Hinkley Point C | Development Consent Order Application

Environmental Statement
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Environmental Statement - Volume 4

Bridgwater C

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CHAPTER 1: INTRODUCTION

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1. INTRODUCTION

1.1 Introduction

1.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1** for the Site Location Plan). A detailed description of the proposed development is provided in **Chapter 2** of this volume of the ES.

1.1.2 The proposed development forms part of the Hinkley Point C (HPC) Project to which this application for Development Consent to the Infrastructure Planning Commission (IPC) relates. The components of the HPC Project are defined in **Volume 1**, **Chapter 1** of this ES (see **Figure 1.2** for the HPC Project Site Context Plan). This proposed development would be used by EDF Energy during the construction phase of the HPC power station to accommodate non-home-based workers for approximately seven years (see **Chapter 4** of this volume of the ES for details of the operational phase of the proposed development).

1.1.3 Following construction of the HPC power station, it is likely that the proposed development would be transferred to a third party for use as student accommodation or other educational uses in connection with Bridgwater College. **Chapter 5** of this volume of the ES provides details on the post-operational phase of the proposed development. It should be read in conjunction with the **Post-Operational Strategy** appended to the **Planning Statement**. However, should a planning application be submitted outside of the Development Consent Order (DCO) process, for use of the site post-operation, this application would be considered by the local planning authority.

1.1.4 This chapter provides details on:

- the structure and scope of the Environmental Impact Assessment (EIA) of the proposed development; and
- the location and existing land uses on the site; and any relevant planning history and planning policy context.

1.1.5 This chapter should be read in conjunction with the **Accommodation Strategy,** the **Planning Statement** and the **Bridgwater C Accommodation Campus Design and Access Statement** which provide further information on both the rationale for the proposed development and its design. The **Consultation Report** summarises the responses to EDF Energy's Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations and identifies how the proposed development has evolved in response to the consultations.

1.1.6 A glossary of terms is contained in **Volume 1** of this ES.

1.2 Environmental Impact Assessment and this Environmental Statement

a) Requirement for Environmental Impact Assessment

1.2.1 Schedule 1 to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the Infrastructure Planning EIA Regulations) (Ref. 1.1) lists developments for which an EIA is mandatory. Nuclear power stations are listed at 2(b) of Schedule 1 and consequently an EIA is required for the HPC Project.

b) Structure of the Environmental Statement

1.2.2 **Volume 1** of this ES provides the following details of the HPC Project:

- the rationale for the proposed HPC Project;
- consideration of the alternatives to the proposed HPC Project;
- the legislative and planning policy context of the proposed HPC Project; and
- the methodology adopted for the proposed HPC Project EIA.

1.2.3 This volume of the ES covers the following environmental topics, in separate chapters, insofar as they relate to the proposed development:

- **Chapter 1**: Introduction
- **Chapter 2**: Description of Proposed Development
- **Chapter 3**: Construction
- **Chapter 4**: Operation
- **Chapter 5**: Post-operation
- **Chapter 6**: Alternatives
- **Chapter 7**: Socio-economics
- **Chapter 8**: Transport
- **Chapter 9**: Noise and Vibration
- **Chapter 10**: Air Quality
- **Chapter 11**: Soils and Land Use
- **Chapter 12**: Geology, Land Contamination and Groundwater
- **Chapter 13**: Surface Water
- **Chapter 14**: Terrestrial Ecology and Ornithology
- **Chapter 15**: Landscape and Visual
- **Chapter 16**: Historic Environment
- **Chapter 17**: Amenity and Recreation
- **Chapter 18**: Summary of Environmental Mitigation

1.2.4 Refer to **Volume 1**, **Chapter 7** of this ES for details of the scoping and consultation undertaken since Spring 2008 in connection with this EIA.

1.2.5 Where appropriate, environmental topic chapters have been prepared to a standard format applying the following structure:

- Introduction
- Scope and Objectives of Assessment
- Legislation, Policy and Guidance
- Methodology, including Study Area
- Baseline Environmental Characteristics
- Assessment of Impacts
- Mitigation of Impacts
- Residual Impacts
- Summary of Impacts

1.2.6 **Volume 2** of this ES reports on the EIA carried out in respect of the proposed HPC power station development. The assessments carried out in respect of the other proposed associated developments are reported separately in other volumes of this ES.

1.2.7 Correspondence, data, technical reports, photomontages and plans relating to the proposed development are provided in this volume of the ES.

1.2.8 A **Non-Technical Summary** (NTS) of this ES has also been prepared in support of the application for Development Consent.

1.2.9 A detailed description of the EIA methodology applied to the HPC Project is provided in **Volume 1**, **Chapter 7** of this ES.

c) Environmental Impact Assessment Assumptions

1.2.10 Where assumptions have been made for individual environmental topic assessments these are identified within the relevant environmental topic chapters in this volume of the ES.

d) Cumulative Impacts

1.2.11 For each environmental topic, assessments of the site-specific cumulative impacts arising from the proposed development are reported in the relevant environmental topic chapters in this volume of the ES.

1.2.12 Cumulative impacts arising from this proposed development in combination with other elements of the HPC Project and other relevant projects are identified and assessed in **Volume 11** of this ES.

1.3 Development Site

a) Location and Land Uses

1.3.1 The site is located to the north-east of Bridgwater, the largest town within the administrative area of Sedgemoor District Council (SDC) (see **Figure 1.1**). The site is approximately 12km south-east of the HPC development site. **Figure 1.2** identifies

the location of this site and the other proposed associated developments (see **Volume 1**, **Chapter 3** of this ES for details) in relation to the HPC development site.

1.3.2 The site covers an area of approximately 1.9ha.

1.3.3 The southern part of the site is currently used by Bridgwater and Albion Rugby Football Club as its second team training pitch; and vehicle parking for the Club and Bridgwater College. The northern part of the site forms part of the existing gyratory system on College Way, linking Bridgwater College, Bridgwater and Albion Rugby Football Club and Bridgwater Town Football Club with the A39 (Bath Road). The main part of the site (i.e. the southern part) was previously used as a landfill and is therefore known to be contaminated (see **Chapter 12** of this volume for details).

1.3.4 College Way runs along the north-eastern and eastern boundary of the site, with green space located on the eastern side of College Way. The gardens of residential properties on Fairfax Road back on to this green space.

1.3.5 The site is bounded to the south by an access road into Bridgwater Town Football Club. The main Bridgwater College campus is located to the south of this access road, which comprises educational buildings, recreational facilities, car parking, a bus terminus and other related development.

1.3.6 The Bridgwater and Albion Rugby Football Club's first team pitch, clubhouse and two spectator stands are located immediately adjacent to the western boundary of the site. Beyond this is the Bridgwater to Highbridge railway line (part of the Bristol to Penzance line), with Bridgwater railway station approximately 1.3km to the south-west of the site.

1.3.7 A planning application is pending determination for a performing arts centre on land to the north of the site (Planning Application Reference: 08/11/00093 (see **Figure 1.3**)). Outline planning permission was previously granted for an arts and theatre centre on the same parcel of land in September 2006 (Planning Application Reference: 08/05/00212), however this planning permission has since lapsed.

1.3.8 There are no public rights of way (PRoW) within the site. The only statutory, regional or local designations of relevance to the site relate to the designation of Recreational Open Space for the majority of the site. See the environmental topic chapters for details of any designations in the vicinity of the site.

1.3.9 The sports pitch, to be lost as a result of the proposed development, would be replaced by Bridgwater and Albion Rugby Football Club at another site in Bridgwater. This would be progressed under a town and country planning application, to be determined by the local planning authority.

b) Planning History

1.3.10 There is no relevant planning history in respect of the site.

c) Planning Policy Context

1.3.11 **Volume 1**, **Chapter 4** details the overarching legislative and planning policy context for the HPC Project, including relevant legislation and national, regional and local planning policy. Where applicable, further details of the relevant legislation and

planning policies specific to the different environmental topics are set out in the technical assessment chapters in this volume of the ES.

1.3.12 The following adopted and emerging local policies are of potential relevance to the site.

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 1.2)

1.3.13 The Sedgemoor District Local Plan forms part of the development plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007).

1.3.14 The Proposals Map (Inset Map No. 1) indicates that the entire site (Bridgwater and Albion Rugby Football Club second team training pitch) is designated as an area of Recreational Open Space (Policy RLT1). The site is within the defined Development Boundary of Bridgwater.

1.3.15 Land immediately surrounding the site is also subject to the following designations:

- An area of Recreational Open Space (Policy RLT1) (the Bridgwater and Albion Rugby Football Club first team pitch) situated to the immediate west of the site.
- Land allocated for Public Open Space ('unsaved' Policy RLT5) is situated beyond College Way to the north of the site.
- An Off-Road Cycle Route (Policy TM1) linking College Way with Fairfax Road is located to the south-east of the site.

1.3.16 Policy STR4 (Development Location Strategy) states:

"The overall policy on development distribution for the period 1991-2011 is to identify land and sites on the basis of the following priorities:

1. *Firstly on brownfield land or sites which offer the opportunity for redevelopment or re-use, the development of which would contribute towards regeneration, viability and vitality, and which are within or close to existing or proposed public transport corridors in this order:*

   a) *within Bridgwater, Burnham-on-Sea and Highbridge;*

   b) *within Rural Centres and Villages; and*

   c) *in the countryside, re-using existing buildings, or for development where a countryside location is essential.*

2. *Secondly on greenfield sites, only if it is demonstrated that sufficient brownfield sites or re-use opportunities are unavailable. It shall be in this order:*

   a) *at Bridgwater;*

   b) *at Burnham-on-Sea/Highbridge;*

   c) *at Cheddar; and*

d) at Rural Centres and Villages which have the greatest range of facilities and are the most accessible by means other than the car."

1.3.17 Policy TM1 (Safe and Sustainable Transport) states:

"Safe and Sustainable Transport will be achieved by the following means:

a) development will not be permitted which would prejudice the construction of cycle and pedestrian routes and bus lanes defined on the Proposals Map, unless suitable alternative routes are provided by the developer;

b) development will not be permitted which would reduce the convenience and safety of existing rights-of-way, bridle paths and cycle paths unless suitable alternative routes are provided by the developer;

c) development will only be permitted if the design makes adequate and safe provision for access by foot, cycle, public transport and vehicles so long as it's appropriate to the scale of the development and in accordance with National and County Council design standards and Somerset County Council's Highway hierarchy;

d) the Developer shall provide the transport infrastructure required by the development to an agreed phased programme. Where off-site works are required, these shall be appropriate to the scale and nature of the development and shall be funded by the developer; and

e) development will not be permitted for proposals which would have a significant impact on the highway network without the prior submission of a Traffic Impact Assessment."

1.3.18 Policy BE1 (Sustainable and Quality Development) states that applicants for planning permission for all development will be required to submit justification as to how the proposal has considered a wide range of design criteria, including sustainable development issues.

1.3.19 Policy RLT1 (Protection of Recreational Open Space) states:

"That development which would result in the loss of recreational open space will not be permitted unless:

a) the existing sports and recreation facilities can best be retained and enhanced through the redevelopment of a small part of the site; or

b) a replacement facility of equivalent sports and/or recreation benefit is made available; or

c) the proposed development provides sports and/or recreation facilities of greater benefit than the long-term recreational value of the open space that would be lost."

ii. Sedgemoor Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 1.3)

1.3.20 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. An addendum to the Core Strategy was subject to a further consultation from 23 November 2010 until 18 January 2011. Changes prior to submission, proposed as a result of the consultation process were reported and endorsed by SDC's Executive Committee on 9 February 2011. The Core Strategy Proposed Submission was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

1.3.21 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to Chapter 4 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings.

1.3.22 At the close of the hearing sessions on 26 May 2011, the Inspector agreed with SDC and EDF Energy that, in an attempt to reach agreement on the disputed Chapter 4, SDC would re-draft Chapter 4 and EDF Energy would have the opportunity to respond. The position of both parties in relation to the re-drafted Chapter 4 was set out in correspondence between SDC, EDF Energy and the Inspector. As a result of the correspondence invited by the Inspector, SDC has agreed to make further changes to the Core Strategy which make clear that the Core Strategy does not set any policies, tests or requirements for the IPC to apply in deciding whether any element of the development comprised in an application for development consent is acceptable, nor the basis on which any such application should be approved. Instead, the chapter is to set out those matters which SDC may take into account in preparing its LIR for the HPC application for Development Consent Order. These, therefore, represent aspirations of the Council, rather than formal planning policy for the HPC DCO application. This was confirmed in the Inspector's binding report of the EiP, published on 27 September 2011. It is expected that the Core Strategy will be adopted in October 2011.

1.3.23 Emerging policies MIP1, MIP2 and MIP3 relate specifically to the HPC Project, as set out in the re-drafted Chapter 4 (dated 29 July 2011).

1.3.24 Policy MIP1 (Major Infrastructure Proposals) explains that applications for major infrastructure development will be considered against the relevant national planning policy and the strategy and relevant policies of the development plan. The objective from the Council's perspective is that major infrastructure proposals should, where possible, contribute positively to the implementation of the spatial strategy and meet the underlying objectives of it.

1.3.25 Policy MIP2 (Hinkley Point C Associated and Ancillary Development) sets out the considerations that the Council will take into account in the preparation of a LIR in responding to proposals for development associated with, or ancillary or related to the HPC Project, where they are not the determining authority. Such considerations include: directing accommodation proposals to a range of sites, primarily in Bridgwater; measures to avoid, minimise and then mitigate adverse impacts on the transport network; meeting the accommodation needs of the temporary workforce in a way that does not have an unreasonable adverse effect on the housing market;

providing appropriate community facilities where addition demand is generated by the project; delivery of education, employment and training opportunities for the local community; and the delivery of investment in infrastructure, buildings and green infrastructure.

1.3.26 Policy MIP3 (Hinkley Point C: Planning Obligations and Mitigation) states that the Council will seek to ensure, wherever possible, that the proposals avoid, minimise and mitigate (including, where appropriate, compensate for) impacts during the construction, operation, decommissioning, and restoration phases.

1.3.27 In addition, the following emerging policies contained in the Core Strategy (Proposed Submission) are considered to be of potential relevance.

1.3.28 Policy S1 (Spatial Strategy for Sedgemoor) states in relation to Bridgwater:

> *"To create the most sustainable form of growth for Sedgemoor, Bridgwater will be the focus for the District's housing, employment and retail growth. As the principal town in the District it will accommodate the majority of new development within its urban area through the provision of a strategic urban extension, brownfield sites and at other well related greenfield locations…"*

1.3.29 Policy S2 (Infrastructure Delivery) states that all new development that generates a demand for infrastructure will only be permitted if the necessary on and off-site infrastructure required to support and mitigate the impact of the development is either already in place or there is a reliable mechanism in place to ensure that it will be delivered at the time and in the location it is required.

1.3.30 Policy S3 (Sustainable Development Principles) states:

> *"Development proposals will be supported where they contribute to meeting all of the relevant following objectives:*
>
> - *mitigating the causes of climate change and adapting to those impacts that are unavoidable;*
> - *prioritise where appropriate the reuse of previously developed land and buildings within existing settlements and then at the most sustainable locations on the edge of the identified settlements in accordance with the Spatial Strategy (Policy S1:Spatial Strategy for Sedgemoor);*
> - *be located to minimise the need to travel and to encourage any journeys that remain necessary to be possible by alternative modes of travel including maximising opportunities for walking, cycling and the use of public transport; and*
> - *a vibrant, diverse and responsive local economy that supports investment and regeneration of our towns and rural settlements…"*

1.3.31 Policy S4 (Mitigating the Causes and Adapting to the Effects of Climate Change) states that development should contribute to both mitigating and adapting to climate change and to meeting targets to reduce carbon dioxide emissions.

1.3.32 Policy D2 (Promoting High Quality and Inclusive Design) states, amongst other things, that development will need to demonstrate high quality, sustainable and

inclusive design that responds positively to the characteristics of the site and surrounding area, as well as taking into account climate change.

1.3.33 Policy D3 (Sustainable Construction and Reducing Carbon Emissions in New Development) states that the Council will encourage the use of sustainable construction techniques that promote the reuse and recycling of building materials, maximise opportunities for the recycling and composting of waste on all new development proposals (residential and non-residential) and reduce CO_2 emissions.

1.3.34 Policy D4 (Renewable or Low Carbon Energy Generation) states that the Council will support proposals that maximise the generation of energy from renewable or low carbon sources, provided that the installation would not have significant adverse impact taking into account, amongst other things, the impact of the scheme on landscape character, visual amenity, historic features and biodiversity.

1.3.35 Policy P1 (Bridgwater) states, *inter alia*, that development proposals in Bridgwater will be supported if they contribute to meeting all of the relevant following objectives:

- *To ensure that new development is of the highest quality in terms of sustainability and design and celebrates the town's past whilst signposting its new future.*
- *To contribute to the delivery the Parrett Barrier strategic solution to flood risk in the town.*
- *To attract new industry and business with particular emphasis on higher skilled local jobs.*
- *To deliver a range of housing that meets the needs of both existing and newly forming households and inward migration.*
- *To deliver an integrated transport strategy with an emphasis on public transport, walking and cycling, but that also meets the needs of the motorist and delivers adequate parking provision and network improvements.*
- *Creating connections and linkages between the town centre, residential neighbourhoods, employment areas and retail parks.*
- *To promote a new green network including parks, green corridors, habitat creation and tree planting and to sustain existing environmental assets within and around the town.*
- *Contributing where appropriate to improving or creating vital public realm that includes active public spaces, recreational routes and safe and calm streets.*
- *Creation and improvement of facilities and spaces that support leisure, sport and cultural activities.*

iii. Hinkley Point C Project Supplementary Planning Document (Consultation Draft) (February 2011) (Ref. 1.4)

1.3.36 SDC and West Somerset Council (WSC) have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning

Document ("the draft HPC SPD") commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD.

1.3.37 Following the Sedgemoor Core Strategy EiP and subsequent correspondence with the Inspector, it is clear that the SPD cannot set tests, policies or requirements for the IPC to apply to the consideration of the HPC Project. If the Councils continue with the SPD preparation, its text will need to be considered in this light and it could not carry any significant weight in the determination of the application for Development Consent. As it may be relied upon by some stakeholders, however, the principal contents of the draft HPC SPD as it relates to the site are summarised below.

1.3.38 The draft HPC SPD provides advice in relation to the HPC proposals, expanding upon the policy context for the proposals. This includes the associated development.

1.3.39 With regard to the approach to the accommodation campuses at North East Bridgwater, Box 25 in the draft HPC SPD sets out, amongst other things:

> *"Development proposals for permanent housing and temporary campus facilities for worker accommodation on the Innovia, Cattle Market and Rugby Club Training Pitch site would be encouraged, subject to the consideration of detailed proposals. Any proposals will be expected to support the creation of an exemplar sustainable community as a natural extension to Bridgwater and contribute to the delivery of the Bridgwater Vision. Development should seek to properly integrate with existing and new neighbouring communities and will project a strong positive image for Bridgwater."*

1.3.40 With regard to the approach to the Bridgwater and Albion Rugby Football Club's second team training pitch, the site, Box 26 in the draft HPC SPD states:

> *"Development on the Rugby Club Training Pitch should seek to contribute to the profile of the College along the Bath Road, address long-term issues of access and provide a gateway to the College. Development should front the college access road and create a high quality built form which is fit for purpose for College use. Design constraints and opportunities that should inform the master-planning of the site are illustrated in figure 8.6.*
>
> *Any development at this site should seek to anchor Bridgwater College and the Community School as the focus of activity and create landmark structures that provide a gateway to these establishments. The design should address access and street safety."*

iv. Bridgwater Vision (July 2009) (Ref. 1.5)

1.3.41 Whilst not forming part of the statutory development plan for Sedgemoor, the Bridgwater Vision (2009) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

1.3.42 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area.

1.3.43 The site falls within the 'Sydenham and Bower' character area. Page 83 describes the vision for 'The Knowledge Quarter', stating:

> *"Sydenham and Bower would become a mixed residential, employment and educational area with a focus on the East Bridgwater Community School and Bridgwater College, linked to new employment and knowledge based industries."*

v. Bridgwater Strategic Flood Defence Tariff SPD (September 2009) (Ref. 1.6)

1.3.44 In September 2009, SDC adopted the Bridgwater Strategic Flood Defence Tariff SPD that sets out a funding mechanism to deliver strategic flood defences for Bridgwater. Specifically, this sets out the mechanism to seek contributions from new development toward the capital costs of the 'Parrett Barrier', a tidal surge barrier that is the preferred long term flood defence solution for the town. The site falls within the 'indicative' geographical area for which the tariff applies, as shown on the plan in Appendix 2 of the SPD.

References

1.1 Infrastructure Planning Regulations (SI 2009/2263). HMSO, 2009.

1.2 SDC. Sedgemoor District Local Plan (1991-2011 Adopted Version). 2004.

1.3 SDC. Sedgemoor District Council Local Development Frameworks Core Strategy (Proposed Submission). September 2010.

1.4 SDC and WDC. Consultation Draft Hinkley Point C Project Joint Supplementary Planning Document (SPD). 2011.

1.5 Bridgwater Challenge Partnership. Bridgwater Vision – Delivering a Strategic Framework. 2009.

1.6 SDC. Bridgwater Strategic Flood Defence Tariff Supplementary Planning Document (SPD). 2009.

CHAPTER 2: DESCRIPTION OF PROPOSED DEVELOPMENT

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2. DESCRIPTION OF PROPOSED DEVELOPMENT

2.1 Introduction

2.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1**). The proposed development would comprise:

- an accommodation campus, including living space for 150 occupants within four accommodation buildings; an all weather 5-a-side football pitch; 66 car parking spaces, and motorcycle and bicycle spaces; a temporary canteen building for a period of approximately six months until the facilities at Bridgwater A accommodation campus become operational; and internal access roads;
- alterations to the existing gyratory on the A39 (Bath Road), including provision of two bus shelters and changes to the road markings;
- access road off College Way;
- landscaping within the site, including tree planting along College Way; and
- other ancillary development, including signage, fencing, lighting, CCTV and utilities.

2.1.2 The proposed development forms part of the Hinkley Point C (HPC) Project to which this application for Development Consent to the Infrastructure Planning Commission (IPC) relates. The components of the HPC Project are defined in **Volume 1**, **Chapter 1** of this ES (see **Figure 1.2**). This proposed development would be used by EDF Energy during the construction phase of the HPC power station to accommodate non-home-based workers for approximately seven years.

2.1.3 It is anticipated that construction of the proposed development would commence in Quarter 1 2013 (in the event that Development Consent is granted and any relevant pre-commencement requirements are discharged) and would take approximately 12 months to construct. It is estimated that the accommodation campus would be operated by EDF Energy between Quarter 1 2014 and Quarter 1 2021, after which the facility would no longer be required by EDF Energy and would be transferred to a third party for use in connection with Bridgwater College (see **Chapter 5** of this chapter of the ES for details).

2.1.4 Details of each phase of the proposed development are described in **Chapters 3** to **5** (construction, operation and post-operation respectively) of this volume of the ES.

2.1.5 This chapter provides details on:

- the design principles adopted for the proposed development;
- the masterplan, including site layout, scale and components of the proposed development; and

- the quantum of development proposed.

2.1.6 This chapter should be read in conjunction with the **Bridgwater C Accommodation Campus Design and Access Statement** which provides details of the proposed development in terms of land use, amount of development, layout, scale, landscaping, appearance and access.

2.2 Design Principles

2.2.1 The proposed development has evolved through the adoption of the following principles:

- an understanding of EDF Energy's operational requirements for the proposed development, in terms of its use by the non-home-based construction workforce and the transportation of the workforce to the HPC development site;
- the outcomes of the Environmental Impact Assessment (EIA) undertaken for the proposed development, to avoid where possible, or mitigate and manage potential impacts on sensitive receptors;
- the site's context; and
- the planning policy context.

2.2.2 The design process has been iterative, undertaken over approximately 24 months; and has been informed by consultation and engagement with stakeholders, including statutory consultees and the local community. The formal Stage 1, Stage 2 and Stage 2 Update consultations which relate to this site are documented in detail in the **Consultation Report**. Any meetings or other engagement held with relevant statutory consultees to discuss specific EIA-related aspects of the proposed development are documented within the relevant environmental topic chapters in this volume of the ES.

2.2.3 The process by which the siting and sizing of the proposed development has been determined, as part of a holistic strategy for the wider HPC Project, is detailed in the **Accommodation Strategy**.

2.2.4 **Chapter 6** of this volume of the ES provides a description of the alternatives considered in terms of the siting, sizing, masterplanning and detailed design of the proposed development. It should be read in conjunction with the **Alternative Site Assessment** which is appended to the **Planning Statement**.

2.3 Site Masterplan and Design

a) Site Layout

2.3.1 The proposed development would include four accommodation buildings, ancillary buildings and structures, a 5-a-side football pitch, a 66 space car park and other ancillary development (see paragraph 2.1.1 for details). **Figure 2.1** identifies the location and size of each of the components of the proposed development.

2.3.2 The accommodation buildings, one of which includes the site security office at ground floor level, would front College Way. The ancillary buildings and structures would comprise a fire hydrant plant, rainwater harvesting storage plant, mechanical

plant (including air source heat pumps), refuse compounds and any other associated plant. These would be located within a compound along the southern boundary of the site, adjacent to the internal access road or on the roof of the buildings (including photovoltaics). Two bicycle storage/smoking shelters are proposed adjacent to the accommodation buildings.

2.3.3 The 66 space car park in the south-western part of the accommodation campus and the 5-a-side football pitch in the north-western part of the accommodation campus would be adjacent to the Bridgwater and Albion Rugby Football Club's first team pitch to the west of the site.

2.3.4 A temporary canteen building, necessary for the period until the Bridgwater A accommodation campus becomes available, would be situated in between the car park and the 5-a-side football pitch. Following removal of the temporary canteen building the land would be grassed over and used as amenity space by the occupants of the accommodation campus.

2.3.5 Access/egress into the site would be off College Way. The internal access road would run east to west from the entrance point off College Way into the car park in the south-western part of the site.

2.3.6 The existing car park to the north of the proposed fence line around the accommodation campus would be retained for use by Bridgwater and Albion Rugby Football Club and Bridgwater College. However, it would be used by EDF Energy during the construction phase until the proposed access/egress into the site, off College Way, is in place (see **Chapter 3** of this volume of the ES for details of the construction phase). Bicycle stands would also be provided within the car park to the north of the proposed 5-a-side football pitch for use by the local community accessing the pitch. No other alterations are proposed to the existing car park.

2.3.7 The proposed development would be set within a landscaped area, comprising enhanced perimeter landscaping along the eastern, southern and western boundaries. Landscaping is also proposed within the proposed development to define routes, screen compound areas and the car park and create an attractive environment for occupants.

b) Accommodation Buildings

2.3.8 The proposed development would provide 150 bedrooms within four accommodation buildings, situated along the eastern boundary of the site (see **Figure 2.1**). It is proposed that Building A1, located closest to the access/egress into the site, would provide 36 bedrooms, including one accessible unit. Building A1 would also include a 24-hour manned security/administration office. Buildings A2, A3 and A4 would each provide 38 bedrooms, including one accessible bedroom unit per building.

2.3.9 The level of detail provided is equivalent to that of a full planning application. EDF Energy expects to build out in accordance with the approved planning drawings. However, a small amount of flexibility is sought to take account of any modest changes that could arise from the post-planning detailed design stage. Therefore, flexibility is sought to build out within the minimum and maximum building dimensions identified in **Table 2.1**. The assessments within the environmental impact assessment have been carried out on this basis. Details would be submitted to the

IPC (or successor body) where there would be deviation from the approved plans following Development Consent being approved.

Table 2.1: Proposed Accommodation Buildings

Building/ Structure Reference	**Proposed Use**	**Building Dimensions as Identified on Planning Drawings (m)** *(height x width x length)*	**Minimum Building Dimensions (m)** *(height x width x length)*	**Maximum Building Dimensions (m)** *(height x width x length)*
A1	Living accommodation and security office	10.5 x 13.2 x 26.1	9.8 x 12.6 x 25.5	10.8 x 13.8 x 26.7
A2, A3 and A4	Living accommodation	10.5 x 13.2 x 26.1	9.8 x 12.6 x 25.5	10.8 x 13.8 x 26.7

2.3.10 The buildings would allow for internal modification during EDF Energy's occupation (e.g. should additional accessible rooms be required they could be created by joining two bedrooms) or at the post-operational phase (see **Chapter 5** of this volume of this ES for details).

2.3.11 The external appearance of the accommodation buildings would assimilate with Bridgwater College, Bridgwater and Albion Rugby Football Club's clubhouse and its immediate surrounds. It is proposed that the ground floor would be clad in a panelised dark grey metal and the first and second floors clad in terracotta.

c) Temporary Canteen Building

2.3.12 It is anticipated that this proposed development would be complete before the amenity building within the Bridgwater A accommodation campus becomes operational. In this instance a temporary canteen building would be provided within the Bridgwater C site to provide canteen facilities in the short-term (approximately six months) until occupants of the Bridgwater C accommodation campus could use the amenity facilities at the Bridgwater A accommodation campus (see **Figure 2.1**). Once the temporary canteen is no longer required the land on which it would be site would be grassed over and used as amenity space for occupants.

2.3.13 The temporary canteen has not been designed in full. Therefore, parameters within which the temporary single storey building would be constructed within are detailed in **Table 2.2**. The assessments within the environmental impact assessment have been carried out on this basis. Details would be submitted to the IPC (or successor body) prior to construction of the relevant part.

Table 2.2: Proposed Temporary Canteen Building

Building/ Structure Reference	**Proposed Use**	**Minimum Building Dimensions (m)** *(height x width x length)*	**Maximum Building Dimension (m)** *(height x width x length)*
10	Temporary canteen, including seating area and kitchen	2.1 x 8.3 x 21.4	3.1 x 9.5 x 22.6

d) External Sports Facility

2.3.14 One all weather 5-a-side football pitch would be provided in the north-western part of the site. The pitch would be located outside the 1.8m security fence line, surrounded by a 5.0m high fence with containment netting and associated lighting (see **Figure 2.1**). The pitch would be available for use and lit, when required, between 08:00 and 22:00 each day (see **Chapter 4** of this volume of the ES for details).

2.3.15 Until the sports facilities at the Bridgwater A accommodation campus become available (see **Volume 3, Chapter 2** of the ES for details) the local community would have access to the 5-a-side football pitch at the Bridgwater C accommodation campus. This would be managed via the on-site security/administration office (see **Chapter 4** of this volume of the ES for details).

e) Ancillary Buildings and Structures

i. Bus Shelters

2.3.16 A bus stop, incorporating two bus shelters, for workers going to the HPC development site would be located to the north-west of the accommodation buildings, just off the A39 (Bath Road) on the existing gyratory (see **Figure 2.1)**. Full details of these structures would be submitted to and approved by the IPC (or successor body) prior to commencement of the relevant part of the development.

ii. Bicycle and Smoking Shelters

2.3.17 Two bicycle storage shelters with associated stands are proposed adjacent to the accommodation buildings. Within these would be a small area for smoking. They would be built within the area identified in **Figure 2.1.** These structures would be metal framed, covered shelters, painted to match the colour of the ground floor elevation of the accommodation buildings. Full details of these structures would be submitted to and approved by the IPC (or successor body) prior to commencement of the relevant part of the development.

2.3.18 Four bicycle stands would be provided within each shelter upon first occupation. Bicycle usage would be monitored during the operational phase and should demand from occupants increase, an additional four spaces per shelter (i.e. eight additional spaces) could be accommodated.

2.3.19 In addition, uncovered bicycle stands would be provided to the north of the 5-a-side football pitch, with capacity for four bicycles. This would be provided for the local community using the 5-a-side football pitch; and thereafter for use by the Bridgwater and Albion Rugby Football Club and Bridgwater College.

iii. Services/Plant Infrastructure

2.3.20 A plant compound is proposed within the south-western corner of the site, to the south of the car park. The compound would incorporate the fire hydrant plant and rainwater harvesting storage plant. The compound would be built within the area identified in **Figure 2.1**. The timber clad, single storey, flat roof compound would be accessed from the car park. To the east of the compound would be a mechanical plant and associated equipment, housed within wooden fencing.

2.3.21 Two additional compounds, dedicated to the storage of refuse, are proposed either side of the internal access road. Each compound would serve the two accommodation buildings nearest to them.

2.3.22 These would be constructed in accordance the approved plans, unless further details are submitted to and approved by the IPC (or successor body) prior to commencement of the relevant part of the development.

f) Access

2.3.23 Vehicular, cyclist and pedestrian access would be via a new priority access junction off College Way, approximately 250m to the south of the A39 (Bath Road) junction. Access/egress into the site would run centrally through the site in an east-west direction. The road would provide vehicular access to the car parking area within the south-western corner of the site and for the servicing of the facility (see **Figure 2.1**).

2.3.24 The parking area would provide 66 car parking spaces (60 spaces for occupants of the proposed development and six for the facilities management team). Three motorcycle spaces would also be provided. Pedestrian connections within the site and to the A39 (Bath Road) via College Way would be provided (see **Figure 2.1**).

2.3.25 Pedestrian connections within the site to the A39 (Bath Road) via College Way are provided (see **Figure 2.1**).

g) Public Access

2.3.26 The proposed development would be designed to adhere to the Disability Discrimination Act (DDA) 1995 (Ref. 2.1). The buildings and bus shelters would be wheelchair accessible; and accessible parking spaces (four for occupants and one for the facilities management team) would be provided within the car park.

h) Security and Lighting

2.3.27 The site (excluding the 5-a-side football pitch) would be bounded by a 1.8m high security fence. A security barrier would be provided at the access/egress into the site.

2.3.28 The 5-a-side football pitch would be bounded by a 5.0m high fence with containment netting. A gate would be provided from the accommodation campus into the 5-a-side football pitch for use by the occupants; and a second entrance gate would be provided for use by the local community along the northern boundary of the pitch (see **Figure 2.1**).

2.3.29 CCTV would be provided around the perimeter of the site, monitored from the on-site security office.

2.3.30 The site would be lit by lighting columns ranging from 5-8m in height (see **Figure 2.2**). External lighting has been designed to adhere to the Institute of Electrical Engineers' recommendations (Ref. 2.2) in order to minimise ecological and amenity impacts in the vicinity of the site, enhance the landscaping scheme and ensure that the routes through the site are safe and well integrated within the proposed development.

i) Landscaping

2.3.31 The eastern boundary of the site would be enhanced with new tree and shrub planting along College Way. The tree planting would comprise Field maple and Ash informally grouped to complement the existing native tree groups to the north-east of the site which are proposed to be retained. The existing swale along College Way is proposed to be retained and the road verge enhanced with wildflower meadow planting.

2.3.32 New informal hedgerow and tree planting is proposed against the western boundary of the site as a screen against the Bridgwater and Albion Rugby Football Club's first team rugby pitch and spectator stands. New tree and shrub planting is also proposed along the southern boundary of the site to improve the appearance of the access road to the Bridgwater Town Football Club.

2.3.33 The outdoor amenity, seating and circulation spaces have been organised along a central hard paved pedestrian spine running on a north/south axis through the site. A linear grove of Silver Birch, under planted with Ivy, is proposed against the western edge of this central spine to buffer the interface against the car park and the Bridgwater and Albion Rugby Football Club's existing first team sports pitch. The area of land between the proposed car park and the 5-a-side football pitch would be grassed over for use as amenity space by the occupants of the proposed development following removal of the temporary canteen building. Details of the proposed landscape scheme are detailed in **Figure 2.3**.

j) Drainage

2.3.34 Surface water run-off would be attenuated to greenfield run-off rates using a combination of Sustainable Urban Drainage Systems (SuDS), including permeable paving and sealed underground storage.

2.3.35 All pipes, manholes and underground tanks would be supported by deep structural piles to prevent damage from settlement.

2.3.36 Water would be discharged into an existing combined sewer to the south-east of the site, whilst foul water would also be discharged into an existing combined sewer to the south-east of the site. The proposed drainage plan is provided in **Figure 2.4**.

k) Utilities

2.3.37 There is a Western Power overhead cable running along the eastern boundary of the site, which may need to be re-routed; and an underground low voltage electricity cable situated within the southern boundary of the site routed towards the Bridgwater Town Football Club. There is also a telecommunications duct within the eastern boundary of the site.

2.3.38 Gas, telecommunications and water were identified to the east of the site boundary. New service applications for electricity, water and drainage have been submitted.

CHAPTER 3: CONSTRUCTION

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3. CONSTRUCTION

3.1 Introduction

3.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1**). This chapter of the ES describes the construction phase of the proposed development. It should be read in conjunction with **Chapter 2** of this volume of the ES which describes the proposed development.

3.1.2 Details of the construction phase are necessarily broad at this stage and may be subject to modification during the detailed design stage or once a contractor is appointed. For this reason, a worst-case scenario has been taken, applying experience in relation to other developments of a similar size and nature and the best judgement of the environmental experts.

3.1.3 The environmental impacts and disturbance arising from the construction activities would be managed through a range of control measures and monitoring procedures, the principles of which are outlined in the **Environmental Management and Monitoring Plan (EMMP),** with further details provided in the Subject-Specific Management Plans (SSMPs) for the site.

3.1.4 This chapter should be read in conjunction with the **Construction Method Statement (Annex 2)** of this ES.

3.1.5 This chapter provides the following indicative details:

- a programme of works;
- the hours of work and resources;
- an overview of the construction works;
- a description of the construction site access(es) and egress(es) and likely traffic implications; and
- a list of the plant and equipment likely to be used.

3.2 Programme of Works

3.2.1 The construction phase of the Hinkley Point C (HPC) Project would commence in the event that Development Consent is granted and any relevant pre-commencement requirements are discharged, in Quarter 1 2013.

3.2.2 It is anticipated that construction of the proposed development would take approximately 12 months, which includes the preparatory works. For the purposes of this Environmental Impact Assessment (EIA), it is anticipated that the proposed development would be operational from Quarter 1 2014 (see **Chapter 4** of this volume of the ES for details).

3.3 Hours of Work and Resources

a) Hours of Work

3.3.1 It is anticipated that the core working hours for the construction phase would be:

- Monday to Friday 07:00 - 19:00
- Saturday 07:00 - 13:00
- No working on Sundays, Bank or Public Holidays

3.3.2 Any work outside these hours would be in extraneous circumstances or where works are only carried out within the internal area of the buildings. Undertaking works outside of these hours would be subject to prior agreement, with reasonable notice (a minimum of 14 days), by Sedgemoor District Council's Environmental Health Department, who may impose reasonable restrictions.

b) Resources

3.3.3 The number of workers needed to construct the proposed development would fluctuate during the course of the construction programme. It is estimated that the peak construction employment would be approximately 40 persons.

3.4 Description of Works

3.4.1 **Table 3.1** provides an overview of the proposed construction works. These works, and the individual activities within each stage, would overlap and are only indicative at this stage.

Table 3.1: Overview of the Works

Works	Activity
Preparatory Works	Site clearance
	Ecological mitigation (breeding birds) (see **Chapter 14** of this volume of the ES for details)
Construction Works	Erection of temporary site fencing/hoardings and signage
	Creation of temporary site access(es)
	Temporary construction compound (including office, parking, welfare facilities, temporary utilities)
	Diversion of services/utilities
	Environmental containment of the landfill and any removal of contaminated materials
	Piling works and construction of the foundations
	Construction of permanent access, highway improvements, internal roads and parking area
	Installation of utilities
	Erection of the bus stops on the gyratory off A39 (Bath Road)
	Construction of buildings and plant – foundations, superstructure, fit out and connections to utilities

Works	Activity
	Installation of permanent lighting, fencing, security (including CCTV), access control and signage
	Removal of temporary construction compound (see preparatory works for details)
	Landscaping and public realm works (subject to seasonal constraints)

a) Preparatory Works

i. Ecological Mitigation

3.4.2 Ecological mitigation, including clearance of vegetation, would be required. Further details are provided in **Chapter 14** (Terrestrial Ecology and Ornithology) of this volume of the ES.

ii. Site Establishment

3.4.3 In conjunction with the ecological mitigation works, the site would be secured with suitable temporary fencing at the boundary of the work areas.

3.4.4 Site clearance would progress across the site, removing vegetation and stripping the topsoil. Vegetation and scrub removal, of which there are limited amounts, would be avoided during the breeding bird season (March to August). If removal is required during this period, it would be carried out under the supervision of an ecologist. Any topsoil would be removed from the site under appropriate material management protocols.

3.4.5 The temporary construction compound comprising an office, welfare accommodation, security, materials storage areas, site parking and internal site access routes would be constructed within the site boundary (see **Figure 3.1**). These buildings would be of prefabricated, modular construction and are likely to be delivered to site on flat-bed road vehicles.

3.4.6 Temporary site utilities comprising power, water, drainage and telecommunications would be provided at the earliest opportunity.

b) Construction Works

i. Environmental Containment and Foundations

3.4.7 The site lies over a former waste landfill, which is contaminated. The construction strategy would be developed in accordance with the Environment Agency's publication 'Model Procedures for the Management of Land Contamination' (Ref. 3.1), given the constraints of the site. The Environment Agency and Sedgemoor District Council's Environmental Health Department would be consulted throughout.

3.4.8 The building foundations would comprise pre-cast concrete driven piles which would penetrate the landfill and enter the underlying mudstone bedrock. The piles would comprise an initial bore through the landfill which would be filled with bentonite as a sealant. The pre-cast piles which are approximately 27m long and 0.45m in diameter would then be driven through the bentonite. The contaminated arisings from the

works would be removed from the site and taken to a licensed facility for disposal (see **Chapter 12** of this volume of the ES for details).

ii. Construction of Buildings

3.4.9 The superstructure of the four accommodation buildings would be either steel, timber or a combination of both materials and clad in a panelised dark grey metal at ground floor level and terracotta panels at first and second floor levels. The **Bridgwater C Accommodation Campus Design and Access Statement** provides further details.

3.4.10 The frames would be brought to site already constructed and the external cladding and roofs would be added on-site. As with the superstructure, emphasis would be on pre-assembly and prefabrication wherever possible for the fit out within the buildings, including the en-suite bathroom pods.

3.4.11 The temporary canteen building would be constructed using modular or prefabricated construction techniques; and would be constructed in a similar way to the accommodation buildings.

3.4.12 Gas protection measures would be incorporated, where necessary, in the superstructure.

iii. Construction of Roads and Parking Areas

3.4.13 The access/egress off College Way and highway improvements to the gyratory (see **Figure 2.1**) would be constructed to adoptable standards and the works would be undertaken at a mutually agreed time with the highway authority.

3.4.14 The internal roads and parking areas would be constructed using traditional bituminous surfacing. Initially the areas would be constructed to base course level, with the final wearing course layer added towards the end of the construction phase, prior to occupation of the proposed development.

iv. Construction Utilities

3.4.15 The surface water drainage scheme would comprise an underground attenuation storage tank linking into a gravity drain, discharging into the existing combined sewer in College Way. The drainage runs would be lined, where necessary, to provide protection from potential contamination from the landfill waste. Refer to the **Bridgwater C Flood Risk Assessment** for further details.

3.4.16 The foul water from the proposed development would be discharged into the combined sewer on College Way.

3.4.17 Power and telecommunication supplies would be provided to connect the adjacent networks.

v. Other Elements

3.4.18 At the same time as the buildings are being fitted out, the landscaping scheme (subject to it being the appropriate season), ancillary structures (e.g. plant compounds and bicycle shelters), the 5-a-side football pitch, the final fencing and other security measures (e.g. CCTV and lighting) would all be constructed.

3.4.19 The primary landscaping works would be undertaken during the appropriate season, with the final landscaping works completed at the end of the construction works, after the removal of the construction accommodation and other temporary infrastructure.

3.4.20 Wherever possible the landscaping would incorporate the topsoil and earthworks arising from the earlier excavation works.

3.4.21 The two bus shelters adjacent to the gyratory (see **Figure 2.1**) would be constructed prior to first occupation of the proposed development. Their construction would be timed to fall outside of Bridgwater College's term time, to minimise any potential impact on the operation and use of the existing access.

3.5 Construction Site Access and Traffic Implications

a) General

3.5.1 It is estimated that there would be approximately 4,702 (two-way) vehicle movements over the 12 month construction phase. These movements would be principally associated with the delivery of materials, the removal of waste and journeys to and from the site by contractors (see the **Transport Assessment** for details).

b) Construction Site Access and Egress

3.5.2 Access into the site during the early part of construction phase would be gained from the north, via the Bridgwater and Albion Rugby Football Club's car park. Once the permanent site access off College Way has been constructed, access would be via this point for the remainder of the construction phase. **Figure 3.1** identifies the proposed access/egress for the construction phase.

3.5.3 All vehicles accessing the construction site would be required to park within the construction site boundary to avoid any congestion in the surrounding roads and the existing car park. College Way would continue to be available for vehicles and pedestrians accessing Bridgwater College and the sports clubs throughout the construction phase.

3.5.4 The security access and management of the construction phase would be arranged to minimise any construction traffic queuing outside of the construction site boundary. This would include the following, where feasible: setting specific delivery dates and collection times; a requirement for authorisation when visiting the site via vehicle, including restrictions on the workforce travelling to site by car; and the reviews of the **Travel Plan** by the management team.

3.5.5 Whilst no long-term road closures are envisaged, there is a requirement for localised road width restrictions on College Way in connection with the highway works around the existing gyratory.

3.6 Construction Plant and Equipment

3.6.1 It is anticipated that the following plant and equipment are likely to be used during the construction phase:

- piling rigs
- excavators – rubber tyred and tracked

- specialist environmental containment plant
- pumps
- dewatering equipment
- dozers and loading shovels
- articulated dump tracks
- rollers
- portable generators
- floodlights
- compressors
- concrete saws and drills
- lorry mounted concrete pumps
- concrete mixer trucks
- poker vibrators
- mobile cranes
- hoists
- asphalt pavers and planers
- flat bed lorries
- fork lift trucks
- mobile elevating work platforms
- telescopic handlers

References

3.1 Environment Agency. Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination, CLR 11. 2004.

CHAPTER 4: OPERATION

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4. OPERATION

4.1 Introduction

4.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1**). This chapter of the ES describes the operational phase of the proposed development and should be read in conjunction with **Chapter 2** of this volume of the ES.

4.1.2 The site is conveniently located close to the proposed Bridgwater A site (see **Volume 3** of the ES), allowing opportunities for the sharing of facilities at the Bridgwater A campus (e.g. the laundry, sports pitches, amenity spaces) and the bus services to the Hinkley Point C (HPC) development site.

4.2 Operational Phase Overview

i. General Operation

4.2.1 The proposed development would operate 24 hours a day, 7 days per week, to cater for all occupants, irrespective of their shift pattern. The accommodation buildings have been designed to be adaptable; making it possible to move partition walls during the operational phase, to meet any changing needs of EDF Energy.

4.2.2 Occupants would be required to comply with a Code of Conduct, to limit adverse impacts on the local community and ensure high standards of conduct. Refer to the **Accommodation Strategy** for further details.

4.2.3 There would be a level of employment associated with the running and management of the proposed development, estimated to be around seven positions or a "headcount" of 14 workers. However, additional staff would be required for the operation of the temporary canteen until the canteen facility at the proposed Bridgwater A accommodation campus becomes available. These positions are likely to be filled almost entirely by home-based living local to the site.

4.2.4 A facilities management team would be put in place to manage the proposed development, including: maintenance, security, managing bookings and cleaning. The **Accommodation Strategy** provides further details on the proposed management arrangements.

4.2.5 Parking spaces would be allocated by the facilities management team at the time of allocating availability.

4.2.6 A bus pick up/drop off point, incorporating two shelters, would be located on the existing gyratory off the A39 (Bath Road) in the northern part of the site (see **Figure 2.1**). Occupants of the proposed development could pick up the bus from this point should they not wish to walk to the Bridgwater A site.

4.2.7 Manned security would be provided at all times. This would be supported by CCTV along the perimeter fence, which would be monitored from the security office (see **Figure 2.1**).

4.2.8 External lighting would be provided within site, including along the perimeter fence (see **Figure 2.2**). The security lighting would be lit, when required, outside daylight hours. The proposed sports pitch would only be lit between 08:00 and 22:00.

ii. Amenity Facilities

4.2.9 A temporary canteen would be provided for approximately six months (see **Figure 2.1**) until the proposed Bridgwater A accommodation campus becomes operational. After that time, occupants of the proposed development would use the facilities provided at the Bridgwater A accommodation campus.

4.2.10 An all weather 5-a-side football pitch is proposed in the north-western part of the accommodation campus (see **Figure 2.1**). The local community would have access to this 5-a-side football pitch until the sports pitches at the proposed Bridgwater A accommodation campus become available (by Quarter 2 2015). Booking of this facility would be managed by the facilities management company. Public access would be through a gate to the north of the pitch. Occupants of the proposed development would access the pitch from within the accommodation campus. The sports pitch would only be used between 08:00 and 22:00; and lighting would only be provided when in use, if necessary.

iii) Waste Management

4.2.11 Commercial contractors would service the proposed development for refuse collection. The **Waste Management Implementation Strategy** provides further details of how waste arisings would be recycled, re-used or disposed of.

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5. POST-OPERATION

5.1 Introduction

5.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1**). This chapter of the ES provides a description of the post-operational phase and should be read in conjunction with **Chapter 2** of this volume of the ES. This chapter provides an overview of the post-operational phase.

5.2 Post-Operational Phase Overview

5.2.1 The proposed development is expected to be operational for approximately seven years (see **Chapter 4** of this volume of the ES for details). Once construction of the Hinkley Point C (HPC) power station is complete, EDF Energy would no longer require this facility (anticipated to be during Quarter 1 2021).

5.2.2 It is proposed that the post-operational state for this site would be the retention of the development for use in connection with Bridgwater College, possibly as student accommodation (Use Class C2: Residential Institutions) or other educational related uses, such as teaching spaces (Use Class D1: Non-Residential Institution). The preferred post-operational strategy would be developed closer to the time that the land is not required by EDF Energy to support the construction of the HPC power station.

5.2.3 Prior to cessation of use by EDF Energy, a Post-Operational Scheme would be submitted to the Infrastructure Planning Commission (IPC) (or successor body) for approval of the physical works required to put the site into the required post-operational state. A town and country planning application would be required to be submitted to and approved by the local planning authority in respect of the use of the proposed development in its post-operational state. It would also be possible for third parties to make alternative planning application(s), which would be determined through the town and country planning process in the normal way. Refer to the **Post-operational Strategy** appended to the **Planning Statement** for further details.

5.2.4 Any works to be carried out in connection with the approved post-operational scheme would be required to be carried out within 12 months of EDF Energy ceasing use of the accommodation campus or the approval of the scheme, whichever is the later.

5.2.5 **Table 5.1** sets out the potential scenarios for the post-operational phase. It has been assumed that the majority of the infrastructure would be retained and details of this would be determined as part of a post-operational scheme.

Table 5.1: Bridgwater C Post-Operational Infrastructure

To be Retained	To be Removed by EDF Energy Prior to Hand-over of the Site	Optional
• Platform • Accommodation buildings • Sports pitch • Hardstanding for vehicle parking • Internal roads • Site access • Landscaping • Screen planting (trees along college way) • Utilities • Highway works	• Signage	• Fencing • Lighting • CCTV • Bus shelters on the gyratory

5.2.6 Worst case assumptions have been applied to the determination of environmental impacts arising from post-operational activities. These are described in the relevant chapter of this volume of the ES. However, in broad terms, the extent of works required for any removal of infrastructure would be similar to, and no greater than, those described in **Chapter 3** (Construction) of this volume of the ES.

5.2.7 During any removal works the same preventative and management measures applied during the construction phase (see **Chapter 3** of this volume of the ES for details) would also be applied during the post-operational phase. Any works would be carried out in accordance with an Environmental Management Plan (EMMP), which would be submitted to and approved by the IPC (or successor body) at the relevant time.

5.2.8 During the period between EDF Energy ceasing use of the site and the post-operational scheme being implemented, the site would be maintained by EDF Energy in accordance with a maintenance scheme to be submitted to and approved by the IPC (or successor body) prior to cessation of use of the facility.

CHAPTER 6: ALTERNATIVES

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6. ALTERNATIVES

6.1 Introduction

6.1.1 This chapter of the Environmental Statement (ES) has been prepared in respect of the proposed 150-bed accommodation campus (the proposed development), on land referred to by EDF Energy as the Bridgwater C site (the site) (see **Figure 1.1**). This chapter of the ES provides details on the alternative sites and design iterations considered as part of the overall design process and should be read in conjunction with **Chapter 2** of this volume of the ES which describes the proposed development.

6.1.2 Schedule 4 to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the Infrastructure Planning EIA Regulations) (Ref. 6.1) requires applicants to outline the main alternatives studied and to provide an indication of the main reasons for the applicant's choice, taking into account the environmental impacts.

6.1.3 This chapter provides an outline of the following:

- alternative sites considered for the proposed development;
- alternative sizing and land uses of the proposed development; and
- a summary of the design iteration for the proposed development (which is provided in more detail in the **Bridgwater C Accommodation Campus Design** and **Access Statement**).

6.1.4 This chapter should be read in conjunction with **Volume 1, Chapter 5** of this ES, which describes the alternative project-wide strategies, including the accommodation strategy, that have informed the proposed development. For further information refer to the **Planning Statement**.

6.2 Alternative Sites

a) History of Site Selection

6.2.1 EDF Energy considered a range of settlements within Sedgemoor and West Somerset Districts as potential locations for accommodation campuses. These settlements included: Bridgwater, Highbridge and Burnham, Cannington, Nether Stowey, Cheddar, North Petherton, Wedmore, Ashcroft, Axbridge, East Brent, East Huntspill, Pawlett, Puriton, Westonzoyland, Woolavington, Williton and Minehead. Positive and negative attributes of the settlements were considered, including factors such as: proximity to the Hinkley Point C (HPC) development site and commuting time; local planning polices; settlement type and range of facilities on offer; and the likely availability of development sites. The **Alternative Site Assessment** appended to the **Planning Statement** provides further information.

6.2.2 As part of EDF Energy's Stage 1 consultation, four search areas were identified as potential sites in Bridgwater to accommodate up to 500 non-home-based workers, in one or more campuses, during the construction phase of the HPC Project. Bridgwater was considered an appropriate location for this development given its proximity to the strategic and local highway network, to facilitate the movement of workers to and from the HPC development site. Bridgwater is considered to be a key

town within the South West, capable of accommodating significant levels of growth, in both housing and employment, as part of the regeneration proposals.

6.2.3 The search centred around a cluster of sites to the north-east of the town centre, on sites identified by EDF Energy as BRI-A, BRI-B and BRI-C; and a greenfield site outside of Bridgwater identified as BRI-D (see **Figure 6.1**). Whilst the BRI-D site benefits from an extant planning permission for a 100-bed hotel it was subsequently discounted by EDF Energy due to its distance from Bridgwater, lack of local facilities for occupants and feedback to EDF Energy's Stage 1 consultation.

6.2.4 Two sites within Cannington village (identified as CAN-C and CAN-D search areas) and two sites within Williton (identified as WIL-A and WIL-B search areas) were also identified in EDF Energy's Stage 1 consultation as potentially suitable locations for the siting of an accommodation campus for up to 120 workers and 200 workers respectively (see **Figure 6.2** and **Figure 6.3**). These locations were not progressed due to an overall revision to EDF Energy's accommodation strategy, which was informed in part by responses to EDF Energy's Stage 1 consultation.

6.2.5 EDF Energy's accommodation strategy now proposes to locate accommodation campuses in Bridgwater and on the HPC development site. The accommodation strategy has been informed by EDF Energy's operational requirements, feedback to formal consultation and technical assessments. Refer to the **Accommodation Strategy** for details.

6.2.6 A sequential test of potentially suitable residential sites (given their commonality in terms of basic requirements) in Bridgwater was undertaken, having regard to the following documents prepared by, or on behalf of, Sedgemoor District Council (SDC):

- all allocated residential sites in Bridgwater from the adopted Sedgemoor Local Plan (Ref. 6.2);
- all sites with extant planning permission (for over 5 dwellings) for residential development in Bridgwater identified in the Sedgemoor 5 Year Land Supply Report 2011 - 2016 (Ref. 6.3);
- all Bridgwater sites identified in the Sedgemoor Strategic Housing Land Availability Assessment (Ref. 6.4) and recognised as having potential to deliver residential development in the next five years (as identified in the Sedgemoor 5 Year Land Supply Report 2010 - 2015 (Ref: 6.5) and the Sedgemoor 5 Year Land Supply Report 2011 - 2016 (Ref: 6.3));
- sites suggested as being suitable for worker accommodation in Bridgwater in the emerging HPC Project Supplementary Planning Document (Ref. 6.6); and
- other known and significant potential development sites.

6.2.7 Those sites in the Sedgemoor 5 Year Land Supply Report 2011 - 2016 (Ref. 6.4) which were recorded as not being deliverable within the five year period (from 2011 to 2016) were excluded from the assessment.

6.2.8 This search for suitable sites had regard to flood risk, which identified that there were no suitable sites for accommodation campuses within Bridgwater that are located within Flood Zones 1 or 2. Further details are provided in the **Overarching Flood Risk Assessment Report (OFRAR)**.

6.2.9 Of the 62 sites in Bridgwater, analysis showed that the majority of the sites identified were either too small to accommodate a campus of a minimum of 150 bedspaces, or had constraints which rendered them unsuitable or unavailable for campus accommodation of the type and scale required by EDF Energy.

6.2.10 EDF Energy considered grouping sites in close proximity to each other. However, only sites of approximately 1.5ha or larger were considered, as operationally anything smaller would be impractical to provide shared services and would result in adverse traffic impacts as the HPC Project buses would have to travel between more sites to pick up non-home-based workers. Concentrating workers on one or two sites also helps manage the workers, to ensure high standards of behaviour and provide a critical mass of workers to support the amenity and leisure facilities. In this context, 11 sites (or groups of sites) met the minimum site area of 1.5ha. However six sites were dismissed because they failed the subsequent tests, for reasons including: size (even where co-joining could be achieved), proximity to the town centre and associated services/facilities and availability during the period required by EDF Energy.

6.2.11 The remaining five sites are all located in the north-eastern area of Bridgwater. However, the sites were not equally suitable, with distinctions on deliverability and suitability. Full details of the merits or constraints of each site are detailed in the **Alternative Site Assessment** appended to the **Planning Statement**. In summary this assessment concluded that there are no more suitable or deliverable sites than those identified by EDF Energy. Furthermore, no alternative sites were identified by stakeholders during the formal consultation (see the **Consultation Report** for details) to those identified by EDF Energy.

6.3 Alternative Sizing and Land Uses

6.3.1 As part of EDF Energy's Stage 1 consultation, it identified Bridgwater as a potentially suitable location for accommodation to house up to 500 non-home-based workers, in one or more campuses. At the time of the Stage 1 consultation, EDF Energy anticipated that approximately 30% (~750) of non-home-based workers would want to live in an accommodation campus. On this basis a range of potential locations were identified and sized having regard to the locality and any site specific characteristics. Further analysis of the construction workforce profile has since been undertaken to inform the accommodation strategy.

6.3.2 EDF Energy identified a number of potential search areas to accommodate (in part or as a whole) these non-home-based workers, including the 'BRI-C search area' (see **Figure 6.1**), of which this site formed part (see Section 6.2 of this chapter for details).

6.3.3 As part of EDF Energy's Stage 2 consultation, the size and layout of the BRI-C site was amended having regard to matters including: access arrangements, environmental considerations and design restrictions. At that stage EDF Energy proposed to accommodate 150 bedspaces and associated leisure and amenity facilities. As part of EDF Energy's Stage 2 Update consultation the size of the site remained unchanged (i.e. 150 bedspaces). Some alternatives were subsequently made to the nature of recreational and amenity facilities provided. This was to ensure that there would not be any deficiencies in provision of services and facilities for occupants prior to the Bridgwater A accommodation campus becoming available,

whilst ensuring the land take would be minimised and occupants would be encouraged to use existing facilities where feasible and appropriate.

6.4 Design Iteration

6.4.1 This section briefly details the alternative design options considered and iterations during the design process. This process has been informed by:

- responses to consultation (see the **Consultation Report** for details);
- technical assessments, which include, but are not limited to an environmental impact assessment and a flood risk assessment;
- operational requirements of EDF Energy (see the **Bridgwater C Accommodation Campus Design** and **Access Statement** for details); and
- design development using expertise of the full design team (see the **Bridgwater C Accommodation Campus Design** and **Access Statement** for details).

a) Consultation Stages

6.4.2 During EDF Energy's Stage 1 consultation, outline proposals for the 'BRI-C search area' (see **Figure 6.1**) were presented. This search area was identified as a potentially suitable location to accommodate (in part or as a whole) up to 500 non-home-based workers.

6.4.3 Following the Stage 1 consultation, and in response to written responses received by statutory consultees, EDF Energy selected this site as a 'preferred site' option.

6.4.4 The scale of development in this location was refined to a site of approximately 2ha in the north-eastern part of the Stage 1 consultation search area. The extent of the site was reduced to omit Bridgwater Town Football Club, to the south of the site, as the Club did not wish to relocate. Bridgwater and Albion Rugby Football Club also stated that their first team rugby pitch (to the west of the Bridgwater C site) should be retained. Consequently, the search area narrowed to Bridgwater and Albion Rugby Football Club's second team pitch. Additional land to the north of the second team pitch, incorporating the Bridgwater and Albion Rugby Football Club's car park and highway land, was also included within the search area.

6.4.5 EDF Energy's proposals at the Stage 2 consultation included a 150-bed accommodation campus, with a car park, canteen, bus stop, an administration and security office, gym, a plant/energy centre, highways infrastructure and landscaping (see **Figure 6.4**).

6.4.6 In response to feedback from EDF Energy's Stage 2 consultation and further design iteration by EDF Energy, amendments were made to the proposed development in order to avoid, or mitigate, any potential environmental impacts and to enhance the overall sustainability and acceptability of the proposed development. These iterations (see **Table 6.1** and **Figure 6.5**) were presented by EDF Energy as part of its Stage 2 Update consultation.

6.4.7 Regular design meetings were held to discuss design development with input from design consultants, ecologists, landscape architects, civil engineers, hydrologists,

sustainability specialists, transport specialists, noise and air quality specialists and other environmental specialists.

Table 6.1: Key Design Changes Proposed at the Stage 2 Update Consultation

Change	Rationale
Creation of a new access road off College Way.	To create a safe and accessible access/egress to the proposed development for both vehicles and pedestrians, maintaining security on site and reducing the impact on the existing car park and adjoining neighbours.
Use of the existing bus stop along the A39 (Bath Road).	Occupants of the proposed development would have the option of either using the bus stop on the proposed Bridgwater A accommodation campus or to take a bus to the HPC development site from the dedicated waiting area proposed, just off the A39 (Bath Road) (see **Figure 2.1**).
Removal of ancillary facilities.	To maximise operational efficiency and minimise land take, the facilities on the proposed Bridgwater A accommodation campus site will be shared by the occupants of the Bridgwater C accommodation campus site.
Alteration to site boundary.	Consequential changes to reflect the final proposed development and minimise land take.

6.4.8 Since the Stage 2 Update consultation further design development has occurred in response to consultation feedback and ongoing design development. These changes are summarised in **Table 6.2**.

Table 6.2: Key Design Changes Proposed since the Stage 2 Update Consultation

Change	Rationale
Inclusion of an all weather 5-a-side pitch in the north-western part of the site.	This would enable access to sports facilities for the general public until facilities at the Bridgwater A accommodation campus site become available and occupants of the proposed development.
Inclusion of a temporary canteen (approximately nine months) until the Bridgwater A accommodation campus becomes operational.	This would enable the proposed Bridgwater C accommodation campus site to become operational whilst the proposed Bridgwater A accommodation campus site is being constructed.
Alteration to site boundary.	Consequential changes to reflect the final proposed development and minimise land take.

b) Main Alternative Site Layouts Considered

6.4.9 In addition to the main alternatives considered as part of the Stage 1, Stage 2 and Stage 2 Update consultations, other alternative site layouts were considered as part of the internal design evolution. These are briefly set out in **Table 6.3**, together with the reasons why they were not progressed.

Table 6.3: Main Alternative Site Layouts

Alternative	Reason not Chosen
Use of the existing car park to the north of the accommodation buildings in connection with the proposed development.	This car park is well used by the Bridgwater and Albion Rugby Football Club and Bridgwater College throughout the week. Therefore the car parking would not be used in connection with the operational phase of the proposed development, to ensure that there would not be an impact on existing users.
Provision of permanent amenity facilities within the proposed development, particularly catering facilities.	For operational reasons and to ensure the best use of land and resources it was considered appropriate for the recreation and amenity facilities to be shared between the Bridgwater A and Bridgwater C accommodation campus sites. However, some limited provision is included within the proposed accommodation buildings at Bridgwater C to ensure that occupants can prepare light snacks, to ensure that occupants do not need to travel to the Bridgwater A accommodation campus sites or local facilities for all requirements.
Bus pick-up points on College Way or solely at the Bridgwater A accommodation campus.	Pick up points at both the gyratory along the A39 (Bath Road) and at the Bridgwater A accommodation campus site will ensure that occupants of the Bridgwater C accommodation campus site can access bus services with ease and minimise impacts on the local community.
Use of the existing Bridgwater and Albion Rugby Football Club's clubhouse.	EDF Energy is required to ensure that it has sufficient space and type of facilities to meet the needs of the occupants of the accommodation campus. Therefore, EDF Energy is ensuring the needs of the occupants are catered for within the accommodation campuses directly. However, occupants would be able to use existing facilities and services in the local area.
Use of the existing Bridgwater Football Club's access road to the south of the proposed development.	To minimise any potential impact on existing road users it was considered necessary to provide a separate vehicular access/egress into the proposed development. This was considered particularly important given the specific security requirements for the proposed development by EDF Energy.
Changes to the internal site layout.	The siting of the proposed buildings and structures were refined to ensure operational efficiency and ensure minimum land take.
Changes to the number of bedspaces within the proposed development.	150 bedspaces was considered the appropriate scale to ensure operational efficiency whilst responding to the local context in terms of scale.
Changes to building heights.	Variation in building heights from the proposed three storeys was considered but discounted on the basis that these would not assimilate with the character of the area or could result in a less efficient use of land.

References

6.1 Infrastructure Planning Regulations (SI 2009/2263). HMSO, 2009.

6.2 SDC, Sedgemoor District Local Plan (1991-2001 Adopted Version). 2004.

6.3 SDC. Sedgemoor 5 Year Land Supply Report (2011-2016). 2010.

6.4 SDC. Strategic Housing Land Availability Assessment. 2009.

6.5 SDC. Sedgemoor 5 Year Land Supply Report (2011-2016). 2010.

6.6 SDC and WDC. Consultation Draft Hinkley Point C Project Joint Supplementary Planning Document (SPD). 2011.

CHAPTER 7: SOCIO-ECONOMICS

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7. SOCIO-ECONOMICS

7.1 Introduction

7.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential socio-economic impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus, referred to hereafter as the proposed development on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1 to 5** of this volume of the ES.

7.2 Scope and Objectives of Assessment

7.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees (including Sedgemoor District Council (SDC), West Somerset Council (WSC) and Somerset County Council (SCC)), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations. The assessment of socio-economic impacts has been undertaken adopting the methodologies described in Section 7.4.

7.2.2 The baseline environmental characteristics, against which the likely environmental impacts of the proposed development are assessed, have been determined through a desk-based analysis of demographic and economic characteristics relating to the proposed development, and are described in Section 7.5. The immediate study area for this assessment is illustrated in **Figure 7.1.**

7.2.3 Socio-economic impacts are presented in Section 7.6; and appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance are identified in Section 7.7. An assessment of residual impacts following implementation of these mitigation measures are presented in Section 7.8. Section 7.9 provides a summary of potential impacts.

7.2.4 Cumulative socio-economic impacts arising from the HPC Project (i.e. the combined impact of the HPC power station and the associated developments) are assessed in **Volume 2, Chapter 9** of this ES.

7.2.5 Cumulative socio-economic impacts arising from the proposed development in combination with other elements of the HPC Project and other relevant projects are identified and assessed in **Volume 11** of this ES.

7.2.6 The objectives underlining the socio-economic impact assessment were to:

- describe the socio-economic baseline of the immediate study area in terms of economic, demographic and housing data and existing policy;
- identify the sensitive receptors applicable to the proposed development (the local community and economy) and identify an immediate study area;

- assess the socio-economic impacts (on employment, expenditure, accommodation, local facilities and demographics) of the proposed development during the construction, operational and post-operational phases;
- recommend mitigation measures, if determined necessary, to prevent, reduce or off-set the development's impacts on socio-economics; and
- assess the residual impacts of the development on socio-economics.

7.2.7 A glossary of the terminology used in this chapter is provided in **Volume 1** of the ES.

7.3 Legislation, Policy and Guidance

7.3.1 As stated in **Volume 1, Chapter 4** of this ES, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref. 7.1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) (Ref. 7.2) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs. NPS EN-1 section 5.12 and NPS EN-6 section 3.11 draw attention to the need to assess the socio-economic impacts of nationally significant energy infrastructure.

7.3.2 In addition to this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

7.3.3 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Policy and Legislation

i. Inter-organisational Committee Guidelines and Principles for Social Impact Assessment (Ref. 7.3)

7.3.4 Some international guidance is provided by the Inter-organisational Committee on Guidelines and Principles for Social Impact Assessment (ICGPS), with more recent academic updates by Vanclay (Ref. 7.4), Glasson (Ref. 7.5) and Chadwick (Ref. 7.6). The ICGPS defines social impacts as:

> *"the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organise to meet their needs, and generally cope as members of society".*

ii. EU Directive 85/337/EEC (the EIA Directive) (Ref. 7.7)

7.3.5 EU Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC), on the assessment of the impacts of certain public and private projects on the environment, requires a description of possible impacts on human beings. In

the Lisbon Declaration (Ref. 7.8), a subsequent statement on sustainable economic growth in Europe, the main dimensions of social sustainability in the context of EIA are defined as education, employment policy (to create more and better jobs), modernising social protection and the promotion of equality to counter poverty and social exclusion.

b) National Policy and Guidance

7.3.6 There is no UK legislation that specifies the detailed content required for socio-economic assessments or provides appropriate standards and thresholds for impact significance. However, there are a number of guidelines of relevance to socio-economic assessment.

i. Department of the Environment (DoE) (1989) Environmental Assessment: A Guide to the Procedures, London: HMSO (Ref. 7.9)

7.3.7 Early guidance from the UK Government suggested that:

"certain aspects of a project including numbers employed and where they will come from should be considered within an environmental statement."

ii. Office of the Deputy Prime Minister (ODPM) (2004) Creating, Using and Updating a Neighbourhood Baseline, London: HMSO (Ref. 7.10)

7.3.8 More recent guidance on the use of official statistics in baseline assessment work is provided in the Office of the Deputy Prime Minister's (ODPM) publications.

iii. Department for Communities and Local Government (CLG) (2006) Environmental Impact Assessment: A Guide to Good Practice and Procedures, A Consultation Paper, London: CLG (Ref. 7.11)

7.3.9 This guidance on the approach to EIA is provided by the Department of Communities and Local Government (CLG). This guidance outlines standard approaches to baseline data collection, consultation, methodology, impact assessment and mitigation that adhere to the above legislative framework on preparing an EIA.

iv. Planning Policy Statement 1: Delivering Sustainable Development (2005) (PPS1) (Ref. 7.12)

7.3.10 PPS1 was published in 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

7.3.11 Paragraph 5 states that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things: contributing to sustainable economic development; and ensuring high quality development through good and inclusive design, and the efficient use of resources.

7.3.12 Paragraph 16 of PPS1 advises that development plans should promote development that creates socially inclusive communities, including suitable mixes of housing. It states:

"Planning policies should:

- *ensure that the impact of development on the social fabric of communities is considered and taken into account;*

- *seek to reduce social inequalities;*
- *address accessibility (both in terms of location and physical access) for all members of the community to jobs, health, housing, education, shops, leisure and community facilities;*
- *take into account the needs of all the community, including particular requirements relating to age, sex, ethnic background, religion, disability or income;*
- *deliver safe, healthy and attractive places to live; and*
- *support the promotion of health and well being by making provision for physical activity."*

7.3.13 Paragraph 23 advises that the Government is committed to promoting a strong, stable, and productive economy that aims to bring jobs and prosperity for all. Amongst other things, planning authorities should:

"(i) Recognise that economic development can deliver environmental and social benefits;

(ii) Recognise the wider sub-regional, regional or national benefits of economic development and consider these alongside any adverse local impacts;

(iii) Ensure that suitable locations are available for industrial, commercial, retail, public sector (e.g. health and education) tourism and leisure developments, so that the economy can prosper;

(v) Recognise that all local economies are subject to change; planning authorities should be sensitive to these changes and the implications for development and growth; and

(viii) Ensure that infrastructure and services are provided to support new and existing economic development and housing."

v. Planning Policy Statement 4 (PPS4): Planning for Sustainable Economic Growth (PPS4) (2009) (Ref. 7.13)

7.3.14 PPS4 sets out the Government's comprehensive policies for the planning of sustainable economic development in both urban and rural areas. The policies contained in PPS4 apply to development which: provides employment opportunities; generates wealth; or produces or generates an economic output or product.

7.3.15 Paragraph 9 states that the Government's overarching objective is sustainable economic growth.

7.3.16 Paragraph 10 states that the Government's objectives for planning are to, amongst other things: "build prosperous communities by improving the economic performance of cities, towns, regions, sub-regions and local areas, both urban and rural; reduce the gap in economic growth rates between regions, promoting regeneration and tackling deprivation; promote the vitality and viability of town and other centres as important places for communities; and raise the quality of life and the environment in rural areas by promoting thriving, inclusive and locally distinctive rural communities whilst continuing to protect the open countryside for the benefit of all."

7.3.17 Policy EC6 (Planning for Economic Development in Rural Areas) states that local planning authorities should ensure that the countryside is protected for the sake of its intrinsic character and beauty, the diversity of its landscapes, heritage and wildlife, the wealth of its natural resources and to ensure it may be enjoyed by all.

7.3.18 It further advises that, in rural areas, local planning authorities should, amongst other things: strictly control economic development in open countryside away from existing settlements, or outside areas allocated for development in development plans; and identify local service centres and locate most new development in or on the edge of existing settlements.

7.3.19 Policy EC10 (Determining Planning Applications for Economic Development) advises that local planning authorities should adopt a positive and constructive approach towards planning applications for economic development and that planning applications which secure sustainable economic growth should be treated favourably.

7.3.20 Paragraph EC10.2 states that all planning applications for economic development should be assessed against the following impact considerations:

"a. whether the proposal has been planned over the lifetime of the development to limit carbon dioxide emissions, and minimise vulnerability and provide resilience to, climate change;

b. the accessibility of the proposal by a choice of means of transport including walking, cycling, public transport and the car, the effect on local traffic levels and congestion (especially to the trunk road network) after public transport and traffic management measures have been secured;

c. whether the proposal secures a high quality and inclusive design which takes the opportunities available for improving the character and quality of the area and the way it functions;

d. the impact on economic and physical regeneration in the area including the impact on deprived areas and social inclusion objectives; and

e. the impact on local employment."

7.3.21 Policy EC11 (Determining planning applications for Economic Development other than for Main Town Centre Uses which are not in accordance with the Development Plan) advises local planning authorities to:

"a. weigh market and other economic information alongside environmental and social information;

b. take full account of any longer term benefits, as well as the costs, of development, such as job creation or improved productivity including any wider benefits to national, regional or local economies; and

c. consider whether those proposals help to meet the wider objectives of the development plan."

7.3.22 Policy EC12 (Determining Planning Applications for Economic Development in Rural Areas) states that in determining planning applications for economic development in

rural areas, local planning authorities should, amongst other things, support development which enhances the vitality and viability of market towns and other rural service centres.

vi. Planning Policy Statement 7: Sustainable Development in Rural Areas (PPS7) (2004) (Ref. 7.14)

7.3.23 PPS7 sets out the Government's planning policies that apply to rural areas, including country towns and villages and the wider, largely undeveloped countryside up to the fringes of larger urban areas.

7.3.24 The following key principles are considered relevant:

"(i) Decisions on development proposals should be based on sustainable development principles, ensuring an integrated approach to the consideration of:

- *social inclusion, recognising the needs of everyone;*
- *effective protection and enhancement of the environment;*
- *prudent use of natural resources; and*
- *maintaining high and stable levels of economic growth and employment.*

(v) Priority should be given to the re-use of previously-developed ('brownfield') sites in preference to the development of greenfield sites, except in cases where there are no brownfield sites available, or these brownfield sites perform so poorly in terms of sustainability considerations (for example, in their remoteness from settlements and services) in comparison with greenfield sites.

(vi) All development in rural areas should be well designed and inclusive, in keeping and scale with its location, and sensitive to the character of the countryside and local distinctiveness."

c) Regional Policy

7.3.25 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 (RPG10) for the South West 2001-2016 (RPG10) (2001) (Ref. 7.15)

7.3.26 RPG 10 sets out the broad development strategy for the period to 2016 and beyond. The HPC Project falls within the Central sub-region.

7.3.27 With regards to the Central sub-region, Policy SS 3 (The Sub-Regional Strategy) advises that the planning of development and infrastructure investment in the region should be based on the following objectives:

- *"Raise the economic performance of the sub-region;*
- *Encourage sustainable growth at Exeter and Taunton and economic diversification at Torbay;*
- *Improve transport and economic links within and through the sub-region and with neighbouring areas;*
- *Focus housing, employment, retail and social facilities in sustainable locations to reduce social exclusion and rural need; and*
- *Conserve and enhance important environmental assets".*

7.3.28 Policy EN5 (Health, Education, Safety and other Social Infrastructure) states that health, education and other social infrastructure requirements need to be taken into account fully in development planning throughout the region.

7.3.29 Policy EC 1 (Economic Development) advises that local authorities, the South West of England Regional Development Agency (SWRDA), local economic partnerships and other agencies should support the sustainable development of the regional economy by, amongst other things:

- *"positively promoting and encouraging new economic activity in the areas where it can bring the greatest economic and social benefits and make the greatest contribution to reducing regional disparities in prosperity…ensuring that the region's unique environmental and cultural assets are maintained, enhanced and utilised to attract and develop business activity;*
- *developing the skills and abilities of the region's people by improving access to training, education and employment opportunities."*

7.3.30 Policy EC 3 (Employment Sites) states that local authorities, the SWRDA and other agencies should aim to provide for a range and choice of employment sites to meet the projected needs of local businesses and new investment. These should include, amongst other things, major strategic sites suitable for significant inward investment and large-scale reinvestment by existing companies.

ii. The Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of States Proposed Changes 2008-2026 (July 2008) (Ref. 7.16)

7.3.31 The Secretary of State for Communities and Local Government published the proposed changes to the South West's long-term plan (the Draft Regional Spatial Strategy (RSS)) on 22 July 2008, which marked the start of a 12 week consultation which ran until 24 October 2008. The Secretary of State's Proposed Changes to the Draft RSS take account of the Examination in Public Panel's recommendations along with representations made about the Draft RSS and other relevant evidence. The Review has now been suspended awaiting the Government's intended revocation of Regional Spatial Strategies.

7.3.32 The draft RSS looks forward to 2026 and sets out the Government's policies in relation to the development of land within the region. Policy SD4 (Sustainable Communities) states that growth and development will be planned and managed positively to create and maintain Sustainable Communities throughout the region by, amongst other things:

- *"Realising the economic prosperity of the South West and reducing disparity;*
- *Linking the provision of homes, jobs and services based on role and function so that cities, towns and villages and groups of places have the potential to become more self contained and the need to travel is reduced;*
- *Encouraging business activity and particularly small businesses and their contribution to the region's prosperity, including through promoting regional sourcing;*
- *Making adequate and affordable housing available for all residents, including the provision of a range and mixture of different housing types to accommodate the requirements of local communities;*
- *Making the best use of existing infrastructure and ensuring that supporting infrastructure is delivered in step with development;*
- *Supporting social and economic progress by enhancing education, skills development and training."*

7.3.33 Development Policy D (Infrastructure) states that the planning and delivery of development should ensure efficient and effective use of existing infrastructure and should provide for the delivery of new or improved transport, education, health, culture, sport and recreation and green infrastructure in step with development.

iii. Somerset & Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 7.17)

7.3.34 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to socio-economic impacts. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

7.3.35 Policy STR1 (Sustainable Development) states that development in Somerset and the Exmoor National Park should, amongst other things:

- *"Ensure access to housing, employment and services;*
- *give priority to the continued use of previously developed land and buildings; and*
- *enable access for people with disabilities."*

7.3.36 Policy STR6 (Development Outside Towns, Rural Centres and Villages) states that development outside Towns, Rural Centres and Villages should be strictly controlled and restricted to that which benefits economic activity, maintains or enhances the environment and does not foster growth in the need to travel.

7.3.37 Policy STR7 (Implementation of the Strategy) states that to ensure that development in Somerset and the Exmoor National Park is implemented in a way that meets the sustainable development aims of the strategy, development should fairly and reasonably contribute towards the provision of relevant community services and facilities, environmental improvements and infrastructure, that are directly related to and necessary for the development to proceed.

iv. The Sustainable Community Strategy for Somerset 2008-2026 (2009) (Ref. 7.18)

7.3.38 This document sets out the Somerset Strategic Partnership's long-term vision for Somerset in 2026. The document does not contain any policies of specific relevance to the HPC Project. More generally, the document seeks to broaden and strengthen the local economy through: increasing the overall employment rate; increasing the average earning of employees in the area; and, increasing the new business registration rate.

d) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 7.19)

7.3.39 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is subject to the site-specific designations as an area of Recreational Open Space (Policy RLT1), given the current use of part of the site as a rugby training pitch. The site is within the defined development boundary.

7.3.40 The following saved policies are of relevance to socio-economics.

7.3.41 Policy STR4 (Development Location Strategy) sets out that the first priority for development is on brownfield land or sites which offer the opportunity for redevelopment or re-use, and in the following order: a) within Bridgwater, Burnham-on-Sea and Highbridge; b) within rural centres and villages; c) in the countryside. The second priority would be for development on greenfield sites, only if it is demonstrated that sufficient brownfield sites or re-use opportunities are unavailable, and in the following order: a) within Bridgwater; b) within Burnham-on-Sea and Highbridge; c) within Cheddar; and d) within rural centres and villages.

7.3.42 Policy RLT1 (Protection of Recreational Open Space) states:

"Development which would result in the loss of recreational open space will not be permitted unless:

a) the existing sports and recreation facilities can best be retained and enhanced through the redevelopment of a small part of the site; or

b) a replacement facility of equivalent sports and/or recreation benefit is made available; or

c) the proposed development provides sports and/or recreation facilities of greater benefit than the long-term recreational value of the open space that would be lost."

ii. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission) (September 2010) (Ref. 7.20)

7.3.43 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

7.3.44 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the Core Strategy.

7.3.45 Vision 1 of the Core Strategy (A Spatial Vision for Sedgemoor) outlines that, by 2027, Sedgemoor will have a thriving, diverse and resilient economy underpinned by an ambitious and skilled local labour force. Furthermore, by 2027, Bridgwater will be seen as a place that is re-energising into a confident town through well designed strong, innovative architecture, a more vibrant town centre and revitalised neighbourhoods - encouraging a greater sense of local community, well being and civic pride.

7.3.46 A number of strategic objectives have been developed to underpin the Core Strategy approach. This includes Strategic Objectives SO4 to create more sustainable communities and SO6 to ensure the economic wellbeing of our communities, by developing an economic blueprint to shape the restructuring of our economy and transform the workforce.

7.3.47 The following Core Strategy (Proposed Submission) policies are of potential relevance to socio-economics.

7.3.48 Policy S1 (Spatial Strategy for Sedgemoor) states that to create the most sustainable form of growth for Sedgemoor, Bridgwater will be the focus for the District's housing, and employment growth. Also, priority will be given to development opportunities in the identified settlements that contribute towards regeneration, viability and vitality, and which are within or close to existing or proposed public transport corridors.

7.3.49 Policy S2 (Infrastructure Delivery) states that all new development that generates a demand for infrastructure will only be permitted if the necessary on and off-site infrastructure required to support and mitigate the impact of the development site is either already in place or there is a reliable mechanism to in place to ensure that it will be delivered at the time and in the location it is required.

7.3.50 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, promote greater self containment of settlements by contributing to communities that are supported by adequate services, a diverse range of employment opportunities and physical and social infrastructure. Also, development proposals will be expected to contribute towards a vibrant, diverse

and responsive local economy that supports investment and regeneration of our towns and rural settlements.

7.3.51 Policy D2 (Promoting High Quality and Inclusive Design) states, amongst other things, that development will need to demonstrate high quality, sustainable and inclusive design that responds positively to the characteristics of the site and surrounding area.

7.3.52 Policy D4 (Renewable or Low Carbon Energy Generation) states the Council will support proposals that maximise the generation of energy from renewable or low carbon sources, provided that the installation would not have significant adverse impact taking into account, amongst other factors, the extent of any direct benefits to the local area and community.

7.3.53 Policy D19 (Health and Social Care) states that new development that creates a need for additional health care that cannot be met through existing facilities will be expected to meet any identified shortfall. All major planning applications will be required to provide a Health Impact Assessment.

7.3.54 Policy D20 (Green Infrastructure) states that Green Infrastructure will be safeguarded, maintained, improved, enhanced and added to, as appropriate, to form a multi-functional resource which, amongst other things, will provide enhanced settings for existing and proposed developments and create pleasant and sustainable places in which to live in, work in or visit.

7.3.55 Policy D21 (Community and Cultural Facilities) states that the Council will work with partners to provide additional, extended or enhanced community and cultural facilities. New development that creates a need for additional provision that cannot be met through existing facilities will be expected to meet any identified shortfall.

iii. Sedgemoor District Council: Bridgwater Vision (2009) (Ref. 7.21)

7.3.56 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

7.3.57 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. In particular, it states:

> *"Labour force changes associated with decommissioning at 'A' and the future decommissioning of 'B' (current life to 2016) and the potential requirements associated with the construction and operation of new facilities, will require long term planning and community engagement. Substantial effort will be required at a grass roots and business levels if any new investment is to positively tackle the socio-economic issues of the local area and have wider benefits into the local supply chain. This will require for example, the developer to enter into an employment and skills charter to ensure a significant proportion of the local labour is utilised.*
>
> *Due to the high complexity of decommissioning, construction, and operation of a nuclear power station Hinkley Point is a catalyst for a higher skilled workforce and could have a more significant positive impact on the*

structure of the local economy and the community if the proposal is designed in such a way to maximise real community benefit.

The planned construction of a new nuclear power station will not only bring many jobs, but also will require local businesses to improve their skills in order to prepare for future bidding, which in its own turn should contribute to the development of a knowledge economy."

iv. Sedgemoor District Council: Consultation Draft Hinkley Point C Project Supplementary Planning Guidance (2009) (Ref. 7.22)

7.3.58 Sedgemoor District Council (SDC) and West Somerset Council (WSC) have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** of this ES for a description of the position regarding the status of the draft HPC SPD.

7.3.59 Paragraph 6.9 sets out that, to ensure that the Hinkley development acts as a key driver for the achievement of a more dynamic, entrepreneurial, inclusive and sustainable economy, proactive measures should be taken in relation to:

- *"People – to ensure the local workforce has the skills to become in involved in the HPC project and related industries;*
- *Place – to ensure provision is made in suitable locations for HPC associated employment development sites and that positive employment legacy uses are enabled where appropriate; and*
- *Business – establish positive procurement practices and support to ensure local businesses can fully participate in the supply chain by having access to and the ability to compete for HPC contracts."*

7.3.60 Specifically in relation to the site, Box 25 in the draft HPC SPD advises that development proposals for permanent housing and temporary campus facilities for worker accommodation would be encouraged, subject to the consideration of detailed proposals. It goes on to state that any proposals will be expected to support the creation of an exemplar sustainable community as a natural extension to Bridgwater and contribute to the delivery of the Bridgwater Vision. It also states that development should seek to properly integrate with existing and new neighbouring communities and will project a strong positive image for Bridgwater.

7.3.61 The draft HPC SPD also advises that permanent buildings at the site should be designed to provide legacy uses, specifically teaching space and student accommodation. It also states that proposals should also seek to retain existing sports and recreation facilities or open space, or set out proposals for the provision of replacement sports and leisure facilities of equivalent benefit (page 47).

v. Other Local Planning Documents

7.3.62 The Sedgemoor Economic Masterplan 2008-2016 (SEM) (Ref. 7.23) is SDC's economic development strategy and is intended to complement other strategies, including the Sedgemoor Local Development Framework, Corporate Plan (Ref. 7.24)

and Sustainable Community Strategy (Ref. 7.25). The SEM outlines SDC's approach to economic regeneration in the District and how it considers the economy should grow in a sustainable manner into the future. The SEM recognises the importance of the HPC Project to SDC's economy and the benefits and opportunities offered by the nuclear energy sector.

7.3.63 Further planning policy context is provided in **Volume 1, Chapter 4** of this ES and **Chapter 1** of this volume of the ES.

7.4 Methodology

7.4.1 The socio-economic impacts assessment seeks to establish the potential social and economic impacts of the proposed development and to assess the expected impacts against the current baseline conditions.

7.4.2 An Environmental Appraisal was produced as part of EDF Energy's Stage 2 Consultation. This included a socio-economic assessment and individual socio-economic appraisals of each of the proposed associated developments. A number of comments were received on the approach to the technical assessment, mainly from SDC and WSC within their consultation responses (see the **Consultation Report** for details).

7.4.3 EDF Energy has been working with WSC and SDC since the Stage 2 consultation to address these comments.

7.4.4 The ES submitted in support of this application for Development Consent includes an overall assessment of the impacts of the HPC Project, including the construction workforce on the surrounding area (**Volume 2, Chapter 9** of this ES); and the site specific chapters for each of the proposed associated developments (**Chapter 7** in **Volumes 3** to **10** of this ES) address the direct socio-economic impacts of each of those proposed developments.

7.4.5 **Volume 2**, **Chapter 9** of this ES includes updated employment assessments incorporating the construction employment impacts of the sites into a single assessment including likely home-based and non-home-based workers (see Technical Paper 1, Workforce Profile, published as part of the Stage 2 Update consultation and appended to **Volume 2**, **Chapter 9** of this ES).

7.4.6 The approach adopted for this assessment has been designed to comply with the legislation and guidance described above, the methodology described in **Volume 2, Chapter 9** of this ES (the socio-economic impact assessment for the HPC Project) and the generic criteria presented in **Volume 1, Chapter 7** of this ES.

7.4.7 The construction labour force requirements for each of the proposed off-site associated developments have been provided by EDF Energy's construction team, based on the likely costs of construction and previous experience of similar projects. These have been cross checked against similar projects requiring similar labour skills. The numbers contained in the assessment represent a peak workforce, but it is assumed that this would be similar to the average number of workers on site over the construction phase. These numbers represent part of the civils histogram contained in **Volume 2, Chapter 9** of this ES.

a) Study Area

7.4.8 The study areas for the HPC project-wide (**Volume 2**, **Chapter 9**) and associated development (**Volumes 3** to **10**, **Chapter 7**) socio-economic assessments have been chosen to reflect different types of impacts that might be expected at appropriate spatial scales. Therefore, for the HPC project-wide assessment, labour markets have been identified at 60-minutes and 90-minutes travel time from the main site to address economic impacts, and district- and county-wide areas are identified to address accommodation market impacts. Other community and population impacts, for example on public service provision and community facilities, have been assessed using ward clusters within the 60-minute travel area.

7.4.9 The geographical extent of the study area for this is the immediate study area surrounding the site (as shown in **Figure 7.1**) – comprising the Lower-level Super Output Areas (LSOAs) in the immediate vicinity of the site (Sedgemoor 008A, 008B, 008C, 008D, 008E and 010A, 010B, 010C, 010D). These LSOAs, which are areas of statistical geography containing around 1,500 people (residents), incorporate all of the Bridgwater Bower and Bridgwater Sydenham wards, and a small part of the Bridgwater Eastover ward.

7.4.10 Statistical information relating to the local level (SDC and WSC), county/regional level (Somerset and/or South West England) and national level (England and Wales) is, however, taken into account when assessing the sensitivity of receptors and hence the overall significance of impacts.

b) Baseline Assessment

7.4.11 Baseline socio-economic conditions for the relevant study areas have been established through:

- consultation with appropriate statutory bodies; and
- analysis of nationally recognised data and survey information obtained from the Office of National Statistics (ONS) and other Government departments including the Department of Communities and Local Government, such as:
  - Census (2001) data and mid-year population estimates (2001-2009) (Ref. 7.26).
  - Annual Business Inquiry (2008) data (Ref. 7.27).
  - DWP (2010) Out-of-Work Benefit Claimant Data (Ref. 7.28).
  - Indices of Multiple Deprivation (2010) (Ref. 7.29).
  - A study of local sports facilities has been undertaken for the Bridgwater area, based on information obtained from the Sport England Active Places website (Ref. 7.30).
  - The level of provision of primary healthcare, including GP list sizes, is based on data from NHS Choices (2011) and NHS Business Services (2010).
  - Crime figures are based on Avon and Somerset Constabulary (2010) data for 3-month crime rates.

7.4.12 Due to the nature of the socio-economic data, no specific surveys were commissioned or undertaken for this assessment.

c) Consultation

7.4.13 Consultation has been undertaken throughout the EIA process and further information is provided in the **Consultation Report.**

7.4.14 EDF Energy has undertaken consultation through a Planning Performance Agreement with the local authorities. A socio-economic workstream was established through this process and other formal and informal consultation. Responses to all comments received by EDF Energy are set out in the **Consultation Report**, which is submitted in support of this application for Development Consent. Key points are summarised below.

7.4.15 Meetings have been held with SDC, WSC and SCC throughout the EIA process to discuss the scope of the assessment. These meetings are summarised in the **Consultation Report**. In addition, workshops have been held with local authorities to identify and confirm the likely socio-economic impacts associated with the proposed development and to identify possible measures to mitigate for these impacts.

7.4.16 EDF Energy's proposals for accommodation campuses in Bridgwater have been reviewed and amended following EDF Energy's Stage 1, 2 and 2 Update consultations, which highlighted a number of socio-economic concerns related to community cohesion, crime and safety and community facility issues (e.g. the removal and replacement of existing sport and recreation facilities and public access to new facilities).

7.4.17 A formal socio-economic working group, incorporating representatives from SDC, WSC, SCC and EDF Energy was established in October 2010. The working group has considered the methodology adopted for the estimation of employment numbers and the consequent impacts on accommodation and public services.

d) Assessment Methodology

7.4.18 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. In addition the following specific methodology was applied for the determination of impact magnitude.

i. Value and Sensitivity

7.4.19 The sensitivity of an environmental receptor is a combination of the 'value', which for most environmental receptors relates to importance at international, national, regional and local scales. In relation to socio-economics, the 'higher' value receptors are dealt with in the HPC Project main site assessment (**Volume 2**, **Chapter 9** of this ES). The remainder of the receptors identified within the associated development assessments (**Volumes 3** to **10**, **Chapter 7** of this ES) are either 'low' (i.e. significant at district-level) or 'very low' (i.e. not a significant receptor e.g. local labour markets or specific retail outlets/rural economy). In addition, most socio-economic receptors have relatively high tolerance to change as they are not static but subject to constant turnover (e.g. demographics and economy).

7.4.20 The socio-economic receptors that may experience an impact during the construction, operational and post-operational phases of the proposed development have been identified as the resident population of the immediate study area, and the

labour market and economy of the immediate study area as described in Section 7.5 (d). In addition, qualitative receptors are identified in terms of the demographic and community profile of the immediate study area, in relation to identified baseline characteristics such as deprivation, and the local business community (in terms of supply chain and the wider economy).

7.4.21 As such, the value of receptors at the local level, as directed by **Table 7.3** of **Volume 1, Chapter 7** of this ES, are identified as low or very low (i.e. of local significance only, and with some tolerance to accommodate change). **Table 7.1** shows the values attributed to each receptor.

Table 7.1: Value/Sensitivity of Receptors to Socio-economic Impacts

Impact Type	Receptor	Value and Sensitivity	Justification
Employment	Labour market and economy of the immediate study area	Low	Based on the sensitivity of the local employment environment to temporary employment opportunities, local importance and tolerance to accommodate the proposed change.
Local Expenditure	Local economy and specific retailers	Low	Based on the sensitivity of the employment environment to temporary employment opportunities, a very low importance is predicted, although this would be of low sensitivity as there are a limited number of retail outlets in the immediate study area
Demographic and Community	Residential population of the immediate study area	Medium	The value of the receptor is considered medium due to the nationally significant level of deprivation and need in the immediate study area; The sensitivity is considered medium overall due to the tolerance to change demonstrated by the annual level of population turnover within Bridgwater
Supply Chain	Local economy	Very low	A very low importance receptor as the local economy is not predominantly focused on supply of contract workers

ii. Magnitude

7.4.22 The magnitude of impact has been established by considering the consequences that the proposed development would have upon the local population and economy, and has been considered in terms of high, medium low and very low. Potential impacts have been considered in terms of their propensity to be permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

7.4.23 Magnitude is a function of the geographical extent of the impact, it's duration, permanence and reversibility.

7.4.24 Impacts may arise during all three phases of the proposed development – construction, operational and post-operational phases. Where an impact could reasonably be placed within more than one magnitude rating conservative professional judgement has been used to determine which rating would be applicable.

7.4.25 In adherence with **Table 7.2** of **Volume 1, Chapter 7** of this ES, magnitude is assessed as low or very low where changes are noticeable and temporary over a partial area affecting key characteristics (in this case the existing resident population

and workforce). Magnitude is assessed as medium or high where changes are permanent or irreversible over the majority of the development area or beyond.

7.4.26 **Table 7.2**, which is derived from **Table 9.5** of **Volume 2**, **Chapter 9** of this ES, identifies those impacts relevant to this proposed development where magnitude can be defined with reference to the baseline and quantitative indicators.

7.4.27 Other qualitative assessments of magnitude are based on professional judgement. The criteria seek, as far as possible, to identify quantitative criteria as to the level of change in relation to the current capacity of the area.

7.4.28 This recognises the dynamic nature of the environment within which the HPC development would interact. **Table 7.2** sets out where assessments are quantitative or qualitative, and where impacts are not relevant to the proposed development, and shows that due to the local, temporary nature of some impacts, a low or very low magnitude is likely.

