributions of annual mean $PM_{2.5}$ concentrations are above the screening criterion in 2017 and 2027. These areas include residential properties to the east of the power station as well as a sports complex and a large number of ships and boats.

6.24 Figures AQ6.6 and Figure AQ6.7 show those areas where the process contributions of annual mean and 24-hour mean PM_{10} concentrations are above the screening criteria. For the annual mean PM_{10} process contributions,

the areas include a number of residential flats to the east of the power station as well as a few ships that may remain in the docks for long durations. For the 24-hour mean PM_{10} process contribution, only small areas in close proximity to the power station are above the screening criterion in 2017 and 2027. These areas do not include any residential properties or ships.

6.25 For Scenario 3 (use of diesel fuel under abnormal conditions), a larger area, covering both residential flats to the east of the power station and ships, may experience significant 24-hour mean PM_{10} impacts, as shown in Figure AQ6.7. There are also potentially significant impacts of sulphur dioxide close to the power station, as shown in Figure AQ6.8. The area where the screening criterion is exceeded for the 1-hour mean sulphur dioxide process contributions does not include any residential properties, but does include some ships and areas of the dock where people may be present for a sufficient time. The area where the screening criterion for the 24-hour mean sulphur dioxide process contribution is exceeded includes residential flats to the east of the power station as well as some ships.

6.26 To provide a more detailed assessment of these potential impacts, the process contributions have been added to the baseline concentrations to derive the total pollutant concentrations. The maximum total pollutant concentrations are set out in Table AQ6.5 for both the specific receptor locations and across the gridded area.

Table AQ6.5 Predicted Total Air Quality Concentrations (µg/m^3) Relevant to Human Health (2017, 2027 and Diesel Backup)

Pollutant / Metric	Maximum Total Concentration			Limit
	Scenario 1	Scenario 2	Scenario 3	
Specific Receptor Locations				
Nitrogen dioxide annual mean	40.0	39.8	n/a	40
PM_{10} annual mean	34.4	34.8	n/a	40
PM_{10} 90.4th percentile of 24-hour means	n/a	n/a	47.6	50
$PM_{2.5}$ annual mean	16.5	16.9	n/a	25
Sulphur dioxide 99.7th percentile of 1-hour means	n/a	n/a	82.1	350
Sulphur dioxide 99.2th percentile of 24-hour means	n/a	n/a	42.7	125

Pollutant / Metric	Maximum Total Concentration			Limit
	Scenario 1	Scenario 2	Scenario 3	
Gridded Area				
Nitrogen dioxide annual mean	40.0	40.0	n/a	40
PM_{10} annual mean	39.6	40.0	n/a	40
PM_{10} 90.4th percentile of 24-hour means	38.2	39.5	**58.5**	50
$PM_{2.5}$ annual mean	16.7	17.1	n/a	25
Sulphur dioxide 99.7th percentile of 1-hour means	n/a	n/a	84.3	350
Sulphur dioxide 99.2th percentile of 24-hour means	n/a	n/a	63.2	125

6.27 Table AQ6.5 shows the total (process contribution plus background) concentrations are below the limit values for all pollutants, except for the 24-hour mean for PM_{10} for Scenario 3. This predicted exceedence is founded on two very worst-case assumptions; that the proposed power station would operate on diesel fuel for more than 35 days in a year, and that background concentrations across the North Mole area are represented by Rosia Road (which is a roadside site, strongly affected by road traffic emissions). Taking these two factors into consideration, it is considered unlikely that operation under abnormal conditions of diesel fuel would cause the 24-hour mean criterion to be exceeded.

Ecosystems

6.28 The predicted nitrogen oxides and sulphur dioxide concentrations and rates of nutrient and acid nitrogen deposition associated with emissions from the power station are provided in Table AQ6.6. The maximum predicted concentrations and deposition rates at the Rock of Gibraltar SAC/SPA are provided, for any of the three meteorological years considered.

Table AQ6.6: Predicted Maximum Pollutant Concentrations and Deposition associated with Power Station Emissions, Relevant to Impacts on Vegetation and Ecosystems

Pollutant/Averaging Period	Maximum Process Contribution						Level
	Scenario 1		Scenario 2		Scenario 3		
	Value	% of Level	Value	% of Level	Value	% of Level	
Annual Mean Nitrogen Oxides (µg/m^3)	0.4	**1.2**	0.3	**1.1**	n/a	n/a	30
24hr-mean Nitrogen Oxides (µg/m^3)	2.2	2.9	2.4	3.2	1.5	2.0	75
Annual Mean Sulphur Dioxide (µg/m^3)	0.1	0.4	0.1	0.6	n/a	n/a	20
Annual Mean Nutrient Nitrogen Deposition Rate on Grasslands (kg-N/ha/yr)	0.2	**4.1**	0.2	**4.0**	0.2	**3.8**	5
Annual Mean Nutrient Nitrogen Deposition Rate on Forests (kg-N/ha/yr)	0.4	**4.1**	0.4	**4.0**	0.4	**3.8**	10

[a] Values above the screening criteria shown in bold.

6.29 These predicted maximum concentrations can be compared with the screening criteria recommended by the Environment Agency, as previously described in Section 2, and the following conclusions can be drawn:

- the predicted maxima annual mean nitrogen oxide concentration (1.2% of the objective) is above the screening criterion (1%);
- the predicted maximum 24-hour mean nitrogen oxide concentrations (2.9% of the objective) is well below the screening criterion (10%).
- the predicted maxima annual mean sulphur dioxide concentration (0.6% of the objective) is below the screening criterion (1%); and
- the predicted maxima annual mean nutrient nitrogen deposition rate (4.1% of the objective) is above the screening criterion (1%).

6.30 The potential for significant impacts of 24-hour mean nitrogen oxides and annual mean sulphur dioxide concentrations from the power station can thus be discounted.

6.31 The predicted annual mean nitrogen oxides concentrations and the nutrient nitrogen deposition exceed the screening criterion and therefore require further assessment.

6.32 Figures AQ6.9 and Figure AQ6.10 show the areas affected by nitrogen oxides concentrations above the 1% screening criterion, for 2017 and 2027 respectively.

6.33 The maximum contribution of annual mean nitrogen oxides concentrations has been added to the ambient background concentration to derive the total concentration at the SAC/SPA. Similarly, the maximum nutrient nitrogen deposition contribution from the power station has been added to the background to provide the total nutrient nitrogen deposition. These total values are presented in Table AQ6.7.

Table AQ6.7: Predicted Maximum Pollutant Concentrations and Deposition Rates, Relevant to Vegetation Resulting from Power Station Emissions Combined with Background

Pollutant/Averaging Period	Maximum Total Concentration			Level
	Scenario 1	Scenario 2	Scenario 3	
Annual Mean Nitrogen Oxides (µg/m^3)	**93.0**	**93.0**	n/a	30
Annual Mean Nutrient Nitrogen Deposition Rate on Grasslands (kg-N/ha/yr)	**5.7**	**5.7**	**5.7**	5
Annual Mean Nutrient Nitrogen Deposition Rate on Forests (kg-N/ha/yr)	**11.4**	**11.4**	**11.4**	10

[a]The total nitrogen oxides concentration is made up of the process contribution and the background concentration from the Bleak House monitoring site.

[b] The nutrient nitrogen deposition rates are made up of the process contribution and a deposition rate derived from the nitrogen dioxide concentration measured at Harbour Views.

[c] The nutrient nitrogen deposition rates are for nitrogen dioxide deposition only. Other reactive species of nitrogen, from long-range transport, will mean that the total deposition rates are higher than shown.

6.34 The significance of these predicted total concentrations and deposition rates is quantified in Chapter 12 (Ecology and Nature Conservation).

7 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS

7.1 This section provides a summary of the potential significant effects based on the impacts described in Section 6.

Construction

7.2 Without mitigation, the construction works are considered to be **medium risk**. However, IAQM does not provide a method for assessing the significance of effects before mitigation, and advises the pre-mitigation significance should not be determined. The significance of effects after mitigation are described in Section 8 – Residual Effects.

Operation

7.3 There are no predicted exceedences of the criteria set for the protection of human health under any of the scenarios tested. It is concluded that the operational effects with regard to human health are of **no significance**, based on the criteria described in Section 3.

7.4 The addition of the power station emissions to background concentrations of NOx and nitrogen deposition rates has been quantified. The potential effects on ecosystems (the Gibraltar Rock SAC) is determined in Chapter 12: Ecology and Nature Conservation.

Transboundary

7.5 There are no predicted exceedences of the criteria set for the protection of human health at any location across the border with Gibraltar. It is concluded that the transboundary operational effects with regard to human health are **not significant**.

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS

Construction Mitigation

8.1 Measures to mitigate dust emissions will be required during the construction phase of the development in order to reduce impacts upon nearby sensitive receptors.

8.2 The site has been identified as a Medium Risk site during earthworks and construction, and Low Risk for trackout, as set out in Table AQ6.3. Comprehensive guidance has been published by IAQM (Institute of Air Quality Management, 2014) that describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on monitoring during demolition and construction (Institute of Air Quality Management, 2012b). This reflects best practice experience and has been used, together with the professional experience of the consultant and the findings of the dust impact assessment, to draw up a set of measures that will be incorporated into the specification for the works. These measures are described in Appendix IV.

8.3 The mitigation measures will be written into the dust control plan required under Gibraltar Regulations. This dust control plan will be submitted to the Chief Environmental Health Officer prior to issue of a certificate of approval.

8.4 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There will not be any excess to cause runoff.

8.5 With these mitigation measures in place it is predicted there will be **no residual significant effects** associated with air quality during construction.

Operational Mitigation

8.6 The proposed new power station will fully comply with European Directive 96/61/EC and local regulations covering Integrated Pollution Prevention and Control, and will operate under a permit issued by the Gibraltar Environmental Agency.

8.7 Mitigation by design is included in the scheme, by after-treatment of the exhaust gases. Selective Catalytic Reduction (SCR) will be used to reduce

NO_x emissions by 70% for the natural gas and by 87% for the dual-fuel generators in 2017, increasing to 75% reduction for natural gas and 89% reduction for dual-fuel generators after 2027 when the additional generator is commissioned.