Table 7.2: Criteria Used to Determine the Magnitude of the Socio-economic Impacts

	High	Medium	Low	Very Low
Employment Impacts				
Construction Employment	Construction employment at the proposed development is assessed as part of the project-wide Workforce Profile, addressed in **Volume 2**, **Chapter 9.** An assessment has been made to identify significance at a local level, based on temporary proportional increases against baseline jobs and residents in the immediate study area:			
	> 100% increase in jobs in the immediate study area	**50-100% increase in jobs in the immediate study area**	**10-50% increase in jobs in the immediate study area**	**< 10% increase in jobs in the immediate study area**
Operational Employment	Elements of operational employment at the associated development sites related to the project-wide construction workforce are incorporated into the project-wide Workforce Profile, addressed in **Volume 2**, **Chapter 9.** An element of employment at the Bridgwater-A and Bridgwater-C accommodation campuses would be additional (e.g. catering, cleaning and recreation staff). These have been highlighted and quantified in the relevant assessment. The following significance criteria have been used to identify the impact in the immediate study area, which will be temporary:			
	> 100% increase in jobs in the immediate study area	**50-100% increase in jobs in the immediate study area**	**10-50% increase in jobs in the immediate study area**	**< 10% increase in jobs in the immediate study area**
Business and Supply Chain and Operational Expenditure	Assessed Qualitatively			
Demographic and Community Impacts				
Community Cohesion and Public Services	Effect of new NHB workers represents 50%+ of annual average new residents	Effect of new NHB workers represents 20 to up to 50% of annual average new residents	Effect of new NHB workers represents 10 to up to 20% of annual average new residents	Effect of new NHB workers represents less than 10% of annual average new residents
	The 'additive' impacts of three proposed accommodation campuses (i.e. HPC development site (see **Volume 2** of this ES), Bridgwater C (see this volume of the ES) and Bridgwater A (see **Volume 3** of this ES) in terms of community impacts and economic effects are assessed in **Volume 2, Chapter 9** of this ES.			

	High	Medium	Low	Very Low
Sport and Recreation	Assessed qualitatively in relation to unique sensitive receptors.			
Local Expenditure Impacts				
Construction and Post-operational Employment	Employment generated represents > 100% increase relative to local resident population in the **immediate study area**	Employment generated represents 50-100% increase relative to local resident population in the **immediate study area**	Employment generated represents 10-50% increase relative to local resident population in the **immediate study area**	Employment generated represents < 10% increase relative to local resident population in the **immediate study area**

iii. Significance

7.4.29 Within this chapter, the generic descriptions used to define the significance of impacts follow those given in **Table 7.5** of **Volume 1, Chapter 7** of this ES. An Impact Assessment Matrix (IAM) compares the magnitude of impacts with the value and sensitivity of the receptor to determine the significance of impacts at **Table 7.4** of **Volume 1, Chapter 7** of this ES.

7.4.30 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the receptor. The methodology by which the predicted significance of the impacts, without mitigation, is outlined in **Volume 1, Chapter 7** of this ES.

7.4.31 The assessment of impact significance is the most important step in the EIA process, since it is used to determine whether mitigation is required, and also to determine whether mitigation measures have reduced impacts to an acceptable residual level.

iv. Cumulative Impacts

7.4.32 As part of the Stage 2 Consultation it was suggested by SDC and WSC in their joint response that the labour market impacts and the consequent impacts on demand for accommodation and public services/community facilities should be considered alongside the wider labour force requirements of the proposed off-site associated developments and the HPC development itself. The interactive cumulative construction employment impacts of the HPC Project (i.e. the HPC development and all the associated developments) are assessed in **Volume 2, Chapter 9** of this ES. In addition, an assessment of the cumulative impacts of HPC project-wide development alongside external projects (i.e. construction/development projects elsewhere in the local area and region) is set out in **Volume 11, Chapter 6** of this ES.

7.4.33 In common with the other proposed associated developments, the proposed development would have a relatively minor economic impact in the context of the overall HPC Project. In addition, the non-home-based construction workforce would be dispersed over a relatively wide area and, therefore, potential impacts on demand for accommodation and public services would be dispersed well beyond the site and associated LSOAs. These impacts are therefore considered as part of the assessment of the overall HPC Project and its cumulative impacts (See **Volume 2, Chapter 9,** and **Volume 11** of this ES. In addition, the cumulative community impacts of the overall proposals on Bridgwater are described in **Volume 11** of the ES.

7.4.34 The assessment of the socio-economic impacts follows the IPC's guidance (Ref. 7.31) for the potential effects to be based on evidenced impacts. In relation to the accommodation campuses, WSC and SDC made representations on potential impacts. As part of the research process, an evidence base has been considered but there is no objective means of quantifying the impacts and therefore assessment of the impacts of the proposed development on the local community has been carried out qualitatively. The cumulative community impacts of the overall proposals on Bridgwater are described in the cumulative impact assessment (**Volume 11** of this ES).

e) Limitations, Constraints and Assumptions

7.4.35 The assessment of impacts has been undertaken against the baseline conditions as defined by the data sources referenced Section 7.4. As with any dataset, these may be subject to change.

7.4.36 The numbers contained in the assessment of employment represent a peak workforce, but it is assumed that this would be similar to the average number of workers on site over the construction period. These numbers represent part of the overall associated development workforce histogram contained in **Volume 2, Chapter 9** of this ES.

7.4.37 There is inherent uncertainty in predicting the number and distribution of non-home-based construction workers on a project-wide basis for a project of this scale. As the nature of the construction of this associated development would require a comparatively small number of construction worker hours in comparison with the overall HPC Project, any variation would not likely change the overall significance of the HPC project-wide assessment, which is provided in **Volume 2**, **Chapter 9** of this ES.

7.5 Baseline Environmental Characteristics

a) Introduction

7.5.1 This section of the ES describes the socio-economic baseline for the proposed development.

b) Study Area Description

7.5.2 The site is located to the north-east of Bridgwater, the administrative centre of Sedgemoor District, and a major industrial centre. The site lies approximately 12km south-east from the HPC development site.

7.5.3 The site covers an area of approximately 1.9ha and is located to the north-east of Bridgwater town centre. The part of the site (southern part) is currently used by Bridgwater and Albion Rugby Football Club (BARFC) (the Club) as a second team rugby training pitch. The northern part of the site is occupied by an informal area of hardstanding which is used by the Club and Bridgwater College for vehicle parking. The site is accessed from College Way, to the south of the A39 (Bath Road). Land used by the Club bounds the site to the west, with the Bridgwater to Highbridge railway line. Land used by Bridgwater College bounds the site to the south.

7.5.4 College Way runs along the eastern boundary of the site with linear green space located on the eastern side of College Way. The gardens of residential properties on Fairfax Road within the Sydenham Ward, back on to this green space.

7.5.5 The nearest residential properties, on Fairfax Road and the A39 (Bath Road) are located approximately 50m and 75m respectively from the site boundary.

7.5.6 The Club (second team training pitch) is the only sports and recreation facility located within the site. However, a number of sports and recreation facilities are located within a 1km radius of the site. These include Bridgwater Town Football Club, Bridgwater College Sports Centre, Bridgwater Sports and Social Club and East Bridgwater Sports Centre. There are no areas of open access land or public open space located within the site.

c) Planning History / Existing Proposals

7.5.7 There are currently several development opportunities within the Sydenham and Bower area, including capital investment in social housing through the Homes in Sedgemoor programme, rebuilding of East Bridgwater Community School under the Building Schools for the Future programme, the new Bridgwater community hospital, and the North East Bridgwater development (Planning Reference: 08/05/00212 (Ref. 7.32), see **Volume 3, Chapter 1** for details). Bridgwater College campus is also located in the area and has a number of ambitious expansion plans, which has included the recently completed Energy Skills Centre. The post-operational use of the proposed development in connection with Bridgwater College is therefore likely to be relevant.

7.5.8 In May 2011, Bridgwater College submitted a full planning application for the erection of a performing art centre on this land (Planning Application Reference: 08/11/00093) (Ref. 7.33). The proposed development includes a 350-seat flexible auditorium, a dance studio with associated changing, technical and teaching spaces, a small cafe, public amenities and parking.

d) Environmental Baseline

7.5.9 The socio-economic baseline for the project-wide study areas (including Sedgemoor, West Somerset and Taunton Deane Districts, Somerset County and wider scales, along with urban areas within the three aforementioned districts and a 60-minute travel distance and 90-minute travel distance (also referred to as the Construction Daily Commuting Zone (CDCZ)) from the HPC development site) is presented in **Volume 2, Chapter 9** of this ES. The following baseline description focuses on the site and the immediate study area as outlined in **Figure 7.1**.

7.5.10 Key socio-economic indicators of relevance to the proposed development are summarised in **Table 7.3.**

7.5.11 Baseline information for the area immediately surrounding the site (i.e. the area covered by LSOAs Sedgemoor 008A, 008B, 008C, 008D, 008E and 010A, 010B, 010C, 010D) is set out below. Alongside this, a summary of the same datasets for Bridgwater (Mid-level Super Output Areas 008, 009, 010, 011 and 013) is included:

- Population – the population of the area is approximately 14,123, of which approximately 8,734 are of working age (i.e. 16 to 64). As shown in **Table 7.4** the

population of the area declined slightly (-1.4%) between 2001 and 2009, compared to growth in Sedgemoor (5.8%) and nationally (4.8%). The population of Bridgwater is approximately 38,590, of whom around 23,552 are of working age. Bridgwater's population grew significantly (7.9%) between 2001 and 2009, a higher rate than in Sedgemoor (5.8%) and nationally (4.8%) (Ref. 7.34).

- Housing – there are around 6,208 homes in the immediate study area and 17,465 within Bridgwater (Ref. 7.35). Within Bridgwater, around 20% of homes are in social rented tenures, compared to approximately 12.5% across Sedgemoor.
- Employment – according to ABI/BRES data (2009) (Ref. 7.36), there are 6,878 employee jobs in the immediate study area, of which 38% are in distribution, hotels and restaurants sectors, and 28% are in public administration, education and health sectors. There are 17,979 jobs in Bridgwater, of which 29% are in distribution, hotels and restaurants sectors, 29% are in public administration, education and health sectors, and 13% are in banking and finance sectors.
- Business structure – the local business structure in the immediate study area currently consists predominantly of construction, retail, wholesale and manufacturing sectors with an element of business administration and support services. For the wider Bridgwater area, retail dominates reflecting the influence of the town centre, although construction and manufacturing also hold a high proportion of jobs. Smaller businesses dominate the work units present in the study area with the majority comprising between one and four employees. However, there are also some larger work units, including one with 400-499 employees and one with 750-999 employees. Both of these are in the immediate study area (Office for National Statistics, Annual Business Inquiry 2009 (Ref. 7.37)).
- Unemployment – the level of worklessness among working age residents is relatively high at 19%, well above the average for Sedgemoor (14.6%) and national averages (15.2%). In Bridgwater, this figure is at 17.5% of working age residents (Ref. 7.38).
- Deprivation – levels of deprivation in Bridgwater are also relatively high, especially in the north-east of the town, with an average rank for the LSOAs of 10,653 (out of 32,482 LSOAs in England) (Ref. 7.39). One of the nine LSOAs is within the 10% most deprived in England, and two of the nine LSOAs in the immediate study area are currently ranked within the 20% most deprived in England. A spatial representation of the data is included in **Figure 7.2**.
- Crime – average recorded crime rates in the Bridgwater Neighbourhood Area (September to November 2010) are higher than the average for the Somerset West Basic Command Unit (6.2 per 1,000 compared to 4.9 per 1,000), although lower than the Avon and Somerset Constabulary average of 6.7 per 1,000. Analysis of crime by type indicates that over the 12 months preceding November 2010 the majority of recorded crime is classified as 'anti-social behaviour' (Avon and Somerset Constabulary, 2010) (Ref. 7.40). This is outlined in **Table 7.5. Figure 7.3** illustrates that a number of areas in east Bridgwater to the south of the proposed development and the town centre, are within the 20% and 10% most deprived areas nationally in terms of the IMD 2010 crime domain, which measures relative levels of theft, burglary, criminal damage and violence.

- Sports and leisure facilities – as highlighted, the site is directly adjacent to the BARFC's sports facilities and currently forms part of it.

Table 7.3: Summary Baseline Data for the Immediate Study Area and Bridgwater

Indicator	Immediate Study Area (LSOAs Sedgemoor 008A-E and 010A-D)	Bridgwater (MSOAs Sedgemoor 008, 009, 010, 011 and 013)
Population growth (2001-2009)	-1.4%	7.9%
Dwellings (2009)	6,208	17,465
Working-age population (mid-2009)	8,734	23,552
Total population (all ages) (mid-2009)	14,123	38,590
% Social rented homes	18.6% (Sedgemoor = 12.5%, England = 19.2%)	19.7% (Sedgemoor = 12.5%, England = 19.2%)
Employment (2009)	6,878	17,979
Out of work benefit claimants as % of working-age population (2010)	19% (Sedgemoor = 14.6%; England = 15.2%)	17.5% (Sedgemoor = 14.6%; England = 15.2%)
Average IMD 2010 ranking (out of 32,482 LSOAs in England; 1 = most deprived)	10,653 (one LSOA is in 10% most deprived nationally, two are in 20% most deprived nationally)	12,369

Source: Office of National Statistics (ONS), Annual Business Inquiry/Business Register and Employment Survey (2009), Department of Work and Pensions (DWP) (2010), Department for Communities and Local Government (2010)

Table 7.4: Resident Population Growth for the Immediate Study Area and Other Spatial Levels (2001-2009)

Area	Population (mid-2001)	Population (mid-2009)	% Growth 2001-2009
LSOA 008A-E and 010A-D	14,325	14,123	-1.4%
Bridgwater	35,763	38,590	7.9%
West Somerset	35,069	35,383	0.9%
Sedgemoor	106,030	112,136	5.8%
Somerset	498,707	523,471	5.0%
South West	4,249,433	4,498,556	5.9%
England	49,449,746	51,809,741	4.8%

Source: Office for National Statistics Mid-Year Population Estimates (Ref. 7.41)

Table 7.5: Crime Rates and Total Recorded Crime

Average (3-month) Crime Rates Sept-Nov 2010						
Area	**Burglary**	**Robbery**	**Vehicle Crime**	**Violence**	**Anti-Social Behaviour**	**ALL CRIMES**
Bridgwater Neighbourhood Area	0.8	0	0.4	1.4	4.8	6.2
Somerset West Basic Command Unit	0.6	0	0.4	1	4.1	4.9
Avon and Somerset Constabulary	0.9	0.1	0.6	1.5	4.4	6.7
Total Recorded Crime, Bridgwater Neighbourhood Area (Nov 2009-Nov 2010)						
Area	**Burglary**	**Robbery**	**Vehicle Crime**	**Violence**	**Anti-Social Behaviour**	**ALL CRIMES**
Bridgwater Neighbourhood Area	596	15	323	1,052	3,808	4,576

Source: Avon and Somerset Constabulary (2010) (Ref. 7.40)

7.6 Assessment of Impacts

a) Construction Impacts

7.6.1 This section identifies and assesses the potential impacts of the construction phase on the socio-economic environment of the immediate study area.

i. Employment Impacts

7.6.2 Recruitment of construction workforce is considered as part of the HPC development site construction employment impact assessment (**Volume 2, Chapter 9** of this ES), as the anticipated employment associated with this proposed development is too small to assess the likely impacts on the local labour market as a 'stand-alone' assessment.

7.6.3 Estimates of the potential employment likely to be generated during the construction phase of the proposed development are provided below. Some additional off-site employment could also be supported, for example, in the design and planning of facilities and in overall project management. This is likely to be of a very low magnitude, and would have a very low value. As the sensitive receptor in this case would be the wider (regional) economy, this is likely to lead to a **negligible** impact and is not included within the figures below.

7.6.4 Construction employment of the proposed development is estimated at a peak of around 40 construction workers. Estimated start and end-dates are outlined in **Chapter 3** of this volume of the ES.

7.6.5 Overall, a medium-term increase in local employment opportunity would be expected to arise within the immediate study area and the wider Sedgemoor District. The peak construction employment of 40 workers represents around 0.6% of the baseline workforce level in the immediate study area, and therefore has a very low magnitude. Based on the low sensitivity of the employment environment to medium-term employment opportunities, a low importance is predicted. Consequently, a **medium**

term negligible impact is expected on labour demand and subsequent accommodation demand in the immediate study area.

ii. Demographic Impacts

7.6.6 The 'additive' impacts of the three proposed accommodation campuses (i.e. HPC development site (see **Volume 2** of this ES), Bridgwater A (see **Volume 3** of this ES) and Bridgwater C (this volume of the ES)) in terms of community impacts and economic effects are assessed in **Volume 2, Chapter 9.**

iii. Local Expenditure Impacts

7.6.7 Given the nature of the proposed construction activities for the proposed development, there is considered to be potential for suitably qualified companies based in Somerset and the wider South West region to be involved in the works as contractors or sub-contractors. Around 10,000 construction companies exist in the wider South West region, predominantly small to medium sized enterprises (SMEs). With current market conditions, positive interest is expected from the medium to large size firms, with further opportunities for small firms and the self-employed as sub-contracted labour.

7.6.8 The presence of up to 40 peak construction workers would also provide a small temporary injection of expenditure into the local economy, particularly with local accommodation providers, retail and catering businesses.

7.6.9 The magnitude of the potential impact on local expenditure is assessed as very low given that the maximum number of workers would be only around 0.5% of the population of the immediate study area, and would be temporary. Based on the very low sensitivity of the employment environment to medium-term employment opportunities, a very low importance is predicted, although this would be of low sensitivity as there are a limited number of retail outlets in the immediate study area. Consequently, a **negligible** impact would be expected in the area. As the study area is expanded to include the expenditure for a wider area, a commensurate reduction in the magnitude would occur.

iv. Community Impacts

7.6.10 Residents and businesses in the area and more widely in Sedgemoor would be encouraged and supported to secure economic benefits from the HPC Project – including jobs and supply chain opportunities. At the immediate study area scale, the magnitude of the impact is assessed as very low, and has a very low importance in terms of the wider economy, resulting in a **negligible** impact.

v. Sport and Recreation

7.6.11 The construction, operational and post-operational phases of the proposed development would necessitate the removal of an existing training pitch used by Bridgwater Rugby Club (part of BARFC). A planning application is being progressed by BARFC for the replacement of the rugby pitch at an alternative site in Bridgwater. This planning application will be submitted to and determined by the local planning authority (Sedgemoor District Council).

7.6.12 EDF Energy has committed to preparatory mitigation via financial contributions that are outlined in the Draft Site Preparation Works Section 106 Agreement, which is

summarised in the Heads of Terms which is an appendix to the **Planning Statement**. This approach would cover potential impacts related to the temporary uplift in demand for sports facilities as a result of non-home-based construction workers (see **Chapter 9, Volume 2** of this ES for project-wide impacts and mitigation). It is assumed that these contributions would enable the provision of new facilities before the end of the construction phase at the site. Depending on the timescale for delivery of these facilities, it is likely that no overall impact would arise.

b) Operational Impacts

i. Employment Impacts

7.6.13 There would be an element of employment in the operational phase of the proposed development. This is anticipated to amount to:

- Two employment positions equating to a total "headcount" of four workers on-site associated with security.
- Five employment positions equating to a total 'headcount' of ten workers in the temporary canteen.
- Five employment positions equating to a total "headcount" of ten workers on-site associated with cleaning.

7.6.14 The two bus driver positions, equating to a "headcount" of four workers, are included in the overall construction workforce profile. All of these employment positions created are included within the estimated 5,600 construction workers for the HPC Project identified at **Volume 2, Chapter 9** of this ES.

7.6.15 There will be a level of additional employment associated with the running and management of the accommodation campus, in cleaning positions, estimated to be around five positions or a "headcount" of 20 workers. These jobs are likely to employ almost entirely home-based persons who are locally recruited.

7.6.16 The magnitude of employment would be very low (long-term temporary employment) in proportion to the immediate study area (0.2% of the existing baseline workforce); the importance and sensitivity of the receptor would be low although may be locally important due to high unemployment in the area. Consequently, a long-term **negligible** impact is expected.

ii. Impact on Population and Demographics

7.6.17 The majority of non-home-based construction workers living at the proposed development would be young and male. Data from the Annual Population Survey (2010) (Ref. 7.42) indicates that around 90% of construction workers are men, and overwhelmingly in the 20-49 age range. The increase of 150 non-home-based construction workers, if every bedspace in the proposed development was filled, is equal to an increase of around 1.7% of the working-age population of the immediate study area, 1% of the total population of the immediate study area.

7.6.18 The value of the local community as a receptor is considered medium due to the nationally significant level of deprivation and need in the immediate study area; The sensitivity is considered medium overall due to the tolerance to change demonstrated by the annual level of population turnover within Bridgwater. At peak occupation, the

proposed development would represent 7% of average annual new residents in Bridgwater, therefore representing a very low magnitude. This results in a **minor** impact.

7.6.19 The extent to which this is beneficial or adverse will depend on specific types of interaction with the local community. For Bridgwater as a whole, and on public and other services these are assessed in **Volume 2, Chapter 9**. Specific impacts of the Bridgwater C Campus are considered below.

iii. Community Cohesion

7.6.20 EDF Energy's baseline review of community cohesion highlights potential impacts on public services and economic impacts, which are assessed in the HPC development socio-economic assessment (**Volume 2, Chapter 9** of this ES) and potential community tensions, the key issues of which are residents' equal entitlement to employment and services. There is no single, quantifiable means of assessing these effects using standard magnitude assessments and it is not therefore possible to apply a significance rating to the impact. Nevertheless, as a precautionary measure a range of mitigation measures will be applied to prevent or reduce any adverse impacts that may arise, as explained further in **Volume 2, Chapter 9** of this ES.

iv. Supply Chain and Construction Worker Expenditure

7.6.21 There is potential for some local and regional companies to be involved in the ongoing operational phase of the proposed development as contractors and suppliers. The supply chain effects associated with the operational phase of the accommodation campuses will be greater than the other proposed associated developments (e.g. park and ride and freight management facilities). Employment opportunities in the accommodation campuses will include a wider range of sectors, for example cleaning, security and maintenance.

7.6.22 However, it cannot be determined whether suppliers are present in the area, therefore a very low magnitude impact is expected on a very low importance receptor (the local economy is not predominantly focused on supply of contract workers). A **negligible** impact is expected.

7.6.23 The occupants of the proposed development are likely to create demands for goods and services from local firms, and these demands would create additional employment. The residents and employees of the proposed development would demand services locally, which may generate some increases in services-related employment. Important sources of demand would be the net additional local expenditure by residents of the proposed development. However, due to the very low magnitude of the operational employment, and the low sensitivity of the receptor, a **negligible** impact is expected.

v. Sport and Recreation

7.6.24 The construction phase of the proposed development would necessitate the removal of an existing training pitch used by Bridgwater Rugby Club (part of BARFC).

7.6.25 During the operational phase of the proposed development, occupants of the proposed development would have access to the all weather 5-a-side pitch, and the

adjacent facilities at the Bridgwater A accommodation campus, which comprises one full size grass football pitch and two all weather 5-a-side pitches.

7.6.26 Until the sports facilities proposed as part of the Bridgwater A accommodation campus are built, the local community would have access to this 5-a-side football pitch. An entrance gate would be provided for use by the local community and a second secure entrance gate would be provided from the accommodation campus for use by the occupants of the accommodation campus.

7.6.27 One all weather 5-a-side football pitch would be provided at the site, but located outside of the proposed 1.8m security fence line around the accommodation campus.

7.6.28 As outlined above, it is assumed that a replacement rugby pitch would be provided off-site during the construction phase as a result of a planning application currently underway. Additionally, EDF Energy has committed to preparatory mitigation via financial contributions that are outlined in the Draft Site Preparation Works Section 106 Agreement, which is summarised in the Heads of Terms which are an appendix to the **Planning Statement**. This approach would cover potential impacts related to the temporary uplift in demand for sports facilities as a result of non-home-based construction workers (see **Chapter 9, Volume 2** of this ES for project-wide impacts and mitigation). It is assumed that these contributions would enable the provision of new facilities before the end of the construction phase at the site. Depending on the timescale for delivery of these facilities, it is likely that no overall impact would arise.

c) Post-operational Impacts

7.6.29 This section identifies and assesses the potential impacts of the post-operational phase on the socio-economic environment of the immediate study area. A description of the post-operational phase and estimated timescales is presented in **Chapter 5** of this volume of the ES.

7.7 Mitigation of Impacts

a) Mitigation and Best Practice Measures During Construction

7.7.1 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

7.7.2 EDF Energy has committed to preparatory mitigation via financial contributions that are outlined in the Draft Site Preparation Works Section 106 Agreement, which is summarised in the Heads of Terms which is an appendix to the **Planning Statement**. This approach would cover potential impacts related to the temporary uplift in demand for sports facilities as a result of non-home-based construction workers (see **Chapter 9, Volume 2** of this ES for project-wide impacts and mitigation).

7.7.3 All impacts during the construction phase on socio-economic aspects are assessed as being of no greater significance than **negligible**, or are beneficial, in terms of employment generation and expenditure. Consequently no mitigation measures are required. However, EDF Energy would adopt best practice to enhance beneficial impacts.

7.7.4 EDF Energy has committed in a proposed Section 106 Agreement with West Somerset Council on the site preparation works for Hinkley Point to make substantial contributions to sports provision, including in Bridgwater, in advance of the need to prepare for the impacts of the workforce.

7.7.5 In terms of amenity disruption and community impacts during the construction phase, a series of project-wide measures would be put in place to address minor concerns raised during the consultation process, some of which have the potential to provide socio-economic benefits. These include registration of the site with the United Kingdom's "Considerate Constructors Scheme". This construction industry initiative commits those companies and sites in the scheme to be considerate and good neighbours as well as clean, respectful, safe, environmentally conscious, responsible and accountable.

7.7.6 Based on concerns raised in response to EDF Energy's Stage 2 Update consultation (see **Consultation Report** for details), EDF Energy is committed to ensuring that the site is operated considerately with 24-hour security and effective management of vehicle flows. EDF Energy would also introduce worker code of conduct practices to ensure that construction workers behave well in the local area, appended to the **Community Safety Management Plan**.

7.7.7 The **Health Impact Assessment** also identifies likely effects on local communities' health and wellbeing.

7.7.8 The requirements of the workforce for the off-site associated developments, including Bridgwater C, are incorporated into the **Construction Workforce Development Strategy** appended to the **Economic Strategy** to maximise recruitment of Somerset residents. Activities would also be established to maximise the economic benefits of the development. These measures would include:

- business supplier events and skills training;
- engagement with schools and colleges in the local area in order to help them plan the education and training requirements of their students;
- an on-going commitment to local procurement and training to up-skill the workforce;
- a dedicated supply chain representative in the Bridgwater office (undertaking an outreach programme with local businesses); and
- a series of 'supply chain' events for local businesses to provide a clear understanding of EDF Energy's requirements from suppliers.

7.7.9 Until the sports facilities at the Bridgwater A accommodation campus are built, the local community would have access to the 5-a-side football pitch on the site. Use of the proposed 5-a-side football pitch would be managed via the on-site security/administration office.

7.7.10 Specific mitigation in relation to the impacts of the proposed development on public services and the wider community in Bridgwater is detailed in **Volume 2, Chapter 9** of this ES.

b) Mitigation Measures during Operational Phase

7.7.11 Impacts on community cohesion and capacity of public services and community facilities have been assessed in **Volume 2**, **Chapter 9,** along with qualitative impacts on Bridgwater. A precautionary approach has been taken in the context of wider mitigation plans outlined in the **Community Safety Management Plan**, the **Construction Worker Development Strategy** and the **Community Fund**.

7.7.12 It is assumed that the replacement rugby pitch would be provided during the construction phase as mitigation for the loss of the existing pitch during that phase.

7.7.13 All other operational impacts from the proposed development are assessed as being of **negligible** significance, therefore no specific mitigation is required.

c) Mitigation Measures during Post-operational Phase

7.7.14 All impacts arising from the post-operational phase of the proposed development are assessed as being of **negligible** significance, therefore not requiring specific mitigation.

7.8 Residual Impacts

a) Construction Impacts

7.8.1 All residual impacts during the construction phase on socio-economic aspects are assessed as of no greater significance than **negligible** in terms of employment generation and expenditure, would be medium-term and temporary and consequently are considered acceptable for the proposed development.

7.8.2 EDF Energy have committed through Section 106 Agreement to provide financial contributions to pre-mitigate for the loss of sports facilities during the construction phase, and the provision of sports facilities in the wider area to account for the temporary population increase (non-home-based construction workers).

b) Operational Impacts

7.8.3 All residual impacts during the operational phase on socio-economics are assessed as having **minor beneficial** or **negligible** impacts and are therefore considered acceptable for the proposed development.

c) Post-operational Impacts

7.8.4 All residual impacts during the post-operational phase on socio-economics would be of **minor beneficial** or **negligible** significance, and are therefore considered acceptable for the proposed development.

7.9 Summary of Impacts

7.9.1 The summary of impacts is shown in **Table 7.6**.

Table 7.6: Summary of Impacts

Impact	Receptor	Potential Impact	Potential Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
Construction Phase								
Employment Impacts	Labour market and economy of the immediate study area	0.6% increase in immediate study area workforce	Very low	Site-specific, direct, temporary, medium-term	Low	Negligible	None required	Negligible
Demographic Impacts	Residential population	The 'additive' impacts of three proposed accommodation campuses (i.e. HPC development site (see **Volume 2** of this ES), Bridgwater C (see this volume of the ES) and Bridgwater A (see Volume 3 of this ES) in terms of community impacts and economic effects are assessed in **Volume 2, Chapter 9** of this ES.						
Local Expenditure Impacts	Local economy and specific retailers	0.5% increase in immediate study area working-age population	Very low	Site-specific, direct, temporary, medium-term	Low	Negligible	None required	Negligible
Community Impacts	Residential population of the immediate study area	Residents and businesses secure economic benefits	Very low	Not site-specific, indirect, temporary, medium-term	Low	Negligible	None required	Negligible
Operational Phase								
Employment Impacts	Labour market and economy of the immediate study area	Peak of 24 workers on-site, potential for 20 jobs additional to Workforce Profile	Very low	Site-specific, direct, temporary, long-term	Low	Negligible	None required	Negligible
Supply Chain	Local / Regional economy	Businesses secure economic benefits	Very low	Not site-specific, indirect, temporary, long-term	Very low	Negligible	None required	Negligible
Construction Worker Expenditure	Local economy and specific retailers	Demand for goods and services locally	Very low	Indirect, temporary, long-term	Low	Negligible	None required	Negligible

Impact	Receptor	Potential Impact	Potential Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
Population and Demographics	Residential population of the immediate study area	Change in population dynamics and community cohesion	Very low	Direct, temporary, long term	Low	Minor	Outlined at **Volume 2**, **Chapter 9,** along with qualitative impacts on Bridgwater, and refers to mitigation measures outlined through the **Community Safety Management Plan**, the **Construction Worker Development Strategy** and the **Community Fund**.	Minor
Community Cohesion	Residential population of the immediate study area	EDF Energy's baseline review of community cohesion highlights potential effects on public services, economic impacts, which are assessed in the HPC development site socio-economic assessment (**Volume 2, Chapter 9** of this ES) and potential community tensions, the key issues of which appear to be residents' equal entitlement to employment and services. Although there is no single, quantifiable means of assessing these effects, potential negative effects will be highlighted and mitigation provided.						

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CHAPTER 8: TRANSPORT

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8. TRANSPORT

8.1 Introduction

8.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential transport impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus, referred to hereafter as the proposed development, on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development and the construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

8.1.2 A glossary of the terminology used in this chapter is provided in **Volume 1** of this ES.

8.2 Scope and Objectives of Assessment

8.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees including Somerset County Council (SCC), the Highways Agency (HA), Sedgemoor District Council (SDC), West Somerset Council (WSC), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations. SCC and the HA are highway authorities for the highways that are relevant to this assessment.

8.2.2 The early sections of this chapter provide background on the scope of the assessment, the legislative and planning policy context (Section 8.3), the assessment methodology (Section 8.4) and the key characteristics of the HPC Project which inform the transport assessment as a whole. Section 8.5 describes the baseline transport conditions in the locality of the proposed development and Section 8.6 the anticipated future baseline taking account of developments with planning approval and anticipated future traffic growth (but not the HPC Project).

8.2.3 Section 8.7 onwards then discusses the transport impacts in the locality of the proposed development for the three assessment periods of 2013, 2016 and 2021.

8.2.4 This chapter is based upon the findings of the **Transport Assessment** (**Annex 7** of this ES) that supports the application for Development Consent.

8.2.5 The assessment of transportation impacts has been undertaken adopting the methodologies described in **Volume 1, Chapter 7**, and Section 8.4.

8.2.6 This chapter focuses on the transportation potential impacts of:

- severance;
- driver delay;
- pedestrian delay;
- pedestrian amenity; and
- accidents and safety.

8.2.7 Other transport issues such as public transport, walking and cycling and travel planning are dealt with in the **Transport Assessment**.

8.2.8 The future baseline traffic conditions are compared with future traffic conditions with the HPC Project to assess the impact of the proposed development, in the context of the HPC Project, on the transport networks. The traffic assessments used to inform this analysis assume implementation of the transport strategy and the proposed highway improvements which are both described in the **Transport Assessment** and summarised in this chapter. Any further mitigation measures, where proposed, are described in Section 8.8. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 8.9.

8.2.9 Cumulative transportation impacts arising from the proposed development in combination with other elements of the HPC Project and other relevant projects are identified and assessed in **Volume 2**, **Chapter 10** of this ES. The traffic flows used are those generated by committed developments and other predicted growth in the area plus those generated by the HPC Project (i.e. the HPC development site and all the associated development sites).

8.2.10 The objectives underlying the assessment are to:

- identify the potential environmental transport impacts of the proposed development within the context of the HPC Project, taking into account the characteristics of the proposed development and the sensitivities of the local environment;
- identify and describe measures which would be taken to mitigate any identified adverse environmental impacts; and
- predict and evaluate the extent and significance of residual effects taking into account the mitigation.

8.3 Legislation, Policy and Guidance

8.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential transport environmental impacts associated with the construction, operational and post-operational phases of the proposed development.

8.3.2 As stated in **Volume 1**, **Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref. 8.1) when combined with the NPS for Nuclear Power

Generation (NPS EN-6) (Ref. 8.2) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs.

8.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

8.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) (Ref. 8.3)

8.3.5 PPS1 was published in January 2005 and sets out the Governments' overarching planning policies on the delivery of sustainable development through the planning system.

8.3.6 PPS1 includes a number of key principles relating to development plans including the formulation of an integrated approach to development and the formulation of access policies.

8.3.7 Paragraph 27 (Delivering Sustainable Development) sets out the general approach to delivering sustainable development. In preparing development plans, planning authorities should, amongst other things:

> *"Provide improved access for all to jobs, health, education, shops, leisure and community facilities, open space, sport and recreation, by ensuring that new development is located where everyone can access services or facilities on foot, bicycle or public transport rather than having to rely on access by car, while recognising that this may be more difficult in rural areas."*

ii. Planning Policy Guidance 13: Transport (PPG13) (2011) (Ref. 8.4)

8.3.8 Originally published in March 2001 and revised in January 2011, PPG13 sets out the national context for planning for transport.

8.3.9 The objectives of PPG13 are to integrate planning and transport at the national, regional, strategic and local level to:

- "*Promote more sustainable transport choices for both people and for moving freight;*
- *Promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling; and*
- *Reduce the need to travel, especially by car."*

8.3.10 Paragraph 46 states:

> *"…Policies need to strike a balance between the interests of local residents and those of the wider community, including the need to protect the vitality of urban economies, local employment opportunities and the overall quality of life in towns and cities. Local authorities, freight operators, businesses and developers should work together, within the context of freight quality partnerships, to agree on lorry routes and loading and unloading facilities and on reducing vehicle emissions and vehicle and delivery noise levels, to enable a more efficient and sustainable approach to deliveries in such sensitive locations."*

8.3.11 Annex C of PPG13 relates to transport infrastructure. It states that care must be taken to minimise the environmental impact of any new transport infrastructure projects, including the impacts which may be caused during construction (paragraph C1). Annex C goes on to state that particular emphasis should be given to the need to explore a full range of alternative solutions to problems, including solutions other than road enhancement (paragraph C4).

b) National Guidance

i. Circular 2/07 – Planning and the Strategic Road Network (Ref. 8.5)

8.3.12 Circular 2/07 'Planning and the Strategic Road Network' published in 2007, details the Highways Agency's (HA) role and requirements in respect of the control of development in proximity to the Strategic Road Network (SRN), for which they are responsible. The Circular sets out:

- An approach adopted by the HA to encourage sustainable development while avoiding the potential for adverse effects on the SRN.
- A framework for collaborative working coordinating a number of organisations including Government Offices, regional and local planning authorities, local highway authorities, public transport providers and developers.
- How the HA will deal with planning applications. Although the Circular predates the Planning Act 2008, the collaborative approach which it advocates is firmly in line with the 'front loaded' approach to DCO applications.

8.3.13 The Circular draws on national policy and guidance and advocates the adoption of a demand management approach to development and promotes Travel Plans as an integral part of managing the capacity of the trunk road network.

ii. Department for Transport – Guidance on Transport Assessment (Ref. 8.6)

8.3.14 The DfT published its 'Guidance on Transport Assessment' (GTA) in March 2007. The guidance sets out the following principles:

- Reduce the need to travel, especially by car – thought should be given to reducing the need to travel; consider the types of uses (or mix of uses) and the scale of development in order to promote multi purpose or linked trips.
- Sustainable accessibility – promote accessibility by all modes of travel, in particular public transport, cycling and walking; assess the likely travel behaviour or travel pattern to and from the proposed site; and develop appropriate measures to influence travel behaviour.
- Mitigation measures – ensure as much as possible that the proposed mitigation measures avoid unnecessary physical improvements to highways and promote innovative and sustainable transport solutions.

iii. Highways Agency Protocol for Dealing with Planning Applications (Ref. 8.7)

8.3.15 The HA has produced a protocol to assist developers in working with them when submitting a planning application for a development which could have an impact on the SRN.

8.3.16 The section titled 'Stage 2: Formal consultation by the Local Planning Authority' states that:

> *"For developments generating more than 30 two-way trips to the network during any peak period, a transport assessment and travel plan prepared in accordance with DfT and DCLG's 'Guidance on transport assessment' and meeting the requirements of DfT Circular 02/2007."*

8.3.17 This section also sets out the process that the HA requires regarding the consideration of mitigation measures:

- All reasonable steps shall be taken to minimise the level of physical mitigation required, through the use of measures such as travel plans, development phasing, heavy goods vehicle booking systems and encouraging flexible working.
- Physical measures on the local road network to minimise the impact on the strategic road network shall be utilised as far as is reasonably possible.
- Once all reasonable minimisation and off-network mitigation has been implemented, the HA will consider capacity improvements on the strategic road network. The HA will not accept local capacity improvements where they would overload the wider network.

c) Regional Planning Policy

8.3.18 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the

Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001 – 2016 (RPG10) (2001) (Ref. 8.8)

8.3.19 Regional Planning Guidance for the South West (RPG10) sets out a broad strategy for the South West up to 2016.

8.3.20 Section 8 relates specifically to Transport and sets out the Regional Transport Strategy (RTS). The RTS has 5 key objectives:

> *"To support the spatial strategy of RPG and to service existing and new development efficiently and in an integrated fashion;*
>
> *To reduce the impact of transport on the environment, by reducing the need to travel, encouraging travel by more sustainable means (especially by walking and cycling) and locating development at accessible locations, particularly by public transport; and to achieve environmental improvements by directing investment to those locations where infrastructure is required to offset the damaging effects arising from the impacts of traffic and transport;*
>
> *To secure improved accessibility to work, shopping, leisure and services by public transport, walking and cycling;*
>
> *To create a modern, efficient and integrated transport system that will meet the demands of a dynamic regional economy, help overcome regional peripherality and meet all travel needs; and*
>
> *To ensure the safe use of regional transport network and its associated facilities." (Page 83).*

8.3.21 Policy TRAN 1 (Reducing the Need to Travel) states that local authorities, developers and other agencies should work towards reducing the need to travel by private motor vehicle through the appropriate location of new development.

8.3.22 Policy TRAN 6 (Movement of Goods) states that local authorities, the business community, transport operators and other agencies should work together to achieve more sustainable patterns of distribution. Amongst other things, they should aim to locate major freight generating development close to the regional rail and road networks.

8.3.23 Policy TRAN10 (Walking, Cycling and Public Transport) states that:

"Local authorities, transport operators and other agencies should aim to increase the share of total travel by these modes and ensure that they provide attractive and reliable alternatives to the private car by:

Seeking transport assessments and travel plans for all new major developments and encouraging major organisations to prepare and implement such plans, having regard to sustainable transport objectives set by local authorities in the local transport plan; and

Ensuring that major new development delivers (or sets out a clear and realistic strategy to deliver) a realistic choice of access by public transport, walking and cycling."

d) The Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes 2008 – 2026 (July 2008) (Ref. 8.9)

8.3.24 Chapter 5 sets out the strategy's regional approach to transport. The main aim of the RTS is to support the RSS and reduce the rate of road traffic growth by:

"Supporting economic development (identified in the RES) by maintaining and improving the reliability and resilience of links from the region's Strategically Significant Cities and Towns (SSCTs) to other regions, international markets and connectivity within the region;

Addressing social exclusion by improving accessibility to jobs and services;

Making urban areas work effectively and creating attractive places to live by developing the transport network in support of the strategy to concentrate growth and development in the SSCTs; and

Reducing negative impacts of transport on the environment including climate change." (Page 139).

8.3.25 Policy RTS1 (Corridor Management) states that, in order to improve the reliability and resilience of journey times, to develop opportunities to facilitate a modal shift and support growth at the Strategically Significant Cities and Towns (SSCTs), which include Bridgwater and Taunton, provision will be made to manage the demand for long distance journeys and reduce the impacts of local trips on corridors of national and regional importance.

8.3.26 Policy RTS2 (Demand Management and Sustainable Travel Measures at the SSCTs) states that demand management measures should be introduced progressively at the SSCTs to reduce the growth of road traffic levels and congestion. This should be accompanied by a 'step change' in the prioritisation of sustainable travel measures serving these places.

8.3.27 Policy RTS3 (Parking) states that parking measures should be implemented to reduce reliance on the car and encourage the use of sustainable transport modes.

e) Somerset and Exmoor National Park Joint Structure Plan Review 1991 – 2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 8.10)

8.3.28 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to landscape/townscape and visual impacts. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

8.3.29 Policy STR1 (Sustainable Development) states that development should, amongst other things, develop a pattern of land use and transport which minimises the length of journeys and the need to travel and maximises the potential for the use of public transport, cycling and walking; and conserve biodiversity and environmental assets, particularly nationally and internationally designated areas.

8.3.30 Policy 39 (Transport and Development) states that proposals for development should be considered having regard to:

- the management of demand for transport;
- achieving a shift in transport modes to alternatives to the private car and lorry wherever possible; and
- the need for improvements to transport infrastructure.

8.3.31 Policy 45 (Bus) states that facilities for buses should be improved. This should include measures to give priority to buses and to introduce park and ride systems where these are the most sustainable option.

8.3.32 Policy 48 (Access and Parking) states that developments which generate significant transport movements should be located where provision may be made for access by walking, cycling and public transport. The level of parking provision in settlements should reflect their functions, the potential for the use of alternatives to the private car and the need to prevent harmful competitive provision of parking. The level of car parking provision associated with new development should first take account of the potential for access and provide for alternatives to the private car, and then, should be no more than is necessary to enable development to proceed.

8.3.33 Policy 49 (Transport Requirements of New Development) states that proposals for development should be compatible with the existing transport infrastructure, or, if not, provision should be made for improvements to infrastructure to enable development to proceed. In particular development should:

- Provide access for pedestrians, people with disabilities, cyclists and public transport.
- Provide safe access to roads of adequate standard within the route hierarchy and, unless the special need for and benefit of a particular development would warrant an exception, not derive access directly from a National Primary or County Route.

- In the case of development which will generate significant freight traffic, be located close to rail facilities and/or National Primary Routes or suitable County Routes subject to satisfying other Structure Plan policy requirements.

8.3.34 Policy 50 (Traffic Management) states that traffic management schemes which improve safety, travel conditions and the environment should be implemented to make the best possible use of the highway network. Such schemes should remove or reduce heavy or unnecessary vehicles from settlements or sensitive environments and improve conditions for pedestrians, cyclists and public transport users.

8.3.35 Policy 52 (Freight Traffic (Lorries in the Environment)) states that traffic, and particularly lorries, should be encouraged to use National Primary Routes wherever possible through appropriate measures such as positive signing and by discouraging the use of unsuitable roads through traffic management schemes.

8.3.36 Policy 54 (Transport Proposals and the Environment) states that new transport proposals and improvements, particularly road schemes must take into account the need to: minimise the impact of proposals through mitigation and compensation measures; improve or conserve the natural and built environment; avoid the risk of pollution to the water environment, including water resources; minimise the consumption of resources both in construction and operation; and, minimise conflict with adjoining land uses.

8.3.37 Policy 58 (Ports and Wharves) states that existing port and wharf facilities should be safeguarded from development which would prejudice their potential in the transport network. Any proposals for new facilities should be within or related to settlements.

f) Local Planning Policy

i. Sedgemoor District Local Plan 1991 – 2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 8.11)

8.3.38 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific transport designations. An Off-road Cycle Route (Policy TM1) linking College Way with Fairfax Road is located to the south-east of the site. The site is within the defined Development Boundary.

8.3.39 The following saved policy is considered to be potentially relevant.

8.3.40 Policy TM1 (Safe and Sustainable Transport) states that safe and sustainable transport will be achieved by the following means:

"a) development will not be permitted which would prejudice the construction of cycle and pedestrian routes and bus lanes defined on the Proposals Map, unless suitable alternative routes are provided by the developer;

b) development will not be permitted which would reduce the convenience and safety of existing rights-of-way, bridle paths and

cycle paths unless suitable alternative routes are provided by the developer;

c) *development will only be permitted if the design makes adequate and safe provision for access by foot, cycle, public transport and vehicles so long as it's appropriate to the scale of the development and in accordance with National and County Council design standards and Somerset County Council's Highway hierarchy;*

d) *the Developer shall provide the transport infrastructure required by the development to an agreed phased programme. Where off-site works are required, these shall be appropriate to the scale and nature of the development and shall be funded by the developer; and*

e) *development will not be permitted for proposals which would have a significant impact on the highway network without the prior submission of a Traffic Impact Assessment."*

ii. Sedgemoor Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 8.12)

8.3.41 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

8.3.42 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to Chapter 4 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the Core Strategy.

8.3.43 The following Core Strategy (Proposed Submission) policies are of potential relevance:

- Policy S1 (Spatial Strategy for Sedgemoor) states that development proposals will be expected to support the delivery of required infrastructure, including such things as transport infrastructure.
- Policy S2 (Infrastructure Delivery) states that all new development that generates a demand for infrastructure will only be permitted if the necessary on and off-site infrastructure required to support and mitigate the impact of the development site is either already in place or there is a reliable mechanism in place to ensure that it will be delivered at the time and in the location it is required.

- Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, be located to minimise the need to travel and to encourage any journeys that remain necessary to be possible by alternative modes of travel including maximising opportunities for walking, cycling and the use of public transport.
- Policy S4 (Mitigating the Causes and Adapting to the Effects of Climate Change) states that development should mitigate the cause of climate change through, amongst other things, ensuring development encourages modes of transport other than the car.
- Policy D2 (Promoting High Quality and Inclusive Design) states, amongst other things, that development will need to demonstrate that it is accessible to all potential users using a range of transport modes, be integrated into existing patterns of movement and be permeable. Its design should create good connections to wider areas with a clear network of routes for walking and cycling.
- Policy D9 (Sustainable Transport and Movement) states, amongst other things, that travel management schemes and development proposals that reduce congestion, encourage an improved and integrated transport network and allow for a wide choice of modes of transport as a means of access to jobs, homes, leisure and recreation, services and facilities will be encouraged and supported.
- Policy D10 (Managing the Transport Impacts of Development) states that development proposals that will have a significant transport impact should, amongst other things: be supported by an appropriate Transport Assessment and Travel Plan; ensure inclusive, safe and convenient access for all; provide safe access to roads; ensure that the expected nature and volume of traffic and parked vehicles generated would not compromise road safety and/ or function; comprehensively address the transport impact of development and appropriately contribute to the delivery of necessary transport infrastructure; not prejudice safeguarded transport infrastructure; and enhance and develop rights-of way.

g) Other Relevant Local Documents

i. Hinkley Point C Project Supplementary Planning Document Consultation Draft (February 2011) (Ref. 8.13)

8.3.44 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD.

8.3.45 The draft HPC SPD does not set out any specific transport policies in relation to the site. In relation to transport generally, Box 8 of the draft HPC SPD states that the County Council and District Councils will expect the HPC Project promoter to:

"Align the Transport/Freight Strategy with other Council plans and strategies. The transport proposals for the HPC project during both the

construction and operational phases of the power station should integrate with and contribute to the delivery of the approved transport strategies as set out in the Somerset Future Transport Plan and associated transport policies and implementation plan, the Bridgwater, Taunton and Wellington Future Transport Strategy, the Bridgwater Vision, Western Somerset Economic Development and Access Strategy and emerging Williton master-plan.

Minimise the volume of road traffic associated with the development of the new power station at all times, but especially during peak hours and during the peak tourism season between the months of June, July and August. The efficient and safe functioning of key routes, including the M5, A38, A361, A370, A371 and A372 must be protected.

Maximise the safe, efficient and sustainable movement of people and materials required for the proposed nuclear power station.

Provide transport mitigation where additional traffic flows of the project exacerbate or cause highway congestion problems.

Any new highway proposals are to be justified by a full New Approach to Appraisal (NATA) assessment. Appraisals should address potential impacts raised during consultation, such as the potential severance effect to Brymore School of the western by-pass option at Cannington.

All proposed highway works are to be the subject of a full operational analysis and a road safety audit in accordance with then current guidance.

Provide sustainable transport solutions for access to the site that workers and visitors will be required to use. This should include provision of public transport priority measures in the form of bus lanes and other bus priority measures on key routes from associated development sites to the main site for construction and other vehicles, providing a beneficial transport legacy.

Provide sustainable transport linkages to and from all associated development sites to provide access to employment, education, retail, leisure and healthcare facilities.

Ensure the number of parking spaces provided at or near to the site during the construction phase is as close as possible to zero.

Enable effective controls to be put in place to ensure workers and visitors do not park in inappropriate locations.

Ensure as much construction material as possible is delivered by sea.

Minimise the amount of waste materials, including topsoil, transported off-site.

Provide necessary improvements to the transport network to mitigate any adverse impacts on the community; including but not limited to congestion, air quality and road safety impacts. For example, include safety improvements where the additional traffic flows of the project exacerbate existing road safety problems.

Minimise traffic disruption both for the local community and visitors to the area.

Control and manage the flow of any road freight movement associated with the development in order to ensure appropriate routes are used, avoid peak hour movement and to respond to incidents on the transport network.

Agree and enable deployment of robust plans for managing unforeseen incidents on the transport network, including but not limited to traffic management plans, diversionary routes and freight/ delivery management systems.

Provide long-term, sustainable legacy benefits for the local community.

Protect the natural and built environment and ensure the image of the area is not adversely affected.

Ensure that public transport services are protected throughout the construction, operation and decommissioning of the Hinkley Point nuclear power stations.

Ensure that the needs of cyclists and pedestrians are protected and enhanced throughout the construction and operation of the proposed nuclear power station. This should include enhanced pedestrian and cycle facilities from associated development sites to the centres of nearby towns and villages, including provision of the Bristol Road/Bath Road link and rail crossing in Bridgwater.

Protect current Public Rights of Way (PRoW) in and around Hinkley Point and associated development sites, and where stop-ups are required, ensure that PRoW are implemented that do not result in significant diversion lengths.

Develop and implement Travel Plans for the proposed power station and associated development that will be monitored during construction and operation of Hinkley Point C.

Monitor all movement associated with the development to ensure agreed mode share targets and thresholds for traffic congestion, air quality and road safety are achieved during construction and operation.

Fully mitigate and compensate for the adverse environmental impact of development related traffic. This should involve providing sufficient funds through appropriate legal agreements to enable the relevant authorities and

agencies to implement further mitigation measures should any unforeseen impacts occur during the construction of the development."

ii. Somerset Future Transport Plan (Ref. 8.14)

8.3.46 Somerset's Future Transport Plan 2011 – 2026 (FTP) replaced Somerset County Council's (SCC) Second Local Transport Plan (LTP2) in April 2011 and sets out a long term strategy for helping to deliver transport priorities up until 2026.

8.3.47 The FTP contains the following statements:

"Help communities help themselves with regard to transport improvements;

Assisting people to make smarter travel choices;

Assisting people in being more active by providing more opportunities to travel in a healthy way;

Manage the effect transport-related noise has on communities;

Work with developers to ensure they take in to account the way people travel, and how people travel to access services;

We will help hauliers choose the most appropriate routes and work to improve communication between communities and the hauliers that serve them;

Encourage people to cycle and make more trips on foot."

iii. Technical Note 4 – Somerset County Council Transport Policies: Transport and Development (Ref. 8.15)

8.3.48 The 'Technical Note 4 – Somerset County Council Transport Policies: Transport and Development – March 2010' document is a supporting Technical Document to the FTP.

8.3.49 Section 6 of the document relates specifically to the proposed new nuclear development at Hinkley Point and recognises that it is one of the developments that are likely to have a big impact on transport in Somerset over the next 15 years.

iv. Bridgwater Vision (Ref. 8.16)

8.3.50 Whilst not forming part of the statutory development plan for Sedgemoor, the Bridgwater Vision (2009) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

8.3.51 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area.

8.3.52 The site falls within the 'Sydenham and Bower' character area. The transport related design principles for North East Bridgwater character area are as follows:

- Improved pedestrian and cycle routes will be promoted throughout the area to connect residents to local shops and services, community facilities, employment areas, the rail station and the town centre.
- The strategic role of Bower Lane will be strengthened as development occurs with connections between North East Bridgwater and South Bridgwater promoted (page 84).

v. Bridgwater, Taunton and Wellington Transport Strategy (Ref. 8.17)

8.3.53 The Transport Strategy for Bridgwater, Taunton and Wellington for the period 2009 – 2026 was adopted by SCC in March 2010. The strategy indicates a number of infrastructure improvements that may be implemented during the strategy's lifespan in support of the draft RSS and will likely be a key component of the Third Somerset LTP.

8.3.54 At section 5.1 on Bridgwater the strategy states that SCC:

> *".....will further investigate the potential for introducing park and ride sites on the edges of the town to reduce town centre congestion. We will seek to improve sustainable links to the railway station, as well as increasing opportunities for walking and cycling in the town by removing physical barriers created by roads, by providing new infrastructure and by improving the pedestrian environment in the town centre."*

8.3.55 Further planning policy context is provided in the Legislative and Planning Policy Context chapter (**Volume 1**, **Chapter 4**) and the Introduction chapter (**Volume 4**, **Chapter 1**).

8.4 Methodology

8.4.1 The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic' (Ref. 8.18) have been used to ensure that the environmental impacts arising due to predicted changes in traffic levels are properly and comprehensively addressed. In addition the Design Manual for Roads and Bridges (DMRB) Volume 11 has been referred to in the development of this chapter (Ref 8.19).

8.4.2 The IEMA guidelines advise the use of a 'check-list' of potential effects covering noise, vibration, visual impact, severance, driver delay, pedestrian delay, pedestrian amenity, accidents and safety, hazardous loads, air pollution, dust and dirt, ecological impact and heritage and conservation areas.

8.4.3 The guidelines acknowledge that for many developments some of the effects listed may not be widely relevant, but suggest that reasons should be provided for any exclusions.

8.4.4 This chapter deals only with the transport related effects, i.e. severance; driver delay; pedestrian delay; pedestrian amenity; accidents and safety. Other transport related effects such as noise and air quality are dealt with in other chapters of this ES.

8.4.5 The sections below describe the different elements of the assessment then provide detail on the application of the IEMA methodology to the transport environmental effects of the proposed development.

a) Study Area

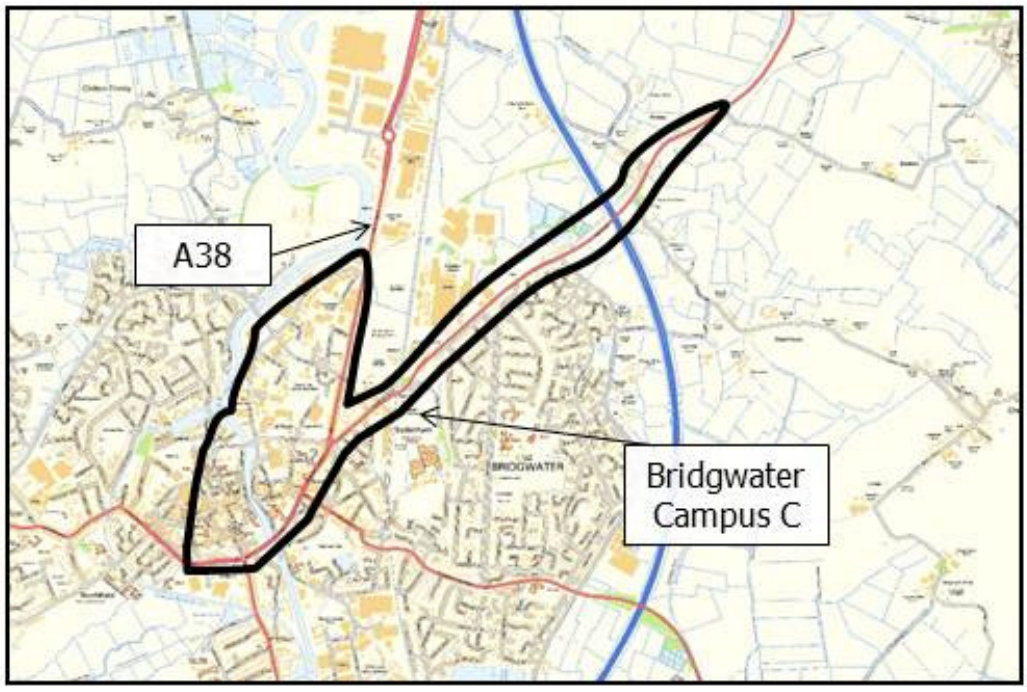
8.4.6 In accordance with the IEMA guidance, the study area has been defined by identifying any link or location where it is felt that significant environmental impacts may occur as a result of the proposed development.

8.4.7 The geographical extent of the study area includes:

- The A38 between The Drove and Cross Rifles roundabout.
- The A38 between Cross Rifles and St. John Street.
- The A38 between St. John Street and Taunton Road.
- The A39 Bath Road north-east of Cross Rifles roundabout.
- St. John Street.
- The Clink.
- The Drove.

8.4.8 The study area is illustrated in **Plate 8.1**.

Plate 8.1: Bridgwater C Study Area



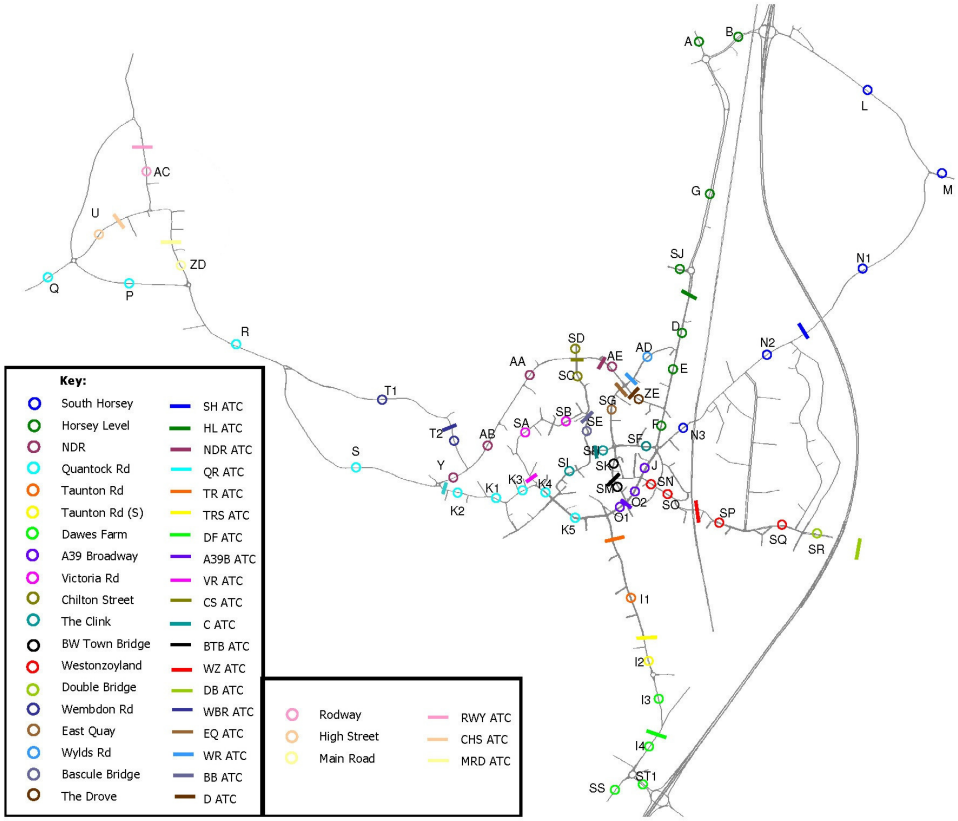
b) Traffic Assessment

8.4.9 This section summarises the methodology used to derive traffic flows used in the environmental impact assessment. Full details are included within the **Transport Assessment**.

8.4.10 The traffic assessment for the HPC Project has been undertaken using a Paramics model (referred to hereafter as the model). The model has been used to predict changes in flow and junction performance as a result of the traffic generated by committed developments in the area and the HPC Project. It also predicts the effects of changes to the highway network.

8.4.11 The links modelled are shown at **Plate 8.2**. Link locations are identified by a circle symbol, with the relevant link code also shown. Locations where Automatic Traffic Count (ATC) data were collected are identified with a line.

Plate 8.2: Modelled Links



i. Assessment Years and Quarters

8.4.12 The following assessment periods have been considered:

- 2009: Base Year.
- Quarter 3 2013.
- Quarter 4 2016.
- 2021.

8.4.13 2009 is the base year selected and is the year when the majority of traffic surveys were undertaken.

8.4.14 Quarter 3 2013 is when the HPC development site construction would have commenced, but the majority of the associated development sites would not be operational. At this stage, the proposed development would be under construction and the only associated development that would be operational is the Junction 24 site. The Cannington bypass would not be completed at this stage.

8.4.15 Quarter 4 2016 is the period used in the assessment to represent the peak construction impacts associated with the HPC Project. At this stage the proposed development (and the other associated developments) would be operational and all highway mitigation measures would be in place including the Cannington bypass. Based on the workforce and freight movement profiles, the fourth quarter is the period when traffic impacts are likely to be at their greatest.

8.4.16 In 2021 the HPC development site would be fully operational although some construction activity would still be on-going (mainly the Intermediate Spent Fuel Store). The Junction 24 development and Cannington park and ride site would still be operational. The Bridgwater C accommodation campus would have ceased operation and would have entered its post-operational phase. There would be no deconstruction and therefore this has not been assessed in the 2021 assessment. The scenario used for assessment is a combination of the worst case quarter for construction workforce and the worst case quarter for operational staff.

8.4.17 The first assessment in this chapter is for 2016 since this is the anticipated period of peak construction impact at the HPC development site. Following this an assessment is made of the impacts in 2013 and 2021.

ii. Assessment Periods

8.4.18 The primary assessments have been undertaken on a daily basis (24 hour Annual Average Daily Traffic) since this reflects the impacts on severance, pedestrian amenity and safety. However, the peak network periods have also been assessed since these are relevant for pedestrian and driver delays. Vehicle delays have been assessed for all hours modelled in the model, i.e. 06:00 to 10:00 and 13:00 to 20:00.

iii. Baseline Traffic Flows

8.4.19 The baseline year for the purposes of this assessment is 2009.

8.4.20 The **Local Model Validation Report (LMVR)** appended to the **Transport Assessment** sets out all of the traffic data that has been collected to build the model.

iv. Future Year Baseline Traffic Flows

8.4.21 Baseline traffic models have been developed for 2013, 2016 and 2021. These incorporate the traffic generation from all committed developments in the area, i.e. those with planning permission. In addition, other growth has been allowed for by using TEMPRO and NTEM growth factors agreed with the transport authorities. Also included are any committed highway improvement schemes. These are as follows:

- Committed highway schemes implemented by 2013:
  - South Bridgwater Link Road.
  - A39 Silverfish/Crandon Bridge.
- Committed highway schemes implemented by 2016:
  - North East Bridgwater Link Road.
- Committed highway schemes implemented by 2021:
  - Dunball roundabout improvement.

8.4.22 The future year base models for 2013, 2016 and 2021 have been agreed by the transport authorities. These are referred to as the Reference Case scenarios for each assessment year.

v. Trip Generation

8.4.23 Given the bespoke nature of the proposed HPC development there are no UK Power Station land use trip rates available to determine the likely trip generation of the construction and operational phases of the HPC Project. Instead a first principles trip generation methodology has been employed as summarised below. The details of the methodology are set out in the **Transport Assessment**. The trip generation methodology covers the proposed development and the remainder of the HPC Project.

Workforce

8.4.24 The construction workforce that would be required to construct the HPC Project has been derived from EDF Energy data collated from constructing similar reactors. It is anticipated it would take approximately nine years to complete the main construction works for the HPC Project when both units would be operational (including preliminary works); during this period it is forecast that the construction workforce would peak at 5,600 in 2016.

8.4.25 A profile of the number of operational workers required to operate the two UK EPR Rector Units has been derived based on data from similar existing UK EDF Energy managed power stations (i.e. Hinkley Point B (HPB) and Sizewell B). It is anticipated an operational workforce of 900 personnel would be required, of which 810 would be present on site on any one day. Operational staff have been included in the workforce profile.

8.4.26 EDF Energy has developed a transport strategy that is described fully in the **Transport Assessment**. A summary of the strategy for the movement of construction staff is set out below:

- On-site parking at the HPC development site would be heavily constrained: only 200 on-site parking spaces for contractors' staff. As such, the large majority of the construction workforce would travel to and from site by bus, either from park and ride sites or by direct bus services.
- Park and ride: park and ride facilities would be established near to Junction 23 and Junction 24 of the M5 motorway, and at Cannington and Williton. These will serve both home-based and non-home-based workers who would travel to the park and ride facilities and then be transferred by bus to the HPC development site.
- Direct bus services: direct bus services would be provided from the accommodation campuses in Bridgwater and there would also be buses provided for workers on key routes to the HPC development site. The routes would need to align to the location of workers and would need to be reviewed on a regular basis as part of the travel plan in order to respond to changes in demand.
- Walking and cycling: walking and cycling forms an important element of the strategy for workers who would be encouraged to walk or cycle directly to the HPC development site from suitable locations; to the park and ride sites; and to bus routes. In conjunction with SCC, an audit of relevant cycling and walking routes has been undertaken and improvements have been developed. Measures to encourage walking and cycling will be included in the travel plan.
- Major infrastructure interventions: even with the transport strategy and freight management strategy there would inevitably be an increase in traffic movements (freight; buses and cars) on the local network. After careful consideration and consultation EDF Energy has concluded that a bypass around Cannington should form part of the HPC Project proposals. This is in order to mitigate the impacts of additional traffic and in particular HGVs and buses that would otherwise pass through the village.
- Highway network improvements: a series of highway improvements have been developed. These measures include those that assist safety as well as capacity.
- Travel plans: travel planning forms an integral part of the transport strategy. The **Framework Travel Plan** requires the use of sustainable modes and seeks to minimise use of the private car where practicable. One of the key features of the transport strategy is that workers will be required to use certain modes. For example, if a worker lived at an accommodation campus they would be required to use a direct bus to get to the HPC development site.

8.4.27 The people trip generation has been based on the workforce profiles and transport strategy described above. The mode assigned to workers (walk, cycle, direct bus, park and ride) has been based on an assessment of the distribution of the staff and the most suitable mode for them. Workers would be prescribed a mode of travel by EDF Energy. For example, workers assigned to a particular park and ride site would be required to use that site for their onward journey to the HPC development site.

8.4.28 The number of buses estimated to use the road network is based on a regular timetable of buses allowing workers to arrive at the pick up point over a period of time. When the detailed bus operations are fixed the number of buses is likely to reduce significantly since there would be more precise adjustment of buses to match demand.

Freight

8.4.29 The development of the HPC Project would require significant quantities of construction materials to be delivered to the HPC development site and associated development sites including the proposed development. EDF Energy has developed a **Freight Management Strategy** (**FMS**) which is appended to the **Transport Assessment**.

8.4.30 The proposed freight measures aim to reduce and control the use of road freight traffic during the construction phase, especially in the peak hours. A range of options have been investigated and further details are provided in the **FMS**.

8.4.31 A summary of the measures proposed in the **FMS** is shown below:

- The re-use and storage of excavated materials on-site to avoid exporting off-site.
- The use of water for delivery of bulk materials and the largest AILs through the construction of a temporary jetty at HPC, the refurbishment and extension of Combwich Wharf and the construction of a new freight laydown facility at Combwich.
- Introducing off-site freight management facilities at Junction 23 and Junction 24, to control incoming freight traffic flow and holding freight vehicles in case of an incident on the local network or on-site.
- Regulating traffic flow by using a project-wide delivery management system (DMS) to regulate flows and move away from peak time congestion.
- Reducing small vehicle movements through consolidation of postal/courier deliveries at the freight management facilities.

8.4.32 EDF Energy is committed to bringing at least 80% of bulk materials required for HPC development site concrete production by sea. In accordance with EDF Energy's objectives, the use of water would be maximised to what is practicable. However, it must be recognised that there are constraints to the use of water and in particular tides and poor weather can affect use.

8.4.33 The freight generation and material quantities figures are based on EDF Energy's extensive experience of constructing Pressurised Water Reactors in France as well as information from the construction of Sizewell B in the UK. It is also augmented by data emerging from the on-going construction of Flamanville 3 in France. Where additional materials are required due to site-specific elements of the HPC Project (e.g. for such items as the construction of the temporary jetty and sea wall) estimates have been made based on the design of the infrastructure.

8.4.34 The quantum of materials required to construct the off-site associated developments including the proposed development has been derived based on the proposed layout and construction specification.

8.4.35 The quantum of waste for the HPC Project has been derived based on the **Waste Management Implementation Strategy**.

8.4.36 The material and waste quantities have been profiled over the construction phase in accordance with the construction programme. This includes for the construction and deconstruction of the proposed development. The material and waste have then been assigned a mode of transport (i.e. jetty, Combwich Wharf or by road). All materials for the construction and deconstruction of the proposed development are assumed to be delivered by road. Any material or waste to be delivered or removed by road has been converted to freight vehicle movements by applying average vehicle payload assumptions to each type of material and waste.

8.4.37 For the purpose of quantifying freight traffic the freight vehicles associated with the construction of the HPC Project have been categorised as follows:

- Heavy Goods Vehicles – HGVs: all vehicles exceeding a maximum gross weight of 3.5 tonnes (maximum allowable total weight when loaded). These include medium goods vehicles (maximum gross weight between 3.5 and 7.5 tonnes) and heavier more lorries with two or more axles.
- Light Goods Vehicles – LGVs: vans, pickups, 4x4s and cars with a maximum gross weight of 3.5 tonnes.

8.4.38 It has been assumed that the construction materials, plant and equipment for the HPC Project would be transported by HGVs while LGVs would be used for transporting food and consumables, small items and specialist tools/equipment. LGVs would also include contractors' fleet vehicles.

8.4.39 The definition of HGVs includes Medium Goods Vehicles (MGVs). Therefore when the numbers and impacts of HGVs are discussed later in this chapter they include MGVs.

8.4.40 The number of HGVs per day would fluctuate around the average figure depending on the type of on-site activities and delivery requirements. It is considered that a factor of ±50% applied to the average would provide an adequate range to cater for these variations e.g. an average of 250 HGVs (500 movements) over a quarter may result in the number of HGVs per day varying between 125 (250 movements) and 375 (750 movements).

8.4.41 The above paragraphs have considered the overall traffic generation of the HPC Project. Details of the site specific traffic generation for the proposed development are provided in the Section 8.7.

Overall Trip Generation

8.4.42 In overall terms it is considered that the trip generation for both people and freight is robust for at least the following reasons:

- Assessment in Quarter 4 2016 is for the peak of the construction phase and that level of activity lasts only approximately five months.
- Traffic using the park and ride sites includes a contingency of 10%.
- HGV movement estimates are based on conservative assumptions on the use of sea for deliveries and on the payloads per HGV.
- HGV estimates for the construction (and, where relevant, de-construction) of the associated developments include a contingency of 20%.
- The definition of a HGV used includes MGVs.
- Bus numbers are based on a high frequency timetable. Numbers will reduce when bus timetables are more precisely matched to worker demand and location.
- No allowance has been made for the fact that the Bridgwater A accommodation campus is on land allocated for housing and for which a traffic allowance is already made in the Reference Case flows. Similarly, no reductions have been made for traffic that would cease to be generated as the existing use of the Somerfield Site at Junction 24 has come to an end.

vi. Trip Distribution

8.4.43 The detailed methodology for estimating the trip distribution is set out in the **Transport Assessment** and is summarised in this section.

Workforce Distribution

8.4.44 Given the bespoke and complex nature of the HPC Project, there is no historical data that can be used to establish a robust trip distribution for employees who would be working on the construction of the HPC Project. Instead a gravity model has been built using data from the socio-economics impact assessment.

8.4.45 In terms of skills, the construction workforce can be divided predominantly into civil operatives and mechanical and electrical operatives with the remaining workforce comprising supervisory, managerial and clerical staff, plus site services and security employees.

8.4.46 The existing skills profile in the local area does not fully meet the specialised requirements of the construction of the HPC Project and therefore there would be two types of construction workers, as follows:

- Home-based workers, who would commute to and from work on a daily basis from their home address.
- Non-home-based workers, who cannot feasibly commute to and from work on a daily basis from their home address and would therefore require temporary accommodation in the vicinity of the HPC development site.

8.4.47 The split of home-based and non-home-based workers would change over the course of the construction phase as the nature of the construction evolves. As the construction progresses, a different, more specialised, workforce will be required. These workers would most likely need to be attracted from further afield, resulting in increases in the percentage of workers occupying local temporary accommodation.

8.4.48 Research within the UK construction industry has demonstrated that construction workers tend to commute daily up to 90 minutes. It has therefore been assumed that the home-based workers would commute up to 90 minutes from their home to the HPC development site. It is considered that the non-home-based workers would tend to live closer to the HPC development site as they are moving into the area primarily for work and the travel time to work will be a material factor when choosing accommodation. It has therefore been assumed that the non-home-based workers would commute up to 60 minutes from their temporary accommodation to the HPC development site.

8.4.49 In order to assist with the housing of the non-home-based workers, EDF Energy proposes to provide campus accommodation both at the HPC development site and within Bridgwater. A total of 1,510 spaces would be provided. In addition to the campus provision, non-home-based workers would live in existing accommodation in the vicinity of the HPC development site.

8.4.50 The workforce for the proposed development is likely to be more locally based and would use similar transport modes. In particular employees would be able to use buses heading to and from the HPC development site.

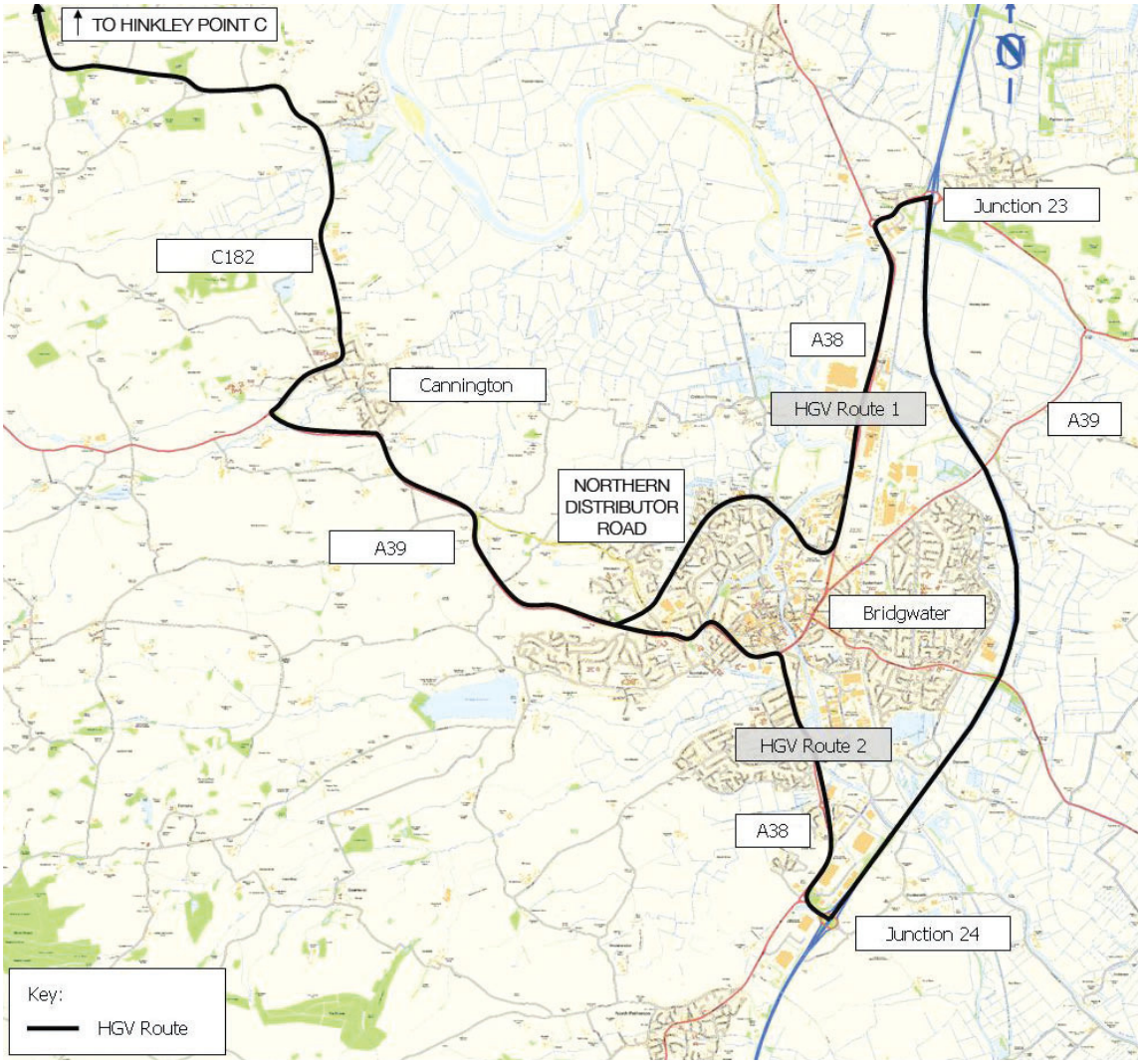
Freight Distribution

8.4.51 Full details of the freight distribution are set out in the **Transport Assessment** and appended **FMS**.

8.4.52 It has been assumed that all HGV movements associated with construction at the HPC development site would travel via the M5 motorway and through Bridgwater. HGVs travelling to the HPC development site would pass through freight management facilities at Junction 23 or Junction 24 of the M5 and then use the routes shown below to access HPC. Prior to completion of the Cannington bypass, HGVs would pass along High Street, Cannington. After completion of the bypass, all HGVs connected with the HPC development site would use the bypass. In the early years, when only the freight management facility at Junction 24 is operational, some HGVs would pass from the freight management facility at Junction 24 via the M5 to Junction 23 and then use the northern HGV route via Bristol Road and the Northern Distributor Road. **Plate 8.3** below shows the two designated HGV routes to the HPC development site.

8.4.53 HGVs for the construction of the proposed development would mainly come from the motorway. LGVs would come from a more local area.

Plate 8.3: Designated HGV Routes to the HPC Development Site



vii. Impact Assessment

8.4.54 The trip generation and distribution has been used to derive vehicular trip origins and destinations. These are then added to the Reference Case models for 2013, 2016 and 2021 to give the with-development models.

8.4.55 Examination of the 2016 Reference Case and 2016 with-development models identified certain capacity issues in both scenarios. Therefore measures are proposed to seek to assist traffic movements. In addition certain safety enhancements are proposed. A list of these highway proposals is shown below. These highway proposals are in addition to accesses provided to the HPC development site and associated development sites. They form a transport mitigation package that is included in the HPC Project.

- M5 Junction 23 roundabout.
- A38 Bristol Road/Wylds Road junction.
- A38 Bristol Road/The Drove junction.
- Wylds Road/The Drove junction.
- A39 Broadway/A38 Taunton Road junction*.
- A39 New Road/B3339 Sandford Hill roundabout*.
- Washford Cross roundabout*.
- Huntworth Roundabout*.
- Claylands Corner junction*.
- Cannington Traffic Calming Measures*.
- C182 Farringdon Hill Lane horse crossing*.
- Cannington bypass.
- A38 Bristol Road/A39 Bath Road (Cross Rifles) roundabout (see below).

8.4.56 The improvements at Cross Rifles are not included in the application for development consent. The HPC generated traffic flows are predicted to have a very small impact on Cross Rifles roundabout. Notwithstanding this, an improvement scheme for Cross Rifles, which is contained within the highway boundary, has been introduced into the model for the purpose of the assessment to assist traffic flow at this critical node which currently experiences congestion. However, it is EDF Energy's understanding that SCC may prefer to implement their own scheme, which goes beyond the highway boundary. It is proposed that EDF Energy would make a contribution to SCC to allow them to promote their own scheme, the modelled scheme or an alternative scheme, using funding from development contributions in the area.

8.4.57 These changes to the highway network were added to the model for 2016 and 2021. In the 2013 model, only the improvements marked with an asterisk (*) were included, although it is EDF Energy's intention to implement as much as possible of the full mitigation package by the end of 2013.

8.4.58 Adding the proposed highway improvements to the With Development models created the With Development and Mitigation models.

8.4.59 Extensive output can be derived from a run of the model, and this is discussed in detail in the **Transport Assessment**. For the purposes of this chapter, the outputs used have been the changes in traffic flows on sections of the highway network (known as links) close to the proposed development. Outputs have been shown in this chapter for:

- All vehicles.
- HGVs and buses.

c) Accidents and Safety

8.4.60 The road safety assessment carried out for the HPC Project is reported in the **Road Safety Strategy** that is appended to the **Transport Assessment**. This section summarises the agreed methodology used for the study to assess the impact of the HPC Project on road safety.

8.4.61 Accident data for the five years up to the end of June 2010 has been obtained from SCC and the HA for the study area.

8.4.62 The accident data has been compared against the national accident rates to determine if any links have rates significantly higher than would otherwise be expected.

8.4.63 The local road network has then been broken down into parishes and accident clusters identified using the definitions developed by the Somerset Road Safety Partnership (SRSP) as follows:

- an accident cluster in an urban location is where at least seven accidents have occurred within a 50 metre radius in a five year period; and
- an accident cluster in a rural location is where at least seven accidents have occurred within a 100 metre radius in a five year period.

8.4.64 An assessment has then been made of the likely impact of the proposed HPC Project on road safety in the study area. This has been done based on the likely changes in traffic flows as a result of the proposed development. However, it is important to note that traffic flows would also increase as a result of increases in traffic flows excluding HPC (i.e. due to committed developments and general growth).

8.4.65 Measures to mitigate the impact on road safety in the study area have been identified. These aim to address issues at existing sites that have experienced a higher than average accident rate that could be exacerbated by any increase in traffic flow generated by the HPC Project. However, these measures are in addition to, and assume the provision of, the highway improvements to be brought forward by EDF Energy to address capacity issues and SCC's own safety improvement programme.

d) Consultation

8.4.66 Extensive consultation has been undertaken throughout the EIA process. As a result of the consultation process, comments have been received from the highway authorities and have informed this assessment. In addition meetings and discussions with the highway authorities have been extensive and on-going to agree the scope of the assessment. The highway authorities have agreed the methodology for estimating the traffic flows for this assessment, in addition to other traffic data required for the noise and air quality assessments

e) Assessment Methodology

8.4.67 The following paragraphs provide a detailed methodology of how the IEMA 'Guidelines for the Environmental Assessment of Road Traffic' (1992) (Ref. 8.20) have been applied in this ES chapter.

i. Screening Process

8.4.68 The potential effects of the HPC Project have been determined by comparing the With Development and Mitigation scenario to the Reference Case scenario in the assessment years. Within the IEMA guidance, two broad rules are suggested which can be used as a screening process to limit the scale and extent of the assessment:

- Rule 1: include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Rule 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more.

8.4.69 Where the predicted increase in traffic flows is lower than the above thresholds, the IEMA guidelines suggest the significance of the effects can be stated to be negligible and further detailed assessments are not warranted. Increases in traffic flows on individual links below 10% are generally considered to be insignificant in environmental assessment terms given that daily variations in background traffic flow may vary by this amount.

ii. Sensitivity of Receptors

8.4.70 The sensitivity of a road can be defined by the vulnerability of the user groups who may use it, e.g. elderly people or children. A sensitive area may be where pedestrian activity may be high, for example in the vicinity of a school or where there is already an existing accident issue. It should be noted that the sensitivity of the receptor is judged on the sensitivity of road users (primarily pedestrians). It also takes account of the existing nature of the road e.g. an existing "A" road is likely to have a lower sensitivity than a minor residential road.

8.4.71 **Table 8.1** provides a summary of the types of receptors and the sensitivity of each, defined as substantial, moderate, minor or negligible.

Table 8.1: Sensitivity of Receptors

Receptor Type	Receptor Sensitivity
Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident clusters, retirement homes, roads without footways that are used by pedestrians.	Substantial
Traffic flow sensitive receptors: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, recreation facilities	Moderate
Receptors with some sensitivity to traffic flow: places of worship, public open space, tourist attractions and residential areas with adequate footway provision	Minor
Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions	Negligible

8.4.72 A desktop exercise augmented by a number of site visits has been undertaken to identify the sensitive receptors in the study area. All road links within the study area have been assessed and assigned sensitivity. Recognising the quantity of road links within the study area, for ease of review the assessment narratives have focused on the road links that would lead to highest impact.

8.4.73 The identified links that represent sensitive receptors in the study area, and their assigned sensitivity, are shown in **Table 8.2**. A plan of the link locations is shown earlier in this chapter at **Plate 8.2**.

Table 8.2: Study Area Receptor Sensitivity

Link	Link Ref.	Sensitivity
A38 between The Drove and Cross Rifles	F	Moderate
A38 between Cross Rifles and St. John Street	J	Moderate
A38 between St. John Street and Taunton Road	O2	Minor
A39 Bath Road north-east of Cross Rifles	N3	Moderate
St. John Street	SN	Moderate/Substantial
The Clink	SF	Minor
The Drove	ZE	Minor

iii. Magnitude

8.4.74 To assist with the judgement of magnitude of impact, reference has been made to the IEMA guidelines (Ref. 8.20). This guidance sets out consideration and in some cases thresholds with respect to changes in the volume and composition of traffic to facilitate a subjective judgement of traffic impact and significance. These thresholds are guidance only and provide a starting point by which a detailed analysis will inform the assessment of the impact magnitude.

8.4.75 It is important to note that the impacts assessed are temporary, not permanent, and this affects the significance attached to them. In 2016 the maximum workforce assessed would be present at the HPC development site for only five months. Similarly the peak HGV flows in 2013 occur for only a few months. However, it is also recognised that, whilst it would be below the peaks which have been assessed here, there would be sustained traffic generation arising from the HPC construction phase for a significant number of years and therefore that the temporary effects associated with HPC construction would continue for longer than would normally be the case for the construction phase of most developments. The period of relatively high levels of sustained traffic generation related to the construction of the HPC Project and the operation of the associated developments is approximately 5-6 years and, as a worst case assumption, it can therefore be assumed that the impacts assessed for the 2016 period would persist for that length of time. In reality traffic flows would often be at a somewhat lower level than have been assessed for 2016, and where it is considered that the period for the assessed 2016 impact is likely to be materially shorter or longer, comment is included in the text.

8.4.76 In addition it is also important to note that in the assessment, a HGV is defined as a HGV or MGV. Therefore the actual number of HGVs would be less than used in the assessment.

8.4.77 As described earlier in this chapter, within any quarter the number of HGV movements would vary from the average for that quarter. Some days the number would be above average and some days below. The hour by hour modelling has been undertaken on the basis of a peak day within the quarter under analysis. However, the daily flows (AADT) used are for an average day to be consistent with other assessments within the ES (e.g. air quality) and because it is normal practice to assess the average i.e. the most likely set of circumstances. However, where there is likely to be a significant impact, a commentary on the peak day for HGVs is also provided.

iv. Types of Impact

8.4.78 The following paragraphs cover each of the impacts that are considered in this chapter.

Severance

8.4.79 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery and describes a series of factors that separate people from places and other people. Such division may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself.

8.4.80 The measurement and prediction of severance is difficult, but relevant factors include road width, traffic flow, speed, the presence of crossing facilities and the number of movements across the affected route.

8.4.81 IEMA guidelines refer to the Department of Transport's 'Manual of Environmental Appraisal' (Ref. 8.20), which suggests that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively. It is advised that these broad indicators should be used with care and regard paid to specific local conditions.

Pedestrian Delay

8.4.82 IEMA guidelines note that changes in the volume, composition and or speed of traffic may affect the ability of people to cross roads. Typically, increases in traffic levels result in increased pedestrian delay, although increased pedestrian activity itself also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their judgement to determine the significance of the impact.

8.4.83 The IEMA guidelines refer to a report published by the Transport Research Laboratory (TRL SR356, Goldschmidt, 1976) as providing a useful approximation for determining pedestrian delay. The TRL research concluded that mean pedestrian delay was found to be 8 seconds at flows of 1,000 vehicles per hour and below 20 seconds at 2,000 vehicles per hour for various types of crossing condition. This research has been reproduced in DMRB Volume 11, Section 3, Part 8. Figure 1 of

Part 8 provides predictive mean pedestrian delay based on empirical data taking into account traffic flow and a range of parameters such as crossing width and vehicle speeds.

8.4.84 A two-way flow of 1,400 vehicles per hour has been adopted as a lower threshold for assessment (equating to a mean 10 second delay for a link with no pedestrian facilities in the TRL report). Below this flow pedestrian delay is unlikely to be a significant factor. This is deemed a robust starting point for narrowing down the modelled routes within the study area and ensuring the routes selected exceeded the suggested threshold of analysis in DMRB Volume 11. It should be noted that for controlled forms of pedestrian crossing the pedestrian delays are less.

Pedestrian Amenity

8.4.85 IEMA guidelines define pedestrian amenity as the relative pleasantness of a journey and can include fear and intimidation if they are relevant. As with pedestrian delay, amenity is affected by traffic volumes and composition along with pavement width and pedestrian activity. The guidelines suggest tentative thresholds of significance would be where the traffic flow is halved or doubled.

Driver Delay

8.4.86 IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at or close to the capacity of the system.

8.4.87 A comparison of journey times on key routes in the model has been undertaken to establish the increase in driver delay as a result of the HPC Project. These are reported in full in the **Transport Assessment** and summarised in this chapter.

Accidents and Safety

8.4.88 IEMA guidelines do not include any definition in relation to accidents and safety, suggesting that professional judgement will be needed to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents. The full results of the safety assessment contained in the **Road Safety Strategy** are reported in the **Transport Assessment** and are summarised in this chapter.

8.4.89 **Table 8.3** summarises the criteria that have been used to determine magnitude of impacts. However, the absolute level of an impact is also important in determining its magnitude, e.g. the total flow of traffic or HGVs on a link. Comment is made on this in the analysis.

Table 8.3: Magnitude of Impact Criteria

Impact	Magnitude of Impact			
	Negligible	Minor	Moderate	Substantial
Severance	Change in total traffic or HGV flows of less than 30%	Change in total traffic or HGV flows of 30-60%	Change in total traffic or HGV flows of 60-90%	Change in total traffic or HGV flows over 90%
Pedestrian Delay	Two way traffic flow < 1,400 vehicles per hour	A judgement based on the road links with two way traffic flow exceeding 1,400 vehicles per hour in context of the individual characteristics		
Pedestrian Amenity	Change in total traffic or HGV flows < 100%	A judgement based on the routes with >100% change in context of their individual characteristics		
Driver Delay	A judgement based on the journey time assessment			
Accidents and Safety	A judgement based on analysis detailed in the **Road Safety Strategy**			

v. Significance of Impacts

8.4.90 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the receptor, using the impact significance assessment matrix set out in **Table 8.4**:

Table 8.4: Significance of Impacts

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Minor	Moderate	Substantial
Negligible	Negligible	Negligible	Negligible	Minor
Minor	Negligible	Negligible	Minor	Moderate
Moderate	Negligible	Minor	Moderate	Substantial
Substantial	Negligible	Moderate	Substantial	Substantial

8.4.91 Potential effects are therefore concluded to be of negligible, minor, moderate or substantial significance. For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

vi. Cumulative Impacts

8.4.92 The assessments for each of the elements of the HPC Project, i.e. the main HPC development and associated developments (see **Volume 2, Chapter 10** and **Chapter 8** in each of **Volumes 3** to **10** of this ES), include all flows associated with the overall HPC Project, i.e. flows to and from the HPC development site and the associated development sites. Furthermore these assessments include other committed (non-HPC) developments for the area. In addition there are some other developments that have not been included in those assessments. These are dealt with in a qualitative way within **Volume 11** of this ES.

f) Limitations, Constraints and Assumptions

8.4.93 The main limitation in baseline conditions presented in this chapter concerns the precision of traffic counts. Such counts are recorded over a day or a week and are subject to an accuracy of + or – 10%. However conditions predicted by the model have been validated using standard criteria and are therefore considered to provide a representative estimate.

8.4.94 Traffic generation estimates for the HPC Project are based on a number of assumptions on matters such as materials quantities, number of workers, construction programme etc. Where appropriate, worst case assumptions have been made. For example, the peak construction quarter in 2016 is assessed and conservative assumptions are made on goods vehicle payloads.

8.5 Baseline Conditions

8.5.1 The site is located off College Way, off the A39 (Bath Road).

a) Pedestrian Network

8.5.2 Paragraph 74 of PPG13, advises that walking offers the greatest potential to replace short car trips, particularly those under 2km.

8.5.3 There are footways along both sides of the A39 (Bath Road), approximately 2m in width. A zebra crossing is provided to the west of Union Street and a further zebra crossing is provided to the west of College Way. Over the railway bridge on the A39 (Bath Road), there is a footway on the northern side approximately 2m wide. A separate footbridge is provided on the southern side of Bath Road, which is approximately 3m in width.

8.5.4 There is a zebra crossing approximately 30m north of the Cross Rifles roundabout on the A38 (Bristol Road) that provides pedestrian access to the nearby Sainsbury's supermarket. There are footways on both sides of the A38 (Bristol Road) and two arms of the A38/Bristol Road/The Drove junction have signal controlled pedestrian crossing facilities (i.e. The Drove and A38 Bristol Road south arm).

b) Cycle Network

8.5.5 Paragraph 77 of PPG13 advises that cycling also has potential to substitute for short car trips, particularly those under 5km, and to form part of a longer journey by public transport.

8.5.6 The existing cycle facilities within a 5km cycle catchment of the proposed development site include:

- A signed cycle route provides a connection between Bridgwater railway station and the town centre via St. John Street and Eastover.
- A high quality segregated cycle/footpath along one side of the northern section of Feversham Road.

- A high quality off-road cycle route connecting the Northern Distributor Road (NDR) to Crowpill Lane.
- An off-road shared pedestrian and cycle route is provided in the Sydenham part of Bridgwater, connecting Redgate Street to Longstone Avenue.
- A high quality segregated cycle/footpath along at least one but in parts on both sides of the NDR between the A39 and the junction with Wylds Road.
- As the NDR segregated cycle/footpath approaches the River Parrett, it routes south to connect to Linham Road. The cycle route runs south along Linham Road. At the Marina the route divides in two with one route heading west along the Bridgwater to Taunton Canal to connect to Victoria Road. The other part of the route heads south off-road along the River Parrett, over the Clink (no formal crossing facilities provided) and then continues along West Quay and Binford Place. At the southern end of Binford Place the cycle route continues off-road through Blake Gardens, under the A39 Broadway and connects to Old Taunton Road and then connects back onto the Canal towpath, which forms part of the River Parrett Trail (National Cycle Network Route 3).

c) Bus Network

8.5.7 The Institute of Highways and Transportation (IHT) 'Guidelines for Planning for Public Transport in Developments', published in 1999 (Ref. 8.21), recommends a maximum walking distance to bus stops of 400m.

8.5.8 Within Bridgwater there is a bus and coach station at Watsons Lane, near to the ASDA supermarket. The bus and coach station was opened in 2004 and is operated by First Group.

8.5.9 With regard to bus stops near to the site, there is a set of bus stops immediately to the west of the A39 (Bath Road)/Union Street/Lower Bath Road junction and these are served by Route 1, the Sydenham/Wyndham Road Circular.

8.5.10 There is also a set of bus stops on the A39 (Bath Road), adjacent to Frederick Road, which is served by Route 1 and Route 375 to Wells and Bristol.

8.5.11 There are also a number of bus stops on the A38 (Bristol Road), the nearest of which to the proposed development site is a set of bus stops to the south of Union Road. These are served by Route 21/21A from Taunton to Burnham-on-Sea. Further details on these services are provided in **Table 8.5**.

Table 8.5: Existing Bus Services

Service	Route	Weekday Frequency		Saturday Frequency	Sunday Frequency
		Daytime	Evening		
1	Sydenham – Bridgwater – Hamp	15 mins	-	20 mins	-
21/21A	Burnham – Bridgwater – Taunton	20-30 mins	60 mins	30 mins	120 mins
375	Wells – Catcott – Bridgwater	60 mins	-	60 mins	-

d) Rail Network

8.5.12 Bridgwater railway station is approximately 1.5km from the site. There are two walking routes from the site to the railway station as follows:

- via the A39 (Bath Road), Polden Street and Wellington Road; or
- via College Way, dedicated footway/cycleway and Clarks Road.

8.5.13 Passenger services through Bridgwater station are operated by First Great Western and Cross Country train operating companies. The basic service pattern between Cardiff Central and Taunton is one train per hour in each direction Monday to Sunday.

8.5.14 Direct services from Bridgwater to Exeter are limited with one train service in the morning at 07:10 and one night service at 00:04. Further details on train services are provided in **Table 8.6**:

Table 8.6: Train Services from Bridgwater Railway Station

Destination	Days of Operation	AM Peak Times (0600-1000)	PM Peak Times (1600-2000)
Taunton	Mon – Fri	06:09, 07:10, 08:09, 09:19, 09:48	16:45, 17:46, 18:46, 19:15, 19:48
	Sat	06:09, 07:06, 08:10, 09:52	06:42, 17:42, 18:42, 19:42
	Sun	08:24, 09:15	06:48, 18:54, 19:59
Bristol	Mon – Fri	06:14, 06:48, 07:05, 07:25, 07:40, 08:48, 09:49	16:28, 17:17, 18:19, 19:24
	Sat	07:05, 07:44, 08:09, 09:10	16:19, 17:19, 18:19, 19:19
	Sun	08:55	17:30, 18:34, 19:16
Cardiff	Mon – Fri	06:14, 06:48, 07:05, 07:25, 07:40, 08:48, 09:49	16:28, 17:17, 18:19, 19:24
	Sat	07:05, 07:44, 08:09, 09:10	16:19, 17:19, 18:19, 19:18
	Sun	N/A	N/A
Exeter (indirect)	Mon – Fri	06:09, 07:10, 08:09, 09:19, 09:48	16:45, 17:46, 18:46, 19:15, 19:48
	Sat	06:09, 08:10, 09:52	16:12, 17:42, 18:42, 19:42
	Sun	08:24, 09:15	06:48, 18:54, 19:59

e) Highway Network

8.5.15 The A39 (Bath Road), in the vicinity of the site, is a 7.3m wide single carriageway with street lighting. The speed limit on this road is 30mph until the approach to the bridge over the M5 motorway, where the speed limit increases to 40mph. There are waiting restrictions (double yellow lines) on the A39 (Bath Road in the vicinity of the site.