Residual Significant Effects

8.8 With mitigation in place, IAQM recommends that the residual effects during construction will **not be significant**.

8.9 There are no predicted exceedences of the criteria set for the protection of human health during operation of the power station. Mitigation measures to abate emissions from the proposed power station are included by design. The residual effects are unchanged from Section 6, and are **not significant**.

8.10 The expected reductions in emissions with the decommissioning of the existing power supplies will result in net reductions in NO_x concentrations and nitrogen deposition rates across the Gibraltar Rock SAC. Small contributions to existing background NO_x and nitrogen deposition will occur across the SAC as a result of emissions from the power station. The effect of these increases is assessed in Chapter 12 (Ecology and Nature Conservation).

9 CONCLUSION

9.1 A detailed air quality assessment has been carried out to determine the potential significant effects of the proposed power station at North Mole.

9.2 Should the proposed power station be consented. the existing power station at Waterport will be decommissioned. The impact of the emissions from the existing Waterport Power Station have been considered and removed from future baseline conditions, since it will not be operational.

9.3 The construction works have the potential to generate emissions of dust. An assessment of the risk of impacts arising has been undertaken, and has been used to identify a range of appropriate mitigation measures. These measures will be incorporated into the dust control plan which will be submitted for approval by the Chief Environmental Health officer. With these mitigation measures in place, it is concluded that any effects will not be significant.

9.4 The proposed new power station will operate in accordance with local regulations regarding Integrated Pollution Prevention and Control, and will operate under permit from the Environmental Agency. The emissions of NO_x will be controlled by Selective Catalytic Reduction (SCR), which will abate the release by between 70% and 89%. The detailed modelling study has shown that the criteria set for the protection of human health will not be exceeded for any of the operating scenarios considered.

9.5 Existing and predicted future nitrogen oxides concentrations exceed the critical level in the baseline scenario (ie without the proposed power station). Emissions from the proposed power station will add to these concentrations. The effect of this is assessed in Chapter 13: Ecology and Nature Conservation.

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APPENDICES

APPENDIX AQ1 GIBRALTAR AIR QUALITY ACTION PLAN AND ACTION PLAN UPDATE

Air Quality Action Plan

The Gibraltar Air Quality Action Plan (Government of Gibraltar, 2010d) sets out the actions that Government is taking to reduce air pollution. It sets out how the Government will encourage other organisations and the business community to take action to improve air quality. The priority is to achieve the national objectives and EC limit values for PM10 and NO2 in the short to medium term.

The Action Plan consists of the following:

- Control of dust from unmade lands:
  - Unmade land has been identified as causing the greatest impact on measured PM_{10} in Gibraltar. Control of the unmade land will be exercised by the introduction of dust mitigation measures, or alternatively planting, landscaping or covering the land with hard standing dependant on its future use. Land is at a premium in Gibraltar and there are very few plots of unmade land.
- Control of re-suspended particulate matter from roads:
  - Increase the frequency of road sweeping. Increase the frequency of road flushing;
  - Stop using salt water for flushing purposes and use potable water;
  - Control of dust emissions from demolition and construction;
  - Introduction of new designated legislative instrument;
  - Introduction of a dust code of practice;
  - Expansion of monitoring programme to include analysis for sea salt.
- Traffic Management Plan:
  - Improve traffic fluidity;
  - Park-and-ride facilities to be built close to border;
  - Provide bicycle 'Take, Ride and Leave' facility;
  - Provision of free bus service on most bus routes.
- New Power Station:
  - The Action Plan states that three old power stations are being replaced with a single, more modern station and that this will reduce NO_x emissions.

The Action Plan states that the combination of measures listed above are anticipated to reduce PM10 concentrations to well below the limit values by the end of the time extension in 2011 (no PM10 exceedences have been recorded since this time) and to reduce NO2 concentrations to well below the limit values by 2015. It further states that once the limit values have been achieved the measures will continue in place to ensure that the improvements in air quality achieved are maintained.

APPENDIX AQ2 CONSTRUCTION DUST ASSESSMENT PROCEDURE

The criteria developed by IAQM divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition
- earthworks
- construction
- trackout.

The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is negligible and that any effects will not be significant. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the potential dust emission magnitude (Step 2A);
- The sensitivity of the area to dust effects (Step 2B).

These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

Dust emission magnitude is defined as either ‘Small’, ‘Medium’, or ‘Large’. The IAQM explains that this classification should be based on professional judgement, but provides the examples in Table AQ-A2.1.

Table AQ-A2.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
Demolition	
Large	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout [a]	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

The sensitivity of the area is defined taking account of a number of factors:

- The specific sensitivities (to dust) of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration;
- Site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

The first requirement is to determine the specific sensitivities of local receptors. The IAQM recommends that this should be based on professional judgment, taking account of the principles in Table AQ-A2.2. These receptor sensitivities are then used in the matrices set out in Tables AQ-A2.3, AQ-A2.4, and AQ-A2.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts with no mitigation applied. The IAQM provides the matrix in Table AQ-A2.7 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

The IAQM provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided by the IAQM has been used as the basis for the requirements set out in Appendix AQ-3.

STEP 4: Determine Significant Effects

The IAQM does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally not be significant (Institute of Air Quality Management, 2014).

The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will not be significant.