8.5.16 Immediately to the west of the site is a bridge over the Bristol to Penzance railway line. The bridge carriageway has reduced width and there is signage advising that eastbound traffic has priority over westbound traffic over the bridge.

8.5.17 The junction of A39 Bath Road/A38 Bristol Road is referred to as the 'Cross Rifles' roundabout. This is a four arm roundabout with the A38 Bristol Road joining from the north, the A39 Bath Road joining from the east, A39 Broadway joining from the south and The Clink joining from the west.

8.5.18 The A38 Bristol Road is a main arterial route into Bridgwater and, as such, carries significant volumes of traffic especially in the peak periods. During peak periods queues form on the A38 into Bridgwater, which affect the operation of the A38/Express Park roundabout as the queues extend across the circulatory carriageway.

8.5.19 To the south of Express Park is the A38/Wylds Road priority junction, which provides vehicular access to a major industrial/commercial area of Bridgwater. Wylds Road is restricted and vehicles are only permitted to turn left from Wylds Road to the A38 Bristol Road. Immediately to the west of the junction, on Wylds Road is Allerton Road and the operation of this minor junction can impede the flow of traffic turning to and from the A38, particularly as Wylds Road is used by a significant volume of heavy goods vehicles accessing/egressing the industrial areas nearby. It should also be noted that Wylds Road is also used by southbound traffic heading into Bridgwater who are avoiding the delays further south at the Cross Rifles roundabout.

8.5.20 Further south is the signal-controlled junction of the A38 (Bristol Road)/The Drove. The operation of this junction is complicated by the proximity of Union Street on the eastern side of the A38 immediately to the south of the signal-controlled junction. Union Street is a 'left-in left-out' priority junction and its bellmouth kerbs encroach into the traffic signal-controlled junction. The Drove forms part of what is referred to as the NDR, which was built in 1992.

8.5.21 The baseline traffic flows for the highway network in the study area are shown in **Table 8.7**.

Table 8.7: 2009 Baseline Two-way Daily (24 hour AADT) Vehicular Traffic Flows

Link	Link Ref.	2009 Base
A38 between The Drove and Cross Rifles	F	16,818
A38 between Cross Rifles and St. John Street	J	20,240
A38 between St. John Street and Taunton Road	O2	18,820
A39 (Bath Road) North-east of Cross Rifles	N3	17,129
St. John Street	SN	11,549
The Clink	SF	17,521
The Drove	ZE	7,030

8.5.22 Personal injury accident data has been assessed for the period 1 August 2004 – 31 July 2009 for the HPC study area and is summarised in **Table 8.8**. Further details on accident details are included in the **Road Safety Strategy** appended to the **Transport Assessment**.

Table 8.8 Personal Injury Accident Data Summary – 1 August 2004 until 31 July 2009

Area	Link	Accident Severity				Accidents Involving Vulnerable Users			
		Total	Slight	Serious	Fatal	Total	Peds	Cyclist	Motor cycle
Bridgwater Campuses	A38 north of The Drove	4	3	0	1	3	1	1	1
	The Drove west of A38	4	4	0	0	2	1	0	1
	Union Street	1	1	0	0	1	0	1	0
	A38 between The Drove and Cross Rifles	7	7	0	0	7	3	2	2
	The Clink west of Cross Rifles	0	0	0	0	0	0	0	0
	A39 south of Cross Rifles	5	4	1	0	5	3	2	0
	A39 west of Campuses	16	13	3	0	16	6	5	5
	A39 east of Campuses	5	4	1	0	5	0	1	4

8.6 Future Baseline Conditions

8.6.1 As set out earlier in this chapter, the assessment years selected are 2013, 2016 and 2021. Therefore future baseline conditions have been assessed for these years. Future baseline conditions are referred to as the Reference Case scenario.

8.6.2 For 2016 the Reference Case flows are shown below along with the comparison to the 2009 Base Case flows. For 2013 and 2021 the Reference Case flows are shown in the Section 8.7.

8.6.3 **Table 8.9**, **Table 8.10** and **Table 8.11** summarise the 2009 Base Case and 2016 Reference Case flows for the daily (24 hour AADT), AM Peak (08:00 to 09:00) and PM peak (17:00 to 18:00) hours. These are two-way flows (e.g. sum of the eastbound and westbound flows). It should be emphasised that the Reference Case flows are flows that are predicted to occur without the HPC Project. The increases in flow compared with the 2009 Base Case are due to other planned developments in the area and application of DfT growth factors.

8.6.4 Changes in predicted flows on a link can take place for a number of reasons. Additional traffic from planned developments will add traffic to a link. However, if congestion and delay on one link increases this could lead to traffic diverting to an alternative route. This could then lead to an increase in flow on the diversion route but a decrease on the congested link from which traffic diverts.

Table 8.9: 2009 Base vs. 2016 Reference Case Two-way Daily Vehicular Traffic Flows

Link	Link Ref.	2009 Base	2016 Ref Case	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	16,818	18,764	1,946	12%
A38 between Cross Rifles and St. John Street	J	20,240	22,485	2,245	11%
A38 between St. John Street and Taunton Road	O2	18,820	20,802	1,982	11%
A39 Bath Road North-east of Cross Rifles	N3	17,129	15,740	-1,389	-8%
St. John Street	SN	11,549	12,638	1,089	9%
The Clink	SF	17,521	16,541	-980	-6%
The Drove	ZE	7,030	7,666	636	9%

Table 8.10: 2009 Base vs. 2016 Reference Case Two-way AM Peak Vehicular Traffic Flows

Link	Link Ref.	2009 Base	2016 Ref Case	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,386	1,481	95	7%
A38 between Cross Rifles and St. John Street	J	1,507	1,673	166	11%
A38 between St. John Street and Taunton Road	O2	1,625	1,712	87	5%
A39 Bath Road North-east of Cross Rifles	N3	1,564	1,481	-83	-5%
St. John Street	SN	950	1,060	110	12%
The Clink	SF	1,199	1,133	-66	-5%
The Drove	ZE	508	617	109	22%

Table 8.11: 2009 Base vs. 2016 Reference Case Two-way PM Peak Vehicular Traffic Flows

Link	Link Ref.	2009 Base	2016 Ref Case	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,162	1,466	304	26%
A38 between Cross Rifles and St. John Street	J	1,673	1,841	168	10%
A38 between St. John Street and Taunton Road	O2	1,531	1,719	188	12%
A39 (Bath Road) North-east of Cross Rifles	N3	1,688	1,352	-336	-20%
St. John Street	SN	972	1,169	197	20%
The Clink	SF	1,624	1,413	-211	-13%
The Drove	ZE	709	758	49	7%

8.6.5 As can be seen there are expected to be general, but not universal, increases of flow on the network by 2016 (without the HPC Project), although there are reductions on the A39 (Bath Road) north-east of Cross Rifles and The Clink. This is likely to be due to congestion at Cross Rifles leading to traffic diverting to other routes.

8.7 Assessment of Impacts

8.7.1 As noted earlier in this chapter the assessments have been undertaken for three assessment periods:

- 2013 (representative of the early phase of construction of the HPC Project);
- 2016 (representative of peak construction activity for the HPC Project and the operational phase of the proposed development); and
- 2021 (representative of the operational phase of the HPC power station and, where applicable, the post-operational phase of the temporary associated developments).

8.7.2 The With Development scenario for each assessment assumes that the proposed highway improvement package described earlier in this chapter would be implemented. Each assessment also assumes the implementation of the transport strategy, as described in the **Transport Assessment**.

8.7.3 In respect of the 2013 assessment this includes the period in which the proposed development would be under construction. In total, the FMS has estimated that 2,203 HGVs would be required to deliver materials for the construction of the proposed development which represents an average of 12 movements per day over the 12 month construction phase. These movements include a 20% contingency, as explained in the FMS, and therefore provide a robust basis for assessment. They have been profiled over time in accordance with the construction schedule and are included in the 2013 With Development assessment, along with all other HPC related traffic at that time. Further details on the construction of the proposed development is contained in **Chapter 3** of this volume of the ES.

8.7.4 It is estimated that 40 workers would be employed in constructing the proposed development and these are included within the overall workforce profile. These workers would travel to site by walking, cycling, local buses or by the HPC bus.

8.7.5 In respect of the 2016 assessment this includes the period in which the proposed development would be operational and at peak usage, as this is the assessment period which relates to the peak construction workforce.

8.7.6 The traffic associated with the movement of buses and workers to and from the proposed development, as well as non-work trips associated with campus occupants are therefore included within the 2016 With Development transport assessment, along with all other HPC related traffic at that time. Further details on the operation of the proposed development are contained in **Chapter 4** of this volume of the ES.

8.7.7 In respect of the 2021 assessment this covers the period in which the proposed development is anticipated to be no longer operational. However, the buildings

would remain and therefore there would be no removal of buildings in the post-operational phase of the proposed development. Any future use would need to be subject to a separate planning application hence no traffic generation from the proposed development has been assumed in 2021.

8.7.8 When considering the traffic impacts of the proposed development it may be relevant to distinguish between the traffic impacts of the HPC Project as a whole and the impacts of the proposed development in isolation.

8.7.9 The detailed figures shown below present the outputs from the modelling in the area. These flows include all HPC traffic generated in the vicinity of the site. A separate detailed modelling exercise has not been undertaken of the traffic impacts associated with the construction, operation and post-operation of the proposed development in isolation as the associated traffic movements would be small relative to the HPC Project as a whole. However, a commentary on the impact of the proposed development in isolation is made in some places and this informs the assessment which is made in this chapter as a whole. A more detailed assessment of impacts on severance, pedestrian delay, pedestrian amenity, driver delay and accidents and safety in Bridgwater associated with all HPC related traffic is considered within **Volume 2**, **Chapter 10** of this ES.

a) 2016

8.7.10 The tables below show the 2016 With Development scenario compared with the 2016 Reference Case. Daily and network AM and PM peak hour flows are shown for all vehicles. Daily flows are also shown for HGVs plus buses.

8.7.11 As with the 2009 Base Case and 2016 Reference Case comparison above, some flow changes may be due to vehicle re-routing rather than directly due to HPC traffic.

Table 8.12: 2016 Reference Case vs. 2016 With Development Daily (24 Hour AADT) Two Way All Vehicles Traffic Flows

Link	Link Ref.	2016 Ref Case	2016 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	18,764	18,361	-402	-2.1%
A38 between Cross Rifles and St. John Street	J	22,485	24,208	1,722	7.7%
A38 between St. John Street and Taunton Road	O2	20,802	22,124	1,322	6.4%
A39 Bath Road North-east of Cross Rifles	N3	15,740	17,788	2,048	13.0%
St. John Street	SN	12,638	11,815	-823	-6.5%
The Clink	SF	16,541	16,704	163	1.0%
The Drove	ZE	7,666	7,664	-2	0.0%

Table 8.13: 2016 Reference Case vs. 2016 With Development Two Way AM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2016 Ref Case	2016 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,481	1,617	136	9.2%
A38 between Cross Rifles and St. John Street	J	1,673	1,959	286	17.1%
A38 between St. John Street and Taunton Road	O2	1,712	1,936	225	13.1%
A39 Bath Road North-east of Cross Rifles	N3	1,481	1,795	314	21.2%
St. John Street	SN	1,060	936	-124	-11.7%
The Clink	SF	1,133	1,244	111	9.8%
The Drove	ZE	617	581	-37	-5.9%

Table 8.14: 2016 Reference Case vs. 2016 With Development Two Way PM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2016 Ref Case	2016 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,466	1,356	-110	-7.5%
A38 between Cross Rifles and St. John Street	J	1,841	2,032	190	10.3%
A38 between St. John Street and Taunton Road	O2	1,719	1,812	93	5.4%
A39 Bath Road North-east of Cross Rifles	N3	1,352	1,717	365	27.0%
St. John Street	SN	1,169	940	-229	-19.6%
The Clink	SF	1,413	1,582	169	12.0%
The Drove	ZE	758	736	-22	-2.9%

Table 8.15: 2016 Reference Case vs. 2016 With Development Two Way Daily (24 Hour AADT) HGV + Bus Flows

Link	Link Ref.	2016 Ref Case	2016 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	887	969	82	9.3%
A38 between Cross Rifles and St. John Street	J	1,012	979	-33	-3.2%
A38 between St. John Street and Taunton Road	O2	935	938	3	0.3%
A39 Bath Road North-east of Cross Rifles	N3	655	710	55	8.4%
St. John Street	SN	413	383	-30	-7.4%
The Clink	SF	474	381	-93	-19.7%
The Drove	ZE	296	698	402	135.9%

8.7.12 The increase in flow on the A38 (Bath Road) north-east of Cross Rifles is primarily due to the improvement in capacity at Cross Rifles. In 2016 there would be no HGV movements generated by the proposed development.

i. Severance

8.7.13 None of the links within the study area would experience an increase in general traffic flows above 100% as a result of the HPC Project. The Drove would experience an increase in daily HGV and bus flows of 135.9% but this is an industrial estate road with limited pedestrian activity and is therefore considered to be a minor receptor in terms of sensitivity. The overall significance of impact on this route arising from all HPC related traffic would therefore be classified as moderate adverse. However, as noted above, when taking into account that the actual impact of the proposed development in isolation would only be due to buses and not HGVs – and that most of the HGV and bus traffic on The Drove would not relate to the proposed development – this reduces the significance of the impact to **minor adverse**.

ii. Pedestrian Delay

8.7.14 Those highway links with a predicted two-way flow greater than 1,400 vehicles per hour include the A38, the A39 (Bath Road) and The Clink. However, the magnitude of impact on all of these links as a result of the HPC Project is negligible and therefore the overall significance of impact is **negligible**.

iii. Pedestrian Amenity

8.7.15 None of the links within the study area would experience an increase in general traffic flows above 100% as a result of the HPC Project. The Drove would experience an increase in daily HGV and bus flows of 135.9% but this is an industrial estate road with limited pedestrian activity and therefore the overall significance of impact is considered to be **negligible**.

iv. Driver Delay

8.7.16 The **Transport Assessment** includes a detailed analysis of journey times on various routes in Bridgwater and surrounding areas and demonstrates that there is no material detriment to journey times within Bridgwater as a whole. Overall journey speeds would be maintained. During the modelled hours (06:00 to 10:00 and 13:00 to 20:00) the average speed of a vehicle through the modelled network is 29.1mph in the 2016 Reference Case and 29.0mph in the With Development scenario. Hence there is no material change.

8.7.17 One of the journey time routes is the A39 from Crandon Bridge/Silverfish junction to Cross Rifles. This is the most relevant for the proposed Bridgwater C accommodation campus and is therefore included below. Further journey time analysis is included within the **Transport Assessment**.

8.7.18 The red line on the graphs shows the 2016 Reference Case (i.e. what is predicted to happen without the HPC Project but with other growth). The green line shows the journey times if HPC Project traffic is added but with without the highway improvements. The blue line shows the journey times with HPC Project traffic and the highway improvements (the With Development scenario). Twenty model runs were undertaken to produce the results for each scenario. The range of results is shown by the dotted lines with the average being shown by the solid line. The range of results is known as the confidence interval. The period between 10:00 and 13:00 hours has not been modelled (as agreed with the transport authorities) and therefore the graphs should be ignored for these periods. A change is only considered statistically significant if the confidence intervals (i.e. the range of results from the multiple runs undertaken) between two scenarios do not overlap.

Plate 8.4: Journey Time Analysis Route 3 – Eastbound

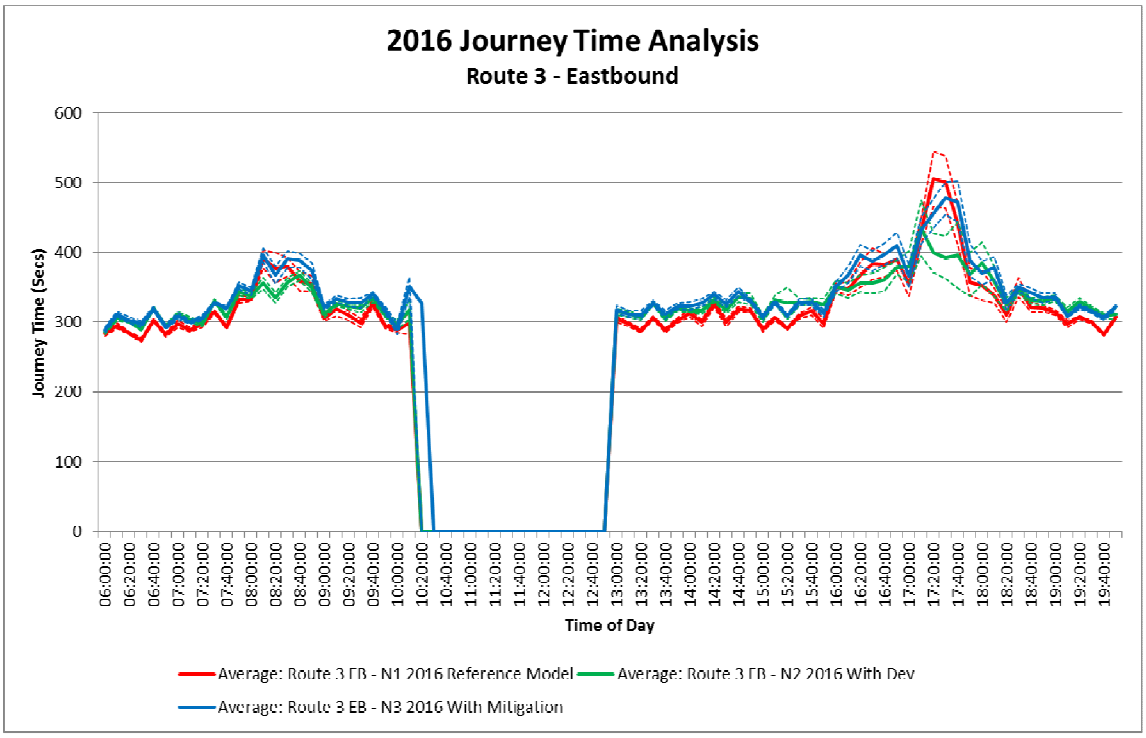
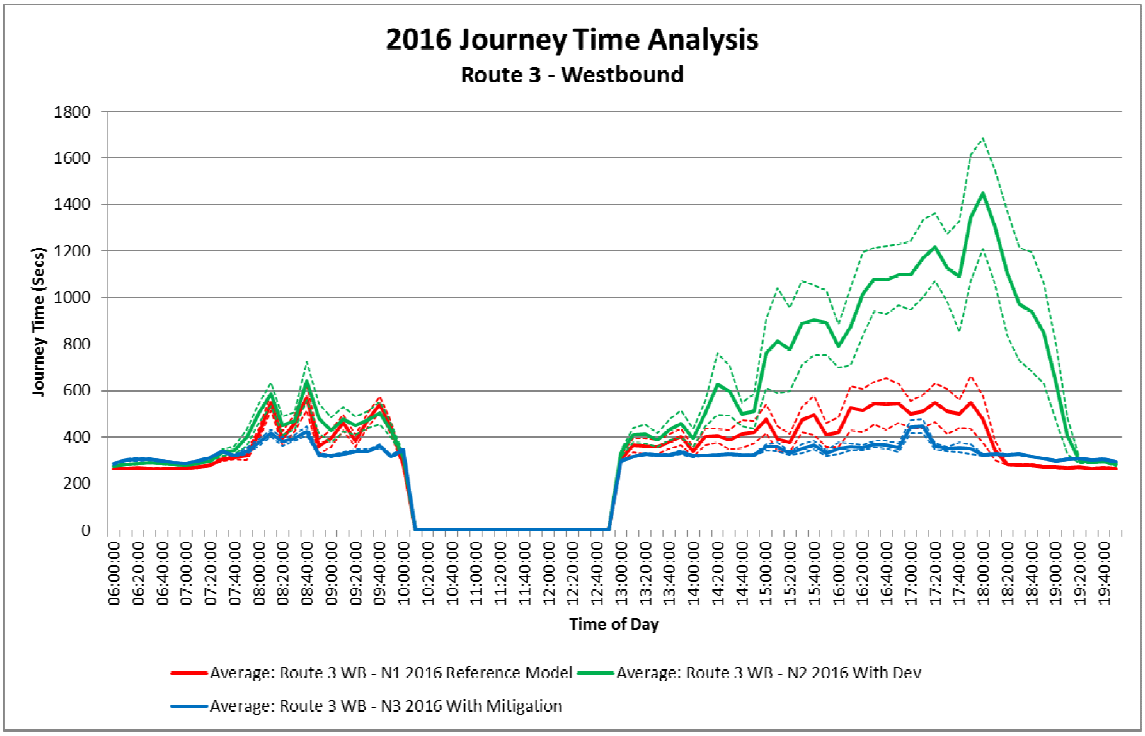


Plate 8.5: Journey Time Analysis Route 3 – Westbound



8.7.19 Comparing With Development scenario (i.e. including the highway improvements) the against the 2016 Reference Case, on Journey Time Route 3 in the eastbound direction (away from the HPC development site) there are predicted to be slight detriments in journey time during early morning, early afternoon and late evening. There would be no statistically significant differences during the AM or PM peaks. In the westbound direction (towards the HPC development site) the With Development scenario (i.e. including the highway improvements) shows improved journey times in the morning and evening peak periods.

8.7.20 On the basis of the above, the impact on journey times of the HPC Project including the highway improvements in Bridgwater is considered to be of **minor beneficial** significance.

v. Accidents and Safety

8.7.21 As noted earlier in this chapter, a full safety study has been undertaken and the results are reported in the **Road Safety Strategy** that is appended to the **Transport Assessment**.

8.7.22 The study demonstrates that there are a number of accident clusters where traffic flows would increase due to committed development schemes as well as the HPC Project. Somerset County Council has an on-going safety improvement programme in Bridgwater which is looking at a number of the clusters.

8.7.23 The study demonstrates that a number of the highway improvements proposed by EDF Energy would bring forward safety enhancements. In particular this is the case at the Wylds Road/The Drove junction and Dunball Roundabout. The introduction of a scheme at Cross Rifles would also enhance safety.

8.7.24 As noted earlier in this chapter, the increases in total traffic flows in Bridgwater as a result of the HPC Project as a whole are all less than 30% although HGV and bus flows would increase by greater than 30% in one location.

8.7.25 Taking all the above into account the potential impact on safety is judged to be **negligible**.

b) 2013

8.7.26 As noted earlier in this chapter, 2013 represents the early construction phase of the HPC Project before the associated developments are operational, except the Junction 24 development which would be operational by Quarter 3 2013. There would be less traffic than in 2016. Some freight vehicles and buses would be routed from the Junction 24 development up the M5 to Junction 23 and then along the northern HGV route through Bridgwater via the Northern Distributor Road.

8.7.27 As well as the construction at the main HPC development site, the associated developments would also be under construction including this proposed development. Therefore construction traffic to/from the proposed development is included in the 2013 assessment.

8.7.28 In terms of highway improvements, the analysis has been undertaken on the basis that only the Site Preparation Works improvements plus Huntworth roundabout would be in place. The Cannington bypass would not be operational until Quarter 4 2014.

8.7.29 Therefore the highway improvements assumed for the purposes of the 2013 assessment are:

- A39 Broadway/A38 Taunton Road junction improvement.
- A39 New Road/B3339 Sandford Hill Roundabout installation.
- Washford Cross Roundabout installation.
- Huntworth Roundabout improvement.
- Claylands Corner junction improvement.
- Cannington Traffic Calming Measures.
- C182 Farringdon Hill Lane Horse Crossing.

8.7.30 However, EDF Energy will seek to bring forward the highway improvement package as soon as possible and therefore some additional improvement measures may be in place before the assessment period of Quarter 3 2013.

8.7.31 The results of the assessment are shown in the tables below. These cover daily all vehicle flows, peak hour (AM and PM) all vehicle flows and daily HGV and bus flows.

Table 8.16: 2013 Reference Case vs. 2013 With Development Daily (24 Hour AADT) Two way All Vehicles Traffic Flows

Link	Link Ref.	2013 Ref Case	2013 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	18,017	18,032	14	0.1%
A38 between Cross Rifles and St. John Street	J	21,539	21,932	393	1.8%
A38 between St. John Street and Taunton Road	O2	19,876	20,278	402	2.0%
A39 Bath Road north-east of Cross Rifles	N3	18,846	18,771	-74	-0.4%
St. John Street	SN	11,937	12,076	139	1.2%
The Clink	SF	17,718	17,893	174	1.0%
The Drove	ZE	7,265	7,769	504	6.9%

Table 8.17: 2013 Reference Case vs. 2013 With Development Two Way AM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2013 Ref Case	2013 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,457	1,472	15	1.0%
A38 between Cross Rifles and St. John Street	J	1,582	1,612	30	1.9%
A38 between St. John Street and Taunton Road	O2	1,666	1,734	68	4.1%
A39 Bath Road north-east of Cross Rifles	N3	1,643	1,613	-30	-1.8%
St. John Street	SN	959	987	27	2.9%
The Clink	SF	1,195	1,222	26	2.2%
The Drove	ZE	513	543	30	5.8%

Table 8.18: 2013 Reference Case vs. 2013 With Development Two Way PM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2013 Ref Case	2013 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,289	1,288	-1	0.0%
A38 between Cross Rifles and St. John Street	J	1,748	1,828	79	4.5%
A38 between St. John Street and Taunton Road	O2	1,599	1,648	49	3.1%
A39 Bath Road north-east of Cross Rifles	N3	1,770	1,782	12	0.7%
St. John Street	SN	1,022	991	-31	-3.0%
The Clink	SF	1,590	1,637	47	2.9%
The Drove	ZE	708	737	30	4.2%

Table 8.19: 2013 Reference Case vs. 2013 With Development Two Way Daily (24 Hour AADT) HGV + Bus Flows

Link	Link Ref.	2013 Ref Case	2013 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	931	923	-8	-0.9%
A38 between Cross Rifles and St. John Street	J	1,095	1,217	122	11.1%
A38 between St. John Street and Taunton Road	O2	1,033	1,189	156	15.1%
A39 Bath Road NE of Cross Rifles	N3	825	973	148	17.9%
St. John Street	SN	434	461	27	6.2%
The Clink	SF	521	501	-20	-3.8%
The Drove	ZE	306	719	413	135.0%

8.7.32 As can be seen the flows on the A38 (Bath Road) north-east of Cross Rifles are predicted to reduce slightly. This is likely to be due to traffic redistributing due to delays since the planned improvement at Cross Rifles would not be in place until 2016.

i. Severance

8.7.33 None of the links within the study area would experience an increase in general traffic flows above 30% as a result of the HPC Project. However, The Drove is predicted to experience an increase in daily HGV and bus movements of 135.0%, which is considered to be a substantial magnitude of impact.

8.7.34 The Drove is considered to be a minor receptor in terms of sensitivity as it is an industrial estate road, with limited pedestrian activity. The overall significance of impact on this route would therefore be classified as moderate adverse. However, HGV movements on The Drove in 2013 are not principally associated with the construction of the proposed development but would arise from the wider HPC Project. This reduces the significance of the impact arising from the proposed development considered in isolation to **minor adverse**.

ii. Pedestrian Delay

8.7.35 Those highway links with a predicted two-way flow greater than 1,400 vehicles per hour include the A38, the A39 (Bath Road) and The Clink. However, the magnitude of impact on all of these links as a result of the HPC Project is negligible and therefore the overall significance of impact is **negligible**.

iii. Pedestrian Amenity

8.7.36 None of the links within the study area would experience an increase in general traffic flows above 100% as a result of the HPC Project. The Drove would experience an increase in daily HGV and bus flows of 135.0% but this is an industrial estate road with limited pedestrian activity and therefore the overall significance of impact is considered to be **negligible**.

iv. Driver Delay

8.7.37 The basis of the assessment of driver delay in 2013 is the same as for the 2016 assessment. The results of the journey time analysis for Route 3 are shown below.

8.7.38 One of the journey time routes is the A39 from Crandon Bridge/Silverfish junction to Cross Rifles. This is the most relevant for the proposed Bridgwater C accommodation campus and is therefore included below. Further journey time analysis is included within the **Transport Assessment**.

Plate 8.6: Journey Time Analysis Route 3 – Eastbound

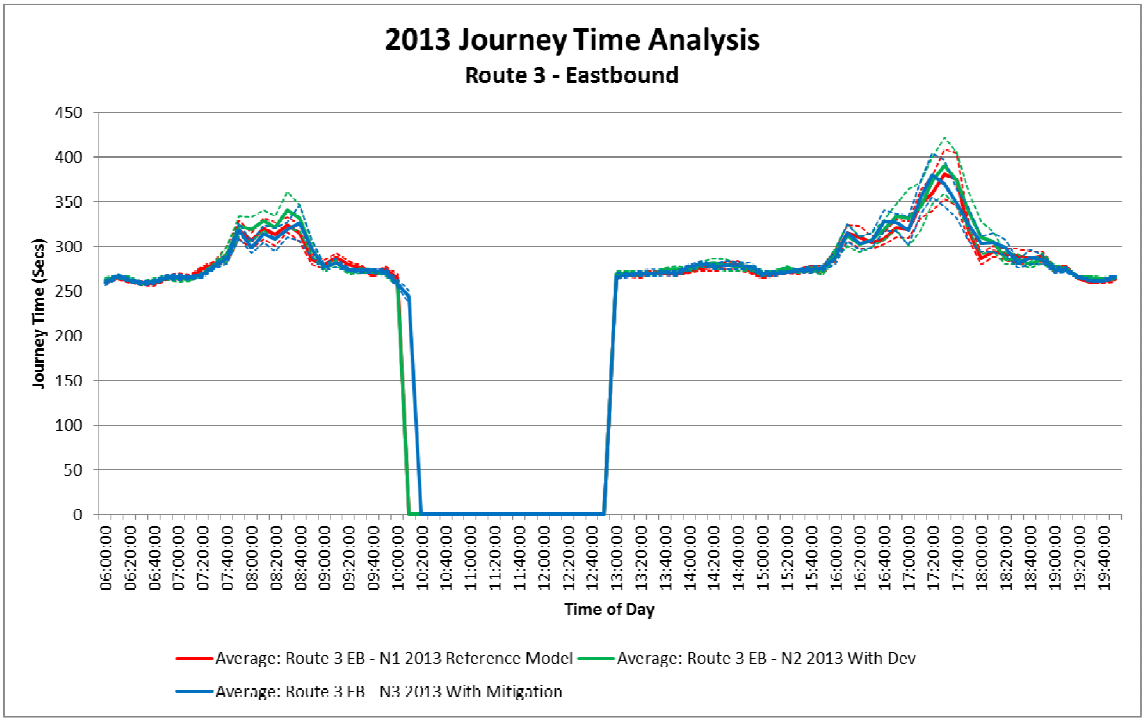
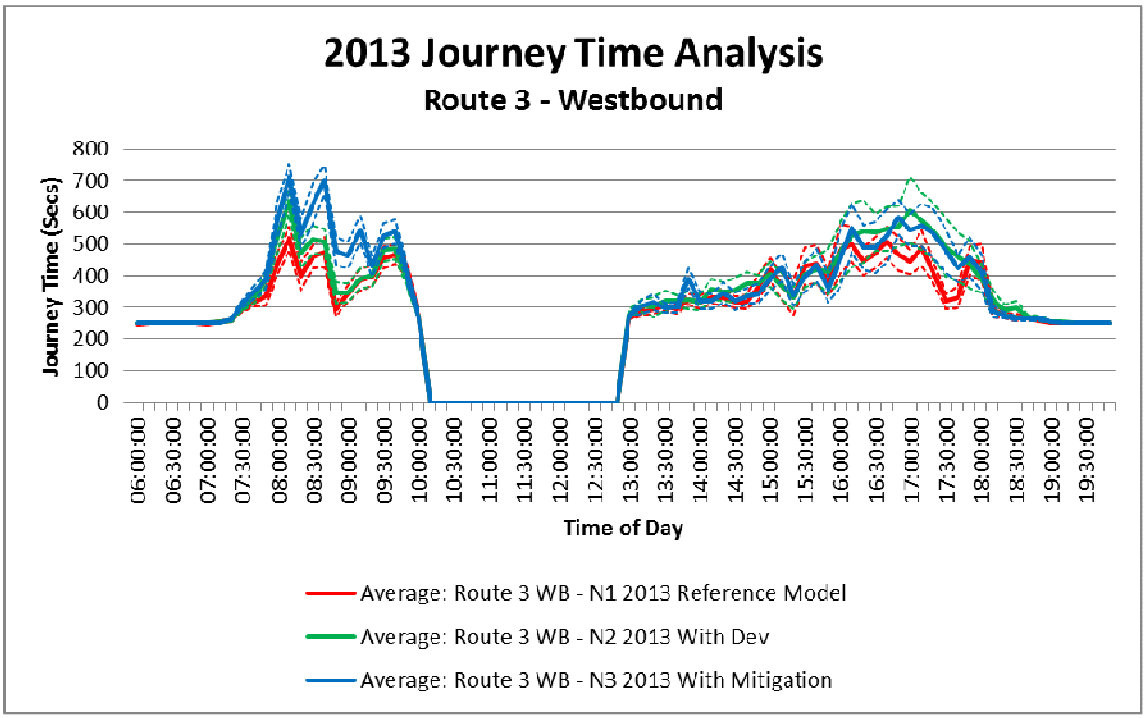


Plate 8.7: Journey Time Analysis Route 3 – Westbound



8.7.39 On Journey Time Route 3 in the eastbound direction (away from the HPC development site) for the With Development scenario (i.e. including the highway improvements) there would be a negligible change in journey times during peak periods. In the westbound direction (towards the HPC development site) there is predicted to be some detriment in journey time in the AM peak and PM peak.

8.7.40 On the basis of the above, the impact on journey times in 2013 of the HPC Project is considered to be of **minor adverse** significance.

v. Accidents and Safety

8.7.41 The accident and safety analysis for 2013 is very similar to that for 2016 and the significance of the safety impact in 2013 is therefore considered **negligible**.

c) 2021

8.7.42 In 2021 it is anticipated that the HPC power station would be operational and employing approximately 900 personnel. In addition there would still be some construction activity at the HPC development site and some of the associated development sites would be in the post-operational phase. However, overall construction activity would be modest compared with 2016. The Junction 24 development would remain operational as would Cannington park and ride. At this stage of the HPC Project it is assumed that the proposed development would no longer be operational. Therefore none of the HPC related traffic shown below would relate to movements associated with the proposed development.

8.7.43 The results of the modelling are shown in the tables below.

Table 8.20: 2021 Reference Case vs. 2021 With Development Daily (24 Hour AADT) Two way All Vehicles Traffic Flows

Link	Link Ref.	2021 Ref Case	2021 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	18,783	18,636	-148	-0.8%
A38 between Cross Rifles and St. John Street	J	23,146	25,263	2,117	9.1%
A38 between St. John Street and Taunton Road	O2	21,226	23,036	1,810	8.5%
A39 Bath Road North-east of Cross Rifles	N3	18,265	19,967	1,702	9.3%
St. John Street	SN	12,439	12,055	-384	-3.1%
The Clink	SF	17,222	16,921	-301	-1.7%
The Drove	ZE	7,889	7,534	-355	-4.5%

Table 8.21: 2021 Reference Case vs. 2021 With Development Two Way AM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2021 Ref Case	2021 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,490	1,639	149	10.0%
A38 between Cross Rifles and St. John Street	J	1,665	2,006	341	20.5%
A38 between St. John Street and Taunton Road	O2	1,712	1,968	256	15.0%
A39 Bath Road North-east of Cross Rifles	N3	1,740	2,002	262	15.0%
St. John Street	SN	1,039	1,000	-39	-3.8%
The Clink	SF	1,253	1,275	22	1.8%
The Drove	ZE	644	698	54	8.3%

Table 8.22: 2021 Reference Case vs. 2021 With Development Two Way PM Network Peak All Vehicles Traffic Flows

Link	Link Ref.	2021 Ref Case	2021 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	1,353	1,376	23	1.7%
A38 between Cross Rifles and St. John Street	J	1,847	2,023	175	9.5%
A38 between St. John Street and Taunton Road	O2	1,725	1,818	92	5.4%
A39 Bath Road North-east of Cross Rifles	N3	1,686	1,833	146	8.7%
St. John Street	SN	1,106	908	-198	-17.9%
The Clink	SF	1,486	1,532	46	3.1%
The Drove	ZE	674	720	46	6.8%

Table 8.23: 2021 Reference Case vs. 2021 With Development Two Way Daily (24 Hour AADT) HGV + Bus Flows

Link	Link Ref.	2021 Ref Case	2021 With Dev	Increase (Numerical)	Increase (%)
A38 between The Drove and Cross Rifles	F	951	1,114	163	17.1%
A38 between Cross Rifles and St. John Street	J	1,057	1,051	-6	-0.6%
A38 between St. John Street and Taunton Road	O2	971	970	-1	-0.1%
A39 Bath Road North-east of Cross Rifles	N3	657	833	176	26.7%
St. John Street	SN	434	374	-60	-13.9%
The Clink	SF	491	387	-104	-21.3%
The Drove	ZE	331	427	96	29.0%

8.7.44 As can be seen the flows on the A38 (Bath Road) north-east of Cross Rifles would increase since the planned improvement at Cross Rifles would be in place and traffic would be redistributed on the basis of this highway improvement.

i. Severance

8.7.45 None of the links within the study area would experience an increase in general traffic flows above 30% as a result of the HPC Project. In addition none of the links would experience an increase in HGV and bus flows of 30% or more.

8.7.46 The overall significance of impact from the HPC Project in 2021 in the study area is therefore considered to be **negligible**.

ii. Pedestrian Delay

8.7.47 Those highway links with a predicted two-way flow greater than 1,400 vehicles per hour include the A38, the A39 (Bath Road) and The Clink. However, the magnitude of impact on all of these links as a result of the HPC Project is negligible and therefore the overall significance of impact is **negligible**.

iii. Pedestrian Amenity

8.7.48 None of the links within the study area would experience an increase in general traffic flows above 100% as a result of the HPC Project. Therefore the overall significance of impact is considered to be **negligible**.

iv. Driver Delay

8.7.49 The basis of the assessment of driver delay in 2021 is the same as for the 2016 assessment. The average speeds through the assessment network are predicted to improve in 2021 due to the highway improvements that would be introduced. In the morning peak, the average speed increases from 22.5mph to 24.7mph. In the evening peak the average speed increases significantly from 18.7mph to 25.6mph. Over the whole of the modelled period the average speed increases from 26.9mph to 29.9mph.

8.7.50 The outputs from the journey time analysis on Route 3 are shown in **Plate 8.8** and **Plate 8.9**.

Plate 8.8: Journey Time Analysis Route 3 – Eastbound

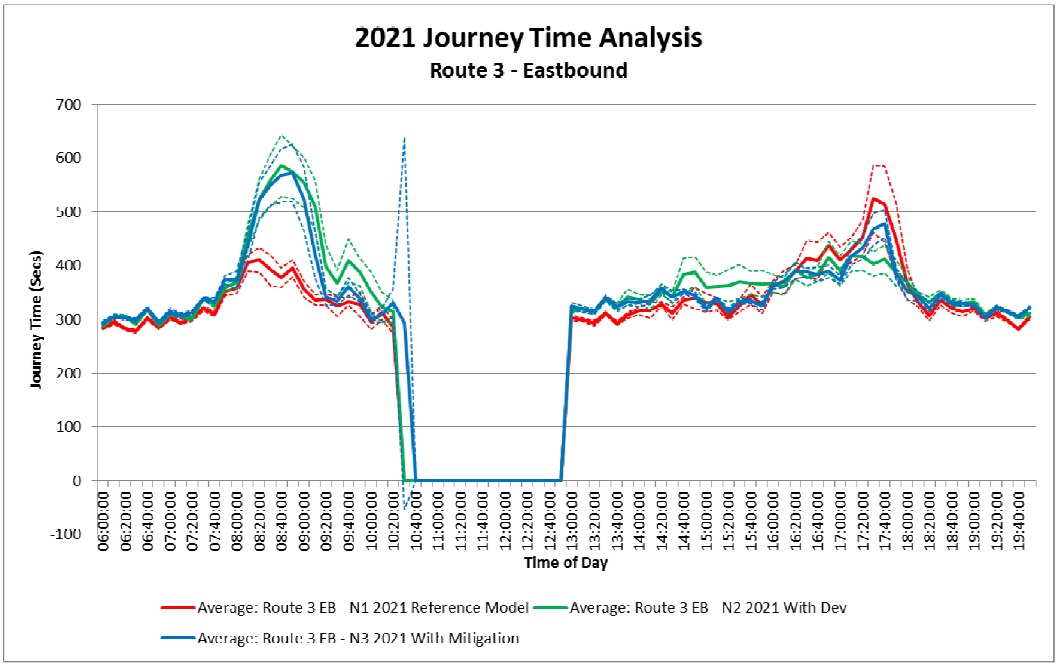
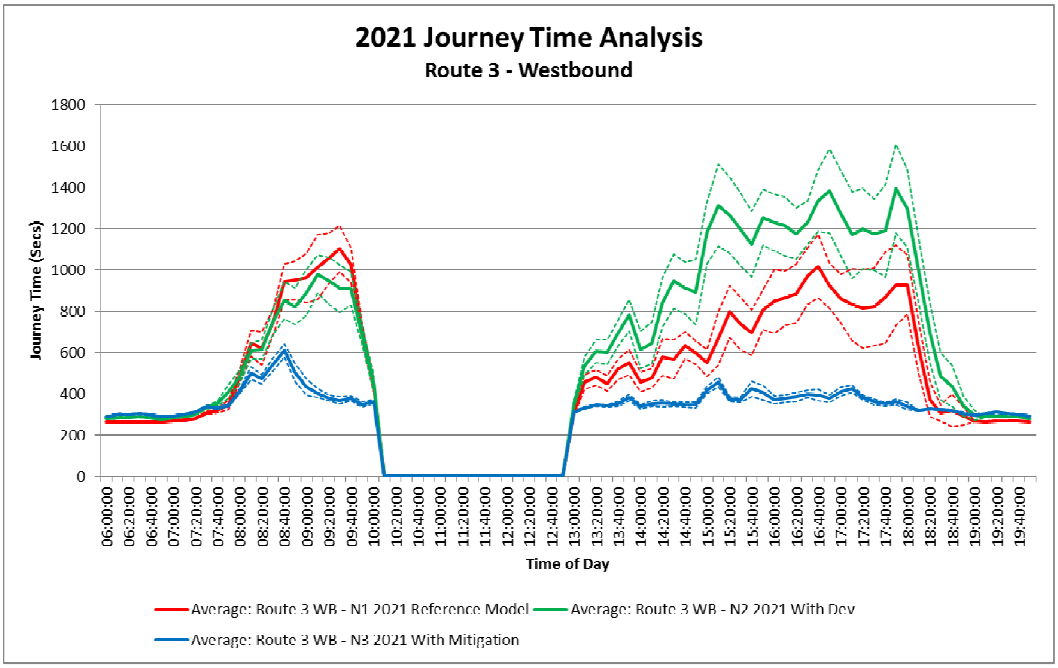


Plate 8.9: Journey Time Analysis Route 3 – Westbound



8.7.51 Comparing With Development scenario (i.e. including the highway improvements) against the 2021 Reference Case, on Journey Time Route 3 in the eastbound direction (away from the HPC development site) there are predicted to be improvements in the evening peak with a detriment during the morning peak. However in the morning peak the Reference Case eastbound journey times are

predicted to be significantly less than those in the westbound direction. In the westbound direction (towards the HPC development site) the With Development scenario (i.e. including the highway improvements) shows a significant improvement to the journey times in the morning and evening peak periods.

8.7.52 On the basis of the above the impact of the HPC Project on journey times in 2021 is considered to be **moderate beneficial**.

v. Accidents and Safety

8.7.53 The accident and safety analysis for 2021 is very similar to that for 2016. The significance of the safety impact is considered **negligible**.

8.8 Mitigation of Impacts

8.8.1 As stated earlier in this chapter, the main part of the transport mitigation comprises the transport strategy and the highway improvements. The assessment in Section 8.7 takes into account these mitigation measures.

8.8.2 In addition to the proposed highway improvements, EDF Energy proposes to contribute to potential safety enhancements and pedestrian and cycle improvements within Bridgwater that Somerset County Council is progressing as part of their ongoing programme of improvements.

8.8.3 There are no additional junctions within SCC's programme that are local to the proposed development and have not already been included in EDF Energy's proposed highway improvements package.

8.9 Residual Impacts

8.9.1 The residual impacts for the proposed development would be the same as the impacts described in Section 8.7.

8.10 Summary of Impacts

8.10.1 A summary of the impacts and residual impacts is provided in **Table 8.24, Table 8.25** and **Table 8.26**.

Table 8.24: Summary of Impacts 2016

Description of Impact	Impact	Mitigation Measure	Residual Impact
Severance	Minor Adverse	None proposed	Minor Adverse
Pedestrian Delay	Negligible	None proposed	Negligible
Pedestrian Amenity	Negligible	None proposed	Negligible
Driver Delay	Minor Beneficial	None proposed	Minor Beneficial
Accidents and Safety	Negligible	None proposed	Negligible

Table 8.25: Summary of Impacts 2013

Description of Impact	Impact	Mitigation Measure	Residual Impact
Severance	Minor Adverse	None proposed	Minor Adverse
Pedestrian Delay	Negligible	None proposed	Negligible
Pedestrian Amenity	Negligible	None proposed	Negligible
Driver Delay	Minor Adverse	None proposed	Minor Adverse
Accidents and Safety	Negligible	None proposed	Negligible

Table 8.26: Summary of Impacts 2021

Description of Impact	Impact	Mitigation Measure	Residual Impact
Severance	Negligible	None proposed	Negligible
Pedestrian Delay	Negligible	None proposed	Negligible
Pedestrian Amenity	Negligible	None proposed	Negligible
Driver Delay	Moderate Beneficial	None proposed	Moderate Beneficial
Accidents and Safety	Negligible	None proposed	Negligible

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CHAPTER 9: NOISE AND VIBRATION

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9. NOISE AND VIBRATION

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential noise and vibration impacts arising from the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

9.1.2 A glossary of terminology used in this chapter is provided in **Volume 1** of the ES. An introduction to the principles of noise and vibration is provided in **Appendix 9A**.

9.2 Scope and Objectives of Assessment

9.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees including Sedgemoor District Council (SDC), West Somerset Council (WSC), Somerset County Council (SCC), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

9.2.2 The assessment of noise and vibration impacts on sensitive receptors arising from the proposed development has been undertaken adopting the methodologies described in **Volume 1**, **Chapter 7** of the ES**,** and Section 9.4.

9.2.3 The existing baseline conditions, against which the likely environmental impacts of the development are assessed, have been determined through baseline noise monitoring and calculations of potential future noise levels, and are described in Section 9.5 of this chapter. This section also identifies the existing and future sensitive receptors to noise and vibration levels. The study area for this assessment, as illustrated in **Figure 9.1,** includes potentially sensitive receptors adjacent to the proposed development boundary and local approach roads.

9.2.4 Noise and vibration impacts are presented in Section 9.6 of this chapter, and appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance are identified in Section 9.7 of this chapter. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 9.8 of this chapter.

9.2.5 Cumulative noise and vibration impacts arising from the proposed development in combination with other elements of the Hinkley Point C (the HPC Project) and other relevant projects are provided in **Volume 11** of this ES. The potential in-combination effects of noise and vibration from different aspects of the operation of the proposed development has been considered in Section 9.6 of this chapter.

9.2.6 The objectives underlying the noise and vibration assessment were to:

- identify all potentially sensitive receptor locations that may be affected by the construction or operation of the proposed development, or proposed post-operational works;
- characterise the baseline acoustic climate at representative locations for identified noise sensitive receptors;
- assess noise and vibration impacts on sensitive receptors within the study area;
- recommend mitigation measures, if considered necessary, to prevent, reduce or off-set the noise and vibration impacts on noise sensitive receptors; and
- assess the residual noise and vibration impacts on sensitive receptors.

9.2.7 An assessment of the potential noise and vibration impacts associated with off-site road traffic generated during construction, operation and post-operation of the site is detailed in **Volume 2**, **Chapter 11** of the ES, as this considers all generated traffic associated with the HPC Project.

9.3 Legislation, Policy and Guidance

9.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential noise impacts associated with the construction, operation and post-operational phases of the proposed development.

9.3.2 As stated in **Volume 1**, **Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs.

9.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

9.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International

i. World Health Organization (WHO) 'Guidelines for Community Noise' (Ref. 9.1)

9.3.5 This document provides health-based guidance on suitable noise levels in the form of 'guideline values', intended to avoid or minimise community annoyance by noise. Guidance is provided on noise levels for both indoor and outdoor areas.

9.3.6 Table 4.1 of the WHO guidelines (Ref. 9.1) recommends environmental daytime and evening limits of 55dB L_{Aeq} or less over the 16 hour daytime period (07:00-23:00) 'to avoid minimal serious annoyance', and 50dB L_{Aeq} 'to avoid minimal moderate annoyance.'

9.3.7 However, it is important to understand that the WHO recommendations represent the onset of health impacts such as annoyance and sleep disturbance from noise exposure and that exposure in excess of these is not necessarily indicative of significant adverse impacts.

9.3.8 Rather than applying the WHO guideline values as noise level limits, it is established practice to use them to identify thresholds above which greater attention should be paid to the various possibilities for noise control action.

ii. World Health Organization 'Night Noise Guidelines for Europe' (WHO, 2009) (Ref. 9.2)

9.3.9 The 'Night Noise Guidelines for Europe' (Ref. 9.2) is again concerned with the potential health effects of environmental night noise, based on a review of available research by a working group of experts.

9.3.10 It recommends a target of 40dB $L_{night,outside}$ 'at a residential façade (incident noise level) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly'. The $L_{night,outside}$ indicator relates to the annual average night-time noise level and takes account of the varying need to open windows at night throughout the year. An interim target of 55dB $L_{night,outside}$ was also recommended for countries where the 40dB $L_{night,outside}$ guideline is not achievable.

9.3.11 The night noise guidelines assume a sound insulation of 21dB for an average building envelope, allowing for those that wish to sleep with windows slightly open, and acknowledge that if noise levels increase, people may close their windows.

9.3.12 The guidelines provided indicate, from available research, the levels above which an effect starts to occur or shows itself to be dependent on the exposure level. However, these observed effect thresholds do not establish the significance of effects, which may not become significant unless much higher degrees of noise exposure occur.

9.3.13 A 'National Noise Incidence Study' (Ref. 9.3) in 2000 identified through an ambient noise monitoring survey at 1160 locations that 95% of the properties in the UK exceeded the 40dB $L_{night,outside}$.

b) National

i. Noise Policy Statement for England (NPSE) 2010 (Ref. 9.4)

9.3.14 The Noise Policy Statement for England (NPSE) (Ref. 9.4), published in March 2010, sets out the long-term vision of Government noise policy. The noise policy aims, as presented within this document are:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

9.3.15 The NPSE draws on two established concepts from toxicology that are currently being applied to noise effects, for example, by the World Health Organization, namely NOEL – No Observed Effect Level and LOAEL – Lowest Observed Adverse Effect Level. The NPSE extends these concepts and introduces the concept of a Significant Observed Adverse Effect Level (SOAEL). This is the level above which significant adverse effects on health and quality of life are understood to occur.

9.3.16 The second aim of the NPSE refers to the situation where the effect lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8 of the NPSE). This does not mean that such adverse effects cannot occur.

9.3.17 The third aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

ii. Planning Policy Guidance 24: Planning and Noise (PPG24) (1994) (Ref. 9.5)

9.3.18 PPG24 (Ref. 9.5) was published by the Department of the Environment (now the Department for Communities and Local Government) in 1994. This guidance is intended to provide advice to planners on:

> *"…how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business … It outlines some of the main considerations which local planning authorities should take into account in drawing up development plan policies and when determining planning applications for development..."*

9.3.19 For new developments that will introduce noise into an area, PPG24 confirms (in Annex 3) that it is appropriate to use previously established assessment methodologies and refers to the relevant assessments and control methods. Further guidance on assessing noise is given in relation to 'Noise from road traffic' (Annex 3, paragraph 1), 'Noise from industrial and commercial developments' (Annex 3, paragraphs 19-20), and 'Noise from construction sites' (Annex 3, paragraph 21). The appropriate assessment methodologies are discussed in Section 9.4 of this chapter.

c) Regional

9.3.20 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High

Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001-2016 (RPG10) (2001) (Ref. 9.6)

9.3.21 RPG 10 (Ref. 9.6) sets out the broad development strategy for the period to 2016 and beyond. With specific reference to noise, RPG10 calls for Local Authorities and others to improve the local environment by reducing incidents of noise pollution (paragraph 4.23) and reducing the impact of transport on the environment (which in turn can increase the occurrence of noise) (paragraph 8.5). There are no specific policies for assessing noise for new developments.

ii. Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes for Public Consultation (July 2008) (Ref. 9.7)

9.3.22 There are no specific policies relating to noise within the draft RSS.

iii. Somerset & Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 9.8)

9.3.23 **Chapter 7** deals with transport and identifies noise as an occurrence of greater mobility (paragraph 7.1). There are no specific policies relating to noise within the Structure Plan.

d) Local

i. Sedgemoor District Local Plan 1991-2011(2004) (Policies 'saved' from 27 September 2007) (Ref. 9.9)

9.3.24 The Sedgemoor District Local Plan (Ref. 9.9) forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in September 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific noise designations. The site is within the defined Development Boundary.

9.3.25 The following saved policy is considered to be potentially relevant.

9.3.26 Policy PCS15 (Noise Pollution) states:

"Noise generating development will not be permitted if it would:

(a) be liable to unacceptably increase the level or disruptive character of noise experienced in any area to the detriment of its character; or

(b) be liable to unacceptably increase the noise experienced by the users of existing or proposed noise sensitive development to the detriment of those users.

Noise sensitive development will not be permitted if its users will be unacceptably affected by noise generating uses."

ii. Sedgemoor District Council Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 9.10)

9.3.27 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

9.3.28 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the Core Strategy.

9.3.29 The following Core Strategy (Proposed Submission) policies are of potential relevance.

9.3.30 Policy D4 (Renewable and Low Carbon Energy Generation) that the Council will support such proposals provided that such installations would not have significant adverse impact taking into account, amongst other things, any unreasonable adverse impact on users and residents of the local area including the generation of noise.

9.3.31 Policy D9 (Sustainable Transport and Movement) states that proposals should contribute to reducing adverse environmental issues, including noise pollution and vibration.

9.3.32 Policy D10 (Managing the Transport Impacts of Development) states that development proposals that will have a significant transport impact should be supported by an appropriate Noise and Vibration Assessment.

9.3.33 Policy D16 (Pollution Impacts of Development and Protecting Residential Amenity) states:

"Development proposals that are likely to result in levels of air, noise, light or water pollution (including groundwater), vibration or soil contamination that would be harmful to other land uses, human health, tranquility or the built and natural environment will not be supported.

Where there are reasonable grounds to suggest that a development proposal may result in a significant adverse environmental impact, the Council will require planning applications to be supported by assessments relating to [amongst other things]:

- *noise pollution and/or vibration....*

Where it is demonstrated that it is possible to manage the potential adverse impacts of the development proposals through its design or mitigation

measures, the Council will, by means of condition or legal agreement, seek to ensure such measures are effective, for example improving limitations on matters including hours of operation, emissions of fumes, noise and light, parking and servicing for both construction and operational stages.

Development proposals that would result in the loss of land of recreational and/or amenity value or unacceptably impact upon the residential amenity of occupants of nearby dwellings and any potential future occupants will not be supported. Particular consideration will be given to the extent that the proposal could result in unacceptable noise and disturbance, overshadowing, overlooking and/or visual dominance."

e) Supplementary Planning Guidance

9.3.34 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town. The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It states that it will be essential to evaluate the environmental impact of the Hinkley Point proposals both pre and post construction which may include noise (page 44).

9.3.35 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD.

9.3.36 Box 10 in the draft HPC SPD sets out principles for worker accommodation. It states that an over-arching Worker Accommodation Strategy and individual proposals for worker accommodation should include details of how they respond to, amongst other things, minimising local impacts including noise disturbance (page 25).

9.3.37 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1**, **Chapter 4**) and the Introduction chapter (**Chapter 1**) of this volume for this site.

9.4 Methodology

9.4.1 The assessment and all supporting surveys have been conducted in accordance with relevant best practice guidance and standard methodologies.

9.4.2 Generic international guidance is provided by the WHO (Ref. 9.1 and Ref. 9.2). Methodologies specific to the construction, operational and post-operational noise and vibration assessment are described below.

9.4.3 The construction and post-operational noise and vibration assessments determine the potential impacts using criteria contained in specific guidance documents. The operational noise assessments consider the potential change in noise and vibration levels due to the proposed development to determine the potential impacts.

a) Study Area

9.4.4 The purpose of the assessment is to determine the potential worst-case impacts. Therefore, it is reasonable to assume that the nearest (unscreened) receptor locations to the proposed development are those which are likely to experience the greatest noise and vibration impacts.

9.4.5 During the baseline assessment, ambient noise measurements were undertaken at locations that represent groups of residential receptors in Bridgwater. The nearest residential receptors to the proposed development are located on Fairfax Road and the A39 (Bath Road).

9.4.6 The study area is illustrated in **Figure 9.1**.

b) Baseline Assessment

i. Noise Sensitive Receptors

9.4.7 A noise sensitive receptor is identified as a location where significant changes in environmental noise levels have the potential to cause either adverse or beneficial impacts. Recognised impacts typically include:

- influence to the amenity of an area;
- potential disturbance to sleep, comfortable conversation or entertainment;
- degradation of an educational environment; and
- interruption of a religious ceremony.

9.4.8 Commercial premises at which particularly sensitive activities occur might also be included, but EDF Energy is not aware of any such locations in the area that might be affected.

9.4.9 Noise sensitive receptors in the study area have been selected principally according to the likelihood of the impacts occurring, and also to represent a group of locations, on a 'worst-case' basis, where similar impacts may occur.

ii. Baseline Noise Survey

9.4.10 A baseline noise survey was undertaken between 8 and 9 December 2009 at locations C/1 and C/2 (see **Figure 9.1**). Short-term attended measurements were taken during the late morning and peak afternoon periods on 8 December and during the early morning and inter-peak period of 9 December 2009. Continuous unattended monitoring was undertaken between 19 and 21 January 2011 at locations C/3 and C/4.

9.4.11 A description of each baseline noise measurement survey location is provided below:

- **Location C/1** - Approximately 10m south-west of the southern façade of No.100c Bath Road. This property was considered to be representative of the series of residential properties on the A39 (Bath Road) to the north of the site, with the selected property being closest to the proposed development boundary.
- **Location C/2** - Approximately 15m west of the western façade of No.74 Fairfax Road. This property was considered to be representative of the rear (western)

façades of a series of residential properties on Fairfax Road, with the selected property (No.74) being the closest to the proposed development boundary.

- **Location C/3** – Approximately 15m south-west of the façade of residential properties on the A39 (Bath Road), at the junction with College Way. This location is approximately 125m north of the proposed development boundary.

- **Location C/4** – Approximately 9m west of the rear façade of No. 70 Fairfax Road facing College Way. This location is approximately 45m east of the proposed development boundary.

9.4.12 The baseline noise survey was undertaken to establish the existing acoustic climate at nearby residential receptor locations. Full details are provided in **Appendix 9B** along with a complete set of monitoring data.

9.4.13 The parameters recorded for each measurement included:

- L_{Aeq} the equivalent continuous level, providing an average of all noise events and used for planning assessment in PPG24;
- L_{A90} the level exceeded for 90% of the time, defined as background level;
- L_{A10} the level exceeded for 10% of the time, used to assess road traffic noise;
- L_{Amax} the maximum instantaneous sound pressure level recorded during the measurement; and
- L_{Amin} the minimum instantaneous sound pressure level recorded during the measurement.

9.4.14 Baseline noise measurements were undertaken at a height of between 1.2m and 1.5m above ground level, in free-field conditions in accordance with BS 7445: 2003 'Acoustics – description and measurement of environmental noise' – Part 1 'Guide to quantities and procedures' (Ref. 9.11).

9.4.15 Significant rainfall prior to the survey meant that the ground was damp at all locations around Bridgwater. During the survey, conditions were mainly overcast, although sunny patches were present during the afternoon monitoring periods. Precipitation was limited to infrequent, light drizzle and little wind (<2m/s) was recorded. The ambient daytime temperature averaged 12°C, although for the monitoring periods before 09:00 the average was 6°C. Between the 19 and 21 January 2011, meteorological conditions were dry, with no wind. Day-time temperatures averaged 4°C with night-time temperatures averaging -2°C.

9.4.16 It was judged that the meteorological conditions did not significantly influence the survey results in accordance with BS 4142: 1997 'Method for rating industrial noise affecting mixed residential and industrial areas' (Ref. 9.12).

9.4.17 All staff involved with noise measurements were either Members of the Institute of Acoustics (IoA) or held the IoA Certificate of Competence in Environmental Noise Measurement.

9.4.18 The measurements were carried out using a Rion NL31 Class I integrating sound level meter which was field-calibrated before and after each set of measurements. No variation of the calibration signal was observed.

9.4.19 Measurements of existing vibration levels at receptor locations have not been undertaken. Annoyance due to vibration is not related to a comparison of pre- and post-development vibration levels. Pre-development vibration level measurements are not, therefore, usually necessary to assess the likelihood of vibration damage or annoyance from any new vibration sources.

c) Consultation

9.4.20 In undertaking this assessment, meetings have been held with the appropriate Environmental Health Officer (EHO) of SDC.

9.4.21 A scoping consultation meeting was held with SDC on 1 October 2009. Possible sites were identified and potential sources of noise and vibration were discussed. The meeting achieved agreement regarding the requirement to determine baseline noise levels during all periods of proposed operation, including early morning and late evening development peak periods. SDC also advised that impacts of operational plant noise (and other operational noise) should be assessed in accordance with BS 4142:1997 (Ref. 9.12), with a target criterion of 5dB above the prevailing background not to be exceeded.

d) Assessment Methodology

i. Value and Sensitivity

9.4.22 For each assessment undertaken, overall sensitivity relates to human receptors living in proximity to the site or affected highways.

9.4.23 Both Bridgwater and Albion Rugby Football Club and Bridgwater Town Football Club are potential sensitive receptors with respect to recreation and amenity assets. With regard to the Bridgwater and Albion Rugby Football Club, match fixtures at this club would generally take place outside the hours during which construction of the development is proposed; and therefore the club is not considered to be sensitive to construction noise. The pitches associated with Bridgwater Town Football Club, when in use during weekday working hours, are considered as being of low sensitivity to construction and operational noise.

9.4.24 Private residential properties are categorised as ‘Medium’ sensitivity, with ‘High’ sensitivity reserved for locations where very good communication and resting conditions are essential (for example schools, hospitals, care homes for the elderly or people with learning disabilities). This is based upon guidance provided by the WHO (Ref. 9.1).

9.4.25 Teaching facilities at Bridgwater College, approximately 110m to the south of the site, are therefore categorised as ‘High’ sensitivity for the purpose of this assessment. However, this level of sensitivity will apply to when the College is open only.

ii. Magnitude

9.4.26 The magnitude of impact has been assessed on the scale of consequences that the proposed development would have, based upon the predicted noise and vibration levels. It has been categorised as high, medium, low and very low.

9.4.27 The magnitude criteria used in this assessment is detailed in the later sections of this chapter, for each phase of the proposed development.

iii. Construction-Related Noise

9.4.28 Construction site noise is assessed differently from noise associated with permanent installations, as it is recognised that the former are an inevitable by-product of required works and their impacts are defined as temporary. Construction works are controlled by guidelines and are subject to local authority control. Advice is contained within British Standard BS 5228: 2009 'Code of Practice for Noise and vibration control on construction and open sites' – Part 1 'Noise' (Ref. 9.13). This document contains a database of the noise emissions from individual items of equipment and activities to predict the noise from demolition and construction methods to identified receptors. Guidance is given on the impacts of different types of ground and barrier attenuation and on how to assess the impact of fixed and mobile plant. Predictions of noise propagation in accordance with BS 5228-1 were undertaken and are included in **Table 9C.2** and **9C.3** in **Appendix 9C**.

9.4.29 Whilst not mandatory, Annex E of BS 5228-1 (Ref. 9.13) provides advice to assist the development of noise assessment criteria based on previous published guidance and methodologies adopted successfully from other planning applications.

9.4.30 Therefore, in assessing the requirement for noise limits, or operating period controls relating to construction works, government agencies and local authorities generally give consideration to the following aspects of the planned works, all of which have a bearing on the 'significance' of the impact:

- duration of planned activities (weeks, months, years);
- whether activities are planned for the night-time period;
- proximity of the proposed development to residential areas; and
- predicted source-term noise levels and noise impacts at residential areas.

9.4.31 The proposed noise magnitude criteria for construction works are presented in **Table 9.1**. The limits are taken from guidance in BS 5228-1 (Ref.9.13).

9.4.32 It is proposed that the core working hours for the construction phase would be 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays, with no working on Sundays or public holidays (see **Chapter 3** of this volume). For the purposes of this assessment, it has been assumed that the construction activities specified in **Appendix 9C** would only take place during these core working hours.

Table 9.1: Guidelines for the Assessment of Magnitude for Construction Noise

Magnitude	Guideline
High	Generation of daytime facade noise levels (predicted construction noise plus measured ambient noise) in excess of 75dB(A) $L_{eq,12hr.}$
Medium	Generation of daytime facade noise levels (predicted construction noise plus measured ambient noise) that are in the range of 65 to 75dB(A) $L_{eq,12hr.}$
Low	Generation of daytime facade noise levels (predicted construction noise plus measured ambient noise) that are in the range of 55 to 65dB(A) $L_{eq,12hr.}$
Very Low	Generation of daytime facade noise levels (predicted construction noise plus measured ambient noise) that are below 55dB(A) $L_{eq,12hr.}$

iv. Construction-Related Vibration

9.4.33 Guidance on the assessment of the potential vibration impacts associated with construction activities is provided within BS 5228: 2009 'Code of practice for the control of noise and vibration on construction and open sites' – Part 2 'Vibration' (Ref. 9.14). This document refers to the measurement and assessment guidance provided in BS 6472 'Guide to evaluation of human exposure to vibration in buildings' – Part 1: 2008 'Vibration sources other than blasting' (Ref. 9.15) and BS ISO 4866 'Mechanical vibration and shock – vibration of fixed structures – guidelines for measurement of vibrations and evaluation of their effects on structures (Ref. 9.16) (supersedes BS 7385-1: 1990), and Part 2: 1993 'Guide to damage levels from ground-borne vibration' (Ref. 9.17).

9.4.34 For the type of development proposed, plant such as compressors, pumps, generators and heavy goods vehicles (HGVs) are likely to be the most significant sources of low frequency noise with the potential to cause resonance in nearby buildings, which is often perceived as vibration by occupants.

9.4.35 Construction works may cause sudden but intermittent vibration. In such events, it is necessary to be able to quickly compare levels against criteria to give an immediate evaluation of the likelihood of a problem without resource to complex post-processing of results. Under these conditions, assessment criteria based on Peak Particle Velocities (PPV) are most appropriate.

9.4.36 Based on **Table B.1** of BS 5228-2 (Ref. 9.14), the proposed PPV significance criteria for typical construction in activities, measured at a sensitive receptor location, are presented in **Table 9.2**.

Table 9.2: Construction Vibration Magnitude Assessment Criteria

Magnitude	Vibration Level (mm/s PPV)	Impact
High	10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.
Medium	1.0	It is likely that vibration of this level in residential environment will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
Low	0.3	Vibration might be just perceptible in residential environments.
Very Low	0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.

v. Operational Noise – On-site Activities

9.4.37 The methodology for the assessment of operational noise impacts associated with activities undertaken within the boundary of the site is described below.

9.4.38 BS 4142: 1997 (Ref. 9.12) provides a method of assessing the likelihood of complaint from a noise source by comparing the rating level of that source with the background noise level L_{A90}. The assessment must be undertaken at noise-sensitive receptors

affected by noise from existing or proposed fixed industrial operations, including factories and commercial/industrial units.

9.4.39 The 'specific' noise (dB L_{Aeq}) from the site or industrial operation under assessment is compared to the background noise (dB L_{A90}) at the receptor in the absence of the specific noise. The specific noise is additionally assessed for the presence of distinguishing or unusual noise characteristics (e.g. contains distinguishable tones or impulses), for which a +5dB 'penalty' is added to the specific noise to derive the 'rating' (dB $L_{Ar, Tr}$) level.

9.4.40 In Section 9 of BS 4142: 1997 (Ref. 9.12), it is stated that a rating level of around 10dB above the existing background noise level indicates that complaints are likely, whilst a rating level of around of 5dB above the existing background noise level is of 'marginal significance'. This has been interpreted since the introduction of the Standard in 1967, to mean that a 5dB excess due to new, fixed plant noise sources is, in general, acceptable. For this reason the EHO of SDC recommended this assessment criterion in this study (see Section 9.4 of this chapter).

9.4.41 Based on this recommendation, the proposed significance criteria for mechanical plant associated with the site, once fully operational, are presented in **Table 9.3**. In the absence of specific guidance, these criteria are proposed for assessing the potential impact of all other noise sources associated with the site once operational, where appropriate (including proposed recreational activities).

Table 9.3: Operational Plant Noise Magnitude Assessment Criteria

Magnitude	Guideline
High	Rating noise level from operating mechanical plant more than 10dB above the existing $L_{A90, T}$ background noise level.
Medium	Rating noise level from operating mechanical plant between 5dB and 10dB above the existing $L_{A90, T}$ background noise level.
Low	Rating noise level from operating mechanical plant between 0.1dB and 5dB above the existing $L_{A90, T}$ background noise level.
Very Low	Rating noise level from operating mechanical plant below the existing $L_{A90, T}$ background noise level.

vi. Significance of Impacts

9.4.42 Within this chapter, the generic descriptions used to define the level of impact significance and the likelihood of occurrence are the same as those given in **Volume 1, Chapter 7** (**Table 7.4**), where an Impact Assessment Matrix (IAM) is presented which compares the magnitude of an impact with the sensitivity of the receptor to determine level of impact significance.

9.4.43 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

vii.Cumulative Impacts

9.4.44 The assessments of cumulative noise and vibration impacts from other developments associated with the HPC Project have been assessed in **Volume 11**. The assessments have also considered the potential cumulative impact on noise and

vibration from other consented and proposed developments in the area. The potential in-combination impacts of noise and vibration from different aspects of the operation of the proposed development have been assessed in Section 9.6 of this chapter.

e) Limitations, Constraints and Assumptions

9.4.45 Baseline noise surveys were undertaken at a limited number of monitoring locations identified as being representative of groups of sensitive receptors, e.g. residential dwellings in a certain area.

9.4.46 Assumptions have been made about the type of equipment and machinery to be used during the construction works based upon likely methods to be adopted and previous development project experience, but contractors may adopt different working methods to reach the same goals. The assessment presented herein has therefore adopted a worst-case scenario wherever possible.

9.4.47 The use and number of fixed mechanical service plant associated with the proposed buildings were informed by emerging design briefs. Individual plant model and type were assumed, with typical sound power output data obtained from manufacturer publications.

9.4.48 A level of 43dB L_{Aeq} at 45m from the edge of the pitch was assumed for use of the 5-a-side football pitch, based upon previous measurements, with use of this facility restricted to no access allowed between 22:00 and 08:00.

9.5 Baseline Environmental Characteristics

a) Introduction

9.5.1 This section presents the baseline environmental characteristics for the site and surrounding area with specific reference to noise and vibration.

b) Baseline Noise Survey

9.5.2 The main daytime noise sources at the measurement locations (see **Figure 9.1**) were as follows:

- **Location C/1** - The most significant noise sources at this location included road traffic on the A39 (Bath Road) and occasional traffic on College Way. Trains could also be heard passing by. During the late morning monitoring period, noise from road works approximately 50m from the microphone significantly contributed to the measured levels. These works included: the use of a pneumatic drill; regular loud banging; and increase in road traffic noise due to temporary traffic lights.
- **Location C/2** - The most significant noise source during the day was vehicles and pedestrians accessing the site. Additional noise sources identified during the survey included: a distant road traffic hum from the M5 motorway; and birdsong in nearby vegetation. During the early measurement period, the hum from traffic on the M5 motorway dominated the local noise climate.
- **Location C/3** – The most significant noise sources at this location included road traffic on the A39 (Bath Road) and occasional traffic on College Way. Trains

could also be heard passing by and people movements associated with Bridgwater College.

- **Location C/4** – The dominant noise source at this location was vehicles and people on College Way associated with Bridgwater College. Trains passing by were also audible from this location.

9.5.3 The results of the baseline monitoring surveys at C/1, C/2, C/3 and C/4 are presented in **Table 9.4**. In addition, the variation in ambient noise levels at locations C/3 and C/4 are shown in **Appendix 9B**, as these were the only locations where continuous monitoring was undertaken.

Table 9.4: Baseline Noise Survey Results: C/1 - C/4

Location	Monitoring Period (start date)	Start Time	Measurement Duration (T) (hh:mm)	Sound Pressure Level, dB (fast time weighting)			
				$L_{Aeq, T}$	$L_{A90, T}$	$L_{A10, T}$	$L_{Amax, T}$
C/1	09 December 2009	06:27	00:15	58.8	51.9	61.9	73.8
	09 December 2009	11:43	00:30	60.4	54.6	62.6	88.2
	09 December 2009	12:15	00:30	59.8	53.1	61.9	86.0
	08 December 2009	18:04	00:30	60.0	57.1	62.8	77.0
C/2	09 December 2009	06:47	00:15	51.4	49.5	52.8	59.8
	08 December 2009	11:46	00:30	55.5	50.6	57.5	86.4
	09 December 2009	12:50	00:30	54.8	45.2	57.7	76.5
	08 December 2009	17:26	00:30	54.3	49.9	56.7	81.0
C/3	19 January 2011	15:05	08:00	63.8	56.9#	64.1#	96.9
	19 January 2011	23:05	08:00	55.9	45.8#	56.9#	77.3
	20 January 2011	07:05	16:00	63.0	57.5#	64.5#	98.5
	20 January 2011	23:05	08:00	55.8	43.8#	56.5#	79.0
	21 January 2011	07:05	03:00	63.8	57.1#	64.7#	96.9
C/4	19 January 2011	15:53	07:15	54.9	50.1#	55.6#	74.3
	19 January 2011	23:08	08:00	47.3	41.5#	46.7#	68.4
	20 January 2011	07:08	16:00	56.2	50.3#	57.3#	76.1
	20 January 2011	23:08	08:00	45.8	40.3#	45.9#	66.7
	21 January 2011	07:08	03:00	56.0	50.5#	57.5#	74.8

Notes: # Average 15 minute values

9.5.4 The results of the baseline noise survey are considered typical of noise levels in an urban setting.

9.5.5 For the purpose of the construction noise assessment, in accordance with BS 5228-1 (Ref. 9.13), a typical existing ambient noise level has been derived from measured data. This was derived from the logarithmic mean of the measured $L_{Aeq, 15min}$ values during working day periods (07:00 – 19:00 Monday to Friday and 07:00 – 13:00 on Saturday). The typical daytime ambient level at No. 100c Bath Road and No. 70 Fairfax Road were determined to be 63.7dB and 56.6dB $L_{Aeq, day}$ respectively.

9.5.6 For the purpose of the operational noise impact assessment, in accordance with BS 4142 (Ref. 9.12), the 'representative' background noise level at night was defined by the arithmetic mean of measured $L_{A90,\ 15min}$ values between 02:00 and 04:00. This approach was agreed through consultation with SDC. This level was determined to be 45.8dB and 43.1dB $L_{A90,\ T}$ at No. 100c. Bath Road and No. 70 Fairfax Road respectively.

9.6 Assessment of Impacts

a) Introduction

9.6.1 For the proposed development, the impact assessment with respect to noise and vibration on the existing environment covers the following issues:

- potential increase in noise during the construction works;
- potential vibration generated by the construction works;
- potential increase in noise due to operation of the proposed development and use of its associated amenities; and
- potential increases in noise during the post-operation phase.

9.6.2 Due to the typically low vibration levels that are likely to be generated (primarily by on-site vehicle movements), it is expected that operational and post-operational activities would not result in perceptible vibration impacts on any of the sensitive receptors. Therefore, no further assessment of this operational vibration was undertaken. This was agreed in consultation meetings held with the EHO at SDC.

b) Best Practice

9.6.3 Best practice measures would be undertaken and are considered to form part of the proposed development. They would be based on the principles set out in the **Environmental Management and Monitoring Plan** (**EMMP)** with further information provided within the **Noise and Vibration Management Plan**. As measures forming part of the proposed development have been taken into account in the assessment of impacts. Measures will include the following.

i. Construction and Post-Operational Noise

9.6.4 The standard of good practice outlined in BS 5228-1 (Ref. 9.13) would be followed. This includes:

- continuous noisy plant to be housed in acoustic enclosures (where practicable);
- use of electrical items of plant instead of diesel plant in especially sensitive locations (where practicable);
- exhaust silencing and plant muffling equipment to be maintained in good working order;
- avoid unnecessary revving of engines and switch off equipment;
- minimise drop heights of materials; and
- start up plant sequentially rather than all together (where practicable).

9.6.5 In addition, a formal system would be put in place during the works which identifies the roles and responsibilities of site staff regarding a noise and vibration complaint action procedure. Site logs would be maintained; detailing all complaints received relating to noise and/or vibration disturbance impacts and the corresponding action taken including the response made to each complainant.

9.6.6 In general, good public relations and extensive consultation with local authorities is necessary to minimise the impact of construction work. Liaison would be undertaken with the local community ensuring they have advance notice of the schedule of works.

ii. Construction Vibration

9.6.7 BS5228:Part 2 (Ref. 9.14) gives detailed advice on standard good construction practice for minimising impacts from construction vibration. It would be a requirement of contractors to follow this guidance.

9.6.8 Measures to reduce the predicted impact from piling activities on site would include, where appropriate:

- pre-boring of the upper strata; and
- informing residents in advance of piling operations.

iii. Operational Noise

9.6.9 Standard good practice in design and management of the operational site would also be employed to minimise the potential for noise disturbance. This includes:

- no unnecessary idling of vehicle engines (shuttle buses and coaches);
- training of site occupants to ensure noise is kept to a minimum, especially during the early and late sensitive periods associated with departure and arrivals associated with HPC shift patterns. This would include no loud radios, excessive slamming of doors, revving of engines or use of horns; and
- appropriate design and siting of fixed service plant associated with the amenity and residential buildings. Noise from such equipment is relatively easy to attenuate, more so at the design stage. For example, breakout noise from heating and ventilation plant contained within plant rooms can be silenced using acoustic ventilation louvres, fans contained within units with ducted intakes, exhausts silenced using in-duct attenuators, and noise from boiler flue fans silenced by atmospheric-side boiler flue attenuators.

c) Construction Impacts

9.6.10 The assessment of construction activities was undertaken with regard to potential noise and vibration impacts at C/3 and C/4. These locations are considered representative of location C/2 and C/1 respectively. In addition, Bridgwater College and Bridgwater Town Football Club (BTFC) have been included in the assessment.

9.6.11 The key activities during the construction phase of the proposed development that may cause noise and vibration impacts are:

- earthworks and site preparation;
- building construction including piling; and
- construction of site roads and parking facilities.

i. Construction-Related Noise

9.6.12 In order to evaluate the noise generation during the construction phase of the proposed development, it was necessary to define the various activities that would be undertaken. Different construction contractors may use different methods of working and plant. However, it is possible to undertake a generic construction assessment of noise and vibration based on expected methods of working gained from experience of similar development.

9.6.13 For each activity of the construction works, a representative complement of assumed plant, associated sound power level (L_w) and prediction routines (to the requirements of BS 5228-1 (Ref. 9.13) are included in **Appendix 9C**.

9.6.14 The BS 5228-1 (Ref. 9.13) prediction method uses the shortest distance from the receptor to the construction activities. The nearest boundary of respective working areas was used as the calculation point for equipment/plant classed as 'mobile' (including loaders and excavators) and from equipment/plant classed as 'fixed' (including generators).

9.6.15 Predicted noise levels, detailed in **Appendix 9C** and summarised in **Table 9.5**, are therefore conservative and in practice the actual noise levels may not attain those predicted.

9.6.16 Prediction of construction activity noise levels at each receptor took into account features that may affect propagation, such as ground absorption and screening by natural and/or formed topography. Other factors, such as the length of the working traverse and the machinery 'on-time', were also included within the calculations.

Table 9.5: Summary of Worst-case Predicted Construction Noise Levels at the Nearest Noise Sensitive Receptor Locations to the Construction Works, Based on BS 5228-1 Calculation (excluding ambient noise)

Receptor	Predicted Worst-case Noise Levels, closest approach dB $L_{Aeq, 12h}$		
	Earthworks and Site Preparation	Building Construction	Construction of Site Roads and Parking Facilities
Dwellings on Bath Road/College Way	57	61	58
No. 70 Fairfax Road	59	62	65
Bridgwater College	50	53	52
Bridgwater Town Football Club playing pitches	54	54	57

9.6.17 The predicted construction noise levels in **Table 9.5** do not include existing ambient noise levels at the sensitive receptor locations and are not, therefore comparable with the proposed noise magnitude criteria presented in **Table 9.1**. **Table 9.6** shows

the impact of adding measured ambient noise level to these values and, therefore, provides an indication of potential impacts.

Table 9.6: Summary of Worst-case Predicted Construction Noise Levels at the Nearest Noise Sensitive Receptor Locations to the Construction Works, Based on BS 5228-1 Calculation

Receptor	Predicted Worst-case Noise Levels[1], closest approach dB $L_{Aeq, 12h}$		
	Earthworks and Site Preparation	Building Construction	Construction of Site Roads and Parking Facilities
Dwellings on Bath Road/College Way	60	62	62
No. 70 Fairfax Road	65	66	66
Bridgwater College	58	59	59
Bridgwater Town Football Club playing pitches	59	59	60

Note: [1] Predicted noise levels include relevant measured ambient noise levels:
Dwellings Bath Road/College Way = 64 dB $L_{Aeq, day}$
No. 70 Fairfax Road = 57dB $L_{Aeq, day}$
Bridgwater College and BTFC = 57 dB $L_{Aeq, day}$

9.6.18 **Table 9.6** and the detailed calculations in **Appendix 9C** show that the highest predicted noise levels during the construction phase fall within the low to medium magnitude criteria, for dwellings on Fairfax Road and Bath Road which are receptors of medium value and sensitivity. Therefore, as a result of the conservative assessment, with all plant working at the closest approach, the impacts of these works are predicted to be of **minor** to **moderate adverse** significance.

9.6.19 Noise levels during construction have been predicted at Bridgwater College, which is considered to be a receptor of high value and sensitivity. Noise levels for the College fall within the low magnitude criterion. Therefore, as a result of the conservative assessment, with all plant working at the closest approach, the impacts of these works are predicted to be of **moderate adverse** significance. The duration of the construction works is expected to be 12 months.

9.6.20 During use of the Bridgwater Town Football Club (BTFC) pitches to the south-west of the site, the predicted construction noise magnitude is predicted to be low (see **Table** 9.5). This magnitude of impact on a receptor of low sensitivity to environmental noise gives rise to a construction noise impact of **minor adverse** significance. Scheduled BTFC matches occur during weekend afternoon or weekday evening periods, outside the proposed construction working hours for the proposed development. Therefore, unless the pitch is being used for other events or training purposes there is likely to be no impact during construction working hours.

9.6.21 The nature of the construction phase means that the conservative situation predicted may exist for only a matter of days, or even hours. There would be regular periods, even during the course of a single day, when the assumed plant would not be in operation, for example during breaks or changes of working routine.

ii. Construction-Related Vibration

9.6.22 Surface plant such as cranes, compressors and generators are not recognised sources of high levels of environmental vibration. Reference to Figure 1 of British Steel document 'Control of Vibration and Noise during Piling' (Ref. 9.18) confirms that, even at a closest distance of 10m, PPV levels significantly less than 5mm/s are generated by such plant. For example, a bulldozer may generate a PPV of approximately 0.6mm/s and a 'heavy lorry on a poor road surface' a PPV of less than 0.1mm/s at 10m. These values are well below limits at which even cosmetic building damage becomes likely (15mm/s (BS 5228-2)) (Ref. 9.14).

9.6.23 Typical construction and demolition working routines are unlikely to generate levels of vibration at local receptors above which cosmetic damage would be expected to be sustained.

9.6.24 It is anticipated that, due to the nature of the ground conditions, piling would be required for the foundations of the accommodation buildings. It is proposed to use pre-cast 250mm by 300mm square section piles. BS 5228-2 (Ref. 9.14) states that vibration level generated from driven piles are intermittent.

9.6.25 Due to the distance to the nearest sensitive receptor (63m) and the very low level of intermittent vibration likely to be caused, the magnitude of any impact is assessed as very low (refer to **Table 9.2**), for receptors of medium value and sensitivity. Hence the significance of the impact is predicted to be **minor adverse**.

d) Operational Impacts

9.6.26 The assessment of operational activities was undertaken with regard to potential noise and vibration impacts at C/3 and C/4. These locations are considered representative of location C/2 and C/1 respectively. An assessment has not been undertaken for Bridgwater College and Bridgwater Town Football Club as, during the potentially sensitive hours of impact (late evening and early morning), these receptors would not be in use.

9.6.27 The key activities during operation of the proposed development that may cause noise and/or vibration impacts are:

- vehicle movements on the site; and
- residential use of the site.

i. Operational Noise - On-site Activities

9.6.28 The proposed development would provide accommodation and some amenities (i.e. a 5-a-side, all weather pitch). The occupants of the proposed development would use the communal amenities at the proposed Bridgwater A accommodation campus.

9.6.29 The accommodation buildings would require mechanical and electrical (M&E) equipment (for example, mechanical ventilation and heat recovery (MVHR) units). Whilst these are small units, their operation would have the potential to impact upon nearby residential dwellings. The assessment has assumed that each accommodation block has a MVHR unit mounted on the roof which operates continuously, generating a steady noise level therefore no penalty value has been added.

9.6.30 In Section 9.5, the 'representative' background noise levels at night was determined to be 41dB $L_{A90,15min}$ at 100c Bath Road and 38dB $L_{A90,15min}$ at 70 Fairfax Road. Based on this level, a specific noise limit of 43dB $L_{Aeq,T}$ for the sum of all the proposed M&E plant is therefore proposed.

9.6.31 The assessment of potential noise impacts from the use of the 5-a-side pitch has been assessed using a value of 43dB L_{Aeq} at 45m from the edge of the pitch. Due to the nature of noise generated from outdoor sports facilities, which fluctuates over the period for which it is in use, a 5dB penalty value has been added in accordance with BS 4142. The use of these facilities would be restricted with no access allowed between 22:00 and 08:00.

Table 9.7: Summary of Worst-case Predicted On-Site Operational Noise Levels at the Nearest Boise Sensituie Receptor Locations, Based on BS 4142

Receptor	Ref.	'Representative' Background Noise Level dB $L_{A90,15min}$		Predicted Specified Noise Level, dB $L_{Aeq,T}$	
		Day-time	Night-time	M&E plant	Sports Pitch[1]
Dwellings on Bath Road/College Way	C/3	52	41	34	30
No. 70 Fairfax Road	C/4	57	38	40	33

Note: [1] Predicted noise levels include 5dB penalty value in accordance with BS4142

9.6.32 Using the BS 4142 (Ref. 9.12) methodology, the total noise emission from all of the installed M&E plant is predicted to be below the existing background noise levels at the nearest noise sensitive receptors.

9.6.33 **Table 9.7** shows that the magnitude of M&E plant noise associated with the accommodation buildings is assessed as very low, on receptors of medium value and sensitivity using the criteria presented in **Table 9.3**. Therefore, the noise impact of M&E plant associated with the accommodation buildings is predicted to be of **minor adverse** significance.

9.6.34 **Table 9.7** shows that the magnitude of the sports pitch is assessed as very low, on receptors of medium value and sensitivity using the criteria presented in **Table 9.3**. Therefore, the noise impact of sports pitch is predicted to be of **minor adverse** significance.

ii. Operational In-Combination Effects

9.6.35 The assessments of operational noise impacts have considered the worst-case scenarios with respect to when they are likely to occur. Therefore, noise from fixed mechanical and electrical plant on-site are likely to be most significant during quieter night-time periods, whilst normal operation of the associated sports facilities would only occur during daytime and evening hours.

9.6.36 Similarly, noise from on-site vehicle movements (including park and ride buses) on the site roads would be most significant during the quieter night-time periods. However, noise from these sources would be of no greater magnitude or significance than the movement of these vehicles and others on the public highway (A39 (Bath Road)), which is closer to the assessed sensitive receptors.

9.6.37 The combined rating noise level from operating mechanical and electrical plant and the sport facilities is predicted to be 41dB $L_{Ar,\ Tr}$ at Fairfax Road, which is 7dB(A) below the representative evening background noise level (48.2 dB $L_{A90,\ 15min}$). The overall combined noise magnitude is therefore very low (refer to **Table 9.3**), for receptors of medium value and sensitivity. Therefore, the combined operational noise impact is assessed as being of **minor adverse** significance.

e) Post-Operational Impacts

9.6.38 Following completion of the HPC construction phase EDF Energy would no longer require the facility. It is proposed that the facility would be transferred to a third party for use in connection with Bridgwater College (See **Chapter 5** of this volume of the ES). It is considered that the impacts of this phase would be no greater than those assumed for the operational phase of the proposed development.

9.7 Mitigation of Impacts

9.7.1 Restricted operational hours and good working practices, including the operation of plant and machinery (for which further information is provided within the **Noise and Vibration Management Plan**), have been taken into account within the assessments set out above.

9.8 Residual Impacts

9.8.1 Although it was predicted that some activities associated with construction of the proposed development would result in moderate adverse noise impacts there are considered to be no appropriate mitigation measures and the residual impacts would remain as those assessed in Section 9.6.

9.8.2 The residual impacts of operation of the proposed development would remain as those assessed in Section 9.6.

9.9 Summary of Impacts

9.9.1 **Table 9.8** presents a summary of the impacts predicted with respect to noise and vibration during the construction, operational and post-operational phases of the proposed development.

Table 9.8: Summary of Impacts

Receptor	Potential Impact	Potential Magnitude	Description	Value/Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
Construction Phase							
Residential receptors	Noise	Medium/low	Localised Direct Adverse Temporary Short-term Reversible	Medium	Minor to moderate	None proposed	Minor to moderate Adverse
Bridgwater College	Noise	Low	Localised Direct Adverse Temporary Short-term Reversible	High	Moderate	None proposed	Moderate Adverse
BTFC	Noise	Low	Localised Direct Adverse Temporary Short-term Reversible	Low	Minor	n/a	Minor Adverse
Residential receptors	Vibration	Very low	Localised Direct Adverse Temporary Short-term Reversible	Medium	Minor	n/a	Minor Adverse

Receptor	Potential Impact	Potential Magnitude	Description	Value/Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
On-site Operational Phase							
Residential receptor	Noise from campus building service plant	Very low	Localised Direct Adverse Temporary Long-term Reversible	Medium	Minor	n/a	Minor Adverse
Residential receptor	Noise from recreational activities	Very low	Localised Direct Adverse Temporary Long-term Reversible	Medium	Minor	n/a	Minor Adverse
Residential receptors	Operational in-combination noise	Very low	Localised Direct Adverse Temporary Long-term Reversible	Medium	Minor	n/a	Minor Adverse
Post-Operational Phase							
Residential receptors	Noise	Very low	Localised Direct Adverse Temporary Short-term Reversible	Medium	Minor	n/a	Minor Adverse

Receptor	Potential Impact	Potential Magnitude	Description	Value/Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
Bridgwater College	Noise	Very low	Localised Direct Adverse Temporary Short-term Reversible	High	Minor	n/a	Minor Adverse

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CHAPTER 10: AIR QUALITY

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Appendix 10C: Air Quality Significance Criteria
Appendix 10D: Input Parameters and Results for ADMS Roads Assessments

10. AIR QUALITY

10.1 Introduction

10.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential air quality impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus (the proposed development). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

10.1.2 An introduction to air quality pollution is provided in **Appendix 10A** and a glossary of the terminology used in this chapter is provided in **Volume 1** of the ES.

10.2 Scope and Objectives of Assessment

10.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees, including Sedgemoor District Council (SDC), West Somerset Council (WSC) and Somerset County Council (SCC), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

10.2.2 The assessment of air quality impacts has been undertaken adopting the methodologies described in **Volume 1**, **Chapter 7** and in Section 10.4 of this chapter.

10.2.3 The existing and future baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through baseline air quality monitoring and predictive modelling, and are described in Sections 10.5 and 10.6.

10.2.4 The study area with respect to potential fugitive dust and particulate impacts and on-site construction plant and machinery exhaust emissions impacts is shown on **Figure 10.1**. **Figure 10.2** shows the study area and road sources considered in the vehicular exhaust emissions impact assessment. The locations of the assessed sensitive receptors are also presented on each figure.

10.2.5 Air quality impacts are presented in Section 10.6, and appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be potentially significant are identified in Section 10.7. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 10.8.

10.2.6 The assessment of cumulative impacts of the proposed development with other elements of the HPC Project, and other proposed projects, is presented in **Volume 11** of this ES.

10.2.7 The objectives underlying the air quality assessment are to:

- identify all potentially sensitive receptor locations that may be affected by the construction, operational or post-operational phases of the proposed development;
- determine baseline air quality;
- assess air quality impacts of the proposed development on sensitive receptors;
- recommend mitigation measures, if considered necessary, to prevent, reduce or off-set the air quality impacts on sensitive receptors; and
- assess the residual air quality impacts on sensitive receptors.

10.3 Legislation, Policy and Guidance

10.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential air quality impacts associated with the construction, operation and post-operational phases of the proposed development.

10.3.2 As stated in **Volume 1**, **Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs.

10.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

10.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

i. The World Health Organization (WHO) Air Quality Guidelines (AQGs) (Ref. 10.1 and Ref. 10.2)

10.3.5 WHO AQGs (Ref. 10.1 and Ref. 10.2) offer global guidance to policy-makers on reducing the health impacts of air pollution. The guidelines, first produced in 1987 and updated in 1997, previously adopted a European scope, whilst the current 2005 guidelines are applied globally. They recommend revised limits for the concentration of selected air pollutants including particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) applicable across all WHO regions.

10.3.6 In addition to the guideline values, the AQGs give interim targets (ITs) related to outdoor air pollution, for each air pollutant, aimed at promoting a gradual shift from higher to lower concentrations. If these ITs are achieved, reductions in risks for acute and chronic health impacts from air pollution would be expected, but the ultimate objective should be progress towards the guideline values.

10.3.7 Although these guidelines are neither standards nor legally binding criteria, they are designed to offer guidance in reducing the health impacts of air pollution based on expert evaluation of current scientific evidence. The WHO AQGs and ITs are summarised in **Appendix 10B, Table 1**.

b) European Legislation

i. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe (EU Directive 2008/50/EC) (Ref. 10.3)

10.3.8 European Union (EU) policy on air quality aims to develop and implement appropriate instruments to improve air quality within the EU member states. EU Directive 2008/50/EC (Ref. 10.3), which came into force in June 2008, merges most of the existing air quality legislation into a single directive (the exception is the fourth "Daughter Directive" under the 1996 Framework Directive (96/62/EC)) (Ref. 10.4) This reorganisation of the legislation did not include a change to the existing air quality Limit Values. It introduces a new framework for $PM_{2.5}$ (fine particles), including the limit value and exposure related targets with a period of two years provided to all EU Member States to transpose the new Directive. The introduction of this framework was based on increasing evidence that this size of particle can be more closely associated with observed adverse health impacts than PM_{10}. The EU air quality Limit Values are summarised in **Appendix 10B, Table 2**.

10.3.9 The air quality Limit Values relate to ambient pollutant concentrations in the air and the limits are set on the basis of medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the WHO as to how each pollutant affects human health. Above these limits, sensitive members of the public (e.g. children, the elderly and the infirm) may experience adverse health impacts.

10.3.10 Other European Directives relate to equipment standards such as the control of emissions of gaseous and particulate pollutants from internal combustion engines and on the quality of petrol and diesel fuels. These are discussed in greater detail in Section 10.6.

c) National Legislation and Guidance

i. The Environment Act 1995 (Ref. 10.5)

10.3.11 The Environment Act 1995 (Ref. 10.5) required the preparation of a national Air Quality Strategy to set air quality standards and objectives for specified pollutants. The Act also outlined measures to be taken by local authorities (LAs) in relation to meeting those standards and objectives (the Local Air Quality Management (LAQM) framework).

ii. The Air Quality Standards Regulations (Ref. 10.6)

10.3.12 The Air Quality Standards Regulations 2010 (Ref. 10.6) transpose into UK legislation the European Directives (Ref. 10.3 and Ref. 10.4), the Council's decision on exchange of information (Ref. 10.7), as well as replacing the Air Quality Standards Regulations 2007 (Ref. 10.8). The Air Quality Standards Regulations 2010 came into force in the UK on 11 June 2010. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards with attainment dates in line with the European Directives.

iii. The Air Quality Regulations 2000 (Ref. 10.9), the Air Quality Regulations 2002 (Ref. 10.10) and the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Ref. 10.11)

10.3.13 In the UK, action on air quality is driven by the health-based objectives for key air pollutants, which have been made statutory through the Air Quality Regulations 2000 (Ref. 10.9), as amended in 2002 (Ref. 10.10) and set out in the 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) (Ref. 10.11). The Air Quality Objectives (AQOs) are based on the Air Quality Standards/Air Quality Limit Values, with interim target dates to help the UK move toward the achievement of the EU Air Quality Limit Values. The AQOs in the AQS are a statement of policy intentions or policy targets and as such, there is no legal requirement to meet these objectives, except in so far as they mirror any equivalent legally binding Limit Values in EU legislation.

10.3.14 The AQOs incorporate dates by which each standard is to be achieved. These are policy based targets set by the Government which take into account economic efficiency, practicability and technical feasibility. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance (i.e. a limited number of permitted exceedences of the standard over a given period).

10.3.15 The AQOs for each pollutant in the AQS and the Air Quality Regulations set out above are summarised in **Appendix 10B, Table 3**. For some pollutants (e.g. NO_2), there is both a long-term (annual mean) and a short-term standard. In the case of NO_2, the short-term objective is for a 1-hour averaging period, whereas for fine particles (PM_{10}) it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure of persons on the pavement adjacent to a busy road, compared with the exposure of occupiers of residential properties adjacent to a road.

10.3.16 The 2007 AQS replaced the previous Air Quality Strategy for England, Scotland, Wales and Northern Ireland (January 2000) and Addendum (February 2003). The majority of the AQOs set out in this previous version of the Air Quality Strategy were retained; however, the provisional objectives previously proposed for PM_{10} were replaced in England, Wales and Northern Ireland with a new framework for considering the impacts of $PM_{2.5}$. The Air Quality Standards Regulations 2010 (Ref. 10.6) incorporated into statute the annual mean $PM_{2.5}$ AQO limit value of 25µg/m^3 as previously set out in the AQS (to be achieved by 2015), and also defined exposure reduction targets for $PM_{2.5}$. However, these $PM_{2.5}$ objectives/reduction targets have not been

incorporated into LAQM Regulations and local authorities have no statutory obligation to review and assess air quality against them.

10.3.17 Of the pollutants included in the AQS, NO_2, PM_{10} and $PM_{2.5}$ are particularly relevant to this assessment, as road traffic is a major source of these pollutants. Where road traffic is the dominant source of air pollution, the objectives for these pollutants tend to be the most difficult to achieve according to the experience of local authorities undertaking review and assessments of air quality. Further, it is generally considered that where the AQOs for the concentrations of NO_2 and PM_{10} are achieved, and where there are no other substantial local sources of air pollution, such as from industrial processes, the AQOs for the other pollutants included within the Air Quality Standards Regulations 2010 (Ref. 10.6) should also be achieved.

iv. Local Air Quality Management Technical Guidance LAQM.TG(09) (Ref. 10.12)

10.3.18 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their review and assessment work. Local Air Quality Management Technical Guidance LAQM.TG(09) (Ref. 10.12) is designed to support local authorities in carrying out their duties under the Environment Act 1995 (Ref. 10.5) and subsequent Air Quality Regulations (Ref. 10.9 and Ref. 10.10).

10.3.19 LAQM.TG(09) provides guidance to local authorities on when to declare an Air Quality Management Area (AQMA) should exceedences of AQOs occur. In setting an AQMA, a local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below AQO levels. Progression towards this goal is managed through the on-going LAQM review and assessment process.

10.3.20 The guidance, referred to in this chapter as LAQM.TG(09), has been used where appropriate to inform the assessment presented herein.

v. The Environmental Protection Act 1990 (EPA) (Ref. 10.13)

10.3.21 The EPA 1990 (Ref. 10.13) makes provision within England, Wales and Scotland for the improved control of pollution arising from certain industrial and other processes. Part of the EPA applies to the control of dust and particulates associated with construction.

10.3.22 The EPA (Ref. 10.13) defines statutory nuisances. Definitions of statutory nuisance relevant to dust and particles are:

- *"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance"; and*
- *"Any accumulation or deposit which is prejudicial to health or a nuisance".*

10.3.23 Section 79 of the EPA states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply

with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

10.3.24 There are no statutory limit values for dust deposition above which 'nuisance' or 'annoyance' is deemed to exist. Nuisance/annoyance is a subjective concept and its perception is highly dependent upon the existing conditions and the change to air quality conditions which has occurred (i.e. increase in pollutant concentrations or dust deposition rates relative to background levels).

10.3.25 However, research carried out on behalf of the former Department of the Environment (DoE) (Ref. 10.14) provides some guidance as to the determination of annoyance from fugitive dust and suggests that complaints are likely when the rate of dust deposition is two to three times the normal background level of dust deposition in the area. The report suggests that it is preferable that continuous sources with a high or medium dust emission potential are separated by a stand-off distance from sensitive uses, and goes on to recommend a distance of between 100-200m separation from a substantial dust emitting source (with the qualification that these distances can be reduced if appropriate, and if effective mitigation measures are identified and implemented).

d) National Planning Policy

i. Planning Policy Statement 23: Planning and Pollution Control (PPS23) (2004) (Ref. 10.15)

10.3.26 National policy for local planning authorities in England regarding local air quality and new development is provided in PPS23 (Ref. 10.15). This statement provides advice on the policies and practices that should be taken into account by those involved in the planning of any development that has the potential to cause pollution.

10.3.27 With regard to emissions to air, and specifically LAQM, PPS23 states, in Paragraph 8, that:

- *"any consideration of the quality of air and potential impacts arising from development, possibly leading to an impact on health, is capable of being a material planning consideration, in so far as it arises or may arise from any land use."*

10.3.28 This is most likely to be the case in situations where the proposed development could produce an exceedence of the AQOs and result in an AQMA designation, where development is proposed in an AQMA, or where a proposed development renders a local authority's AQAP unworkable.

10.3.29 PPS23 also states that the presence of an AQMA should not result in the sterilisation of a site from development.

e) Regional Planning Policy

10.3.30 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional

strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 (RPG10) for the South West 2001–2016 (RPG10) (2001) (Ref. 10.16)

10.3.31 RPG 10 (Ref. 10.16) sets out the broad development strategy for the South West for the period to 2016 and beyond. Paragraph 4.9 explains that reducing the need to travel by concentrating development in and around urban areas and placing a greater emphasis on movement by foot, cycle and public transport will be important in helping to reduce air pollution overall. Policy EN2: Air Quality states:

"Local authorities should:

- *include in their development plans and proposals policies on the location of potentially polluting developments and of sensitive developments in the vicinity of existing polluting developments, in line with guidance in PPS23 (as and when it is updated) and in Air Quality and Land Use Planning LAGM.G3(00);*
- *designate air quality management areas where required as part of the local air quality management process;*
- *ensure that air quality considerations are properly considered along with other material considerations in the planning process, particularly where any air quality management areas have been designated."*

ii. Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes for Public Consultation (July 2008) (Ref. 10.17)

10.3.32 **Chapter 7** sets out the strategy's approach to environmental quality. Within this chapter, Policy RE9: Air Quality states:

- *"The impacts of development proposals on air quality must be taken into account and Local Authorities should ensure, through LDD's that new development will not exacerbate air quality problems in existing and potential AQMA's.*
- *This should include considerations of the potential impacts of new developments and increased traffic levels on internationally designated nature conservation sites, and adopt mitigation measures to address these impacts."*

iii. Somerset & Exmoor National Park Joint Structure Plan Review 1991-2001 (2000) (Policies saved from 27 September 2007) (Ref. 10.18)

10.3.33 **Chapter 4** provides a framework for protection, conservation and management for the natural and built environment. There are no specific policies relating to air quality within the Structure Plan.

f) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 10.19)

10.3.34 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in September 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific air quality designations. The site is within the defined Development Boundary.

10.3.35 There are no specific policies relating to air quality within the Local Plan.

ii. Sedgemoor District Council Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 10.20)

10.3.36 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

10.3.37 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the Core Strategy.

10.3.38 The following Core Strategy (Proposed Submission) policies are of potential relevance:

10.3.39 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, protect and enhance the quality of the natural, built and historic environment.

10.3.40 Policy D4 (Renewable and Low Carbon Energy Generation) states that the Council will support such proposals provided that such installations would not have significant adverse impact taking into account, amongst other things, any unreasonable adverse impact on users and residents of the local area including the generation of emissions.

10.3.41 Policy D9 (Sustainable Transport and Movement) states that proposals should contribute to the reduction of adverse environmental issues, including air pollution, through appropriate mitigation measures.

10.3.42 Policy D10 (Managing the Transport Impacts of Development) states that development proposals that will have a significant transport impact should be supported by an appropriate Air Quality Assessment.

10.3.43 Policy D16 (Pollution Impacts of Development and Protecting Residential Amenity) states:

> *"Development proposals that are likely to result in levels of air, noise, light or water pollution (including groundwater) vibration or soil contamination that would be harmful to other land uses, human health, tranquillity or the built and natural environment will not be supported.*
>
> *Where there are reasonable grounds to suggest that a development proposal may result in a significant adverse environmental impact, the Council will require planning applications to be supported by assessments relating to [amongst other things]:*
>
> - *air pollution; and*
> - *carbon emissions.*
>
> *Where it is demonstrated that it is possible to manage the potential adverse impacts of the development proposals through its design or mitigation measures, the Council will, by means of condition or legal agreement, seek to ensure such measures are effective, for example improving limitations on matters including hours of operation, emissions of fumes, noise and light, parking and servicing for both construction and operational stages."*

g) Supplementary Planning Guidance

10.3.44 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 10.21) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

10.3.45 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the Hinkley Point proposals both pre and post construction but makes no specific reference to air quality issues.

10.3.46 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1**, **Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD.

10.3.47 The draft HPC SPD does not set out any specific guidance in relation to air quality impacts at the site.

10.3.48 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4**) and the Introduction chapter (**Volume 4, Chapter 1**).

i. Air Quality Strategy for Somerset 2008 (Ref. 10.22)

10.3.49 The Air Quality Strategy for Somerset 2008 (Ref. 10.22) sets out strategic recommendations for working towards improved air quality and protecting existing air quality across Somerset. The Strategy represents the culmination of air quality management work over recent years, incorporating input from all six Councils that form the administrative region of Somerset (i.e. SCC and the five local authorities of Mendip District Council, South Somerset District Council, Taunton Deane Borough Council, SDC and West Somerset Council (WSC)).

10.3.50 The Strategy recognises the need to provide an integrated response to air quality management, and sets out a view to facilitating future improvements. The Strategy aims to complement the LAQM process, and the actions within the document provide a framework for how these improvements can be facilitated within Somerset.

ii. 2010 Air Quality Progress Report (Ref. 10.23)

10.3.51 The 2010 Air Quality Progress Report (Ref. 10.23), prepared by SDC, forms part of the LAQM system introduced by the Environment Act 1995 (Ref. 10.5) and subsequent Air Quality Regulations (Ref. 10.9 and Ref. 10.10). This report follows on from the Council's Updating and Screening Assessment Report in 2009 (Ref. 10.24), which concluded that a detailed assessment would not be required for any pollutant. There are currently no AQMAs declared within the authority area.

10.3.52 The report identifies that ambient NO_2 pollutant concentrations were highest in Bridgwater owing to high traffic flows, reduced speed (congestion) and narrowing of the A38, with properties close to the main highway.

10.3.53 The 2010 Air Quality Progress Report concluded that no exceedences of either the annual mean or 1-hour mean NO_2 objectives were identified within the authority area. Forward projection of the NO_2 monitoring results (the only pollutant monitored by the Council) to 2010 suggested that the NO_2 annual mean AQO would likely be met.

10.3.54 SDC plans to continue with existing NO_2 monitoring and to provide an Air Quality Progress Report in 2011.

10.4 Methodology

10.4.1 The assessment and the supporting surveys have been conducted in accordance with relevant best practice guidance and standard methodologies.

10.4.2 With the exception of emissions from vehicular movements associated with the proposed development, this assessment does not consider operational phase emissions because they are considered to be insignificant.

a) Study Area

10.4.3 The study area with respect to potential fugitive dust and particulate impacts and on-site construction plant and machinery exhaust emissions impacts is shown on **Figure 10.1**. **Figure 10.2** shows the study area and road sources considered in the vehicular exhaust emissions impact assessment. The locations of the assessed sensitive receptors are also presented on each figure.

10.4.4 The geographical extent of the study area for the fugitive dust and particulate assessment and the on-site construction plant and machinery exhaust emissions assessment (see **Figure 10.1**) includes:

- sensitive receptors located within 200m of the site (distance consistent with scoping guidance provided in the Design Manual for Roads and Bridges (DMRB) (Ref. 10.25)); and
- further receptors located beyond 200m of the site which have been included based on professional judgement.

10.4.5 The geographical extent of the study area for the vehicular exhaust emissions assessment (see **Figure 10.2**) includes:

- the roads affected by the proposed development as identified by traffic modelling;
- sensitive receptors located within 200m of the affected roads (distance consistent with scoping guidance provided in the Design Manual for Roads and Bridges (DMRB) (Ref. 10.25));
- further receptors located beyond 200m of the affected roads which have been included based on professional judgement.

10.4.6 The receptors that have been selected have ensured that the potential worst-case impacts associated with the proposed development have been assessed. It has been assumed that the nearest (unscreened, i.e. with no current barriers between the source and receptor which would reduce air quality impacts, e.g. dense woodland) receptor locations to the proposed development or affected roads are those likely to experience the greatest air quality impacts.

10.4.7 There are no ecological receptors (i.e. statutory designated sites, including Special Areas of Conservation, Sites of Community Importance, candidate Special Areas of Conservation, Special Protection Areas, potential Special Protection Areas, Sites of Special Scientific Interest and Ramsar sites) located in close proximity to (i.e. within 200m of) the site or the affected road network, and consequently no such receptors have been considered in the assessment (see **Chapter 14, Volume 4**). This approach is consistent with Highways Agency guidance published in the Design Manual for Roads and Bridges (DMRB) (Ref.10.25) for the scoping of ecological receptors within air quality assessments of vehicular emissions.

b) Baseline Assessment

10.4.8 Baseline air quality characteristics for the site and surrounding areas have been identified through:

- a baseline air quality monitoring campaign;
- review of desk based information; and
- consultation with officers of WSC and SDC.

10.4.9 With respect to air quality, the nearest sensitive receptor locations comprise residential dwellings on the A39 (Bath Road) located next to the site boundary and approximately 12km south-east of the HPC development site. In order to determine the existing background air quality, a baseline air quality monitoring programme was undertaken in the vicinity of the HPC development site.

10.4.10 The monitoring programme was undertaken for the pollutants (NO_2, PM_{10} and SO_2) of primary concern (SO_2 was included in the programme in order to assess future on-site diesel exhaust emissions from construction plant and machinery (Ref. 10.26 and Ref. 10.27). A baseline air quality monitoring survey for these pollutants was undertaken, commencing on 25 February 2009 and finishing on 15 September 2009.

10.4.11 Desk based studies carried out for the assessment included the identification and evaluation of:

- local industrial pollution emission sources within the district of Sedgemoor; and
- existing air quality - an evaluation of estimated background pollutant concentrations provided in Defra's UK Air Quality Information Resource (UK-AIR) (Ref. 10.28).

10.4.12 When the annual mean pollutant concentrations obtained during the monitoring programme were compared with the pollutant background concentrations available in the desk based assessment literature, the decision was taken to use the background concentrations available from the literature for assessment purposes (see Section 10.5 of this chapter and the Air Quality Modelling Report – Ref. 10.29), because this would provide a worst-case approach in terms of evaluation of total concentrations against the AQOs.

c) Consultation

10.4.13 Meetings have been held with Environmental Health Officers (EHOs) of West Somerset Council (WSC) and Sedgemoor District Council (SDC). At a scoping consultation meeting held with both Councils on 9 December 2008, the specific requirements for the air quality assessment were discussed and agreements reached regarding the methodologies to be adopted.

10.4.14 The following advice and direction was provided by WSC and SDC, which has been taken into account within this assessment:

- baseline monitoring of NO_2 along potential vehicular routes to/from HPC is not required;
- use of UK-AIR background pollutant concentrations (Ref. 10.28) is acceptable; and
- use of Environmental Protection UK (EPUK) significance criteria (Ref. 10.30) would provide a robust assessment of potential air quality impacts.

10.4.15 A second consultation meeting was held with the above councils and Arup (representing WSC) on 1 October 2009, where the main findings of the assessment work undertaken by that time were presented. No substantial changes to the scope or assessment methodology were requested.

10.4.16 A third consultation meeting was held with Arup on 22 February 2011. The purpose of this meeting was to present additional work undertaken since the Stage 2 consultation, and to review consultation comments received at Stage 2 and consider how to address them. The following key points were agreed during the meeting:

- with regards to the vehicular emissions dispersion modelling studies, there was no need to consider varying queue lengths at junctions for each scenario modelled, but there was, however, a need to consider varying vehicle average speed for junctions within each scenario modelled; and
- exclusion of car park area sources within the vehicular dispersion modelling study should be acceptable, depending upon the size and intended usage of the car parks.

d) Assessment Methodology

i. Introduction

10.4.17 For this chapter of the ES, the generic descriptions used to define the impact and its likelihood of occurrence (probability) are those given in **Volume 1, Chapter 7**. However, specific assessment criteria that define the magnitude and significance of air quality impacts have been developed and are used in this assessment. These specific criteria are described below.

10.4.18 Beneficial impacts are identified, but not quantitatively assessed.

10.4.19 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor (or equivalent) significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

10.4.20 Given the difference in the potential air quality impacts and assessment methodologies applied to fugitive dust and particulates, and vehicular/plant exhaust pollutant emissions to air, two separate assessment criteria have been developed and applied, based upon current published best practice guidance:

- *vehicular/plant exhaust pollutant emissions to air* – assessment criteria applied to vehicular emissions and on-site exhaust emissions to air from construction plant and machinery have been developed from guidance

published in the EPUK document entitled 'Development Control: Planning for Air Quality (2010 Update)' (Ref. 10.30); and

- *fugitive dust and particulates* – best practice guidance issued by the Greater London Authority (GLA) and London Councils (Ref. 10.31), Building Research Establishment (BRE) (Ref. 10.32) and Quality of Urban Air Review Group (QUARG) (Ref. 10.33) provide guidelines that allow the evaluation of the risk of air quality impacts occurring during demolition and/or construction, and these have been adapted for consideration of fugitive dust and particulates.

ii. Assessment Criteria Applied to Vehicular Emissions and Exhaust Emissions from Construction Plant

10.4.21 The descriptors presented in **Table 10.1** for the magnitude of change in pollutant concentrations have been either taken directly or developed from guidance published by EPUK (Ref. 10.30). Although criteria detailed in **Table 10.1** are designed for developments producing a permanent change, they are applied in the case of this site (i.e. because some of the infrastructure would remain to facilitate reuse of the site following cessation of use by EDF). For long-term pollutant emissions, the magnitude of change is determined based upon the magnitude of increase of the annual mean concentration of NO_2, PM_{10} or $PM_{2.5}$. For short-term pollutant emissions, the magnitude of change is determined based upon the number of exceedences of the short-term AQO limit concentration for PM_{10}, NO_2 or SO_2. The specific magnitude criteria for the 'other pollutants' which are relevant to this assessment, in relation to their defined objective and limit value, are presented in **Appendix 10C**.

Table 10.1: Definition of Impact Magnitude Developed for Vehicular Emissions and Exhaust Emissions to Air from Construction Plant and Machinery

Magnitude of change [a]	Annual mean NO_2/PM_{10} [b]	Number of days with PM_{10} > 50µg/m^3 [b]	Other Pollutants [b]
Large	Increase >4µg/m^3	Increase >4 days	Increase >10%
Medium	Increase 2 to 4µg/m^3	Increase 2 to 4 days	Increase 5-10%
Small	Increase 0.4 to 2µg/m^3	Increase 1 to 2 days	Increase 1-5%
Imperceptible	Increase <0.4µg/m^3	Increase <1 day	Increase <1%

[a] *The magnitude of change descriptors as provided in the EPUK guidance have been retained for the Air Quality Impact Assessment. Comparing these descriptors to the magnitude ratings used in other Chapters (see **Volume 1, Chapter 7**), 'imperceptible' equates to 'very low', 'small' equates to 'low', 'medium' equates to 'medium', and 'large' equates to 'high'.*

[b] *Taken from EPUK guidance.*

10.4.22 The magnitude criteria have been applied to pollutant concentrations predicted by the modelling of vehicular emissions to air, and in addition the prediction of exhaust emissions to air from on-site construction plant and machinery.

10.4.23 Once the magnitude of the potential impact is established, the actual pollutant concentration at the receptor is taken into account, in combination with the magnitude of change, using the approach set out in **Table 10.2**.

Table 10.2: Air Quality Impact Descriptors for Vehicular Emissions and Exhaust Emissions to Air from Construction Plant and Site Machinery

Absolute Concentration in Relation to relevant Objective/Limit Value	Change in Concentration or Number of Exceedences [a, b, c]		
	Small	Medium	Large
Above objective/limit value with scheme			
Annual mean PM_{10}/NO_2 concentration >40µg/m^3	Slight adverse	Moderate adverse	Substantial adverse
24-hour PM_{10} objective >35 exceedences			
Other pollutants >100% objective/limit value			
Just below objective/limit value with scheme			
Annual mean PM_{10}/NO_2 concentration 36 to 40µg/m^3	Slight adverse	Moderate adverse	Moderate adverse
24-hour PM_{10} objective 32 to 35 exceedences			
Other pollutants 90-100% objective/limit value			
Below objective/limit value with scheme			
Annual mean PM_{10}/NO_2 concentration 30 to 36µg/m^3	Negligible	Slight adverse	Slight adverse
24-hour PM_{10} objective 26 to 32 exceedences			
Other pollutants 75-90% objective/limit value			
Well below objective/limit value with scheme			
Annual mean PM_{10}/NO_2 concentration <30µg/m^3	Negligible	Negligible	Slight adverse
24-hour PM_{10} objective <26 exceedences			
Other pollutants <75% objective/limit value			

[a] *The impact descriptors as provided in the EPUK guidance have been retained for the Air Quality Impact Assessment. Comparing these descriptors to the impact significance criteria used in other ES Chapters (see **Volume 1, Chapter 7**), 'negligible' equates to 'negligible', 'slight adverse' equates to 'minor adverse', 'moderate adverse' equates to 'moderate adverse', and 'substantial adverse' equates to 'major adverse'. However, the above air quality impact descriptors are only used as a tool to describe predicted impacts; whether air quality impacts are assessed as significant or not significant is based upon the professional judgement of the air quality expert performing the assessment (as is recommended in the EPUK guidance).*

[b] *See **Table 10.1**.*

[c] *An imperceptible change (see **Table 10.1**) would be described as '**negligible**'.*

10.4.24 The specific impact descriptor criteria for the 'other pollutants' which are relevant to this assessment, in relation to their defined objective and limit values, are presented in **Appendix 10C**.

10.4.25 The criteria presented in **Table 10.1** and **Table 10.2** have been used for describing the impact at each specific receptor. This has then been used to inform the evaluation of the overall significance of air quality impacts. The latest EPUK guidance (Ref. 10.30) allows for the greater application of professional judgement when assessing impact significance than was prescribed in earlier versions. Impacts are therefore assessed as significant or not significant using the professional judgement of the air quality assessor. The EPUK guidance (Ref. 10.30) states that considerations in making these decisions should include:

- the number of properties affected by slight, moderate or substantial air quality impacts;
- the number of people exposed to poor air quality when a development introduces new exposure into an existing area of poor air quality;
- the magnitude of the changes and descriptions of the impacts at receptors;
- the exceedence of an objective or limit value predicted to arise where none existed before or size of an exceedence area is substantially increased as a result of the development;
- where existing air quality in the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced as a result of the development;
- where development interferes significantly with or prevents the implementation of actions within an AQAP;
- where development interferes significantly with the implementation of a local air quality strategy;
- uncertainty of the results; and
- the extent to which an objective or limit value is exceeded.

10.4.26 The specific impact descriptor criteria for the 'other pollutants' which are relevant to this assessment, in relation to their defined objective and limit values, are presented in **Appendix 10C**.

iii. Assessment Criteria Applied to Fugitive Dust and Particulates

10.4.27 As previously noted, best practice guidance (Ref. 10.31, 10.32, 10.33) has been adapted for consideration of fugitive dust and particulates generated by construction works associated with the proposed development. The guidance consolidates existing best practice used in London, the UK and other countries in order to provide a consistent approach in reducing emissions from these activities. The evaluation criteria used to define risk are presented in **Table 10.3**.

Table 10.3: Best Practice Guidance on Fugitive Dust and Particulates Risk Classification

Risk Categories	Criteria
Low Risk Site	• development of up to 1,000m^2 of land; and • potential for emissions and dust to have an infrequent impact on sensitive receptors.
Medium Risk Site	• development between 1,000 and 15,000m^2 of land; and • potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.
High Risk Site	• development of greater than 15,000m^2 of land; and • major development as defined by the Local Planning Authority (LPA); and

Risk Categories	Criteria
	• potential for emissions and dust to have a significant or likely impact on sensitive receptors.

10.4.28 The above classifications are proposed in the absence of specific fugitive dust and particulate mitigation measures. They are used in combination with site specific conditions to inform the assessment of the significance of the potential impact of fugitive dust and particulates from the proposed development.

10.4.29 Once the risk category was established by following the above methodology, the degree of significance of an adverse impact was determined for each potential impact from the Impact Assessment Matrix (IAM) shown in **Table 10.4**. The impact criteria in **Table 10.4** have been developed specifically for assessment of the construction impacts of fugitive dust and particulates based on best practice guidance issued by the GLA and London Councils (Ref. 10.31).

Table 10.4: Impact Significance Assessment Matrix for Fugitive Dust and Particulates

Distance to Human Receptors (m) [a]	Risk from Development		
	Low	Medium	High
100-200	Negligible	Negligible	Minor
50-100	Minor	Moderate	Moderate
0-50	Minor	Moderate	Major

[a] *Distance to a human receptor of greater than 200m is assessed as '**negligible**'.*

10.4.30 The 200m distance to receptor criterion is based on the distance beyond which no significant impacts are expected for road traffic emissions (Ref. 10.25). The 100m distance to receptor criterion is based on guidance which assumes that the majority of dust is deposited within 100m of the emissions sources (Ref. 10.34). The 50m criterion allows the identification of properties which are close to the source and therefore likely to experience a greater magnitude of impact during construction. **Figure 10.1** illustrates these respective distance criteria in relation to the site boundary.

iv. Assessment of Impacts from Vehicular Emissions

10.4.31 The proposed development forms part of an overall mitigation strategy proposed to alleviate construction traffic impacts associated with the development of the HPC Project. As well as limiting traffic congestion and other potential environmental impacts, such as impacts on noise and vibration, these mitigation measures are intended to help reduce local air quality impacts from road traffic during the construction phase of the HPC Project.

10.4.32 Given the wide geographical extent of the proposed HPC Project and the potential area over which receptors may be impacted due to HPC Project related vehicular emissions, the potential impacts have been spatially disaggregated. Therefore, this assessment focuses upon the potential air quality impacts of vehicular emissions from HPC Project-related traffic at the

identified worst-case sensitive receptor group locations along those routes closest to the proposed Bridgwater C site. **Volume 2, Chapter 12** discusses the overall wider context of the HPC Project and provides a summary of the overall air quality impacts predicted at all identified worst-case sensitive receptor group locations within the HPC Project study area as a whole.

10.4.33 Air quality impacts associated with HPC Project related vehicular emissions have been determined by comparing the magnitude of change between the air quality predicted for the future assessment year with the HPC Project (the 'with development' scenario) against the air quality predicted for the future assessment year in the absence of the HPC Project (the 'without development' scenario). This information has been used in combination with an evaluation of the air quality predicted for the 'with development' scenario against the relevant UK AQOs in order to determine the significance of the potential air quality impacts. The approach taken to this assessment is explained in the following paragraphs of this chapter (see section 10.4iv).

10.4.34 This assessment of the air quality impacts of vehicular emissions from HPC Project-related traffic on sensitive receptors located on routes in the vicinity of the proposed Bridgwater C site (that is presented in this chapter) forms part of a wider assessment of HPC Project-related vehicular emissions which is presented in **Volume 2, Chapter 12** and **Chapter 10** in each of **Volumes 3** to **10**.

10.4.35 Within the UK, assessments of air quality impacts related to emissions from road traffic tend to focus only upon NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$) concentrations in the atmosphere. This is because exhaust emissions of the other air pollutants associated with road traffic (SO_2, carbon monoxide (CO) and hydrocarbons, including benzene and 1,3-butadiene) are only released in relatively small quantities and urban roadside concentrations are all well within the relevant UK AQOs. It is only NO_2, PM_{10} and $PM_{2.5}$ that currently pose a human health concern where road traffic is the dominant source of air pollution, and which are close to and, in some traffic-congested urban areas, above AQOs. All the AQMAs in the UK that have been declared as a result of road traffic emissions have been declared either for NO_2 or for both NO_2 and PM_{10}. In this way, local authority review and assessment can be cost-effectively targeted at the pollutants of real concern and the insignificant pollutants can be scoped out of the assessment. This applies equally to the EIA process.

10.4.36 Consequently, detailed dispersion modelling and subsequent assessment of NO_2, PM_{10} and $PM_{2.5}$ emissions to air arising from road traffic has been undertaken.

10.4.37 For the prediction of air quality impacts due to emissions arising from road traffic associated with the HPC Project, the air pollutant dispersion model ADMS-Roads has been used. This model, developed by Cambridge Environmental Research Consultants (CERC), uses detailed information regarding traffic flows and composition on the local road network, combined with local meteorological conditions, to predict pollution concentrations at specific locations selected by the user. ADMS-Roads version 3.0 with Surfer version 9 was used for this study.

10.4.38 Full details of the ADMS-Roads dispersion modelling study which has been undertaken are presented in the Air Quality Modelling Report (Ref. 10.29). In summary, the traffic data used for the road traffic air quality impact assessment has been taken from the validated Paramics micro-simulation traffic model built to assess the effect of the HPC Project proposals. For each modelling scenario the output traffic data from the Paramics model were factored using Automatic Traffic Count data to provide 24-hour Annual Average Daily Traffic (AADT) data for Light Duty Vehicles (LDVs) and Heavy Duty Vehicles (HDVs). The 24-hour AADT traffic input data relevant to the assessment is presented in **Appendix 10D**.

10.4.39 Given the large spatial extent of the road network to be considered within the modelling domain (which includes all the proposals for the HPC Project), three ADMS-Roads models were set-up and run, encompassing the three main geographical areas within the overall HPC Project study area; one for the road network around Cannington (the 'Cannington model'), one for the road network around Bridgwater (the 'Bridgwater model') and one for the road network around Williton (the 'Williton model'). The Bridgwater C site was included within the 'Bridgwater model' (Ref. 10.29).

10.4.40 Annual mean pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) were predicted for discrete human receptors, which include locations adjacent, or near, to the routes that are likely to experience a change in traffic flow or composition as a result of the proposed development. These discrete human receptors have been selected to be representative of the likely worst-case impacts and benefits which may occur in the area surrounding the road network where traffic flows and/or composition may be affected by the proposed development (see **Figure 10.2**).

10.4.41 The number of potential exceedences of the short-term relevant AQOs were estimated using published relationships between the annual mean and short-term pollutant concentrations. LAQM.TG(09) (Ref. 10.12) advises that it is valid to assume that exceedences of the 1-hour mean AQO for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or greater.

10.4.42 An empirical relationship between the annual mean and the number of exceedences of the 24-hour mean AQO for PM_{10} is also provided within LAQM.TG(09) (Ref. 10.12):

$$\text{Number of 24-hour mean exceedences} = -18.5 + 0.00145 \times \text{annual mean}^3 + \frac{206}{\text{annual mean}}$$

10.4.43 This relationship was used to determine whether exceedences of short-term PM_{10} AQO are likely, based upon the annual PM_{10} concentrations predicted by the model.

10.4.44 The model-predicted pollutant concentrations were verified against available monitoring data, following the methodology published in LAQM.TG(09) (Ref. 10.12), in order to minimise modelling uncertainty and systematic error. This involved correcting modelled results by an adjustment factor to gain greater confidence in the final results. Full details of the verification procedure are

presented in the Air Quality Modelling Report (Ref. 10.29). However, in summary, an adjustment factor of 2.838 was applied to the modelled road NO_x contributions predicted by the Bridgwater model. In the absence of roadside monitoring data for particulate matter and in line with the recommendations provided in LAQM.TG(09) (Ref. 10.12), the same verification factor was also applied to PM_{10} and $PM_{2.5}$ modelled road contributions. The impact assessment was undertaken using these verified results, and all discussion herein therefore refers to verified model outputs.

10.4.45 Quantitative assessment of the impacts on local air quality from vehicular emissions associated with traffic generated by the proposed HPC Project was then completed through a comparison to modelled pollutant concentrations with the current statutory standards and objectives set out in **Appendix 10B**.

10.4.46 For the assessment, five scenarios have been modelled:

- 2009 'model verification/baseline';
- 2013 'without development';
- 2013 'with development';
- 2016 'without development'; and
- 2016 'with development'.

10.4.47 2009 was selected as the model verification/baseline year (model verification is discussed in detail within the Air Quality Modelling Report (Ref. 10.29)), as this is the most recent year for which monitoring data, meteorological data, traffic data and emissions factors were all available at the time the assessment was undertaken.

10.4.48 2013 was selected as an assessment year as it represents the year with peak HDV movements relating to the proposed HPC Project, prior to operation of (i.e. during the construction of) the various associated developments, which are specifically intended to minimise adverse impacts on the highway network during the construction of HPC. The 2013 scenario has been used to represent the period in which the proposed development (and other off-site associated developments) would be in the construction phase.

10.4.49 The 2013 'without development' scenario represents the future 2013 baseline scenario, and includes forecast traffic growth with committed development (unrelated development with extant planning permission) only (see **Chapter 8** of this volume for information on what committed development has been included).

10.4.50 The 2013 'with development' scenario includes:

- forecast traffic growth including committed development;
- construction of the proposed HPC power station (preliminary works traffic associated with peak heavy duty vehicles (HDV) movements in Quarter 3 2013);
- construction of the proposed development; and

- construction of the other proposed off-site associated developments.

10.4.51 2016 was selected to represent the year with peak construction related traffic movements associated with the HPC Project (peak workforce at the HPC development site), following the commencement of operation of the other proposed associated developments. The 2016 scenario has been used to represent the period in which the proposed development (and other off-site associated developments) would be operational.

10.4.52 The 2016 'without development' scenario represents the future 2016 baseline scenario and includes forecast traffic growth with only committed development (see **Chapter 8** of this volume for information on what committed development has been included).

10.4.53 The 2016 'with development' scenario includes:

- forecast traffic growth including committed development;
- construction of the proposed HPC power station (peak workforce at the HPC development site);
- operation of the proposed development (i.e. the Bridgwater C accommodation campus); and
- operation of the other proposed off-site associated developments.

10.4.54 Car parks have not been included within the ADMS model on the basis of their size and intended usage. Car parking spaces have been limited to 66 at the Bridgwater C accommodation campus, and would not be used in a similar manner to, for example, a supermarket car park, whereby multiple users would use the same space within one day; occupancy of each space will be defined by the number of working shifts at the HPC site, i.e. each space will be used by a maximum of three different vehicles per day.

10.4.55 A detailed description of the traffic data scenarios used in the assessment are contained within the Transport Chapter (see **Chapter 8** of this volume). Provision for a car sharing scheme and further travel plan measures (including the proposed Highways Improvements) to mitigate traffic impacts was made in the impact assessment presented herein. Consideration has also been given to non-work (i.e. leisure) vehicle movements of the HPC construction staff using the road network, and the impacts associated with such movements are included within the presented assessment.

v. Assessment of Impacts from Fugitive Dust and Particulates

10.4.56 A qualitative assessment of the potential air quality impacts due to the generation and dispersion of fugitive dust and particulates during construction of the proposed development has been undertaken using information in guidance documents produced by the following organisations:

- Building Research Establishment (BRE) (Ref. 10.32);
- Quality of Urban Air Review Group (QUARG) (Ref. 10.33); and
- GLA and London Councils (Ref. 10.31).

10.4.57 As there are no formal assessment criteria for fugitive dust and particulates generation and dispersion, the significance of impacts associated with the construction phase of the proposed development has been determined qualitatively by:

- identifying the site construction works activities that could generate fugitive dust and particulates and their likely duration;
- identifying sensitive receptors (e.g. schools, residential properties, statutory designated ecological sites) within 200m of the defined site boundary or closest area of site construction activity (or receptors located at greater distance from the site which have been included based on professional judgement); and
- taking account of the prevailing wind direction and wind speed.

10.4.58 The potential impact of fugitive dust and particulates on the closest human receptors to the site has been considered. As described above, these human receptors are illustrated in **Figure 10.1**.

vi. Assessment of impacts from Exhaust Emissions from On-site Construction Plant

10.4.59 Emissions to air from the exhausts of construction plant and machinery were also assessed qualitatively, based on the assumed likely items of equipment and plant expected to be used during the site construction works and their likely duration of use. The significance of these emissions was then determined against the criteria described in Section 10.4ii above.

vii.Cumulative Impacts

10.4.60 **Volume 1, Chapter 7** of this ES sets out the methodology used to assess cumulative impacts. The only exception is cumulative air quality impacts from vehicle emissions, which are presented within this chapter, as the traffic data used for the assessment includes both development-related traffic associated with all aspects of the HPC Project and other committed development in the study area. The assessment of cumulative impacts of the proposed development with other elements of the HPC Project, and other proposed projects, is presented in **Volume 11** of this ES.

e) Limitations, Constraints and Assumptions

10.4.61 Whilst average speeds of queuing traffic specific to each link and scenario have been applied to each ADMS-Roads modelled scenario, queuing distances determined for the 2009 scenario were applied to all of the ADMS-Roads modelled scenarios. However, sensitivity analysis which has been undertaken indicates that queuing distances do not substantially impact the model predicted pollutant concentration results obtained (Ref. 10.27).

10.4.62 The entire modelled road network was input within the ADMS-Roads models at an elevation of 0m. This is consistent with recommendations made by CERC, which state that terrain effects need only be included where the gradient exceeds 1 in 10. ADMS-Roads does not allow road cuttings (which may reduce impacts at receptors located in immediate proximity to the road within the cutting) to be entered within the model. However, sensitivity

analysis which has been undertaken indicates that this does not significantly impact the model predicted pollutant concentration results obtained and is likely to represent a worst-case approach as a receptor on the edge of a cutting is likely to be more exposed and therefore subject to increased turbulence and so greater dispersion (Ref. 10. 27).

10.4.63 Assumptions have been made about the type of equipment and machinery to be used during the construction works based upon likely methods to be adopted and previous development project experience, but contractors may adopt different working methods to reach the same goals. The assessment presented herein has therefore adopted a worst-case approach, wherever possible.

10.4.64 Despite the limitations, constraints and assumptions noted above, the approach and methodology adopted for this chapter is both transparent and consistent with relevant legislation (**Volume 1, Chapter 7**) and key guidance. The assessment is considered to give an appropriate representation of the assessment scenarios, and the approach has been discussed and agreed with the local authorities.

10.5 Baseline Environmental Characteristics

a) Introduction

10.5.1 This section describes the baseline environmental characteristics for the site and surrounding areas with specific reference to air quality.

b) Study Area Description

i. Environmental Setting

10.5.2 Bridgwater is located in an urban setting, approximately 12km south-east of the HPC development site. The proposed development site is located on the A39 (Bath Road). The site is currently accessed from the north, off College Way, to the south of the Bath Road. The southern part of the site is currently used by Bridgwater and Albion Rugby Football Club as its second team training pitch. The northern part of the site is occupied by an informal area of hardstanding and this is also used by the Club and Bridgwater College for vehicle parking (see **Figure 10.1**).

10.5.3 Land use in the surrounding areas is predominantly for residential purposes. The main arterial roads in the study region are the A39 which runs immediately to the north of the proposed development site, the A38 which lies approximately 500m west of the site and the A372 to the south. The M5 motorway lies approximately 1.5km to the east.

ii. Local Emission Sources

10.5.4 SDC has not identified any industrial sources of emission which may substantially impact air quality (Ref. 10.23 and Ref. 10.24) within the district. This was confirmed by an Environment Agency 'What's in your backyard?' search, carried out in August 2011 (Ref. 10.35).

10.5.5 The main existing source of air pollutants within the study area is road traffic. In addition to the M5 motorway, SDC has identified the A38 and A39 as the most substantial sources of vehicle emissions to air in the district. SDC currently undertakes air quality monitoring for NO_2 at ten roadside locations in Bridgwater. Their diffusion tube monitoring identified 2009 annual mean NO_2 concentrations at these locations to be below the annual mean NO_2 AQO limit concentration of 40µg/m^3.

10.5.6 Fugitive dust and particulates also arise in the site locality, both as a natural consequence (wind turbulence and subsequent suspension) and due to agricultural operations such as ploughing. The significance of these existing sources will increase during periods of continuous dry weather and increased wind speeds. Furthermore, due to the site's proximity to the coast, the presence of marine aerosols may also constitute a substantial natural local source of particulates.

iii. Existing Air Quality

UK Air Quality Information Resource

10.5.7 Estimated background pollutant concentrations are provided in Defra's UK-AIR (Ref. 10.28). Concentrations are provided for each 1km x 1km grid square for the entire UK. These background concentrations have been calculated from a base year of 2008 (or 2001 in the case of some pollutants, including SO_2), with projections provided for all years up to and including 2020, using the National Atmospheric Emissions Inventory (NAEI) and associated projections.

10.5.8 Estimated background concentrations from Defra's UK-AIR are available for PM_{10}, $PM_{2.5}$, NO_2, NO_x, SO_2, CO, benzene and 1,3-butadiene. **Table 10.5** summarises the NO_2, PM_{10}, $PM_{2.5}$ and SO_2 background concentrations obtained for 2009 from Defra's UK-AIR for the four grid-squares located closest to the site (for the purposes of this assessment, data are only required for these pollutants - see Section 10.4 of this chapter).

Table 10.5: Summary of Annual Mean NO_2, PM_{10}, $PM_{2.5}$ and SO_2 Background Concentrations at the Proposed Development Site Obtained for 2009 from Defra's UK Air Quality Information Resource

OS National Grid Reference	2009 Annual Mean Background Concentration (µg/m^3)			
	NO_2	PM_{10}	$PM_{2.5}$	SO_2 [a]
330500, 137500	21.7	16.3	10.8	2.9
331500, 137500	16.0	15.0	9.8	3.6
330500, 138500	14.9	15.2	9.6	3.1
331500, 138500	20.3	16.0	10.3	3.0
Average	**18.2**	**15.6**	**10.1**	**3.2**

[a] *In the absence of annual adjustment factors for SO_2, the 2001 background concentrations for SO_2 obtained from Defra's UK Air Quality Information Resource have been taken to represent the 2009 background SO_2 concentration.*

10.5.9 Averaging the concentrations for these four squares provides 2009 annual mean background concentrations for NO_2, PM_{10} and $PM_{2.5}$ of 18.2µg/m^3,

15.6µg/m^3 and 10.1µg/m^3 respectively. In the absence of annual adjustment factors for SO_2, the background SO_2 annual mean concentration from 2001 has been taken to represent the 2009 background, with an average value of 3.2µg/m^3. This value for SO_2 is likely to be an overestimate of the current background concentration, in light of tighter restrictions being imposed regarding the sulphur content of fuels since 2001, thus decreasing SO_2 emissions to air. The UK annual mean NO_2 and PM_{10} AQOs are both set at 40µg/m^3, whilst the annual mean $PM_{2.5}$ AQO is set at 25µg/m^3. There is no annual mean UK AQO for SO_2.

10.5.10 In relation to the 'without development' scenarios for 2013 and 2016, the future baseline conditions over what would be the duration of the Project (but in the absence of the Project) would be expected to marginally improve year on year. Minor improvements to baseline air quality conditions are anticipated with time as a result of technological improvements (to vehicle engines and industrial processes), legislative measures and government incentives to improve air quality.

Council Air Quality Progress Reports

10.5.11 SDC's 2010 Air Quality Progress Report (Ref. 10.23) provides the latest published review and assessment of air quality in the district. SDC currently undertakes passive diffusion tube monitoring for NO_2 at 22 locations within the towns of Bridgwater, Highbridge, Cheddar, and at a number of bridges along the M5 motorway. These represent roadside, urban centre and background locations. No other air pollutants are monitored.

10.5.12 The 2009 annual mean (bias adjusted) NO_2 concentrations for the 22 monitoring sites ranged between 9.2µg/m^3 and 39.2µg/m^3. Study of the diffusion tube results has not identified any locations within the district that are expected to exceed the annual mean NO_2 AQO of 40µg/m^3. There are also therefore no potential exceedences of the 1-hour mean NO_2 AQO of 200µg/m^3.

10.5.13 The SDC NO_2 diffusion tube monitoring data from three roadside monitoring locations in Bridgwater was used for ADMS-Roads model output verification purposes (see the Air Quality Modelling Report (Ref. 10.29)).

c) Receptors and Identified Value and Sensitivity

10.5.14 The human receptors considered in this assessment, i.e. those residents local to the site (as illustrated in **Figure 10.1**) and those residents located along the affected road network, as illustrated in **Figure 10.2**, are all of high value and high sensitivity in terms of local air quality impacts.

10.5.15 **Table 10.6** provides a summary of the sensitivity of the assessed receptors to potential air quality impacts from the proposed development.

Table 10.6: Summary of Receptor Sensitivity

Receptor	Exposure	Sensitivity	Justification
Human receptors at residential locations near to the site boundary (as illustrated in **Figure 10.1**) and	Continuous long-term	High	Potential adverse health impacts may be possible as a result of continuous long-term exposure

Receptor	Exposure	Sensitivity	Justification
along the affected road network (as illustrated in **Figure 10.2**)			to potentially elevated air pollutant concentrations
Users of footpaths and Public Rights of Way (PRoW) (human receptors - casual walkers and hikers)	Transient short-term	Low	Potential adverse health impacts are not expected as a result of transient short-term exposure to potentially elevated air pollutant concentrations

10.5.16 Due to the low sensitivity assigned to users of PRoW and the confidence with which it can be concluded that the magnitude of impact will be no greater than medium (given the nature of the activities associated with the proposed development that could lead to impacts upon air quality) it is considered that there will be no circumstance where significant air quality impacts will occur to users of PRoW. On this basis the consideration of impacts upon users of PRoW is scoped out of further assessment.

10.6 Assessment of Impacts

a) Introduction

10.6.1 For the proposed development, the impact assessment with respect to air quality on the existing environment covers the following issues:

- qualitative assessment of fugitive dust and particulate emissions during the construction works;
- qualitative assessment of exhaust emissions of on-site plant and machinery, during the construction works;
- quantitative assessment of road traffic emissions along effected routes during the construction and operation of the proposed development; and
- qualitative assessment of potential air quality impacts during the post-operational activities of the proposed development.

10.6.2 EDF Energy is committed to implementing best practice measures to minimise dust impacts, especially in the vicinity of sensitive receptors. These measures would be used during construction and in this sense are part of the "design". However, the risk based methodology for assessing dust impacts requires that such measures must be taken into account as mitigation. These measures are described in the mitigation section below.

b) Construction Impacts

i. Fugitive dust and particulate matter generated by construction activities

10.6.3 The extent to which dust and particulate matter generation and possible annoyance arising from construction activities might occur is difficult to assess quantitatively. Dust and particulate levels due to emissions directly from the site and any roadways including haulage roads (if dry), would depend upon various factors at any one time, including:

- nature of work being undertaken;

- wind direction;
- wind speed;
- precipitation;
- type and quantity of material being handled;
- particle size distribution of the material being handled; and
- moisture content of the material being handled.

10.6.4 Although dust levels would be greatest when there is a plentiful supply of fine, dry particles, the majority of these influencing factors are dependent upon both site working methods and weather conditions. As a consequence, the uncertainties associated with estimated emission factors are too great for meaningful numerical predictions to be made. A qualitative approach has therefore been taken. Assessment of the potential implications of contaminated dust arising from the construction activities is presented within **Chapter 12** of this volume.

Assumed construction plant

10.6.5 In order to evaluate fugitive dust and particulate generation during the phase it is necessary to define the various activities that would be undertaken. Construction contractors may use different working methods and plant. However, it is possible to undertake a generic assessment of air quality impacts based on expected methods of working gained from experience with previous similar developments. In undertaking this assessment, a worst-case approach has been taken by considering the upper range estimates for required plant numbers, which therefore provides a conservative basis for the assessment of potential air quality impacts. This assessment also considers all combined elements of construction at the site, as opposed to each in isolation, i.e. consideration has been given to any potential overlap as a result of multiple activities being undertaken at the same time.

10.6.6 **Chapter 3** of this volume provides a breakdown of the assumed type of plant (Non-Road Mobile Machinery - NRMM) and equipment associated with the construction phase of the proposed development.

Local climate conditions

10.6.7 Meteorological data covering the period 1 January 2005 to 31 December 2009 were obtained for the Hinkley Point site from the United Kingdom Meteorological Office (UKMO) Numerical Weather Prediction model to provide an indication of prevailing wind directions and the frequency of moderate to strong winds. These wind data and accompanying precipitation rate data are considered representative of the meteorological conditions prevalent at the site and were therefore used to assess the likelihood of receptors located in the vicinity of the site being affected by fugitive dust and particulate emissions.

10.6.8 Wind sectors have been assigned for the hourly meteorological data for Hinkley Point (covering the period 2005 to 2009), based upon the reported wind direction (degrees). Each wind sector category represents the mid-point of each wind sector ±11.25°, e.g. the mid-point of north north-west (NNW) is

337.50°, and therefore any winds with a bearing ranging from 326.25° to 348.75° have been classified as NNW. Each of the 16 wind sectors thus represents 22.5°.

10.6.9 The wind rose for 2005 to 2009 (see **Figure 10.3**) illustrates a predominant wind direction from the west north-west (WNW) at 18.0% of the time, with winds from the west also occurring frequently at 10.5% of the time. These are followed by southerly and west-south-westerly (WSW) winds, both at a frequency of 7.2%. Wind directions from the north and NNW occur relatively infrequently (2.4% and 2.6% of the time, respectively).

10.6.10 **Table 10.7** presents the frequency of winds as a percentage of all winds at Hinkley Point between 2005 and 2009, for each wind direction within specified wind speed categories. Calm conditions (<0.5m/s) occur for only 0.4% of the time. Wind speeds between 0.5 and 5.0m/s occur for approximately 45.7% of the time, whilst winds of above 5m/s occur for around 53.9% of the time.

Table 10.7: Frequency of Winds as a Percentage of all Winds at Hinkley Point between 2005 and 2009

Wind speed (m/s)	Wind direction (o)																TOTAL (%)
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0-0.5	0.02	0.03	0.03	0.04	0.01	0.01	0.03	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.38
0.5-5.0	1.47	1.90	2.61	2.65	2.30	2.69	3.10	3.42	3.95	3.69	2.95	2.27	2.38	5.36	3.27	1.68	45.69
5.0-7.5	0.60	1.25	1.68	1.70	0.99	0.83	1.20	1.32	2.14	2.05	2.35	2.39	3.10	6.65	2.25	0.60	31.10
7.5-10.0	0.21	0.45	0.80	0.64	0.19	0.24	0.33	0.50	0.85	0.83	0.99	1.73	2.87	3.97	1.15	0.18	15.93
>10.0	0.10	0.11	0.17	0.14	0.06	0.03	0.07	0.12	0.28	0.27	0.23	0.78	2.12	1.96	0.35	0.10	6.89
TOTAL %	**2.40**	**3.75**	**5.28**	**5.17**	**3.56**	**3.80**	**4.72**	**5.38**	**7.24**	**6.87**	**6.54**	**7.20**	**10.49**	**17.96**	**7.04**	**2.59**	**100.00**

10.6.11 Although the critical wind speed for raising particles into the air would be dependent upon the physical condition of the surface and the size range of particles present, the potential for the generation of airborne dust would increase with elevated wind speed.

10.6.12 A wind rose showing the frequency of winds of a speed greater than 5m/s is presented in **Figure 10.4** (wind-blown dust arising, for example as a result of erosion of stockpiled material, typically occurs with winds in excess of 5.4m/s (Ref. 10.31)). Wind directions from the WNW and westerly sectors occur most frequently for the higher wind speeds, accounting for 23.3% and 15.0% of winds above 5m/s, respectively.

10.6.13 Airborne dust levels are also more likely to be elevated during periods of prolonged warm, dry weather. During periods of wetter weather, precipitation not only minimises the amount of fugitive dust and PM_{10} that becomes airborne, but also removes existing airborne dust and PM_{10} from the atmosphere via washout and rainout. Analysis of precipitation rate data between 2005 and 2009 for Hinkley Point indicates that dry conditions are prevalent for 67.0% of time. Thus, for the remaining 33.0% of the time, airborne fugitive dust and PM_{10} levels are not likely to be significant and thereby cause annoyance.

Receptor location relative to source

10.6.14 The distance from the dust source to the sensitive receptor location is also critical. Both airborne dust and particle concentrations, and dust deposition rates, decrease rapidly with distance from the source. This is primarily due to dispersion and dilution effects, but is also enhanced by the rapid deposition of the larger particles. The very largest particles usually only travel 10 to 20m before being deposited. PM_{10} particles, on the other hand, are not readily deposited and can travel for longer distances, although some is deposited within 100m of the source. Hence, it is in the 100m zone from the source of dust generation where the impact from dust and particles would be greatest.

10.6.15 The worst-case (nearest) sensitive human receptors to the site were identified. Distance and bearing from potential dust generating construction activities, direction and frequency of winds carrying airborne particles from construction activities to the receptor, and the frequency of dry days were calculated. Distance has been calculated from the receptor to the closest point of site activity, as the effective management of construction related dust generation should prevent re-suspension of dust from carriageways becoming a source. **Table 10.8** presents a summary of these results.

Table 10.8: Distance and Bearing of Human Health Receptors to the Site, and Frequency of Occurrence of Meteorological Conditions that are Likely to Lead to Increased Likelihood of Fugitive Dust.

Receptor	Grid Reference		Bearing from site (°) [1]	Distance to receptor from site boundary (m) [2]	Dominant wind sector affecting each receptor [3]	Frequency of occurrence (% of hourly values) [4]		
	X	Y				All weather conditions	Wind with speed >5 m/s	Wind with speed >5 m/s, no precipitation
100C Bath Road	330964	137768	344	26	SSE	17.3	6.8	2.8
74 Fairfax Road	331108	137549	106	37	WNW	35.5	24.4	17.1
Bridgwater College	330978	137387	192	109	NNE	11.4	5.4	3.6

[1] 'Bearing from site' calculated based upon the angle from the closest point of the proposed site boundary to the receptor.

[2] 'Distance to receptor from construction site' calculated by measuring the minimum distance from the receptor to the proposed site boundary, and therefore represents a worst-case approach.

[3] Dominant wind sector affecting each receptor' derived assuming that the wind originating from opposite each receptor (i.e. 'Bearing from construction site' ±180°) is most likely to affect that particular receptor.

[4] *'Frequency of occurrence' values calculated based upon the sum of the frequency of particular weather conditions within the hourly meteorological dataset, for the 'Dominant wind sector affecting each receptor' plus the two adjacent wind sectors, e.g. if the dominant wind sector affecting a receptor is NNW, then 'frequency of occurrence' represents the total frequency of the particular weather condition occurring within the hourly meteorological dataset, for the wind sectors NW, NNW, and N, calculated as a percentage of all 43,848 hourly meteorological data values).*

10.6.16 The human receptors closest to the proposed Bridgwater C site are located on Bath Road and Fairfax Road (see **Figure 10.1**). **Table 10.8** shows that the receptor '100C Bath Road', located only 26m from the site, is affected by predominantly south south-easterly winds, with meteorological conditions that may lead to fugitive dust and PM_{10} at this location prevalent for only 2.8% of the time (wind with speed greater than 5m/s and no precipitation). The receptor '74 Fairfax Road' is located 37m from the site and is affected by predominantly west north-westerly winds, with meteorological conditions that may lead to fugitive dust and PM_{10} at this location prevalent for 17.1% of the time. For the other sensitive receptor 'Bridgwater College', located 109m from the site, north north-easterly winds would principally affect this location, and meteorological conditions that may lead to fugitive dust and PM_{10} are prevalent for only 3.6% of the time.

10.6.17 Whilst the site covers more than 15,000m^2 of land, given the intensity and type of construction activities expected on site, it is considered that the potential for emissions and dust from the site may have only an intermittent or likely impact on sensitive receptors. Therefore, the site has been classified as medium risk with respect to fugitive dust and PM_{10} generation (see **Table 10.3**).

10.6.18 The identified human receptor 'Bridgwater College' is located over 100m from the proposed construction activities. The significance of fugitive dust and PM_{10} impacts at the receptor 'Bridgwater College' therefore is predicted to be **negligible**.

10.6.19 Two of the identified human receptors are located less than 50m from the proposed construction activities. The significance of fugitive dust and PM_{10} impacts at receptors '100C Bath Road' and '74 Fairfax Road' are therefore predicted to be **moderate**. Meteorological conditions that may lead to elevated fugitive dust and PM_{10} at these locations from on-site construction activities are prevalent for a maximum 17.1% of the time. The potential frequency that fugitive dust and PM_{10} may be experienced at these receptors is therefore limited by the reduced occurrence of meteorological conditions that are conducive to elevated dust levels. The impact from dust at these receptors would be local, direct, adverse, possible and medium-term but temporary.

10.6.20 Measures would be applied to minimise airborne fugitive dust and PM_{10} generation. These are set out in the **Air Quality Management Plan (AQMP)**. The application of best practice guidance and control measures employed on construction sites would minimise dust generation and mitigation measures ensuring that any potential impacts would be at an acceptable level at the identified human receptor locations (see Section 10.7).

ii. Exhaust emissions from on-site plant and machinery utilised during construction

10.6.21 Diesel powered off-road construction plant and machinery (NRMM) are not currently subject to the same stringent controls as normal road vehicles. It is therefore appropriate to assess the potential air quality impacts associated with exhaust emissions from NRMM used during construction. However, there are various European Directives which have been implemented to control NRMM emissions and progressively reduce their potential impact.

10.6.22 European Directive 2002/88/EC (Ref. 10.36) relates to measures to control the emission of gaseous and particulate pollutants from internal combustion engines to

be installed in NRMM, and implements two stages of emission limit values for compression ignition engines. The two stages of emissions limits for new diesel engines set the maximum allowable emissions of NO_X, particulate matter, hydrocarbons and carbon monoxide. Stage I is already in force for all engine categories and Stage II has now been implemented for almost all engines.

10.6.23 Directive 2004/26/EC9 (Ref. 10.37) of the European Parliament and of the Council (amending Directive 97/68/EC (NRMM Directive) and Directive 2002/88/EC), implements three stages of future emissions limits (Stage IIIA, IIIB & IV) that apply to equipment already within the scope of Directive 97/68/EC (Ref. 10.38).

10.6.24 All engines installed that are not already available in the market would have to comply with the emission limits before 2015 (with the exception of Stage IV for engines other than constant speed engines with a production date prior to 31 December 2013 and 30 September 2014, where the compliance date may be postponed by two years).

10.6.25 Directive 98/70/EC (Ref. 10.39) (as amended by Directive 2003/17/EC (Ref. 10.40)) relating to the quality of petrol and diesel fuels establishes minimum specifications for petrol and diesel to be placed on the market in the EU, including gas oils intended for use by NRMM. These were required to contain less than 2,000mg/kg of sulphur decreasing to 1,000mg/kg by 1 January 2008 at the latest.

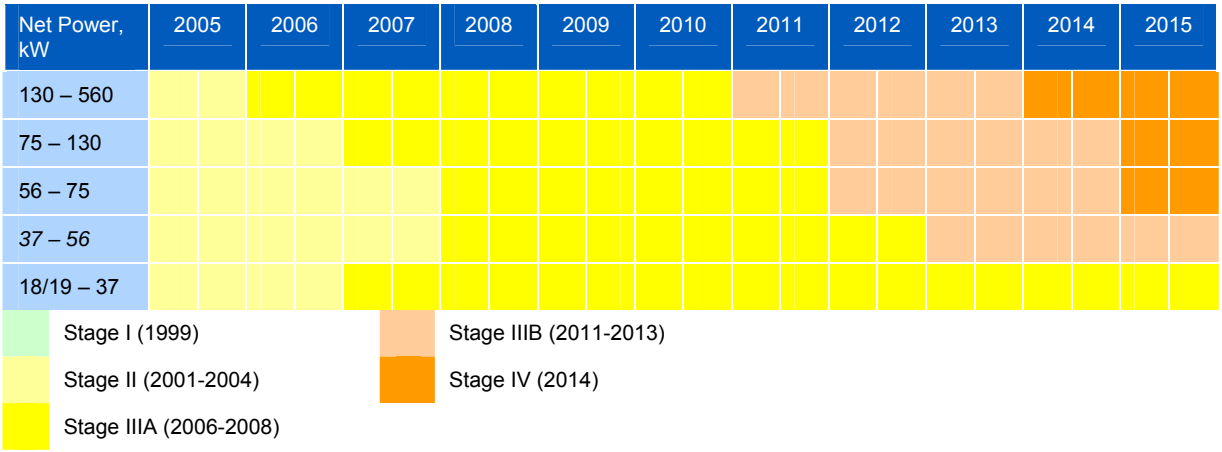
10.6.26 For small engines (37-75kW), the predicted technology required to meet Stage IIIA controls includes engine modifications, adoption of electronic engine control, improved fuel pumps and limited, un-cooled Exhaust Gas Recirculation (EGR). For larger engines which already utilise electronic engine control, the predicted technologies required are engine modifications, common rail injection, air-air charge cooling and limited, un-cooled EGR. Further reductions for small engines (i.e. 18 - 37kW) are considered impractical (Ref. 10.41).

10.6.27 For engines to meet Stage IIIB controls it is expected that Diesel Particulate Filters (DPFs) would be fitted. To ensure reliable operation of DPFs, the use of low sulphur content fuels would be needed (approximately 10mg/kg sulphur, whilst gas oil has 2,000mg/kg sulphur, decreasing to 1,000mg/kg from 2008) (Ref. 10.41).

10.6.28 Stage IV controls are expected to force the adoption of Selective Catalytic Reduction (SCR) de-NO_X after-treatment systems in addition to DPFs.

10.6.29 A summary of the implementation dates for the emission standards is presented in **Table 10.9**.

Table 10.9: Summary of the Implementation Dates for NRMM Emission Standards



10.6.30 **Chapter 3** of this volume provides a breakdown of the assumed NRMM to be used within the construction phase. However, for the purposes of this assessment, given the plant and machinery required on site and the medium-term nature of the construction, a qualitative assessment approach of NRMM emissions to air of principal concern (NO_x, PM_{10} and SO_2) is considered appropriate. The adopted qualitative approach considers the likely quantities and type of NRMM to be used during the construction works, combined with the locations of sensitive receptor groups.

10.6.31 Given the likely numbers of plant on-site, their frequency and anticipated duration of operation, the magnitude of increase in pollutant concentrations associated with exhaust emissions from the numbers of NRMM operating would likely be imperceptible, even at the nearest receptor '100C Bath Road', located approximately 26m from the site boundary (works at this separation distance to the receptor would be less frequent and of an intermittent nature). Therefore, there are no human receptors that have the potential to be significantly impacted by NRMM emissions generated by the Bridgwater C site construction works.

10.6.32 Background pollutant concentrations in the site locality are well below the relevant AQOs; there is therefore a substantial amount of headroom before any of the relevant short-term and long-term AQOs would potentially be exceeded (see Section 10.5 and **Appendix 10B**). Given the above, on-site exhaust emissions to air as a result of NRMM associated with construction are predicted to be of imperceptible or small magnitude, and thus **negligible** in terms of impact at the assessed human receptors. This impact is therefore considered to be **not significant**. Impacts from on-site exhaust emissions from NRMM would be local, adverse, direct, unlikely and temporary in nature.

c) Operational Impacts

10.6.33 As previously discussed in Section 10.4 with the exception of emissions from vehicular movements associated with the operation of the proposed development (which are covered in the following section), this assessment does not consider any other operational phase emissions. All other potential air quality impacts as a result of the operation of the Bridgwater C site are considered to be insignificant and therefore have not been subject to detailed assessment.

i. Vehicular Exhaust Emissions

10.6.34 The impacts on human receptors of exhaust emissions to air resulting from vehicle movements associated with the combined HPC Project during the 2013 (construction of the proposed Bridgwater C development) and 2016 (operation of the proposed Bridgwater C development) scenarios were predicted using the air pollutant dispersion model ADMS Roads. The traffic input data, obtained from the transport consultant working on behalf of EDF Energy, and further information used in the ADMS Roads assessment is presented in **Appendix 10D**. Additional information regarding the modelling methodology is provided in the Air Quality Modelling Report (Ref. 10.29).

10.6.35 Estimates of vehicle pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) were predicted and assessed for the 2013 and 2016 scenarios identified in Section 10.4, for 'with' (i.e. with all road traffic associated with the HPC Project) and 'without development' (i.e. future baseline without HPC) scenarios. Pollutant concentrations were also predicted for the 2009 model verification/baseline scenario. Comparison of these modelled scenarios allowed the specific impacts of exhaust emissions to air generated by vehicle movements associated with the proposed development to be assessed, and also evaluated against the existing and future baseline air quality in the study area.

10.6.36 The purpose of the proposed accommodation campus at the Bridgwater C site is to minimise adverse effects on the local highway network during the construction of the HPC nuclear power station. This will assist in minimising vehicular air quality impacts at sensitive receptors along the affected highways.

10.6.37 In order to confirm whether the Bridgwater C accommodation campus site is considered appropriate, in air quality terms, for residential use, pollutant concentrations at four receptors ('Bri-C Accommodation 1', 'Bri-C Accommodation 2', 'Bri-C Accommodation 3' and 'Bri-C Accommodation 4') have been predicted for the 2016 scenario (operation of the Bridgwater C accommodation campus). These locations are considered to be representative of worst-case air pollutant concentrations likely to be experienced by the on-site workers during the site's operation.

10.6.38 A full set of results from all dispersion modelling undertaken, along with detailed discussion of the outputs, are available in the Air Quality Modelling Report (Ref. 10.29). A summary of the main results at human receptors located adjacent to the affected roads near to the Bridgwater C site are provided below in **Table 10.10**, whilst pollutant concentrations predicted at all of the identified worst-case human health discrete receptors located along those routes closest to the site are presented in **Appendix 10D**.

Table 10.10: Maximum Predicted Pollutant Concentrations at Specific Receptors Located along those Routes Closest to the Bridgwater C Site.

	2009 'without development'	2013 'without development'	2013 'with development'	2016 'without development'	2016 'with development'
Maximum annual mean NO_2 concentration ($\mu g/m^3$)	32.02	29.05	29.73	23.48	25.01
Maximum annual mean PM_{10} concentration ($\mu g/m^3$)	19.89	19.27	19.28	18.30	18.56
Maximum annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)	12.39	11.72	11.72	10.96	11.12

10.6.39 A discussion of the results and determination of impact significance is presented below for each pollutant.

NO_2 annual mean concentrations

10.6.40 During the construction and operational periods of the Bridgwater C site (i.e. 2013 and 2016 scenarios), annual mean NO_2 concentrations are predicted to increase by no more than 11.9%, as a result of combined HPC Project development related traffic, at the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.41 The highest predicted concentration for the 2013 'with development' scenario occurs at '131 The Drove' where a concentration of 29.73µg/m^3 is observed. This figure, represents an 11.9% (3.15µg/m^3) increase when compared to the 2013 'without development' scenario (**Appendix 10D, Table 8**). The 3.15µg/m^3 increase at '131 The Drove' is also the largest predicted increase relative to the 40µg/m^3 NO_2 annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.42 Therefore, with regard to potential impact on the specific discrete human health receptors located along those routes closest to the Bridgwater C site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC Project during the 2013 (construction of the Bridgwater C site) scenario are of no greater than medium magnitude. The potential impact of these emissions on the discrete human health receptors is local, adverse, direct, likely and medium-term. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

10.6.43 The highest predicted concentration for the 2016 'with development' scenario occurs at '131 The Drove' where a concentration of 25.01µg/m^3 is observed. This figure represents an 7.7% (1.79µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 10**). The 1.79µg/m^3 increase at '131 The Drove' is also the largest predicted increase relative to the 40µg/m^3 NO_2 annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.44 Therefore, with regard to potential impact on the specific discrete human health receptors located along those routes closest to the Bridgwater C development site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC Project during 2016 (operation of the Bridgwater C site) scenario are of no greater than small magnitude. The potential impact of the emissions on the discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature, i.e. they may only occur throughout the duration of the HPC construction programme, prior to either the full removal of all structures and associated infrastructure and restoration of the site to its former use, or the removal of only fencing and CCTV from the site to allow retention of the development for use by a third party in connection with Bridgwater College. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

10.6.45 The highest predicted concentration for the 2016 'with development' scenario for the four on-site receptors occurs at 'Bri-C Accommodation 1' where a concentration of 16.39µg/m^3 is observed. This figure represents a 0.5% (0.08µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 10**).

The 0.08µg/m^3 increase at 'Bri-C Accommodation 1' is also the largest predicted increase relative to the 40µg/m^3 NO_2 annual mean AQO for the four selected discrete human health receptors located on the Bridgwater C site.

10.6.46 Therefore, with regard to potential impact on the specific discrete human health receptors located on the Bridgwater C development site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC Project during 2016 (operation of the Bridgwater C site) scenario are of no greater than imperceptible magnitude. The potential impact of the emissions on the on-site discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

NO_2 1-hour mean concentrations

10.6.47 The empirical relationship given in LAQM.TG(09) (Ref. 10.12) states that exceedences of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or above. Although it is not possible to determine with precision the number of potential exceedences of the short-term air quality objective limit concentration, it is evident that annual mean NO_2 concentrations at all discrete human health receptor locations located both in the proximity of the Bridgwater C site and on the site itself are well below this limit, for both the assessed 2013 and 2016 development scenarios.

10.6.48 Therefore, with regard to potential impact on all specific human health discrete receptor locations both in proximity to and on the Bridgwater C site, short-term vehicle emissions of NO_2 associated with traffic generated by the combined HPC Project during either the 2013 (construction of the Bridgwater C site) and 2016 (operation of the Bridgwater C site) scenarios are of imperceptible magnitude. The potential impact of these emissions on the human health discrete receptors is local, adverse, direct, and likely. Potential impacts will be medium-term during the construction of the Bridgwater C site, and long-term but temporary during the operation of the Bridgwater C site. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

PM_{10} annual mean concentrations

10.6.49 During the operational periods of the Bridgwater C site (i.e. 2013 and 2016 scenarios), annual mean PM_{10} concentrations are predicted to increase by no more than 1.4% as a result of combined HPC project development related traffic, at the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.50 The highest predicted concentration for the 2013 'with development' scenario occurs at '86 Bath Road' where a concentration of 19.28µg/m^3 is observed. This figure represents a 0.1% (0.01µg/m^3) increase when compared to the 2013 'without development' scenario (**Appendix 10D, Table 12**).

10.6.51 The largest predicted increase relative to the 40µg/m^3 PM_{10} annual mean AQO for the 2013 'with development' scenario occurs at '131 The Drove' where a concentration of 18.00µg/m^3 is observed. This figure represents a 1.3% (0.22µg/m^3) increase when compared to the 2013 'without development' scenario (**Appendix 10D, Table 12**).

10.6.52 The highest predicted concentration for the 2016 'with development' scenario occurs at '86 Bath Road' where a concentration of 18.56µg/m^3 is observed. This figure represents a 1.4% (0.26µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 13**). The 0.26µg/m^3 increase at '86 Bath Road' is also the largest predicted increase relative to the 40µg/m^3 PM_{10} annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.53 Therefore, with regard to potential impact on the specific human health discrete receptors located along those routes closest to the Bridgwater C site, long-term vehicle emissions of PM_{10} associated with traffic generated by the combined HPC Project development during both the 2013 (construction of the Bridgwater C site) and 2016 (operation of the Bridgwater C site) scenarios are of imperceptible magnitude. The potential impact of these emissions on the discrete human health receptors is local, adverse, direct, and likely. Potential impacts will be medium-term during construction of the Bridgwater C site and long-term but temporary during the operation of the Bridgwater C site. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

10.6.54 The highest predicted concentration for the 2016 'with development' scenario for the four on-site receptors occurs at 'Bri-C Accommodation 1' where a concentration of 16.15µg/m^3 is observed. This figure represents a 0.1% (0.01µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 13**).

10.6.55 The largest predicted increase relative to the 40µg/m^3 PM_{10} annual mean AQO for the 2016 'with development' scenario occurs at 'Bri-C Accommodation 2' where a concentration of 16.16µg/m^3 is observed. This figure represents a 0.1% (0.02µg/m^3) increase when compared to the 2016 'without development' scenario **(Appendix 10D, Table 13**).

10.6.56 Therefore, with regard to potential impact on the specific discrete human health receptors located on the Bridgwater C development site, vehicular emissions of PM_{10} associated with traffic generated by the combined HPC Project during 2016 (operation of the Bridgwater C site) scenario are of no greater than imperceptible magnitude. The potential impact of the emissions on the on-site discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

PM_{10} 24-hour mean concentrations

10.6.57 The empirical relationship between the annual mean and the number of exceedences of the PM_{10} 24-hour mean objective given in LAQM.TG(09) (Ref. 10.12) was used to determine the increase in the number of days exceeding the 1-hour mean PM_{10} air quality objective, at receptor locations located both in proximity to the proposed Bridgwater C development site and on the site itself, as a result of traffic generated by the combined HPC Project. There was a maximum of three predicted days exceeding the 50µg/m^3 objective limit, for 2013 'with' and 'without development' scenarios and two predicted days exceeding the 50µg/m^3 objective limit, for 2016 'with' and 'without development' scenarios. At the discrete human health receptor locations located both in proximity to the Bridgwater C site and on the site itself there was therefore no increase in the number of days exceeding the short-term PM_{10}

objective limit as a result of traffic generated by the combined HPC Project during the 2013 (construction of the Bridgwater C site) and 2016 (operation of the Bridgwater C site) scenarios.

10.6.58 Therefore, with regard to potential impact on all specific human health discrete receptor locations both in proximity to and on the Bridgwater C site, short-term vehicle emissions of PM_{10} associated with traffic generated by the combined HPC Project development during either the 2013 (construction of the Bridgwater C site) and 2016 (operation of the Bridgwater C site) scenarios are of imperceptible magnitude. The potential impact of the emissions on the human health discrete receptors is local, adverse, direct and likely. Potential impacts will be medium-term during the construction of the Bridgwater C site, and long-term but temporary during the operation of the Bridgwater C site. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

$PM_{2.5}$ annual mean concentrations

10.6.59 During the construction and operational periods of the Bridgwater C site (i.e. 2013 and 2016 scenarios), annual mean $PM_{2.5}$ concentrations are predicted to increase by no more than 1.6% as a result of combined HPC project development related traffic, at the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.60 The highest predicted concentration for the 2013 'with development' scenario occurs at '86 Bath Road' where a concentration of 11.73µg/m^3 is observed. This figure represents a 0.1% (0.01µg/m^3) increase when compared to the 2013 'without development' scenario (**Appendix 10D, Table 14**).

10.6.61 The largest predicted increase relative to the 25µg/m^3 $PM_{2.5}$ annual mean AQO for the 2013 'with development' scenario occurs at '131 The Drove' where a concentration of 11.02µg/m^3 is observed. This figure represents a 1.6% (0.17µg/m^3) increase when compared to the 2013 'without development' scenario (**Appendix 10D, Table 14**).

10.6.62 The highest predicted concentration for the 2016 'with development' scenario occurs at '86 Bath Road' where a concentration of 11.12µg/m^3 is observed. This figure represents a 1.5% (0.16µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 15**). The 0.16µg/m^3 increase at '86 Bath Road' is also the largest predicted increase relative to the 25µg/m^3 $PM_{2.5}$ annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.63 Therefore, with regard to potential impact on the specific human health discrete receptors located along those routes closest to the Bridgwater C site, long-term vehicle emissions of $PM_{2.5}$ associated with traffic generated by the combined HPC Project development during both the 2013 (construction of the Bridgwater C site) and 2016 (operation of the Bridgwater C site) scenarios are of imperceptible magnitude. The potential impact of these emissions on the discrete human health receptors is local, adverse, direct, and likely. Potential impacts will be medium-term during the construction of the Bridgwater C site and long-term but temporary during the operation of the Bridgwater C site. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

10.6.64 The highest predicted concentration for the 2016 'with development' scenario for the four onsite receptors occurs at 'Bri-C Accommodation 1' where a concentration of 9.65µg/m^3 is observed. This figure represents a 0.1% (0.01µg/m^3) increase when compared to the 2016 'without development' scenario (**Appendix 10D, Table 15**). The 0.01µg/m^3 increase at 'Bri-C Accommodation 1' is also the largest predicted increase relative to the 25µg/m^3 $PM_{2.5}$ annual mean AQO for the four selected discrete human health receptors located on the Bridgwater C site.

10.6.65 Therefore, with regard to potential impact on the specific discrete human health receptors located on the Bridgwater C development site, vehicular emissions of $PM_{2.5}$ associated with traffic generated by the combined HPC Project during 2016 (operation of the Bridgwater C site) scenario are of no greater than imperceptible magnitude. The potential impact of the emissions on the on-site discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature. Without mitigation, the potential impact is assessed as **negligible** and is therefore determined to be **not significant**.

Uncertainty in future year NO_x and NO_2 predictions

10.6.66 The Defra LAQM helpdesk (Ref. 10.42) has identified analyses of historical monitoring data within the UK that show a disparity between measured concentration data and the projected decline in concentrations associated with emission forecasts for future years. Trends in ambient concentrations of NO_x and NO_2 in many urban areas of the UK have generally shown two characteristics; a decrease in concentration from about 1996 to 2002-2004, followed by a period of more stable concentrations from 2002-2004 up until 2009. The main regions showing evidence of a consistent downward trend in either NO_x or NO_2 concentrations that would be supported by UK-AIR and emission inventory estimates, are more rural, less densely trafficked, parts of the UK.

10.6.67 The reason for this disparity is currently not fully understood, but it is thought to be related to the actual on-road performance of diesel road vehicles when compared with calculations based on the Euro emission standards. Preliminary studies suggest the following:

- NO_x emissions from petrol vehicles appear to be in line with current projections and have decreased by 96% since the introduction of 3-way catalysts in 1993.
- NO_x emissions from diesel cars, under urban driving conditions, do not appear to have declined substantially, up to and including Euro 5. There is limited evidence that the same pattern may occur for motorway driving conditions.
- NO_x emissions from HDVs equipped with SCR are much higher than expected when driving at low speeds.

10.6.68 This disparity in the historical national data highlights the uncertainty of future year projections of both NO_x and NO_2. At this stage however, there is no robust evidence upon which to base any revised road traffic emissions projections.

10.6.69 Defra and the devolved administrations are currently investigating these issues, and once the reasons are fully understood updated guidance will be published.

10.6.70 To take account of this uncertainty, for the purposes of this assessment, a worst-case approach was taken through the application of emission factors and

background concentrations for 2009 (i.e. base year levels) for all future years. This is in addition to the above assessment approach, for which the currently published guidelines have been followed (i.e. emission factors and background concentrations reduce in future years). This approach to assessing sensitivity provides a means by which to assess the extreme worst-case upper concentrations that may prevail in future years.

Worst case NO_2 annual mean concentrations

10.6.71 During the construction and operational periods of the Bridgwater C site (i.e. 2013 and 2016 scenarios), worst case annual mean NO_2 concentrations are predicted to increase by no more than 12.2% as a result of combined HPC Project development related traffic, at the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.72 The highest predicted concentration for the worst case 2013 'with development' scenario occurs at '131 The Drove' where a concentration of 35.70µg/m^3 is observed. This figure represents a 12.2% (3.88µg/m^3) increase when compared to the worst case 2013 'without development' scenario (**Appendix 10D, Table 9**). The 3.88µg/m^3 increase at '131 The Drove' is also the largest predicted increase relative to the 40µg/m^3 NO_2 annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.73 Therefore, with regard to potential impact on the specific discrete human health receptors located along those routes closest to the Bridgwater C site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC Project during the 2013 (construction of the Bridgwater C site) scenario are of up to medium magnitude (a medium magnitude was only identified at the receptor '131 The Drove' – at the other 18 identified discrete human health receptor locations, magnitude was either small or imperceptible). The potential impact of these emissions on the discrete human health receptors is local, adverse, direct, likely and medium-term. Without mitigation, the greatest potential impact would be assessed as **slight adverse**, occurring only at the receptor '131 The Drove' (impacts at the other 18 identified discrete human health receptor locations would be assessed as negligible). Therefore, on the basis of professional judgment, taking into account the factors in Paragraph 10.4.26, the worst-case modelling approach taken, the small number of receptors affected by impacts of this magnitude and the fact that there are still no predicted exceedences of the annual mean NO_2 AQO, the potential impacts are determined to be **not significant**. This does not, therefore, affect the judgement of significance as presented in Section 10.6.42.

10.6.74 The highest predicted concentration for the worst case 2016 'with development' scenario occurs at '131 The Drove' where a concentration of 35.55µg/m^3 is observed. This figure represents a 10.54% (3.39µg/m^3) increase when compared to the worst case 2016 'without development' scenario (**Appendix 10D, Table 11**). The 3.39µg/m^3 increase at '131 The Drove' is also the largest predicted increase relative to the 40µg/m^3 NO^2 annual mean AQO for the 19 selected discrete human health receptor locations in proximity to the proposed Bridgwater C site.

10.6.75 Therefore, with regard to potential impact on the specific discrete human health receptors located along those routes closest to the Bridgwater C development site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC

Project during 2016 (operation of the Bridgwater C site) scenario are of no greater than medium magnitude (a medium magnitude was only identified at the receptor '131 The Drove' – at the other 18 identified discrete human health receptor locations, magnitude was either small or imperceptible). The potential impact of the emissions on the discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature. Without mitigation, the greatest potential impact would still be assessed as **slight adverse**, occurring only at the receptor '131 The Drove' (impacts at the other 18 identified discrete human health receptor locations would be assessed as negligible). This does not affect the judgement of significance as presented in Section 10.6.44, i.e. the potential impacts are still determined to be **not significant**.

10.6.76 The highest predicted concentration for the worst case 2016 'with development' scenario for the four on-site receptors occurs at 'Bri-C Accommodation 1' where a concentration of 20.40µg/m^3 is observed. This figure represents a 0.7% (0.15µg/m^3) increase when compared to the worst case 2016 'without development' scenario (**Appendix 10D, Table 11**). The 0.15µg/m^3 increase at 'Bri-C Accommodation 1' is also the largest predicted increase relative to the 40µg/m^3 NO_2 annual mean AQO for the four selected discrete human health receptors located on the Bridgwater C site.

10.6.77 Therefore, with regard to potential impact on the specific discrete human health receptors located on the Bridgwater C development site, vehicular emissions of NO_2 associated with traffic generated by the combined HPC Project during worst case 2016 (operation of the Bridgwater C site) scenario are of no greater than imperceptible magnitude. The potential impact of the emissions on the on-site discrete human health receptors is local, adverse, direct, likely and long-term but temporary in nature. Without mitigation, the potential impact is assessed as **negligible** and is therefore still determined to be **not significant** (see Section 10.6.46).

Worst case NO_2 1-hour mean concentrations

10.6.78 The empirical relationship given in LAQM.TG(09) (Ref. 10.12) states that exceedences of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or above. Although it is not possible to determine with precision the number of potential exceedences of the short-term AQO limit concentration, it is evident that annual mean NO_2 concentrations at all discrete human health receptor locations located both in the proximity of the Bridgwater C site and on the site itself are well below this limit, for both the assessed 2013 and 2016 worst case development scenarios.

10.6.79 Therefore, adopting the worst case approach (i.e. assuming 2009 emission factors and background pollutant concentrations for future assessment years), with regard to potential impact on all specific human health discrete receptor locations both in proximity to and on the Bridgwater C site, short-term vehicle emissions of NO_2 associated with traffic generated by the combined HPC Project during either the 2013 (construction of the Bridgwater C site) or 2016 (operation of the Bridgwater C site) scenarios are found to be of an imperceptible magnitude. Without mitigation, the potential impact for the 2013 and 2016 scenarios would therefore still be assessed as **negligible** and **not significant**.

Summary

10.6.80 Therefore, regardless of which of the two modelling methodologies are adopted for NO_2 future year concentration predictions, with regard to potential impact on the specific discrete human health receptors located along those routes closest to the Bridgwater C site, vehicular emissions during the construction and operational periods of the Bridgwater C site (i.e. 2013 and 2016 scenarios) are **not significant**.

10.6.81 All predicted pollutant concentrations at the four on-site receptors are below the relevant AQOs for the 2016 'with development' scenario, and potential air quality impacts at these locations have been assessed to be **not significant**. The Bridgwater C accommodation campus site is therefore considered appropriate, in air quality terms, for residential use by the on-site workers during the site's operation.

d) Post-operational Impacts

10.6.82 Following the completion of the construction of the HPC Project, the Bridgwater C accommodation campus would cease to be operational by EDF Energy. The development would be retained excluding minor structures (subject to a planning application for subsequent use), to allow use by a third party in connection with Bridgwater College (see **Volume 4, Chapter 5**).

10.6.83 On this basis, post-operational air quality impacts are considered to be less, and certainly no greater, than those impacts associated with the construction and operational phases of the development. With the exception of fugitive dust and particulate matter impacts at the receptors '100C Bath Road' and '74 Fairfax Road', generated by post-operational activities, all potential air quality impacts are considered to be **negligible** or **not significant**. Potential impacts from fugitive dust and particulate matter impacts at the receptors '100C Bath Road' and '74 Fairfax Road', generated by post-operational activities, are considered to be no more than **moderate**, prior to the implementation of any potential mitigation measures.

10.7 Mitigation of Impacts

10.7.1 A summary of the potential air quality impacts during the construction, operational and post-operational phases of the proposed development is presented in Section 10.9. All potential air quality impacts have been assessed to be negligible or not significant with the exception of fugitive dust and particulate matter impacts generated during the construction and post-operational phases. For road traffic emissions associated with all phases of the proposed development, no mitigation is considered to be required.

10.7.2 The following section provides best practice methods and mitigation measures to be implemented to minimise the predicted air quality impacts, with specific focus to minimise any airborne dust impacts that may potentially be generated by construction activities.

a) Mitigation of impacts during construction

10.7.3 Environmental impacts and disturbance arising from construction activities would be managed through a range of control measures and monitoring procedures which are outlined in the **Environmental Management and Monitoring Plan (EMMP)** and detailed in associated **Subject-Specific Management Plans** (SSMPs) for the

Bridgwater C site. The control measures for the protection of the air quality environment, including minimisation of fugitive dust and particulate generation from the site, are set out in the **Air Quality Management Plan** (**AQMP**).

i. Fugitive dust and PM_{10} generated by construction activities

10.7.4 Best practice guidance control methods and mitigation measures that would be implemented to manage fugitive dust and PM_{10} emissions during the construction works, and to ensure associated impacts are prevented in areas in proximity to the site, are presented within the **AQMP**.

10.7.5 The **AQMP** makes reference to current best practice guidance and other supporting documentation, including:

- BRE publication 'Control of dust from construction and demolition activities' (2003) (Ref. 10.32);
- QUARG publication 'Airborne Particulate Matter in the UK – Third report of the Quality of Urban Air Review Group' (1996) (Ref. 10.33);
- Office of the Deputy Prime Minister 'Minerals Policy Statement 2: Controlling and Mitigating the Effects of Mineral Extraction in England – Annex 1: Dust' (Ref. 10.34);
- Greater London Authority and London Councils publication 'The control of dust and emissions from construction and demolition - Best Practice Guidance' (2006) (Ref. 10.31);
- CIRIA 'Environmental good practice on site guide' (third edition) (Ref. 10.43); and
- Defra Secretary of State's Guidance for Mobile Crushing and Screening - Process Guidance Note 3/16(04) (Ref. 10.44).

10.7.6 The **AQMP** would be implemented throughout the duration of construction of the site, ensuring that dust and fugitive particulate emissions are kept to a minimum. Examples of typical good construction practice methods and dust mitigation that may be implemented to control fugitive dust and PM_{10} generation during the construction works include:

- vehicles carrying loose aggregate and workings to be sheeted during periods of dry and windy weather, or if dust emissions become a problem;
- implementation of design controls for construction equipment and vehicles and use of appropriately designed vehicles for materials handling;
- completed earthworks/stockpiles to be covered or seeded as soon as is practicable in order to stabilise surfaces (finished platforms would be covered, external slopes would be seeded and therefore eventually vegetated);
- use of mobile or fixed spray units to dampen surfaces as dictated by weather conditions;
- provision and use of wheel washing facilities at all exits as well as procedures for effective cleaning and inspection of vehicles, which should include total vehicle washing and ticketing of vehicles;
- regular inspection and, if necessary, cleaning and repair of local highways and site boundaries to check for dust deposits (and removal if necessary);

- use of dust-suppressed tools for all operations, and use of dust extraction techniques where available;
- ensuring that all construction plant and equipment are maintained in good working order and not left running when not in use; and
- restricting all on-site movements and dust generating activities to a minimum.

10.7.7 A formal system would need to be put in place during the works which identifies the roles and responsibilities of site staff regarding the procedures to be applied to respond to any complaints relating to air quality. Site logs would be maintained, detailing all complaints received relating to air quality, and the corresponding action taken including the response made to each complainant.

10.7.8 The extent of which dust mitigation would be implemented on site during the construction works would be flexible and responsive, with additional recommendations and measures introduced when required during particularly dust generating activities, sensitive periods, or upon receipt of valid annoyance dust complaints. Working practices would be systematically audited and revised where necessary in order to ensure fugitive dust impacts are mitigated to an acceptable level at the identified sensitive receptor locations.

ii. Exhaust emissions from on-site plant and machinery

10.7.9 Best practice guidance control methods and mitigation measures that would be implemented to control on-site exhaust emissions from plant and machinery (NRMM) during the construction of the proposed development site include:

- minimising idling times of plant and machinery;
- ensuring all equipment is in good working order and working efficiently;
- use of ultra low sulphur diesel (ULSD) in all equipment and plant, where practicable;
- ensuring that all equipment is fitted with appropriate particulate filters or any other appropriate exhaust after-treatments, where practicable; and
- use of the newest equipment that meets the latest emission standards.

b) Mitigation of impacts from road traffic emissions to air

10.7.10 The **Freight Management Strategy** and the **Framework Travel Plan,** appended to the **Transport Assessment**, have been developed to minimise vehicle movements during the construction and operational phases of the Bridgwater C site and the wider HPC Project, hence reducing the associated impacts from vehicle exhaust emissions to air relative to the worst-case assessment detailed in Section 10.6. Such measures would include, but would not be limited to, car sharing schemes and provision of bus transport for the workforce, plus other highway improvement schemes. Full details of the proposed traffic mitigation measures are provided within **Volume 4, Chapter 8**.

c) Mitigation of impacts during post-operation

10.7.11 Best practice measures and further mitigation measures during post-operational activities would be similar to those detailed above for the construction and operational phases (where applicable).

10.8 Residual Impacts

10.8.1 With the exception of fugitive dust and particulate matter impacts at the receptors '100C Bath Road' and '74 Fairfax Road', generated by construction and post-operational activities, all potential air quality impacts have been assessed as **negligible** or **not significant** prior to the implementation of any mitigation.

10.8.2 Construction and post-operational activities of the proposed Bridgwater C site development would require careful dust management to minimise impacts to neighbouring dwellings, specifically at the receptors phases (where applicable) '100C Bath Road' and '74 Fairfax Road' (as provided in Section 10.7a above). The imposition of the mitigation measures described above, in addition to the application of standard good practice in construction operations, would result in a residual impact from fugitive dust and particulate matter impacts at the receptors '100C Bath Road' and '74 Fairfax Road', generated by construction and post-operational activities, of no more than **minor** significance.

10.9 Summary of Impacts

10.9.1 **Table 10.11** presents a summary of the predicted air quality impacts. As stated above, the methodology applied to the assessment of impacts from fugitive dust and PM_{10} is different to the methodology applied to the assessment of other air quality impacts. Therefore, the descriptors given in the "magnitude/risk and method of determination", "impact descriptor", "impact significance" and "residual impact significance" columns for dust/PM_{10} impacts and other air quality impacts are not directly comparable. Full details of the assessment methodologies employed for the air quality impact assessment are provided in Section 10.4 of this chapter of the ES.

Table 10.11: Impacts and Mitigation

Receptor	Potential Impact	Magnitude/Risk and Method of Determination	Description	Impact Descriptor	Significance	Proposed Mitigation/Best Practice	Residual Impact
Construction Phase							
Local air quality and amenity at assessed human receptors – 100C Bath Road and 74 Fairfax Road	Fugitive dust and PM_{10} originating from construction activities	Medium Risk (qualitative fugitive dust and PM_{10} assessment)	• Local • Adverse • Direct • Possible • Medium-term • Temporary	N/A	Moderate	Detailed measures to minimise fugitive dust and PM_{10} generation would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction sites	Minor
Local air quality and amenity at assessed human receptor – Bridgwater College	Fugitive dust and PM_{10} originating from construction activities	Medium Risk (qualitative fugitive dust and PM_{10} assessment)	• Local • Adverse • Direct • Possible • Medium-term • Temporary	N/A	Negligible	Detailed measures to minimise fugitive dust and PM_{10} generation would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction sites	Negligible
Local air quality at assessed human receptors	Exhaust emissions (PM_{10}, NO_x and SO_2) from on-site plant and machinery (NRMM) associated with construction activities	Imperceptible Magnitude (qualitative on-site exhaust emissions assessment)	• Local • Adverse • Direct • Unlikely • Medium-term • Temporary	Negligible	Not significant	Detailed measures to reduce emissions to air would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction sites, construction traffic management, phasing of construction activities, and use of plant and vehicles compliant with current emissions standards.	Not significant

Receptor	Potential Impact	Magnitude/Risk and Method of Determination	Description	Impact Descriptor	Significance	Proposed Mitigation/Best Practice	Residual Impact
Local air quality at assessed human receptors	Long-term NO_2 emissions associated with traffic during the construction (2013) of the Bridgwater C site	Medium Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Medium-term • Temporary	Negligible/ Slight Adverse	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant
Local air quality at assessed human receptors	Short-term NO_2 and PM_{10} emissions, and long-term PM_{10} and $PM_{2.5}$ emissions associated with traffic during the construction (2013) of the Bridgwater C site	Imperceptible Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Medium-term • Temporary	Negligible	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant

Receptor	Potential Impact	Magnitude/Risk and Method of Determination	Description	Impact Descriptor	Significance	Proposed Mitigation/Best Practice	Residual Impact
Operational Phase							
Local air quality at assessed human receptors	Long-term NO_2 emissions associated with traffic during the operation (2016) of the Bridgwater C site	Small/Medium Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Long-term • Temporary	Negligible/Slight Adverse	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant
Local air quality at assessed human receptors	Short-term NO_2 and PM_{10} emissions, and long-term PM_{10} and $PM_{2.5}$ emissions associated with traffic during the operation (2016) of the Bridgwater C site	Imperceptible Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Long-term • Temporary	Negligible	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant
Local air quality at assessed human receptors located on-site (Bri-C accommodation receptors)	Long-term NO_2, PM_{10} and $PM_{2.5}$ emissions, and short-term NO_2 and PM_{10} emissions associated with traffic during the operation (2016) of the Bridgwater C site	Imperceptible Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Long-term • Temporary	Negligible	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant

Receptor	Potential Impact	Magnitude/Risk and Method of Determination	Description	Impact Descriptor	Significance	Proposed Mitigation/Best Practice	Residual Impact
Post-operational Phase							
Local air quality and amenity at assessed human receptors – 100C Bath Road and 74 Fairfax Road	Fugitive dust and PM_{10} originating from post-operational activities	Medium Risk (qualitative fugitive dust and PM_{10} assessment)	• Local • Adverse • Direct • Possible • Short-term • Temporary	N/A	Moderate	Detailed measures to minimise fugitive dust and PM_{10} generation would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction/demolition sites	Minor
Local air quality and amenity at assessed human receptor – Bridgwater College	Fugitive dust and PM_{10} originating from post-operational activities	Medium Risk (qualitative fugitive dust and PM_{10} assessment)	• Local • Adverse • Direct • Possible • Short-term • Temporary	N/A	Negligible	Detailed measures to minimise fugitive dust and PM_{10} generation would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction/demolition sites	Negligible
Local air quality at assessed human receptors	Exhaust emissions (PM_{10}, NO_x and SO_2) from on-site plant and machinery (NRMM) associated with post-operational activities	Imperceptible Magnitude (qualitative on-site exhaust emissions assessment)	• Local • Adverse • Direct • Unlikely • Short-term • Temporary	Negligible	Not significant	Detailed measures to reduce emissions to air would be provided in the **AQMP**, and would follow best practice guidance and measures typically employed on construction/demolition sites, post-operational traffic management, phasing of post-operational activities, and use of plant and vehicles compliant with current emissions standards.	Not significant
Local air quality at assessed human receptors	Long-term NO_2 emissions associated with traffic during the post-operation of the Bridgwater C site	Medium/Large Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Short-term • Temporary	Slight Adverse/Moderate Adverse	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant

Receptor	Potential Impact	Magnitude/Risk and Method of Determination	Description	Impact Descriptor	Significance	Proposed Mitigation/Best Practice	Residual Impact
Local air quality at assessed human receptors	Short-term NO_2 and PM_{10} emissions, and long-term PM_{10} and $PM_{2.5}$ emissions associated with traffic during the post-operation of the Bridgwater C site	Imperceptible Magnitude (quantitative assessment of vehicular emissions)	• Local • Adverse • Direct • Likely • Short-term • Temporary	Negligible	Not significant	The **Freight Management Strategy** and the **Framework Travel Plan** would be implemented to minimise vehicular movements, and use of vehicles compliant with emissions standards	Not significant

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CHAPTER 11: SOILS AND LAND USE

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11. SOILS AND LAND USE

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential soil, land use and agriculture impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus, referred to hereafter as the proposed development on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapter 1** to **5** of this volume of the ES.

11.2 Scope and Objectives of Assessment

11.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees (including Sedgemoor District Council (SDC), West Somerset Council (WSC) and Somerset County Council (SCC)), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

11.2.2 The assessment of impacts on soil, land use and agricultural receptors has been undertaken adopting the methodologies described in **Volume 1, Chapter 7** of this ES and Section 11.4 of this chapter.

11.2.3 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through a review of desk based information and field observations, and are described in Section 11.5 of this chapter; this section also identifies the existing and future receptors. The study area for this assessment, as illustrated in **Figure 11.1**, comprises all land within the proposed development site (the site), together with other land within 25m of the site boundary. The extent of this zone of land adjacent to the site boundary is based on consideration of the scale of development earthworks, the nature of site boundaries and the type of adjacent land uses. Also included within the study area are any contiguous agricultural drainage ditches and field drainage systems.

11.2.4 Section 11.6 of this chapter assesses the potential impacts on soil, land use and agricultural receptors. Section 11.7 of this chapter identifies appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance. Assessment of within-site cumulative impacts on soil and land use is included. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 11.8 of this chapter.

11.2.5 The assessment of cumulative impacts of the proposed development with other elements of the Hinkley Point C Project and other relevant projects is provided in **Volume 11** of the ES.

11.2.6 The objectives of the assessment are to:

- identify all soil, land use and agricultural receptors within and adjacent to the site that may be affected by the works;
- characterise the baseline environmental conditions for soil, land use and agriculture within the study area;
- assess the impacts of the construction, operation and post-operational phases, on soil, land use and agriculture;
- identify mitigation measures, if determined necessary, to reduce the impacts on soil, land use and agriculture; and
- assess the residual impacts of the proposed development on soil, land use and agriculture.

11.2.7 Due to the fact that many environmental aspects are interrelated there may be a degree of overlap with other technical chapters in this volume, particularly that concerning geology and land contamination (**Chapter 12**), surface water (**Chapter 13**) and terrestrial ecology and ornithology (**Chapter 14**) of this volume. Where impacts are identified in the assessment that are addressed in greater depth in relation to other environmental aspects (e.g. potential impacts from contaminated land, alterations to drainage regimes and impacts on biodiversity) these impacts are considered in this chapter but only in so far as the extent to which they may result from changes to soils, land use and agriculture.

11.3 Legislation, Policy and Guidance

11.3.1 This section identifies and describes legislation, policy and guidance relevant to the assessment of impacts to soil and land use associated with the construction, operational and post-operational phases of the proposed development. As the site is not classified as agricultural land and is not subject to any agri-environment schemes, the relevant legislation relates specifically to the prevention of the spread of invasive and noxious weeds. There is no international legislation relevant to the soils and land use assessment for this site.