Table AQ-A2.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects [a]		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM_{10}		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features

Class	Principles	Examples
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

[a] People's perception will vary depending on the existing dust deposition in the area

Table AQ-A2.3: Sensitivity of the Area to Effects on People and Property from Dust Soiling [2]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Low	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table AQ-A2.4: Sensitivity of the Area to Human Health Effects 2

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 $\mu g/m^3$	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 $\mu g/m^3$	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 $\mu g/m^3$	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 $\mu g/m^3$	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low

[2] For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table AQ-A2.5: Sensitivity of the Area to Ecological Effects 2

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table AQ-A2.6: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX AQ3 MODELLING METHODOLOGY

The impacts of emissions from the proposed power station and the existing Waterport power station have been predicted using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the art understanding of the dispersion processes within the atmospheric boundary layer. The model has been run to predict the contribution of the proposed emissions to annual mean concentrations of NOx, SO_2, and PM (assumed to be both $PM_{2.5}$ and PM_{10}), the 99.79th percentile of 1-hour mean nitrogen dioxide concentrations, the 90th percentile of 24-hour mean PM_{10} concentrations, the 99.7th of 1-hour mean and 99th percentile of 24-hour mean SO_2 concentrations and the highest 8-hour mean CO concentration.

Waterport Power Station

The station consists of three engines of 5.2 MW capacity each. Emissions data have been provided by Bouygues Energies and Services based on information provided by the Gibraltar Electricity Authority and are summarised in Table AQ-A3.1. As the power station is gas-fired, it was not necessary to consider emissions of PM_{10}/$PM_{2.5}$ or SO_2 as these will be minimal. It was also considered unnecessary to make baseline adjustments to CO concentrations as this is not a pollutant likely to represent any constraints. For the purposes of modelling, the stacks for each engine have been combined into a single stack. The location of the combined stack included in the model as shown in Figure AQ3-1.

Table AQ-A3.1: Waterport Power Station - Model Input Parameters (at 100% load)

Parameter	Value
No. Stacks	3
Exit velocity (m/s)	32
Exit temperature (°C)	328
Individual stack diameter (m)	0.90
Combined stack diameter (m)	1.56
Stack height (m)	21m
Emissions (for all 3 stacks)	
	Emission Rate (g/s)
NOx (as NO_2)	63.6

Proposed Power Station

The proposed new power station will fully comply with European Directive 96/61/EC and local regulations covering Integrated Pollution Prevention and Control, and will operate under a permit issued by the Environmental Agency. Emissions parameters have been taken from the engineering studies prepared by Bouygues Energies and

Services (2015a, 2015b and 2015c). Table AQ-A3.2 sets out the assumed emissions and release conditions related to the scenarios described in Section 3.

Table AQ-A3.2: Proposed Power Station – Modelled Scenarios

Scenario 1 - 2017		
Parameter	**3 DF Generators**	**1 Gas Generator**
Stack height	24.2 m	24.2 m
Stack diameter	3.14 m	1.81 m
Exit temperature	426 ºC	158 ºC
Exit velocity	14.5 m/s	9.1 m/s
Emission rates (g/s)		
NOx (as NO_2) [(a)]	3.58	0.54
PM [(b)]	0.60	0.20
SO_2 [(c)]	0.12	0.04
CO [(d)]	19.1	5.9
Scenario 2 - 2027		
Parameter	**3 DF Generators**	**2 Gas Generators**
Stack height	24.2 m	24.2 m
Stack diameter	3.14 m	2.56 m
Exit temperature	426 ºC	158 ºC
Exit velocity	14.5 m/s	9.1 m/s
Emission rates (g/s)		
NOx (as NO_2) [(a)]	2.69	0.78
PM [(b)]	0.60	040
SO_2 [(c)]	0.12	0.08
CO [(d)]	19.1	11.8
Scenario 3 – Abnormal conditions Backup		
Parameter	**3 DF Generators with Diesel**	
Stack height	24.2 m	
Stack diameter	3.14 m	
Exit temperature	426 ºC	
Exit velocity	14.5 m/s	
Emission rates (g/s)		
NOx (as NO_2) [(a)]	2.45	
PM [(b)]	4.40	
SO_2 [(c)]	4.30	
CO [(d)]	3.50	

(a) Emission rate with 85% SCR reduction)

The model has been run using the ADMS chemistry module. To take account of the chemistry in the plume, background concentrations of nitrogen oxides, nitrogen dioxide and ozone have been taken from the Bleak House monitoring site for 2012, 2013 and 2014. In order to determine the process contributions from the proposed plant, the model has been run once with a zero emission rate and once using the emissions shown in Table AQ-A3-2. The process contributions have then been calculated by taking the difference between the two scenarios.

The calculation of short-term means has been carried out on an hour-by-hour basis. The Bleak House data have only been used to inform the chemistry routine, and as such, using a suburban site (with relatively high ozone concentrations) provides a worst-case assessment. Where relevant, the process contributions to nitrogen dioxide concentrations derived using this method have been added to local background concentrations as set out in the Main Chapter. Thus, the use of background data from Bleak House should not be taken to imply that the local background concentrations have been underestimated.

Meteorology

The dispersion and dilution of pollutant emissions is strongly affected by the local meteorological conditions, including wind speed, direction, and the degree of atmospheric turbulence. Suitable meteorological data are available from Gibraltar Airport.

Hourly sequential datasets for 2012 to 2014 have been used in this study. These are plotted in wind roses in Figure AQ.A3.1. This shows that the prevailing winds are from the northeast to easterly and southwest to westerly directions.

An important factor that needs to be borne in mind is that the area is frequently associated with strong “gap winds” known as the “Levanter” and the “Poniente”. The Lavanter describes easterly winds, while the Poniente describes westerly winds. The Levanter winds can occur at any time of the year but are most common during the period May to October. During very strong easterly winds the wind field around the Rock may be severely distorted, such that the surface wind direction is changed, even becoming inverted on the downwind side.

A further effect is the formation of a strong inversion layer at a height of several thousand feet (which will restrict the dispersion of pollutants into the upper atmosphere). The inversion layer associated with the Levanter is probably too high to have a significant effect on the plume dispersion within the near-field distances considered in this assessment. In terms of the other effects, the close proximity of the proposed power station to the meteorological monitoring site will mean that the data used will represent the initial dispersion of the plume relatively well.

Terrain

ADMS can simulate the perturbation of the meteorological flow field by complex terrain. Terrain has been accounted for in the dispersion model using 90 m x 90 m resolution digital elevation data from the United States National Aeronautics and Space Administration (NASA) Shuttle Radar Topographic Mission outputs. These data have been incorporated in the dispersion model as a terrain file.

Building Downwash

Entrainment of the plume into the wake of the proposed North Mole power station building (the so-called building downwash effect) has been taken into account in the modelling of the scheme. For the modelling of the Waterport power station, entrainment of the plume into the wake of the Waterport power station building and nearby residential buildings has been taken into account.

APPENDIX AQ4 CONSTRUCTION MITIGATION

The following is a set of measures that should be incorporated into the specification for the works:

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before and during work on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager; and
- Display the head or regional office contact information.

Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) approved by the Local Authority which documents the mitigation measures to be applied, and the procedures for their implementation and management.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Undertake daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust. Record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority when asked;
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction (Institute of Air Quality Management, 2012b).

Preparing and Maintaining the Site

- Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- cover, seed, or fence stockpiles to prevent wind whipping.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all vehicles switch off their engines when stationary – no idling vehicles; and
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes, conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;

- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover from small areas during work, not all at once.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces), if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use; and
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.

CHAPTER 10

COASTAL PROCESSES AND WATER QUALITY

CONTENTS

GLOSSARY AND ABBREVIATIONS **CPI**

1 INTRODUCTION **CP1**

2 LEGISLATIVE CONTEXT **CP2**

International Law CP2
National Law CP2
Policy Framework CP3

3 SCOPE AND METHODOLOGY **CP4**

Criteria CP4
Scope CP4
Assessment Methodology CP5
Sensitive Receptors and Magnitude of Impact CP5
Significance Criteria and Magnitude of Effect CP6
Limitations and Assumptions CP6

4 EXISTING CONDITIONS **CP8**

General Area CP8
Tides, Waves and Currents CP8
Water Quality CP9
North Mole Reclamation CP10

5 FUTURE BASELINE **CP11**

6 POTENTIAL IMPACTS **CP12**

Sensitive Receptors CP12
During Construction CP12
During Operation CP13

7 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS **CP14**

Coastal Processes Effects CP14
Water Quality Effects CP14

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS **CP16**

Construction Management CP16
Operational Management CP16
Residual Significant Effects CP16

9 CONCLUSION **CP17**

10 REFERENCES **CP18**

APPENDICES

APPENDIX CP1 GIBRALTAR DEVELOPMENT PLAN

LIST OF TABLES

Table CP2.1 - The Gibraltar Development Plan (2009), Relevant Policies
Table CP3.1 - Significance Criteria and Likelihood of Significant Effects

GLOSSARY AND ABBREVIATIONS

BGTW	British Gibraltar Territorial Waters
CD	Chart Datum
CEMP	Construction Environmental Management Plan
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Commission
HM	Her Majesty's
IEMA	Institute of Environmental Management and Assessment
km	kilometre
m	metre
m^2	metre squared
MCZ	Marine Conservation Zone
SAC	Special Area of Conservation

1 INTRODUCTION

1.1 This chapter provides an assessment of the potential coastal processes and water quality impacts associated with the proposed new power station along the North Mole, Gibraltar.

1.2 The assessment evaluates the coastal processes and water quality characteristics and effects observed from an Environmental Impact Assessment (EIA) conducted for the proposed development. The scope of the assessment focuses on the coastal areas in the vicinity of the site, on the west coast of Gibraltar. The impact assessment is guided by the proximity of the proposed new power station to the sea, which raises the potential risks from flooding and wave action as well as the potential for future impacts from climate change, namely sea level rise. The proximity of the site to the Southern Waters of Gibraltar Special Area of Conservation (SAC) means that the site characteristics, as well as construction and operation phase processes, must be fully assessed, including discharges into the local marine environment.