11.3.2 As stated in **Volume 1, Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the Infrastructure Planning Commission (IPC) on applications for nuclear power generation developments that fall within the scope of the NPSs.

11.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

11.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical

assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) National Legislation

i. The Wildlife and Countryside Act 1981 (as amended) (Ref. 11.1)

11.3.5 The Wildlife and Countryside Act 1981 restricts the introduction of certain animals and plants. For example Japanese knotweed *(Reynoutria japonica)* and giant hogweed *(Heracleum mantegazzianum)* are listed under Schedule 9 of the Act, and subject to Section 14 of the Act which makes it an offence to plant, or cause these species to grow in the wild.

ii. The Environmental Protection Act 1990 (Ref. 11.2)

11.3.6 Japanese knotweed and giant hogweed are regarded as a controlled waste under the Environmental Protection Act 1990 and must be disposed at licensed sites or by burning on site.

b) National Planning Policy

i. Planning Policy Statement 7 'Sustainable Development in Rural Areas' (PPS7) (2004) (Ref 11.3)

11.3.7 PPS7 sets out the Government policy on development within the countryside. It sets out policy for promoting development in rural areas whilst conserving the character of the countryside and protecting the best and most versatile agricultural land, defined as Grade 1, 2 and 3a of the Agricultural Land Classification (ALC) (paragraph 28).

11.3.8 Paragraph 28 of PPS7 states:

> *"The presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the ALC), should be taken into account alongside other sustainability considerations (e.g. biodiversity... including soil quality) when determining planning applications."*

11.3.9 The loss of best and most versatile land (BMVL) is no longer considered to be of *national* importance (as was set out in the precursor to PPS7, Planning Policy Guidance 7 (PPG7)). The loss of BMVL is now a matter to be taken into account at a local level rather than at a national level (via the former Ministry of Agriculture Fisheries and Food (MAFF)) as was the case previously.

ii. Consultation Paper on a New Planning Policy Statement: Planning for a Natural and Healthy Environment (March 2010) (Ref. 11.4)

11.3.10 In March 2010, the Government published a Consultation Paper for a new Planning Policy Statement: Planning for a Natural and Healthy Environment. The document was published in March 2010 and the consultation period expired in June 2010.

11.3.11 At the outset, the document makes clear that in its final form, the PPS will replace PPS7 in so far as it relates to, amongst others, soils and agricultural quality (paragraphs 28 and 29).

11.3.12 With specific reference to agricultural land, proposed Policy NE8.9 states:

> *"When considering applications involving significant areas of agricultural land, local planning authorities should take account of the presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the ALC) alongside other sustainability considerations. Where significant development of agricultural land is unavoidable, local planning authorities should seek to develop areas of poorer quality land (grades 3b, 4 and 5) in preference to that of a higher quality, except where this would be inconsistent with other sustainability considerations. Little weight should be given to the loss of agricultural land in grades 3b, 4 and 5, except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environment or the local economy."*

c) Regional Planning Policy

11.3.13 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001 – 2016 (RPG10) (2001) (Ref. 11.5)

11.3.14 RPG10 sets out the broad development strategy for the period to 2016 and beyond. With specific reference to soil and land use, paragraph 3.76 explains that land quality is considered in various ways including its value for agricultural production. It goes on to refer to the ALC system which is used to grade agricultural land which forms the basis for classifying best and most versatile agricultural land. It also refers to further guidance contained within PPG7, which as explained above, has now been replaced by more recent guidance contained within PPS7.

11.3.15 Policy SS20 relates to Rural Land (including Urban Fringe) Uses. It states that local authorities and other agencies, in their plans, policies and proposals should, amongst other things:

> *"Conserve the region's best and most versatile agricultural land and associated soils in accordance with the guidance in PPG7; land of a poorer quality should be used in preference to higher quality except where other sustainability criteria suggest otherwise.*
>
> *Development Plans should set out policies on the level of protection from development, to be afforded to the best and most versatile agricultural land*

and associated soils in relation to other considerations such as landscape character, biodiversity and sustainability."

ii. Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes for Public Consultation (July 2008) (Ref. 11.6)

11.3.16 Chapter 7 deals with Enhancing Distinctive Environments and Cultural Life. Paragraph 7.13.17 relates to Best and Most Versatile (BMV) land and states:

"Best and Most Versatile (BMV) land needs to be taken into account alongside other sustainability considerations when deciding between sites. The BMV agricultural soils need to be protected from development because these are the most flexible in terms of the range of crops or produce that can be grown, and therefore the most valuable for current and future agricultural production. Given changes to Common Agricultural Policies (CAP) and the fact that this is driving businesses to become more economically efficient, it is important that the best land is protected, for possible future agricultural needs. In some circumstances, BMV land may be subject to development pressures, particularly in areas identified for growth in Sections 3 and 4."

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27th September 2007) (Ref. 11.7)

11.3.17 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with saved policies from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to soil and land use. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

11.3.18 Policy 7 relates to Agricultural Land and states:

"Subject to the overall aims of the strategy, provision should not be made for permanent development, excluding forestry and agricultural, involving the best and most versatile agricultural land (Grades 1, 2 and 3a) unless there are no alternative sites on lower quality agricultural land and there is on overriding need for development in that location. Where land in Grades 1, 2 and 3a does need to be developed there is a choice between different grades, development should be diverted towards land of the lowest grade."

11.3.19 The supporting text to Policy 7 explains that better quality agricultural land can be significantly more productive than other land, whatever the intensity of production, and that its protection from development is a material consideration in assessing proposals. Paragraph 4.31 goes on to state:

"Where provision has to be made for permanent development, it should preferably involve land falling into one of the lower grades of the ALC (Grades 3b, 4 or 5), as defined by the Ministry of Agriculture, Fisheries and Food. It must be recognised that this lower quality land can often be the richest in terms of biodiversity, archaeology and its contribution to the quality of the landscape. Where land in Grades 1, 2 and 3a has to be developed, the development should be directed towards land of the lowest grade. Provision for permanent development involving the best and most versatile agricultural land should only be made where there are no

alternative sites available on lower quality land and where there is an overriding need for development in that location. Consideration may also need to be given to the ecological value and nature conservation issues, particularly habitat and species protection, which affects lower grade agricultural land. This could inhibit or restrict its development potential and thus increase pressure for development on agricultural land of a higher grade. Where this occurs, a balance will need to be sought between the requirements of this policy and those of Policy 1: Nature Conservation, where the lower grade agricultural land has had a nature conservation designation applied to it."

d) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 11.8)

11.3.20 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific soils and land use designations.

11.3.21 There are no relevant saved policies relating to soils and land use impacts at the site

ii. Sedgemoor District Council Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 11.9)

11.3.22 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

11.3.23 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to Chapter 4 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the Core Strategy.

11.3.24 The following Core Strategy (Proposed Submission) policies are of potential relevance.

11.3.25 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to minimise the impact on natural resources, avoid pollution and incorporate the principles of sustainable construction to contribute to, amongst other things, soil protection.

11.3.26 Policy S4 (Mitigating the Causes and Adapting to the Effects of Climate Change) states that development should adapt to the effects of climate change through, amongst other things, protection of soils in order to ensure that they are resilient to the effects of climate change.

11.3.27 Policy D16 (Pollution Impacts of Development and Protecting Residential Amenity) states that development proposals that are likely to result in soil contamination that would be harmful to other land uses, human health, tranquillity, or the built and natural environment will not be supported.

iii. Supplementary Planning Guidance

11.3.28 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 11.10) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

11.3.29 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the Hinkley Point proposals both pre and post construction (page 44).

11.3.30 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the consultation draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** of the ES for a full summary of the position regarding the status of the draft HPC SPD.

11.3.31 The draft HPC SPD provides advice in relation to the HPC Project, expanding upon the policy context for the proposals, which includes associated development.

11.3.32 The draft HPC SPD does not set out any specific guidance in relation to soils and land use impacts at the site.

11.3.33 Further planning policy context is provided in the Legislative and Planning Policy Context chapter (**Volume 1, Chapter** 4 of the ES) and the Introduction to **Chapter 1** of this volume of the ES.

11.4 Methodology

11.4.1 The assessment has been conducted in accordance with standard guidance for England and Wales and detailed in Sections 11.4. (b, c and d) of this chapter. This Chapter addresses the likely impacts of the development during the construction, operational and post-operational phases of the proposed development.

a) Study Area

11.4.2 The geographical extent of the study area for the assessment includes:

- the area of the site;
- surrounding land within 25m of the site as, given the scale of proposed earthworks, surrounding land use and boundary hedgerows and trees, it is within this radius that any potential impacts associated with soil erosion or dust emissions are considered likely to occur; and
- agricultural drainage ditches and field drainage systems which are contiguous with drainage ditches and drainage systems within the site.

11.4.3 The study area above is illustrated in **Figure 11.1**.

b) Baseline Assessment

11.4.4 Existing soil and land use conditions have been characterised from two types of data generation:

- desk-based review of web-based resources, published maps and documents; and
- information received through consultation.

11.4.5 Desk-based studies were carried out in accordance with best practice and standard methodologies where applicable.

i. Desk Based Review

11.4.6 Baseline information on the following subjects was obtained from existing published literature and from web-based information:

- soil types (information obtained from Findlay (1965) (Ref 11.11), The Soils of the Mendip District of Somerset. Memoir of the Soil Survey of England and Wales, and the Soil Survey of England and Wales (1984) Soils and Their Use in South West England. SSEW Bulletin No 14, and associated Map Sheet No 5 (Ref. 11.12));
- preliminary Agricultural Land Classification (ALC) grades (information obtained from mapping provided on the Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.defra.gov.uk)) and obtained on 22 February 2011 (Ref. 11.13)); and
- agri-environment schemes (Environmental Stewardship Agreements and Countryside Stewardship schemes) (information obtained from mapping provided on the MAGIC website) (www.magic.defra.gov.uk)) and obtained on 22 February 2011 (Ref. 11.13).

ii. Field Survey

11.4.7 As this site lies over a former landfill and has been used as playing fields with associated vehicle parking for some period of time, the land is classified as non-agricultural land. Hence no field survey is required to determine soil type or agricultural land classification.

iii. Agricultural Land Classification (ALC)

11.4.8 ALC involves grading agricultural land quality into five different classes (see **Appendix 11A**). The site is classed as non-agricultural land and hence does not have an ALC Grade. ALC Grades for land adjoining the site were determined from web-based data held by Natural England (Ref. 11.13) which provides broad-scale mapping of ALC grades across England.

iv. Land Use Crops and Stock

11.4.9 Land use, including agricultural cropping and stocking, was determined from published data (Ref. 11.16) and photographic evidence. Since the site comprises a former landfill comprising made ground, now used as playing fields and a car park, the land is classified as non-agricultural land and supports no crops or livestock.

c) Consultation

11.4.10 Consultation has been undertaken throughout the EIA process and further information may be found in the **Consultation Report.** Consultation on soil, land use and agricultural issues has formed part of the overall consultation process, particularly as it relates to: (a) terrestrial ecology; (b) surface water; and (c) landscape issues. Specific consultation has taken place with the Animal Health Division of Defra with regard to the potential presence of animal burial pits and with Natural England with regard to agri-environment schemes and ALC data. Responses from consultees during both formal and informal consultation have been taken into account.

d) Assessment Methodology

11.4.11 Whilst soil loss and land degradation can have adverse consequences, for example in relation to agricultural production, water quality and biodiversity, there are no established or published methods for assessing the impacts of development upon soils, land use or agricultural receptors. The criteria used in this assessment are the ALC Grades as set out by the former Ministry of Agriculture, Fisheries and Food (MAFF) (1988) (Ref 11.14).

11.4.12 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. The magnitude of impacts and receptor value/sensitivity are assessed using criteria that are specific for soil, land use and agriculture (set out below); then their significance of impacts is assessed using an Impact Assessment Matrix (IAM) which combines the magnitude of impact and receptor value/sensitivity assessments specific to soil, land use and agriculture as well as professional judgement. As explained in **Volume 1, Chapter 7** of this ES, impacts rated as negligible or minor are considered to be acceptable without further mitigation.

11.4.13 The assessment addresses the likely impacts of the proposed development during the construction, operational and post-operational phases. The operation and post-operational phases of the development are not expected to have any further impact on land use and soils beyond those caused during construction. The assessment of impacts on soils and land use relates to the following key factors:

- the soil types, their quality and agricultural land classification likely to be affected by the proposed development;
- the type of farm enterprises present and farming practices including any agri-environment schemes; and
- the possible presence of crop/soil/animal diseases or noxious weeds.

i. Receptor Value and Sensitivity

11.4.14 All of the soil, land and agricultural receptors that may be impacted by the proposed development have been assigned a level of importance in accordance with the quality of the soil and the ALC grade of land as set out in **Table 11.1**. ALC Grades are described in **Appendix 11A**. Where a receptor could reasonably be placed within more than one value and sensitivity rating, conservative professional judgement has been used to determine which rating would be applicable. The sensitivity of a soil to stripping, handling and stockpiling has been taken into consideration, specifically where particular soil types or soil Wetness Classes (**Appendix 11B**) make them especially vulnerable to damage and loss of viability when handled. In such cases the *sensitivity* of a soil may be assessed as high, even though its *value* as an agricultural soil may be medium.

Table 11.1: Guidelines for the Assessment of Receptor Value and Sensitivity

Value and Sensitivity	Guidelines
High	**ALC and agricultural productivity:** Grade 1 agricultural land, specialised agricultural activity such as horticultural crops, soft fruit, etc. Irrigated agriculture. Higher level agri-environment scheme lands. **Soil Conditions:** (i) Value for Agriculture Soils with low or no wetness limitation affecting workability (wetness class I or II[1]), where drought is also not a limitation. (ii) Vulnerability to damage. Soils with a high susceptibility to structural damage and soil erosion throughout the year, including heavy textured, poorly structured soils.
Medium	**ALC and agricultural productivity:** Grades 2 and 3a agricultural land. Annual horticultural cropping (non-irrigated). Entry level agri-environment scheme lands. **Soil Conditions:** (i) Value for Agriculture Soils with low wetness limitation affecting workability (wetness class II), where drought is not a limitation. (ii) Vulnerability to damage. Soils with some seasonal susceptibility to structural damage and soil erosion.
Low	**ALC and agricultural productivity:** Grade 3b agricultural land. Arable or grassland areas. **Soil Conditions:** (i) Value for Agriculture - soils with moderate wetness limitation affecting workability (wetness class III or IV); or (ii) Vulnerability to damage - soils with medium to coarse textures and some resistance to soil structural damage for most of the year.

[1] The definition of soil Wetness Classes (WC) is provided in **Appendix 11B**.

Value and Sensitivity	Guidelines
Very low	**ALC and agricultural productivity:** Agricultural land of Grades 4 or 5 Arable or grassland areas. **Soil Conditions:** (i) Value for Agriculture Soils with high wetness limitation affecting workability (wetness class V or VI). Soils in which droughtiness is a limitation to crop growth; or (ii) Vulnerability to damage Coarse textured and stony soils with little potential for soil structural damage.

11.4.15 In addition to the receptors described in **Table 11.1**, agricultural stock (off-site grazing animals) and pets have been identified as possible receptors in relation to the very specific issue of potential (unrecorded) animal burial pits within the site and the risk of exposure to disease from these pits, if present and accidentally disturbed. This is also addressed in **Volume 4, Chapter 12** of this ES, with regard to human receptors. Stock animals and pets are considered to be high value/sensitivity receptors.

ii. Magnitude of Impact

11.4.16 The magnitude of impact has been based on the consequences that the development would have upon soils, land and agricultural receptors and has been considered in terms of high, medium and low (see **Table 11.2**). Where an impact could reasonably be placed within more than one magnitude rating, conservative professional judgement has been used to determine which rating would be applicable.

11.4.17 There is no published guidance on thresholds for assessing what scale of loss is a significant loss of agricultural land, but the presence of best and most versatile land (BMVL) is a factor in the consideration of the sustainability of development proposals as set out in Paragraph 28 of PPS7 (Ref. 11.3). PPS7 promotes the creation of a sustainable countryside framework, and places the loss of best and most versatile land within the context of meeting wider sustainability objectives. The assessment of magnitude of impact provided in **Table 11.2** is based on: (a) generic guidelines used throughout this assessment **(Volume 1, Chapter 7, Table 7.5)**; (b) timescales of permanent or temporary (both long and short term) loss of agricultural land; and (c) land area loss thresholds previously adopted by MAFF (Ref. 11.14) when considering proposals involving more than 20ha of best and most versatile land and also land not classified as BMVL, but still given over to agricultural use.

Table 11.2: Guidelines for the Assessment of Magnitude

Magnitude	Guidelines
High	Permanent or long-term (>10 years) loss of >50ha of best and most versatile agricultural land/entire regional/ resource of best and most versatile land (ALC Grades 1, 2, 3a). (50ha being the size of a moderate to large sized land holding according to Defra statistics for Somerset)*.Existing land use will not be able to continue.
Medium	Medium to long-term (5-10 years) loss of 20-50ha of best and most versatile land, or large proportion of local resource of BMVL. (20-50ha being the size of a moderate sized land holding according to Defra statistics for Somerset)*. Existing land use will be able to continue but noticeable changes (such as a measureable loss of yield, additional land management or increased fertilising) would occur.
Low	Temporary (<5 years) loss of 10-20ha of best and most versatile land, or large proportion of local resource of BMVL. (10-20ha being the size of a small to moderate sized land holding according to Defra statistics for Somerset)*. Existing land use will be able to continue but noticeable changes (such as the need for additional land management, increased fertilising or reduced cropping choices) would occur.
Very Low	Temporary short-term (<2 years) loss of <10ha of BMVL. (0-10ha being the size of a small sized land holding according to Defra statistics for Somerset)*. Short-term adverse changes to the value of the soil, land use or agricultural receptor but recovery is expected in the short-term (0-1 years), and there would be no impact on its integrity. No material change to existing land use. Loss or degradation of area of BMVL but a small proportion of local resources. No impact on overall agricultural land availability for wider area/region.

** Data taken from the Defra - June National Census of Agriculture and Horticulture (Land Use and Livestock on Agricultural Holdings at June 1 2010), England – Final Results (Ref. 11.15).*

11.4.18 Potential impacts have been considered in terms of permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

11.4.19 A permanent impact is considered irreversible and, consequently, often represents an impact of high magnitude. The sources of impact may arise during construction or operation.

iii. Significance of Impacts

11.4.20 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed receptor sensitivity and/or importance. The method for significance of the impacts, without mitigation, is outlined in **Volume 1, Chapter 7** of this ES. An Impact Assessment Matrix (IAM) is provided for this purpose, to assist professional judgement. The assessment of impact significance is the most important step in the EIA process, since it is this which is used to determine whether mitigation is required and also to determine whether mitigation measures have reduced the impact to an acceptable residual level. It considered that only those impacts assessed as being greater than minor adverse which require mitigation.

iv. Residual Impacts

11.4.21 The final step in the EIA process is the assessment of the residual impacts after the implementation (where necessary) of the proposed mitigation measures. In this assessment, residual impacts assessed as minor or negligible are considered to be acceptable for the project.

v. Cumulative Impacts

11.4.22 **Volume 1, Chapter 7** of this ES refers to the methodology used to assess cumulative impacts. Additive and interactive effects between impacts generated within the site boundary and study area are assessed within this chapter. Cumulative impacts that consider activities and impacts generated at distance from the site and study area are considered in **Volume 11** of this ES; this assesses the HPC Project-wide cumulative impacts and in-combination impacts with other proposed or reasonably foreseeable projects.

e) Limitations, Constraints and Assumptions

11.4.23 It has been assumed for the purposes of the assessment that soil quality, type and ALC grade for the Bridgwater area follows that described in the following published sources:

- Findlay (1965) The Soils of the Mendip District of Somerset. Memoir of the Soil Survey of England and Wales (Ref. 11.11).
- Soil Survey of England and Wales (1984) Soils and Their Use in South West England. SSEW Bulletin No 14 and associated Map Sheet No 5 (Ref. 11.12).
- Envirocheck Report 2011 (Ref: 11.16).
- MAGIC (Multi-Agency Geographic Information for the Countryside) website (www.magic.gov.uk) (Ref. 11.13).

11.4.24 The information relating to Countryside Stewardship and Environmental Stewardship Schemes has been obtained from the 'indicative' map information provided in the online MAGIC interactive map system.

11.4.25 Defra has no records of animal burial pits within the site; however, this does not eliminate the possibility that unrecorded pits may be present.

11.5 Baseline Environmental Characteristics

a) Introduction

11.5.1 This section describes the soil, land use and agricultural baseline for the site. Descriptions of baseline conditions with respect to contaminated soils and ground and surface waters are provided within **Chapters 12** and **13** respectively of this volume of the ES.

b) Study Area Description

i. Site Overview

11.5.2 The development site is 1.9ha in size, located above a former landfill and is mainly occupied by sports pitches and hard standing (car parks) with mature screening vegetation around the northern and eastern boundaries.

ii. Soil Types

11.5.3 The site is not considered to have a 'natural' soil type. The surrounding land comprises other sports pitches, built up urban land, roads and a railway line. No agricultural land lies adjacent to the site. The underlying ground conditions of the site

are described in detail in **Chapter 12** (Land Contamination and Groundwater) of this volume of the ES.

iii. Agricultural Field Drainage

11.5.4 As the site is not in agricultural use, there is no agricultural field drainage within the site itself and no connections to any adjacent, off-site, agricultural drainage systems. The site will contain artificial drainage for the sports pitches and to manage car park and site run-off.

iv. Historic Land Use

11.5.5 Information derived from historical mapping data (Ref. 11.16), and interpreted in **Chapter 12** of this volume of the ES, indicates that since 1889 when the site consisted of agricultural fields, it has subsequently been used for clay extraction, infilled as a domestic landfill site, restored to 'pasture/grazing' land in 1979 and finally developed as playing fields. There is no current evidence of a historic small pond formerly present on site.

v. Agricultural Land Classification (ALC)

11.5.6 The site is classified as non-agricultural land as it largely comprises artificially created sports pitches and hard-standing. Adjoining land is also not classified as agricultural land.

vi. Agricultural Activity and Crops

11.5.7 The land use is primarily recreational with some small areas of woodland/scrub along the site's northern and eastern boundaries. There is no agricultural land use or cropping within the site.

11.5.8 There are no agricultural buildings and no agricultural tracks or farm access routes within the site.

vii. Agri-environment Schemes

11.5.9 The site and surrounding land is not part of any agri-environment scheme.

viii. Other Environmental Designations

11.5.10 There are no other environmental designations for soils and land use within the site.

ix. Common Land

11.5.11 There are no areas of common land within or adjacent to the site.

x. Invasive and Alien Weed Species

11.5.12 Invasive weed species such as Japanese knotweed are not currently widespread or invasive within the proposed development site.

c) Identification of Soil and Land Use Receptor Value and Sensitivity

11.5.13 The value and sensitivity of soil and land use receptors identified within or immediately adjacent to the site are described in **Table 11.3**. There is no generic guidance for attributing value and sensitivity criteria to soil and agricultural receptors. That provided in **Table 11.3** is based on professional judgement of the quality (for agriculture) and sensitivity (to structural damage) of *in situ*, pre-development topsoil.

Table 11.3: Value and Sensitivity of Soil and Land Use Receptors at the Site

Receptor	Value/ Sensitivity	Comment
Agricultural Land Classification Grade *On-site land*	None/Not Applicable	No agricultural soils within the development footprint.
Agricultural Land Classification grade *Off-site land*	None/Not Applicable	Determined in relation to the potential of the adjoining off-site land, in terms of broad-scale mapping of ALC, for productive farming activity.
Topsoil *in situ* quality and condition (i.e. vulnerability to damage) *On-site soils*	Very low	Most of site covered by sports or soft landscaping. Small area of woodland covered soils fringing the development area.
Topsoil *in situ* quality and condition (i.e. vulnerability to damage) *Off-site soils*	Very low	Determined in relation to general soil type and wetness class in the area and potential vulnerability to damage through physical disturbance of adjoining off-site land.
Agricultural Crops and grazed grassland *On-site grassland and crops*	None/Not applicable	No on-site agricultural crops present.
Agricultural crops and grazed grassland *Off-site grassland and crops*	None/Not applicable	Determined in relation to the broad-scale mapping of ALC grade of the land and the type(s) of grassland/crop(s) present.
Agricultural stock, and pets (e.g. dogs) Off-site grazing animals	High	Determined in relation to the sensitivity of stock and (potentially) household pets to diseases from disturbed animal burial pits.
Agricultural field drainage system *Off-site land*	Very low	Determined in relation to the need to maintain continuity and efficacy of drainage systems in adjacent (off-site) agricultural fields.

11.6 Assessment of Impacts

a) Introduction

11.6.1 This section assesses those aspects of the proposed development which would impact upon soil, land use and agricultural receptors within the study area.

11.6.2 Impacts are assessed in relation to proposed development activities, identified soil and land use receptors and relevant legislation and policy as described in Section 11.2 of this chapter. Hence, impacts affecting BMVL (Grades 1, 2 and 3a), soil quality, agri-environment schemes and animal health are considered in line with PPS7 (Ref. 11.3.) The potential for the proposed development to cause a breach of the WCA (as amended) in relation to the spread of noxious and invasive weeds is assessed.

11.6.3 A summary of identified impacts and mitigation measures is provided in **Table 11.4**.

b) Construction Impacts

11.6.4 Although there is only a thin layer of soil, and no natural soil profiles on site, the topsoil from the existing rugby pitch will be stripped, temporarily stockpiled on site and used in soft landscaping within the proposed development.

i. ALC and Loss of Agricultural Soils

11.6.5 Within the site there will be no impacts on agricultural soils or land use as the site is not in agricultural use. There will be no loss of agricultural land as a result of the proposed development and no impacts on crops or grazed grassland or farming activity.

11.6.6 Similarly, as the surrounding (off-site) land is not in agricultural use, there will be no off-site impacts on agricultural soils.

11.6.7 Since there are no natural soils on site and it is anticipated that stripped soils would be reused to create areas of landscaping very soon after stripping, no adverse impacts are anticipated in relation to soils on site.

ii. Agri-Environment Schemes

11.6.8 None of the land within the site belongs to any agri-environment scheme and as a result there will be no impacts on agri-environment schemes.

iii. Adjoining Land from Invasive and Noxious Weed Species

11.6.9 The areas of bare ground created during site construction works provide opportunities for colonisation by a variety of plant species, including potentially noxious and invasive weeds. If left uncontrolled, these could potentially spread beyond the site on to adjacent land areas and cause an offence under the WCA (Section 11.3). Such an impact is unlikely as the hard standing and managed sports pitches on site offer relatively few opportunities for colonisation and, due to the pattern of weed dispersal, would affect a relatively small area of land in close proximity to working areas. Such an impact is readily reversible and short-term.

11.6.10 It is both a legal requirement and standard construction good practice to implement prevention and control measures (such as regular site inspection) to avoid the establishment and spread of invasive and noxious weed species. The magnitude of impact is therefore assessed as very low, affecting adjacent land receptors assessed as being of very low value/sensitivity. The impact significance is assessed as being **negligible adverse**.

iv. Animal Health from Exposed Animal Burial Sites

11.6.11 No animal burials are recorded within the site and the potential impact magnitude is assessed as very low. The likelihood of encountering or accidentally disturbing unrecorded old burial sites is considered to be unlikely. The potential impacts on humans should previously unrecorded burial sites be discovered are addressed in **Chapter 12** of this volume. With regard to non-human receptors (including livestock, pets and working dogs), the value/sensitivity of animals exposed to disease from disturbed burial pits is considered to be high. Livestock and other animals would not be present within working areas, but may be present on public paths and on adjacent land and hence there is the possibility (albeit unlikely) of exposure to disease from

burial sites should an unrecorded pit be accidently disturbed during works. The significance of impact is, therefore, assessed as **minor adverse**.

v. Changes to Agricultural Field Drainage Systems

11.6.12 During ground clearance, soil stripping and earthworks activities, existing drainage systems within the site would be temporarily disrupted or lost. This could result in temporary flooding or at least waterlogging of adjacent (off-site) but non-agricultural land. This impact has been considered fully in **Chapter 13** of this volume of the ES and the **Bridgwater C Flood Risk Assessment**.

c) Cumulative Construction Impacts

11.6.13 There would be no cumulative construction impacts on soil, land use and agricultural receptors.

d) Operational Impacts

11.6.14 There would be no operational impacts on soil, land use and agricultural receptors.

e) Cumulative Operation Impacts

11.6.15 There would be no cumulative operation impacts on soil, land use and agricultural receptors.

f) Post-Operation Impacts

11.6.16 There would be no post-operational impacts on soils, land use and agricultural receptors.

g) Cumulative Post-Operation Impacts

11.6.17 There would be no cumulative post-operational impacts on soil, land use and agricultural receptors.

11.7 Mitigation of Impacts

a) Introduction

11.7.1 This section describes the proposed mitigation measures to manage and reduce the identified impacts on soil resources and current land uses within and in the immediate vicinity of the site during the construction, operational and post-operation phases.

11.7.2 For the purpose of this assessment, mitigation measures are required where an impact of moderate or major significance would occur or is predicted to occur. No specific mitigation is proposed for impacts whose significance is assessed as minor or negligible, as these levels of impact are considered to be acceptable.

11.7.3 Environmental impacts and disturbance arising from construction activities will be managed through a range of control measures and monitoring procedures, the principles of which are outlined in the **Environmental Management and Monitoring Plan** (EMMP) and detailed in the associated Subject-Specific Management Plans (SSMPs). General good practice measures to protect adjacent land from the indirect impacts of dust generation, changes to surface water run-off and sediment deposition

would be implemented as part of the management plans for the site. These are more fully described in **Chapter 10**, Air Quality and **Chapter 13**, Surface Water of this volume.

11.7.4 Procedures would be implemented as part of the **EMMP** to ensure appropriate biosecurity (disease and pest control) and weed control to protect adjacent land.

11.8 Residual Impacts

11.8.1 A summary of identified residual impacts and mitigation measures is provided in **Table 11.4.**

11.8.2 No impacts on soil, land use and agricultural receptors were identified in relation to the construction, operational and post-operational phases of the proposed development. The residual impact significance of all impacts is assessed as **negligible**.

Table 11.4: Summary of Impacts

Receptor	Potential Impact	Magnitude	Description	Value/Sensitivity	Significance	Proposed Mitigation/ Best Practices	Residual Impacts
On-site ALC or agricultural land quality (agricultural land use potential)	Impacts on ALC and loss of agricultural soils	None	N/A	None/Not Applicable	N/A	N/A	N/A
Agricultural land use	Impacts on agri - environment schemes	None	N/A	None/Not Applicable	N/A	N/A	N/A
Adjoining land (non-agricultural)	Impacts on adjoining land from invasive and noxious weed species	Very low	Indirect Adverse Temporary	Very low	Negligible	No specific mitigation required. As part of standard good working practice – controls on working as part of EMMP	Negligible
Off-site grazing animals, agricultural stock, pets	Impacts on animal health from exposed animal burial sites	Very low	Indirect Adverse Temporary	High	Minor	No specific mitigation required. As part of standard good working practice – controls on working as part of EMMP	Minor

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CHAPTER 12: GEOLOGY, LAND CONTAMINATION AND GROUNDWATER

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APPENDICES

Appendix 12A: Landmark Envirocheck Report (Order Number 29572368_1_1)

Appendix 12B: Structural Soils Ltd. (SSL) (September 2011), 'Factual Report on Ground Investigation at Associated Developments Bridgwater C Campus, Phases I, II and III'.

Appendix 12C: CLEA v1.06 Model Runs for Residential Land Use Scenario without Home Grown Produce Scenario

Appendix 12D: Ammoniacal Nitrogen Conversion Calculations

12. GEOLOGY, LAND CONTAMINATION AND GROUNDWATER

12.1 Introduction

12.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential geology, land contamination and groundwater impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus, referred to hereafter as the proposed development, on land referred to by EDF Energy as Bridgwater C (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

12.1.2 A glossary of the terminology used in this chapter is provided in **Volume 1** of the ES.

12.2 Scope and Objectives of Assessment

12.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees, including the Environment Agency, Sedgemoor District Council (SDC) and Somerset County Council (SCC), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

12.2.2 The assessment of geology, land contamination and groundwater impacts has been undertaken adopting the methodologies described in **Volume 1, Chapter 7** of this ES, and Section 12.4 of this chapter.

12.2.3 For soil, this chapter discusses impacts on soil from contamination only; refer to **Chapter 11** of this volume for a detailed assessment of the impacts of the proposed development on soil as a result of physical disturbance and handling.

12.2.4 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through desk based assessments (DBA) and intrusive site investigations, and are described in Section 12.5 of this chapter.

12.2.5 Geology, land contamination and groundwater impacts are presented in Section 12.6 of this chapter, and appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance are identified in Section 12.7 of this chapter. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 12.8 of this chapter.

12.2.6 Cumulative geology, land contamination and groundwater impacts arising from the proposed development in combination with other elements of the Hinkley Point C (HPC) Project and other proposed projects are identified and assessed in **Volume 11** of this ES.

12.2.7 The objectives underlying the geology, land contamination and groundwater impact assessment were to:

- identify the extent and value/type of geology, groundwater and likelihood of land contamination within the study area which may be affected by, or be relevant to, the proposed development;
- characterise the baseline geological, groundwater and land contamination conditions for the site and surrounding area (i.e. the study area);
- assess the potential impacts of the proposed development on geology, groundwater and land contamination within the study area;
- identify mitigation measures, if considered necessary, to reduce the potential negative impacts of the proposed development on geology, land contamination and groundwater; and
- assess the residual impacts of the construction, operational and post-operational phases of the proposed development on geology, land contamination and groundwater.

12.3 Legislation, Policy and Guidance

12.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential geology, land contamination and groundwater impacts associated with the construction, operational and post-operational phases of the proposed development.

12.3.2 As stated in **Volume 1, Chapter 4** of this ES, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs. The need to assess the impact of nationally significant energy infrastructure on geological sites and groundwater is referred to in NPS EN-1, sections 5.3 and 5.15. This is repeated in section 3.9 of NPS EN-6.

12.3.3 In addition, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

12.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical

assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

12.3.5 There is no European Union (EU) legislation which is directly relevant to the subjects of geology and land contamination apart from the Environmental Liability Directive (2004/35/EC) (Ref. 12.1). There are various pieces of EU Legislation which are relevant to groundwater quality, and indirectly relevant to land contamination. The most relevant of these to the proposed development are the:

- Water Framework Directive (2000/60/EC) (Ref. 12.2).
- Groundwater Directive (80/68/EEC) (Ref. 12.3).
- Nitrates Directive (91/676/EEC) (Ref. 12.4).

i. Environmental Liability Directive (Ref. 12.1)

12.3.6 The Environmental Liability Directive is based on the 'polluter pays' principle and requires EU member states to impose obligations and liabilities on operators whose activities cause or threaten environmental damage. Environmental damage specifically includes land contamination where there is a significant risk of adverse effects to human health.

12.3.7 The Environmental Liability Directive requires an operator to take preventative, as well as remedial, measures. It applies both to damage that has occurred and where there is an imminent risk of it occurring, but does not apply to damage that occurred prior to 30 April 2007. The Environmental Liability Directive is implemented in England by the Environmental Damage (Prevention and Remediation) Regulations 2009 (SI 2009/153) (Ref. 12.5).

ii. The Water Framework Directive (Ref. 12.2)

12.3.8 The overall purpose of the Water Framework Directive (WFD) is to establish a framework for the protection of surface fresh water, estuaries, coastal water and groundwater. The objectives of the WFD are to enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, promote the sustainable use of water, reduce pollution of water (especially by 'priority' and 'priority hazardous' substances), and ensure progressive reduction of groundwater pollution.

12.3.9 The main features of the WFD are:

- Member states should take all necessary measures to ensure that groundwater quality does not deteriorate and to prevent the input of pollutants to groundwater.
- Discharges of hazardous substances must cease or be phased out within 20 years of their identification as a priority hazardous substance.
- All inland and coastal waters within defined river basin districts must reach at least good status by 2015. The Directive defines how this should be achieved through

the establishment of environmental objectives and ecological targets for surface waters.

12.3.10 The WFD incorporates an associated annex which comprises a list of 33 priority substances including 13 priority hazardous substances. This annex has now been replaced by the Directive on Priority Substances (2008/105/EC) (Ref.12.6) which also includes a list of substances for which it should be investigated whether they should be included in the list of priority substances or priority hazardous substances. In July 2006 the European Commission published a proposal for a directive on environmental quality standards in the field of water policy (COM 2006 397) (Ref. 12.7), which would set limits on concentrations in surface waters for priority substances.

12.3.11 The WFD will ultimately lead to the repeal of several other long standing key directives including on the Protection of Groundwater from Dangerous Substances (80/68/EEC) (Ref. 12.3) and Substances Discharged into the Aquatic Environment (76/464/EEC) (Ref. 12.8).

12.3.12 In England and Wales, the WFD primarily implemented through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Ref. 12.9). The Regulations establish a system of river basin management planning. The water bodies of England and Wales have been allocated to river basin areas depending on catchment areas and a plan drawn up for each. The plans contain a programme of measures tailored to each catchment designed to ensure its water bodies achieve and maintain the appropriate status in accordance with the timelines set out in the WFD.

12.3.13 As part of the ongoing implementation of the WFD, the Environment Agency has recently been given the power to apply environmental standards to individually defined WFD water bodies via the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 (Ref. 12.10). The thresholds and descriptions of water body typology within these Directions are largely based upon the research work by the United Kingdom Technical Advisory Group (UKTAG).

iii. Groundwater Directive (Ref. 12.3)

12.3.14 The Groundwater Directive aims to protect groundwater against pollution caused by dangerous substances. The Directive requires the prevention of the discharge of List I substances (now 'Hazardous' substances) to groundwater, and the investigation of List II substances (now 'Non-Hazardous' substances) prior to direct or indirect discharge. The Directive is due to be repealed in 2013 by the WFD (2000/60/EC) (Ref. 12.2). The Directive is primarily implemented in England and Wales by the Environmental Permitting (England and Wales) Regulations 2010 (SI 2010/675) (Ref. 12.11).

12.3.15 The EU has also adopted the Directive on the Protection of Groundwater Against Pollution and Deterioration (2006/118/EC) (Ref. 12.12). The aim of this Directive is to ensure good groundwater quality by 2015, in line with the requirements of the WFD. The Directive sets out specific measures for preventing and controlling groundwater against pollution and deterioration.

iv. Nitrates Directive (Ref. 12.4)

12.3.16 The Nitrates Directive requires member states to identify waters which are or could become polluted by nitrates and to designate as Nitrate Vulnerable Zones (NVZs) all land draining to those waters and contributing to the pollution.

12.3.17 The following criteria are laid down in the Directive for use in identifying polluted waters:

- surface freshwaters which contain or could contain, if preventative action is not taken, nitrate concentrations greater than 50mg/l;
- groundwaters which contain or could contain, if preventative action is not taken, nitrate concentrations greater than 50mg/l; and
- natural freshwater lakes, or other freshwater bodies, estuaries, coastal waters and marine waters which are eutrophic or may become so in the near future if protective action is not taken.

b) National Legislation

i. Geology

The Wildlife and Countryside Act 1981 (Ref. 12.13)

12.3.18 The Wildlife and Countryside Act (WCA) as amended by the Countryside and Rights of Way Act 2000 (Ref.12.14) covers the protection of wildlife, the countryside, National Parks and the designation of protected areas, and Public Rights of Way (PRoW). It provides the designation of Sites of Special Scientific Interest (SSSIs), which are areas of special scientific interest by way of their flora, fauna, or geological or geophysical features, as well as National Nature Reserves (NNRs) or Marine Nature Reserves (MNRs).

12.3.19 Specific guidelines have been produced for SSSIs to protect their special interest from damage or deterioration. Consultation with the appropriate conservation agencies must be made prior to any development or activities which could impact these sites. They are subject to legal protection and are managed to conserve their habitats or to provide special opportunities for scientific study.

ii. Land Contamination

12.3.20 There are several items of legislation and/or guidance that aim to deal with the prevention of land and groundwater contamination and those which aim to address and remediate or rectify contamination once it has occurred. As with EU legislation, several of these regulations are more indirectly relevant to the control and prevention of contaminated land. Examples of indirectly relevant regulations are listed here for reference but are not discussed in detail within this chapter:

- Control of Pollution (Oil Storage) (England) Regulations 2001 (SI 2001/2954) (Ref. 12.15).
- Nuclear Installations Act 1965 (Ref. 12.16).

Environmental Protection Act 1990 Part 2A (Ref. 12.17)

12.3.21 The key piece of legislation which is directly relevant to contaminated land in the UK is Part 2A of the Environmental Protection Act (EPA) 1990 and associated Contaminated Land Regulations (England) 2006 (SI 2006/1380) (Ref. 12.19). The Environment Act 1995 added Part 2A to the Environment Protection Act 1990 and Part 2A came into force in 2000. This contains the primary legislation in relation to identifying, assessing and where necessary determining liability for the remediation of contaminated land and groundwater in England and Wales. Part 2A (as it is more commonly known) created a statutory definition of 'Contaminated Land' as:

> *"Any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*
>
> *a) significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *b) pollution of controlled waters is being, or is likely to be, caused."*

12.3.22 Further to the legislation described above, a consultation report was issued by Defra in 2010 (Ref. 12.18), which stated proposals for updating and revising the Statutory Guidance (Ref. 12.17). The consultation also includes proposed minor amendments to the Contaminated Land (England) Regulations 2006 (Ref. 12.19). The proposed updates and revisions provide guidance on how the Local Authority should go about deciding whether significant pollution of controlled waters is being caused, or whether there is a significant possibility of such pollution being caused. The consultation period for the consultation report was held between December 2010 and March 2011.

12.3.23 Part 4 A.37 of Defra circular 01/2006 (Ref. 12.20) states that land should not be designated as contaminated land where:

- a substance is already present in controlled waters;
- entry into controlled waters of that substance from the land has ceased; and
- it is not likely that further entry would take place.

12.3.24 Section 86 of the Water Act 2003 (Ref. 12.21) sets out an amendment to this definition by introducing the thresholds of "significant pollution of controlled waters" and "significant possibility of significant pollution of controlled waters". However, this section is not yet in force and the Government has not announced an anticipated commencement date.

12.3.25 Tables A and B of the statutory guidance provided in Department of Environment, Food and Rural Affairs (Defra) circular 01/2006 define statutory receptors under Part 2A, which include:

- human beings;
- various ecological systems and designated ecological sites;

- property including crops, produce, livestock and wild animals which are the subject for shooting or fishing rights; and
- buildings.

12.3.26 The Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 2006 (SI 2006/1379) (Ref. 12.22) extended Part 2A to include some, but not all, land contaminated by radioactive substances. The regulations only apply to radioactivity arising from historical practice or works activity not naturally occurring (e.g. radon is a naturally occurring radionuclide). The regulations reserve to the Health and Safety Executive (HSE) the power to deal with radioactive contaminated land on a site licensed under the Nuclear Installations Act 1965 (Ref. 12.16). The Radioactive Contaminated Land (Modification of Enactments) (England) (Amendment) Regulations 2007 (SI 2007/3245) (Ref. 12.23) add the category of radioactive contaminated land caused by off-site nuclear occurrences. Radioactive Contaminated Land (Modification of Enactments) (England) (Amendment) Regulations 2010 (SI 2010/2147) (Ref. 12.24) extended Part 2A further again to include radon and radionuclides present as a result of radioactive decay, where they are the result of the after-effects of a radiological emergency or a past activity.

12.3.27 The application of Part 2A to radioactive contamination differs in some respects from its application to non-radioactive contamination. In particular, in relation to radioactive contamination, the definition of 'Contaminated Land' is modified such that it only covers harm to human health and not pollution of controlled waters, and there is no requirement for such harm to be 'significant' as for non-radioactive contamination.

Environmental Damage (Prevention and Remediation) Regulations 2009 (Ref. 12.5)

12.3.28 The Environmental Damage (Prevention and Remediation) Regulations 2009 (Ref. 12.5) implement the provisions of the Environmental Liability Directive (Ref. 12.1) in England. The Regulations follow the provisions of the Directive closely and accordingly impose obligations and liability on operators for environmental damage caused or threatened by their activities, specifically including damage to land by contamination by substances, preparations, organisms or micro-organisms that results in a significant risk of adverse effects on human health. The Regulations only apply to damage that takes place after the Regulations come into force on 1 March 2009.

Environment Agency Pollution Prevention Guidelines (Ref. 12.25)

12.3.29 A number of Pollution Prevention Guidelines (PPG) (Ref. 12.25) have been produced by the Environment Agency, covering a range of subject areas. They aim to provide practical advice to industry and the public on legal responsibilities, and good environmental practice and management to prevent pollution of surface water, groundwater and land from activities such as storage of oils and fuels, refuelling activities, construction and demolition, fire water management and vehicle washing.

Environment Agency Contaminated Land Report (CLR 11), Model Procedures for the Management of Land Contamination (Ref. 12.26)

12.3.30 Environment Agency CLR 11 (Ref. 12.26) provides the technical framework for applying a risk management process when dealing with land impacted by contamination. The technical approach presented in the Model Procedures is designed to be applicable to a range of non-regulatory and regulatory contexts. These include:

- development or redevelopment of land under the planning regime;
- regulatory intervention under Part 2A of the Environment Protection Act 1990;
- voluntary investigation and remediation; and
- managing the potential liabilities of those responsible for individual sites or a portfolio of sites.

UK Best Practice Guidance

12.3.31 In addition to the above legislation and policies, there is a large amount of UK best practice guidance which is relevant to geology and land contamination. Some of the key pieces of guidance documents are summarised below (this list is not intended to be exhaustive):

- BS10175:2001 Investigation of Potentially Contaminated Sites - Code of Practice (Ref. 12.27). This guidance was re-issued in March 2011; however the 2001 version of the guidance was current and applicable at the time of the intrusive investigations.
- BS5930:1999+A2:2010 Code of practice for site investigations (Ref. 12.28).
- EN ISO 14688-1:2002 Geotechnical investigation and testing - Identification and classification of soil - Part 1: Identification and description (Ref. 12.29).
- BS EN ISO 10381-2:2002 Soil Quality - Sampling - Part 2: Guidance on sampling techniques (Ref. 12.30).
- Department of Environment. Prioritisation and categorisation procedure for sites that may be contaminated. Contaminated Land Report 6 (Ref. 12.31).
- Environment Agency. Human health toxicological assessment of contaminants in soil. (Science Report SC050021/SR2) (Ref. 12.32).
- Environment Agency. An ecological risk assessment (ERA) framework for contaminants in soil (Ref. 12.33).

iii. Groundwater

12.3.32 The WFD, Groundwater Directive and Nitrates Directive are implemented in the UK through a series of primary (Acts) and secondary legislation (Regulations), including those detailed below.

The Environmental Permitting (England and Wales) Regulations 2010 (Ref. 12.11)

12.3.33 The Groundwater Regulations 1998 (SI 1998/2746) (Ref. 12.34) came into force in 1999 and implemented the 1980 EU Groundwater Directive (Ref. 12.3). The Regulations are designed to protect groundwater from pollution arising mainly from industrial and agricultural activities. These were replaced on 31 October 2009 by the Environmental Permitting (England and Wales) Regulations 2010 (Ref.12.11) which harmonise the regulations with the Groundwater Directive (2006/118/EC) (Ref. 12.12).

12.3.34 The main activities likely to lead to a direct or indirect discharge of hazardous substances (formerly List I) or non-hazardous pollutants (formerly List II) require formal authorisation. Direct discharges of hazardous substances are prohibited. Activities which may result in indirect discharges (from tipping or disposal) or hazardous substances may only be authorised if prior investigation shows the groundwater is permanently unsuitable for other uses. Such authorisation should contain conditions to ensure that necessary technical precautions are taken to prevent an indirect discharge of hazardous substances. Non-hazardous discharges would only be authorised with conditions if prior investigation can demonstrate that groundwater pollution can be prevented. Where a discharge is authorised, the authorisation will specify the details of the discharge. Authorisations (permits) may be reviewed at any time.

12.3.35 A discharge may be leachate from waste materials or leakage from an above or below ground storage tank, a soakaway and other sources.

12.3.36 It is an offence to *"cause or knowingly permit"* the discharge of hazardous substances or non-hazardous pollutants which might lead to their entering groundwater without an authorisation (permit).

Water Resources Act 1991 (Ref. 12.35)

12.3.37 Part II of the Water Resources Act 1991 (WRA) (Ref. 12.35) covers the licensing of water abstractions, including groundwater. Section 29 of the WRA covers the exemption of 'construction dewatering' from the abstraction licensing regime by stating in 29(2) that:

> *"The restriction on abstraction shall not apply to any abstraction of water from a source of supply in so far as the abstraction…is necessary:*
>
> *(a) to prevent interference with any mining, quarrying, engineering, building or other operations (whether underground or on the surface); or*
>
> *(b) to prevent damage to works resulting from any such operations."*

12.3.38 The WRA also empowers the Environment Agency to undertake anti-pollution works in relation to controlled water (including groundwater) and recover the expenses involved from the person who caused or knowingly permitted polluting substances to

be present or pollution to have occurred. The Environment Agency may also serve a works notice upon such persons requiring them to undertake anti-pollution works.

Environment Agency Groundwater Protection: Policy and Practice (GP3) 2008 (Ref. 12.36)

12.3.39 The guidance document (Ref. 12.36) provides a framework for the regulation and protection of groundwater resources. It comprises a number of parts. Part 1 outlines the Environment Agency's approach to the management and protection of groundwater. Part 2 provides a technical framework which sets out key principles and concepts. Part 3 provides guidance in the tools available for analysing and assessing the risks to groundwater. Part 4 provides the Environment Agency's position and policies in respect to developments and other activities which may present a risk to groundwater. It also provides guidance on the key groundwater legislation and how to interpret it.

12.3.40 The GP3 policy is risk based. To assist in this, the Environment Agency has developed a series of Groundwater Vulnerability Maps and Source Protection Zones (SPZs). Vulnerability maps identify where a groundwater resource is at risk from pollution (should a pollution source exist) due to the nature of the soil, unsaturated zone or inherent characteristics of the aquifer. SPZs show the level of risk for water quality at an abstraction due to activity on or in the ground. The zones have three divisions, with SPZ1 closest to the source showing the area of highest risk.

12.3.41 The document contains a series of general and specific policies relevant to the proposed development, including:

- general approach to groundwater protection (including storage of pollutants);
- solid waste management;
- discharge of liquid effluents into the ground;
- diffuse sources;
- management of groundwater resources;
- river augmentation from groundwater;
- land contamination; and
- groundwater flooding.

c) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) (Ref.12.37)

12.3.42 PPS1 was published in 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

12.3.43 Paragraph 5 states that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things:

protecting and enhancing the natural and historic environment, the quality and character of the countryside, and existing communities.

ii. Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9) (2005) (Ref. 12.38)

12.3.44 PPS9 was published in 2005 and sets out planning policies on the protection of biodiversity and geological conservation through the planning system. The broad aim of the policy is to ensure that planning, construction, development and regeneration should have minimal impacts on biodiversity and geology and enhance it wherever possible.

12.3.45 Key objectives of PPS9 include (from page 2 of the policy):

> *"To promote sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, environmental and economic development, so that policies and decisions about the development and use of land integrate biodiversity and geological diversity with other considerations.*
>
> *To conserve, enhance and restore the diversity of England's wildlife and geology by sustaining and where possible improving the quality and extent of natural habitat and geological and geomorphological sites; the natural physical processes on which they depend; and the populations of naturally occurring species which they support."*

iii. Planning Policy Statement 23: Planning and Pollution Control (PPS23) (2004) (Ref. 12.39)

12.3.46 PPS23 is intended to complement the pollution control framework under the Pollution Prevention and Control Act 1999 and the Pollution Prevention and Control Regulations 2000. The policy sets out the importance of the planning system in determining the location of development which may give rise to pollution, either directly or indirectly. The policy also seeks to ensure that other uses and developments are not, as far as possible, affected by major existing or potential sources of pollution.

12.3.47 Paragraph 23 of PPS23 states that, in considering individual planning applications, the potential for contamination to be present must be considered in relation to the existing use and circumstances of the land, the proposed new use and the possibility of encountering contamination during development. Local Planning Authorities (LPAs) should satisfy themselves that the potential for contamination and any risks arising are properly assessed and that the development incorporates any necessary remediation and subsequent management measures to deal with unacceptable risks.

12.3.48 Paragraph 24 of PPS23 states that LPAs should pay particular attention to development proposals for sites where there is a reason to suspect contamination. If the potential for contamination is confirmed, further studies to assess the risks and identify and appraise the options for remediation should be required. Paragraph 25 of PPS25 advises that the remediation of land affected by contamination through the granting of planning permission (with the attachment of the necessary conditions)

should secure the removal of unacceptable risk and make the site suitable for its new use.

12.3.49 PPS23 also states that, amongst other things, the following matters may be material in the consideration of individual planning applications where pollution considerations arise:

> *"…the need to ensure that land, after development, is not capable of being determined as contaminated land under Part IIA of the EPA 1990 and that all unacceptable risks have been addressed;*
>
> *…the possible adverse impacts on water quality and the impact of any possible discharge of effluent or leachates which may pose a threat to surface or underground water resources directly or indirectly through surrounding soils;"* (page 12 of the policy)

iv. Consultation Paper on a New Planning Policy Statement - Planning for a Natural and Healthy Environment (2010) (Ref. 12.40)

12.3.50 In its final form, it is intended that this PPS will replace PPS9. The draft PPS contains policies to maintain and enhance, restore or add to biodiversity and geodiversity through the planning system. It includes policies to promote opportunities for the incorporation of beneficial biodiversity and geological features within the design of development, and to maintain networks of natural habitats by avoiding their fragmentation and isolation.

12.3.51 A key objective of this PPS is to bring together related policies on the natural environment and on open space and green spaces in rural and urban areas to ensure that the planning system delivers healthy sustainable communities which adapt to and are resilient to climate change and gives the appropriate level of protection to the natural environment (page 10 of the policy).

d) Regional Planning Policy

12.3.52 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001-2016 (2001) (Ref. 12.41)

12.3.53 RPG 10 sets out the broad development strategy for the period to 2016 and beyond. Policy EN1 (Landscape and Biodiversity) seeks the protection and enhancement of the region's internationally and nationally important landscape areas and nature conservation sites. The protection and, where possible, enhancement of the landscape and biodiversity should be planned into new development.

12.3.54 Policy RE1 (Water Resources and Water Quality) states that to achieve the long-term sustainable use of water, water resources need to be used more efficiently. The policy also states that local authorities, the Environment Agency, water companies and other agencies should seek to, amongst other things, protect groundwater resources.

ii. The Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes 2008-2026 (July 2008) (Ref. 12.42)

12.3.55 Chapter 7 deals with Enhancing Distinctive and Cultural Life. Policy ENV1 states:

> *"The quality, character, diversity and local distinctiveness of the natural and historic environment in the South West will be protected and enhanced, and developments which support their positive management will be encouraged. Where development and changes in land use are planned which would affect these assets, Local Authorities will first seek to avoid loss of or damage to the assets, then mitigate any unavoidable damage, and compensate for loss or damage through offsetting actions. Priority will be given to preserving and enhancing sites of international or national landscape, nature conservation, geological, archaeological or historic importance. Tools such as characterisation and surveys will be used to enhance local sites, features and distinctiveness through development, including the setting of settlements and buildings within the landscape and contributing to the regeneration and restoration of the area."*

12.3.56 Policy RE6 (Water Resources) states that the region's network of ground, surface and coastal waters and associated ecosystems will be protected and enhanced. It also advises that surface and groundwater pollution risks must be minimised so that environmental quality standards are achieved and where possible exceeded.

iii. Somerset & Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'Saved' from 27 September 2007) (Ref. 12.43)

12.3.57 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to geology, land contamination or groundwater impacts. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

12.3.58 Policy 1 (Nature Conservation) states that the biodiversity of Somerset and the Exmoor National Park should be maintained and enhanced. The greatest protection

will be afforded to nature conservation sites of international and national importance. In addition, Local Plans should include policies to maintain and enhance sites and features of local nature conservation importance including landscape features which provide wildlife corridors, links or stepping stones between habitats.

12.3.59 Policy 59 (Safeguarding Water Resources) states that protection will be afforded to all surface, underground and marine water resources from development which could harm their quality or quantity.

e) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'Saved' from 27 September 2007) (Ref. 12.44)

12.3.60 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific soils and land use designations.

12.3.61 There are no relevant saved policies relating to geology, land contamination or groundwater impacts at the site.

12.3.62 Policy PCS16 (Contaminated Land) outlines the policy for contaminated land. However, Policy PCS16 was not saved as part of the Secretary of State's Direction and therefore expired on 24 September 2007. The Council's schedule and reasoning for not saving Policy PCS16 confirms that this is superseded by more recent guidance contained within PPS23 (paragraphs 23 to 25).

ii. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission) (September 2010) (Ref. 12.45)

12.3.63 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

12.3.64 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the Core Strategy.

12.3.65 The following Core Strategy (Proposed Submission) policies are of potential relevance.

12.3.66 Policy S3 (Sustainable Development Principles) states that, amongst other objectives, development proposals will be supported where they contribute to meeting the following:

> *"Minimise the impact on natural resources, avoid pollution and incorporate the principles of sustainable construction to contribute to energy efficiency, renewable energy, waste reduction/recycling, the use of sustainably sourced materials, sustainable drainage, reduced water use, water quality and soil protection."*

12.3.67 Policy D16 (Pollution Impact of Development) states that development proposals that are likely to result in levels of air, noise, light or water pollution (including groundwater), vibration or soil contamination that would be harmful to other land uses, human health, tranquillity, or the built and natural environment will not be supported.

iii. Supplementary Planning Guidance

12.3.68 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 12.46) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

12.3.69 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the Hinkley Point proposals both pre and post construction (page 44).

12.3.70 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (Ref. 12.47) (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the draft HPC SPD.

12.3.71 The draft HPC SPD provides advice in relation to the HPC proposals, expanding upon the policy context for the proposals. This includes associated development.

12.3.72 The draft HPC SPD does not set out any specific guidance in relation to geology, land contamination and groundwater impacts at the site.

12.3.73 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4** of this ES) and the Introduction chapter (**Chapter 1** of this volume).

12.4 Methodology

12.4.1 The baseline environmental studies, surveys and impact assessment for geology, land contamination and groundwater have been conducted in accordance with relevant best practice and standard methodologies as identified under Section 12.3 of this chapter.

12.4.2 Many environmental aspects are interrelated; as such impacts from land contamination have the potential to impact a number of other environmental components (e.g. land contamination may impact upon groundwater, surface waters and/or ecology). For the purpose of this chapter, the impact assessment related to contamination is generally restricted to human health, ecology, crops and livestock, the built environment, soils environment and groundwater resources. **Chapter 13** of this volume presents a detailed assessment of the risks and mitigation measures associated with surface waters.

a) Study Area

12.4.3 The geographical extent of the study area for the assessment of geology, land contamination and groundwater includes:

- the site;
- all land within 500m of the site boundary in order to scope in any potential off-site sources of contamination as well as identify any off-site receptors potentially at risk of any contamination migrating off-site; and
- groundwater receptors up to 1km from the site boundary.

12.4.4 The site is illustrated in **Figure 1.1** in **Chapter 1** of this volume of the ES. **Figure 12.1** shows the study area including the 500m search area buffer. A full description of the proposed development is provided in **Chapter 2** of this volume.

12.4.5 The site comprises an area of approximately 1.9ha (comprising the main development area (area for accommodation campus) and a smaller area (highway works and bus stop)). Refer to **Chapter 2** of this volume of the ES for details.

b) Baseline Assessment

12.4.6 The baseline assessment for geology, land contamination and groundwater is based upon:

- review of desk based information;
- design and undertaking of intrusive investigations and surveys; and
- consultation and engagement with appropriate statutory bodies (e.g. Local Authority, Environment Agency and Natural England).

12.4.7 The following information sources have been used to establish the baseline environmental characteristics within the study area when undertaking this assessment:

- Ordnance Survey (OS) (2005) Landranger Map 1:50,000 scale 'Weston-Super-Mare, Bridgwater and Wells' Sheet 182 (Ref. 12.48).
- Envirocheck Report (**Appendix 12A**).
- Environment Agency 'What's In Your Backyard?' website (Ref. 12.49).
- Environment Agency Groundwater Vulnerability Map for Bridgwater (Ref. 12.50).
- British Geological Survey (BGS) 1:50,000 Sheet 295: Taunton (Ref. 12.51).
- BGS Taunton and the Quantock Hills. Memoir for sheet E295 (Ref. 12.52).
- Natural England Interactive map of SSSI Locations (Ref. 12.53).
- Somerset Geology Group - List of Local Geology (formerly RIG) sites (Ref. 12.54).
- Mott MacDonald (December 2010), 'Hinkley Point C Associated Development - Geotechnical and Geo-Environmental Phase 1 Desk Study Report' (Ref. 12.55).
- Structural Soils Ltd. (SSL) (September 2011), 'Factual Report on Ground Investigation at Associated Developments Bridgwater C Campus, Phases I, II and III' (**Appendix 12B**) (Ref. 12.56).
- AMEC Walkover Survey (January 2010) (Ref. 12.57).
- Environment Agency. Policy and Practice for the Protection of Groundwater. Vulnerability Map Series, 1:100,000 scale: Somerset Coast (Ref. 12.58).
- Environment Agency. Policy and Practice for the Protection of Groundwater. Regional Appendix - Wessex Region (Ref. 12.59).

12.4.8 In addition to the above sources and in accordance with accepted best practice (as identified under Section 12.3(b) 'National Legislation' of this chapter), the baseline conditions with respect to land contamination and groundwater have been determined through the development and subsequent validation of a Conceptual Site Model (CSM). A CSM has been produced to identify potential risks posed to human health and other receptors by sources of soil contamination which may be present on or close to the site.

12.4.9 A CSM is developed as an initial step in the process of assessing risk related to contaminated land and groundwater. A CSM is defined within the British Standard BS 10175 - Investigation of Potentially Contaminated Sites - Code of Practice (2011) (Ref. 12.60) as follows:

> *"Characteristics of a site that are relevant to the occurrence and potential effects of ground contamination that describe the nature and sources of contamination; the ground, groundwater, surface water, ground gases and volatile organic compounds (VOCs) that could be present; the environmental setting; potential migration pathways; and potential receptors."*

12.4.10 The CSM provides a three-dimensional picture of a site, presenting and illustrating the potential pollutant linkages that may exist at the site. A pollutant linkage may exist where a source of contamination is present that may interact with a receptor (target) via a pathway. The source, pathway and receptor are defined as follows:

- source - location from which contamination is, or was, derived;
- pathway - mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor; and
- receptor - persons, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).

12.4.11 The CSM is intended to evolve through the various phases of an investigation as more detailed information becomes available, allowing potential pollutant linkages to be validated or discounted. A site specific CSM has been produced and is presented from Section 12.5 of this chapter (Conceptual Site Model) below.

c) Consultation

12.4.12 Consultation has been undertaken throughout the EIA process and further information may be found in the **Consultation Report**. Consultation meetings were held with SDC, WSC and the Environment Agency to discuss all stages of the assessment including specific aspects of the associated development (e.g. intrusive investigation requirements).

12.4.13 The Animal Health Division of Defra has also been consulted about the potential presence of animal burial pits relating to 'foot and mouth' or other disease outbreaks (detailed in a letter dated 10 December 2009 (Ref. 42/01E/05)) (Ref. 12.61).

d) Assessment Methodology

12.4.14 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. In addition the following specific methodology was applied for the determination of receptor value and sensitivity (see **Table 12.1**) and of impact magnitude (see **Table 12.2**) for geology, land contamination and groundwater.

i. Value and Sensitivity

12.4.15 All of the geology, land contamination and groundwater receptors that may be impacted by the proposed development have been assigned a level of importance in accordance with those definitions set out in **Volume 1, Chapter 7** of this ES and with the definitions given in **Table 12.1**.

12.4.16 The assessment of potential impacts to soil quality as a result of physical disturbance and handling, and the impact of the loss of agricultural land, is presented within **Chapter 11** of this volume.

12.4.17 Where a receptor could reasonably be placed within more than one value and sensitivity rating, conservative professional judgement has been used to determine which rating would be applicable.

Table 12.1: Guidelines for the Assessment of Value and Sensitivity

Value and Sensitivity	Guidelines
High	**Geology** Geology has a national designation (e.g. SSSI) and/or geology has very low capacity to accommodate any change. **Land Contamination** Receptors of high sensitivity and high intrinsic value (e.g. humans, or habitats and ecology within area designated for conservation importance, groundwater abstraction). **Groundwater** Principal Aquifer with significant public water supply abstractions. Site is within Inner or Outer Source Protection Zones.
Medium	**Geology** Geology has a local or regional designation (e.g. Local Geological Site) and/or has low capacity to accommodate any change. **Land Contamination** Receptor of medium sensitivity and value (i.e. possesses key distinctive characteristics). **Groundwater** Principal Aquifer with significant public water supply abstractions. Site is within Catchment Source Protection Zone; or Secondary Aquifer with significant water supply abstractions. Site is within Inner or Outer Source Protection Zone.
Low	**Geology** Geology not designated but possesses key characteristics which may be locally important and/or has a high capacity to accommodate change. **Land Contamination** Receptor of low sensitivity and value (i.e. possesses some distinctive characteristics). **Groundwater** Secondary A Aquifer with water supply abstraction. Site is within Catchment Source Protection Zone.
Very Low	**Geology** Geology not designated and is non distinctive and/or is likely to tolerate the proposed change. **Land Contamination** Receptor of low sensitivity and value i.e. possesses no distinctive characteristics (e.g. subsoil used for engineering fills). **Groundwater** Secondary A/B Aquifer without abstractions in area of activity; or Unproductive.

12.4.18 The potential sensitivity of a human health receptor can be reduced through the application of standard good practices/control measures, as detailed in Section 12.7 of this chapter.

ii. Magnitude

12.4.19 The magnitude of impact has been based on the consequences that the proposed development would have upon geology, land contamination and groundwater, and

has been considered in terms of high, medium, low and very low (see **Table 12.2**). Potential impacts have been considered in terms of permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

12.4.20 Where impact magnitude could reasonably be placed within more than one magnitude rating, conservative professional judgement has been used to determine which rating would be applicable.

Table 12.2: Guidelines for the Assessment of Magnitude

Magnitude of Impact	Guidelines
High	**Geology** Very significant permanent change to solid geology over the whole site so that it is unrecognisable when compared to the baseline conditions down to substantial depths below the ground surface. **Land Contamination** Soil contamination is considered to pose a high risk to potential receptors with one or more pollutant linkage certain to be present. Site certain to be deemed as Part 2A and/or considered unsuitable for use. **Groundwater** Very significant certain or likely change to key groundwater regime characteristics to the extent that National and European legislation is contravened. Change in groundwater level, quality or available resource usefulness is chronic, permanent or prolonged significantly beyond the activity causing the change, and irreversible. Permanent loss of aquifer as useful groundwater resource. Changes are spatially extensive beyond the area in which the impact may occur (e.g. drawdown into adjoining areas or contamination down gradient of site into adjoining areas).
Medium	**Geology** Significant permanent changes to solid geology over the majority of the site so that it is unrecognisable when compared to the baseline conditions down to substantial depths. **Land Contamination** Soil contamination is considered to pose a moderate risk to potential receptors with one or more pollutant linkages likely to be present. Site likely to be deemed as Part 2A and/or considered unsuitable for use. **Groundwater** Significant likely change to key groundwater regime characteristics to the extent that National and European legislation may be contravened. Groundwater quality may be affected permanently or at least for ten years. Change in groundwater level, quality or available resource usefulness is prolonged more than two years beyond the activity causing the change, and only reversible after significant remediation activity. Permanent or long term loss of aquifer as useful groundwater resource. Changes are spatially extensive beyond the area in which the impact may occur (e.g. drawdown into adjoining areas or contamination down gradient of site into adjoining areas).

Magnitude of Impact	Guidelines
Low	**Geology** Noticeable but not significant changes to the near surface geology (weathered material) covering a partial area of the site or a number of isolated locations. **Land Contamination** Soil contamination is considered to pose a low risk to potential receptors with one or more pollutant linkages possibly present. Site possibly deemed as Part 2A and/or considered unsuitable for use. **Groundwater** Possibility of noticeable but insignificant changes in groundwater levels or quality for more than two years, or significant changes for more than six months but less than two years, or barely discernible changes for more than two years. Reversible without external action required. Changes confined largely to the area of impact only. No contravention of National or European legislation.
Very Low	**Geology** Noticeable but insignificant changes to the near surface geology (weathered material only) at a small number of isolated locations across the site. **Land Contamination** Soil contamination is considered to pose a very low risk to potential receptors with one or more pollutant linkages unlikely to be present. Site unlikely to be deemed as Part 2A and/or considered unsuitable for use. **Groundwater** Barely discernible changes in groundwater levels or quality for more than two years, or noticeable but insignificant changes for more than six months but less than two years. Changes confined largely to the area of impact only and reversible without external action. Changes of lower magnitude than baseline seasonal changes. No contravention of National or European legislation.

iii. Significance of Impacts

12.4.21 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the receptor. The methodology to assess the predicted significance of impacts, without mitigation, is outlined in **Volume 1, Chapter 7** of this ES.

12.4.22 For the purpose of this assessment, mitigation measures have been produced where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

iv. Cumulative Impacts

12.4.23 **Volume 1, Chapter 7** of this ES refers to the methodology used to assess cumulative impacts. Additive and interactive effects between impacts generated within the site boundary and study area are assessed within this chapter. In addition, cumulative impacts that consider activities and impacts generated within the same catchment as the proposed development are assessed. Cumulative impacts that consider activities and impacts generated at distance from the site and study area are considered in

Volume 11 of this ES; this assesses the project-wide cumulative impacts and in-combination impacts with other proposed, or reasonably foreseeable projects.

v. Residual Impacts

12.4.24 The final step in the EIA process is the assessment of the residual impacts after the implementation (where necessary) of the proposed mitigation measures.

vi. Assessment Criteria

12.4.25 In addition to the qualitative assessment criteria defined above, where relevant, the description of baseline conditions and the assessment of the significance of potential impacts for land contamination have also included comparison to relevant generic environmental assessment criteria as identified in **Table 12.3**. The assessment criteria have been selected in order to assess the potential impacts which may be caused to receptors on-site and off-site as a result of land contamination and groundwater quality impacts, based on those receptors identified within the DBA (see Section 12.5 of this chapter for details).

Table 12.3: Generic Environmental Assessment Criteria

Environmental Media	Generic Screening Criteria
Soil	**Human Health Risk** Internally derived EDF Energy Soil Screening Values (SSV) using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model (v1.06), which has adopted all the same standard parameters the Environment Agency used to derive standard UK Soil Guideline Values (SGV) for a residential end use without homegrown produce scenario, with the exception of soil organic matter which has been set to 1% (**Appendix 12C**). Soil organic matter content for the site ranges from 0.2% to 30.1% (See Section 12.5); therefore this is considered an appropriate conservative approach (low SOM increases contaminant mobility and availability, and 1% SOM is generally accepted as a typical 'low' SOM, having been adopted in previous CLEA SGVs). Defra/Environment Agency 2002. Research and Development Publication SGV 10. Soil Guideline Values for Lead Contamination. BS3882:2007 Specification for topsoil and requirements for use. Hazardous Waste (England and Wales) Regulations 2005/Chemical (Hazard Information and Packaging Supply) Regulations 2002. **Built Environment Risk** Water Regulations Advisory Service (WRAS) Guidance Note 9-04-02 2002. The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land. Wessex Water Soil Survey Guidance. BRE Special Digest 1 (3rd Edition) (2005) Concrete in Aggressive Ground. **Phytotoxic Risk** Former Inter Departmental Committee for the Redevelopment of Contaminated Land (UK) (ICRCL) 59/83 (N.B. Paper withdrawn by Defra in 2004). Statutory Instrument 1989 No 1263, 'Sludge Use in Agriculture Regulations (1989) (pH value >7).

Environmental Media	Generic Screening Criteria
	Ecological Risk UK and international ecological/ecotoxicological Soil Screening Values. Environment Agency 'An ecological risk assessment (ERA) framework for land contamination,' October 2008. UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 7, Environmental Concentrations of Heavy Metals in UK Soil and Herbage and Report No. 9 Environmental Concentrations of Polycyclic Aromatic Hydrocarbons in UK Soil and Herbage.
Groundwater	River Basin Districts Typology, Standards and Groundwater Threshold Values (WFD) (England and Wales) Directions 2010. UK/EC/WHO Drinking Water Standards and Freshwater and Saline Environmental Quality Standards.
Ground Gas	CIRIA 665. Assessing risks posed by hazardous ground gases to buildings.

e) Limitations, Constraints and Assumptions

12.4.26 At the beginning of the EIA process, available information relating to geology and land contamination (including maps and surveys) was collated in order to undertake an initial desk-based assessment. Where appropriate, and following this assessment, site investigations and surveys were then undertaken in order to supplement this information.

12.4.27 Laboratory analysis was carried out by suitably accredited laboratories which have certified standards of quality control and assurance. The chemical analysis was undertaken by a MCERTS (Environment Agency's Monitoring Certification Scheme) and UKAS accredited laboratory. However, there may be some parameters within the testing suite for which accreditation is not currently available. The chemical analytical data, provided within **Appendix D** of the SSL report (Ref. 12.56) (**Appendix 12B**) presents details of the accreditation status for each of the analytical parameters. All sampling and analysis has been carried out in accordance with BS5930:1999 (Ref. 12.28) and BS10175:2001 (Ref. 12.27), including appropriate quality assurance methods. As such the analysis undertaken is considered to be reliable and representative of the baseline conditions.

12.4.28 The approach and methodology adopted for this chapter are considered to be consistent with relevant guidance (as identified under Section 12.3. The assessments made represent best professional judgment at the time of writing against the criteria specified.

12.5 Baseline Environmental Characteristics

a) Introduction

12.5.1 This section of the ES describes the baseline environmental characteristics for the site, with specific reference to geology, land contamination and groundwater. Distances stated to off-site features are from the site boundary.

12.5.2 The characteristics have been determined from desk-based and intrusive and non-intrusive investigations.

12.5.3 The initial intrusive site investigation was undertaken by Structural Soils Limited (SSL) on behalf of EDF Energy on the 8 and 9 December 2010, and the second phase of investigation took place between 22 March 2011 and 6 April 2011. The findings of the initial investigation and the supplementary investigations are summarised in a factual report produced by SSL (**Appendix 12B**) (Ref. 12.56). The investigations were undertaken in accordance with British Standards BS5930:1999 (Ref. 12.28) and BS10175:2001 (Ref. 12.27).

12.5.4 The initial intrusive investigation comprised the advancement of ten machine dug trial pits (TF01 to TPF10). The trial pit positions are shown in Figure 2 of the SSL report (**Appendix 12B**) (Ref. 12.56). The trial pits were advanced with the use of a mini-excavator to maximum depths of 1.0m below ground level (bgl) in order to determine the presence and nature of any capping material above landfill deposits across the site.

12.5.5 The secondary intrusive investigation works comprised the advancement of 11 sonic boreholes to maximum depths of 10.0m bgl (BHF01 to BHF10). The exploratory hole locations are identified in Figure 2 of the SSL factual report (**Appendix 12B**) (Ref. 12.56).

12.5.6 In addition, a non-intrusive geophysical survey of the site including resistivity tomography and ground conductivity was carried out by Terradat between 13 and 15 December 2010, in order to determine the extent and variability of landfilled wastes beneath the site. The results of the geophysical survey are presented in **Appendix E** of the SSL report (**Appendix 12B**) (Ref. 12.56).

12.5.7 Ground gas and groundwater level monitoring was subsequently undertaken on nine occasions from monitoring installations within seven of the 11 boreholes.

b) Study Area Description

12.5.8 The general location is described in **Chapter 1** of this volume of the ES.

i. Geology

Made Ground

12.5.9 The geological map for the area does not identify any areas of Made Ground within the study area. The Envirocheck Report (**Appendix 12A**) however, indicates that the site has been infilled. For further description see Section 12.5 of this chapter.

12.5.10 The initial intrusive investigations undertaken by SSL identified the presence of Made Ground deposits in all trial pits. The trial pits generally encountered topsoil over a layer of gravel, which was underlain by a Terram-type geotextile membrane. This was then found to overlie clays and gravels containing landfill type material (including plastic, ceramic, glass, brick, concrete, metal, wood, slate, fabric, tiles, bituminous roofing tiles, blue-white crystalline material (unknown content, possible cement bonded asbestos and slag)).

12.5.11 Landfill type wastes were confirmed in trial pits TPF01, TPF02, TPF03, TPF05, TPF08 and TPF10 (refer to Figure 2 in the SSL report (**Appendix 12B**) (Ref. 12.56)).

12.5.12 Made Ground deposits were identified in all of the 11 exploratory holes advanced by sonic drilling methods (BHF01 to BHF10), extending to between 2.80m bgl (BHF10) and 7.40m bgl (BHF02A and BHF03). Topsoil was identified extending to between 0.15m bgl and 0.30m bgl in all but two exploratory holes (BHF08 and BHF10), typically overlying clayey sandy gravel containing brick, limestone, concrete and ceramics and occasional 'coal waste'. A Terram-style geotextile membrane was noted in BHF02, BHF02A, BHF03, BHF04, BHF05, BHF07, BHF08 and BHF09 at a typical depth of 0.40m bgl.

12.5.13 Landfill type wastes were confirmed in the following boreholes:

- BHF01 (from 3.00 to 3.60m bgl, although recovery was poor above this depth) - Waste comprised brick and concrete with much metal and rare plastic and glass.
- BHF02 (from 1.60m bgl to 6.90m bgl) - Clayey gravelly melange of brick, limestone, metal, empty canisters, glass and wood fragments.
- BHF02A (from 1.45m bgl to 7.40m bgl) - Grey-black melange of clayey gravel of brick, concrete, glass, ceramics, metal shards, coal waste. White fabric material, glass and metal noted at 7.00m bgl.
- BHF03 (from 1.50m bgl to 7.40m bgl) - Sandy clayey gravel of limestone, brick, ceramic, wood, coal, metal and glass.
- BHF04 (from 1.10m bgl to 2.90m bgl) - Slightly gravelly clay with occasional metal and glass shards. Melange of wood, glass, metal, concrete and brick from 2.00m bgl to 2.50m bgl.
- BHF05 (from 2.30m bgl to 3.50m bgl) - Black silty melange of metal (shards, nails, pins), glass, wood, brick, concrete, plastic bags, bottle tops, clothing and possible medical dressings.
- BHF06 (from 2.20m bgl to 5.60m bgl) - Compacted metal chain link fence with black discolouration noted from 2.20m bgl to 2.35m bgl, overlying black melange of metal fragments, glass, concrete, ceramics and clothing.
- BHF07 (from 1.80m bgl to 5.20m bgl) - Grey/brown/black landfill material comprising concrete, glass, brick, plastic, ceramics and metal in a clayey matrix.
- BHF08 (from 1.50m bgl to 4.00m bgl) - Brown/grey clayey gravelly melange of wood, glass, concrete, brick, metal, ceramics, coal, clothing and plastic.
- BHF09 (from 1.80m bgl to 4.70m bgl) - Brown silty gravel of glass, metal fragments, brick, concrete, limestone, ceramics and rubber. Rubber matting from 1.80m bgl to 2.00m bgl.
- BHF10 (from 1.50m bgl to 2.80m bgl) - Sandy gravelly clay of fine to coarse concrete, glass, coal, limestone and brick.

12.5.14 Observations of potential contamination (further to the waste materials identified) were noted in the following exploratory holes:

- BHF02 - sheen noted on groundwater (strike at 2.70m bgl) and slight hydrocarbon odour.

- BHF02A - hydrocarbon odour noted at 2.00m bgl (distinct from groundwater strike at 2.70m bgl). Maximum reading of photoionisation detector (PID) was 33.0ppm at 2.00m bgl. A foul odour was also recorded at 6.75m bgl.
- BHF06 - strong diesel odour and a visual sheen associated with landfill materials from 2.35m bgl to 5.60m bgl. Slight hydrocarbon odour noted from 5.60m bgl to 6.00m bgl within underlying clay deposits.
- BHF09 - a hydrocarbon odour was noted at 1.00m bgl.

12.5.15 Records of three boreholes (BH1, BH3 and BH4) and five trial pits (TP1, TP2, TP3, TP5 and TP7) which were excavated in the vicinity of the site have been obtained from the BGS Geo-records service (Ref. ST33/NW/85, relating to a Geotechnics Limited investigation of the Bridgwater and Albion Rugby Football Club).

12.5.16 The Geotechnics Limited boreholes and trial pits indicate approximately 0.4m of topsoil overlying a 4.0m to 5.0m thickness of domestic waste comprising decomposed organic material and up to 70% fill material including ash, paper, wood, brick and glass. One of these boreholes, BH4 (located in the western part of the site), found Made Ground to extend to 5.30m below ground level (bgl) and to comprise soft and firm reddish brown silty clay with some fill materials (brick and ash) to 1.5m bgl, overlying domestic refuse comprising soft dark grey clayey silt with brick, glass, paper, metal and decomposed organic material. Other boreholes and trial pits, advanced to the west of the site, encountered Made Ground waste deposits extending to between 2.3m bgl and 4.3m bgl. Trial pit TP2, located to the south-west of the site, was noted to contain *'large patches of very oily silt'* between 0.25m bgl and 2.30m bgl.

Superficial Geology

12.5.17 The geological map for the area indicates that the site is entirely underlain by drift deposits consisting of Tidal Flat Deposits. This typically comprises fine grained deposits of silt and clay but may comprise poorly sorted sand and gravels within a fine grained matrix.

12.5.18 The initial intrusive trial pit investigations undertaken by SSL did not extend to depths beyond the Made Ground and therefore did not confirm whether natural superficial deposits were present.

12.5.19 Superficial deposits were encountered during the second intrusive phase in SSL boreholes BHF01, BHF02A, BHF03, BHF04, BHF05, BHF06, BHF07, BHF08, BHF09 and BHF10, at depths ranging from 2.80m bgl (BHF10) to 9.70m bgl (BHF03). The superficial deposits typically comprised very soft to stiff clay and silt, and colouration ranging from grey/bluish grey to orangish brown. A sand lense was encountered in BHF01 from 8.40m bgl to 8.80mbgl and BHF04 from 3.80m bgl to 4.00m bgl and 4.40m bgl to 4.70m bgl. Sand horizons were noted in BHF02A (9.87m to 10.00m bgl (termination depth)), BHF03 (9.70m bgl to 10.00m bgl (termination depth)), BHF05 from 8.00m bgl to 10.00m bgl, BHF08 from 8.00m bgl to 10.00m bgl (termination depth), BHF09 from 6.90m bgl to 10.00m bgl (termination depth).

12.5.20 Superficial alluvial deposits were encountered in a borehole advanced within the site (Geotechnics Limited borehole BH4 (BGS Geo-records service (Ref. ST33/NW/85)).

The borehole encountered very soft to soft medium grey silty slightly sandy clay with minor dark grey mottling, occasional decomposed organic root stems and thin layers of very silty, very sandy clay from 5.3m bgl to the borehole termination depth at 7.0m bgl. Trial pits and boreholes advanced by Geotechnics Limited to the west of the site but within close proximity to the site boundary encountered Tidal Flat Deposits at depths of between 1.6m bgl and 4.3m bgl.

12.5.21 Geotechnics Limited boreholes BH1 and BH3 (Geo-records service (Ref. ST33/NW/85)) located to the west of the site, encountered Tidal Flat Deposits comprising typically loose slightly clayey silty fine to medium grained sand from 7.2m bgl to 20.70m bgl (BH1) and from 7.0m bgl to 24.0m bgl (BH3). In borehole BH1, this horizon was found to overlie Tidal Flat Deposits comprising firm dark grey very silty, locally sandy clay to 23.90m bgl.

Solid Geology

12.5.22 The geological map for the area indicates that the site is underlain by solid geology of the Triassic Mercia Mudstone Group.

12.5.23 The Mercia Mudstone Group generally comprises grey and green mudstones and siltstones above reddish brown fissured mudstones and silty mudstones, often with greenish grey mottling.

12.5.24 Exploratory works undertaken to date by SSL have not extended to prove bedrock.

12.5.25 The Geotechnics Limited borehole records held by the BGS Geo-records service indicate that alluvium is underlain by stiff clay/red mudstone (interpreted as the Mercia Mudstone Group) from approximately 24m bgl.

12.5.26 According to current BGS data, the site is not located within a radon affected area, and thus protection measures with regard to radon are not required to be installed within new buildings. Further discussion is addressed in **Volume 2, Chapter 21** of this ES.

12.5.27 **Table 12.4** presents a summary of the ground conditions at the site, based on the results of intrusive investigation (**Appendix 12B**) (Ref. 12.56) and the Geotechnics Limited BGS Geo-records information.

Table 12.4: Lithostratigraphical Sequence within Study Area

Group and Formation		Thickness (m)	Typical Description
None	Topsoil	0.2 - 1.5	Turf over reddish brown silty topsoil with some fill material and with rootlets.
None	Made Ground	1.3 - 7.40	Domestic refuse comprising: soft dark grey clayey SILT with much fill material including brick, glass, paper, plastic, metal etc. and with much decomposed organic material. Geotechnics Limited TP2 observed black 'oily' silt.
None	Tidal Flat Deposits	0.5* - 21.39	Very soft - soft medium grey silty slightly sandy CLAY with minor dark grey mottling, occasional decomposed organic material and thin layers tending to very silty sandy CLAY.
Mercia Mudstone Group	Undifferentiated	0.15* - 0.5*	Very stiff reddish brown extremely closely fissured silty CLAY with occasional small patches altered blue grey.

*Maximum thickness of unit was not proven.

Mineral Extraction

12.5.28 The Somerset Minerals Local Plan (2004) (Ref. 12.62) indicates that the site does not lie within a Mineral Consultation Area (MCA) and is not impacted by any current approved Area of Permission for mineral workings.

12.5.29 One BGS recorded mineral site is located within the study area (Envirocheck Report, **Appendix 12A**), on the entire site. The listing relates to a ceased/disused clay pit. The area previously occupied by the pit has since been used for landfilling and subsequently redeveloped as sports pitches (used by Bridgwater and Albion Rugby Football Club).

Statutory Designations

12.5.30 There are no geological SSSIs, Local Geological Sites (formerly RIGS) or locally designated geological sites within the study area.

ii. Land Contamination

Site History

12.5.31 Historical Ordnance Survey (OS) maps were assessed at the British Library to review the history of the study area. The information obtained from each of the historical maps is detailed in **Table 12.5**.

12.5.32 Note that the distances to points of interest stated within this chapter relative to the site are identified with relation to the main site area identified in **Figure 1.1** of **Chapter 1** of this volume. The distances therefore exclude the smaller area of the site, in which modifications to the existing gyratory and the erection of bus shelters are proposed.

Table 12.5: Information from Historical OS Maps

Year (Scale)	Site Details
1889 (Not to scale)	The site is occupied by agricultural land, although the site boundaries are not defined. The Great Western Railway is located approximately 120m west of the site. The agricultural fields extend to the east and south and partially to the north and west. A small residential development named Sydenham Terrace is located approximately 90m to the north of the site. To the north-east of the site at an approximate distance of 120m is a circular feature, consistent with the appearance of a Tumulus, although this is not identified. A large building of industrial appearance (possibly railway related) is located 300m to the south of the site. The railway station is located approximately 400m to the south. A shrubbery is located approximately 90m to the north-west of the site.
1930 (Not to scale)	The land between the western site boundary and the Great Western Railway is occupied by 12 adjoining excavations. It is not known whether these contained water. A small excavation, possibly a pond, is present to the south-west of the site at a distance of 60m, which has narrow linear features (it is unclear whether these are artificial drainage ditches or field boundaries) trending to the north, east, south and west. The allotment gardens to the north-west have been replaced by a nursery, allotment gardens occupy a field adjacent to the eastern sector of the site and an iron and brass foundry is situated to the west of the site at a distance of approximately 180m.
1962 (1:10,560)	A series of excavations are shown to extend beyond the site boundary in all directions and are identified as being part of a 'Clay Pit'. It is unclear whether the excavations contain water. The land to the south and west of the site remains unchanged. Extensive residential development has occurred to the east of the site occupying the land previously utilised for allotment gardens. The excavations previously shown to the west of the site have been in-filled or are no longer marked.
1968 (Not to scale)	The majority of the site, previously occupied by part of an extensive 'Clay Pit', is now shown as marsh/scrub vegetation with a 'Refuse Tip' shown as occupying the western part of the site. A small pond is marked approximately 60m south-west of the site (as described in the 1930 map), which has associated linear drainage channels extending to the east, west and south. The land to the south and west of the site remains unchanged.
1979 (1:10,000)	The 'Refuse Tip' is no longer shown and the site appears to have been restored to pasture/grazing land. The final landform (post infilling) appears to be raised by approximately 2-3m above the surrounding land. Previously undeveloped land to the south-east of the site is now shown as 'Playing Fields'. The small pond to the south-west of the site and the associated drainage channels are still shown.
1991 (1:10,000)	The site remains largely unchanged. Two footpaths cross the site. The land to the south of the site, previously shown as 'Playing Fields', has been redeveloped to form part of 'Bridgwater College'. The area of land to the south and adjacent to the railway line has been developed to 'Playing Fields'. The small pond to the south-west of the site is no longer shown, although the north-south trending drainage channel previously associated with the pond is present. The remaining surrounding area is not significantly altered.

12.5.33 Mott MacDonald Limited has also reviewed the history of the study area, based on historical OS maps provided as part of a Landmark Envirocheck report (**Appendix 12A**). Their findings were similar to the information presented in **Table 12.5**, with the following additions:

- 1938 - a pit/pond additional to those marked on the 1930 historical map was noted encroaching onto the western site boundary, and a large works was noted at 240m to the north of the site (British Cellophane Works).
- 1966-1967 - a cattle market with an associated abattoir are shown approximately 190m to the north-west of the site.

12.5.34 Although the age and general activity/land use can often be determined from the layout of structures depicted on historical OS plans, specific elements of historical site operations cannot normally be determined from such maps. It should also be noted that historical mapping coverage is not a continuous record. It is possible that features of interest may have appeared and disappeared between coverage dates or, in some cases, may have predated available coverage.

12.5.35 The site has undergone significant changes from the initial usage as agricultural land. Part of the site has been excavated, most likely for clay extraction, before being in-filled and redeveloped as sports facilities (Bridgwater and Albion Rugby Football Club).

12.5.36 Planning history records held by SDC were reviewed to determine any potentially contaminative uses. There are a number of applications listed which relate directly to the site. These are all concerned with various alterations to the existing Bridgwater and Albion Rugby Football Club infrastructure or relate to Bridgwater College located to the south of the site. None of these applications are associated with potentially contaminative uses.

12.5.37 Two site walkover visits have been undertaken at the site; AMEC undertook a site walkover on 6 January 2010 (Ref. 12.57) and Mott MacDonald Limited undertook a site walkover on 20 May 2010 (Ref. 12.55).

12.5.38 The site is occupied by part of the Bridgwater and Albion Rugby Football Club. The site is predominantly flat and is slightly elevated in relation to the surrounding land, with minor slopes around the site boundaries. This potentially indicates that the entire site was in-filled after the western part of the site was used for clay extraction. Vehicular access to the site is possible via College Way from the northern site boundary.

12.5.39 The northern sector of the site includes a tarmac covered car park for spectators of rugby matches, with grassed verges and mature screening vegetation. The remainder of the site is occupied by a rugby pitch and floodlights.

12.5.40 The western site boundary is defined by the spectator stands for the adjoining rugby pitch. The north-eastern and eastern site boundaries are defined by trees and a small ditch, which was dry at the time of the AMEC walkover survey. A 2.5m high chain-link fence defines the southern boundary.

12.5.41 The site is located in the centre of Bridgwater. Bridgwater Town Football Club and Bridgwater College are located to the south of the site, both of which are accessed via College Way, which passes along the eastern boundary of the site. To the west and north-west of the site, on the opposite side of the railway line, are two small

industrial estates separated by A39 (Bath Road). The remainder of the surrounding area is generally in residential use.

12.5.42 No evidence of the historical presence of the small pond previously shown on historical mapping; and the former pits/ponds previously occupying the site and surrounding area were visible during the site walkover.

12.5.43 There are no records of Integrated Pollution Prevention and Control (IPPC) authorisations within the site. However, there is one record of an IPPC authorisation within the study area. This is held by Bridgwater Beef Company Limited, located at the cattle market approximately 190m to the north-west of the site. The authorisation relates to the slaughtering of cattle.

12.5.44 There are six records of Local Authority Pollution Prevention and Control (LAPPC) permits located within the study area. The nearest record is located approximately 340m to the north-east of the site and is held by UCB Cellophane for film coating processes. A permit is held approximately 540m to the north-west of the site by Premdor. The permit relates to the manufacture of timber, wood based products, particleboard and fibreboard. RMC Readymix Southwest Limited hold a LAPPC permit for the blending, packing, loading and use of bulk cement, located approximately 600m to the north-west of the site. J Sainsbury Plc hold a permit for a petrol filling station located approximately 550m to the west of the site and A1 MOT Centre hold a permit for waste oil burners located approximately 700m to the south of the site. The remaining permit is held by Broadway Petrol Filling Service Station, located approximately 600m to the west of the site.

12.5.45 A prosecution relating to authorised processes was made in March 2000. This related to a gas oil leak of approximately 35 gallons to ground on the site, located approximately 500m to the north of the site. The prosecution notice stated that although clean-up has taken place, oil is anticipated to still be in the ground.

12.5.46 There are no records of current landfill sites within the study area.

12.5.47 There are seven records of historical landfill sites within the study area, one of which is located within the site boundary. Bridgwater Borough Council operated a landfill site named Bath Road, which occupied the site. Waste received at the site included inert, industrial, commercial and household wastes from an unknown date until 1973. Historical maps indicate that this may have taken place from the early 1960s.

12.5.48 The closest off-site historical landfill site is named Bristol Road former landfill site, which is located approximately 210m to the north-west of the site. The licence was held by Readymix Concrete (RMC) Limited and the site was operated by Bridgwater Borough Council. Waste deposited at the site included inert, industrial, commercial and household waste which was deposited from 1978 until an unknown date. Another historical landfill site is identified as Cattle Market Tip, located on Union Street at approximately 300m to the north-west of the site. Further information with regard to this landfill is not available.

12.5.49 The ‘Pitt off the Drove’ site is located 480m to the north-west of the site, the ‘Land at Bristol Road’ approximately 570m to the north-west and ‘The Leggar’ approximately 550m to the west. The ‘Pitt off the Drove’ site was operated by S Roberts and Son

(Bridgwater) Limited from 1975 until 1977 and according to available records received inert waste. The 'Land at Bristol Road' site was operated by RMC Limited, and dates of waste deposition extended from 1978 until 1980. Wastes deposited at the site included inert and industrial wastes, specifically concrete sludge. Information on the dates of operation and wastes deposited at 'The Leggar' is not available.

12.5.50 A licensed waste management facility is located approximately 700m to the north-west of the site at 'Castlefields'. The licence was issued in 1999 to S Roberts and Son (Bridgwater) Limited for the transfer of household, commercial and industrial wastes, including scrap metal.

12.5.51 There are two records relating to petrol filling stations within the study area. Bridgwater Self Serve is located approximately 485m to the north-west of the site (listed as open) and Save Bridgwater filling station (listed as obsolete) is located approximately 355m to the west of the site.

12.5.52 There is one record of a Control of Major Accident Hazards (COMAH) site within the study area, registered to UCB Cellophane Limited, at approximately 360m north-east of the site boundary. The record is no longer supplied under COMAH Regulations. There is one record of Notifications of Installations Handling Hazardous Substances (NIHHS) located within the study area. This is also registered to UCB Cellophane Limited, positioned approximately 360m to the north-east of the site. The record is listed as Ceased to be Supplied under the NIHHS Regulations (1982). Note that operations at the UCB Cellophane Limited site have ceased and the site is in a derelict state and subject to demolition works at the time of writing.

12.5.53 There is one record of Planning Hazardous Substance Consents located within the study area. The record is M Thomas Management Limited, located approximately 225m to the south-west of the site. The consent relates to ammonium nitrate and ammonium nitrate compounds (where nitrogen content is more than 28% by weight) or aqueous ammonium nitrate solutions (where concentration of ammonium nitrate is more than 90% by weight). One record is also located just outside of the study area. This is for Courtaulds Films Limited, located approximately 550m to the north-east of the site, holds a consent for toxic substances (carbon disulphide).

12.5.54 The closest trade directory entry to the site is situated approximately 90m to the north-west of the site, and is listed to NWF Packaging for polythene and plastic sheeting supplies. The entry is listed as inactive. The closest active trade directory entries to the site are both situated to the west of the site at approximately 170m and 235m respectively, and are registered to Digimerch.com (printers) and Spot On car body repairs.

12.5.55 There are no authorisations for the keeping, storing or using of radioactive material within the study area.

12.5.56 There are no records of pollution incidents to controlled waters within the study area.

12.5.57 There are no discharge consents within the study area.

Animal Burial Pits

12.5.58 No animal burial pits relating to 'foot and mouth' or other disease outbreaks are recorded within the study area according to a consultation response letter issued by Defra Animal Health on 10 December 2009 (Ref. 42/01E/05) (Ref. 12.61).

12.5.59 However, it should be noted that burial pits were not registered before 1972 and individual animals could still be buried without registration up to the early 1990s. The potential for unrecorded burials being present within the site, although low, cannot be completely discounted.

Statutory Designations

12.5.60 The study area is not designated as Contaminated Land under Part IIA of the Environmental Protection Act 1990 (Ref. 12.17).

12.5.61 There are no sensitive land uses recorded within the study area (such as SSSIs, Ramsar Sites, Special Areas of Conservation, Special Protection Areas and National Nature Reserves).

12.5.62 The study area is not located within a Nitrate Vulnerable Zone for the protection of water quality.

Intrusive Investigation Findings

12.5.63 The initial, limited intrusive investigation undertaken within the site by SSL on behalf of EDF Energy (**Appendix 12B**) (Ref. 12.56) was conducted in order to prove the presence of a cap to the landfill underlying the site, and to provide information on the depth and condition of surface soils.

12.5.64 The initial exploratory works identified the presence of Made Ground in all ten exploratory locations, extending to a maximum proven depth of 1.0m bgl (the maximum depth to which the exploratory trial pits were extended).

12.5.65 Made Ground identified in the initial exploratory holes comprised typically red/brown slightly gravelly clay topsoil to depths of between 0.15m bgl and 0.55m bgl, overlying in some locations gravel of angular to subangular limestone. Anthropogenic materials were noted within the topsoil unit in TPF01, in the north of the site (plastic bottle and slate at 0.50m bgl), and TPF02, in the north-west of the site (ceramics and brick fragments from 0.15m to 0.40m bgl).