1.3 This chapter presents: the relevant European Commission (EC) and national legislation and local policy; the coastal processes and water quality characteristics of the proposed development site and location; the assessment methodology used to assess the baseline conditions of the site and surrounding area; the potential significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant effects; and summarises any residual significant effects. The assessment also includes calculation of the potential future effects from climate change, specifically sea level rise.

1.4 The scope of the study has been informed by an Environmental Scoping Report (Appendix 2, Volume 1: Main Report) and an Environmental Scoping Opinion (Appendix 3, Volume 1: Main Report), as well as by site visits, statutory and public consultation, and a desk-based investigation.

2 LEGISLATIVE CONTEXT

2.1 The assessment methodology has considered relevant EC and national legislation and policy, specifically the Gibraltar Development Plan, 2009 (Her Majesty's (HM) Government of Gibraltar, 2009), the Marine Strategy Regulations, 2011 (HM Government of Gibraltar, 2011) and the EC Water Framework Directive (WFD) 2000/60/EC.

International Law

Water Framework Directive 2000

2.2 The EC WFD, Council Directive 2000/60/EC, was established as a means to protect European water resources, specifically inland surface waters, transitional waters, coastal waters and groundwaters, which serve as vital natural resources for drinking water, wildlife habitats and for industry and recreation. The Directive sets out clear objectives and achievement dates in order for all aquatic ecosystems to achieve a 'good' water quality status by 2020.

2.3 The achievement of 'good' environmental status is determined by hydrological, oceanographic and biogeographic features within an area and is controlled by physical, chemical, geographical, geological, biological and climatic factors, structures or processes.

National Law

Marine Strategy Regulations

2.4 The Gibraltar Marine Strategy Regulations 2011 (HM Government of Gibraltar, 2011) aim to ensure the achievement of good environmental status within the marine strategy area and to maintain the capacity for marine ecosystems to respond to human-induced changes. The Marine Strategy area includes waters, seabed and subsoil within the coastal waters (within one nautical mile of the shoreline), British Gibraltar Territorial Waters (BGTW) (within approximately three nautical miles of the shoreline) or the exclusive economic zone adjacent to Gibraltar. The Regulations also take account of transboundary effects, but not transitional waters.

Policy Framework

Gibraltar Development Plan

2.5 The Gibraltar Development Plan is *"intended to guide land use planning in Gibraltar for the next ten years [until 2019], although it is anticipated that it would be reviewed well before then and rolled forward"* (HM Government of Gibraltar, 2009:1). The Plan was formulated with and subjected to extensive public participation so "*it must be seen as the plan having the support of the community"* (HM Government of Gibraltar, 2009:1). The strategic principles of the plan target seven areas of Gibraltar, which includes the environment.

2.6 Specifically for coastal processes and water quality, the Plan identifies the susceptibility of Gibraltar to coastal inundation due to the low-lying nature of the peninsular. The Plan also recognises the necessity to maintain high quality of coastal waters for the benefit of human health and the environment. Specific policies relating to coastal processes are show in Table CP2.1 (detailed in full in Appendix CP1).

Table CP2.1 The Gibraltar Development Plan (2009), Relevant Policies

Policy	
No.	**Name**
ENV6	Development and Flood Risk
ENV7	Air and Water Quality
ENV8	Protection of Water Quality in the Vicinity of Sea Water Intakes

3 SCOPE AND METHODOLOGY

3.1 This section explains the technical and spatial scope of the coastal processes and water quality assessment, and describes the methodology used for the assessment.

Criteria

3.2 The assessment methodology follows best practice guidelines as outlined by the Institute of Environmental Management and Assessment (IEMA), guidelines for EIA. Following IEMA Guidelines ensures a consistent EIA approach that is compliant to all relevant regulations, legislations and policies. The Guidelines also provide guidance on the assessment methodology, including necessary considerations and inclusions.

3.3 The proposed new power station is described in Chapter 5. The aspects relevant to the assessment of coastal processes and water quality are discussed in this Chapter.

Scope

3.4 The scope of this EIA is solely concerned with the new power station and does not contain any of the reclamation works. It is assumed the site has been prepared for the commencement works of the new power station.

3.5 An Environmental Scoping Report and an Environmental Scoping Opinion (Appendix 2 and 3 respectively, Volume 1: Main Report) have provided the main scope for the impact assessment, and this has been further informed by site visits and professional opinion. The new power station is to be located adjacent to newly reclaimed land, which has required its own EIA. The Environmental Statement (ES) for the North Mole Reclamation (HM Government of Gibraltar, 2014), as identified by the Technical Services Department and the Town Planning department, has been used to inform this desk-based assessment.

3.6 The assessment area includes the west coast of Gibraltar, focussing on the areas in close vicinity to the site. The proximity of the site, on Gibraltar's North Mole, to the coast, introduces the possible impacts from tidal flooding and wave action. Climate studies identify that these impacts are likely to worsen in

the future, so the potential impacts from climate change, particularly on sea level rise, need consideration. The site's proximity to the Southern Waters of Gibraltar SAC means that potential impacts to the marine environment must be considered, including discharges from the site.

3.7 The assessment includes construction and operational phases of the proposed development. The power station cooling systems use air-cooling, rather than seawater, therefore potential impacts during the operational phase from returning warmed seawater is scoped out from the assessment.