12.5.66 A Terram type geotextile liner was encountered underlying the topsoil and gravel layers in exploratory holes TPF03, (at 0.40m to 0.41m bgl), TPF04 (0.55m to 0.56m bgl) and TPF05 (055m to 0.56m bgl), TPF08 (0.55m to 0.56m bgl, and TPF10 (0.50m to 0.51m bgl. The geotextile liner was not encountered in TPF01, TPF02, TPF06, TPF07 and TPF09, although landfill type wastes were encountered directly beneath the topsoil/gravel horizon in TPF01 and TPF02. Figure 2 of the SSL report (**Appendix 12B**) (Ref. 12.56) shows the exploratory hole locations.

12.5.67 Landfill material was recorded in exploratory holes TPF01, TPF02, TPF03, TPF05, TPF08 and TPF10. This was found to vary significantly by location, and was found to

contain a range of waste materials (including plastic, ceramic, glass, brick, concrete, metal, wood, slate, fabric, tiles, bituminous roofing tiles, blue-white crystalline material (unknown), possible cement bonded asbestos and slag). The possible cement bonded asbestos materials were identified in TPF05, between 0.56m bgl and 0.80m bgl (the termination depth of the exploratory hole).

12.5.68 Natural soils (either alluvium or solid geology) were not proven in the initial SSL site investigation.

12.5.69 The results of the geophysical survey of the site presented in **Appendix E** of the SSL report (**Appendix 12B**) (Ref. 12.56) were considered by Terradat to indicate a broad range of conductivity values, reflecting significant lateral variation in electrical properties in the upper part of the landfill and capping materials. Broad zones of high conductivity were established which were considered to represent possible areas of thicker or wetter landfill material at shallow depth. These variations were considered to potentially relate to variations in landfill cap thickness, and/or landfill waste composition. Terradat considered that the results of the conductivity survey may indicate possible landfill cells or concentrations of waste caused by bunds or boundaries within the historic clay pits which were backfilled.

12.5.70 Terradat (**Appendix E** of **Appendix 12B**) (Ref. 12.56) considered that the results of the resistivity tomography survey suggested the presence of a zone of probable dry granular engineered fill to a depth of approximately 3.0m bgl, underlain by a zone of variable thickness (extending up to 6.0m bgl in places) which may be comprised of landfill wastes with possible leachate. The suspected landfill waste was considered by Terradat to be hosted within possible alluvial clay deposits, including narrow zones representing possible landfill cell bunds or boundaries between the historical clay pits. The lower levels of the resistivity sections were considered by Terradat to represent either an increase in clay mineral content of the lithologies present, or an increase in salinity. Terradat also considered that the results of resistivity survey were indicative of the absence of an HDPE liner in the landfill cap, which appears to be supported by the intrusive investigations undertaken by SSL.

12.5.71 The supplementary intrusive investigation undertaken by SSL identified Made Ground topsoil in boreholes BHF01, BHF02, BHF02A, BHF03, BHF04, BHF05, BHF06, BHF07 and BHF09, which was typically 0.2m in thickness. This topsoil was underlain by a geotextile liner at approximately 0.40m bgl in boreholes BHF02, BHF02A, BHF03, BHF04, BHF05, BHF07, BHF08 (0.70m bgl) and BHF09.

12.5.72 Made Ground comprising sandy gravel with some anthropogenic materials (typically brick, concrete and ceramic although ‘coal waste’ materials were also identified in BHF03) and/or gravelly clay was noted within boreholes BHF01, BHF02, BHF02A, BHF03, BHF04, BHF05, BHF06, BHF07, BHF08, BHF09 and BHF10 to maximum depths ranging from 1.45m bgl (BHF02A) to 3.00m bgl (BHF01).

12.5.73 Landfill type waste deposits were identified in the majority of borehole locations. Details of the depths at which wastes were identified, and the waste types present and records of observations of potentially contaminative materials found during the intrusive investigations are detailed earlier in this section.

12.5.74 Nineteen shallow soil samples (i.e. from within 1.0m bgl) and 39 deeper soil samples (i.e. from 1.0m bgl to 10.0m bgl) from the site were analysed in accordance with UKAS/MCERTS standards for arsenic, boron, beryllium, barium, cadmium, chromium, copper, iron, mercury, nickel, lead, selenium, vanadium, zinc, pH, total sulphur, water soluble sulphate, total cyanide, free cyanide, thiocyanate, speciated total petroleum hydrocarbons with Criteria Working Group banding (TPH CWG), speciated polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), benzene, toluene, ethylbenzene and xylenes (BTEX), phenols, visual fibre screen, fraction of organic carbon (FOC) and loss on ignition (LOI).

12.5.75 Six of the 19 shallow soil samples submitted for analysis (TPF01 from 0.6m bgl, TPF02 from 0.45m bgl, TPF03 from 0.90m bgl, TPF05 from 0.75m bgl, TPF08 from 0.80m bgl and TPF10 from 0.75m bgl) were taken from deposits logged as 'landfill material'. Figure 2 in the SSL report (**Appendix 12B**) (Ref. 12.56) identifies the respective sampling locations.

12.5.76 14 of the 39 deeper soil samples submitted for analysis were taken from deposits interpreted as 'landfill material' (BHF01 ES6 (3.5m bgl), BHF02 ES5 (2.0m bgl), ES7 (4.0m bgl) and ES9 (6.0m bgl), BHF03 ES7 (4.0m bgl) and ES9 (6.0m bgl), BHF04 ES5 (2.0m bgl), BHF05 ES6 (3.0m bgl), BHF06 ES7 (4.0m bgl) and ES9 (6.0m bgl), BHF07 ES7 (4.0m bgl), BHF08 ES6 (3.0m bgl), BHF09 ES5 (2.0m bgl) and ES6 (3.0m bgl)).

12.5.77 17 of the 39 deeper soil samples submitted for analysis were taken from natural superficial strata underlying the Made Ground (BHF01 ES12 (5.6m bgl) and ES19 (8.0m bgl), BHF02A ES3 (7.6m bgl), BHF03 ES12 (8.0m bgl) and ES15 (9.5m bgl), BHF04 ES10 (5.5m bgl), BHF05 ES7 (4.0m bgl), ES12 (6.5m bgl) and ES17 (9.5m bgl), BHF06 ES14 (9.0m bgl), BHF07 ES9 (6.0m bgl) and ES15 (9.0m bgl), BHF08 ES9 (5.0m bgl) and ES15 (9.0m bgl), BHF09 ES8 (5.0m bgl) and ES13 (7.5m bgl) and BHF10 ES8 (4.0m bgl)).

12.5.78 A generic Tier 1 risk assessment has been completed where observed concentrations of contaminants in soil have been compared against relevant and applicable soil guideline values (SGVs) or other generic assessment (or screening) criteria as appropriate. The results of shallow soils analysis (i.e. between surface and 1.00m bgl) are presented in **Appendix C** of the SSL report (**Appendix 12B**) (Ref. 12.56) and are summarised within **Table 12.6** and **Table 12.7**. The results of deeper soils analysis (i.e. 1.00m bgl and greater) are presented in **Appendix 12B** (Ref. 12.56**)**.

Human Health Risk Assessment

12.5.79 In October 2009 the Environment Agency released a new version of the CLEA Model (version 1.06) and also published revised toxicological and exposure methodologies (Technical Review 1 - A review of body weight and height data used within in the CLEA Model SC050021 (Ref. 12.63)) and have commenced a programme of updating existing SGVs and producing new guideline values.

12.5.80 The Environment Agency intend to publish revised SGVs and TOX reports for a list of priority substances identified by the SGV taskforce which includes many of the most commonly occurring contaminants. However, at the time of the data assessment

presented herein, the Environment Agency has published SGV reports and associated TOX reports for the following limited range of substances (2010); arsenic, nickel, mercury, selenium, cadmium, phenol, dioxins, furans and dioxin-like PCBs, benzene, xylenes, toluene and ethyl benzene.

12.5.81 The published SGVs are based on a sandy loam soil type with a Soil Organic Matter (SOM) of 6%. SOM data are not available for the study area; however fraction of organic carbon (foc) analysis has been undertaken on 18 samples of soil, with fractions ranging between 0.0009 and 0.1745. According to Environment Agency Briefing Note 7 (Ref. 12.64), SOM can be derived from foc via the following formula:

%SOM = foc x (100/0.58)

12.5.82 A range of Tier 1 Soil Screening Values (SSVs) have been derived by EDF Energy using the CLEA model (v1.06) (Ref. 12.63) and adopting identical input parameters and assumptions to those adopted by the Environment Agency in the published SGVs for residential end use (excluding homegrown produce), with the exception that the SOM has been reduced from 6% to 1% to provide a more conservative and appropriate site specific SOM. As the SOM for site soils ranges from 0.2% to 30.1%, this is considered to provide a suitably conservative approach. In the interest of conservatism, and to account for the longer term use of the site for residential use without individual garden areas, the CLEA standard residential critical receptor (a female child in the 0-6 year age group) has been adopted. This presents a conservative approach for the proposed development, as the main receptors would be adults associated with the construction of the Hinkley Point C power station and subsequently in connection with Bridgwater College. The CLEA model (v1.06) run output reports are provided as **Appendix 12C**.

12.5.83 The Land Quality Management Limited (LQM) and Chartered Institute of Environmental Health (CIEH) (Ref. 12.65) and Contaminated Land: Applications in Real Environments (CL:AIRE) (Ref. 12.66) documents present Generic Assessment Criteria (GAC) for a number of metals and organic contaminants, including the 16 EPA priority PAHs and TPH. LQM/CIEH have used the CLEA model v1.04 to derive their GACs, with CL:AIRE utilising the current CLEA model v1.06. The Tier 1 values derived by EDF Energy for these substances have been generated using the CLEA model (v1.06) and the same criteria and assumptions as the LQM/CIEH and CL:AIRE input parameters.

12.5.84 For the purpose of the human health risk assessment, the EDF Energy derived Tier 1 SSVs have been used for all metals (with the exception of lead) and speciated TPHs. In the absence of published Tier 1 SSVs for the remaining contaminants the following alternative sources have been used:

- for lead, the 2002 Environment Agency SGV (Ref. 12.67) has been used in the absence of a published UK alternative (the SGV has been withdrawn, however the toxicology report and methodology are still valid);
- for total/sum TPH the Hazardous Waste (England and Wales) Regulations 2005 (Ref. 12.68), inert waste threshold has been applied; and

- for pH, the value presented within the BS3882:2007 Specification for Topsoil and Requirements for Use has been applied (Ref. 12.69).

Phytotoxicity Risk Assessment

12.5.85 Contaminated land may pose a risk to plant establishment and growth (phytotoxicity). There are no published UK screening values for assessing phytotoxic risk therefore in order to undertake a Tier 1 assessment of risks to plants the thresholds recommended in the Sludge (Use in Agriculture) Regulations 1989 - Statutory Instrument 1989 No. 1263 (Ref. 12.70) for potentially phytotoxic contaminants copper, nickel and zinc have been used. Water soluble boron is also a potentially phytotoxic contaminant and in lieu of any other available guidelines the value provided by the former ICRCL Guidance Note 59/83 (paper withdrawn by Defra in 2004) has been used.

12.5.86 To assess the risk of pH impacts on plants the pH value presented within the BS3882:2007 Specification for Topsoil and Requirements for Use (Ref. 12.69) has been adopted as the Tier 1 assessment criteria.

Built Environment Risk Assessment

12.5.87 Contamination may pose risks to the built environment (e.g. buried water pipes and concrete). The thresholds recommended in the Water Regulations Advisory Scheme (WRAS) Guidance Note 9-04-03, The Selection of Materials for Water Supply Pipes to be laid in Contaminated Land (Ref.12.71), the Wessex Water Soil Survey Guidance (WWSSG) (Ref. 12.72) and the Building Research Establishment (BRE) Special Digest 1:2005, Concrete in Aggressive Ground (Ref. 12.73) have been used, in order to undertake a Tier 1 assessment of the risk to built environment receptors.

12.5.88 The WRAS Guidance Note (Ref.12.71) has recently been withdrawn and WRAS intends to prepare and publish a replacement Guidance Note making reference to UK Water Industry Research Ltd (UKWIR) guidance (Ref.12.74) which was issued in March 2011. It is not considered that potential changes to risk thresholds which may result from the updated Guidance Note would change the built environment impact assessment ratings or overall conclusions and recommendations of this ES chapter.

12.5.89 The comparison of the analytical results with the above guidance has enabled an initial assessment of the risk posed by the site soils to buried water services and concrete. Note that in terms of assessing the potential for soil contaminants to attack/degrade buried concrete, this assessment only provides an initial screening analysis on the basis of the pH conditions. A full assessment of the potential impact from the site materials on buried concrete, i.e. a full BRE Special Digest 1 assessment, is beyond the scope of this assessment.

Ecological Risk Assessment

12.5.90 Criteria for assessing risk to ecological systems are currently less well developed in the UK. In October 2008 the Environment Agency published an ecological risk assessment (ERA) framework for contaminated soils (Ref. 12.75) in collaboration with Defra, Natural England, Welsh Assembly Government, the Countryside Council

for Wales, local authorities and industry. The ERA framework (Ref. 12.75) contains guidance on the use of ecological Soil Screening Values (SSVs). **Table 17** of the framework (Ref. 12.75) provides proposed SSVs for selected contaminants. For those contaminants not covered by the Environment Agency document, the framework suggests using following alternative sources such as US EPA Eco SSLs (Ref. 12.76), Canadian Soil Quality Guidelines (Ref. 12.77), Oak Ridge National Laboratory Screening Benchmarks (Ref. 12.78) and/or Dutch RIVM Serious Risk Concentrations for Ecosystems (SRCeco) (Ref. 12.79).

12.5.91 The proposed SSVs given in the Environment Agency Guidance document (Ref. 12.75) and the other sources have been used as a Stage 1 screening tool to assess whether the concentrations of soil contaminants may pose a risk to ecology and ecosystems. These Stage 1 ecological SSVs are very conservative, i.e. highly precautionary. It should be noted that there are no statutory designated ecosystems within the study area.

12.5.92 A staged approach to the assessment of ecological risk has been adopted, whereby contaminant concentrations have initially been compared with the ecological SSVs described. Where concentrations exceed the relevant SSVs a further Stage 2 assessment has been carried out where contaminant concentrations have been compared to the English background concentrations recorded in rural soils as published by the Environment Agency in the UK Soil and Herbage Pollutant Survey Reports (Ref. 12.80 and 12.81).

12.5.93 **Table 12.6** and **Table 12.7** present the results of analysis of shallow soil analysis (i.e. samples taken from within the upper 1.0m below ground level (bgl)), during the initial exploratory investigation. **Table 12.8** and **Table 12.9** present the results of deeper soil sample analysis (i.e. from depths of 1.0m bgl and greater, taken during the second exploratory investigation phase).

Table 12.6: Summary of Chemical Analysis Results of Shallow Site Soils (Human Health, Phytotoxic and Built Environment Risk)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/ Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Arsenic	8 - 17	35.0[1]	-	50*	0 (19)	-	0 (19)
Cadmium	<0.5 - 0.8	17.7[1]	-	3	0 (19)	-	0 (19)
Total Chromium	9 - 29	627[1C]	-	600	0 (19)	-	0 (19)
Lead	15 - 309	450[2]	-	500	0 (19)	-	0 (19)
Mercury	<0.17 - 0.82	238[1 inorganic]	-	1	0 (19)	-	0 (19)
Copper	5 - 329	6,200[1]	200[8]	-	0 (19)	**1** (19)	-
Nickel	9 - 52	127[1]	110[8]	-	0 (19)	0 (19)	-
Zinc	45 - 649	40,400[1]	450[8]	-	0 (19)	**1** (19)	-
Selenium	<1 - 1	595[1]	-	3	0 (19)	-	0 (19)
Barium	36 - 540	1,340[1]	-	-	-	-	-
Beryllium	<1 - 2	-	-	-	-	-	-
Boron (water soluble)	<1.0 - 1.8	10,300[1]	3[4]	-	0 (19)	0 (19)	-
Iron	5,990 - 35,400	-	-	-	-	-	-
Vanadium	10 - 36	-	-	-	-	-	-
Cyanide (free)	<1 - 1	762[1, FC]	-	25[FC]	0 (19)	-	0 (19)
Cyanide (total)	<1 - 2	762[1, FC]	-	25[FC]	0 (19)	-	0 (19)
Thiocyanate	<2 - 11.1	-	-	50	-	-	0 (19)
Phenols (total)	<0.2	310[1 P]	-	5	0 (19)	-	0 (19)
Sulphur (total)	132 - 723	5000[4]	-	5000	0 (19)	-	0 (19)
Water soluble sulphate (g/l)	<0.01 - 0.05	-	-	0.5[10]	-	-	0 (19)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/ Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
pH (pH units)	7.2 - 8.5	5.5 - 8.5[3]	5.5 - 8.5[3]	<5 - >8	0 (19)	0 (19)	**10** (19)
Loss on Ignition (550ºC)	3.0 - 41.1	-	-	-	-	-	-
Fraction of Organic Carbon	0.0085 - 0.0512	-	-	-	-	-	-
Asbestos Screen	No fibres identified	Presence of fibres[9]	-	-	0 (19)	-	-
PAH (EPA 16 total)	0.03 - 51.5	100[5]	-	50			
Naphthalene	<0.01 - 0.17	1.64[1]	-	50	0 (19)	-	0 (19)
Acenaphthylene	<0.01 - 0.24	86.1^[1]	-	50	0 (19)	-	0 (19)
Acenaphthene	<0.01 - 0.38	57.0^[1]	-	50	0 (19)	-	0 (19)
Fluorene	<0.01 - 1.29	30.9^[1]	-	50	0 (19)	-	0 (19)
Phenanthrene	<0.01 - 10.7	36.0^[1]	-	50	0 (19)	-	0 (19)
Anthracene	<0.01 - 2.50	1.17^[1]	-	50	**1** (19)	-	0 (19)
Fluoranthene	<0.01 - 8.28	972[1]	-	50	0 (19)	-	0 (19)
Pyrene	<0.01 - 6.20	2,330[1]	-	50	0 (19)	-	0 (19)
Benzo(a)anthracene	<0.01 - 3.71	3.71[1]	-	50	0 (19)	-	0 (19)
Chrysene	0.03 - 5.41	8.84[1]	-	50	0 (19)	-	0 (19)
Benzo(b)fluoranthene	<0.01 - 2.18	6.99[1]	-	50	0 (19)	-	0 (19)
Benzo(k)fluoranthene	<0.01 - 2.49	10.1[1]	-	50	0 (19)	-	0 (19)
Benzo(a)pyrene	<0.01 - 3.19	1.00[1]	-	50	**3** (19)	-	0 (19)
Indeno(1,2,3-cd)pyrene	<0.01 - 2.49	4.17[1]	-	50	0 (19)	-	0 (19)
Dibenzo(a,h)anthracene	<0.01 - 0.89	0.865[1]	-	50	**1** (19)	-	0 (19)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/ Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Benzo(ghi)perylene	<0.01 - 1.66	46.8[1]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_5-C_7	<0.01	0.266[1,6]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_7-C_8	<0.01	607[1,7]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_8-C_9	<0.01	33.2[1(C8-C10)]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_9-C_{10}	<0.01	33.2[1(C8-C10)]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_{10}-C_{12}	<0.1	177[1]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_{12}-C_{16}	<0.1 - 15.0	169^[1]	-	50	0 (19)	-	0 (19)
TPH Aromatic C_{16}-C_{21}	<0.1 - 106	1,290[1]	-	50	0 (19)	-	**1** (19)
TPH Aromatic C_{21}-C_{35}	<0.1 - 221	1,330[1]	-	50	0 (19)	-	**2** (19)
TPH Aliphatic C_5-C_6	<0.01	29.8[1]	-	50	0 (19)	-	0 (19)
TPH Aliphatic C_6-C_8	<0.01	72.7[1]	-	50	0 (19)	-	0 (19)
TPH Aliphatic C_8-C_{10}	<0.01	18.8[1]	-	50	0 (19)	-	0 (19)
TPH Aliphatic C_{10}-C_{12}	<0.1 - 1.2	48^[1]	-	50	0 (19)	-	0 (19)
TPH Aliphatic C_{12}-C_{16}	<0.1 - 12.7	24^[1]	-	50	0 (19)	-	0 (19)
TPH Aliphatic C_{16}-C_{21}	<0.1 - 40.0	8.48^[1]	-	50	**1** (19)	-	0 (19)
TPH Aliphatic C_{21}-C_{35}	<0.1 - 55.0	8.48^[1]	-	50	**1** (19)	-	0 (19)
Total TPH (Sum aliphatic/aromatic)	<0.1 - 451	500[5]	-	50	0 (19)	-	**2** (19)
Benzene	<0.01	0.266 [1]	-	50	0 (19)	-	0 (19)
Toluene	<0.01	607[1]	-	50	0 (19)	-	0 (19)
Ethylbenzene	<0.01	167[1]	-	50	0 (19)	-	0 (19)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/ Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
M- & P-Xylene	<0.01	53.3 [1 (p-)]	-	50	0 (19)	-	0 (19)
O-Xylene	<0.01	59.5[1]	-	50	0 (19)	-	0 (19)
MTBE	<0.01	-	-	50	0 (19)	-	0 (19)

If no value is presented in bold then no samples exceeded the screening criteria.

All units mg/kg unless otherwise stated

< - Value below laboratory limit of detection.

* Wessex Water revised threshold for arsenic. Wessex Water Soil Survey Guidance.

P- - Assessment of the combined concentrations of both m and p isomers, based on the lower Tier 1 concentration for p xylene.

FC - Based on the value for Free cyanide as no total cyanide screening value exists.

C - Based on Chromium (III) in the absence of hexavalent Cr data.

^ - In line with the Environment Agency approach in the published SGVs, the GAC presented has been capped at the soil saturation limit.

1. Internally Derived EDF Energy SSV using CLEA model v1.06 using all the same standard input parameters that the Environment Agency used to derive standard SGVs for residential without homegrown produce end use with the exception that SOM has been set to 1%.
2. Environment Agency (2002) R & D Publication SGV 10. Soil Guideline Values for Lead Contamination, residential land use without plant uptake scenario.
3. BS3882:2007 Specification for Topsoil and requirements for use.
4. Former ICRCL Guidance Note 59/83 (N.B. paper withdrawn by Defra in 2004).
5. The Hazardous Waste (England and Wales) Regulations 2005. Inert Waste Threshold.
6. Benzene Tier 1 Risk Assessment concentration used for Aromatic TPH C5-C7.
7. Toluene Tier 1 Risk Assessment concentration used for Aromatic TPH C7-C8.
8. Statutory Instrument 1989 No. 1263, 'Sludge (Use in Agriculture) Regulations 1989', pH value >7.0.
9. Tier 1 Assessment for asbestos is based on presence or absence of fibres.
10. BRE Special Digest SD1 Specification (3rd Edition 2005), ACEC Class DS-1.

Table 12.7: Summary of Chemical Analysis Results of Site Soils (Ecological Risk)

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Arsenic	8 - 17	19	18[2a]/43[2c]/46[2d]	0[2b]/0[2c]/0[2d]	1.37 - 143[b]	0
Cadmium	<0.5 - 0.8	19	1.15[1]	0	0.1 - 1.78 [b]	0
Total Chromium	9 - 29	19	21.1[1]	**10**	3.89 - 236 [b]	0
Lead	15 - 309	19	167.9[1]	**4**	16.2 - 713 [b]	0
Mercury	<0.17 - 0.82	19	0.06[1]^	**5 (14^)**	0.07 - 1.22 [b]	0
Copper	5 - 329	19	88.4[1]	**2**	4.8 - 75.2 [b]	**2**
Nickel	9 - 52	19	25.1[1]	**4**	2.13 - 88.9 [b]	0
Zinc	45 - 649	19	90.1[1]	**14**	17.7 - 442 [b]	**1**
Selenium	<1 - 1	19	0.52[2a]/4.1[2b]/1.2[2c] / 0.63[2d]	**1 (18^)**[2a]/0[2b]/0[2c] / **1 (18^)**[2d]	0.2 - 1.8 [b1]	0
Barium	36 - 540	19	-	-	-	-
Beryllium	<1 - 2	19	-	-	-	-
Boron (water soluble)	<1.0 - 1.8	19	-	-	-	-
Iron	5,990 - 35,400	19	-	**-**	-	-
Vanadium	10 - 36	19	-	**-**	-	-
Cyanide (free)	<1 - 1	19	-	-	-	-
Cyanide (total)	<1 - 2	19	-	-	-	-
Thiocyanate	<2 - 11.1	19	-	-	-	-
Phenols (total)	<0.2	19	-	-	-	-
Sulphur (total)	132 - 723	19	-	-	-	-
Water soluble sulphate	<0.01 - 0.05	19	-	**-**	-	-

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
(g/l)						
pH (pH units)	7.2 - 8.5	19	-	**-**	-	-
Loss on Ignition (550ºC)	3.0 - 41.1	19				
Fraction of Organic Carbon	0.0085 - 0.0512	19	-	-	-	-
Asbestos screen	No fibres identified	19	-	-	-	-
PAH (EPA 16 total)	0.03 - 51.5	19	29[2b LM]/100[2d LM] / 18[2b HM]/1.1[2d HM]	**2**[2b LM]/0[2d LM] / **2**[2b HM]/**9**[2d HM]	**-**	-
Naphthalene	<0.01 - 0.17	19	17[3]	0	-	-
Acenaphthylene	<0.01 - 0.24	19	-	-	0.000207 - 0.150[c]	-
Acenaphthene	<0.01 - 0.38	19	-	-	0.000006 - 0.141[c]	-
Fluorene	<0.01 - 1.29	19	-	-	0.000135 - 1.1[c]	-
Phenanthrene	<0.01 - 10.7	19	31[3]	0	0.00146 - 2.310[c]	-
Anthracene	<0.01 - 2.50	19	1.6[3]	**1**	0.000135 - 1.1[c]	**1**
Fluoranthene	<0.01 - 8.28	19	260[3]	0	0.000418 - 1.980[c]	-
Pyrene	<0.01 - 6.20	19	-	-	0.000332 - 1.490[c]	-
Benzo(a)anthracene	<0.01 - 3.71	19	2.5[3]	**1**	0.000135 -1.1000[c]	**1**
Chrysene	0.03 - 5.41	19	35[3]	0	0.000216 - 0.996[c]	-
Benzo(b)fluoranthene	<0.01 - 2.18	19	-	-	0.000198 - 2.060[c]	-
Benzo(k)fluoranthene	<0.01 - 2.49	19	38[3]	0	0.000221 - 0.605[c]	-
Benzo (a) Pyrene	<0.01 - 3.19	19	0.15[1]	**9**	0.000867 - 1.540[c]	**2**
Indeno(1,2,3-cd)pyrene	<0.01 - 2.49	19	1.9[3]	**2**	0.000105 - 1.250[c]	**2**

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Dibenzo(a,h)anthracene	<0.01 - 0.89	19	-	-	0.000006 - 0.339[c]	-
Benzo(ghi)perylene	<0.01 - 1.66	19	33[3]	0	0.00587 - 0.943[c]	-
TPH Aromatic C_5-C_7	<0.01	19	-	-	-	-
TPH Aromatic C_7-C_8	<0.01	19	-	-	-	-
TPH Aromatic C_8-C_9	<0.01	19	-	-	-	-
TPH Aromatic C_9-C_{10}	<0.01	19	-	-	-	-
TPH Aromatic C_{10}-C_{12}	<0.1	19	-	-	-	-
TPH Aromatic C_{12}-C_{16}	<0.1 - 15.0	19	-	-	-	-
TPH Aromatic C_{16}-C_{21}	<0.1 - 106	19	-	-	-	-
TPH Aromatic C_{21}-C_{35}	<0.1 - 221	19	-	-	-	-
TPH Aliphatic C_5-C_6	<0.01	19	-	-	-	-
TPH Aliphatic C_6-C_8	<0.01	19	-	-	-	-
TPH Aliphatic C_8-C_{10}	<0.01	19	-	-	-	-
TPH Aliphatic C_{10}-C_{12}	<0.1 - 1.2	19	-	-	-	-
TPH Aliphatic C_{12}-C_{16}	<0.1 - 12.7	19	-	-	-	-
TPH Aliphatic C_{16}-C_{21}	<0.1 - 40.0	19	-	-	-	-
TPH Aliphatic C_{21}-C_{35}	<0.1 - 55.0	19	-	-	-	-
Total TPH (Sum aliphatic/aromatic)	<0.1 - 451	19	3080[4]	0	-	-
Benzene	<0.01	19	130[3]	0	-	-
Toluene	<0.01	19	0.3 [1]	0	-	-
Ethylbenzene	<0.01	19	110[3]	0	-	-

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
M- & P-Xylene	<0.01	19	17[3]	0	-	-
O-Xylene	<0.01	19	17[3]	0	-	-
MTBE	<0.01	19	130[3]	0	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

All units mg/kg unless otherwise stated

< - Value below laboratory limit of detection.

^ - LOD is greater than screening value.

* - Note comparison of soil concentrations with English background concentrations has been undertaken only on those determinands exceeding the Stage 1 SSV, as part of a staged risk assessment approach.

1. Proposed SSV. Environment Agency, Guidance on the Use of Soil Screening Values in Ecological Risk Assessment (Science Report SC070009/SR2b).

2. Ecological Soil Screening Levels, US EPA.

[2a] SSL for Plants.

[2b] SSL for Soil Invertebrates.

[2c] SSL for Wildlife (Avian).

[2d] SSL for Wildlife (Mammalian).

LM Low Molecular weight.

HM High Molecular Weight.

3. Dutch RIVM Serious Risk Concentrations for Ecosystems - Ecotoxicological SRCeco Soil Values.

4. Commercial TPH Value for Fine Soils. (Sum of C_6 - C_{35} aliphatic and aromatic hydrocarbon guideline values). Canadian Wide Standard for Petroleum Hydrocarbons in Soil Canadian Council of Ministers of Environment (CCME) 2008.

[b]. Range of Concentrations Recorded in rural soils in England. UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 7, Environmental Concentrations of Heavy Metals in UK Soils. Environment Agency (Ref. 805).

[b1] Reported range for selenium in normal soils in the UK (Adriano 2001). UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 7, Environmental Concentrations of Heavy Metals in UK Soils. Environment Agency. (Ref. 805).

[c] Range of Concentrations Recorded in rural soils in England. UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 9, Environmental Concentrations of Polycyclic Aromatic Hydrocarbons in UK Soils and Herbage. Environment Agency. (Ref. 816).

Table 12.8: Summary of Chemical Analysis Results of Deeper Site Soils (Human Health, Phytotoxic and Built Environment Risk)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Arsenic	5 - 33	35.0[1]	-	50*	0 (39)	-	0 (39)
Cadmium	<0.5 - 5.4	17.7[1]	-	3	0 (39)	-	0 (39)
Total Chromium	12 - 749	627[1C]	-	600	**1** (39)	-	0 (39)
Lead	10 - 730	450[2]	-	500	**3** (39)	-	**3** (39)
Mercury	<0.17 - 2.49	238[1 inorganic]	-	1	0 (39)	-	**3** (39)
Copper	4 - 825	6,200[1]	200[8]	-	0 (39)	**3** (39)	-
Nickel	10 - 65	127[1]	110[8]	-	0 (39)	0 (39)	-
Zinc	29 - 2,040	40,400[1]	450[8]	-	0 (39)	**6** (39)	-
Selenium	<1	595[1]	-	3	0 (39)	-	0 (39)
Barium	24 - 1,220	1,340[1]	-	-	0 (39)	-	-
Beryllium	<1 - 5	-	-	-	-	-	-
Boron (water soluble)	<1.0 - 17.2	10,300[1]	3[4]	-	0 (39)	**28** (39)	-
Iron	13,800 - 98,200	-	-	-	-	-	-
Vanadium	15 - 58	-	-	-	-	-	-
Cyanide (free)	<1 - 3	762[1, FC]	-	25[FC]	0 (39)	-	0 (39)
Cyanide (total)	<1 - 88	762[1, FC]	-	25[FC]	0 (39)	-	**1** (39)
Thiocyanate	<2 - 33.7	-	-	50	-	-	0 (39)
Phenols (total)	<0.2	310[1 P]	-	5	0 (39)	-	0 (39)
Sulphur (total)	315 - 9,700	5,000[4]	-	5,000	**10** (39)	-	**10** (39)
Water soluble sulphate (g/l)	0.03 - 0.84	-	-	0.5[10]	-	-	**3** (39)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Acid soluble sulphate (% SO_4)	0.07 - 0.20	-	-	0.24[10]	-	-	0 (10)
Aqueous Extract Sulphate (g/l SO_4)	0.11 - 0.42	-	-	0.5[10]	-	-	0 (10)
Total sulphur (%)	0.05 - 0.72	-	-	-	-	-	-
pH (pH units)	7.8 - 10.3	5.5 - 8.5[3]	5.5 - 8.5[3]	<5 - >8	**27** (39)	**27** (39)	**27** (39)
Fraction of Organic Carbon	0.0009 - 0.1745	-	-	-	-	-	-
Asbestos Screen	No fibres identified - non-asbestos fibres identified	Presence of fibres[9]	-	-	0 (non-asbestos containing fibres in one sample) (39)	-	-
PAH (EPA 16 total)	<0.01 - 67	100[5]	-	50	0 (39)	-	**1** (39)
Naphthalene	<0.01 - 3.98	1.64[1]	-	50	**2** (39)	-	0 (39)
Acenaphthylene	<0.01 - 0.32	86.1^[1]	-	50	0 (39)	-	0 (39)
Acenaphthene	<0.01 - 5.59	57.0^[1]	-	50	0 (39)	-	0 (39)
Fluorene	<0.01 - 7.91	30.9^[1]	-	50	0 (39)	-	0 (39)
Phenanthrene	<0.01 - 10.1	36.0^[1]	-	50	0 (39)	-	0 (39)
Anthracene	<0.01 - 5.25	1.17^[1]	-	50	**6** (39)	-	0 (39)
Fluoranthene	<0.01 - 15.6	972[1]	-	50	0 (39)	-	0 (39)
Pyrene	<0.01 - 11.8	2,330[1]	-	50	0 (39)	-	0 (39)
Benzo(a)anthracene	<0.01 - 7.93	3.71[1]	-	50	**2** (39)	-	0 (39)
Chrysene	<0.01 - 6.95	8.84[1]	-	50	0 (39)	-	0 (39)
Benzo(b)fluoranthene	<0.01 - 2.70	6.99[1]	-	50	0 (39)	-	0 (39)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Benzo(k)fluoranthene	<0.01 - 3.38	10.1[1]	-	50	0 (39)	-	0 (39)
Benzo (a) Pyrene	<0.01 - 4.06	1.00[1]	-	50	**9** (39)	-	0 (39)
Indeno(1,2,3-cd)pyrene	<0.01 - 1.74	4.17[1]	-	50	0 (39)	-	0 (39)
Dibenzo(a,h)anthracene	<0.01 - 0.38	0.865[1]	-	50	0 (39)	-	0 (39)
Benzo(ghi)perylene	<0.01 - 2.49	46.8[1]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_5-C_7	<0.01 - 0.01	0.266[1,6]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_7-C_8	<0.01	607[1,7]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_8-C_9	<0.01 - 0.03	33.2[1 (C8-C10)]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_9-C_{10}	<0.01 - 0.07	33.2[1 (C8-C10)]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_{10}-C_{12}	<0.1 - 4.0	177[1]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_{12}-C_{16}	<0.1 - 25.6	169^[1]	-	50	0 (39)	-	0 (39)
TPH Aromatic C_{16}-C_{21}	<0.1 - 123	1,290[1]	-	50	0 (39)	-	**4** (39)
TPH Aromatic C_{21}-C_{35}	<0.1 - 112	1,330[1]	-	50	0 (39)	-	5 (39)
TPH Aliphatic C_5-C_6	<0.01 - 0.01	29.8[1]	-	50	0 (39)	-	0 (39)
TPH Aliphatic C_6-C_8	<0.01	72.7[1]	-	50	0 (39)	-	0 (39)
TPH Aliphatic C_8-C_{10}	<0.01 - 0.02	18.8[1]	-	50	0 (39)	-	0 (39)
TPH Aliphatic C_{10}-C_{12}	<0.1 - 1.1	48^[1]	-	50	0 (39)	-	0 (39)
TPH Aliphatic C_{12}-C_{16}	<0.1 - 16.1	24^[1]	-	50	0 (39)	-	0 (39)
TPH Aliphatic C_{16}-C_{21}	<0.1 - 44.6	8.48^[1]	-	50	**5** (39)	-	0 (39)
TPH Aliphatic C_{21}-C_{35}	<0.1 - 117	8.48^[1]	-	50	**6** (39)	-	**1** (39)
Total TPH (Sum aliphatic/aromatic)	<0.1 - 214	500[5]	-	50	0 (39)	-	**6** (39)

Determinand	Range of Concentrations	Tier 1 Human Health SSV	Tier 1 Phytotoxic SSV	Tier 1 Built Environment SSV (Wessex Water/Water Regulations Advisory Scheme Threshold Value unless stated)	Exceedence of Tier 1 Human Health SSV (number of samples)	Exceedence of Tier 1 Phytotoxic SSV (number of samples)	Exceedence of Tier 1 Built Environment SSV
Benzene	<0.01 - 0.01	0.266 [1]	-	50	0 (39)	-	0 (39)
Toluene	<0.01	607[1]	-	50	0 (39)	-	0 (39)
Ethylbenzene	<0.01	167[1]	-	50	0 (39)	-	0 (39)
M- & P-Xylene	<0.01	53.3 [1 (p-)]	-	50	0 (39)	-	0 (39)
O-Xylene	<0.01	59.5[1]	-	50	0 (39)	-	0 (39)
MTBE	<0.01	-	-	50	0 (39)	-	0 (39)

If no value is presented in bold then no samples exceeded the screening criteria.

All units mg/kg unless otherwise stated

< - Value below laboratory limit of detection.
* - Wessex Water revised threshold for arsenic. Wessex Water Soil Survey Guidance.
P- - Assessment of the combined concentrations of both m and p isomers, based on the lower Tier 1 concentration for p xylene.
FC - Based on the value for Free cyanide as no total cyanide screening value exists.
C - Based on Chromium (III) in the absence of hexavalent Cr data.
^ - In line with the Environment Agency approach in the published SGVs, the GAC presented has been capped at the soil saturation limit.

1. Internally Derived EDF Energy SSV using CLEA model v1.06 using all the same standard input parameters that the Environment Agency used to derive standard SGVs for residential without homegrown produce end use with the exception that SOM has been set to 1%.
2. Environment Agency (2002) R & D Publication SGV 10. Soil Guideline Values for Lead Contamination, residential land use without plant uptake scenario.
3. BS3882:2007 Specification for Topsoil and requirements for use.
4. Former ICRCL Guidance Note 59/83 (N.B. paper withdrawn by Defra in 2004).
5. The Hazardous Waste (England and Wales) Regulations 2005. Inert Waste Threshold.
6. Benzene Tier 1 Risk Assessment concentration used for Aromatic TPH C5-C7.
7. Toluene Tier 1 Risk Assessment concentration used for Aromatic TPH C7-C8.
8. Statutory Instrument 1989 No. 1263, 'Sludge (Use in Agriculture) Regulations 1989', pH value >7.0.
9. Tier 1 Assessment for asbestos is based on presence or absence of fibres.
10. BRE Special Digest SD1 Specification (3rd Edition 2005), ACEC Class DS-1, **Table C2**.

Table 12.9: Summary of Chemical Analysis Results of Deeper Site Soils (Ecological Risk)

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Arsenic	5 - 33	39	18[2a] / 43[2c] / 46[2d]	**6**[2b] / 0[2c] / 0[2d]	1.37 - 143[b]	0
Cadmium	<0.5 - 5.4	39	1.15[1]	**5**	0.1 - 1.78 [b]	**3**
Total Chromium	12 - 749	39	21.1[1]	**32**	3.89 - 236 [b]	**1**
Lead	10 - 730	39	167.9[1]	**12**	16.2 713 [b]	**1**
Mercury	<0.17 - 2.49	39	0.06[1]^	**35 (4^)**	0.07 - 1.22 [b]	**2**
Copper	4 - 825	39	88.4[1]	**8**	4.8 - 75.2 [b]	**8**
Nickel	10 - 65	39	25.1[1]	**21**	2.13 - 88.9 [b]	0
Zinc	29 - 2,040	39	90.1[1]	**26**	17.7 - 442 [b]	**6**
Selenium	<1	39	0.52[2a] / 4.1[2b] / 1.2[2c] / 0.63[2d]	**(39^)**[2a] / 0[2b] / 0[2c] / **(39^)**[2d]	0.2 - 1.8 [b1]	0
Barium	24 - 1,220	39	-	-	-	-
Beryllium	<1 - 5	39	-	-	-	-
Boron (water soluble)	<1.0 - 17.2	39	-	-	-	-
Iron	13,800 - 98,200	39	-	**-**	-	-
Vanadium	15 - 58	39	-	**-**	-	-
Cyanide (free)	<1 - 3	39	-	-	-	-
Cyanide (total)	<1 - 88	39	-	-	-	-
Thiocyanate	<2 - 33.7	39	-	-	-	-
Phenols (total)	<0.2	39	-	-	-	-
Sulphur (total)	315 - 9,700	39	-	-	-	-
Water soluble sulphate (g/l)	0.03 - 0.84	39	-	**-**	-	-

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Acid soluble sulphate (% SO_4)	0.07 - 0.20	10	-	**-**	-	-
Aqueous Extract Sulphate (g/l SO_4)	0.11 - 0.42	10	-	**-**	-	-
Total sulphur (%)	0.05 - 0.72	10	-	**-**	-	-
pH (pH units)	7.8 - 10.3	39	-	**-**	-	-
Fraction of Organic Carbon	0.0009 - 0.1745	39	-	-	-	-
Asbestos screen	No fibres identified - non-asbestos fibres identified	39	-	-	-	-
PAH (EPA 16 total)	<0.01 - 67	39	$29^{2b\ LM}$ / $100^{2d\ LM}$ / $18^{2b\ HM}$ / $1.1^{2d\ HM}$	**4**$^{2b\ LM}$ / $0^{2d\ LM}$ / **7**$^{2b\ HM}$ / **20**$^{2d\ HM}$	**-**	-
Naphthalene	<0.01 - 3.98	39	17^{3}	0	-	-
Acenaphthylene	<0.01 - 0.32	39	-	-	0.000207 - 0.150[c]	-
Acenaphthene	<0.01 - 5.59	39	-	-	0.000006 - 0.141[c]	-
Fluorene	<0.01 - 7.91	39	-	-	0.000135 - 1.1[c]	-
Phenanthrene	<0.01 - 10.1	39	31^{3}	0	0.00146 - 2.310[c]	-
Anthracene	<0.01 - 5.25	39	1.6^{3}	**4**	0.000135- 1.1[c]	**4**
Fluoranthene	<0.01 - 15.6	39	260^{3}	0	0.000418 - 1.980[c]	-
Pyrene	<0.01 - 11.8	39	-	-	0.000332 - 1.490[c]	-
Benzo(a)anthracene	<0.01 - 7.93	39	2.5^{3}	**4**	0.000135 -1.1000[c]	**4**
Chrysene	<0.01 - 6.95	39	35^{3}	0	0.000216 - 0.996[c]	-
Benzo(b)fluoranthene	<0.01 - 2.70	39	-	-	0.000198 - 2.060[c]	-

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Benzo(k)fluoranthene	<0.01 - 3.38	39	38[3]	0	0.000221 - 0.605[c]	-
Benzo (a) Pyrene	<0.01 - 4.06	39	0.15[1]	**19**	0.000867 - 1.540[c]	**6**
Indeno(1,2,3-cd)pyrene	<0.01 - 1.74	39	1.9[3]	0	0.000105 - 1.250[c]	-
Dibenzo(a,h)anthracene	<0.01 - 0.38	39	-	-	0.000006 - 0.339[c]	-
Benzo(ghi)perylene	<0.01 - 2.49	39	33[3]	0	0.00587 - 0.943[c]	-
TPH Aromatic C_5-C_7	<0.01 - 0.01	39	-	-	-	-
TPH Aromatic C_7-C_8	<0.01	39	-	-	-	-
TPH Aromatic C_8-C_9	<0.01 - 0.03	39	-	-	-	-
TPH Aromatic C_9-C_{10}	<0.01 - 0.07	39	-	-	-	-
TPH Aromatic C_{10}-C_{12}	<0.1 - 4.0	39	-	-	-	-
TPH Aromatic C_{12}-C_{16}	<0.1 - 25.6	39	-	-	-	-
TPH Aromatic C_{16}-C_{21}	<0.1 - 123	39	-	-	-	-
TPH Aromatic C_{21}-C_{35}	<0.1 - 112	39	-	-	-	-
TPH Aliphatic C_5-C_6	<0.01 - 0.01	39	-	-	-	-
TPH Aliphatic C_6-C_8	<0.01	39	-	-	-	-
TPH Aliphatic C_8-C_{10}	<0.01 - 0.02	39	-	-	-	-
TPH Aliphatic C_{10}-C_{12}	<0.1 - 1.1	39	-	-	-	-
TPH Aliphatic C_{12}-C_{16}	<0.1 - 16.1	39	-	-	-	-
TPH Aliphatic C_{16}-C_{21}	<0.1 - 44.6	39	-	-	-	-
TPH Aliphatic C_{21}-C_{35}	<0.1 - 117	39	-	-	-	-
Total TPH (Sum aliphatic/aromatic)	<0.1 - 214	39	3080[4]	0	-	-

Determinand	Range of Concentrations	Number of Samples	Ecological Stage 1 SSV	Stage 1 - Exceedence of SSV (number of samples)	Range of Stage 2 Rural England Background Concentrations	Stage 2 - Exceedence of Rural England Background Concentrations*
Benzene	<0.01 - 0.01	39	130[3]	0	-	-
Toluene	<0.01	39	0.3 [1]	0	-	-
Ethylbenzene	<0.01	39	110[3]	0	-	-
M- & P-Xylene	<0.01	39	17[3]	0	-	-
O-Xylene	<0.01	39	17[3]	0	-	-
MTBE	<0.01	39	130[3]	0	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

All units mg/kg unless otherwise stated

< - Value below laboratory limit of detection.
^ - LOD is greater than screening value.
* - Note comparison of soil concentrations with English background concentrations has been undertaken **only** on those determinands exceeding the Stage 1 SSV, as part of a staged risk assessment approach.
1. Proposed SSV. Environment Agency, Guidance on the Use of Soil Screening Values in Ecological Risk Assessment (Science Report SC070009/SR2b).
2. Ecological Soil Screening Levels, US EPA.
2a SSL for Plants.
2b SSL for Soil Invertebrates.
2c SSL for Wildlife (Avian).
2d SSL for Wildlife (Mammalian).
LM Low Molecular weight.
HM High Molecular Weight.
3. Dutch RIVM Serious Risk Concentrations for Ecosystems - Ecotoxicological SRCeco Soil Values.
4. Commercial TPH Value for Fine Soils. (Sum of C_6 - C_{35} aliphatic and aromatic hydrocarbon guideline values). Canadian Wide Standard for Petroleum Hydrocarbons in Soil Canadian Council of Ministers of Environment (CCME) 2008.
b. Range of Concentrations Recorded in rural soils in England. UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 7, Environmental Concentrations of Heavy Metals in UK Soils. Environment Agency (Ref. 805).
b1 Reported range for selenium in normal soils in the UK (Adriano 2001). UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 7, Environmental Concentrations of Heavy Metals in UK Soils. Environment Agency. (Ref. 805).
c Range of Concentrations Recorded in rural soils in England. UK Soil and Herbage Pollutant Survey (UKSHS) Report No. 9, Environmental Concentrations of Polycyclic Aromatic Hydrocarbons in UK Soils and Herbage. Environment Agency. (Ref. 816).

Shallow Soils Analysis

12.5.94 The results of analysis are not generally indicative of the presence of significant contamination although it should be noted that only six of the 19 shallow soil samples analysed were comprised of landfill materials. Few exceedences of Tier 1 screening criteria for human health risk have been identified, comprising exceedences of the screening criteria for the PAH determinands anthracene (one sample), benzo(a)pyrene (three samples), dibenzo(a,h)anthracene (one sample), and aliphatic TPH in the carbon band range C16-C21 and C21-C35 (one sample). These present a low potential risk to human health.

12.5.95 Possible asbestos containing materials (described as possible cement bound asbestos in the exploratory log) were recorded in TPF05, in the eastern sector of the site, at a depth of between 0.56m and 0.80m bgl. The suspected asbestos containing materials were included within the soil sample taken from 0.75m bgl at that location. Laboratory analysis subsequently did not identify asbestos fibres in the sample.

12.5.96 Phytotoxicity criteria were exceeded in one sample (TPF10, located in the southern part of the site, and taken from 0.75m bgl and comprising landfill material as described in the intrusive investigation log). The sample contained concentrations of zinc and copper (649mg/kg and 329mg/kg respectively) above the respective Tier 1 screening criteria of 450mg/kg and 200mg/kg. These contaminants represent a low potential risk to vegetation growth and establishment.

12.5.97 Nine of the 19 soil samples tested exceeded the Wessex Water/Water Regulations Advisory Scheme upper Materials Selection Threshold Value (pH 8). However, as the values of pH recorded in soils from the site range up to pH 8.5 (moderately alkaline), on the basis of the analysis undertaken the pH of soils is not considered to represent a high risk of chemical attack to potable water services. Concentrations of aromatic and aliphatic TPH, and total TPH in two samples (TPF04, from 0.4mbgl, corresponding to gravel and cobbles overlying the Terram geotextile membrane and BHF04 from 0.5m bgl) were found to exceed the Wessex Water/Water Regulations Advisory Scheme upper Materials Selection Threshold Value for petroleum hydrocarbons (50mg/kg). No other exceedences of built environment Tier 1 criteria were recorded. The presence of elevated pH and TPH may pose a low risk to potable water supply pipes.

12.5.98 Concentrations of the majority of chemical determinands were below Stage 1 ecological screening criteria and as such are not considered to pose a risk to ecological systems. However, the following contaminants were present above Stage 1 screening criteria:

- total chromium (ten of 19 samples);
- lead (four of 19 samples);
- mercury (five of 19 samples);
- copper (two of 19 samples);
- nickel (four of 19 samples);

- zinc (14 of 19 samples);
- selenium (one of 19 samples exceeds the plants and mammalian wildlife Stage 1 soil screening value (SSV));
- total PAHs (one of 19 samples for soil invertebrates exceeds the soil invertebrates Stage 1 SSV for low and high molecular weight PAHs, and ten samples exceed the mammalian wildlife Stage 1 SSV for high molecular weight PAHs);
- anthracene (one of 19 samples);
- benzo(a)anthracene (one of 19 samples);
- benzo(a)pyrene (nine of 19 samples); and
- indeno(1,2,3-cd)pyrene (two of 19 samples).

12.5.99 In accordance with the staged approach to the assessment of ecological risk, the concentrations of those contaminants which exceed the Stage 1 screening values have been compared with ranges of concentrations identified in rural soils in England in Environment Agency published soil and herbage pollutant surveys. This approach also accommodates the highly conservative nature of the published ecological screening values.

12.5.100 Comparison of the concentrations recorded in near surface site soils with the Environment Agency published data shows one sample (TPF10, from 0.75m bgl) to yield concentrations greater than the background concentrations for copper and zinc. In addition, the same sample exceeds the background range for anthracene, benzo(a)anthracene, benzo(a)pyrene and indeno (1,2,3-cd)pyrene. Sample TPF04, from 0.40m bgl also recorded concentrations of benzo(a)pyrene and indeno(1,2,3 cd)pyrene which exceed the background concentration ranges for these contaminants. Sample BHF04, from 0.50m bgl, also contained copper above the background concentration. As such, the shallow soils on the site pose a potential risk to ecological systems.

12.5.101 All 19 shallow soil samples were submitted for analysis of volatile organic compounds (VOCs). Contaminant concentrations were below the laboratory LoD (variable, between 0.200µg/kg and 90µg/kg) for the majority of VOCs, with the following exceptions:

- naphthalene (22.2 - 1240µg/kg);
- 1,2,3-trimethylbenzene (2.00 - 40.0µg/kg);
- 1,2,4-trimethylbenzene (2.00 - 60.0µg/kg);
- 1,3,5-trimethylbenzene (3.00 - 10.0µg/kg);
- 1,3- and 1,4-dimethylbenzenes (4.00µg/kg);
- benzene (1.00 - 4.00µg/kg);
- chloroform (1.00 - 6.00µg/kg);
- chlorobenzene (6.00µg/kg);

- ethylbenzene (1.00µg/kg);
- isopropylbenzene (0.900µg/kg);
- iso-propyltoluene (2.00 - 6.00µg/kg);
- n-propylbenzene (1.00 - 4.00µg/kg);
- sec-butylbenzene (1.00 - 6.00µg/kg);
- styrene (0.700 - 1.00µg/kg); and
- trichloroethylene (0.200 - 0.300µg/kg).

12.5.102 The results of VOC analysis, whist indicative of the presence of some VOCs in exceedence of the laboratory LoD, are not suggestive of significant contamination. This is because the highest VOC concentration recorded for which no existing Tier 1 screening value is available (1,2,4-trimethylbenzene, at 60µg/kg) is approximately 23 times lower than the most conservative Tier 1 soil screening value for a VOC compound (benzene, 0.266mg/kg). Elevated naphthalene concentrations were reported (up to 1,240µg/kg), however all concentrations from shallow soils are less than the most conservative soil screening concentration (1.64mg/kg, or 1,640µg/kg).

Deeper Soils Analysis

12.5.103 The results of analysis of soil samples taken from the deeper Made Ground (i.e. from 1.00m bgl and deeper), landfilled waste deposits and underlying natural strata were found to contain generally higher concentrations of contaminants than identified in samples of shallower soils. However, although higher, the concentrations were not found to be substantially elevated.

12.5.104 Possible asbestos fibres were identified in one soil sample of the 39 screened for fibres (ES5 from BHF09). However subsequent analysis established that the fibres were not asbestos containing. Conservative human health Tier 1 screening values were exceeded for total chromium, lead, total sulphur, pH, naphthalene, anthracene, benzo(a)anthracene, benzo(a)pyrene, and aliphatic TPH in the ranges C16-C21 and C21-C35.

12.5.105 Total chromium, lead, sulphur, aliphatic TPH in the ranges C16-C21 and C21-C35 and pH pose a potential risk to human receptors via the dermal contact, soil dust inhalation and ingestion pathways. Naphthalene, anthracene, benzo(a)anthracene and benzo(a)pyrene are semi-volatile, and therefore pose a potential soil vapour inhalation risk (albeit very low, due to their relatively low volatility) to human receptors in addition to the dermal contact and soil particle inhalation/ingestion pathways.

12.5.106 Phytotoxicity soil screening SSVs were exceeded for copper, zinc, water soluble boron and pH. Deep site soils therefore pose a potential risk to vegetation in the event that a contaminant pathway for these contaminants to affect phytological receptors would exist (i.e. by direct soil contact, or root uptake of leached contamination).

12.5.107 Tier 1 soil screening criteria for built environment receptors were exceeded for lead, mercury, sulphur, water soluble sulphate, pH, total PAHs (marginal exceedence) and TPH determinands.

12.5.108 Water soluble sulphate was recorded in three of the 39 samples (BHF02 ES9 from 6.00m bgl, BHF03 ES5 from 2,00m bgl, and BHF05 ES6, from 3.00m bgl) at concentrations which may pose a potential risk of chemical attack to buried concrete structures.

12.5.109 Lead, mercury, sulphur, total cyanide, pH, total PAHs and TPHs (aromatic TPH in the carbon band ranges C16-C21 and C21-35, aliphatic TPH in the carbon band range C21-C35, and total TPH) pose a potential risk to potable water supply services.

12.5.110 Samples from the deeper soils on the site were recorded above Stage 1 ecological screening criteria for the following contaminants: arsenic, cadmium, total chromium, lead, mercury, copper, nickel, zinc, total PAHs, anthracene, benzo(a)anthracene and benzo(a)pyrene.

12.5.111 Adopting a staged approach to assessing the risks posed by soil contamination to ecological receptors, contaminants exceeding the Stage 1 risk assessment concentrations have been compared with English rural background contaminant concentrations published by the Environment Agency (Ref. 12.80 and 12.81). Concentrations of cadmium, total chromium, lead, mercury, copper, zinc and the individual PAH contaminants anthracene, benzo(a)anthracene and benzo(a)pyrene are above both Stage 1 ecological screening criteria and English rural background concentrations and therefore pose a potential risk to ecological receptors.

12.5.112 Selenium was not recorded above the laboratory limit of detection in any sample (1mg/kg). However, the limit of detection is greater than the most conservative ecological screening values for selenium.

12.5.113 All samples from the deeper soils (39 in total) were submitted for analysis of VOCs. Contaminant concentrations were below the laboratory LoD (variable, between 0.200µg/kg and 100µg/kg) for the majority of determinands, with the following exceptions:

- naphthalene (15.8 - 15,400µg/kg);
- 1,2,3-trimethylbenzene (2.00 - 80.0µg/kg);
- 1,2,4-trimethylbenzene (1.00 - 260µg/kg);
- 1,2-dimethylbenzene (2.00 - 30.0µg/kg);
- 1,3,5-trimethylbenzene (0.700 - 40.0µg/kg);
- 1,4-dichlorobenzene (0.800 - 60.0µg/kg);
- benzene (1.00 - 10.0µg/kg);
- carbon disulphide (20.0 - 100µg/kg);
- chloroform (0.600µg/kg);

- chloromethane (5.00µg/kg);
- cis-1,2-dichloroethylene (1.00 - 4.00µg/kg);
- 1,3- and 1,4-dimethylbenzenes (3.00 - 100µg/kg);
- ethylbenzene (0.900 - 20.0µg/kg);
- isopropylbenzene (6.00 - 150µg/kg);
- iso-propyltoluene (3.00 - 1,690µg/kg);
- n-butylbenzene (7.00 - 200µg/kg);
- n-propylbenzene (50.0µg/kg);
- sec-butylbenzene (1.00 - 90.0µg/kg);
- styrene (0.800 - 3.00µg/kg);
- tetrachloroethylene (1.00 - 10.0µg/kg);
- toluene (4.00 - 20.0µg/kg); and
- trichloroethylene (0.500 - 8.00µg/kg).

12.5.114 Screening criteria are not available for the majority of VOC contaminants listed above, however certain contaminants were recorded substantially in exceedence of the laboratory limit of detection (notably 1,2,4-trimethylbenzene and iso-propyltoluene in sample BHF06 ES7 (140µg/kg and 1,690µg/kg respectively), and 1,2,4 trimethylbenzene, carbon disulphide, dimethylbenzene and n-butylbenzene in BHF05 ES6 (260µg/kg, 100µg/kg, 100µg/kg and 200µg/kg respectively)).

12.5.115 Naphthalene was recorded at concentrations of up to 15,400µg/kg in soil samples submitted for VOC analysis. When compared with the most conservative Tier 1 soil screening value (1.64mg/kg (1,640µg/kg), for human health), a total of four samples exceed the screen, and therefore pose a potential human health risk:

- BHF02 (2.00m bgl, 1,720µg/kg).
- BHF03 (6.00m bgl, 15,400µg/kg).
- BHF05 (1.00m bgl, 2,000µg/kg).
- BHF07 (4.00m bgl, 2,000µg/kg).

12.5.116 However, given the conservative nature of the Tier 1 screening value adopted for naphthalene (i.e. on the basis of the receptor type being a female child), the marginal exceedences of the screening value identified in BHF02, BHF05 and BHF07 are not considered to be of significance. The sample from 6.00m bgl in BHF03 is however considered to be potentially significant, at approximately ten times the conservative Tier 1 screening value.

12.5.117 The results of other VOC analysis show the presence of potentially significant concentrations of certain VOCs at depth within the landfilled waste deposits. As a conservative approach, concentrations of contaminants for which no Tier 1 screening criterion is available have been compared with the most conservative Tier 1 soil screening value for a VOC compound (benzene, 0.266mg/kg). Iso-propyltoluene in sample BHF06 (4.00m bgl, 1,690µg/kg) exceeds the benzene human health Tier 1 screening value and may pose a volatile inhalation risk.

12.5.118 However the location in which the elevated VOC concentration listed above was identified (BHF06) corresponds to deep soils (4m bgl) in areas of proposed hard standing and soft landscaping. As such, this is not likely to pose a significant vapour inhalation risk to indoor or outdoor receptors during the operational and post-operational phases of the proposed development. Although the concentration recorded is elevated when compared with conservative Tier 1 human health screening value for benzene, it is not substantially elevated.

12.5.119 VOC concentrations were recorded with a Photoionisation Detector during drilling of boreholes BHF02, BHF02A, BHF05, BHF07 and BHF10. No elevated readings were reported with the exception of BHF02A, in which a maximum reading of 33.0ppm of VOCs was recorded from arisings at 2.00m bgl, corresponding with an observed hydrocarbon odour.

12.5.120 The results of analysis are not generally indicative of the presence of significant contaminant concentrations in the capping soils and shallow waste materials sampled during the SSL investigations. However, the deeper soils on the site were found to contain occasionally elevated concentrations of certain contaminants at concentrations which could potentially impact human health, the built environment, vegetation and ecological systems.

12.5.121 The geophysical investigations are indicative of significant lateral variation in ground conditions beneath the site, which may be representative of variations in the composition and nature of the underlying waste.

Ground Gas

12.5.122 According to current BGS data (**Appendix 12A**), the site is not located within an area where full or basic measures with regards to radon are required to be installed within new buildings.

12.5.123 Monitoring of hazardous ground gas concentrations has been undertaken on ten occasions, between 8 April 2011 and 26 August 2011, at boreholes BHF01, BHF02A, BHF03, BHF05, BHF07, BHF08 and BHF10 (see Figure 2 of the SSL report (**Appendix 12B**) (Ref. 12.56) for details). **Table 12.10** presents a summary of the gas monitoring data.

Table 12.10: Summary of Ground Gas Monitoring on the Site

Borehole	Borehole Pressure (mb)	Atmospheric Pressure (mb)	Gas Flow (l/hr)	Water Depth (m bgl)	Carbon Dioxide (% vol.)	Methane (% vol.)	Oxygen (% vol.)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BHF01	1000 - 1028	1000 - 1028	<0.1 (I)	2.51 - 2.87	<0.0 - 0.5	<0.0	20.2 - 22.6	<0.0	<0.0
			<0.1 (SS)						
BHF02A	1001 - 1032	1001 - 1003	<0.1 (I)	2.55 - 2.82	<0.0 - 18.2	<0.0 - 4.1	<0.0 - 0.9	<0.0 - 1.0	<0.0
			<0.1 (SS)						
BHF03	1009 - 1028	1009 - 1028	<0.1 (I)	2.08 - 2.31	<0.0 - 2.6	<0.0 - 23.1	<0.0 - 1.1	<0.0 - 2.0	<0.0 - 1.0
			<0.1 (SS)						
BHF05	1001 - 1029	1001 - 1029	<0.1 (I)	2.50 - 2.82	<0.0 - 8.4	<0.0 - 5.4	9.7 - 21.0	<0.0 - 2.0	<0.0
			<0.1 (SS)						
BHF07	1002 - 1031	1003 - 1031	<0.1 - 0.3 (I)	1.37 - 1.90	<0.0 - 10.6	<0.0	3.2 - 22.9	<0.0 - 3.0	<0.0
			<0.1 (SS)						
BHF08	1003 - 1031	1003 - 1031	<0.1 (I)	2.24 - 2.46	<0.0 - 14.2	<0.0	4.1 - 22.56	<0.0 - 2.0	<0.0
			<0.1 (SS)						
BHF10	1002 - 1031	1002 - 1031	<0.1 (I)	1.94 - 2.18	<0.0 - 0.7	<0.0 - 0.4	19.6 - 21.6	<0.0 - 3.0	<0.0 - 1.0
			<0.1 (SS)						

(I) Initial reading

(SS) Steady state reading

12.5.124 The results of monitoring are indicative of the presence of elevated methane (up to 23.1% by volume in BHF03) and carbon dioxide (up to 18.2% by volume in BHF02A). These elevated concentrations may pose a risk to human health and the built environment. Recorded gas flow rates are typically negligible (a maximum flow rate of 0.3l/hr was recorded in BHF07).

12.5.125 Guidance on ground gas risk assessment has been published within Construction Industry Research and Information Association (CIRIA) document C665 (Ref. 12.82). The document provides guidance on the derivation of a Gas Screening Value (GSV), which is based on the concentrations of methane and carbon dioxide, and the rate of gas flow recorded at the site. The derivation calculation is described in the document as follows:

> *"Gas screening value (litres of gas per hour) = max borehole flow rate (l/hr) x max gas concentration (%). For example, monitoring data giving a maximum flow rate of 3.5l/hr and a (maximum) concentration of 4.0 per cent methane would have a GSV of 0.14l/hr [4.0/100 x 3.5]."* (Page 87 of CIRIA C665)

12.5.126 Due to the sensitivity of the proposed development (i.e. living accommodation), the worst case measurements for the site are used in the derivation of GSVs, irrespective of whether these were recorded at the same borehole location to present a conservative approach.

12.5.127 The GSV for methane is:

$$0.231 \times 0.3 = 0.0693 \text{l/hr}$$

12.5.128 The GSV for carbon dioxide is:

$$0.182 \times 0.3 = 0.0546 \text{l/hr}$$

12.5.129 Under the 'Situation A' approach presented in CIRIA C665 (Ref. 12.82), using the modified Wilson and Card Methodology presented in **Table 8.5** of that document, the carbon dioxide and methane GSVs would position the site as 'Characteristic Situation 1' (very low risk). However, the table also advises that where methane readings of greater than 1% by volume and/or carbon dioxide readings of greater than 5% by volume are recorded, the upgrading of the site to 'Characteristic Situation 2' (Low risk) should be considered.

12.5.130 By referring to **Table 8.6** of CIRIA C665 (Ref. 12.82), for a residential development not falling within 'Situation B' (i.e. low rise housing with a ventilated subfloor void), a site falling within 'Characteristic Situation 2' would require two levels of protection against hazardous ground gases, of the following type:

> *a. "Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft) with at least 1,200g DPM and underfloor venting; or*
>
> *b. Beam and block or pre-cast concrete and 2,000g DPM/reinforced gas membrane and underfloor venting.*

c. All joints and penetrations sealed". (Page 90 of the guidance)

12.5.131 Concentrations of carbon monoxide and hydrogen sulphide recorded at the site (maximum of 3.0ppm and 1.0ppm, respectively) are minimal, and are not considered to be of significance.

12.5.132 It is therefore considered that whilst hazardous ground gases are present at the site at concentrations which may pose a risk to human health and the built environment, these are not sufficient to render the site unsuitable for the proposed development, provided appropriate gas protection measures are incorporated into the design, construction and operation of the buildings.

iii. Groundwater

Hydrology

12.5.133 The hydrological setting of the site, and the status of the site with relation to risk from fluvial and tidal flooding, is presented in detail in **Chapter 13** of this volume.

Aquifers and Aquifer Characteristics

12.5.134 The geological map for the area indicates that the site is entirely underlain by drift deposits consisting of Tidal Flat Deposits. The drift deposits on the site are entirely underlain by solid geology of the Mercia Mudstone Group.

12.5.135 *Tidal Flat Deposits*: The Tidal Flat Deposits are typically a low permeability deposit and within the site boundary are classed as a Secondary Aquifer (undifferentiated), although small domestic supplies may be obtained from the sandier horizons, especially when in hydraulic continuity with adjacent watercourses. The Tidal Flat Deposits are typically a near surface deposit and, therefore, have the potential to be easily polluted. As the site is located in an urban area, the Environment Agency identifies soils on the site as Soil Class H (soils of high leaching potential). These soils are considered to have limited potential to attenuate diffuse source pollutants. However, this is a precautionary approach taken due to limited data on actual soil composition and properties. The shallow Tidal Flat Deposits which are actually present on the site according to the Geotechnics Limited borehole logs (Ref. ST33/NW/85) comprise silty sand and sandy clay and may therefore not significantly limit the vertical and lateral migration of contamination.

12.5.136 *Mercia Mudstone Group*: The Environment Agency has classified the Mercia Mudstone Group within the study area as a Secondary B Aquifer. The main hydrogeological significance of the Mercia Mudstone Group is that it functions as an aquitard that confines the regionally important Sherwood Sandstone (Permo-Triassic) Principal Aquifer. The occurrence of groundwater within the group is unpredictable and permeability is generally dominated by fractures.

Groundwater Levels and Flows

12.5.137 Groundwater/leachate was encountered in the SSL investigation within the following boreholes during drilling (a sheen and slight hydrocarbon odour was noted on groundwater in BHF02):

- BHF01 - standing water was noted at 5.70m bgl.
- BHF02 - strike at 2.70m bgl.
- BHF02A - strike at 2.70m bgl.
- BHF03 - strike at 2.20m bgl.
- BHF06 - strike at 3.00m bgl.
- BHF07 - strike at 2.80m bgl.
- BHF08 - strike at 2.10m bgl.
- BHF09 - strike at 2.10m bgl.

12.5.138 Groundwater/leachate rest levels recorded by SSL during ground gas and groundwater level monitoring between 8 April 2011 and 26 August 2011 are presented within **Table 12.10**. The results of monitoring confirm that groundwater rest levels are typically in the range 1.5m bgl to 2.5m bgl (although the shallowest groundwater rest level was 1.37m bgl at BHF07). Groundwater flow is expected to be towards the River Parrett, to the west/north-west of the site. However the former use of the site as a clay extraction pit and subsequent landfill site is expected to result in the natural containment of leachate within the extents of the former clay pit.

12.5.139 Site investigation records from the Geotechnics Ltd investigation, provided by the BGS Geo-records service (Borehole Ref. ST33/NW/85), identifies groundwater strikes at between 2.2m bgl and 4.4m bgl, with standing water observed at between 4.2m bgl and 1.8m bgl. Strong flows were recorded in several locations. No information is presented in the logs to confirm whether groundwater on the site is saline, however saline groundwater is reported in a BGS Geo-records service listed borehole located approximately 700m to the north of the site (Ref. ST33/NW/45), and approximately 600m from the River Parrett. The information relating to this borehole indicates groundwater with a rest level of approximately 3m bgl, although the borehole is stated to extend to a depth of 250ft (approximately 76.2m) and therefore the groundwater described in the log may be from a deep source.

12.5.140 The groundwater within the superficial deposits is likely to flow towards the River Parrett, i.e. towards the north-west.

Groundwater Use

12.5.141 The site does not lie within a currently defined Source Protection Zone (Inner Zone, Outer Zone or Total Catchment). The closest SPZ (Inner Zone) is located approximately 13.5km west of the site.

12.5.142 There is one current record of a groundwater abstraction licence within a 500m radius of the site. The borehole is located approximately 400m to the north of the site, and is registered to Courthaulds Films Limited (assumed to be Courtaulds Films Limited) for the purposes of industrial cooling. The abstraction is considered likely to be inactive however, as the Innovia site, on which Courtaulds Films Limited were based, ceased operation in 2005 and at the time of reporting the Innovia site is in the process of demolition (Refer to **Volume 3, Chapter 12** of this ES).

Groundwater Chemistry and Leachate Testing

12.5.143 Six samples of soil, collected as part of the SSL investigation, were submitted for leachability testing (2:1) for the following determinands: arsenic, boron, beryllium, barium, cadmium, chromium, copper, iron, manganese, mercury, nickel, lead, selenium, vanadium, zinc, pH, sulphate, sulphur, sulphide, chloride, total cyanide, free cyanide, thiocyanate, BTEX, speciated PAHs, speciated phenols and ammoniacal nitrogen. The results of leachability analysis are presented in **Appendix 12B** (Ref. 12.56), and are summarised within **Table 12.11**, where the data are compared with relevant drinking water standards and Environmental Quality Standards (EQS).

12.5.144 A total of 26 samples of groundwater/leachate were submitted for chemical analysis, comprising 12 samples taken between 22 March 2011 and 8 April 2011 (first groundwater/leachate monitoring campaign, including multiple sampling from boreholes BHF05 and BHF03) seven samples taken on 11 May 2011 (second groundwater/leachate monitoring campaign) and a further seven samples taken on 27 June 2011 (third groundwater/leachate monitoring campaign). The results of analysis from the first groundwater/leachate monitoring campaign are presented within **Table 12.12**, and the results from the second and third groundwater/leachate monitoring campaigns are presented within **Table 12.13** and **Table 12.14** respectively, compared with relevant drinking water standards and Environmental Quality Standards (EQS).

Tier 1 Criteria for Leachability and Groundwater Testing

12.5.145 The concentrations recorded in the leachability testing and groundwater samples have been compared to the UK Drinking Water Standards (DWS) (Ref. 12.83) and saline water and freshwater Environmental Quality Standards (EQS) published in, 'The River Basin Districts Typology, Standards and Groundwater Threshold Values (WFD) (England and Wales) Directions 2010' (Ref. 12.84).

12.5.146 The freshwater EQSs utilised in the assessment are based on the water body status objective for the River Parrett reaching and maintaining a 'good' status (current status is 'moderate') by 2027, as stated in Annex B of the **River Basin Management Plan** for the South West River Basin District (Ref. 12.85).

12.5.147 The freshwater EQS values for the Protection of other Aquatic Life (based on cyprinid fish) have been used based on the status of the River Parrett in the vicinity of the site, as stated in Annex D of the **River Basin Management Plan** for the South West River Basin District (Ref. 12.85). The River Parrett is under tidal influence and is therefore characteristically marine in the vicinity of the site. However a surface water drainage feature is present approximately 20m to the north-east of the site boundary. The drain does not appear to connect to a wider drainage network, however in the interest of conservatism freshwater EQS values are considered to be appropriate to assess the risk to this watercourse. Due to the lack of connectivity with the River Parrett, no tidal inundation of the small surface watercourse in close proximity of the site is assumed.

12.5.148 The saltwater (coastal and transitional water, or 'other surface waters' in the 2010 Directions (Ref. 12.84)) EQS values have been selected based on the water body

status objectives for the Bridgwater Bay coastal waters established under the WFD and the **River Basin Management Plan** (Ref. 12.85). The objective set for Bridgwater Bay is to achieve good ecological status by 2027.

12.5.149 Where no EQS values exist for certain contaminants, the EQS values which were available prior to the publication of the 2010 Directions (Ref. 12.84) have been used. In the absence of UK standards for certain parameters, other published guideline concentrations such as the EQS values for Groundwater Drinking Water Protected Areas (Test 4) specified in the 2010 Directions (Ref. 12.84) and those recommended by the World Health Organisation (WHO) for drinking water (2004) (Ref. 12.86) have been adopted. This approach will essentially provide a conservative Tier 1 assessment. Test 4 presents an aquifer specific range of screening criteria for direct comparison with mean concentrations recorded over a six year monitoring period in a Groundwater Water Protected Area, in order to identify whether any upward trend in contaminant concentrations which can be attributed to anthropogenic impact is apparent.

12.5.150 The study area does not lie within a Groundwater Drinking Water Protected Area and as a consequence the water body status objectives (for groundwater impacts on surface waters in accordance with Part 7 of the WFD (Ref. 12.2)) have not been specified for the aquifer underlying the study area. Therefore, the EQS values are based on those relating to values of 'good' standard for freshwater rivers (Part 4 specific pollutants).

12.5.151 Where appropriate, the relevant freshwater EQS values have been adjusted to account for site specific conditions (i.e. hardness and alkalinity). The following provides details relating to the derivation of site specific EQSs:

- The EQSs for ammoniacal nitrogen (Part 3 Physico-chemical Standards) (Ref. 12.10) have been based on the River Basin Districts Typology, Standards and Groundwater Threshold Values criteria for Type 7 surface water systems. The surface water receptors have been classified as Type 7 surface waters based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency, in accordance with Part 2 **Table 1** of River Basin Districts Typology, Standards and Groundwater Threshold Values (Ref. 12.10).
- The freshwater EQS for copper is based on freshwater receptors containing an annual mean concentration of calcium carbonate (alkalinity) of between 100 and 250 mg/l $CaCO_3$, based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
- The EQS for cadmium is based on the freshwater receptors being classed as Class 5. This approach has been adopted based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
- The EQS for total zinc is based on the corresponding value for freshwater receptors containing an annual mean hardness concentration of 100mg/l to 250mg/l $CaCO_3$, based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.

12.5.152 Where no EQS value (freshwater, or other surface water type) exists in the River Basin Districts Typology, Standards and Groundwater Threshold Values (Ref. 12.10), the previous EQS values (i.e. pre-WFD) have been used as screening criteria.

12.5.153 It should also be noted that the lowest available limit of detection for total cyanide is above the revised annual average EQS (1µg/l) values (freshwater and other surface water type), but not above the maximum allowable concentration (5µg/l) for free cyanide.

12.5.154 As there is currently no drinking water standard for petroleum hydrocarbons, the value of 10µg/l, which was previously used in the 1989 Water Supply Regulations (Ref. 12.87) has been used. Furthermore, in lieu of any fresh/saline water EQS standards for petroleum hydrocarbons, the value of 50µg/l for DW1 treatment from the Surface Water (Abstraction for Drinking Water) (Classification) Regulations 1996 (Ref. 12.88) has been used.

12.5.155 A series of calculations have been used to convert the concentrations of ammoniacal nitrogen (as N) reported by the laboratory to ammonium (NH4), in order to assess against the drinking water standard Tier 1 value. These calculations are provided as **Appendix 12D**, and are:

$$\frac{Concentration}{14} \times 18 = AmmoniumNH_4$$

12.5.156 A comparison of the results of laboratory leachability analysis with generic environmental assessment criteria is presented in **Table 12.11**. Of the six samples tested, five correspond to samples from the upper part of the landfill waste mass.

Table 12.11: Summary of Leachability Testing Analysis Results (Deep and Shallow Soils)

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Arsenic (leachable)	<1 - 46	30	10 [1T]	**8**	25 [4 A GC]	**2**	50 [4 A / G15]	0
Barium (leachable)	6 - 119	30	-	-	-	-	100 [5]	**2**
Beryllium (leachable)	<1	30	-	-	-	-	-	-
Cadmium (leachable)	<1	30	5 [1T]	0	0.2 [4 A (C5) MAC] / 1.5 [4 (C5)]	**30 * [LOD]** / 0	0.25 [4 A(C5) MAC (C5) * LOD] / 1.5 [4]	**30 * [LOD]** / 0
Chromium (leachable)	<1 - 3	30	50 [1T]	0	15 [2 AD]	0	4.7 [A 4] / 32 [P G15 4]	0 / 0
Lead (leachable)	<1 - 31	30	25 [1T]	**2**	7.2 [4 A]	3	7.2 [4 A]	**3**
Mercury (leachable)	<0.1 - 0.2	30	1 [1T]	0	0.05 [4 A] / 0.07 [4 MAC]	**9 (21 * [LOD]) / 9 (21 * [LOD])**	0.05 [4 A] / 0.07 [4 MAC]	**9 (21 * [LOD]) / 9 (21 * [LOD])**
Nickel (leachable)	<1 - 12	30	20 [1T]	0	20 [4 A]	0	20 [4 A]	0
Copper (leachable)	<1 - 29	30	2,000 [1 T]	0	5 [4 A GC]	**6**	10 [4 A G15#]	**4**
Manganese (leachable)	<1 - 332	30	50 [1T]	**16**	-	-	-	-
Zinc (leachable)	<1 - 568	30	5,000 [5 T]	0	40 [A4 GC D]	**2**	75 [4 AT#G15]	**1**
Selenium (leachable)	<1 - 3	30	10 [7T]	0	-	-	-	-
Vanadium (leachable)	<1 - 22	30	-	-	100 [2 AT]	0	60 [2 A#]	0
Iron (leachable)	<10 - 1112	30	200 [1 T]	**3**	1,000 [A4 CG]	**1**	1,000 [A4 G15]	**1**
Boron (leachable)	<10 - 2770	30	1,000 [1 T]	**7**	7,000 [2 AT]	0	2,000 [2 AT]	**3**
pH (pH units)(leachable)	7.8 - 8.8	30	6.5-9.5 [1]	0	6-8.5 [2 P]	**4**	6 [4 (P5)H] 9 [4 (P)H]	0
Ammoniacal Nitrogen (mg/l)(leachable)	<0.1 - 60.3	30	-	**-**	-	-	0.3 [(P90) 4 T7 G15]	**23**

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Ammonium (mg/l)(leachable)	<0.1 - 77.5[@]	30	0.5 [1]	**23**	-	-		
Sulphur (mg/l) (leachable)	<1 - 240	30	-	-	-	-	-	-
Sulphate (mg/l)(leachable)	<1 - 669	30	250 [1]	**2**	-	-	400[A 3]	**1**
Free Cyanide (leachable)	<2 - 7	30	-	-	1 [4 A] / 5 [4 P GC FCN]	**5 (25 * [LOD]) / 1**	1 [4] A / 5 [4 P G15 FCN]	**5 (25 * [LOD]) / 1**
Total Cyanide (leachable)	<5 - 24	30	50 [1]	0	1 [4 A] / 5 [4 P GC FCN]	**8 (22 * [LOD]) / 8**	1 [4] A / 5 [4 P G15 FCN]	**8 (22 * [LOD]) / 8**
Thiocyanate (leachable)	<100 - 400	30	-	-	-	-	-	-
Sulphide (mg/l) (leachable)	<0.1 - 0.4	30	-	-	-	-	-	-
Chloride (mg/l)(leachable)	<1.0 - 99.8	30	250 [1]	0	-	-	250 [3 A]	0
PAH (EPA 16 total) (leachable)	<0.02 - 1.65	29	0.1 [1^^]	14	-	-	-	-
Naphthalene (leachable)	<0.02 - 0.45	29	-	-	1.2 [4 A]	0	2.4 [4 A]	0
Acenaphthylene (leachable)	<0.02 - 0.18	29	-	-	-	-	-	-
Acenaphthene (leachable)	<0.02 - 0.73	29	-	-	-	-	-	-
Fluorene (leachable)	<0.02 - 0.12	29	-	-	-	-	-	-
Phenanthrene	<0.02 - 0.09	29	-	-	-	-	-	-

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
(leachable)								
Anthracene (leachable)	<0.02 - 0.08	29	-	-	0.1[A] / 0.4 [MAC]	0 / 0	0.1[A] / 0.4 [MAC]	0 / 0
Fluoranthene (leachable)	<0.02 - 0.14	29	-	-	0.1 [4 A] / 1 [4 MAC]	**2** / 0	0.1 [4 A] / 1 [4 MAC]	**2** / 0
Pyrene (leachable)	<0.02 - 0.13	29	-	-	-	-	-	-
Benzo(a)anthracene (leachable)	<0.02 - 0.05	29	-	-	-	-	-	-
Chrysene (leachable)	<0.02 - 0.07	29	-	-	-	-	-	-
Benzo(b)fluoranthene (leachable)	<0.02 - 0.03	29	0.1 [1^^^]	0	Σ0.03 [4 A]	**3 (26 *[LOD])**	Σ0.03 [4 A]	**3 (26 *[LOD])**
Benzo(k)fluoranthene (leachable)	<0.02 - 0.03	29	0.1 [1^^^]	0				
Benzo (a) Pyrene (leachable)	<0.02 - 0.03	29	0.01 [1]	**2 (27 * [LOD])**	0.05 [4 A] / 0.1 [4 MAC]	0 / 0	0.05 [4 A] / 0.1 [4 MAC]	0 / 0
Indeno(1,2,3-cd)pyrene (leachable)	<0.02	29	0.1 [1^^^]	0	Σ0.002 [4 A]	**29 * [LOD]**	Σ0.002 [4 A]	**29 * [LOD]**
Benzo(ghi)perylene (leachable)	<0.02	29	0.1 [1^^^]	0				
Dibenzo(a,h)anthracene (leachable)	<0.02 - 0.05	29	-	-	-	-	-	-
Phenol (leachable)	<10 - 10	30	-	-	7.7 [4 A] / 46 [4 P]	**1 (28 * [LOD])** / 0	7.7 [4 A] / 46 [4 P]	**1 (29 * [LOD])** / 0
Cresols (leachable)	<10	30	-	-	-	-	-	-

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Xylenols (leachable)	<10	30	-	-	-	-	-	-
Resorcinol (leachable)	<10	30	-	-	-	-	-	-
Benzene (leachable)	<1	30	1 [1T]	0	8 [A4]	0	10 [A4]	0
Toluene (leachable)	<1 - 7	30	-	-	40 [A4] / 370 [P4]	0 / 0	50 [A4 G15] / 380 [P G15 4]	0 / 0
Ethylbenzene (leachable)	<1	30	-	-	-	-	-	-
M- & P- Xylene (leachable)	<1	30	-	-	Σ30 [A T4]	0	Σ30 [A T4]	0
O- Xylene (leachable)	<1	30	-	-				
MTBE (leachable)	<1	30	-	-	-	-	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

#	Based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
-	No current threshold value available.
D	Dissolved.
T	Total.
A	Annual Average.
P	95-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 5% of the time or more).
P90	90-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 10% of the time or more).
P5	5-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is less than the standard for 5% of the time or more).
MAC	Maximum Allowable Concentration.

C5	Cadmium EQS based on class 5 hardness (>200 mg/l $CaCO_3$), based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
GC	Threshold value based on 'good standard' for transitional and coastal waters to meet objective of WFD for Bridgewater Bay to achieve good ecological status by 2027 (no chemical criteria target thresholds specified).
G15	Threshold value based on 'good standard' to meet objective of WFD for River Parrett to achieve good status by 2027.
FCN	Threshold value for free cyanide (as HCN).
T7	Type 7 surface water, based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
H	Threshold value for high standard based on current WFD Status.
@	Ammonium values calculated from reported laboratory ammoniacal nitrogen concentrations (see **Appendix 12D**).
* LOD	Exceedences of the annual average EQS have occurred due to the limit of detection (LOD) not being low enough. This is a consequence of the current methodologies of analysis for these parameters. However, these 'exceedences' are not considered to be environmentally significant.
^^	The parametric value applies to the sum of the concentrations of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene detected and quantified in the monitoring process.
^^^	The individual concentrations are based on the 0.1 µg/l quoted for the sum of the four PAH compounds. By virtue of the total Tier 1 concentration being reported as 0.1 µg/l, the Tier 1 concentration for each individual compound has been applied at this value.
1.	The Water Supply (Water Quality) Regulations 2000.
2.	National Environmental Quality Standards (EQS) - For List II substances. Source DoE Circular 7/89. (Saltwater EQS = Saltwater concentration, Freshwater EQS = Freshwater Protection of other aquatic life - cyprinid fish).
3.	Environment Agency Non-Statutory (Operational) Environmental Quality Standards. Source **Table B11** Environment Agency EPR H1 Environmental Risk Assessment Part 2 Assessment of point source releases and cost benefit analysis.
4.	The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010.
5.	The Water Supply (Water Quality) Regulations 1989. N.B These Regulations were superseded by the 2000 regulations therefore there is currently no UK DWS for zinc and/or Total Petroleum Hydrocarbons.
6.	The Surface Waters (Dangerous Substances) (Classification) Regulations 1998.
7.	Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996.

12.5.157 The following determinands were recorded above the Tier 1 screening criteria in one or more samples of soil leachate:

- arsenic (drinking water standard and saline water EQS);
- barium (freshwater EQS);
- lead (drinking water standard, freshwater and saline water EQS);
- mercury (annual average and maximum allowable concentration freshwater and saline water EQS);
- manganese (drinking water standard);
- zinc (freshwater and saline water EQS);
- copper (freshwater and saline water EQS);
- iron (drinking water standard and freshwater and saltwater EQS);
- boron (drinking water standard and freshwater EQS);
- pH (saline water EQS);
- ammoniacal nitrogen (freshwater EQS);
- ammonium (drinking water standard);
- sulphate (drinking water standard and freshwater EQS);
- free and total cyanide (annual average and maximum allowable concentration freshwater and saline water EQS);
- total PAHs (drinking water standard);
- fluoranthene (freshwater and saline water EQS);
- benzo(b)fluoranthene and benzo(k)fluoranthene (freshwater and saline water EQS); and
- phenol (annual average freshwater and saline water EQS).

12.5.158 In addition to the above, the laboratory limit of detection (LoD) is greater than one or more of the Tier 1 screening criteria for the following contaminants:

- cadmium (freshwater and salt water annual average and maximum allowable concentration EQS); and
- indeno(1,2,3-cd)pyrene and benzo(g,h,i)perylene (the LoD for these contaminants individually exceeds the freshwater and saltwater EQS for both).

12.5.159 On the basis of the leachability testing undertaken on the shallow soils (i.e. from within 1m bgl) from the site, no significant source of potential leachable contamination has been proven to exist. Samples taken from deeper soils (i.e. from 1m bgl and greater), including the main body of the landfilled waste deposits, have

established the presence of some leachable determinands which may pose a risk to controlled waters.

12.5.160 Leachability testing represents a conservative approach to soil leachate generation potential. However concentrations of leachable manganese were recorded at approximately 6.5 times the drinking water standard. Leachable zinc was recorded at approximately 14 times the saline water EQS and 7.5 times the freshwater EQS. Leachable iron was recorded at approximately 5.5 times the drinking water standard. Ammoniacal nitrogen was recorded at 201 times the freshwater EQS. Ammonium was recorded at 155 times the drinking water standard. Total cyanide was recorded at up to 24 times the annual average freshwater and saline water EQS. These concentrations pose a potential risk to controlled waters, even allowing for substantial dilution of groundwater before reaching an abstraction point or surface water body (e.g. the River Parrett or surface water drainage network if there was a viable pathway for leachate to migrate to these receptors).

12.5.161 The results of analysis from the first groundwater/leachate monitoring campaign are presented within **Table 12.12**, the results from the second groundwater/leachate monitoring campaign are presented within **Table 12.13**, and the results of the third groundwater/leachate monitoring campaign are presented within **Table 12.14**, compared with relevant drinking water standards and Environmental Quality Standards (EQS). Boreholes which were advanced within, or close to, the existing sports pitch on the site (i.e. BHF04, BHF06 and BHF09) were decommissioned following the completion of the intrusive works, and therefore were not available for sampling and analysis.

Table 12.12: Summary of Groundwater/Leachate Testing Analysis Results (First Monitoring Campaign)

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Arsenic (dissolved)	2 - 59	12	10 [1T]	**6**	25 [4 A GC]	**4**	50 [4 A / G15]	**1**
Barium (dissolved)	19 - 674	12	-	-	-	-	100 [5]	**8**
Beryllium (dissolved)	<1	12	-	-	-	-	-	-
Cadmium (dissolved)	<1	12	5 [1T]	0	0.2 [4 A (C5)] / 1.5 [4 (C5) MAC]	**12** * [LOD] / 0	0.25 [4 A(C5) MAC (C5)] / 1.5 [4]	**12** * [LOD] / 0
Chromium (dissolved)	<1 - 8	12	50 [1T]	0	15 [2 AD]	0	4.7 [A 4] / 32 [P G15 4]	**1** / 0
Lead (dissolved)	<1 - 2	12	25 [1T]	0	7.2 [4 A]	0	7.2 [4 A]	0
Mercury (dissolved)	<0.1 - 0.6	12	1 [1T]	0	0.05 [4 A] / 0.07 [4 MAC]	**9** (**3*** [LOD]) / **9** (**3*** [LOD])	0.05 [4 A MAC] / 0.07 [4]	**9** (**3*** [LOD]) / **9** (**3*** [LOD])
Copper (dissolved)	<1 - 11	12	2,000 [1T]	0	5 [4 A GC]	**1**	10 [4 A G15#]	**1**
Calcium (dissolved) (mg/l)	204	1	250 [8]	0	-	-	-	-
Manganese (dissolved)	46 - 2,060	12	50 [1T]	**11**	-	-	-	-
Magnesium (dissolved)	34,400	1	50,000 [8]	0	-	-	-	-
Nickel (dissolved)	3 - 44	12	20 [1T]	**1**	20 [4 A]	**1**	20 [4 A]	**1**
Zinc (dissolved)	1 - 17	12	5,000 [5 T]	0	40 [A4 GC D]	0	75 [4 AT#G15]	0
Selenium (dissolved)	<1 - 14	12	10 [7T]	**1**	-	-	-	-
Vanadium (dissolved)	<1 - 87	12	-	-	100 [2 AT]	0	60 [2 A#]	**1**
Iron (dissolved)	24 - 25,300	12	200 [1 T]	**5**	1,000 [A4 CG]	**4**	1,000 [A4 G15]	**4**
Boron	111 - 4,920	12	1,000 [1 T]	**8**	7,000 [2 AT]	0	2,000 [2 AT]	**3**

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
pH (pH units)	7.1 - 12.0	12	6.5-9.5 [1]	**1**	6-8.5 [2 P]	**1**	6 [4 (P5)H] 9 [4 (P)H]	**1**
Ammoniacal Nitrogen (mg/l)	1.2 - 165	12	-	**-**	-	-	0.3 [(P90) 4 T7 G15]	**12**
Ammonium (mg/l)	1.5 - 212.1[@]	12	0.5 [1]	**12**	-	-	-	**-**
Sulphur (total) (mg/l)	<0.1	2	-	-	-	-	-	-
Sulphur (elemental/free) (mg/l)	1 - 44	10	-	-	-	-	-	-
Sulphate (mg/l)	<1 - 112	12	250 [1]	0	-	-	400[A 3]	0
Free Cyanide	<2/<8.8 - 2	12	-	-	1 [4 A] / 5 [4 P GC FCN]	**1** (**11*** [LOD]) / **1*** [LOD]	1 [4 A] / 5 [4 P G15 FCN]	**1** (**11*** [LOD]) / **1*** [LOD]
Total Cyanide	<5 - 9	12	50 [1]	0	1 [4 A] / 5 [4 P GC FCN]	**3** (**9*** [LOD]) / **3**	1 [4 A] / 5 [4 P G15 FCN]	**3** (**9*** [LOD]) / **3**
Thiocyanate (mg/l)	<0.1 - 0.9	12	-	-	-	-	-	-
Sulphide (mg/l)	<0.1 - 0.2	12	-	-	-	-	-	-
Chloride (mg/l)	<1 - 179	12	250 [1]	0	-	-	250 [3 A]	0
PAH (EPA 16 total)	<0.01 - 28.78	12	0.1 [1^^]	**9**	-	-	-	-
Naphthalene	<0.01 - 19.62	12	-	-	1.2 [4 A]	**2**	2.4 [4 A]	**2**
Acenaphthylene	<0.01 - 0.09	12	-	-	-	-	-	-
Acenaphthene	<0.01 - 3.22	12	-	-	-	-	-	-
Fluorene	<0.01 - 1.61	12	-	-	-	-	-	-
Phenanthrene	<0.01 - 2.48	12	-	-	-	-	-	-

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Anthracene	<0.01 - 0.54	12	-	-	0.1 [A] / 0.4 [MAC]	**4 / 1**	0.1 [A] / 0.4 [MAC]	**4 / 1**
Fluoranthene	<0.01 - 1.31	12	-	-	0.1 [4 A] / 1 [4 MAC]	**7 / 1**	0.1 [4 A] / 1 [4 MAC]	**7 / 1**
Pyrene	<0.01 - 0.92	12	-	-	-	-	-	-
Benzo(a)anthracene	<0.01 - 0.17	12	-	-	-	-	-	-
Chrysene	<0.01 - 0.29	12	-	-	-	-	-	-
Benzo(b)fluoranthene	<0.01 - 0.07	12	0.1 [1^^^]	0	Σ0.03 [4 A]	**3**	Σ0.03 [4 A]	**3**
Benzo(k)fluoranthene	<0.01 - 0.11	12	0.1 [1^^^]	**1**				
Benzo (a) Pyrene	<0.01 - 0.10	12	0.01 [1]	**3**	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0
Indeno(1,2,3-cd)pyrene	<0.01 - 0.07	12	0.1 [1^^^]	0	Σ0.002 [4 A]	**3 (9* [LOD])**	Σ0.002 [4 A]	**3 (9* [LOD])**
Benzo(ghi)perylene	<0.01 - 0.08	12	0.1 [1^^^]	0				
Dibenzo(a,h)anthracene	<0.01 - 0.01	12	-	-	-	-	-	-
Phenol	<10	12	-	-	7.7 [4 A] / 46 [4 P]	**12* [LOD]** / 0	7.7 [4 A] / 46 [4 P]	**12* [LOD]** / 0
Cresols	<10 - 40	12	-	-	-	-	-	-
Xylenols	<10 - 20	12	-	-	-	-	-	-
Resorcinol	<10 - 420	12	-	-	-	-	-	-
Benzene	<1/<5	12	1 [1T]	**1* [LOD]**	8 [A 4]	0	10 [A 4]	0
Toluene	<1/<5	12	-	-	40 [A 4] / 370 [P 4]	0 / 0	50 [A 4 G15] / 380 [P G15 4]	0 / 0
Ethylbenzene	<1/<5	12	-	-	-	-	-	-
M- & P- Xylene	<1/<5	12	-	-	Σ30 [A T 4]	0	Σ30 [A T 4]	0

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
O- Xylene	<1/<5	12	-	-				
MTBE	<1/<5	12	-	-	-	-	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

Based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.

\- No current threshold value available.

DPA River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010 Part 7 Groundwater Threshold Values for Groundwater Drinking Water Protected Areas.

D Dissolved.

T Total.

A Annual Average.

P 95-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 5% of the time or more).

P90 90-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 10% of the time or more).

P5 5-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is less than the standard for 5% of the time or more).

MAC Maximum Allowable Concentration.

C5 Cadmium EQS based on class 5 hardness (>200mg/l $CaCO_3$), based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.

GC Threshold value based on 'good standard' for transitional and coastal waters to meet objective of WFD for Bridgewater Bay to achieve good ecological status by 2027 (no chemical criteria target thresholds specified).

G15 Threshold value based on 'good standard' to meet objective of WFD for River Parrett to achieve good status by 2027.

FCN Threshold value for free cyanide (as HCN).

T7 Type 7 surface water.

H Threshold value for high standard based on current WFD Status.

@ Ammonium values calculated from reported laboratory ammoniacal nitrogen concentrations (see **Appendix 12D**).

* LOD Exceedences of the annual average EQS have occurred due to the limit of detection (LOD) not being low enough. This is a consequence of the current methodologies of analysis for these parameters. However, these 'exceedences' are not considered to be environmentally significant.

^^ The parametric value applies to the sum of the concentrations of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene detected and quantified in the monitoring process.

^^^ The individual concentrations are based on the 0.1 µg/l quoted for the sum of the four PAH compounds. By virtue of the total Tier 1 concentration being reported as 0.1 µg/l, the Tier 1 concentration for each individual compound has been applied at this value.

1. The Water Supply (Water Quality) Regulations 2000.
2. National Environmental Quality Standards (EQS) - For List II substances. Source DoE Circular 7/89. (Saltwater EQS = Saltwater concentration, Freshwater EQS = Freshwater Protection of other aquatic life - cyprinid fish).
3. Environment Agency Non-Statutory (Operational) Environmental Quality Standards. Source **Table B11** Environment Agency EPR H1 Environmental Risk Assessment Part 2 Assessment of point source releases and cost benefit analysis.
4. The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010.
5. The Water Supply (Water Quality) Regulations 1989. N.B These Regulations were superseded by the 2000 regulations therefore there is currently no UK DWS for zinc and/or Total Petroleum Hydrocarbons.
6. The Surface Waters (Dangerous Substances) (Classification) Regulations 1998.
7. Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996.
8. Private Water Supply Regulations 1992.