Assessment Methodology

3.8 The assessment methodology addresses the potential impacts to the site from coastal processes, primarily flooding, wave action and the potential future impacts due to climate change, and water quality, including any potential discharges from the site. Impacts are assessed on a:

- Site-specific basis;
- The direct impacts on coastal processes and water quality;
- The indirect impacts on other disciplines (benthos, fisheries, coastal protection, water quality, sediment quality, conservation/designated sites).

3.9 The assessment first identifies the current and/or baseline conditions of the site and then addresses the potential future impacts during the construction and operational phases. Where significant effects are identified, mitigation options are provided.

3.10 The assessment methodology utilises desk-based investigations as well as professional opinion and site visits.

Sensitive Receptors and Magnitude of Impact

3.11 The magnitude of impacts and the sensitivity of receptors are categorised as low, medium, high or very high.

Sensitive Receptors

3.12 Sensitive receptors are designated as:

- **Very High** – Internationally designated receptor;
- **High** – Nationally recognised receptor;

- **Medium** – Regionally important receptor;
- **Low** – Locally important receptor;
- **Negligible** – Receptor only of local importance and with resilience to change.

Magnitude of Impacts

3.13 Magnitude of Impact are designated as:

- **Very High** – Permanent changes over the whole development area and beyond;
- **High** – Permanent changes over much of the development area;
- **Medium** – Noticeable, but temporary changes over a partial area;
- **Low** – Noticeable, but temporary changes with little area or time extent;
- **Negligible** – Changes not discernable from background conditions.

Significance Criteria and Magnitude of Effect

3.14 Potential effects are assessed by comparing the magnitude of an impact against the sensitivity of a receptor. Where the sensitivity of a receptor is low and the magnitude of an impact is low it is unlikely that there will be a significant effect, however, where the sensitivity of a receptor is high-very high and the magnitude of effect if high-very high it is very likely that there will be a significant effect. The interaction between sensitivity of receptors and magnitude of impact is shown in Table CP3.1.

Table CP3.1 Significance Criteria and Likelihood of Significant Effects

Likelihood of Significant Effects		Magnitude of Impact			
		Low	**Medium**	**High**	**Very High**
Sensitivity of Receptor	**Low**	None	Minor	Medium	Medium
	Medium	Minor	Medium	Medium	High
	High	Medium	Medium	High	Very High
	Very High	Medium	High	Very High	Very High

3.15 Effects can be direct, indirect, secondary or cumulative, short, medium or long-term, positive or negative, and permanent or temporary. Assessment guidelines also highlight the potential for interactions between effects.

Limitations and Assumptions

3.16 The assessment has utilised desk-based study in order to complete the assessment, which has included review of the ES produced for the nearby

reclamation development (HM Government of Gibraltar, 2014). The data and conclusions from that assessment cannot be independently verified, but professional opinion has been applied to this assessment and reported in this ES.

4 EXISTING CONDITIONS

General Area

4.1 The proposed site is located along the North Mole of Gibraltar, a breakwater on the northwest coast of the peninsula. The North Mole extends west into the Bay of Gibraltar, a body of water that is approximately 8 kilometres (km) wide and connects to the Strait of Gibraltar (to the south). The Strait of Gibraltar subsequently opens up into the Atlantic Ocean (to the west) and the Mediterranean Sea (to the east). The Bay is approximately 400 metres (m) deep where it meets the Strait of Gibraltar, with steeply sloping shelves towards the north, west and east, and the greatest gradient slopes to the south. The 5 m depth contour extends out to 100 m from the coast in the north and joins the coast in the south; the 50 m depth contour extends out to 2 km from the coast in the north and 1 km in the south.

4.2 The west coast of Gibraltar is intensely modified and contains large extents of coastal engineering (which modifies the local-regional coastal regime and processes), and the site itself is located on an area of previously reclaimed land.

4.3 The proposed site is located approximately 3 km north of the Gibraltar Southern Waters SAC. This is a European designated Natura 2000 site, with designated protections under the European Habitats Directive and Birds Directive. The site is located approximately 1 km south of a Marine Conservation Zone (MCZ), a nationally designated protection site.

Tides, Waves and Currents

Tides

4.4 The tidal range around Gibraltar is up to 1 m for spring neap tides, with tides occurring semi-diurnally. The tides are heavily influenced by incoming tides from the Atlantic Ocean, to the west, and the Mediterranean Sea, to the east, and this results in large tidal gradients through the Strait of Gibraltar.

Waves

4.5 Within the Strait of Gibraltar, westerly waves have a height of 0.75 - 1.25 m 46% of the time, 2.25 - 3 m for 1% and 6.25 m for 0.1 %. Inshore transformations for these wave heights would result in a typical wave height of approximately 1 m at North Mole, however, this value would be further reduced by diffraction off breakwaters and seabed shallowing around the artificial reef.

4.6 Extreme wave heights occur due to propagation and diffraction around Gibraltar of waves from the east (Mediterranean) or west (Atlantic). Offshore wave heights for 1-in-100 year extreme events are predicted as 8.5 m (east) and 7 m (west); this translates to approximate coastal wave heights of 3 m and 2 m.