Table 12.13: Summary of Groundwater/Leachate Testing Analysis Results (Second Monitoring Campaign)

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Arsenic (dissolved)	2 - 60	7	10 [1T]	**2**	25 [4 A GC]	**1**	50 [4 A / G15]	**1**
Barium (dissolved)	29 - 392	7	-	-	-	-	100 [5]	**4**
Beryllium (dissolved)	<1	7	-	-	-	-	-	-
Cadmium (dissolved)	<1	7	5 [1T]	0	0.2 [4 A (C5)] / 1.5 [4 (C5) MAC]	**7*[LOD]** / 0	0.25 [4 A(C5)] / 1.5 [4 MAC (C5)]	**7*[LOD]** / 0
Chromium (dissolved)	<1 - 4	7	50 [1T]	0	15 [2 AD]	0	4.7 [A 4] / 32 [P G15 4]	0 / 0
Lead (dissolved)	<1 - 4	7	25 [1T]	0	7.2 [4 A]	0	7.2 [4 A]	0
Mercury (dissolved)	<0.1 - 0.8	7	1 [1T]	0	0.05 [4 A] / 0.07 [4 MAC]	**5 (2*[LOD]) / 5 (2*[LOD])**	0.05 [4 A] / 0.07 [4 MAC]	**5 (2*[LOD]) / 5 (2*[LOD])**
Copper (dissolved)	<1 - 16	7	2,000 [1T]	0	5 [4 A GC]	**1**	10 [4 A G15#]	**1**
Manganese (dissolved)	21 - 4,670	7	50 [1T]	**6**	-	-	-	-
Nickel (dissolved)	2 - 56	7	20 [1T]	**3**	20 [4 A]	**3**	20 [4 A]	**3**
Zinc (dissolved)	2 - 8	7	5,000 [5 T]	0	40 [A4 GC D]	0	75 [4 AT#G15]	0
Selenium (dissolved)	<1 - 11	7	10 [7T]	**1**	-	-	-	-
Vanadium (dissolved)	<1 - 48	7	-	-	100 [2 AT]	0	60 [2 A#]	0
Iron (dissolved)	76 - 24,200	7	200 [1 T]	**4**	1,000 [A4 CG]	**1**	1,000 [A4 G15]	**1**
Boron	150 - 2,610	7	1,000 [1 T]	**4**	7,000 [2 AT]	0	2,000 [2 AT]	**3**

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
pH (pH units)	7.1 - 12.2	7	6.5-9.5 [1]	**2**	6-8.5 [2 P]	**2**	6 [4 (P5)H] 9 [4 (P)H]	**2**
Ammoniacal Nitrogen (mg/l)	2.3 - 67.4	7	-	**-**	-	-	0.3 [(P90) 4 T7 G15]	**7**
Ammonium (mg/l)	3.0 - 86.7[@]	7	0.5 [1]	**7**	-	-	-	**-**
Sulphur (total) (mg/l)	<1 - 20	7	-	-	-	-	-	-
Sulphate (mg/l)	<1 - 57	7	250 [1]	0	-	-	400[A] [3]	0
Free Cyanide	<2	7	-	-	1 [4 A] / 5 [4 P GC FCN]	**7*[LOD]** / 0	1 [4 A] / 5 [4 P G15 FCN]	**7*[LOD]** / 0
Total Cyanide	<5	7	50 [1]	0	1 [4 A] / 5 [4 P GC FCN]	**7*[LOD]** / 0	1 [4 A] / 5 [4 P G15 FCN]	**7*[LOD]** / 0
Thiocyanate (mg/l)	<0.1 - 0.9	7	-	-	-	-	-	-
Sulphide (mg/l)	<0.1	7	-	-	-	-	-	-
Chloride (mg/l)	26 - 251	7	250 [1]	**1**	-	-	250 [3 A]	**1**
PAH (EPA 16 total)	0.10 - 4.97	6	0.1 [1^^]	**5**	-	-	-	-
Naphthalene	<0.01 - 1.82	6	-	-	1.2 [4 A]	**1**	2.4 [4 A]	0
Acenaphthylene	<0.01 - 0.03	6	-	-	-	-	-	-
Acenaphthene	<0.01 - 0.61	6	-	-	-	-	-	-
Fluorene	<0.01 - 0.36	6	-	-	-	-	-	-
Phenanthrene	<0.01 - 0.59	6	-	-	-	-	-	-
Anthracene	<0.01 - 0.16	6	-	-	0.1[A] / 0.4 [MAC]	**1** / 0	0.1[A] / 0.4 [MAC]	**1** / 0

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Fluoranthene	<0.01 - 0.48	6	-	-	0.1 [4 A] / 1 [4 MAC]	**2** / 0	0.1 [4 A] / 1 [4 MAC]	**2** / 0
Pyrene	<0.01 - 0.38	6	-	-	-	-	-	-
Benzo(a)anthracene	<0.01 - 0.17	6	-	-	-	-	-	-
Chrysene	<0.01 - 0.18	6	-	-	-	-	-	-
Benzo(b)fluoranthene	<0.01 - 0.09	6	0.1 [1^^^]	0	Σ0.03 [4 A]	**1**	Σ0.03 [4 A]	**1**
Benzo(k)fluoranthene	<0.01 - 0.03	6	0.1 [1^^^]	0				
Benzo (a) Pyrene	<0.01 - 0.06	6	0.01 [1]	**1**	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0
Indeno(1,2,3-cd)pyrene	<0.01 - 0.03	6	0.1 [1^^^]	0	Σ0.002 [4 A]	**1 (5*[LOD])**	Σ0.002 [4 A]	**1 (5*[LOD])**
Benzo(ghi)perylene	<0.01 - 0.03	6	0.1 [1^^^]	0				
Dibenzo(a,h) anthracene	<0.01	6	-	-	-	-	-	-
Phenol	<10	7	-	-	7.7 [4 A] / 46 [4 P]	**7* [LOD]** / 0	7.7 [4 A] / 46 [4 P]	**7* [LOD]** / 0
Cresols	<10	7	-	-	-	-	-	-
Xylenols	<10	7	-	-	-	-	-	-
Resorcinol	<10 - 280	7	-	-	-	-	-	-
Benzene	<1 / <5 - 3	7	1 [1T]	**1 (4*[LOD])**	8 [A 4]	0	10 [A 4]	0
Toluene	<1 / <5	7	-	-	40 [A 4] / 370 [P 4]	0 / 0	50 [A 4 G15 G15 4] / 380 [P]	0 / 0
Ethylbenzene	<1 / <5	7	-	-	-	-	-	-
M- & P- Xylene	<1 / <5	7	-	-	Σ30 [A T 4]	0	Σ30 [A T 4]	0

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
O- Xylene	<1 / <5	7	-	-				
MTBE	<1 / <5	7	-	-	-	-	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

#	Based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
-	No current threshold value available.
DPA	River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010 Part 7 Groundwater Threshold Values for Groundwater Drinking Water Protected Areas.
D	Dissolved.
T	Total.
A	Annual Average.
P	95-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 5% of the time or more).
P90	90-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 10% of the time or more).
P5	5-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is less than the standard for 5% of the time or more).
MAC	Maximum Allowable Concentration.
C5	Cadmium EQS based on class 5 hardness (>200mg/l $CaCO_3$), based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.
GC	Threshold value based on 'good standard' for transitional and coastal waters to meet objective of WFD for Bridgewater Bay to achieve good ecological status by 2027 (no chemical criteria target thresholds specified).
G15	Threshold value based on 'good standard' to meet objective of WFD for River Parrett to achieve good status by 2027.
FCN	Threshold value for free cyanide (as HCN).
T7	Type 7 surface water.
H	Threshold value for high standard based on current WFD Status
@	Ammonium values calculated from reported laboratory ammoniacal nitrogen concentrations (see **Appendix 12D**).
* LOD	Exceedences of the annual average EQS have occurred due to the limit of detection (LOD) not being low enough. This is a consequence of the current methodologies of analysis for these parameters. However, these 'exceedences' are not considered to be environmentally significant.

^^ The parametric value applies to the sum of the concentrations of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene detected and quantified in the monitoring process.

^^^ The individual concentrations are based on the 0.1 µg/l quoted for the sum of the four PAH compounds. By virtue of the total Tier 1 concentration being reported as 0.1 µg/l, the Tier 1 concentration for each individual compound has been applied at this value.

1 The Water Supply (Water Quality) Regulations 2000.

2 National Environmental Quality Standards (EQS) - For List II substances. Source DoE Circular 7/89. (Saltwater EQS = Saltwater concentration, Freshwater EQS = Freshwater Protection of other aquatic life - cyprinid fish).

3 Environment Agency Non-Statutory (Operational) Environmental Quality Standards. Source **Table B11** Environment Agency EPR H1 Environmental Risk Assessment Part 2 Assessment of point source releases and cost benefit analysis.

4 The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010.

5 The Water Supply (Water Quality) Regulations 1989. N.B These Regulations were superseded by the 2000 regulations therefore there is currently no UK DWS for zinc and/or Total Petroleum Hydrocarbons.

6 The Surface Waters (Dangerous Substances) (Classification) Regulations 1998.

7 Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996.

8 Private Water Supply Regulations 1992.

Table 12.14: Summary of Groundwater/Leachate Testing Analysis Results (Third Monitoring Campaign)

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Arsenic (dissolved)	3 - 702	7	10 [1T]	**3**	25 [4 A GC]	**2**	50 [4 A / G15]	**1**
Barium (dissolved)	20 - 383	7	-	-	-	-	100 [5]	**4**
Beryllium (dissolved)	<1	7	-	-	-	-	-	-
Cadmium (dissolved)	<1	7	5 [1T]	0	0.2 [4 A (C5)] / 1.5 [4 (C5) MAC]	**7*[LOD]** / 0	0.25 [4 A(C5)] / 1.5 [4 MAC (C5)]	**7*[LOD]** / 0
Chromium (dissolved)	<1 - 7	7	50 [1T]	0	15 [2 AD]	0	4.7 [A 4] / 32 [P G15 4]	**1** / 0
Lead (dissolved)	<1 - 14	7	25 [1T]	0	7.2 [4 A]	**1**	7.2 [4 A]	**1**
Mercury (dissolved)	0.1 - 1.4	7	1 [1T]	**1**	0.05 [4 A] / 0.07 [4 MAC]	**7** / **7**	0.05 [4 A] / 0.07 [4 MAC]	**7** / **7**
Copper (dissolved)	<1 - 16	7	2,000 [1T]	0	5 [4 A GC]	**1**	10 [4 A G15#]	**1**
Manganese (dissolved)	52 - 3,670	7	50 [1T]	**7**	-	-	-	-
Nickel (dissolved)	3 - 92	7	20 [1T]	**1**	20 [4 A]	**1**	20 [4 A]	**1**
Zinc (dissolved)	3 - 41	7	5,000 [5 T]	0	40 [A4 GC D]	**1**	75 [4 AT#G15]	0
Selenium (dissolved)	<1 - 11	7	10 [7T]	**1**	-	-	-	-
Vanadium (dissolved)	<1 - 82	7	-	-	100 [2 AT]	0	60 [2 A#]	**1**
Iron (dissolved)	35 - 5,140	7	200 [1 T]	**5**	1,000 [A4 CG]	**2**	1,000 [A4 G15]	**2**
Boron (dissolved)	217 - 2,710	7	1,000 [1 T]	**4**	7,000 [2 AT]	0	2,000 [2 AT]	**1**

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
pH (pH units)	6.9 - 10.6	7	6.5-9.5 [1]	**1**	6-8.5 [2 P]	**1**	6 [4 (P5)H] 9 [4 (P)H]	**1**
Ammoniacal Nitrogen (mg/l)	2.6 - 87.8	7	-	**-**	-	-	0.3 [(P90) 4 T7 G15]	**7**
Ammonium (mg/l)	3.3 - 112.9[@]	7	0.5 [1]	**7**	-	-	-	**-**
Sulphur (total) (mg/l)	<1 - 36	7	-	-	-	-	-	-
Sulphate (mg/l)	<1 - 100	7	250 [1]	0	-	-	400[A 3]	0
Free Cyanide	<2 / <6	7	-	-	1 [4 A] / 5 [4 P GC FCN]	**7*[LOD]** / **1*[LOD]**	1 [4 A] / 5 [4 P G15 FCN]	**7*[LOD]** / **1*[LOD]**
Total Cyanide	<5 - 6	7	50 [1]	0	1 [4 A] / 5 [4 P GC FCN]	**1 (6*[LOD])** / **1**	1 [4 A] / 5 [4 P G15 FCN]	**1 (6*[LOD])** / **1**
Thiocyanate (mg/l)	<0.1 - 1.4	7	-	-	-	-	-	-
Sulphide (mg/l)	<0.1 - 0.2	7	-	-	-	-	-	-
Chloride (mg/l)	28 - 214	7	250 [1]	0	-	-	250 [3 A]	0
PAH (EPA 16 total)	<0.01 - 5.32	7	0.1 [1^^]	**5**	-	-	-	-
Naphthalene	<0.01 - 1.03	7	-	-	1.2 [4 A]	0	2.4 [4 A]	0
Acenaphthylene	<0.01 - 0.03	7	-	-	-	-	-	-
Acenaphthene	<0.01 - 0.95	7	-	-	-	-	-	-
Fluorene	<0.01 - 0.41	7	-	-	-	-	-	-
Phenanthrene	<0.01 - 0.72	7	-	-	-	-	-	-
Anthracene	<0.01 - 0.17	7	-	-	0.1[A] / 0.4 [MAC]	**1** / 0	0.1[A] / 0.4 [MAC]	**1** / 0

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
Fluoranthene	<0.01 - 0.70	7	-	-	0.1 [4 A] / 1 [4 MAC]	**4** / 0	0.1 [4 A] / 1 [4 MAC]	**4** / 0
Pyrene	<0.01 - 1.24	7	-	-	-	-	-	-
Benzo(a)anthracene	<0.01 - 0.26	7	-	-	-	-	-	-
Chrysene	<0.01 - 0.39	7	-	-	-	-	-	-
Benzo(b)fluoranthene	<0.01 - 0.11	7	0.1 [1^^^]	0	Σ0.03 [4 A]	**1**	Σ0.03 [4 A]	**1**
Benzo(k)fluoranthene	<0.01 - 0.22	7	0.1 [1^^^]	0				
Benzo (a) Pyrene	<0.01 - 0.09	7	0.01 [1]	**1**	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0	0.05 [4 A] / 0.1 [4 MAC]	**1** / 0
Indeno(1,2,3-cd)pyrene	<0.01 - 0.03	7	0.1 [1^^^]	0	Σ0.002 [4 A]	**1 (5*[LOD])**	Σ0.002 [4 A]	**1 (5*[LOD])**
Benzo(ghi)perylene	<0.01 - 0.07	7	0.1 [1^^^]	0				
Dibenzo(a,h) anthracene	<0.01 - 0.01	7	-	-	-	-	-	-
Phenol	<10 - 650	7	-	-	7.7 [4 A] / 46 [4 P]	**1 (6* [LOD]) / 1**	7.7 [4 A] / 46 [4 P]	**1 (6* [LOD]) / 1**
Cresols	<10 - 70	7	-	-	-	-	-	-
Xylenols	<10	7	-	-	-	-	-	-
Resorcinol	<10 - 100	7	-	-	-	-	-	-
Benzene	<1/<5 - 4	7	1 [1T]	**1 (1*[LOD])**	8 [A 4]	0	10 [A 4]	0
Toluene	<1/<5	7	-	-	40 [A 4] / 370 [P 4]	0 / 0	50 [A 4 G15 G15 4] / 380 [P]	0 / 0
Ethylbenzene	<1/<5	7	-	-	-	-	-	-
M- & P- Xylene	<1/<5	7	-	-	Σ30 [A T 4]	0	Σ30 [A T 4]	0

Determinand	Range of Concentrations (µg/l unless stated)	Number of Samples	Drinking Water Standard (DWS) (µg/l unless stated)	Exceedences of DWS	Environmental Quality Standard Transitional and Coastal Waters/'Other Surface Waters' (µg/l unless stated)	Exceedences of EQS Transitional and Coastal Waters/'Other Surface Waters'	Environmental Quality Standard Freshwater (µg/l unless stated)	Exceedence of EQS Freshwater
O- Xylene	<1/<5	7	-	-				
MTBE	<1/<5	7	-	-	-	-	-	-

If no value is presented in bold then no samples exceeded the screening criteria.

Based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.

\- No current threshold value available.

DPA River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010 Part 7 Groundwater Threshold Values for Groundwater Drinking Water Protected Areas.

D Dissolved.

T Total.

A Annual Average.

P 95-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 5% of the time or more).

P90 90-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is greater than the standard for 10% of the time or more).

P5 5-percentile (defined as a standard that is failed if the measured value of the parameter to which the standard refers (e.g. concentration of a pollutant) is less than the standard for 5% of the time or more).

MAC Maximum Allowable Concentration.

C5 Cadmium EQS based on class 5 hardness (>200mg/l $CaCO_3$), based on the last reported hardness of the River Parrett at the Monksleaze Close monitoring point (2003) according to the Environment Agency.

GC Threshold value based on 'good standard' for transitional and coastal waters to meet objective of WFD for Bridgewater Bay to achieve good ecological status by 2027 (no chemical criteria target thresholds specified).

G15 Threshold value based on 'good standard' to meet objective of WFD for River Parrett to achieve good status by 2027.

FCN Threshold value for free cyanide (as HCN).

T7 Type 7 surface water.

H Threshold value for high standard based on current WFD Status

@ Ammonium values calculated from reported laboratory ammoniacal nitrogen concentrations (see **Appendix 12D**).

* LOD Exceedences of the annual average EQS have occurred due to the limit of detection (LOD) not being low enough. This is a consequence of the current methodologies of analysis for these parameters. However, these 'exceedences' are not considered to be environmentally significant.

^^ The parametric value applies to the sum of the concentrations of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene detected and quantified in the monitoring process.

^^^ The individual concentrations are based on the 0.1 µg/l quoted for the sum of the four PAH compounds. By virtue of the total Tier 1 concentration being reported as 0.1 µg/l, the Tier 1 concentration for each individual compound has been applied at this value.

1 The Water Supply (Water Quality) Regulations 2000.

2 National Environmental Quality Standards (EQS) - For List II substances. Source DoE Circular 7/89. (Saltwater EQS = Saltwater concentration, Freshwater EQS = Freshwater Protection of other aquatic life - cyprinid fish).

3 Environment Agency Non-Statutory (Operational) Environmental Quality Standards. Source **Table B11** Environment Agency EPR H1 Environmental Risk Assessment Part 2 Assessment of point source releases and cost benefit analysis.

4 The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010.

5 The Water Supply (Water Quality) Regulations 1989. N.B These Regulations were superseded by the 2000 regulations therefore there is currently no UK DWS for zinc and/or Total Petroleum Hydrocarbons.

6 The Surface Waters (Dangerous Substances) (Classification) Regulations 1998.

7 Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996.

8 Private Water Supply Regulations 1992.

12.5.162 The following determinands were recorded above the Tier 1 screening criteria in one or more samples:

- arsenic (drinking water standard, saline water and freshwater EQS in first, second and third monitoring campaigns);
- barium (freshwater EQS in first, second and third monitoring campaigns);
- chromium (annual average freshwater EQS in first and third monitoring campaigns);
- lead (saline water and freshwater EQS in third monitoring campaign);
- mercury (annual average and maximum allowable concentration saline water and freshwater EQS in first, second and third monitoring campaigns);
- copper (saline water and freshwater EQS in first, second and third monitoring campaigns);
- manganese (drinking water standard in first, second and third monitoring campaigns);
- nickel (drinking water standard, saline water and freshwater EQS in first, second and third monitoring campaigns);
- zinc (saline water EQS in third monitoring campaign);
- selenium (drinking water standard in first, second and third monitoring campaigns);
- vanadium (freshwater EQS in first and third monitoring campaigns);
- iron (drinking water standard, saline water and freshwater EQS in first, second and third monitoring campaigns);
- boron (drinking water standard and freshwater EQS in first, second and third monitoring campaigns);
- pH (above maximum drinking water standard, saline water and freshwater EQS in first, second and third monitoring campaigns);
- ammoniacal nitrogen (freshwater EQS in first, second and third monitoring campaigns);
- ammonium (drinking water standard in first, second and third monitoring campaigns);
- free cyanide (annual average saline water and freshwater EQS in first monitoring campaign);
- total cyanide (annual average and 95th percentile saline water and freshwater EQS in first and third monitoring campaigns);
- chloride (drinking water standard and freshwater EQS in second monitoring campaign);

- total PAHs (drinking water standard in first, second and third monitoring campaigns);
- naphthalene (saline water and freshwater EQS in first monitoring campaign, and saline water EQS in second monitoring campaign);
- anthracene (annual average and maximum allowable concentration saline water and freshwater EQS in first monitoring campaign, and annual average saline water and freshwater EQS in second and third monitoring campaigns);
- fluoranthene (annual average and maximum allowable concentration saline water and freshwater EQS in first monitoring campaign, and annual average saline water and freshwater EQS in second and third monitoring campaigns);
- sum of benzo(b)fluoranthene and benzo(k)fluoranthene, (saline water and freshwater EQS in first, second and third monitoring campaigns, and drinking water standard for benzo(k)fluoranthene in first monitoring campaign);
- benzo(a)pyrene (drinking water standard, annual average saline water and freshwater EQS in first, second and third monitoring campaigns);
- sum of indeno(123-cd)pyrene and benzo(ghi)perylene (saline water and freshwater EQS in first, second and third monitoring campaigns);
- phenol (annual average and 95th percentile saline water and freshwater EQS in third monitoring campaign); and
- benzene (drinking water standard in second and third campaigns).

12.5.163 In addition to the above, the laboratory limit of detection (LoD) is greater than one or more of the Tier 1 screening criteria for the following contaminants:

- cadmium (annual average saline water and freshwater EQS);
- dissolved mercury (annual average and maximum allowable concentration saline water and freshwater EQS);
- free cyanide (annual average and 95th percentile saline water and freshwater EQS);
- total cyanide (annual average saline water and freshwater EQS);
- sum of indeno(123-cd)pyrene and benzo(ghi)perylene (saline water and freshwater EQS);
- phenol (saline water and freshwater EQS); and
- benzene (drinking water standard).

12.5.164 The results of analysis of groundwater/leachate samples shows the presence of a number of contaminants at levels in exceedence of Tier 1 screening criteria, and which therefore may present a risk to controlled waters. The majority of contaminants which have been identified in site groundwaters are present at concentrations below or close to the Tier 1 screening values or laboratory limit of detection. However, certain determinands were reported at potentially significantly

elevated concentrations (the text within parentheses identifies from which sampling campaign the most elevated concentrations were reported):

- dissolved arsenic was identified at up to 70 times the drinking water standard (third monitoring campaign);
- dissolved barium was identified at up to 6.7 times the freshwater EQS (first monitoring campaign);
- dissolved mercury (also identified in elevated concentrations in site soils) was identified at up to 28 times the annual average EQS and 20 times the maximum allowable concentration for freshwater and saline water (third monitoring campaign);
- manganese was recorded at up to 93.4 times the drinking water standard (second monitoring campaign);
- vanadium was identified at up to 4.3 times the freshwater EQS (first monitoring campaign);
- dissolved iron was identified at greatly elevated concentrations, of up to 126 times the drinking water standard and 25.3 times the saline water and freshwater EQS (first monitoring campaign);
- boron was identified at up to 4.9 times the drinking water standard and 2.46 times the saline water and freshwater EQS (first monitoring campaign);
- pH was recorded at up to 12.2 pH units;
- ammoniacal nitrogen was recorded at up to 550 times the freshwater EQS (first monitoring campaign);
- ammonia was recorded at up to 424 times the drinking water standard (first monitoring campaign);
- total cyanide was recorded at up to nine times the annual average saline water and freshwater EQS (first monitoring campaign);
- naphthalene was recorded at up to 16 times the saline water EQS and eight times the freshwater EQS (first monitoring campaign);
- fluoranthene was recorded at up to 13.1 times the annual average freshwater and saline water EQS (first monitoring campaign);
- the sum of benzo(b)fluoranthene and benzo(k)fluoranthene was recorded at up to six times the freshwater and saline water EQS (first monitoring campaign);
- the sum of indeno(123-cd)pyrene and dibenzo(ghi)perylene was recorded at up to 75 times the freshwater and saline water EQS (first monitoring campaign). It should be noted however that the laboratory limit of detection is an order of magnitude greater than the EQS value; and
- phenol was recorded at up to 84 times the annual average freshwater and saline water EQS.

12.5.165 The results of analysis indicate that some chemical contaminants are present within groundwaters/leachate on the site at levels which may pose a risk to controlled waters, and are probably derived from leaching of site soils (in particular the landfilled waste deposits).

iv. Conceptual Site Model

12.5.166 Following a review of the baseline and intrusive investigation information, a Conceptual Site Model (CSM) has been produced to identify potential risks posed to human health and other receptors by soil contamination which may be present on or off-site. A description of the identified and potential sources, pathways and receptors (targets) is provided below.

Potential Sources of Contamination

12.5.167 The site is currently occupied by part of the Bridgwater and Albion Rugby Football Club but does not include the associated clubhouse or spectator stands. The environmental baseline information has shown that the site was previously utilised for clay extraction and the resulting voids were subsequently infilled with waste.

12.5.168 On the basis of available records and the results of the exploratory investigation, the former landfill within the site is understood to have been used for the disposal of inert, industrial, commercial and household wastes. Therefore it has the potential to generate hazardous ground gases and leachate which may pose a risk to human health, buildings and the wider environment.

12.5.169 The results of chemical soil analysis have identified only marginally elevated contaminant concentrations within the shallow soil (i.e. the upper 1.0m bgl). However, the deeper soils, including the main body of the landfilled waste has been found to contain higher concentrations of contaminants, which may pose a risk to human health, the built and soil environments. On the basis of this assessment, the likelihood of soil contamination being present on the site, mainly within the landfilled waste material, is currently assessed as ‘certain (likely to occur on many occasions). Concentrations of soil and waste contaminants in exceedence of soil screening criteria are present. However, these concentrations are relatively low when considering that the soils in part comprise aged landfilled domestic wastes. In addition, considering the proposed end use of the site as residential accommodation for workers and subsequent educational use, it is unlikely given the concentrations of contaminants identified within soil that the site would be determined as presenting a Significant Possibility of Significant Harm (SPOSH), i.e. statutory Contaminated Land under Part 2A.

12.5.170 Concentrations of some heavy metals (copper and zinc) and individual PAHs in shallow soils (within 1.0m bgl) and heavy metals (cadmium, chromium (III), lead, mercury, copper and zinc) and individual PAHs (deeper soils, i.e. below 1.0m bgl), have been recorded within site soils at concentrations greater than the Stage 1 and Stage 2 ecological screening values, indicating that there is a slight risk to ecological systems from these contaminants in soils and landfilled waste materials present on-site.

12.5.171 Copper and zinc were identified within site soils at concentrations which may pose a phytotoxic risk. The pH of the site soils was also found to be elevated (alkaline) in places.

12.5.172 Leachability testing of the soils on the site has been undertaken. The results of analysis confirms that soils from the site contain contaminants with the potential to generate leachate at concentrations which exceed conservative Tier 1 screening values, including many which may pose a risk to controlled waters.

12.5.173 Groundwater chemical analysis confirms that shallow groundwater/leachate on the site is not of good quality, containing a number of contaminants (some of which were identified in soil and leachability testing samples) significantly in exceedence of the Tier 1 screening criteria, and which may pose a risk to controlled waters (if a viable pathway was to exist).

12.5.174 The likelihood of significant groundwater contamination being present on the site is therefore assessed as 'certain'. The risk posed by such contamination to off-site controlled waters (principally groundwater) is assessed as low (i.e. the site could possibly be determined as Part 2A on the basis of risk posed to controlled waters by contaminated groundwater/leachate, and possibly suitable for use under the definitions provided in **Table 12.2**, if a viable pathway exists for such contamination to impact upon controlled waters).

12.5.175 On the basis of the monitoring data the site has been characterised as 'Characteristic Situation 2' in accordance with CIRIA C665 (Ref. 12.82).

Potential New Sources of Contamination during Construction/Operation

12.5.176 A detailed description of the proposed development, the methods and materials to be used during the construction, operation and post-operational phases are presented within **Chapter 1** of this volume of the ES. During the proposed works, 'new' potential sources of contamination could be present, such as those associated with:

- the contractor's compound (e.g. oil tanks/generators, sewage disposal etc.);
- wheel washing facilities;
- fuel and storage areas for plant and generators;
- temporary spoil stockpiles;
- excavated, reused soils and fills (should these be contaminated);
- leached contamination from excavated soils;
- contaminated run-off from the operational site;
- contamination within drainage systems; and
- release of contaminants from mechanised plant.

12.5.177 The list above is intended to be indicative and not exhaustive.

Potential Pathways and Exposure Mechanisms

12.5.178 The following potential pathways/exposure mechanisms (this list is not exhaustive) may exist on-site during the proposed construction, operational and any post-operational phase works. The pathways identified with an asterisk are not considered to be active during the operational phase, as the site would be encapsulated with hardstanding, covered by 'clean' soil in amenity soft landscaped areas or covered by buildings, and no works involving ground clearance would take place:

- human uptake pathways (derived from the CLEA model for commercial/industrial land use);
  - ingestion of soil*;
  - ingestion of outdoor dust*;
  - dermal contact with soil*;
  - contact with outdoor dust*;
  - inhalation of vapours outside; and
  - inhalation of vapour inside.
- infiltration and leaching through areas of exposed Made Ground/soil and bedrock;
- windborne transport of soil and dust from areas of exposed soils and rock*;
- migration and mobilisation of contaminants by piling operations*;
- root uptake by plants and trees on the site;
- ingestion, inhalation, dermal contact by ecological fauna;
- predation/bioaccumulation by ecological fauna;
- migration of contamination (e.g. ground gas/leachate) via permeable soils and bedrock;
- migration via groundwater flow;
- surface water run-off migration via surface water flow (drainage trenches and natural watercourses) (see **Chapter 13** of this volume);
- migration via man made conduits (e.g. service trenches, drains, services etc.); and
- entry into buildings via cracks, defects in the floor slab, service entry points etc.

12.5.179 The following activities may create and/or introduce new pathways and/or disturb and mobilise contamination during the construction works (note that this list is not exhaustive):

- soil stripping;
- demolition/dismantling;

- excavation and filling operations particularly using granular and permeable soils and fills;
- piling operations;
- general earthworks/re-grading;
- increased ground loading due to structures;
- installation of drainage network (construction phase); and
- dewatering.

Potential Receptors and Identified Value and Sensitivity

12.5.180 The following are considered to be potential receptors for soil contamination during the construction and operational phases of the site:

- humans (on-site - e.g. construction and maintenance workers and users of the proposed development);
- humans (off-site - e.g. users of local footpaths and local residents);
- controlled waters (i.e. groundwater (see below) and surface water (see **Chapter 13** of this volume));
- crops and livestock (see **Chapter 11** of this volume for details);
- terrestrial ecological systems including plants, trees and other vegetation (excluding crops). For full details of value and sensitivity see **Chapter 13** of this volume;
- built environment (i.e. construction materials); and
- soil environment.

12.5.181 On-site humans (i.e. construction workers): Construction workers are considered to have high value and sensitivity to contaminants. However health, safety and environmental legal requirements, and the good practices which would be adopted specifically those relating to the use of the appropriate personal protective equipment (PPE) and good hygiene, would reduce this. Therefore, the overall rating for value and sensitivity of on-site humans is considered to be low, as possible exposure to land contamination should be prevented or minimised through normal good practice.

12.5.182 On-site humans (i.e. users of the proposed development): On-site end users are considered to have high value and sensitivity to contaminants, and would not necessarily adopt PPE and good hygiene practices (as would construction and maintenance workers) which would reduce potential exposure, therefore their value and sensitivity is considered to remain high.

12.5.183 Off-site humans (i.e. users of local footpaths and local residents): Off-site humans are considered to be of 'high' value and sensitivity as they would not be using appropriate PPE.

12.5.184 Potential risks posed to on and off-site crops and livestock: This is primarily through potential phytotoxic/toxic effects from exposure to soil and/or groundwater contamination. For the purposes of this ES, the value and sensitivity for crops and livestock has been based on the agricultural land use classification (ALC) as detailed in **Chapter 11** of this volume.

12.5.185 Potential risks posed to terrestrial ecological systems (flora and fauna): This is from direct pathways such as ingestion, inhalation and direct contact with soil and/or groundwater contamination but also indirectly through potential predation and bioaccumulation of contamination. The assessment of the value and sensitivity of ecological receptors on-site and off-site has been determined on the basis of the findings of the ecology chapter, **Chapter 14** of this volume.

12.5.186 On-site soil environment: The value and sensitivity of the on-site uncontaminated soils to contamination is assessed as medium on the basis that the most valuable and sensitive soil which will be present at the site (i.e. soils proposed to be used at the site in areas of amenity soft landscaping).

12.5.187 Off-site soil environment: The value and sensitivity of the off-site soil environment is assessed as medium in adjacent areas, due to the presence of amenity land use (sports pitches and soft landscaping) in the surrounding area.

12.5.188 Buried concrete structures and buried potable water services may be at risk from chemical attack by site soils and groundwater/leachate, and the infiltration and build-up of hazardous ground gases may occur in buildings on the site. The value and sensitivity of these receptors is assessed as 'low to medium'. The proposed development includes: four accommodation buildings, an all weather 5-a-side football pitch, a temporary canteen, and some ancillary structures (see **Chapter 2** of this volume). As such, the value of the development is assessed as relatively low, as the structures to be built (with the exception of the accommodation buildings) is of relatively low to medium sensitivity to contamination or geotechnical problems when compared with, for example, bridges or tunnels.

12.5.189 The Tidal Flat Deposits and Mercia Mudstone are classified as a Secondary Aquifer (undifferentiated) and a Secondary B Aquifer respectively. The value and sensitivity of on-site groundwaters is therefore assessed as 'very low' because there is no significant local use and no Source Protection Zone within the study area.

12.5.190 The River Parrett is located at approximately 950m to the west and north-west of the site. At approximately 4.7km northwards (downstream) the River becomes a key component of the Severn Special Protected Area and Ramsar site and the Bridgwater Bay SSSI (see **Chapter 13** and **Chapter 14** of this volume). However no statutory designations apply to the River in the vicinity of the site. There are no surface water bodies within the site although a surface water drain is positioned at approximately 20m to the north-east of the site boundary; risks posed to surface waters from the proposed development are discussed within **Chapter 13** of this volume.

12.5.191 As the site does not lie within a SSSI, Local Geological Site (formerly RIGS) or locally designated geological site and has previously undergone significant disturbance/destruction as part of historical clay extraction works, it is deemed that

the geology of the study area can accommodate any minor changes as these would have no unacceptable impacts on the character or value. The geology of the study area is therefore considered to be of 'very low' value and sensitivity.

12.5.192 A summary of the value and sensitivity of the receptors at the site is provided in **Table 12.15**. Value and sensitivity of some receptors (e.g. ecology and plants, trees, crops and other vegetation) can range from very low to high. In accordance with other chapters in this volume the most valuable and sensitive receptor has been used for the purposes of the impact assessment in order to make the overall impact assessment conservative in approach.

Table 12.15: Value and Sensitivity of Geological, Land Contamination and Groundwater Receptors

Receptor	Value/Sensitivity	Comment
Humans On-site	Low	Determined in relation to standard site working practices and procedures (including the application of appropriate PPE and hygiene standards) significantly reducing the risk of exposure to otherwise high sensitivity/value receptors.
Humans **On-site (i.e. development site end users)**	High	Determined in relation to the absence of PPE and as such reduced protection against exposure to contamination.
Humans Off-site	High	Determined in relation to the absence of PPE and as such reduced protection against exposure to potential contamination.
Crops and Livestock On-Site	None/Not applicable	No crop growing or livestock grazing takes place on-site.
Crops and Livestock Off-Site	None/Not applicable	No crop growing or livestock grazing takes place within the study area.
Ecological Systems (including plants, trees and other vegetation) On-Site	Low	Determined on the basis of the absence of significant vulnerable ecological systems on-site. See **Chapter 14** of this volume for details.
Ecological Systems (including plants, trees and other vegetation) Off-Site	Low	Determined on the basis that significant vulnerable ecological systems (habitats or species) are absent from the site but are nearby off-site (see **Chapter 14** of this volume for details). No statutory or non-statutory designated ecological sites are present within the study area.
Soil Environment On-site	Medium	Determined on the basis of the most valuable and sensitive soils to be present at the site (i.e. those to be used for amenity soft landscaping). Note that this value and sensitivity rating may differ from that given in **Chapter 11** of this volume, as that assessment is based on the effects of physical disturbance, not chemical contamination.

Receptor	Value/Sensitivity	Comment
Soil Environment Off-site	Medium	Determined on the basis of the most sensitive use of the off-site soil environment (i.e. amenity soft landscaping).
Buried Concrete Structures/Built Environment On-site	Medium	Determined in relation to the potential for soils and groundwater to cause chemical deterioration of buried concrete structures, and for chemical contamination of buried potable water services.
Groundwater On-site and Off-site	Very low	Determined in relation to the Secondary (undifferentiated) and Secondary B Aquifers present on the site, in particular the presence of significant Tidal Flat Deposits across the site.
Geology On-site	Very low	Determined in relation to the lack of a geological designation on-site, the likely tolerance of the geological assets of the site to the effects of the proposed development and the prior impact on geology of the historical clay extraction within the site.

12.6 Assessment of Impacts

a) Introduction

12.6.1 The focus of this section is on the potential impacts related to geology and the disturbance of contaminated soils that could impact human health, ecology, groundwater receptors, the built and/or soil environments. As identified above, due to the absence of agricultural land within the study area, no assessment has been undertaken with respect to the potential impacts of the development to crops or livestock. Potential impacts to surface waters are addressed in **Chapter 13** of this volume.

12.6.2 Potential impacts to the soil environment, i.e. reduction in soil quality as a result of physical disturbance and handling during the works, are described and assessed within the soils and land use chapter (see **Chapter 11** of this volume). However, the potential impacts to soils or impairment of soil functionality as a result of contamination (either existing or as a result of spillages and leakages from mechanised plant or equipment during the works) has been assessed within this section.

12.6.3 The proposed development would be transferred to a third party for use in connection with Bridgwater College (see **Chapter 5** of this volume). None of the potential work in the post-operational phase would have any impact greater than those set out for the operational phase.

i. Environmental Management and Protection Measures

12.6.4 The following impact assessment has been undertaken assuming that legislative compliance and the implementation of standard good practice working methods which are typically employed on UK development sites would be implemented. It should be noted that the application of minimum legislative requirements and standard good construction practices are not considered as formal mitigation (i.e.

specific additional mitigation to reduce assessed moderate or major adverse impacts) for this ES.

12.6.5 Environmental impacts and disturbance arising from construction activities would be managed through a range of control measures and monitoring procedures, the principles of which are outlined in the **Environmental Management and Monitoring Plan (EMMP)** and in the **Land Contamination Management Plan (LCMP)**.

12.6.6 Protection measures include those relating to the control of release of potentially contaminated materials into the environment from the original source location. Certain standard control measures which are typically applied on construction sites where substantive earthworks are undertaken are also effective at controlling the dispersion and creation of contamination.

12.6.7 The following impact assessment assumes legislative compliance and the implementation of standard good practice working methods which are typically employed on UK development sites.

12.6.8 Excavated materials are to be screened against acceptability criteria as they arise during the works and how their chemical and geotechnical suitability would be determined for re-use on the site. Procedures for the tracking and recording of the placement of different material types on-site would describe how any unforeseen ground conditions are to be addressed. Typical requirements include the quarantining of any unexpected material and subjecting it to representative sampling and analysis to inform appropriate decision making with respect to the fate of the material.

12.6.9 Examples of standard good practice control measures include the following (note that this list is not exhaustive):

- Dust Control: dust control measures (which are not specific to soil contamination but would still apply) are described and presented in the section relating to air quality (**Chapter 10** of this volume) and would include:
  - covering of soils during transportation;
  - regular inspection and, if necessary, cleaning and repair of local highways and site boundaries to check for the soil/dust deposits (and removal if necessary);
  - use of mobile or fixed spray units to dampen surfaces of exposed soil as indicated by weather conditions; and
  - keeping soil stockpiles or mounds away from the site boundary, and where possible, enclosing soil stockpiles or keeping them securely sheeted.
- Run-off: mitigation measures related to run-off are described and presented in the section relating to surface water (**Chapter 13** of this volume); and
- Contaminated Land: measures that are likely to be employed on construction sites to minimise the potential for land contamination include:

- refuelling of vehicles and other plant to only be carried out either within a designated area or where that is not possible, under the supervision of a suitably qualified and trained site foreman;
- only well maintained equipment and vehicles to be permitted on-site (the earthworks contractor/plant and equipment contractor would provide inspection certificates of the plant/equipment's 'fitness for purpose' and shall regularly inspect and check plant and vehicles throughout the works to ensure they remain 'fit for purpose');
- any item of plant that leaks fuel or oil onto any surface would be considered unfit for use and shall be repaired immediately;
- any spillages of contaminating liquids or other materials would be reported to the site manager immediately. Stocks of oil absorbent materials shall be kept on-site to deal with small spillages;
- all personnel on-site would be made aware of all of the above standard good practice measures and would be instructed to implement them; and
- a combination of material characterisation and removal, where appropriate, prior to stockpiling and construction control measures would be employed in order to ensure that the risk to off-site humans is minimised as far as is practicable.

12.6.10 As a former landfill site, as part of standard good practice, the site would be subject to risk mitigation measures to ensure that no significant detrimental impacts would result from the construction or use of the proposed development, to human health or the environment. For example, piling operations would be designed and undertaken in such a manner as to ensure that no new pathway for contaminant migration from the landfill waste deposits into the underlying Secondary B Aquifer would be generated. Buildings and services on the site would also be designed and constructed in such a way and with such materials that these would not be at risk from contamination or hazardous ground gases potentially associated with the landfill deposits, or deposits from other landfill sites within the study area.

Material Characterisation

12.6.11 In order to comply with PPS23 (Ref. 12.39), a site investigation would normally be required. Site investigation works have therefore been undertaken at the site to address this requirement (see Section 12.5). The site investigation and chemical analysis results are indicative of the presence of certain contaminants which may pose a risk to human health, ecology, the built and soil environments, and groundwater quality.

12.6.12 Any unidentified contamination which may be encountered during the construction earthworks would be either removed off-site immediately, or segregated and contained until chemical testing demonstrates the contamination status and therefore suitability for re-use of the soil. Soils found not to be suitable for re-use due to the presence of significant contamination would be removed from site. Materials handling of contaminated soils would be restricted to areas where these have been identified and, therefore, would not be transported across the site where possible, subject to access/egress constraints. All transport of potentially contaminated

materials would be subject to appropriate dust/odour/vapour control measures as per standard good site practice. This would minimise the risk for further disturbance and release of contaminated dust/vapours which could potentially migrate off-site.

Re-use of Materials

12.6.13 All materials re-use should be supported by appropriate classification and confirmation that they are deemed suitable for use (both chemically and geotechnically). These materials management requirements may also need to be supported by appropriate licence agreements or exemptions. The topsoil removed during soil stripping would be stored and re-used on-site.

Construction of Buildings and Services

12.6.14 Elevated soil contaminant concentrations have been identified in site soils which pose a low potential risk to buried concrete structures and potable water services. These risks would be effectively mitigated by the use of sulphate resistant concrete in subsurface structures within areas affected by these contaminants, and by the use of chemical resistant potable water pipeline construction materials and/or clean service trench infill materials.

Animal Burial Pits

12.6.15 A watching brief for potential sources of contamination which have not been identified during intrusive investigations will be maintained in accordance with procedures set out in the **LCMP**. Any animal burial pits which may be encountered during the ground works will be delineated and removed.

Ecological Mitigation Measures

12.6.16 In accordance with the recommendations made in **Chapter 14** of this volume of the ES, a range of standard non-receptor specific mitigation measures would be implemented during the construction phase, including:

- provision of an Ecological Clerk of Works (ECoW) during all site clearance activities;
- ecological supervision by the ECoW of any activities that have the potential to adversely affect wildlife; and
- general measures such as providing an escape route for animals in deep trenches.

b) Construction Impacts

12.6.17 This section identifies and assesses the potential impacts of the construction phase on geology, land contamination (or its disturbance) and groundwater within the study area. A detailed description of the site and the construction methods and materials to be used is presented in **Chapters 1 to 3** of this volume.

12.6.18 Key construction activities that may impact the environment (note that the list is indicative and is not intended as exhaustive) are as follows:

- preparation (topsoil stripping/stockpiling using mechanised plant and demolition/removal of existing infrastructure associated with floodlighting of the existing Bridgwater and Albion Rugby Football Club);
- excavation works associated with the construction of surface water attenuation storage system, access roads, services and site infrastructure, and the installation of foundations by piling;
- construction activities (e.g. the construction of buildings (foundations, superstructure and fit-out), laying of internal road infrastructure, hardstanding and services); and
- dewatering works.

i. Geology

12.6.19 Impacts to geology as a result of the proposed development are considered to be limited to on-site intrusive activities involving the physical disturbance of soils, superficial and solid geology.

Construction Phase Works

12.6.20 Activities taking place during the construction phase which may impact geological receptors include soil stripping, excavation works/backfilling, demolition/dismantling, temporary stockpiling and piling.

12.6.21 Limited/localised soil stripping, i.e. the removal of soil in the current amenity sports pitch and soft landscaped areas, occupying an area of approximately 1ha of the 1.9ha site, would take place as part of the construction phase as part of the initial levelling works on the site. As natural deposits have been identified from a minimum depth of 2.80m bgl (BHF10), the soil stripping (to an anticipated depth of approximately 300mm) would not involve the removal of shallow geology and as such, soil stripping would have no impact upon the geology of the site.

12.6.22 Soil stockpiling would not impact upon the subsurface environment, and therefore no impact to geology would occur.

12.6.23 Demolition/dismantling of the existing floodlighting infrastructure on the site would not involve excavation beneath the Made Ground and would therefore not affect the geology of the site.

12.6.24 Excavations would take place to shallow depth across localised parts of the site, associated with the construction of foundations for above ground structures (i.e. the accommodation buildings) surface water attenuation storage system, services and the site drainage network.

12.6.25 Piling would be undertaken by driving pre-cast concrete piles of approximately 27m length and 0.45m diameter into the ground. The piles would penetrate the landfill and enter the underlying mudstone bedrock. The piles would comprise an initial bore through the landfill which would be filled with bentonite as a sealant. Piling works (associated with the foundations of the accommodation buildings) would extend beyond the Made Ground and landfilled waste deposits into the underlying superficial

and solid geology (through approximately 19.6m of superficial geology to a depth of approximately 27m bgl, into the underlying solid geology of the Mercia Mudstone Group). However, the geology of the site is not designated and has previously undergone greatly more substantial change as a result of the historical clay extraction works.

12.6.26 The extent of excavation and/or piling works only amounts to a very small fraction of the site (approximately 0.0024ha, or 0.001% of the total site area) and is thus considered *de minimus*. Due to this, and the substantial prior geological change as a result of historical clay extraction, the activity is assessed as low magnitude.

12.6.27 The site has no identified features of geological interest, or local or national designation with respect to geology. Therefore the underlying geology has been assigned a very low value and sensitivity. Due to the ground conditions at the site, the significance of this impact (i.e. construction phase works to geology) is assessed as **negligible**.

ii. Land Contamination

12.6.28 This section considers potential impacts upon human health, ecology (including plants, trees and other vegetation), the soil and built environments. The impacts from land contamination upon groundwater receptors are presented below.

12.6.29 Construction phase impacts relating to land contamination can principally arise from:

- the potential for existing contamination on-site and/or off-site to be mobilised by construction activities, e.g. soil disturbance and dust generation during earthworks; and
- the potential for contamination of the soils to occur during construction works (e.g. from escape of fuel, oils and other contaminating liquids from plant, equipment and storage tanks).

Construction Phase Works on Human Health, Ecology, the Soil and Built Environments - On-site

12.6.30 Activities to take place during the construction phase which may impact upon human health, ecology, the soil and built environments comprise the following: soil stripping, excavation works, demolition/dismantling of the existing infrastructure on the site, piling and the impact of fugitive emissions from excavations and temporary stockpiling.

12.6.31 Soil stripping (i.e. the removal of the sports pitch and soft landscaping) would take place at the site as part of the construction works, affecting an area of approximately 1ha of the 1.9ha site (52% of the site area). The topsoil would be subsequently removed from the site under appropriate material management protocols. Excavations would be required in areas where subsurface structures would be built (e.g. drainage system, services, surface water attenuation storage system and foundations).

12.6.32 Stockpiled soils and other materials in which contamination may be present could potentially generate wind borne contaminated dust or contaminated run-off (i.e.

fugitive emissions), which could result in the transmission of contaminants to sensitive human, soil or built environment receptors. However no long-term storage of soils would take place, with excavated soils to be removed from the site under appropriate material management protocols. Any contaminated soils and waste identified during topsoil stripping and deeper excavations would be segregated and removed from site.

12.6.33 Piling would take place within the footprint of the accommodation buildings through the use of pre-cast driven piling methods. This would comprise an initial bore through the landfill zone which would subsequently be filled with bentonite as a sealant. A second, smaller diameter pre-cast pile would then be driven through the bentonite and advanced into the mudstone bedrock. Contaminated arisings (landfill wastes and/or Made Ground) from the piling works would be removed from the site and taken to a licensed facility for off-site disposal.

12.6.34 No animal burials are recorded within the study area (Ref. 12.62). The likelihood of encountering or accidentally disturbing unrecorded old animal burial pits within the site is considered to be very unlikely.

12.6.35 The results of chemical analysis undertaken on soils and wastes from the proposed development shows the presence of concentrations of a small number of contaminants at concentrations which may pose a risk to human health. No asbestos contamination has been identified in samples of soil or wastes analysed from the site. However due to the potential for the presence of asbestos containing materials within the landfilled waste deposits present at the site, a watching brief for asbestos would be maintained by an appropriately qualified contractor. The landfilled waste deposits and Made Ground which may contain elevated contaminants includes the total footprint of the site and extends to a maximum depth of 7.40m bgl. The piling, excavation and stockpiling works, and to a lesser extent topsoil stripping works, may result in the disturbance and/or mobilisation of contamination associated with these deposits. However, the potential for impacts to occur would be reduced by the implementation of good site practice (as set out in the **LCMP**) in order to minimise potential contaminant mobilisation and release. As such the magnitude of potential impact from buried animals and soil contamination to human health is assessed as low.

12.6.36 Potential impacts to construction workers could occur via direct contact, inhalation and/or ingestion of contaminated soils and soil vapours, and could be adverse, temporary or possibly (depending on the nature of the health impact) permanent, direct and indirect.

12.6.37 The value and sensitivity of construction workers operating on-site is initially rated as high. However, in accordance with standard good practice no worker would be permitted to work at the site without having first received adequate training in the use of appropriate Personal Protective Equipment (PPE), and the adoption of good site hygiene practices. Management control measures would also be in place to ensure the control of exposure to contamination in the event of unforeseen ground conditions being encountered. The adoption of these exposure control methods reduces the overall value and sensitivity rating for construction workers to low. Accordingly the significance of this impact (i.e. the effects of construction phase works on human health on-site) is assessed as **minor adverse**.

12.6.38 Soil analysis has demonstrated the presence of occasional screening value exceedences by some heavy metals and PAHs in localised areas of Made Ground and landfilled wastes on the site. The concentrations of ecotoxic and phytotoxic contaminants in the site soils are however relatively low, particularly within shallow soils, when considering the former use of the site as a domestic waste landfill. The risks from the slightly elevated concentrations of certain potentially ecotoxic contaminants in the localised areas of Made Ground given standard good construction practice and materials management are considered to be low. Therefore the magnitude of potential impacts arising from the disturbance of potentially contaminated soils on-site during the construction works is also considered to be low. Assuming that some of the baseline ecology is still present on-site during the construction works (i.e. not all would be removed by ecological mitigation plans or as part of site stripping and preparation works), the value and sensitivity of the on-site ecology (including plants, trees, and other vegetation) is assessed as low. Consequently the significance of this potential impact (i.e. the effect of construction phase works on ecology on-site) is assessed as **minor adverse**.

12.6.39 Built environment receptors include concrete used for sub-surface structures and potable water supply pipes laid to service the site. These receptors would be present within the main part of the site.

12.6.40 Temporary stockpiling of materials on the site, and the leaching or emission of dust from such stockpiled materials, would not impact upon buildings and services as it is expected that this activity would take place either before the installation of buildings/services, or in designated spaces away from potentially sensitive built environment receptors. In accordance with standard good practice, any potentially contaminated materials would be segregated and either removed from site directly. No stockpiles would be retained on-site following the construction phase.

12.6.41 As contamination has been identified within soils and landfilled wastes on the site at concentrations which may pose a risk to built environment receptors (buried concrete structures and potable water supply pipes), the magnitude of impact is initially assessed as medium.

12.6.42 Sulphate can pose a risk of chemical attack to buried concrete structures. Although the majority of soil samples tested were typically low, (i.e. below the relevant Tier 1 screening criteria for risk to concrete), three sulphate samples were recorded above the screening value. It is assessed that a medium risk to buried concrete structures is posed by site soils, particularly due to the presence of substantial Made Ground deposits including landfilled waste within the site, indicating ground chemical quality will be variable laterally and with depth. However, subsurface concrete structures would be constructed with appropriately sulphate resistant concrete materials, therefore minimising the risks to these structures posed by sulphate within soils.

12.6.43 The magnitude of impact to potable water supply pipes is assessed initially as medium, as soil contaminants have been recorded within the Made Ground and landfill wastes which exceed relevant soil screening criteria (refer to Section 12.5 of this chapter). Any loss of integrity of such infrastructure as a result of contamination could result in an indirect impact upon worker and/or operational phase user's health. However, the potential risks posed to potable water supply pipes would be reduced

substantially by the use of chemical resistant construction materials (e.g. PE/Al/PE type construction) and/or the use of clean backfill in service trenches as required, which would be undertaken under standard good brownfield development practice and which would reduce the potential for contamination to permeate or otherwise damage potable water supply pipes. Due to the control measures identified above, the magnitude of impact to built environment receptors (buried concrete structures and potable water supply pipes) is assessed as low.

12.6.44 There is the potential that any impact could be temporary or permanent (depending on the contaminant) and direct.

12.6.45 It is important to note that the built environment receptors which are to be constructed at the site are of relatively low value (i.e. principally accommodation buildings) when compared with structurally and economically more valuable and sensitive structures such as bridges, tunnels and power stations.

12.6.46 The value and sensitivity to contamination of built environment receptors is therefore assessed as being medium. Accordingly the significance of this impact (i.e. the effects of construction phase works on built environment receptors) is assessed to be **minor adverse**.

12.6.47 On-site soil environment receptors include engineering fills. Soils removed as part of the soil strip would not be removed from the site. The adoption of good site practices would ensure that, where identified or unidentified contaminated materials are encountered during soil stripping, excavations, piling and temporary stockpiling, they would be segregated at source and removed from site for disposal. Therefore, contamination which may be present at the site would be segregated from imported soils which are intended for use in areas of soft landscaping and other construction materials including engineering fills. The potential magnitude of impact to on-site soil environment receptors that may arise as a result of existing contamination (either known or encountered during the construction phase) is therefore assessed as very low. The potential impacts of contamination upon the uncontaminated soil environment are likely to be direct adverse, temporary and/or permanent.

12.6.48 The value/sensitivity of on-site soil receptors is assessed as medium, on the basis of the soil type present at the site (i.e. soils for use only in amenity soft landscaping) (refer to **Chapter 11** of this volume). The results of soil and landfilled waste sample analysis indicate the presence of a number of contaminants at concentrations which may pose a risk to soil quality within the site.

12.6.49 The significance of this impact (i.e. the impacts of the construction phase works) is considered be **minor adverse**.

Potential Contamination due to Spills and Leaks from Mechanised Plant to Human Health, Ecology, the Soil and Built Environments - On-site

12.6.50 Mechanised plant (including conventional scrapers and bulldozers) would be utilised during the construction works. For all activities requiring the use of mechanised plant there is the potential for spillage or leakages of contaminating liquids, such as diesel or hydraulic oil, to contaminate site soils especially during vehicle refuelling operations. Impacts from mechanised plant could occur in any location where

mechanised plant would be used (i.e. the footprint of the proposed development), and in particular in areas where maintenance and refuelling are to take place. However, any accidental spillage or leakage would be localised, of limited volume and the magnitude of impact associated with these activities would be reduced further by the adoption of standard good practices, particularly those relating to vehicles and equipment maintenance and dealing with associated leaks or accidental spills. The magnitude of impact is therefore assessed as very low.

12.6.51 There is the potential for indirect impact upon the health of construction workers arising from exposure to contaminated soils (via ingestion, inhalation or direct contact) which may be generated as a result of accidental leaks or spills of contaminating materials. Given that any soil contamination arising from accidental leaks or spills would be highly localised, the magnitude of exposure would be very low. The value/sensitivity of workers on-site is initially rated as high, however the management, training and control procedures that would be implemented reduces the value/sensitivity rating to low. Accordingly the significance of this impact (i.e. the effects of spills or leaks upon human health from contaminated soil as a result of using mechanised plant) is assessed as **negligible**.

12.6.52 Any remaining on site ecology (including trees, plants and other vegetation) could be impacted by such leaks and spills. However, the magnitude is predicted to be very low. The value and sensitivity of any remaining on-site ecology is assessed in the worst case as low. Accordingly, the significance of the potential impact to ecology from contamination resulting from spills and leaks as a result of using mechanised plant is **negligible**.

12.6.53 Built environment receptors are unlikely to be impacted by spills or leakages of contamination from mechanised plant under the provisions of good site practice and the procedures outlined. The magnitude of impact from soil contamination to built environment receptors is initially considered to be low (i.e. buried concrete structures) to medium (i.e. potable water supply services). However, good construction practice would result in the use of contaminant resistant potable water supply pipes and/or clean service trenches as required on the basis of existing soil contamination. As such the magnitude of impact would overall be reduced to very low. There is the potential that any impact could be temporary or permanent (depending on the contaminant) and direct. As described previously, the value and sensitivity to contamination of built environment receptors is assessed as medium. Accordingly the significance of this impact (i.e. the impacts of contamination from spills or leaks from mechanised plant to the built environment) is considered to be **minor adverse**.

12.6.54 Good site practices would ensure that spills or leakages of contamination from mechanised plant would be largely prevented, and managed where they do occur, therefore a very low magnitude is considered to be applicable. The potential impacts of contamination upon the uncontaminated soil environment are likely to be adverse, temporary and/or permanent, direct and indirect. The on-site soil environment is classified as medium value and sensitivity on the basis of the soil type present at the site during the construction phase (i.e. soil for use only in amenity soft landscaping). The significance of this impact (the impacts of contamination from spills or leaks to the soil environment) is considered be **minor adverse**.

Hazardous Ground Gas Migration and Build-up to Human Health - On-site

12.6.55 Monitoring of hazardous ground gases has been undertaken at the site on nine occasions. The results of the monitoring have shown the presence of elevated concentrations of hazardous ground gases (carbon dioxide and methane). However, borehole gas flow rates are negligible to very low. As such, little to no driving force to enable hazardous ground gas migration has been identified within the site. In addition, soil analysis has confirmed the presence of VOCs within the site which may also pose a human health risk. It is however important to note that these screening criteria are conservative and that the VOC concentrations recorded, whilst above screening values, are not particularly high. Hazardous ground gases may pose a risk to human health via inhalation of elevated concentrations of asphyxiant ground gases (e.g. carbon dioxide) or the effect of the build-up and accidental ignition or combustion of elevated concentrations of methane. The potential effects of such an event would be direct or indirect, and could be temporary or permanent (potentially resulting in injury or death in the worst case).

12.6.56 The waste deposits present at the site are also relatively old (the deposition of waste was halted at the site in 1973), and as such have passed the point of peak gas generation potential. The exploratory hole logs produced by SSL (**Appendix 12B**) (Ref. 12.56) confirm that the waste deposits are in an advanced stage of decomposition, which would appear to confirm that peak gas generation potential for the deposits has passed. As the ground gas scenario has been conservatively evaluated as medium risk under the guidance provided in CIRIA C665 (Ref. 12.78), the initial impact magnitude is assessed as medium.

12.6.57 During the construction phase, construction and other workers on the site may be either outdoors, within temporary buildings on-site (self-contained units raised above the ground surface which would however have service entry points for example, for potable water supply, foul sewer, electricity and telephone). Hazardous ground gases could potentially migrate via these service entry points, or potentially pose a risk to personnel working within confined spaces during the construction process. In addition, the disturbance of landfill wastes, in particular as a result of intrusive activities such as the excavation works and piling works at the site, may result in the release of ground gases, vapours and/or odours which may affect on-site human construction and other workers not working in the vicinity of the intrusive activity.

12.6.58 However, in particular due to the historical use of the site as a landfill, good site working practices would be in place to minimise the risks posed to construction workers by hazardous ground gases. This would include the undertaking of task specific risk assessments where any manual work is to be undertaken within confined spaces within the site. Confined space working would therefore be considered only where no other option was available. Any work within confined spaces would be undertaken with appropriate measures in place, including the provision and use of respiratory protective equipment (RPE) and strict restrictions on working duration and conditions. In order to be protective of all temporary units to be kept on the site, the service entry points would be sealed to prevent the ingress of hazardous ground gases. These units would, as required, also incorporate gas monitoring and/or alarms. Where intrusive works are to be undertaken which may result in the release of hazardous ground gases, vapours and/or odours which may impact on-site human health, continuous air monitoring would be undertaken at the work area. Non-

essential personnel would be removed from the area of potential impact, as required. The measures identified would subsequently result in a very low magnitude of impact. Any impacts from hazardous ground gases would be direct or indirect, and permanent or temporary.

12.6.59 The value/sensitivity of on-site construction workers from the build-up of hazardous ground gases is subsequently assessed as high. On the basis of the above, the significance of this impact (i.e. the effects of hazardous gas migration and build-up to human health) is assessed as **minor adverse**.

Hazardous Ground Gas Migration and Build-up to Built Environment - On-site

12.6.60 Monitoring of hazardous ground gases has identified the presence of elevated concentrations of methane within soils on the site which may pose a risk to the on-site built environment (i.e. the risk of build-up of combustible gases, e.g. methane).

12.6.61 During the construction phase, built environment receptors would be constructed on the site. All buildings to be constructed at the site (covering an area of approximately 0.15ha, i.e. 8% of the 1.9ha site) would incorporate appropriate gas protection to exclude the build-up of hazardous ground gases within. Temporary structures which would be present during the construction phase and early operational phase, such as the site contractors compound buildings and other temporary buildings (including the temporary canteen building), would be of prefabricated, modular construction, and would be set on the site with an appropriate open void beneath, and adequate protection at service entry points to prevent ingress of hazardous ground gases. Any potential impact would be permanent, and direct. Built environment structures which may be at risk from hazardous ground gas ingress and build-up would comprise a relatively small proportion of the site. The magnitude of impact is initially assessed as medium, on the basis of a conservative appraisal of ground gas monitoring data in accordance with CIRIA C665 (Ref. 12.78). However, with the provision of the measures detailed above to minimise the potential for ground gas ingress to both the proposed buildings (i.e. the accommodation buildings) and temporary buildings (i.e. the temporary units within the contractors' compound) the revised magnitude of impact is assessed as very low.

12.6.62 The development is proposed to comprise an accommodation campus; including some ancillary structures and temporary site compound buildings. The value/ sensitivity of built environment receptors on-site is assessed as medium when compared with structurally and economically more valuable and sensitive structures such as bridges, tunnels and power stations and less structurally valuable and sensitive uses such as park and ride facilities. On the basis of the above, the significance of this impact (i.e. the impact of hazardous ground gas migration and build-up to built environment receptors) is assessed as **minor adverse**.

Construction Phase Works on Human Health, Ecology, the Soil and Built Environments - Off-site

12.6.63 Activities to take place during the construction phase which may impact upon human health, ecology and the soil and built environments comprise the following: soil

stripping, excavation works, demolition/dismantling, the impact of fugitive emissions from contaminated material exposed during excavations and stockpiling.

12.6.64 Risk to human health (off-site) could only occur in the event that contamination migrates off-site as a result of soil stripping, excavation, demolition, piling and temporary stockpiling. The most probable mechanism for such off-site migration would be via uncontrolled contaminated dust and/or odour generation and wind transport, and/or surface run-off, during the soil stripping, excavation works, demolition/dismantling and piling works. This could occur if existing contaminated soils are disturbed during the topsoil stripping, excavation, demolition/dismantling and piling works. Topsoil stripping would take place within the main development area of the site (corresponding to 1ha of the 1.9ha site), with all stripped topsoils to be removed from the site by the conclusion of the construction phase.

12.6.65 Potential impacts to human receptors could occur via indirect contact, inhalation and/or ingestion of airborne contaminated dust or contaminated run-off and could be adverse, temporary or possibly (depending on the nature of the health impact) permanent.

12.6.66 The results of chemical analysis undertaken on soils and wastes from the site have identified the presence of a small number of contaminants at concentrations which may pose a risk to human health. No asbestos contamination has been identified in samples of soil or wastes analysed from the site. However, due to the potential for the presence of asbestos containing materials within the landfilled waste deposits a watching brief for asbestos would be maintained by an appropriately qualified contractor. Concentrations of VOCs in exceedence of the Tier 1 human health screening value for benzene have been identified on the site (in one sample from 4.00m bgl in BHF06 only). However, due to the depth at which the elevated VOC concentration was recorded, in addition to the location in which this was found (the central part of the site, in which no building construction is proposed and therefore disturbance of deep soils would not occur), the potential for the disturbance of soil or wastes which may pose a risk from VOC inhalation to off-site human health receptors is considered to be unlikely. The potential for significant contamination to be encountered which may present a risk to off-site human receptors is overall therefore considered to be unlikely.

12.6.67 No animal burials are recorded within the study area. As such the potential for the presence of buried animals to be present at the site is considered to be very unlikely.

12.6.68 During the construction phase activities, measures would be in place to minimise the potential for the release of contaminated dust which could impact off-site receptors, and/or generate odours. Measures include the dampening down and/or covering of exposed soils, particularly during dry periods, the containment and removal from site for disposal of piling arisings, and the tamping down (where this would not negatively impact soil integrity), covering and bunding of temporary stockpiles of materials which may contain contamination to minimise contaminated run-off generation and the extent of exposed soil. In the event any significant contamination is encountered during the construction phase this would be segregated and then removed from the site for off-site disposal. Given the adoption of standard good site practice during the construction phase, the potential magnitude of impact to off-site human receptors is therefore assessed as very low.

12.6.69 The value and sensitivity of off-site humans is assessed as high, as the standard good practice which would be observed by site workers (e.g. the use of PPE and good hygiene practices) would not be observed by these receptors. The significance of this impact (i.e. the impact of construction phase works to human health off-site) is considered to be **minor adverse**.

12.6.70 Soil analysis has demonstrated the presence of exceedences of some heavy metals and PAHs in localised areas of the landfilled waste deposits, and to a lesser degree the shallow Made Ground. The concentrations of toxic, ecotoxic and phytotoxic contaminants in the site soils are generally low considering the former use of the site as a domestic landfill. The risk to off-site receptors from the slightly elevated concentrations of certain potentially ecotoxic contaminants in the localised areas of Made Ground given standard good construction practice and materials containment and management are considered to be very low. Therefore the magnitude of potential impacts to off-site ecology arising from the disturbance of potentially contaminated soils on-site during the construction works is considered to be very low.

12.6.71 The value and sensitivity of off-site ecology (including plants, trees, and other vegetation) is assessed as low (see **Table 12.15**). Consequently the significance of potential impacts to off-site ecology from the potential disturbance and mobilisation of on-site contamination is assessed as **negligible**.

12.6.72 Off-site built environment receptors (i.e. buried concrete and services) would not be impacted by the proposed soil stripping, temporary stockpiling, excavation, demolition/dismantling and piling works, as with the good practice to be adopted on the site the impacts of these works would be limited to the site. Off-site impacts by these activities which may occur would be restricted to wind-blown contaminated dust and/or contaminated run-off, which would have **no impact** on the off-site built environment.

12.6.73 Risk to the off-site soil environment could only occur in the event that contamination migrates off-site as a result of the construction works. The most probable mechanism for such off-site migration would be via uncontrolled contaminated dust generation and wind transport and/or surface run-off (i.e. odour would not impact on this receptor).

12.6.74 Good site practices would ensure that the emission of contamination from the site during the works outlined above is *de minimus*. Therefore, a very low magnitude is considered to be applicable from the construction phase works to the soil environment. The potential impact would be adverse, temporary and/or permanent and direct. The off-site soil environment is classified as medium value and sensitivity on the basis that the use of much of the surrounding area is for amenity landscaping. Stockpiled materials which may contain contamination would be present only temporarily during the construction phase prior to removal. The significance of this impact (i.e. the impacts of construction phase works) to the off-site soil environment is considered to be **minor adverse**.

Potential Contamination due to Spills and Leaks from Mechanised Plant to Human Health, Ecology, Soil Environment and Built Environment - Off-site

12.6.75 For all activities requiring the use of mechanised plant, there is the potential for spillage or leakage of contaminating liquids, such as diesel or hydraulic oil/fluids, to contaminate site soils, especially during refuelling operations. However, such spillages or leaks would be limited and managed by standard good practice and, in the event that such a spillage or leakage occurs, will be localised, of limited volume and the impact would be reduced further by the adoption of standard good practices, particularly practices relating to vehicles and equipment maintenance and the containment/cleanup of associated leaks or accidental spills. This activity (i.e. the effect of contamination to off-site human health, ecology, built environment or soil receptors as a result of spillages or leakages from mechanised plant) is considered to have **no impact**.

iii. Groundwater

Construction Phase Works to Groundwater Quality - On-site and Off-site

12.6.76 Activities to take place during the construction phase which may result in impacts to groundwater quality comprise soil stripping, excavations, stockpiling, demolition and dismantling, piling and dewatering.

12.6.77 The results of soil leachability testing and groundwater analysis from the site confirms the presence of Made Ground and landfill waste deposits (which contain elevated concentrations of contaminants) may pose a risk to groundwaters present beneath both the on-site and off-site areas. The potential for site soils and wastes to represent a significant leachable contamination source, and for the presence of a significant existing leachate/groundwater contamination source, is therefore considered to be 'likely'.

12.6.78 Soil stripping and the storage of excavated soil and wastes in stockpiles could result in the increased leaching and mobilisation of contaminated material into the groundwater during the construction phase (particularly during rainfall events).

12.6.79 Excavation works would be undertaken into Made Ground and/or landfilled waste materials which may contain elevated soil contaminants. Contamination within soils could be disturbed or mobilised (as contaminated leachate). Should this occur, it may pose a risk to groundwater quality.

12.6.80 However, good site practice would minimise the potential for such contamination to impact groundwater. Example measures (note this list is not exhaustive) would include the removal of any potentially contaminated arisings, the tamping down of stockpiled soils where possible (i.e. where this would not cause a detrimental impact to topsoil integrity), bunding and/or covering of excavated materials.

12.6.81 Any localised areas of contamination identified within the site considered to pose an unacceptable risk to groundwater quality and/or other sensitive receptors would be delineated and removed for off-site disposal. Where possible (i.e. unless access or egress constraints prevent this), such contamination would be excavated and placed directly into tipper trucks for disposal off-site and would not be stored on site.

12.6.82 Demolition/dismantling of the existing floodlighting infrastructure would not cause an impact to groundwater quality, as this would involve the removal of the floodlighting infrastructure on the site only. This would involve minimal intrusion into soils on the site.

12.6.83 The piling works, if unmitigated, may pose a risk of existing liquid contaminant mobilisation by the generation of a vertical migration pathway, which may impact upon groundwater quality. The results of contamination testing confirmed the presence of certain contaminants in soils from the site (which may leach and subsequently impact groundwater quality) and the presence of elevated groundwater contaminant concentrations within shallow groundwater and soil leachate samples. However, in accordance with standard good practice, excavations beneath the landfill waste deposits, and piling operations through the waste deposits would be undertaken using techniques designed to avoid the generation of new pathways for contaminant mobilisation. As previously described, piling would comprise an initial bore through the landfill zone which would be subsequently filled with bentonite as a sealant). A second, smaller diameter bore driven pile would then be undertaken through the protective bentonite seal. The approach should ensure that the piling would not generate a new pathway for contamination to migrate via the introduced piles.

12.6.84 On the basis of this approach a medium magnitude of impact to groundwater quality is anticipated to present the worst case impact from the works detailed above. The impacts may be direct and/or indirect, and temporary (i.e. for the duration of the construction phase).

12.6.85 The groundwater body concerned is designated as a Secondary Aquifer (Secondary (undifferentiated) and Secondary B Aquifer). There is no significant local use or existence of SPZs at or adjacent to the site or in the likely area of influence. On the basis of this information the value and sensitivity of the receptor is assessed as very low. The significance of this potential impact (i.e. the effects of construction phase works) on groundwater quality is assessed as **minor adverse**.

Potential Contamination due to Spills and Leaks from Mechanised Plant to Groundwater Quality - On-site and Off-site

12.6.86 For all activities requiring the use of mechanised plant there is the potential for spillages or leakages of contaminating liquids, such as diesel or hydraulic oil, to contaminate site soils especially during refuelling operations and from the accidental release of fuel oils from storage tanks. Unmitigated spillages of fuels, oils or hydraulic fluids could seep through the unsaturated zone and contaminate the groundwater. Potential impacts from mechanised plant may occur in any location where mechanised plant is to be used (i.e. the footprint of the proposed development) but are more likely to occur during maintenance or refuelling. Spillages or leaks from the use of mechanised plant on-site will be limited and managed by standard good practice. In the event that such a spillage or leakage occurs, the impacts would be localised, of limited volume and would be minimised by the adoption of standard good practices (in particular practices relating to vehicles and equipment maintenance and dealing with associated leaks or accidental spills). The impact would be adverse, direct or indirect and temporary. As a result the magnitude of the impact is assessed as very low.

12.6.87 As detailed above, the groundwater body is designated as a Secondary Aquifer (Secondary (undifferentiated) and Secondary B Aquifer) and there is no apparent current use of the resource at (or adjacent to) the site or in the likely area of influence. The value and sensitivity of the on-site groundwater receptor is therefore identified as very low.

12.6.88 The significance of this impact (i.e. the effect of spillages or leakages from mechanised plant on groundwater quality) is assessed as **negligible**.

Construction Phase Works on Groundwater Levels - On-site and Off-site

12.6.89 Activities to take place during the construction phase which may result in impacts to groundwater levels comprise soil stripping, excavations, stockpiling, demolition and dismantling, piling and dewatering.

12.6.90 The demolition/dismantling of the floodlighting infrastructure associated with the current use of the site as a sports pitch would not affect groundwater levels as it is anticipated that all associated excavation would be above the water table, and would occupy a very limited area.

12.6.91 In areas where soil is stripped, there could be some minor effect on groundwater recharge and groundwater levels, as recharge is enhanced due to the removal of baseline soil moisture retention characteristics. This is unlikely to be discernable over and above the normal seasonal variations, given the short timescale for this stage and because the effect would be confined to the location of the soil stripping and its immediate vicinity (approximately 1ha of the 1.9ha site, corresponding to 52% of the total area). The impact would be temporary (i.e. for the duration of the construction phase) and indirect. Consequently, the impact would be very low in magnitude.

12.6.92 Temporary stockpiling works would not cause significant impact on groundwater levels and recharge as no stockpiles would be retained past the construction phase, and all excavated soils and wastes are to be removed from site during this phase. Therefore, the area within which temporary stockpiling may occur will be relatively small and therefore the degree of effect on groundwater levels would be negligible.

12.6.93 Areas of the site in which hardstanding would be installed would typically comprise a layer of granular material up to 300mm thick (sub-base), completed with a granular base course and wearing course. This would be constructed to be impermeable to rainfall, and therefore in such areas rainfall would enter site drainage systems via surface run-off. Services, site drainage and foundation works would be installed at a formation level below the sub-base level, with foundations to be piled to avoid potential subsidence. In addition, an underground surface water attenuation storage system would be built as part of the scheme to capture surface water run-off prior to gravity discharge into the existing combined sewer in College Road.

12.6.94 Groundwater rest levels recorded within the site range from 1.5m bgl to 2.1m bgl. As such, groundwater is expected to be encountered at shallow depth, and localised dewatering would potentially be necessary in areas of foundation construction, for the construction of the surface water attenuation storage system, and where services and site drainage are to be constructed.

12.6.95 Should dewatering be undertaken it would result in localised drawdown of groundwater levels in the vicinity of the excavations. There are a number of mechanisms by which this dewatering could be achieved, including the provision of drains to undertake shallow passive (gravity) dewatering and active pumping from sub-surface sumps. However any dewatering which may be required is expected to be of reasonably shallow depth and occur only for the sub-water table excavations and associated works.

12.6.96 The impact of dewatering would be direct and temporary, as the scale would be confined to the location of excavation and associated works, and the immediate vicinity. It would extend only for the duration of these works as part of the construction phase; consequently, a low magnitude effect is predicted from dewatering. The overall magnitude of impact (worst case) is assessed as low.

12.6.97 As detailed, the groundwater body is designated as a Secondary Aquifer (Secondary (undifferentiated) and Secondary B Aquifer), and there is no current use of the resource at or adjacent to the site or in the likely area of influence. The value and sensitivity of the on-site groundwater receptor is therefore identified as very low. A very low to low impact magnitude has been determined. The impact would be adverse, direct and temporary. The significance of this potential impact (i.e. the effect of construction phase works on groundwater levels) is considered to be **negligible**.

c) Cumulative Construction Impacts

12.6.98 Impacts on geology, land contamination, and groundwater during construction of the Bridgwater C site have all been assessed as negligible or minor. The only minor impacts identified include those from construction phase activities, potential spills and leaks, and groundgas on human health, soils, ecology, and buildings. There is little potential for interactive or additive impacts on these receptors due to the implementation of standard good practices on the site and protective measures included in the project design. Therefore no cumulative impacts during construction are predicted on geology, land contamination, and groundwater at the Bridgwater C site.

12.6.99 During the construction works, only the excavation and piling operations have the potential to impact the on-site geology. The significance of these impacts has been assessed as **negligible**. No cumulative impacts to geology are predicted to occur.

d) Operational Impacts

12.6.100 This section identifies and assesses the potential impacts of the operation of the site on geology, land contamination and groundwater. A description of this phase is described in **Chapter 4** of this volume.

i. Geology

12.6.101 Since impacts to below formation level soils/geology would only occur during the construction phase (i.e. no excavation into the underlying geology during the operational phase), it is considered that there would be **no impact** on geology as a result of the operation of the proposed development.

ii. Land Contamination

12.6.102 Operational phase impacts relating to land contamination may principally arise from:

- Contaminated run-off resulting from the use and/or parking of vehicles within car parking and road infrastructure within the site, which could enter site drainage.
- The potential for hazardous ground gases and/or VOCs from the landfilled waste underlying the site to affect on-site and/or off-site receptors.

12.6.103 No processes or materials storage would take place at the site which might affect soil quality.

Operation of the site to human health - On-site

12.6.104 The site would be partially encapsulated with hardstanding (surfaced), partially covered by buildings and in all areas of soft landscaping a 'cover system' would be present (i.e. the presence of 'clean' soil overlying existing Made Ground deposits). Therefore any users of the proposed development would not be exposed to any potential contamination via the direct contact, soil dust inhalation or ingestion exposure routes.

12.6.105 The intrusive site investigations have identified the presence of soil and groundwater contamination within the site. However, any excavated material which might be identified as contaminated during the construction phase would be segregated, and remediated to make suitable for re-use on-site or removed from the site for off-site disposal. Whilst contaminated soils and wastes would remain at the site (i.e. landfilled waste deposits would remain subsurface at the site), these would be contained beneath soft landscaped cover systems, buildings and/or hardstanding.

12.6.106 During the operational phase of the proposed development no routine operations which would cause soil disturbance would take place, with the possible exception of ground maintenance works (e.g. maintenance of soft landscaped vegetation). Any such works would not extend beneath the cover systems in place however, which would be delineated in soft landscaped areas with a geotextile marker layer. As a result of site infrastructure and the protective measures set out, the magnitude is predicted to be very low.

12.6.107 Users of the proposed development are unlikely to follow standard contaminated land construction good practice with relation to hygiene (as would be the case during the construction phase, for example), and would not be expected to wear PPE. As such, the value and sensitivity of site end users is assessed as high.

12.6.108 As such, the significance of this impact (i.e. the effect on human health of the operation of the site) is assessed as **minor adverse**.

Operation of the site to ecology - On-site

12.6.109 The only sensitive ecological receptors which would be potentially present on the operational site are breeding birds (see **Chapter 14** of this volume for details), which would be unaffected by land contamination. As a result of the above and of site

infrastructure and protective measures, **no impacts** would occur to on-site ecology from soil contamination during the operational use of the site.

Operation of the site to the soil and built environments - On-site

12.6.110 Following the completion of the construction works only soils which are suitable for use would be present at or near surface (e.g. imported topsoils) in the proposed development, i.e. all unacceptable contaminated soils would have been removed from site, or be encapsulated beneath areas of hardstanding/buildings/cover systems. Activities to be undertaken at the site as part of the routine operation of the site are unlikely to be contaminative.

12.6.111 The discharge of foul and surface water drainage associated with the operation of the proposed development would be to a controlled and contained system. Similarly the parts of the site which would potentially be contaminated as a result of the operation of the site would be encapsulated with hardstanding (surfaced) and, therefore, any spillage from vehicles, etc. would be intercepted before reaching soils. Also, no potentially aggressive chemicals are proposed to be stored/used on-site that will impact the soil or built environments. As a result of site infrastructure, operational activities are not likely to result in significant contamination, and therefore **no impacts** associated with land contamination are anticipated during the operational phase of the site.

Migration and build-up of hazardous ground gases to human health - On-site

12.6.112 The results of ground gas monitoring at the site have confirmed the presence of elevated concentrations of hazardous ground gases (i.e. carbon dioxide and methane), and VOCs within soil, which may pose a risk to site end users. However, the results of monitoring did not identify a significant rate of borehole gas flow (i.e. borehole gas flow rates are mainly undetectable (less than 0.1l/hr) and were recorded at no greater than 0.3l/hr). Although elevated soil VOC concentrations were recorded within site soils, significantly elevated concentrations were identified in only two locations (BHF06 at 4.00m bgl and BHF03 at 6.00m bgl), at which depth significant inhalation risk would not be expected to occur. Typical VOC concentrations on the site were low. In addition, due to the presence of hardstanding and/or soft landscaped cover on external parts of the site, the emission of VOCs to the outdoor environment would be negligible and the degree of dilution which would occur before such VOCs could affect human receptors would result in no impact occurring. Therefore, the potential for the elevated ground gas concentrations to migrate and accumulate within the proposed buildings on-site is low.

12.6.113 The buildings to be constructed on the site, in which the potential for hazardous ground gas build-up or inhalation of soil vapours may potentially take place, are to be constructed with appropriate gas and vapour protective measures in place. Any operational maintenance of sewers or other subsurface infrastructure would be covered by standard confined entry health and safety risk assessment and mitigation procedures, which would mitigate any associated risk. This would act to prevent the ingress of such hazardous gases and/or vapours. As such, the potential magnitude of impact is assessed as very low.

12.6.114 Human receptors during the operational phase are considered to be of high value and sensitivity, as they would not be afforded the mitigative protection of PPE/RPE as would be used by construction workers during the construction phase.

12.6.115 The significance of this impact (i.e. the effect of the migration and build-up of hazardous ground gases to human health) is therefore assessed as **minor adverse**.

Migration and build-up of hazardous ground gases to the built environment - On-site

12.6.116 The results of ground gas monitoring at the site have confirmed the presence of elevated concentrations of methane which may pose a risk to the built environment if able to migrate into confined spaces and build up. However, the results of monitoring did not identify a significant rate of borehole gas flow (a maximum of 0.3l/hr flow rate was recorded), and therefore the potential for the elevated ground gas concentrations to migrate into a sensitive receptor (i.e. a confined space within a building) is initially assessed as medium (Characteristic Scenario 2 under CIRIA C665 guidance (Ref. 12.78)).

12.6.117 The buildings to be constructed on the site, in which the potential for hazardous ground gas build-up or inhalation of soil vapours may potentially take place, are to be constructed with appropriate gas and vapour protective measures in place with the scope to be agreed with the regulatory authority. These measures would act to prevent the ingress of such hazardous gases. As such, the potential magnitude of impact is assessed as very low.

12.6.118 The built environment is considered to be of medium value and sensitivity with respect to ground gas migration and build-up, as any impacts which may occur from this source may damage the structure of buildings, in particular the multi-storey accommodation buildings and the economic value of these buildings when compared with, for example, hardstanding and temporary buildings associated with a park and ride development, is relatively high. As such, the significance of this impact (i.e. the migration and build-up of hazardous ground gases) is assessed as **minor adverse**.

Operation of site to human health, ecology, soil environment and built environment - Off-site

12.6.119 No impacts to on-site ecology, soil or built environment receptors with relation to land contamination during the operational phase have been identified and as such no impacts are anticipated to the equivalent off-site receptors (i.e. soil or built environment).

12.6.120 Impacts from land contamination to off-site human health could only occur via the off-site transport of soil contamination by airborne dust. Surface run-off would not be contaminated during the operational phase, as the soils present at or near surface would be suitable for use only, i.e. would not contain elevated contaminant concentrations.

12.6.121 During the operational phase, all soil which contains potentially significant contamination would be encapsulated beneath hardstanding, buildings or cover systems (in areas of soft landscaping), and therefore would not be exposed and pose

a potential risk of contaminated dust release. As such, **no impacts** are anticipated to off-site human health, ecology, the soil environment and built environment.

Migration and build-up of hazardous ground gases to human health and built environment - Off-site

12.6.122 Monitoring of hazardous ground gases on the site has identified the presence of carbon dioxide and methane at concentrations which may pose a risk to human health and the built environment. However, the monitoring has identified negligible borehole gas flow rates. As such, little to no driving force to enable hazardous ground gas migration has been identified within the site. In addition, although elevated concentrations of certain VOCs have been identified (chiefly naphthalene and iso-propyltoluene) within soils on the site which are above adopted soil screening values, it is important to note that these screening criteria are conservative and would not normally be applied for the determination of off-site risk, and that the VOC concentrations recorded, whilst above screening values, are not particularly high. The waste deposits present at the site are relatively old (the deposition of waste was halted at the site in 1973), and as such have passed the point of peak gas generation potential. The exploratory hole logs produced by SSL (**Appendix 12B**) (Ref. 12.56) confirm that the waste deposits are in an advanced stage of decomposition, which would appear to confirm that peak gas generation potential for the deposits has passed.

12.6.123 The proposed development would incorporate hardstanding and buildings across a reasonably large proportion of the site (1.4ha of the 1.9ha site, i.e. 74%). This could result in a change to the ground gas/VOC migration regime beneath the site, and result in off-site migration. However, for the reasons identified above the potential for ground gas to migrate actively from the landfilled waste deposits is considered to be very unlikely. In addition, the site would include areas of soft landscaping (corresponding to 0.5ha, approximately 26% of the 1.9ha site) which would act as a preferential route for gas migration/dispersal to atmosphere. The fact that the landfilling at the site took place within clay extraction pits is also likely to restrict the lateral migration of hazardous gases, as this would be restricted by the relatively low permeability clay deposits forming the extents of the former extraction pits. Furthermore, on the basis of historical mapping and the results of the Geotechnics Limited. Investigation of Bridgwater and Albion Rugby Football Club, the landfilled waste deposits extend beyond the boundary of the site to the south and west, into soft landscaped areas, and from which hazardous ground gases may be able to disperse directly to atmosphere. It is therefore anticipated that there would be **no impact** to off-site receptors from increased ground gas migration.

iv. Groundwater

Potential contaminated site drainage/run-off on groundwater quality - On-site and Off-site

12.6.124 The operational site would include sealed/contained drainage infrastructure, a surface water attenuation storage system and an oil separator, which would subsequently discharge to the existing combined sewer on College Way. These systems would be appropriately maintained and monitored. There is a potential for hydrocarbons and other potential contaminants present in the surface water run-off from the site (e.g. from vehicles) to enter the groundwater system. The potential

scale of the impact is considered to be very low given the proposed presence of a maintained oil separator and the surface water attenuation storage system; and because this could only occur when water levels rose above that of the surrounding groundwater, likely only to occur during extreme rainfall events, and hence infrequently. Consequently, the magnitude of the effect is assessed as very low.

12.6.125 The impact is predicted to be long-term (based on the post-operational use of the site by a third party for educational use) and localised to the site and its vicinity (direct).

12.6.126 The groundwater body concerned is a Secondary (undifferentiated and B) Aquifer and there is no apparent use of the resource within the study area. Consequently, the value and sensitivity of the receptor is identified as very low.

12.6.127 The significance of this potential impact (i.e. the effect of contaminated surface water drainage entering groundwater via site drainage/run-off) is considered to be **negligible**.

Mobilisation of contaminated groundwater/leachate via new migration pathways to groundwater quality - On-site and Off-site

12.6.128 Groundwater quality/leachate at the site has been determined via sampling and analysis to be poor, with a number of determinands present at concentrations in exceedence of Tier 1 screening values. The construction of new infrastructure on the site and introduction of piled foundations potentially could act as conduits for the transmission of contaminated groundwater/leachate to affect groundwater quality on-site and/or off-site.

12.6.129 The introduction of new hardstanding and buildings is anticipated to significantly reduce rainfall infiltration within the site when compared with the pre-development conditions, and as such may reduce the contaminated leachate generation potential. In addition, the construction works will have resulted in the remediation and/or removal of some contaminated soils from the site, thus further reducing the leachate generation potential of the site during the operational phase.

12.6.130 Although service trenches and other subsurface structures may act as a preferential pathway for contaminated groundwater/leachate migration, these are not anticipated to impact on groundwater quality within the existing landfilled waste deposits (i.e. this will not enable the migration of contamination into existing uncontaminated materials). Where necessary, excavations for drainage runs (which would include uncontaminated granular backfill) would be lined to prevent contamination from the landfilled waste deposits. This would prevent the introduction of landfill leachate into the drainage system, and the introduction of run-off into the landfilled wastes via preferential pathways on-site thus enabling new leachate generation/mobilisation.

12.6.131 The piled foundations of the accommodation buildings to be constructed as part of the proposed development would extend to beneath the existing landfilled waste mass. However, these would be undertaken using methods which would prevent the generation of a new vertical migration pathway into the underlying strata (see 12.6.83), and would similarly not introduce a new active pathway for contamination to migrate into otherwise unaffected/less contaminated groundwater resource.

12.6.132 Due to the design and construction controls outlined above to minimise the generation and mobilisation of contaminated leachate and/or groundwater pathways, the impact magnitude is assessed as low.

12.6.133 The value and sensitivity of the groundwater resource on site is assessed as very low, on the basis of its Environment Agency vulnerability designation (Secondary B/Secondary undifferentiated Aquifer). As such, the significance of this impact (i.e. the effects of the mobilisation of contaminated groundwater/leachate via new migration pathways introduced as a result of the construction of the site) is assessed as **negligible**.

Rreduced recharge on groundwater levels - On-site and Off-Site

12.6.134 The presence of impermeable surfaces (i.e. buildings and hardstanding) across a significant area of the proposed development would prevent rainwater percolating through the soil and recharging the groundwater. However, given the overall area of the site (approximately 1.9 ha) the overall impact on groundwater recharge and levels is predicted to be so low as to be undetectable against seasonal fluctuation, as groundwater levels would be controlled/recharged by surrounding areas; and therefore is assessed as being of a very low magnitude.

12.6.135 Any potential impacts would be long-term (i.e. during the lifetime of the development and based on the post-operational use of the site by a third party) and would be likely to affect groundwater levels on the site only. The groundwater body concerned is a Secondary (undifferentiated and B) Aquifer and there is no apparent use of the resource within the study area. Consequently, the value and sensitivity of the receptor is identified as very low.

12.6.136 The significance of this potential impact (i.e. the effect of reduced recharge on groundwater levels) is considered to be **negligible**.

e) Cumulative Operational Impacts

12.6.137 Impacts on geology, land contamination, and groundwater during operation of the Bridgwater site have all been assessed as negligible or minor. The only minor impacts identified, include those from operation activities and groundgas on human health and buildings. There is little potential for interactive or additive impacts on these receptors due to the implementation of standard good practices on the site and protective measures included in the design. Therefore no cumulative impacts are anticipated during operation of the proposed development.

ii. Land Contamination

12.6.138 It is assessed that there are no within site cumulative impacts on contaminated land receptors during the operational phase.

iii. Groundwater

12.6.139 No within site cumulative impacts are predicted to occur on either groundwater levels or on groundwater quality as a result of the operational phase of the proposed development.

f) Post-Operational Impacts

12.6.140 No works are proposed to take place during the post-operational phase of the site. The site, including all buildings and infrastructure present during the operational phase, would be transferred by EDF Energy to the ownership and administration of Bridgwater College for educational use following the operational phase. The proposed development is not to be removed or reinstated to its original condition. As such, no post-operational works (or impacts) have been assessed within this chapter. A description of this phase is presented in **Chapters 1, 2** and **5** of this volume.

12.7 Mitigation of Impacts

12.7.1 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so. No moderate or major adverse impacts to geology, land contamination, and groundwater receptors have been identified and no mitigation is proposed.

12.8 Residual Impacts

12.8.1 As no mitigation is proposed the residual impacts to geology, land contamination and groundwater receptors would remain as those assessed above in Section 12.6 of this chapter.

12.9 Summary of Impacts

12.9.1 **Table 12.16**, **Table 12.17** and **Table 12.18** present summaries of the impacts predicted with respect to geology, land contamination (or its disturbance) and groundwater respectively for the work occurring during the construction, operational and post-operational phases. The tables set out impacts prior to mitigation, the mitigation proposed and the subsequent residual impacts. No post-operational works are proposed to take place. As such, the tables do not consider this phase.

Table 12.16: Summary of Impacts to Geology

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Construction Phase							
On-site surface geology	Construction phase works	Low	Site specific Permanent Direct adverse	Very low	Negligible	None proposed	Negligible
Operational Phase							
On-site surface geology	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A

Table 12.17: Summary of Impacts Relating to Land Contamination

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Construction Phase							
Human health on-site	Construction phase works	Low	Site specific Temporary and/or permanent Direct and/or indirect adverse	Low (worker with full PPE)	Minor	None proposed	Minor
Human health on-site	Potential contamination due to spills and leaks from mechanised plant	Very low	Site specific Temporary and/or permanent Direct and/or indirect adverse	Low (worker with full PPE)	Negligible	None proposed	Negligible
Human health on-site	Hazardous ground gas migration and build-up	Very low	Site specific Temporary and/or permanent Direct adverse	High	Minor	None proposed	Minor
Ecology (including plants, trees and other vegetation) on-site	Construction phase works	Low	Site specific, Temporary and/or permanent, Direct and/or indirect adverse	Low	Minor	None Proposed	Minor

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Ecology (including plants, trees and other vegetation) on-site	Potential contamination due to spills and leaks from mechanised plant	Very low	Site specific, Temporary and/or permanent, Direct and/or indirect adverse	Low	Negligible	None Proposed	Negligible
Buildings/services on-site	Construction phase works	Low	Site specific Temporary and/or permanent Direct adverse	Medium	Minor	None proposed	Minor
Buildings/services on-site	Potential contamination due to spills and leaks from mechanised plant	Very low	Site specific Temporary and/or permanent Direct adverse	Medium	Minor	None proposed	Minor
Buildings/services on-site	Hazardous ground gas migration and build-up	Very low	Site specific Permanent Direct adverse	Medium	Minor	None proposed	Minor
Soil environment on-site	Construction phase works	Low	Site specific Temporary and/or permanent Direct and/or indirect adverse	Medium	Minor	None proposed	Minor

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Soil environment on-site	Potential contamination due to spills and leaks from mechanised plant	Very low	Site specific Temporary and/or permanent Direct and/or indirect adverse	Medium	Minor	None proposed	Minor
Human health off-site	Construction phase works	Very low	Localised Temporary and/or permanent Indirect adverse	High	Minor	None proposed	Minor
Human health off-site	Potential contamination due to spills and leaks from mechanised plant	N/A	N/A	N/A	N/A	N/A	N/A
Ecology (including plants, trees and other vegetation) off-site	Construction phase works	Very low	Localised Temporary and/or permanent, Indirect adverse	Low	Negligible	None proposed	Negligible
Ecology (including plants, trees and other vegetation) off-site	Potential contamination due to spills and leaks from mechanised plant	N/A	N/A	N/A	N/A	N/A	N/A
Soil environment off-site	Construction phase works	Very low	Localised Temporary and/or permanent Direct and/or	Medium	Minor	None proposed	Minor

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
			indirect adverse				
Soil environment off-site	Potential contamination due to spills and leaks from mechanised plant	N/A	N/A	N/A	N/A	N/A	N/A
Buildings/services off-site	Construction phase works	N/A	N/A	N/A	N/A	N/A	N/A
Buildings/services off-site	Potential contamination due to spills and leaks from mechanised plant	N/A	N/A	N/A	N/A	N/A	N/A
Operational Phase							
Human health on-site	Operation of the site	Very low	Localised Temporary and/or permanent Direct and/or indirect adverse	High	Minor	None proposed	Minor
Human health on-site	Migration and build-up of hazardous ground gases	Very low	Site specific Temporary and/or permanent Direct and/or indirect adverse	High	Minor	None proposed	Minor
Ecology (including plants, trees and other vegetation) on-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Buildings/services on-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Buildings/services on-site	Migration and build-up of hazardous ground gases	Very low	Site specific Permanent Direct adverse	Medium	Minor	None proposed	Minor
Soil environment on-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Human health off-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Human health off-site	Migration and build-up of hazardous ground gases	N/A	N/A	N/A	N/A	N/A	N/A
Ecology (including plants, trees and other vegetation) off-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Soil environment off-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Buildings/services off-site	Operation of the site	N/A	N/A	N/A	N/A	N/A	N/A
Buildings/services off-site	Migration and build-up of hazardous ground gases	N/A	N/A	N/A	N/A	N/A	N/A

Table 12.18: Summary of Impacts Relating to Groundwater

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Construction Phase							
Groundwater quality on-site and off-site	Construction phase works	Medium	Site and vicinity of site Temporary Indirect and/or direct adverse	Very low	Minor	None proposed	Minor
Groundwater quality on-site and off-site	Potential contamination due to spills and leaks from mechanised plant	Very low	Site and vicinity of site Temporary Direct and/or indirect adverse	Very low	Negligible	None proposed	Negligible
Groundwater levels and recharge on-site and off-site	Construction phase works	Low	Site and vicinity of site Temporary Direct and/or indirect adverse	Very low	Negligible	None proposed	Negligible
Operational Phase							
Groundwater quality on-site and off-site	Potential contaminated site drainage/run-off	Very low	Site and vicinity of site Permanent Direct adverse	Very low	Negligible	None proposed	Negligible
Groundwater quality on-site and off-site	Mobilisation of contaminated groundwater/ leachate via new migration pathways	Low	Site and vicinity of site Permanent Direct adverse	Very low	Negligible	None proposed	Negligible

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Groundwater levels and recharge on-site and off-site	Reduced recharge	Very low	Site and vicinity of site Temporary Indirect adverse	Very low	Negligible	None proposed	Negligible

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CHAPTER 13: SURFACE WATER

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13. SURFACE WATER

13.1 Introduction

13.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential surface water (water quality, hydrology and drainage) impacts associated with the construction, operational and post-operational phases of the proposed on-site accommodation campus at Bridgwater C (including associated facilities) referred to hereafter as the proposed development on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1 to 5** of this volume of the ES.