4.7 The new coastal reclamation is expected to alter the geometry of the coastline, which could impact the propagation of waves into the coastline as well as their shape and breaking point. The revetment trench around the reclamation may further alter wave direction, breaking and power, however the scale of the reclamation and trench relative to the wider seabed and the Bay is significantly small enough to make it unlikely that any significant effects will occur (HM Government of Gibraltar, 2014).

Currents

4.8 Astronomical, and wind and meteorology processes control currents around Gibraltar, where the strength of wind and meteorology processes weakens towards the north. The intensely modified nature of the west coast of Gibraltar can cause small water current circulations, however these are only local effects and are often counteractive.

Water Quality

4.9 Gibraltar does not have particularly heavy industry, but is increasingly becoming a prominent shipping hub, which increases the risk from accidental spillage of pollutants or other impacts to coastal water quality. Annual averages show 12 minor incidents and 1 major ‘Tier 2’ pollutant spills, and these incidents relate to collision or grounding of ships, rather than shoreline

bunkering spillages (HM Government of Gibraltar, 2012). There is a strong local contingency plan in place to manage any potential oil spill impacts.

4.10 Water bodies neighbouring the site are the Gibraltar Harbour and the Marine Conservation Zone; the Southern Waters of Gibraltar SAC is located 3.5 km south of the site. The Gibraltar Harbour is described as having 'good' water status (HM Government of Gibraltar, 2012), which is judged against biological and physio-chemical conditions as well as the concentrations of specific pollutants and contaminants. The Harbour is classified as having a good ecological potential. The SAC and MCZ have a rich species and habitat diversity, which is further reported in the Ecology and Nature Conservation Chapter (Chapter 12).

North Mole Reclamation

4.11 The new power station is proposed alongside the new reclamation, which is of less than 10,000 metres squared (m^2), including caisson and revetment area, off the North Mole in the northwest of Gibraltar.

4.12 Her Majesty's Government of Gibraltar states that the new reclamation includes caisson placement, revetment placement and fortification with rock armour. The revetments are being constructed around the caissons up to a minimum height of 3.41 m above chart datum (CD). Rock armour facing is constructed on the seaward face of the revetment to a minimum height of 3.91 m above CD. The rock armour provides protection from flooding and wave action effects.

4.13 The reclamation is not expected to effect the regional tidal flow directions or speeds, as it does not interrupt the propagation of waves from the Strait of Gibraltar. The major change to the coastal processes relates to the diffraction and reflection of waves, notably from the extended quay, particularly in the most extreme northwestern point of the new reclamation. This would cause a minor alteration in the wave regime, which could cause an alteration of the zone of effect north and eastwards, by approximately 120 m. The change in wave focus could create a confused sea state, however, this would be a minor effect that would dissipate offshore depending on separation distances.

5 FUTURE BASELINE

5.1 The future baseline describes the condition of the site, and surrounding area, based on the assumption that the proposed development does not occur, however it includes any other planned and/or consented developments within the local vicinity. Future committed developments include:

- North Mole Tank Farm (planning application number: BA11849)
- Coaling Island Boats Marina (BA12306)
- North Mole Industrial Park (BA12692)
- North Mole Reclamation (BA12714)
- North Mole Sullage Plant (BA12734)
- Western Beach Basin for Land Reclamation (BAS13145)
- Coaling Island Reclamation (BA13479)

5.2 Specific details on the coastal and hydrodynamic processes are not available for all of these developments. It is considered, however, that due to the location of the site at the extent of the North Mole, only the North Mole Reclamation and the Western Beach Basin for Land Reclamation could have combined effects with the proposed development. Added to this, the North Mole Reclamation provides coastal protection for the site as well as part of the site itself.

Sea Level Rise

5.3 The increase in sea level for the next 100 years is anticipated to be 0.2-0.7 m. A future worst-case of 0.5 m sea level rise has been assumed for the lifetime of the power station.

6 POTENTIAL IMPACTS

6.1 The potential impacts from coastal processes are from flooding and wave action as well as the potential future impacts from climate change, sea level rise.

6.2 The potential impacts to water quality are from surface water and power station pollutant/contaminant discharges. The likely significant impacts to water quality relate to the increase in pollutant and contaminant concentrations in waters in, on and around the site.

Sensitive Receptors

6.3 The proposed site is at risk from potential coastal processes impacts. The new power station will be of national importance; therefore any potential impacts will be of high significance.

6.4 Surrounding waters and the marine environment are at risk from the potential impacts from pollution, from leaks, spillages and contaminations arising from construction and operational activities of the proposed new power station. The surrounding waters, including the MCZ, are of national to regional importance and contained within the jurisdiction of the WFD, any potential impacts to these receptors are of high significance. The Southern Waters SAC is of European importance; therefore potential impacts to this receptor are of very high significance.

During Construction

6.5 The potential impact identified from coastal processes to the site relate to flooding and wave action and potential impacts with climate change, especially sea level rise. Potential impacts for water quality are from accidental spillages, sediment runoff from the construction site (stormwater runoff), leaks and releases of construction chemicals, including oil and urea; there is also the potential for pollutant leaching from contaminated land from the proposed site.

During Operation

6.6 Potential impacts during the operational phase include those predicted during the construction phase, but also includes potential water quality impacts if there is poor site drainage and storm water overflow.