13.1.2 A glossary of the terminology used in this chapter is provided in Volume 1 of the ES.

13.2 Scope and Objectives of Assessment

13.2.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees (including Sedgemoor District Council (SDC), West Somerset Council (WSC), Somerset County Council (SCC), Somerset Drainage Boards Consortium (SDBC) and the Environment Agency), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

13.2.2 The assessment of surface water impacts has been undertaken adopting the methodologies described in **Volume 1, Chapter 7** of the ES and Section 13.4 of this chapter.

13.2.3 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through desk-based environmental searches and analysis and walkover surveys, and these are described in Section 13.5 of this chapter. The study area for this assessment is illustrated in **Figure 13.1**.

13.2.4 Section 13.6 of this chapter assesses the potential water quality and hydrology and drainage impacts on all surface water features within the study area, including: local ditches, culverts and ponds. The study will also consider the potential hydrological impacts of the proposed development upon man-made drainage systems connected to the proposed development.

13.2.5 Appropriate mitigation measures aimed at preventing, reducing or off-setting potential adverse impacts that are identified to be of significance are identified in Section 13.7 of this chapter. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 13.8 of this chapter.

13.2.6 **Volume 1, Chapter 7** of this ES sets out the methodology used to assess cumulative impacts. Additive and interactive effects between site-specific impacts are considered within this chapter. The assessment of cumulative impacts with other

elements of the HPC Project and other proposed and reasonably forseeable projects are considered in **Volume 11** of this ES.

13.2.7 The objectives underlining the surface water impact assessment were to:

- identify all terrestrial surface water features within the study area that may be affected by the proposed development;
- characterise baseline surface water characteristics of these features;
- assess the impacts of the proposed development on surface water;
- recommend mitigation measures, if determined necessary, to prevent, reduce or off-set the proposed development's impacts on surface water; and
- assess the residual impacts of the proposed development on surface water.

13.3 Legislation, Policy and Guidance

13.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of surface water quality impacts associated with the construction, operational and post-operational phases of the proposed development.

13.3.2 As stated in **Volume 1, Chapter 4** of this ES, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs. NPS EN-1 sections 5.7 and 5.15 state that there should be an assessment of the impact of nationally significant energy infrastructure on flood risk and the water environment respectively. This is repeated in sections 3.6 and 3.7 of NPS EN-6.

13.3.3 In addition, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

13.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

13.3.5 The scope of work is not affected by relevant international legislation beyond that within the European Union (EU).

13.3.6 Many of the standards and methodologies relating to surface waters are regulated at EU level through a range of environmental directives. The most relevant of these with respect to water quality, flood risk and to the proposed development are the:

- Water Framework Directive (WFD) (2000/60/EC) (Ref. 13.1) (which largely supersedes the Dangerous Substances Directive ((76/464/EEC) (Ref. 13.2)).
- Fish Directive (2006/44/EC this is the codified version of Directive 78/659/EEC as amended) (Ref. 13.3).
- Floods Directive (2007/60/EC) (Ref. 13.4).

i. Water Framework Directive

13.3.7 The WFD is a key piece of legislation relating to the protection of water quality and ecological status of freshwaters and coastal waters.

13.3.8 The WFD provides a mechanism by which disparate regulatory controls on human activities that have the potential to impact on water quality may be managed effectively and consistently. In addition to a range of inland surface and groundwater, the WFD covers transitional waters (estuaries and lagoons) and coastal waters up to one nautical mile from mean low water (baseline from which territorial waters are measured). Existing regulations that will eventually be subsumed by the WFD include the Freshwater Fish Directive (78/659/EEC as consolidated in 2006) (Ref. 13.3) and the Dangerous Substances Directive (76/464/EEC) (Ref. 13.2). The WFD is implemented in England and Wales primarily through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (the Water Framework Regulations) (Ref. 13.5).

13.3.9 United Kingdom (UK) surface waters have been divided into a number of discrete units termed ‘water bodies’, with meaningful typologies that relate to physical and ecological characteristics. Based upon ecology and water quality, these water bodies have been classified as falling into different status classes. The WFD requires that all inland and coastal waters must reach at least ‘good status’ by 2015 or set alternative standards and/or a timetable for the achievement of these by 2027 and that the status of all surface water bodies should not deteriorate. Individual water bodies that have been modified by man to the extent that it will not be possible for them to meet the WFD targets are categorised as Heavily Modified Water Bodies.

13.3.10 Implementation of the WFD is primarily achieved through a system of river basin management planning. The water bodies of England and Wales have been allocated to river basin areas depending on catchment areas and a plan drawn up for each. The plans contain a programme of measures tailored to each catchment designed to ensure its water bodies achieve and maintain the appropriate status in accordance with the timelines set out in the WFD.

13.3.11 As part of the ongoing implementation of the WFD, the Environment Agency has recently been given the power to apply environmental standards to individually defined WFD water bodies via the ‘River Basin Districts Typology, Standards and Groundwater Threshold Values’ (Water Framework Directive) (England and Wales) Directions 2010 (Ref. 13.6), and the ‘River Basin Districts Surface Water and Groundwater Classification’ (Water Framework Directive) (England and Wales) Direction 2009 (Ref. 13.7).

ii. Dangerous Substances Directive (76/464/EEC)

13.3.12 The Dangerous Substances Directive (76/464/EEC) (Ref. 13.2) is implemented through the Surface Waters (Dangerous Substances) (Classification) Regulations 1989 (Ref. 13.8), 1992 (Ref. 13.9), 1997 (Ref. 13.10) and 1998 (Ref. 13.11). It sets Environmental Quality Standards (EQS) for a range of substances in water. The regulation of 'Priority Substances' under the WFD effectively supersedes many of these standards, although standards for some substances remain in force. The 2010 Directions referred to above complete the transposition of the Priority Substances Directive (Ref. 13.12).

13.3.13 The Dangerous Substances Directive and its 'daughter' directives are concerned with controlling the level of discharges that may contain dangerous substances that may reach inland, coastal and territorial waters. List I substances – black list, covers substances that are regarded as particularly toxic and persistent and may accumulate in the environment. Pollution by these substances must be eliminated. List II substances – grey list, cover substances which are less serious but still toxic. Pollution by grey list should be reduced wherever possible.

iii. Fish Directive

13.3.14 The Fish Directive (Ref. 13.3) is concerned with protecting and improving the quality of rivers and lakes to encourage self sustaining healthy fish populations. It sets out physical and chemical water quality objectives, and monitoring requirements for designated areas.

13.3.15 The original Directive was originally adopted in 1978 (Ref. 13.13) and was consolidated in 2006. It will be replaced in 2013 by provisions of the WFD (Ref. 13.1).

iv. The Floods Directive 2007

13.3.16 The Floods Directive (2007/60/EC) (Ref. 13.4) requires all Member States to determine if watercourses and coastlines are at flood risk, map flood extent and assets and people at risk form flood, and take appropriate measures to reduce the flood risk. Delivery of the Floods Directive is coordinated with the Water Framework Directive (Ref.13.1) through flood risk management plans and river basin management plans.

13.3.17 The Flood Risk Regulations 2009 (Ref. 13.14), which came into force on 10 December 2009, are the statutory instrument which transposes Directive 2007/60/EC (Ref. 13.4) of the European Parliament on the assessment and management of flood risks for England and Wales. These regulations place a new duty upon the Environment Agency and local authorities to prepare preliminary flood risk assessment (PFRA) maps/reports about past floods in defined river basins and the possible harmful consequences of future floods from the sea, main rivers and reservoirs.

13.3.18 Although the outputs of the Flood Risk Regulations 2009 (Ref.13.14) process are more strategic in nature, the regulations also set a legislative obligation for relevant authorities to provide information where reasonable to fulfil the requirements of the regulations. The named authorities in the regulations include the lead local flood authority, a district council for an area, an internal drainage board(s), a highway

authority, water company, reservoir undertakers, navigation authority, Natural England, Historic Building and Monuments Commission for England, the Countryside Council for Wales and the Welsh Ministers. The specific organisations involved will depend on the specific location and flood risk issues involved.

13.3.19 For this Environment Statement, it should be noted that the lead local flood authority is Somerset County Council. Somerset County Council have also developed a strategic business plan to address the issues arising from the Flood Directive. This is discussed fully later in paragraph 13.3.53.

b) National Legislation

13.3.20 The key pieces of national legislation relevant to the control and mitigation of surface water risks are:

- Environment Act 1995 (Ref. 13.15);
- Environmental Protection Act 1990 (Ref. 13.16);
- Environmental Permitting (England and Wales) Regulations 2010 (EPR) (Ref. 13.17);
- Water Resources Act 1991 (Ref. 13.18);
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (the Water Framework Regulations) (Ref. 13.19);
- Land Drainage Act 1991 (Ref. 13.20); and
- Flood and Water Management Act 2010 (Ref. 13.21).

i. Environment Act 1995 (Ref. 13.15)

13.3.21 This Act established basic terms of reference for the Environment Agency. The Act provides the Environment Agency with a duty to take action as it considers necessary to conserve, enhance and secure the proper use of water resources in England and Wales. In respect of land drainage and flood defence functions, the Act places a duty on the Environment Agency with respect to conservation of natural beauty and sustainable development.

ii. Environmental Protection Act (EPA) 1990 (Ref 13.16)

13.3.22 Part 2A of the Environmental Protection Act 1990 describes a regulatory role for Local Authorities in dealing with contaminated land, including assessment for any resulting pollution of controlled waters.

iii. Environmental Permitting (England and Wales) Regulations 2010 (Ref. 13.17)

13.3.23 The Environmental Permitting Regulations 2010 (Ref 13.17) provide a consolidated system for environmental permits and exemptions for activities which include discharges to surface waters. It also sets out the powers, functions and duties of the regulators. The Environmental Permitting Regulations repeal parts of the Water Resources Act, 1991 (Ref. 13.18).

iv. Water Resources Act 1991 (Ref. 13.18)

13.3.24 The Water Resources Act 1991 (Ref 13.18) (as amended by the Water Act, 2003 (Ref. 13.22) sets out the regulatory controls and restrictions that provide protection to the water environment through controls on abstraction, impounding and discharges as well as identifying water quality and drought provisions. This Act sets the framework for surface water management over the past two decades in the UK, but elements of the Water Resources Act have now been superseded by the Environmental Permitting (England and Wales) Regulations 2010 (Ref. 13.17).

v. Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (the Water Framework Regulations) (Ref. 13.19)

13.3.25 These Regulations make provision for the purpose of implementing the WFD (Ref. 13.1). The Environment Agency is required to carry out detailed monitoring and analysis in relation to each river basin district. The results of the Environment Agency's technical work, the environmental objectives and proposals for programmes of measures are brought together in a River Basin Management Plan (RBMP) for each river basin district. The South West RBMP covers the study area (see paragraph 13.3.48 below).

vi. Land Drainage Act 1991 (Ref. 13.20)

13.3.26 This Act consolidates enactments relating to internal drainage boards and the functions of these boards and of local authorities in relation to land drainage. Internal drainage boards (IDB) exercise a general supervision and perform powers relating to the drainage of land within their district.

13.3.27 Sections 23–27 of the Act address the requirements associated with obstructing flow in watercourses and culverting watercourses. Internal Drainage Board (IDB) powers to serve notice on persons with respect to remedying the condition of watercourses are outlined in Section 25. Sections 28 to 31 are also of relevance to flood risk as they outline the requirements for the restoration and improvement of ditches.

vii. Flood and Water Management Act 2010 (Ref. 13.21)

13.3.28 The Flood and Water Management Act 2010 (Ref. 13.21) sets out proposals for a new framework to help improve flood risk management, manage water more sustainably and improve water related services for the public in England and Wales. The Act received Royal Assent on 8 April 2010 and implementation of the first parts of the Act began on the 1 October 2010.

13.3.29 The Act prescribes a number of changes to the assessment and management of flood risk in England and Wales. These changes include defining new roles and responsibilities for flood risk management (including clarifying the Environment Agency's overview role on flood risk management); continuation of the Environment Agency's role in producing and maintaining the main river map; assignment of lead responsibility for local flood risk management to county and unitary local authorities; encouragement of national design and performance standards for SuDS; and implementation of the Pitt Review (Ref. 13.23) recommendation to place a duty on relevant organisations to co-operate and share information.

c) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) (Ref. 13.24)

13.3.30 PPS1 was published in 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

13.3.31 Paragraph 22 of PPS1 advises that regional planning authorities and local authorities should promote, amongst other things, the sustainable use of water resources and the use of sustainable drainage systems in the management of run-off.

ii. Planning Policy Statement: Planning and Climate Change – Supplement to PPS1 (2007) (Ref. 13.25)

13.3.32 The supplement to PPS1 sets out how planning should contribute to reducing emissions and stabilising climate change (mitigation) and take into account the unavoidable consequences (adaptation).

13.3.33 Paragraph 42 advises that planning authorities in their consideration of the environmental performance of a site, taking particular account of the climate the development is likely to experience over its expected lifetime, should expect new development to, amongst other things:

> *"…give priority to the use of sustainable drainage systems, paying attention to the potential contribution to be gained to water harvesting from impermeable surfaces and encourage layouts that accommodate waste water recycling…"*

iii. Planning Policy Statement 23: Planning and Pollution Control (PPS23) (2004) (Ref. 13.26)

13.3.34 PPS23 is intended to complement the pollution control framework under the Pollution Prevention and Control Act 1999 and the Pollution Prevention and Control Regulations 2000 (now replaced by the Environmental Permitting (England and Wales) Regulations 2010 (Ref. 13.17). The statement advises of the importance of the planning system in determining the location of development which may give rise to pollution, either directly or indirectly. The statement also ensures that other uses and developments are not, as far as possible, affected by major existing or potential sources of pollution.

13.3.35 PPS23 advises that, amongst other things, the following matters may be material in the consideration of individual planning applications where pollution considerations arise:

- *"…the possible adverse impacts on water quality and the impact of any possible discharge of effluent or leachates which may pose a threat to surface or underground water resources directly or indirectly through surrounding soils; and*
- *the need to make suitable provision for the drainage of surface water…" (Page 12).*

iv. Planning Policy Statement 25: Development and Flood Risk (2010) (PPS25) (Ref. 13.27)

13.3.36 PPS25 sets out the Government's policies on development and flood risk. The aim of this PPS is to ensure that flood risk is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding. Where, exceptionally, development is necessary in areas of flood risk, this policy intends to make it safe without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

13.3.37 Paragraph 8 states that local planning authorities should, in determining planning applications:

- *"have regard to the policies in this PPS and, as relevant, in the RSS for their region, as material considerations which may supersede the policies in their existing development plan, when considering planning applications for developments in flood risk areas before that plan can be reviewed to reflect this PPS;*
- *ensure that planning applications are supported by site-specific flood risk assessments (FRAs) as appropriate;*
- *apply the sequential approach (see paras. 13–17) at a site level to minimise risk by directing the most vulnerable development to areas of lowest flood risk, matching vulnerability of land use to flood risk;*
- *give priority to the use of SuDS; and*
- *ensure that all new development in flood risk areas is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed."*

d) Regional Policy

13.3.38 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to be attached to the strategies (see **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001-2016 (RPG10) (2001) (Ref. 13.28)

13.3.39 RPG10 sets out the broad development strategy for the period to 2016 and beyond. Policy RE 1 (Water Resources and Water Quality) states that to achieve the long term sustainable use of water, water resources need to be used more efficiently. The policy also states that the quality of inland and coastal water environments must be conserved and enhanced.

13.3.40 Policy RE 2 (Flood Risk) states that local authorities, the Environment Agency, other agencies and developers should seek to:

- *"protect land liable to river and coastal flooding from new development, by directing development away from river and coastal floodplains;*
- *promote, recognise and adopt the use of sustainable drainage systems for surface water drainage; and*
- *adopt a sequential approach to the allocation and development of sites, having regard to their flood risk potential."*

ii. The Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of State's Proposed Changes 2008-2026 (July 2008) (Ref. 13.29)

13.3.41 Chapter 7 of the Strategy deals with Enhancing Distinctive Environments and Cultural Life. Policy F1 (Flood Risk) states that, taking account of climate change and the increasing risk of coastal and river flooding, the priority is to:

- *"defend existing properties and, where possible, locate new development in places with little or no risk of flooding;*
- *protect flood plains and land liable to tidal or coastal flooding from development;*
- *follow a sequential approach to development in flood risk areas;*
- *use development to reduce the risk of flooding through location, layout and design;*
- *relocate existing development from areas of the coast at risk, which cannot be realistically defended; and*
- *identify areas of opportunity for managed realignment to reduce the risk of flooding and create new wildlife areas."*

13.3.42 Policy RE6 (Water Resources) states that the region's network of ground, surface and coastal waters and associated ecosystems will be protected and enhanced; surface and groundwater pollution risks must be minimised so that environmental quality standards are achieved and where possible exceeded; and local planning authorities must ensure that rates of planned development do not exceed the capacity of existing water supply and wastewater treatment systems and do not proceed ahead of essential planned improvements to these systems.

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 13.30)

13.3.43 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

13.3.44 Policy 15 (Coastal Development) states that provision for any development along the coast, including the Exmoor Heritage Coast, should be made within towns, rural centres and villages. Where development requires an undeveloped coastal location

it should respect the natural beauty, biodiversity and geology of the coast and be essential in that location. New coastal developments should minimise the risk of flooding, erosion and landslip.

13.3.45 Policy 59 (Safeguarding Water Resources) states that protection will be afforded to all surface, underground and marine water resources from development which could harm their quality or quantity.

13.3.46 Policy 60 (Floodplain Protection) states that areas vulnerable to flooding should continue to be protected from development which would cause a net loss of flood storage area or interrupt the free flow of water or adversely affect their environmental or ecological value. In allocating land for development in local plans, consideration must be given to measures to mitigate the impact on the existing land drainage regime to avoid exacerbating flooding problems.

13.3.47 Policy 61 (Development in Areas Liable to Marine Flooding) states that provision should only be made for development in areas vulnerable to marine or tidal flooding where the development is needed in that location, no alternative location exists for the development, and adequate measures exist or can be readily provided to protect the development.

iv. River Basin Management Plan, South West River Basin District (2009) (Ref. 13.31)

13.3.48 The River Basin Management Plan (RBMP) has been prepared for the South West River Basin District's rivers and coastal areas under the requirements of the Water Framework Directive (Ref. 13.1). The plan describes the river basin district, and the pressures that the water environment faces. It shows what this means for the current state of the water environment, and what actions will be taken to address the pressures. It sets out what improvements are possible by 2015 and how the actions will make a difference to the local environment – the catchments, the estuaries, coasts and groundwater.

13.3.49 The plan states that development planning plays a key role in sustainable development and that the Environment Agency will continue to work closely with planning authorities to ensure that planners understand the objectives of the Water Framework Directive and area able to translate them into planning policy (page 29).

13.3.50 The plan presents current and future water body status objectives (Annex B) and thus site specific Environmental Quality Standards (EQS) are able to be derived.

v. Regional Flood Risk Appraisal (RFRA)

13.3.51 In accordance with PPS25 (Ref. 13.27), the South West Regional Assembly published their Regional Flood Risk Appraisal (RFRA) in February 2007 (Ref. 13.32). The document is a high level review of flood risk and strategy. In this document, concerns over the potential effects of climate change are identified across Bridgwater and the wider south-west region.

vi. River Parrett Catchment Flood Management Plan (CFMP)

13.3.52 The Environment Agency published its River Parrett Catchment Flood Management Plan (CFMP) in December 2009 (Ref. 13.33). This document identifies the scale and extent of flooding both currently and in the future and sets policies for managing flood

risk within the catchment. The Bridgwater C development is located within Sub-area 7 Bridgwater, where the policy is "we are already managing flood risk effectively but we may need to take further actions to keep pace with climate change" (Ref.13.33).

vii. Somerset County Council, Flood and Water Management, Strategic Business Plan 2010-2016 (2010) (Ref. 13.34)

13.3.53 The Flood and Water management plan sets out key programmes and projects within Somerset to reduce flood risk to people and property from ordinary watercourses, surface water run-off and groundwater flooding. In addition the plan sets out the long term vision for flood risk management within Somerset. The plan is consistent with the recommendations within the Flood and Water Management Act 2010 (Ref. 13.21).

viii. Managing Flood Risk on the Severn Estuary: Consultation (2011) (Ref. 13.35)

13.3.54 The consultation sets out the Environment Agency's strategy to manage flood risk on the Severn Estuary.

13.3.55 Specifically in relation to the HPC Project, the consultation explains that the Environment Agency's proposals may be amended to complement other projects planned for this area, including the proposed power station at Hinkley Point which would have some impact on flood defences.

e) Local Planning Policy and Local Strategy

i. Sedgemoor District Local Plan (1991-2011 Adopted Version) (2004) (Ref. 13.36)

13.3.56 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan (was adopted in 2004 with relevant policies saved from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific surface water designations.

13.3.57 Policy CNE14A (Flood Risk Assessment) outlines the policy for flood risk. However, this policy was not saved as part of the Secretary of State's Direction and therefore expired on 27 September 2007. The Council's schedule and reasoning for not saving this policy confirms that it is superseded by more recent guidance contained within PPS25 (paragraph 21).

ii. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission) (September 2010) (Ref. 13.37)

13.3.58 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

13.3.59 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to Chapter 4 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the Core Strategy.

13.3.60 The following Core Strategy (Proposed Submission) policies are of potential relevance.

13.3.61 Policy S1 (Spatial Strategy for Sedgemoor) states, amongst other things, that all development will take into account flood risk and vulnerability and be located at lower risk wherever possible. Where it is sequentially demonstrated that this is not possible, the benefits of development will need to outweigh the flood risk and be safe for its lifetime taking into account long-term flood defence strategies.

13.3.62 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, minimise the impact on natural resources, avoid pollution and incorporate the principles of sustainable construction to contribute to, amongst other things, sustainable drainage, reduced water use and water quality.

13.3.63 Policy S4 (Mitigating the Causes and Adapting to the Effects of Climate Change) states that development should adapt to the effects of climate change by, amongst other things:

> *"…minimising the risk of flooding and ensuring appropriate management of land within areas vulnerable to flooding…"*

13.3.64 Policy D1 (Managing Flood Risk) states:

> *"All development proposals in Flood Zones 2 and 3 as defined by the Environment Agency's Flood Map will only be permitted where the Sequential Test is passed as outlined in PPS25, unless:*
>
> - *PPS25 or subsequent replacement makes specific exception for the type of development proposed; or*
> - *The site is allocated or identified for development of the same type, scale and character in this Core Strategy or any subsequent document of the Local Development Framework as that proposed.*
>
> *In undertaking the Sequential Test it is the responsibility of the applicants to demonstrate that there are no reasonably available alternative sites at lower flood risk within a defined area of search where the proposed development could be sited.*
>
> *For the purposes of the Sequential Test the area of search will be the Sedgemoor District area unless:*
>
> - *It can be demonstrated that the development has a specific locational requirement based on functional requirements or to meet a demonstrable specific local need, in which case the area of search should reflect this;*

- *The site is located within or physically adjoining the urban area of Bridgwater, in which case that will be the search area;*
- *The site is located within or physically adjoining the Burnham-on-Sea and Highbridge urban area, in which case that will be the search area; or*
- *The site is located within a settlement boundary of an identified Key Rural Settlement, in which case that will be the search area.*

For the purposes of the Sequential Test, reasonably available alternative sites are those that are within the relevant area of search, can accommodate the requirements of the proposed development and are deliverable.

For residential proposals such sites should be identified in the Council's SHLAA. Sites identified in the Council's SHLAA will be deemed to have passed the Sequential Test but will still need to pass the Exception Test where required. Sites not identified will need to demonstrate why they perform sequentially better.

Where the Exception Test is required by PPS25, development proposals will need to demonstrate how they meet these requirements."

13.3.65 Policy D9 (Sustainable Transport and Movement) states that transport proposals should contribute to reducing adverse environmental issues including surface water run-off.

13.3.66 Policy D20 (Green Infrastructure) states that Green Infrastructure will be safeguarded, maintained, improved, enhanced and added to, as appropriate, to form a multi-functional resource which, amongst other things, contributes to climate change adaptation through, for example, sustainable drainage systems.

iii. Sedgemoor District Council Level 1 Strategic Flood Risk Assessment and Level 2 Strategic Flood Risk Assessment

13.3.67 Sedgemoor District Council published their Level 1 Strategic Flood Risk Assessment (SFRA) in August 2008 (Ref. 13.38). This document presented a review of available flood risk related policy and data across Sedgemoor. This information informed the hydraulic modelling in the Level 2 SFRA (Ref.13.39). The Level 1 report included flood probability maps consistent with the requirements of PPS25 (Ref. 13.27). The Level 1 SFRA reports *"The Level 1 SFRA mapping provides the tools for Sedgemoor District Council to undertake the PPS 25 Sequential Test."* In addition to generic national policies taken directly from PPS25, district specific policies were recommended in the Sedgemoor Level 1 SFRA including flood risk strategies and flood mitigation strategies. More detail on these policies can be found in the Overview Flood Risk Assessment Report.

13.3.68 The Level 1 SFRA (Ref.13.38) confirmed that much of the town centre of Bridgwater, which is in need of physical regeneration, is within an area of high flood risk. There is a clear conflict between managing flood risk and delivering the significant strategic growth envisaged for Bridgwater; levels of growth cannot be accommodated outside areas of high flood risk. Flooding in Bridgwater was investigated in greater detail in

the Level 2 SFRA (Ref.13.39) by carrying out overtopping and breach modelling to determine the areas that are "least worst" within areas of high flood risk.

iv. Supplementary Planning Guidance

13.3.69 Whilst not forming part of the statutory development plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 13.40) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

13.3.70 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have for the area. In relation to managing flood risk, the document advises that the Parrett Tidal Surge Barrier proposal north of the town centre will provide a strategic flood defence solution for Bridgwater (Page 16). It states:

> *"The preferred option for Bridgwater taking into account the economic benefits that accrue to both existing development and new regeneration areas is the construction of a new tidal surge barrier across the river to protect the town from the impact of dangerous high tides…*
>
> *Flood management in Bridgwater will be achieved with the surge barrier working in combination with a system of embankments downstream to provide the level of protection required." (Page 46)*

13.3.71 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of the draft HPC SPD.

13.3.72 In relation to climate change adaptation and flood risk, Box 3 of the draft HPC SPD sets out the following approach:

> *"…In addition to demonstrating general compliance with PPS 25: Development and Flood Risk, the HPC project promoter will be expected to contribute towards the Bridgwater Strategic Flood Defence solution where the development specifically occurs within Sedgemoor District Council.*
>
> *For associated development proposals elsewhere, including Williton, Cannington and Combwich, the HPC project promoter will be expected to demonstrate general compliance with PPS 25 and contribute towards long term flood risk management solutions and show, following a PPS 25 assessment and with mitigation as necessary, that proposed development will not accentuate flood risk to existing properties or land.*
>
> *HPC project development should also be sited and designed to with consideration for other potential effects arising from climate change, such as more frequent summer 'heat waves' and generally warmer summers." (Page 12).*

13.3.73 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4** of this ES) and the Introduction chapter (**Chapter 1** of this volume of the ES).

f) Best Practice Guidance

13.3.74 A range of best practice guidance is of relevance to this assessment including the following (only those specifically referred to in the assessment of impacts are included in the reference list):

- Environment Agency Policy and Practice for the Protection of Groundwater (Ref. 13.41).
- Environment Agency Pollution Prevention Guidance Notes (PPG) (Ref. 13.42), including:
  - PPG 1 General guide to the prevention of water pollution.
  - PPG 2 Above ground oil storage tanks.
  - PPG 3 Use and design of oil separators in surface water drainage systems.
  - PPG 4 Disposal of sewage where no mains drainage is available.
  - PPG 5 Works in, near or liable to affect watercourses.
  - PPG 6 Working at construction and demolition sites.
  - PPG 8 Safe storage and disposal of used oils.
  - PPG 21 Pollution incident response planning.
- Construction Industry Research and Information Association (CIRIA) Report C532: Control of Water Pollution from Construction Sites (Ref. 13.43).
- CIRIA Report C502: Environmental Good Practice on Site (Ref. 13.44).
- CIRIA Culvert Design and Operation Guide (C689) (Ref. 13.45).
- CIRIA: The SuDS Manual (C697) (Ref.13.46).
- BS6031: 1981 Code of Practice for Earth Works (Ref. 13.47).
- Good Practice Guide for Handling Soils (MAFF, 2000) (Ref. 13.48).
- Local and Regional Land Drainage Byelaws.

13.4 Methodology

13.4.1 The methodology adopted for assessing potential impacts to surface water is broadly consistent with the general approach and methodologies adopted across all technical study areas.

13.4.2 In accordance with the requirements for the environmental impact assessment of major projects in the UK (see **Volume 1, Chapter 7** of this ES), the approach adopted consists of four clear stages:

- definition of the current baseline;
- impact assessment;

- proposed mitigation measures; and
- assessment of any residual impacts after implementation of mitigation.

13.4.3 The construction, operational and post-operational phases of the proposed development are assessed.

13.4.4 The assessment presented in this chapter addresses only surface water issues associated with the proposed development. An assessment of potential groundwater impacts is presented in **Chapter 12** of this volume of the ES. Potential impacts on the ecological resources are addressed in **Chapter 14** of this volume of the ES.

a) Study Area

13.4.5 The geographical extent of the study area for this assessment includes:

- the site;
- surface water receptors near to the site (water features within 250m of the site), given that there is potential for these features to be affected by the proposed development;
- surface water receptors within an extended study area (where a particular type of surface water feature is not found to be present within the 250m study area, the study area is extended to a distance of 500m from the site); and
- identified watercourses to their downstream extent, where appropriate.

13.4.6 The study area is illustrated in **Figure 13.1**.

b) Baseline Assessment

13.4.7 Baseline environmental characteristics for the study area were identified by utilising the following key data sources:

- Ordnance Survey (OS) (2005) Landranger Map 1:50,000 scale 'Weston-super-Mare, Bridgwater and Wells' Sheet 182 (Ref. 13.49).
- Envirocheck Report (Ref. 13.50).
- Environment Agency "What's In Your Backyard" website (Ref. 13.51).
- South West River Basin Management Plan (Ref. 13.31).
- Aerial photography (public access internet resources) (Ref. 13.52).
- Walkover survey of the site (January 2010).
- Consultation with appropriate Statutory Bodies (i.e. Environment Agency and Somerset Drainage Boards Consortium (SDBC)).
- Sedgemoor District Council Level 1 Strategic Flood Risk Assessment (Ref. 13.38).
- Sedgemoor District Council Level 2 Strategic Flood Risk Assessment (Ref. 13.39).
- Development at North East Bridgwater Flood Risk Assessment (Ref. 13.53).
- **Bridgwater C Flood Risk Assessment**.

13.4.8 The desk-based assessments and walkover surveys listed above did not identify the need for further survey data. No specific physical surveys were carried out in relation to the assessment of impacts to surface water.

13.4.9 A description of the site and broad baseline conditions is provided in **Chapter 2** of this volume of the ES. Further details regarding the baseline surface water conditions are presented in Section 13.5.

c) Consultation

13.4.10 Consultation has been undertaken throughout the EIA process and further detail is provided in the **Consultation Report**.

13.4.1 Written correspondence was exchanged with the Environment Agency from August 2009. Meetings were held with the Environment Agency, SDC and WSC in October 2009 and February 2010. Stage 1 consultation responses for the site were provided by the Environment Agency and Highways Agency.

13.4.2 Meetings were held with the Environment Agency, SDC and WSC in April 2010 to discuss sequential test; overview of campus masterplans; site specific Flood Risk Assessment (FRA) for all associated developments. A meeting was held with the Somerset Drainage Boards Consortium in April 2010 to discuss FRA for all associated developments.

13.4.3 Stage 2 consultation responses were provided by the Environment Agency, SDBC, SDC and WSC, Bridgwater Town Council and SCC.

13.4.4 Meetings were held with the Environment Agency, SDC and WSC to discuss all stages of the assessment including specific aspects of the associated development in September 2010. Comments received in response to the Stage 2 Update consultation were reviewed and considered in the development of this chapter.

d) Assessment Methodology

13.4.5 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. In addition the following specific methodology was applied for the determination of receptor value and sensitivity (see **Table 13.1**) and of impact magnitudes (see **Table 13.2**) for surface waters.

i. Value and Sensitivity

13.4.6 All of the surface water receptors that may be impacted by the proposed development have been assigned a level of value/sensitivity in accordance with those definitions set out in **Volume 1, Chapter 7** and with the definitions given in **Table 13.1.**

13.4.7 Where a receptor could reasonably be placed within more than one value and sensitivity rating, conservative professional judgement has been used to determine which rating would be applicable.

Table 13.1: Criteria Used to Determine the Value and Sensitivity of Surface Water Receptors

Value and Sensitivity	Description
High	*Water Quality Specific Definition:* Water quality of receptor site supports or contributes towards the designation of a feature of national (or international) importance. Very low capacity to accommodate any change to current water quality status, compared to baseline conditions. Water quality of receptor site classified under the WFD as high or good ecological status/potential. The receptor environment is likely to have natural ecosystems and make very good salmonid and cyprinid fisheries. They may be used for any type of water abstraction including potable supply. *Hydrology and Drainage Specific Definition:* Receptor identified as having no capacity to adapt to, or recover from, proposed form of change, i.e. fluvial watercourse will not naturally realign and erode to optimise flow conveyance such that impact will persist.
Medium	*Water Quality Specific Definition:* Water quality of receptor site supports high biodiversity (not designated). Receptor has low capacity to accommodate change to water quality status. Water quality of receptor site classified under WFD as good ecological status/potential. These rivers are suitable for coarse fisheries. *Hydrology and Drainage Specific Definition:* Receptor identified as having low capacity to accommodate proposed form of change i.e. fluvial watercourse will only partially reconfigure to optimise flow conveyance such that impact may persist or will be transposed to another location.
Low	*Water Quality Specific Definition:* Baseline conditions define an environment that has a high capacity to accommodate proposed change to water quality status due, for example, to the large relative size of receiving water feature and effect of dilution. Baseline water quality status generally poor. Water quality of receptor site could be expected to be classified under the WFD as moderate ecological status/potential. Receptor site is likely to be capable of supporting only limited fish populations. *Hydrology and Drainage Specific Definition:* Receptor identified as having moderate capacity to accommodate proposed form of change i.e. fluvial watercourse will reconfigure to optimise flow conveyance such that change will, after time, return to approaching baseline conditions.
Very low	*Water quality specific definition:* Specific water quality conditions of receptor water feature likely to be able to tolerate proposed change with very little or no impact upon the baseline conditions. Water quality of receptor site could be expected to be classified under the WFD as poor or bad ecological status/potential. These rivers have severely restricted ecosystems and are very polluted. *Hydrology and Drainage Specific Definition:* Receptor identified as being generally tolerant to the proposed change.

ii. Magnitude

13.4.8 The magnitude of impact has been based on the consequences that the proposed development would have upon the local surface water features and has been considered in terms of high, medium, low and very low (see **Table 13.2**). Potential

impacts have been considered in terms of permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

13.4.9 Where an impact could reasonably be placed within more than one magnitude rating, conservative professional judgement has been used to determine which rating would be applicable.

13.4.10 All of the surface water receptors identified as a result of the proposed development have been assigned a level of magnitude in accordance with those definitions set out in **Volume 1, Chapter 7** of this ES**,** and with the surface water specific definitions given in **Table 13.2**.

13.4.11 The following impact assessment has been undertaken which assumes that standard good practice working methods have been implemented on site and compliance with all rules and regulations governing the site. It should be noted that compliance with rules and regulations and standard good construction practices are not considered as formal mitigation (i.e. specific additional mitigation to reduce assessed moderate or major adverse impacts) within this ES.

Table 13.2: Criteria Used to Determine the Magnitude of Surface Water Receptors

Magnitude	Description
High	*Water Quality Specific Definition:* Very significant change to key characteristics of the water quality status of the receiving water feature. Water quality status degraded to the extent that a permanent change and inability to meet EQS, for example, is likely. Very significant change to key hydrological/hydraulic characteristics of the receiving water body to the extent that UK and European legislation is contravened. *Hydrology and Drainage Specific Definition:* Very significant change to key hydrological/hydraulic characteristics of the receiving water body to the extent that UK and European legislation is contravened.
Medium	*Water Quality Specific Definition:* Significant changes to key characteristics of the water quality status taking account of the receptor volume, mixing capacity, flow rate, etc. Water quality status likely to take considerable time to recover to baseline conditions. Significant changes to key run-off characteristics such that hydrological/hydraulic characteristics of the controlled water body are impacted to the extent that UK and European legislation is contravened. Changes are limited in time to the duration of the hydrological event that initiated the change (i.e. normal period of time over which water levels in watercourse receptors would be expected to rise and fall). *Hydrology and Drainage Specific Definition:* Significant changes to key run-off characteristics such that hydrological/hydraulic characteristics of the controlled water body are impacted to the extent that UK and European legislation is contravened. Changes are limited in time to the duration of the hydrological event that initiated the change (i.e. normal period of time over which water levels in watercourse receptors would be expected to rise and fall).

Magnitude	Description
Low	*Water Quality Specific Definition:* Noticeable but not considered significant changes to water quality status of receptor water feature. Activity not likely to alter local status to the extent that water quality characteristics change considerably or EQS are compromised. Activities are likely to have an impact for a short time scale (e.g. relative to turnover of water feature) and baseline water quality conditions are maintained. Noticeable but insignificant changes to key run-off characteristics such that hydrological/hydraulic characteristics of receptor controlled water bodies would not contravene UK and European legislation. *Hydrology and Drainage Specific Definition:* Noticeable but insignificant changes to key run-off characteristics such that hydrological/hydraulic characteristics of receptor controlled water bodies would not contravene UK and European legislation.
Very low	*Water Quality Specific Definition:* Although there may be some impact upon water quality status, activities predicted to occur over a short period. Any change to water quality status will be quickly reversed once activity ceases. Occasional but insignificant impact to key run-off characteristics with changes to hydrological/hydraulic characteristics of receptor controlled water bodies predicted to occur over a short period of time. Any change to hydrological/hydraulic characteristics will be quickly reversed once activity ceases. *Hydrology and Drainage Specific Definition:* Occasional but insignificant impact to key run-off characteristics with changes to hydrological/hydraulic characteristics of receptor controlled water bodies predicted to occur over a short period of time. Any change to hydrological/hydraulic characteristics will be quickly reversed once activity ceases.

iii. Significance of Impacts

13.4.12 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the resource. The methodology for assessment of significance of impacts, without mitigation, is outlined in **Volume 1, Chapter 7** of this ES.

13.4.13 This section describes the proposed mitigation measures to manage and reduce the identified effects on surface water within and in the immediate vicinity of the proposed development during the construction, operational and post-operational phases. For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

iv. Cumulative Impacts

13.4.14 **Volume 1, Chapter 7** of this ES sets out the methodology used to assess cumulative impacts. Additive and interactive effects between site-specific impacts are considered within this chapter. The assessment of cumulative impacts with other elements of the HPC Project and other proposed and reasonably forseeable projects are considered in **Volume 11** of this ES.

e) Limitations, Constraints and Assumptions

13.4.15 Characterisation of surface water quality conditions has been based primarily on a desk-based exercise. Given that there are no surface watercourses within or adjacent to the site boundary, and that the only nearby surface water features are ephemeral (assumed) drainage ditches that are not part of a wider network or used for abstraction purposes, the characterisation and assessment approach is considered to be adequate to provide a dataset which is appropriate for carrying out an impact assessment.

13.4.16 The extent of flood risk has primarily been based on available historical data, current operating regime and simple hydrological/hydraulic calculations. There are no available gauge data for this site. However, such data would not be expected given the type of watercourses (ditches and rhynes) in the vicinity of the site.

13.5 Baseline Environmental Characteristics

a) Introduction

13.5.1 This section of the ES describes the baseline environmental characteristics for the site and surrounding areas with specific reference to water quality, hydrology and drainage. A definition of the baseline characteristics will allow the potential impacts of the proposed development to be determined and appropriate mitigation implemented, if required. It also provides the point of reference against which the success of the adopted mitigation measures can be assessed.

b) Study Area Description

13.5.2 The site is situated to the east of Bridgwater town centre and has an area of approximately 1.9ha.

13.5.3 The site is currently used as a training pitch and gravel covered car park by Bridgwater and Albion Rugby Football Club. Immediately to the west of the site is the main rugby pitch with spectator stands, on the opposite side of which is the Bridgwater to Highbridge railway line. The site is bound to the south by Bridgwater College and to the east by the College Way, with residential properties beyond. There is open space to the north of the site, on which a planning application is pending.

13.5.4 See **Chapter 1** of this volume of the ES for further details of the study area.

i. Environmental Overview

13.5.5 A general environmental baseline overview for the site is provided in the following section to provide background information relevant to both water quality and hydrology and drainage/flood risk.

Topography

13.5.6 Ground levels across the site generally range between 7.3m and 8.6m above Ordnance Datum (AOD), as determined by a global positioning system survey. The LiDAR data provided in the **Bridgwater C Flood Risk Assessment** indicates that the entire Rugby Club, including the site, is slightly elevated in relation to the surrounding area, which is generally at an elevation of approximately 6.5 metres

AOD. The site is located on the south-eastern side of this area of raised ground (raised by historical land filling) and thus a slight slope exists across the site towards the south-eastern site boundary. The LiDAR data indicates that the railway line to the west of the site is within a slight cutting to the north-east of the site as it passes beneath Bath Bridge.

Geology, Hydrogeology and Soils

13.5.7 The natural geology has been overlain with Made Ground (waste infill) across the site.

13.5.8 Exploratory hole records were obtained from the British Geological Survey for a site investigation carried out across the entire Bridgwater and Albion Rugby and Football Club site in 1992 (Ref. 13.54). The records indicate that ground conditions comprise 0.20m to 1.50m of imported topsoil, underlain by domestic waste (i.e. general refuse) to depths of 1.6m to 5.3m below ground level (bgl) and Tidal Flat Deposits (alluvium) to approximately 24m bgl. Additional exploratory investigations have been carried out by EDF Energy in December 2010 and February 2011, further details of which are provided in **Chapter 12** of this volume of the ES.

13.5.9 The geological map (Ref. 13.55) for the area indicates that the natural geology consists of Tidal Flat Deposits overlying the Mercia Mudstone Group, formerly known as Keuper Marl. The Tidal Flat Deposits typically comprise estuarine alluvium consisting of fine grained deposits of silt and clay but may comprise poorly sorted sand and gravels within a fine grained matrix. The Mercia Mudstone Group generally comprises mudstones and siltstones, which are occasionally fractured. A nearby borehole at Puriton showed the Mercia Mudstone to be almost 400m in thickness.

13.5.10 According to the British Geological Survey records (Ref.13.54), groundwater was encountered within the domestic waste at depths between 2.0m and 3.0m (bgl) in November 1992, as supported by more recent drilling investigations (see **Chapter 12** of this volume of the ES for further details).

13.5.11 The Tidal Flat Deposits have been classified by the Environment Agency as a Secondary Aquifer (undifferentiated) (Ref.13.51). The Environment Agency has classified the Mercia Mudstone Group within the study area as a Secondary B Aquifer. However, both the Estuarine Alluvium and the Mercia Mudstone group are often considered to be non-aquifers (Ref.13.56).

13.5.12 The Tidal Flat Deposits are typically a low permeability deposit, although small domestic supplies may be obtained from the sandier horizons especially when in hydraulic continuity with adjacent watercourses (Ref.13.51). The occurrence of groundwater within the Mercia Mudstone Group may be unpredictable and permeability is generally dominated by fractures (Ref.13.55).

13.5.13 The site has been mapped by the Soil Survey of England and Wales (SSEW) as “urban” land (Ref.13.57). According to the Flood Studies Report (FSR) Winter Rainfall Acceptance Potential (WRAP) map (Ref.13.58), the site has a moderate acceptance potential (3), with an associated SOIL classification of 0.37. This SOIL parameter indicates that, on an annual basis, approximately 37% of rainfall does not infiltrate into the underlying ground and runs off as surface water.

Surface Watercourses

13.5.14 The hydrology of the site is presented in **Figure 13.1**. The site is located within the Parrett Internal Drainage Board Boundary. Therefore, with the exception of the River Parrett and the King's Sedgemoor Drain, which are classified as main rivers, the watercourses in the vicinity of the site are under the jurisdiction of Somerset Drainage Boards Consortium. However, for an area located within a drainage board boundary, there are relatively few of the interconnecting field drains, known locally as rhynes, that generally characterise drainage board areas in the immediate vicinity of the site.

13.5.15 The nearest surface watercourse is a small ditch/drain located approximately 20m to the north east of the site. According to the Wessex Water sewer plans, this small ditch flows to the south into a culverted surface water sewer located approximately 20m to the east of the site and subsequently into a combined foul sewer located approximately 25m to the south-east of the site.

13.5.16 Small ditches/drains are also located approximately 70m to the north, 140m to the north-west, 150m to the west and 160m to the south-west of the site. The ditch located approximately 70m to the north is very small and was not viewed during the walkover survey due to overgrown vegetation. It does not appear to be linked to any other watercourse or drainage system. The ditch located approximately 140m to the north of the site is orientated parallel with the railway line and may be linked to the 'Railway rhyne' located approximately 200m to the north, however, this ditch was also overgrown and a flow direction could not be discerned.

13.5.17 The ditches located approximately 150m to the west and 160m to the south-west of the site form part of the Wessex Water surface water sewer system. The surface water sewer system from a small number of houses located approximately 400m to the south-west of the site outfalls into a ditch, which flows northwards towards a surface water sewer inlet located approximately 160m to the south-west of the site. This surface water sewer flows northwards beneath the main Bridgwater and Albion Rugby and Football Club pitch (to the west of the site) and then turns westwards beneath the railway line to outfall into the ditch located approximately 150m to the west of the site. This ditch runs parallel with A39 (Bath Road) for approximately 60m before entering the Wessex Water combined sewer located approximately 220m to the west of the site.

13.5.18 The nearest drainage board maintained rhyne is located approximately 800m to the north east of the site and flows north eastwards, away from the site, parallel with A39 (Bath Road).

13.5.19 The River Parrett is located approximately 950m to the west of the site. According to the draft Parrett Estuary Flood Risk Management (FRM) Strategy (Ref.13.59), river flows from the River Parrett do not influence water levels in Bridgwater or downstream. Water levels are determined by the tidal variation within the Bristol Channel (at the mouth of the river) which has one of the greatest tidal ranges in the world (Ref.13.59).

13.5.20 The tidal influence extends to a sluice gate at Oath, near Langport, which is located approximately 25km from the coastline and approximately 10km upstream of Bridgwater (Ref.13.38). The contributing catchment area (approximately 1,500km^2) of the River Parrett is predominantly rural, however there a number of major

settlements located in the low lying coastal zones. The tributary watercourses are characterised by a dense network of field drains or rhynes with generally shallow slopes.

13.5.21 King's Sedgemoor Drain comprises an artificial drainage channel that diverts the River Cary to discharge into the River Parrett at Dunball Clyce. Dunball Clyce is located approximately 2.8km to the north of the site (NGR 309900, 407100).

Existing Surface and Foul Water Drainage Arrangements

13.5.22 The site is not currently served by a formal drainage system and any rainwater that does not infiltrate is currently allowed to run-off from the site.

13.5.23 Information on the existing surface water and sewer systems in the vicinity of the site was obtained from Wessex Water (Ref.13.60). This information is presented in the **Bridgwater C Flood Risk Assessment**.

13.5.24 The nearest combined sewer connection indicated on the Wessex Water plans is located approximately 25m from the south eastern corner of the site. This sewer connects to existing main sewers in Bath Road. Foul flows from the site area would be treated at the Chiltern Trinity Sewage Treatment Works (STW), which lies on the western banks of the River Parrett. According to the advice from Wessex Water, the flows from the proposed development will need to reach the terminal pumping station on the eastern bank of River Parrett that conveys the flows to the Chiltern Trinity STW.

ii. Gauging Station Data

13.5.25 There are no surface water gauging stations in the vicinity of the site. There are gauge boards installed at West Quay and Dunball but no related historical or current stage records.

iii. Water Quality

13.5.26 Surface water quality of the tidal River Parrett has not historically been monitored by the Environment Agency as part of the River Ecosystem Classification Scheme (which is the largest dataset of surface water quality collected nationwide).

13.5.27 As part of the WFD South West River Basin Management Plan the Environment Agency has characterised and published data on the current ecological status of the tidal River Parrett.

Parrett WFD Water body

13.5.28 The WFD transitional water body description table for the local stretch of the River Parrett is presented in Annex B of the South West RBMP (Ref. 13.31). The RBMP defines the River Parrett as a 'Heavily Modified' watercourse (designated due to flood protection structures) with a current ecological potential status of 'Moderate'. Chemistry data has been used to define several chemical supporting elements and the collective chemical status (a single element that contributes to the overall status definition) is defined as 'Good'. The current ecological status and the status objectives for this water body are based on expert judgement. The current moderate ecological potential classification, resulting from a mitigation measures assessment, has been attributed to a lack of implemented mitigation measures deemed necessary

for this type of heavily modified water body (Ref. 13.31). It is judged to be technically infeasible to put all these required mitigation measures (such as managed realignment of flood defences) in place by 2015, hence the predicted status by 2015 remains at 'Moderate' (target status is good by 2027).

13.5.29 There are no monitoring data on the drainage ditches adjacent to or close to the site (search area extended to 500m as no data found within a 250m radius).

Surface Water Abstraction and Discharge Consents

13.5.30 There are no surface water abstractions within 500m of the site (search area extended to 500m as no abstractions were found within a 250m radius). Groundwater abstractions are identified within **Chapter 12** of this volume of the ES.

13.5.31 There are no current licensed discharges within a 500m radius of the site (search area extended to 500m as no discharges were found within a 250m radius).

iv. Hydrology and Flood Risk

13.5.32 This section considers the baseline flood risk characteristics for the site and should be read in accompaniment to the **Bridgwater C Flood Risk Assessment**.

Tidal Flood Risk

13.5.33 The Environment Agency's flood map (Ref.13.61) and the Sedgemoor Level 1 SFRA (Ref.13.38) indicate that the site is located within Flood Zone 3, which is the zone with high probability of flooding. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Consideration of flood risk to the proposed development as well as the impact on flooding from the development is therefore required.

Historical Tidal Flooding

13.5.34 Prior to the Somerset Levels and Moors being reclaimed and protected from the sea in the 14th Century, tidal flooding probably occurred several times a year (Ref.13.59). There have been a number of historic tidal floods in the Bridgwater region, most notably the 1607 and 1981 tidal surge events. It is reported in the Sedgemoor District Council Level 1 SFRA (Ref.13.38) that in April 1998, tidal and fluvial flooding occurred across Bridgwater, with much infrastructure, land and buildings affected although the number and location of properties affected is unknown.

13.5.35 The 1607 event is considered to have been more extreme than the 1981 event and has been attributed an AEP of between 0.2% (1 in 500 year) and 0.14% AEP (1 in 700 year) (Ref. 13.62). The cause of the 1607 flood has been controversial and the event has been studied by Risk Management Solutions, 2007 (Ref.13.63) who concluded that evidence of the timing of the floods relative to the tides, other weather observations, and the absence of any reports of an earthquake, support the theory that the event was a wind driven storm surge superimposed on an extreme spring tide (Ref.13.62). The storm surge theory has also been discussed in a separate report by Defra in 2005 (Ref.13.64) and by Horsburgh and Horritt in 2006 (Ref.13.65). The consensus as to the driving mechanisms for the event is that very high spring tides, known to have occurred on the day of the flood, were coupled with

a high surge associated with days of strong south-westerly winds that are thought to have preceded the event.

13.5.36 The event broke the sea bank at Burnham-On-Sea and resulted in massive flooding of at least 30 villages; 28 people were drowned at Huntspill and 26 at Brean a death toll that was repeated in many other villages (Ref.13.59). A high water level of 7.72m AOD was noted in Clevedon, which is located approximately 36km north-west of Hinkley Point.

13.5.37 The 1981 flood has been well documented, and is locally known as "the big storm" of Sunday 13 December 1981. A 1.45m surge coincided with the peak of a modest spring tide and tidal defences overtopped long lengths of Somerset's north and west facing coastline (Ref.13.59). A water level of 7.95m AOD was recorded in Bridgwater; the predicted tide had been 6.5m AOD with a 0.38m surge (Ref.13.66). A large volume of tidal water overtopped the defences and filled the majority of the tidal floodplain of the River Parrett. Flooding extended to the M5 motorway, flooding communities and hundreds of hectares of agricultural land. Fortunately the defence improvements scheme implemented following a flood event in 1974 was largely complete by the time of the 1981 event and, as a result, damage in Bridgwater was limited to isolated locations.

Tidal Flood Defences

13.5.38 The Environment Agency Flood Map (Ref.14.61) illustrates the probability of flooding without consideration of any defences. The town of Bridgwater benefits from raised flood defences along the banks of the River Parrett, which are maintained to protect against flood events of a 0.5% (1:200 year) probability of occurring in any year (Ref. 13.38 and Ref. 13.59), which is equivalent to the 1% annual exceedence probability (AEP; 1 in 100 year) standard, and therefore currently provides the protection required by PPS25 (Ref. 13.27). The draft Parrett Estuary Flood Risk Management Strategy (Ref. 13.59) highlights that the standards of defence will deteriorate to a level of 100% AEP by 2115 if no remedial action is taken. This is based on a number of factors including sea level rise and the current condition of the defences.

13.5.39 The future management of the flood defences in the Parrett Estuary is detailed in the Parrett Estuary Shoreline Management Plan (Ref. 13.67). The preferred policy at the site is to 'hold the line' in the short, medium and long-term by maintaining the existing flood defences to ensure that the defence standards are retained, and rebuild and/or upgrade vulnerable defences if necessary.

13.5.40 A surge barrier is the Environment Agency's preferred option to protect Bridgwater in the long-term, since this will not be adequately defended by the existing defences beyond 2030 based on current sea level rise projections (Ref. 13.59). This was confirmed during a scoping consultation meeting with the Environment Agency. The preferred location of the Parrett Tidal Barrier is downstream of Bridgwater, near Dunball Sluice. The barrier would be raised at times of extreme high tides to prevent the greatest threat of a tidal surge inundating the town. According to the Bridgwater Strategic Flood Defence Tariff report (Ref. 13.68), the site is located within the geographical area within which the tariff will apply (an area which will benefit from the defence).

13.5.41 The Parrett Barrier Technical Report 2009, as mentioned in the Bridgwater Strategic Flood Defence Tariff report (Ref. 13.68), suggests that the construction of the barrier

is required between 2030 and 2050 and that detailed feasibility and design work should commence by 2020. During a consultation meeting as part of the Stage 2 consultation, the Environment Agency advised that it was the intention of the local authority to have the Bridgwater strategic flood defence Parrett Barrier constructed and operational by 2030. This barrier would provide Bridgwater with the required *"acceptable standard of safety taking into account climate change..."* as required by PPS25 (paragraph G2), from 2030 onwards such that development within Bridgwater could be permitted.

Tidal Flood Mapping

13.5.42 The Sedgemoor Level 2 SFRA (Ref. 13.39) and the North East Bridgwater FRA (Ref. 13.53) present hazard mapping from overtopping and breaching of the tidal defences.

13.5.43 The results indicate that the vast majority of Bridgwater, including the site, will not be flooded as a result of overtopping of the flood defences during the 0.5% AEP (1 in 200 year) and 0.1% AEP (1 in 1,000 year) present day tidal flood events. Those areas that are affected are flooded to relatively shallow depths. Further modelling presented in the Sedgemoor Level 2 SFRA (Ref. 13.39) representing the situation in 2108 and North East Bridgwater FRA (Ref.13.53) representing the situation in 2107, show the extent and depth of flooding throughout Bridgwater is increased significantly albeit well beyond the lifetime of the proposed development. However, due to the site's slightly elevated topography, the site remains dry and therefore the flood risk is low.

13.5.44 The Sedgemoor Level 2 SFRA (Ref. 13.39) also assessed the risk from a breach in flood defences. The assessment found that the site would also remain dry during the 0.5% AEP and 0.1% AEP breach event including an allowance for climate change, representing the situation up to the year 2108, although it should be noted that the Level 2 SFRA considered breach locations some distance from the site.

13.5.45 The North East Bridgwater FRA (Ref. 13.53) hazard mapping indicates that floodwater resulting from a breach would likely present a "danger to some" at the site. However further interrogation of the results indicates that the site would remain dry, and therefore the risk of flooding is low although access to the site may be impeded.

13.5.46 In summary, the existing studies indicate that the site will be adequately protected by the Parrett defences until at least 2030 and subsequently by the proposed Parrett Tidal Barrier. Therefore, due to the low likelihood of a breach event occurring between 2011 and 2030, breaching of the River Parrett defences during this period is considered to present a residual risk. The potential failure of the proposed Parrett Tidal Barrier (subsequent to its intended implementation in 2030) is also considered to present a residual risk, albeit that the likelihood is low and this relates to a period following the operation of the proposed development.

Fluvial Flood Risk

13.5.47 Although there has been a number of severe fluvial events that have affected large areas of Somerset in recent years (notably autumn 2000), none of these have affected the site or the Parrett Estuary (Ref. 13.59).

13.5.48 The risk of fluvial flooding has been reported in the draft Parrett Estuary Flood Risk Management Strategy Report (Ref. 13.59). It concluded that peak levels in the area of interest are primarily influenced by tidal levels; and that river flows have a lesser impact, and do not cause flooding in Bridgwater as they are controlled by spills into the lower lying Somerset Moors upstream.

13.5.49 The risk of fluvial flooding within the River Parrett was considered further within a flood risk assessment carried out at the North East Bridgwater site (Ref. 13.53) located to the north east of the site. Analysis was carried out which indicated that the predicted water level of the River Parrett was approximately 6.6m AOD, which is approximately 1.8m lower than the lowest defence crest height along the banks of the River Parrett of 8.4m AOD.

13.5.50 The potential fluvial flood risk from the King's Sedgemoor Drain, which converges with the River Parrett approximately 2.3km to the north of the site, was also investigated by the North East Bridgwater FRA (Ref. 13.53). The FRA reported that levels are significantly lower than the elevation of the site and therefore the fluvial risk from this watercourse was considered to be of low probability. This is reinforced by the Sedgemoor District Council Stage 2 SFRA (Ref. 13.39), which shows that there is no risk of flooding from this watercourse.

13.5.51 The flood risk to the North East Bridgwater site from the viewed rhynes including the motorway drain were also assessed as part of the North East Bridgwater FRA (Ref. 4). Due to the raised topography of the site, there are no feasible scenarios during which flooding of these rhynes could present a risk to the Bridgwater C site. Furthermore, the proposed drainage strategy outlined in the North East Bridgwater FRA (Ref. 4) would ensure that drainage within the North East Bridgwater development is adequate.

Combined Fluvial and Tidal Flood Risk

13.5.52 Although tidal flooding is perceived to present the greatest flood risk to the site, the River Parrett has a number of major and minor fluvial tributaries, which may also contribute flow during a tidal event. However, according to the draft Parrett Estuary FRM (Ref. 13.59):

> *"river flows from the River Parrett do not influence the water level at high tide in Bridgwater, or downstream."*

13.5.53 The influence of fluvial flooding on tidal flood levels at the site and downstream was investigated in the North East Bridgwater FRA (Ref. 13.53). This flood risk assessment included modelling of a combined fluvial and tidal event and has been approved by the Environment Agency. A joint probability of 0.5% tidal and 50% fluvial events was considered. The results indicated a peak water level of 8.3m AOD in central to northern Bridgwater under the current conditions. This level of 8.3m in central Bridgwater is equal to the extreme water level (8.30m AOD) at West Quay in central Bridgwater given in the Environment Agency's Areas Benefiting from Defences report (Ref. 13.69) for the North Wessex Area. The extreme water levels used in the Areas Benefiting from Defences report were derived from the 2003 Environment Agency report on Regional Extreme Tide Levels for the South West Region (Ref. 13.70).

13.5.54 The extreme water levels in the Environment Agency's Regional Extreme Tide Levels report (Ref. 13.70) incorporated a tidal surge and wind set up, with no influence from fluvial discharge. The fact that the modelled joint probability event presented in the North East Bridgwater FRA (Ref. 13.53) also produced an extreme water level of 8.3m AOD confirmed that the fluvial element of this joint probability event has a negligible influence on the water levels within the River Parrett. Fluvial influence on the water levels of the River Parrett was therefore not considered further in the subsequent 2D modelling by Brookbanks Consulting Limited (Ref. 13.53).

13.5.55 Based upon the outcome of the studies as explained above, the fluvial influence is considered to be of low probability, in terms of joint probability of occurrence with tidal events resulting in water levels that are greater than those specified for tidal-only events. Therefore, a combined/joint probability event was not considered further in the **Bridgwater C Flood Risk Assessment**.

Groundwater Flood Risk

13.5.56 The Sedgemoor District Council Level 1 SFRA (Ref. 13.38) indicates that there is not a significant risk of groundwater flooding in Bridgwater. Similarly, the Parrett Catchment Flood Management Plan (Ref. 13.33) does not identify groundwater as being a significant source of flooding in Bridgwater. The risk of flooding from this source is relatively minor.

13.5.57 During the ground investigation carried out at the site in November 1992, groundwater was encountered within the underlying Made Ground at depths between 2m and 3m bgl. Considering the low permeability of the underlying natural strata, the hydrological conditions are unlikely to respond to the seasonal cycle or rainfall events with large fluctuations in levels. The near flat local topography, together with a slightly raised ground profile of the site in comparison with the surrounding area, further reduces potential groundwater related risks. It is therefore concluded that groundwater flood risk is of low probability.

Surface Water (Pluvial) Flood Risk

13.5.58 The Sedgemoor District Council Level 1 SFRA (Ref. 13.38) indicates that there is currently no potential risk of overland flow in the area of the site. The site is slightly raised in comparison to the surrounding area and is therefore likely to be well-drained. It is therefore concluded that surface water flood risk is of low probability. However, as discussed previously, the site is not currently served by a formal drainage system and any rainfall which does not infiltrate is allowed to run-off. Therefore, in the absence of mitigation measures, surface water run-off volumes and rates would increase as a result of the proposed development and therefore although the risk is considered to be low probability, measures to control surface water run-off from the proposed development have been incorporated into drainage proposals.

Sewer Flood Risk

13.5.59 The Sedgemoor District Council Level 1 SFRA (Ref. 13.38) provides evidence of local sewer flooding, which is taken from the Wessex Water DG5 Asset Register. According to the Level 1 SFRA, the site is not located within or adjacent to an area at risk of existing sewer flooding. The site's slightly raised topography will ensure that there is a sufficient fall to drainage connections, reducing the risk of sewers backing

up reaching the site. It is therefore considered that the risk of sewer flooding to the site is of low probability.

Flood Risk from Reservoirs and Other Artificial Sources

13.5.60 Flooding from artificial sources includes reservoirs, canals and lakes where water is retained above the natural ground level. As there are no artificial sources within or adjacent to the site, such sources pose no flood risk to the proposed development.

Summary of Flood Risk

13.5.61 A PPS25 compliant Flood Risk Assessment (FRA) has been prepared for the site. The FRA report has a more detailed description of the flood risks and proposals for management of drainage on the site. The aim of the FRA is to ensure that the proposed development occurs in a safe manner, such that new development is not located in flood risk areas, and that flood risk and consequence to surrounding areas is not increased as a result of the proposed development.

13.5.62 **Table 13.3** summarises the potential flooding mechanisms to the site at present.

Table 13.3: Summary of Potential Flood Mechanisms Affecting the Site

Flood Mechanism	Potentially Affecting the Proposed Development
Tidal	Low probability – design mitigation and residual risk addressed in the accompanying FRA
Fluvial	Low probability – design mitigation and residual risk addressed in the accompanying FRA
Combined tidal and fluvial	Low probability
Groundwater	Low probability
Surface water resulting from rainfall (pluvial)	Low probability – design mitigation and residual risk addressed in the accompanying FRA
Sewer	Low probability
Artificial water bodies	Low probability – design mitigation and residual risk addressed in the accompanying FRA

c) Potential Receptor/Sensitivity

13.5.63 The proposed development has the potential to directly affect those surface water features in the vicinity of the site, either though discharges from the site, or through removal or morphological alteration of the watercourses themselves.

13.5.64 The three key surface water receptors relevant to the site are:

- small ditches/drains located approximately 20m north-east, 70m north and 140m to the north-west of the site;
- small ditches located approximately 150m to the west and 160m to the south-west that form part of the Wessex Water surface water system; and
- Wessex Water combined sewers near the site (for drainage impacts only).

13.5.65 The River Parrett adjacent to the site forms part of the following designated areas: Bridgwater Bay SSSI, Severn Estuary Special Area of Conservation (SAC) and Severn Estuary Special Protection Area (SPA).

13.5.66 The nearest identified receptor is the off-site drain approximately 20m to the north-east. It should be noted that this and the other small drains (within a distance of 150m from the site):

- are not designated WFD water bodies;
- do not have assigned Chemical Grades (under the Environment Agency GQA scheme);
- do not have an Environment Agency River Eco-system Classification Grades; and
- are not used for licensed abstraction.

13.5.67 Given their similar nature and the fact that all of these drains are off-site and will not form part of the planned drainage network, it is appropriate to assess them as a single receptor.

13.5.68 There are no planned discharges to surface waters but given the relatively close distance from the site (the nearest approximately 20m), and in order to adopt a precautionary approach, these drains (up to a distance of 150m) are included as a single, potential surface water receptor. By considering the properties of these drains (i.e. those drains up to a distance of 150m from the site) that are listed above, the water quality and hydrology/drainage value/sensitivity of this receptor is assessed to be very low. This is the only receptor identified within this assessment with regards to water quality considerations.

13.5.69 Two ditches are located approximately 150m to the west and 160m to the south-west of the site and form part of the Wessex Water surface water sewer system. These receptors are also assessed as having a very low value/sensitivity rating for hydrology/drainage because they provide only a localised drainage function.

13.5.70 A Wessex Water combined sewer is located near to the site (approximately 25m to the south-east) and any surface water and foul water discharged to this system would ultimately be treated at the Chiltern Trinity Sewage Treatment Works (STW), which lies on the western banks of the River Parrett. The STW consent to discharge contains provision for protection of the water quality status of the receiving environment (River Parrett). No changes to the Chiltern Trinity STW consent to discharge are proposed in relation to this proposed development and the River Parrett does not need further consideration in terms of water quality status protection.

13.5.71 Although the Wessex Water combined sewer would act as an important feature in the management of surface water drainage from the site, it was not considered as a drainage/hydrology receptor within the assessment. This was due to its more important functional role as a source/pathway for sewer flooding, and subsequent control upon population and property receptor impacts near the site.

13.5.72 The combined sewer was not considered as a receptor for water quality due to its limited environmental value and sensitivity. Formal agreement will be required with Wessex Water with regard to the volume and quality of discharges made to the combined sewer.

13.5.73 It is also important to acknowledge the potential surface water impacts of the proposed development upon nearby population and properties. This includes property downstream of the site that might be affected by changes in flows in the nearby ditches and/or sewer system.

13.5.74 The proposed development would be located within the developed area of Bridgwater, with existing properties and population to the north and east of the site, and the main Bridgwater College campus to the south. The location of the site in relation to existing development is shown in **Figure 13.1**.

13.5.75 This receptor (i.e. people and property near to the development) has been assigned a high level of sensitivity.

ii. Receptor Summary

13.5.76 **Table.13.4** summarises the value and sensitivity of surface water receptors near to the site and these values are used in the impact assessment (Section 13.6) considered in this chapter.

Table.13.4: Value and Sensitivity of Surface Water Related Receptors

Receptor	Value and Sensitivity	
	Rating	**Surface Water Element**
Small ditches/drains located approximately 20m north-east, 70m north and 140m to the north-west of the site *Off-site*	Very low	*Water quality* No designations or monitoring. No water quality reliance by abstractions etc. Slow flowing/intermittent, agricultural drainage ditches with anticipated poor water quality characteristics.
	Very low	*Hydrology and drainage* These are small rhynes which provide a localised drainage function.
Small ditches located approximately 150m to the west and 160m to the south west that form part of the Wessex Water surface water system *Off-site*	n/a	*Water quality* No connectivity. Water quality status cannot be impacted.
	Very low	*Hydrology and drainage* These are small rhynes which provide a localised drainage function.
Wessex Water combined sewer *Off-site*	n/a	*Water Quality* The combined sewer was not considered as receptor for water quality due to its limited environmental value and sensitivity.
	n/a	*Hydrology and drainage* The Wessex Water combined sewer was not considered as a drainage/hydrology receptor in the assessment. This was due to its more important functional role as a source/pathway for sewer flooding, and subsequent control upon population and property receptor impacts near the site.

	Value and Sensitivity	
People and property located near to the site or that may be affected by changes in flows in the Wessex Water combined sewer *Off-site*	n/a	*Water quality*
	High	*Hydrology and drainage* High value reflects the importance of people and properties in adjacent development in Bridgwater

13.6 Assessment of Impacts

13.6.1 In this section, potential impacts on the surface water conditions associated with the proposed development are assessed. The assessment has been undertaken in line with the methodology detailed in Section 13.4 of this chapter and assumes legislative compliance and the adoption of standard good practice.

a) Development Description

13.6.2 A full description of the proposed development at the site is provided in **Chapter 2** of this volume of the ES. Further information regarding the proposed construction, operational and post-operational phases are described in **Chapters 3** to **5** respectively, of this volume of the ES.

b) Development Design Features Relevant to the Surface Water Impact Assessment

13.6.3 The design of the site includes a number of specific features of direct relevance to the assessment of impacts on surface water receptors during the lifetime of the site. These features are discussed in detail below.

13.6.4 A drainage strategy has been prepared for the site and is discussed in detail in the **Bridgwater C Flood Risk Assessment**. A summary of the key aspects of the strategy is provided below.

13.6.5 The **Bridgwater C Flood Risk Assessment** states that the utilisation of SuDS is limited due to the following factors:

- Made Ground/domestic waste underlies the site, which may be contaminated;
- below the Made Ground is likely to be relatively impermeable alluvium;
- the relatively shallow groundwater level; and
- requirement for large area for appropriately sized and shaped SuDS water bodies.

13.6.6 Due to the limitations of using SuDS techniques on the site, agreement has been reached with Wessex Water to allow surface water to be discharged into the Wessex Water combined sewer located approximately 25m to the south-east of the site in College Way. Wessex Water has confirmed that 6.1l/s is an acceptable rate for discharge into the combined sewer. Further details are provided in the **Bridgwater C Flood Risk Assessment.**

13.6.7 The drainage strategy also states that before discharging to the sewer, surface water run-off from the site will be attenuated using sealed underground storage. As this site is a restored landfill site with contaminated soils and unconsolidated ground

liable to settlement, all pipes, manholes and underground tanks are likely to need to be supported on deep structural piles to prevent damage from settlement, and would be sealed to prevent the ingress of potentially contaminated water into the drains.

13.6.8 The design of the permeable paving areas would include shallow depression storage (i.e. between kerbs) to facilitate the containment of surface water and to allow infiltration to the underground attenuation tanks (geo-cellular stage). Pollution control of surface water run-off from trafficked areas is proposed to be managed through Class I oil interceptors before discharge into the attenuation tanks. Surface water generated by the roofed areas will discharge directly into the underground cellular storage. Outflow from the attenuation tanks is proposed to be controlled using a vortex control unit before discharge into the Wessex Water sewer.

13.6.9 It is proposed that there would be no change to the existing drainage of the grassed area in the north-west quadrant of the site, which is intended to be used as a 5-a-side football pitch. This area would therefore continue to be drained by infiltration, apart from the all-weather pitch, which would drain into the underground tank.

13.6.10 Site landscaping would also be designed to direct any excess flows away from buildings and access roads and towards the proposed car parks and open space. Where practical, site landscaping is also proposed to create shallow above ground storage areas, which would facilitate containment of any overland flows within the site. Also the design of the car parking areas should allow for the temporary storage of surface water in extreme events (i.e. between kerbs).

13.6.11 The on-site drainage infrastructure will be designed to accommodate the 1% AEP (1:100 year) including a 20% allowance for increased rainfall intensities due to climate change. Further details are provided in the **Bridgwater C Flood Risk Assessment.**

13.6.12 Foul water would also be discharged to the same Wessex Water combined sewer. Wessex Water has agreed that a limit of 1.0l/s foul water from the site can be discharged into this sewer. Foul water would ultimately be treated at the Chiltern Trinity Sewage Treatment Works (STW), which lies on the western banks of the River Parrett.

13.6.13 The proposed design for the site includes further measures to manage the residual risk on the site. These measures include raising of floor levels by 300mm; development of a Flood Emergency Plan for the site, which is compliant with the existing Bridgwater Major Incident Plan; and development of a drainage strategy to attenuate the impacts of a 1:100 year (plus climate change) winter storm event. Full details of these measures are included in the **Bridgwater C Flood Risk Assessment** for the site.

13.6.14 All drainage elements and management plans will adhere to the Environment Agency's pollution prevention guidance, drainage control measures and other environmental measures. These may include:

- minimising the stockpiling of materials and locating essential stockpiles as far away as possible from drainage networks;
- temporary drainage networks developed to cover interim periods during the construction of the permanent drainage system;

- measures to reduce sediment generation at source in construction working areas;
- silt traps used to capture suspended solids;
- oil/water separators prior to discharge into underground storage tanks to remove hydrocarbon contaminants; and
- drainage control to ensure run-off does not exceed the agreed rates.

13.6.15 Environmental impacts and disturbance arising from construction activities would be managed through a range of control measures and monitoring procedures, the principles of which are outlined in the **Environmental Management and Monitoring Plan (EMMP)** with further details provided in the **Water Management Plan (WMP**).

13.6.16 The assessment of potential impacts to surface water assumes good construction methodologies and pollution prevention guidance is adhered to.

13.6.17 Pumping of groundwater from foundations may be required and would be treated by way of a sump and silt trap before discharging to neighbouring Wessex Water Infrastructure. The quality of the groundwater at the development site has been identified as potentially elevated with respect to water quality contaminants and therefore, prior to commissioning of the connection into the Wessex Water sewer, there may be additional requirement for monitoring, treatment and tankering off-site (to licensed disposal facility). It is likely that a temporary sewer connection would be established during this early construction phase and, if required, a specific discharge consent will be sought for these works.

13.6.18 The detail of all measures to protect the water environment would be agreed with the Somerset Drainage Boards Consortium and the Environment Agency, before the commencement of construction, and would also be detailed in method statements to be prepared by the appointed contractor prior to works taking place.

13.6.19 EDF Energy would directly appoint a suitably experienced contractor for construction and maintenance works. During the tendering process the expected environmental requirements will be included in the tender documents, so that all contractors allow for standard environmental control measures in their method statements and staffing and budgetary provisions.

c) Construction Impacts

13.6.20 A description of the construction area, methods and materials to be used for the proposed development is supplied within **Chapter 3** of this volume of the ES. This chapter identifies and assesses the potential impacts of the construction phase on water quality, hydrology and drainage related receptors.

13.6.21 The identified impacts have been based upon the drainage strategy in the **Bridgwater C Flood Risk Assessment**. For the purposes of the construction impact assessment it is assumed that, prior to the commissioning of the drainage infrastructure and permanent sewer connection, a temporary connection to the Wessex Water sewer would be established in order to receive any site drainage in these early stages. It is likely that discharges in these early construction phases would require monitoring for quantity and quality in order to comply with any agreements with Wessex Water. If the quality of the water is found to be poor (e.g. contaminated dewatered groundwater is encountered) then storage and alternative

disposal may be required. Intermediate sealed tank storage of grey and blackwater may be required, prior to disposal to sewer. The **WMP** sets out the principles for monitoring requirements and responsibilities.

i. Water Quality

13.6.22 Given that all surface waters would be discharged to sewer there is no proposed pathway by which surface water quality receptors may be impacted. A single water quality receptor was identified in **Table.13.4**, i.e. the off-site drainage ditches (up to a distance of 150m from the site boundary).

13.6.23 During the construction phase, best practice approaches would be adopted to minimise the risk of a pollution incident arising as a result of an accident. The temporary drainage system would provide control mechanisms to facilitate containment and prevent discharge of contaminated water into surrounding watercourses.

13.6.24 The assessment of water quality construction impacts has assumed that good construction site practice would be adopted, with due regard for the Environment Agency's relevant PPGs. The **WMP** which supports the overall framework as specified in the **EMMP,** sets out the principles and measures which would ensure the careful management and monitoring of construction practices at the site, with respect to surface water and sediment control. These measures would ensure that any discharges from the site would be managed in such a way that there would be no deleterious impact on receiving watercourses and that any Environmental Permit requirements (or other conditions) which are applied to discharges are met in terms of quality and discharge rate at all times.

13.6.25 The potential water quality construction impacts that have been identified within **Table.13.5** are associated with the following construction related activities:

- sediment laden run-off;
- run-off contaminated with hydrocarbons;
- run-off contaminated with concrete leachate;
- discharge of contaminated groundwaters; and
- grey and blackwater discharges.

13.6.26 All potential construction impacts on water quality (presented in **Table.13.5**) were assessed to be no greater than **negligible** or **minor adverse** and therefore acceptable for the scheme to proceed. A brief discussion of these impacts is provided here.

Sediment Laden Run-off

13.6.27 Increased suspended sediment concentrations can have a negative impact on the water quality within a water feature. Impacts are generally related to:

- changes in temperature regime resulting from shallowing of the water body caused by siltation;
- physical disturbance effects;

- increases in turbidity; or
- mobilisation of sediments that are contaminated or are rich in organic matter or nutrients.

13.6.28 Several activities could potentially produce sediment-laden run-off during the construction works. These may include:

- excavations;
- temporary stockpiling of soils;
- general earthworks, which may include:
  - topsoil stripping; and
  - construction of drainage infrastructure.

13.6.29 One water quality receptor has been identified within this assessment, namely the nearby, offsite drainage ditches. The value/sensitivity of this receptor is presented in **Table.13.4**.

13.6.30 The potential impact magnitude upon these offsite drainage ditches is assessed to be very low because there is no pathway by which sediment laden discharges may reach the receptor under the planned drainage strategy. Any potential impact may be described as a direct result of the scheme and unlikely to occur. Any impact from sediment laden run-off would likely be temporary in nature and local. The significance of impact to the offsite drainage ditches is therefore assessed as **negligible.**

Run-off Contaminated with Hydrocarbons

13.6.31 The primary source of potential hydrocarbons at the site during the construction phase is considered to be the use of heavy plant and equipment.

13.6.32 Construction practices would follow best practice guidance and design measures that form part of the drainage infrastructure i.e. oil interceptors would remove hydrocarbons. All discharges would be made to combined sewer and there is no planned pathway by which surface drainage may reach the off-site ditches.

13.6.33 These factors reduce any potential magnitude of hydrocarbon impacts on the nearby off-site rhynes to very low. Any potential impacts that are caused would be local and temporary in nature. Potential impacts would be a direct result of the scheme and the likelihood of occurrence is considered to be unlikely.

13.6.34 The significance of potential impact caused by run-off contaminated with hydrocarbons to the off-site rhynes is assessed to be **negligible**.

Run-off Contaminated with Concrete Leachate

13.6.35 Run-off contaminated with concrete leachate if allowed to enter watercourses can cause rapid changes to pH.

13.6.36 A limited number of construction phase works elements may include the pouring of concrete in-situ. Potential tasks which may include the use of concrete in-situ during the construction works include:

- construction of footings and foundations associated with new buildings;
- concrete associated with road construction, e.g. for kerb areas; and
- concrete associated with subsurface drainage supports.

13.6.37 Factors that have been considered in the assessment of potential impact magnitude include the local (spatial scale) and temporary (temporal scale) nature of impact extent. The likelihood of potential impacts is considered to be unlikely with regards to impacts upon the off-site drainage ditches due to their isolation from the drainage arrangements on the site. The likelihood of impact occurrence on the off-site rhynes is assessed to be unlikely. Given these descriptors and the adoption of best working practices by construction contractors, the magnitude for potential concrete leachate impacts is assessed as very low. The value/sensitivity of those water quality receptors that may be affected by concrete leachate impacts are presented in **Table.13.4**. By considering these descriptors and the Impact Assessment Matrix presented in **Volume 1, Chapter 7** of the ES, the significance of potential concrete leachate impacts is found to be **negligible**.

Discharge of Potentially Contaminated Groundwater

13.6.38 Preliminary ground investigations have found that there may be a potential to encounter contaminated groundwater beneath the site (see **Chapter 12** of this volume of the ES). Excavations (necessary for building foundations or construction of drainage network for example) have the potential to fill with groundwater. There is some potential for groundwaters (if encountered in this way) to have a degree of historical contamination, however there is no pathway that exists that would cause the off-site rhyne receptor to receive such discharges. Groundwater from foundations, if of suitable chemical quality, would be pumped into the neighbouring Wessex Water sewer. If required, and prior to discharge to sewer, the groundwater will be treated by way of a sump and silt trap. There is likely to be an additional requirement for monitoring, treatment and tankering off-site (to licensed disposal facility) before disposal to sewer is established. Such measures form part of the project design and have been taken into account within the rating of potential impact magnitude, which has been determined to be very low.

13.6.39 By considering the value/sensitivity ratings given in **Table.13.4** and the impact descriptors provided above, the potential impact significance on the water quality status of the off-site rhynes from discharge of potentially contaminated groundwater is found to be **negligible**.

Grey and Blackwater Discharges

13.6.40 All grey and blackwater discharges would be directed to Wessex Water sewer. There is no pathway by which this wastewater may reach the off-site drainage ditch and therefore there would be **no impact** generated. If there is a necessity to produce grey and blackwater before the permanent Wessex Water sewer connection is in place, then an intermediate sealed tank would store this material and it would be tankered off-site to a licensed disposal facility as necessary.

ii. Hydrology and Drainage

13.6.41 The three hydrology and drainage related construction impacts considered are:

- increased risk of flooding for nearby properties due to reduction in the floodplain storage;
- natural routing of surface water during the construction phase; and
- damage to Wessex Water sewer infrastructure near the site.

Increased Risk of Flooding for Nearby Properties Due to Reduction in the Floodplain Storage

13.6.42 The site is located on an area of existing raised ground and there are no proposals to increase existing land levels/topography through construction activities at the site. It is therefore unlikely that the proposed development would have any adverse impact upon flood storage and routing in the area of the site. Further details are provided in the accompanying **Bridgwater C Flood Risk Assessment**.

13.6.43 On this basis, the magnitude of potential impact is assessed as very low. The value and sensitivity of the receptor (i.e. surrounding property and population) concerned is assessed as high. The significance of impact is therefore assessed to be **minor adverse.**

Natural Routing of Surface Water during the Construction Phase

13.6.44 The drainage strategy (see **Bridgwater C Flood Risk Assessment**) for the site would not directly disrupt the flow pathways in the existing rhynes and ditches that are located in the vicinity of the site. However, any excavation within their catchment areas could result in a small loss of area contributing run-off to these watercourses, which may lead to some local change in flow regime in the immediate vicinity of the site. However, given the small areas involved, this change is likely to be limited.

13.6.45 With the proposed drainage strategy in place, the magnitude of potential impact is assessed as very low. The value and sensitivity of the receptor (small ditches and drains near the site) concerned is assessed as very low. The significance of impact is therefore assessed to be **negligible**.

Damage to Wessex Water Sewer Infrastructure near the Site

13.6.46 The current drainage strategy proposes that surface water would be discharged under controlled conditions to the combined sewer near to the site. This approach would require the development of a new connection route from the site to the existing combined sewer.

13.6.47 It is possible (but unlikely) that the construction of this new connection could result in damage to existing Wessex Water sewer infrastructure and potentially increase the probability of sewer flooding for nearby property and people. However it is expected that this risk would be limited by adoption of good construction site practice. This would include:

- pre-construction dialogue between EDF Energy and Wessex Water regarding the detailed route and construction methods/techniques to be adopted;
- submission of detailed construction plans/method statement to Wessex Water for approval prior to construction;
- use industry approved construction techniques/methods by EDF Energy's appointed contractors; and
- engagement with Wessex Water (including site visits) during the construction of the connection.

13.6.48 With the implementation of these measures, it is considered that the magnitude of potential impact is very low. The value and sensitivity of the receptor (i.e. people and property near the site) concerned is assessed as high. The significance of impact is therefore assessed, pre-mitigation as **minor adverse.**

d) Cumulative Construction Impacts

i. Water Quality

13.6.49 During the construction phase, all surface water drainage would be routed to the combined sewer. No discharges would be made to the surface water receptors; therefore, no cumulative construction impacts have been identified with respect to surface water quality. Groundwater quality impacts are covered separately in **Chapter 12** of this volume of the ES.

ii. Hydrology and Drainage

13.6.50 The impacts detailed in the previous section are largely independent from each other and influence independent receptors, namely flood storage, the natural routing of surface water during the construction phase, and existing sewer infrastructure. Based upon the available evidence, it is very unlikely that there would be any additional cumulative construction impacts with respect to hydrology and drainage.

e) Operational Impacts

i. Water Quality

13.6.51 During the operational phase, all surface drainage would be directed to the Wessex Water sewer.

13.6.52 The main source of potential impacts to surface water quality is associated with surface drainage which may become contaminated in areas used by vehicles.

13.6.53 The drainage system, as part of its design incorporates oil interceptors. Procedures for managing an emergency spill would be prepared.

13.6.54 During the operational phase grey and black waste water from the welfare facilities will be disposed of directly to the local sewage network. Therefore there would be no discharges of this wastewater to local surface watercourses.

Operational Surface Water Drainage

13.6.55 The possible types of contaminants that may be expected within surface drainage water from the operational site would tend to be grit and hydrocarbons. During winter

months the use of salt for de-icing of areas and roads used by vehicles may increase the salinity of surface run-off, depending on the type of de-icing materials used.

13.6.56 All surface drainage water would be directed towards the sewer and therefore there is no planned pathway by which surface water drainage may impact upon the off-site drainage ditches. A precautionary assessment approach has resulted in this potential impact activity being assessed against the identified receptor.

13.6.57 Discharge of contaminated surface waters (i.e. low level contamination related to salt, hydrocarbons and grit) to the single potential surface water quality receptor may impact upon the water quality status of these drainage ditches. The magnitude of this potential impact on the off-site rhynes is assessed to be very low given the drainage infrastructure and the physical separation of the receptor.

13.6.58 By considering the magnitude assessment above and the receptor sensitivity scores (very low) presented for the off-site rhynes in **Table.13.4**, the potential significance of impacts from operational surface water drainage discharging to the off-site drainage ditches is found to be **negligible**.

ii. Hydrology and Drainage

13.6.59 The three hydrology and drainage related operational impacts considered are:

- increased risk of pluvial and/or sewer flooding due to increased levels of surface water run-off and discharge to sewer network;
- surface water flooding arising from blockages in the on-site drainage network; and
- surface water flooding arising from extreme rainfall events.

Increased Risk of Pluvial and/or Sewer Flooding Due to Increased Levels of Surface Water Run-off and Discharge to Sewer Network

13.6.60 Areas of reduced permeability created at the site could increase surface water run-off and as a result increase flows in the surrounding watercourses/ditches or Wessex Water sewer infrastructure if not controlled.

13.6.61 The proposed development would result in the creation of 0.44ha (43% of the overall site area) of impermeable surface. As a consequence, there would be an increase in surface water run-off and an increase in flood risk if flows are not managed.

13.6.62 The drainage strategy for the site proposes that post construction, run-off rates be limited to a maximum of 6.1l/s; this represents an allowable discharge rate agreed by Wessex Water prior to discharging into their surface water sewer located 25m to the south-east of the site.

13.6.63 Results presented in the drainage strategy show that a volume of 803m^3 would be required to accommodate all flows up to and including a 1% AEP storm event including an allowance for future climate change of 20%. To accommodate the volume of storage and in accordance with CIRIA guidance (Ref. 13.46), it is proposed to use permeable paving in low traffic loading areas in combination with underground geocellular storage via a Class 1 oil interceptor.

13.6.64 With the proposed drainage strategy in place, the magnitude of potential impact is assessed as very low. The value and sensitivity of the receptor concerned (i.e. population and property) is assessed as high. The significance of impact is therefore assessed as **minor adverse.**

Surface Water Flooding Arising From Blockages in the On-site Drainage Network

13.6.65 It is possible that sections of the drainage system proposed might become blocked such that the system becomes surcharged with flow. It is anticipated that the potential for such incidences would be removed at the detailed design stage by designing the development landform to safely convey and store excess flows.

13.6.66 As outlined earlier, the drainage strategy includes a regular maintenance programme to ensure effective working of the system and that any potential exceedence flows are managed on the site and are directed away from existing properties near the site.

13.6.67 As a result, the magnitude of potential impact is assessed as very low. However, the value and sensitivity of the receptor (i.e. people and properties near the site) is assessed as high. The significance of impact is therefore assessed as **minor adverse.**

Surface Water Flooding Arising From Extreme Rainfall Events

13.6.68 The drainage strategy for this site has been designed to manage the surface water discharges arising from rainfall events up to and including a 1% AEP storm event. Although this is adequate to deal with a majority of storm events, there remains a very low residual risk that a more extreme intense rainfall event could occur which would exceed the drainage capacity of the proposed system.

13.6.69 The magnitude of potential impact is assessed as very low. The value and sensitivity of the primary receptor (i.e. nearby population and properties) is assessed as high. The significance of impact is therefore assessed to be **minor adverse**.

f) Cumulative Operational Impacts

i. Water Quality

13.6.70 No cumulative operational impacts have been identified with respect to water quality.

ii. Hydrology and Drainage

13.6.71 The potential cumulative impacts arising from the individual hydrological and drainage impacts identified in the previous section have been assessed. As outlined previously, appropriate measures have been included in the physical design and drainage strategy for the site and it is therefore unlikely that any additional hydrology and drainage related cumulative impacts would occur.

g) Post-operational Impacts

13.6.72 Given the proposed retention of buildings on the site to allow for occupants in connection with Bridgwater College (see **Chapter 5** of this volume of the ES for details) it is assumed that potential impacts arising from the post-operational phase would be very similar to those identified for the operational phase. To avoid

unnecessary duplication, these impacts have not been reproduced in this section. Please refer to the construction impacts section (Section 13.6 of this chapter).

h) Cumulative Post-operational Impacts

13.6.73 There are no cumulative post-operational impacts associated with surface waters given the proposed post-operational use of the site.

13.7 Mitigation of Impacts

13.7.1 No specific additional mitigation is required with respect to potential impacts on surface water receptors.

13.7.2 This assessment is based on the implementation of best practice measures, good construction methodologies, pollution prevention guidance and maintenance regimes. The design of the drainage solution and the **WMP** (and overarching **EMMP**) have due regard for good working practices and these have been considered within impact magnitude ratings. The key elements of the protective design and construction practices to be implemented are summarised in section 13.6 of this chapter and within the **WMP**.

13.8 Residual Impacts

a) Construction Impacts

13.8.1 No residual impacts above minor adverse on surface water quality, hydrology or drainage receptors have been identified.

b) Operational Impacts

13.8.2 No residual impacts above minor adverse on surface water receptors have been identified for the operational phase. This assessment assumes that the proposed drainage system is adequately maintained during the lifetime of the site and that effective discharge from the site is not influenced by future developments in the area (i.e. increasing loading on the drainage capability of the combined sewer to which the site discharges).

13.8.3 Continued maintenance would also be necessary to ensure effective operation of the proposed drainage infrastructure and attenuation tank on the site.

13.9 Summary of Impacts

13.9.1 **Table.13.5** provides a summary of potential surface water impacts.

Table.13.5 Impacts and Mitigation

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Impact Significance	Proposed Mitigation/	Residual Impact
Construction							
Water Quality Impacts							
Offsite drainage ditches (<150m from development boundary)	Sediment laden run-off associated with excavations and drainage infrastructure installations.	Very low (No likely pathway and good practice)	Local Adverse Temporary Direct Unlikely	Very low	Negligible	None required	Negligible
Offsite drainage ditches (<150m from development boundary)	Hydrocarbon contaminated run-off deriving from plant activities.	Very low (No likely pathway and good practice)	Local Adverse Temporary Direct Unlikely	Very low	Negligible	None required	Negligible
Offsite drainage ditches (<150m from development boundary)	Concrete leachate from in situ works	Very low (No likely pathway and good practice)	Local Adverse Temporary Direct Unlikely	Very low	Negligible	None required	Negligible
Offsite drainage ditches (<150m from development boundary)	Discharge of potentially contaminated groundwater	Very low (Potential contamination, however no likely pathway. Pump, monitor and dispose as appropriate approach)	Local Adverse Temporary Direct Unlikely	Very low	Negligible	None required	Negligible

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Impact Significance	Proposed Mitigation/	Residual Impact
Construction							
Hydrology and Drainage Impacts							
Offsite drainage ditches (<150m from development boundary)	Grey and blackwater discharges	n/a (No likely pathway – indirect discharge to sewer)	n/a	n/a	n/a	n/a	n/a
People and property located near to the site or that may be affected by changes in flows in the Wessex Water combined sewer	Increased risk of flooding for nearby properties due to reduction in the floodplain storage	Very low	Local, adverse, temporary, indirect, unlikely	High	Minor	None required	Minor
Existing drainage system on/near the site	Disturbance to the natural routing of surface water	Very low	Local, adverse, temporary, indirect, unlikely	Very low	Negligible	None required	Negligible
People and property located near to the site or that may be affected by changes in flows in the Wessex Water combined sewer	Damage to Wessex Water combined sewer infrastructure near to the site	Very low	Local, adverse, temporary, direct, possible	High	Minor	None required	Minor

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Impact Significance	Proposed Mitigation/	Residual Impact
Operational							
Water Quality Impacts							
Offsite drainage ditch	Contaminated surface waters (low level contamination related to salt, hydrocarbons, grit etc)	Very low (No likely pathway and good practice)	Local Adverse Temporary Direct Possible	Very low	Negligible	None required	Negligible
Offsite drainage ditch	Grey and blackwater discharges	n/a (No likely pathway – indirect discharge to sewer)	n/a	n/a	n/a	n/a	n/a
Hydrology and Drainage Impacts							
People and property near the development site	Increased risk of pluvial and/or sewer flooding due to increased levels of surface water run-off and discharge to sewer network	Very low * Potential risks managed through implementation of a drainage system in the design of site	Local, adverse, temporary, indirect, unlikely	High	Minor	None required	Minor
People and property near the development site	Surface water flooding arising from blockages in the on-site drainage network	Very low * Potential risks managed through implementation of a drainage system in the design of site	Local, adverse, temporary, indirect, unlikely	High	Minor	None required	Minor
People and property near the development site	Surface water flooding arising from extreme rainfall events	Very low * Potential risks managed through implementation of a drainage system in the design of site	Local, adverse, temporary, indirect, unlikely	High	Minor	None required	Minor

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CHAPTER 14: TERRESTRIAL ECOLOGY AND ORNITHOLOGY

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14. TERRESTRIAL ECOLOGY AND ORNITHOLOGY

14.1 Introduction

14.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential terrestrial ecology and ornithology impacts (collectively referred to as biodiversity) associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus, referred to hereafter as the proposed development on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

14.2 Scope and Objectives of Assessment

14.2.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees including Natural England (NE), the Environment Agency (EA), Sedgemoor District Council (SDC) and Somerset County Council (SCC), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

14.2.2 The assessment of impacts on biodiversity has been undertaken adopting the methodologies described in Section 14.4 of this chapter.

14.2.3 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through desk-based data collection and field surveys, and are described in Section 14.5 of this chapter.

14.2.4 Section 14.6 of this chapter sets out the assessment of the impacts on biodiversity of the proposed development, incorporating various measures that avoid or reduce impacts that are not classed as mitigation given that they are an integral part of the scheme. Where potentially significant impacts are identified, measures have been proposed in order to mitigate (i.e. to prevent, reduce or offset) these impacts. Any such mitigation measures are identified in Section 14.7 of this chapter. An assessment of the residual impacts following the implementation of these mitigation measures is presented in Section 14.8 of this chapter.

14.2.5 Cumulative impacts on biodiversity arising from the proposed development, together with other elements of the Hinkley Point C (HPC) Project, and other relevant plans and projects are identified and assessed in **Volume 11** of this ES.

14.2.6 The objective of this chapter is to meet the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (Ref. 14.1) in relation to flora and fauna. This has been achieved through the:

- collection of baseline information on biodiversity;
- identification of biodiversity receptors that could be significantly affected by the proposed development, and the definition of potential impacts on these receptors (i.e. 'scoping');
- assessment of the magnitude and significance of the potentially significant impacts of the proposed development, incorporating design measures that have been devised in response to the findings of the assessment;
- identification of mitigation measures that would avoid or reduce adverse impacts and measures that off-set adverse impacts; and
- assessment of residual impacts (i.e. after the implementation of the proposed mitigation measures).

14.3 Legislation, Policy and Guidance

14.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of biodiversity impacts associated with the construction, operation and post-operational phases of the proposed development.

14.3.2 As stated in **Volume 1**, **Chapter 4** of the ES, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref. 14.2) when combined with the NPS for Nuclear Power Generation (NPS EN-6) (Ref. 14.3) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs. NPS EN-1 section 5.3 states that there should be an assessment of the impacts of nationally significant energy infrastructure on designated sites of ecological conservation importance, protected species, habitats and other species of importance. This is repeated in section 3.9 of NPS EN-6.

14.3.3 In addition, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), and regional and local policy documents. However, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

14.3.4 Furthermore, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, and regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where they are relevant to the technical assessment), since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Conventions

i. The Convention on Biological Diversity 1992 (Ref. 14.4)

14.3.5 The Convention on Biological Diversity (the Convention) focuses on the conservation of all species and ecosystems. It requires the development of national strategies, plans or programmes for the conservation and sustainable use of biodiversity. In

accordance with this, the UK has developed Biodiversity Action Plans (BAPs), which provide guidance for the conservation and management of biodiversity. In 2010, the parties to the Convention agreed the Nagoya Protocol. This provides a transparent legal framework for the effective implementation of one of the three objectives of the Convention, namely the fair and equitable sharing of benefits arising out of the utilisation of genetic resources.

14.3.6 At Nagoya, the parties to the Convention adopted the Strategic Plan for Biodiversity 2011-2020 (Ref. 14.5) with the purpose of inspiring broad-based action in support of biodiversity over the next decade by all countries and stakeholders. The Strategic Plan, which includes 20 targets, known as the Aichi Targets, serves as a flexible framework for the establishment of national and regional targets, and promotes the coherent and effective implementation of the three objectives of the Convention on Biological Diversity.

ii. The Convention on Wetlands 1971 (Ref. 14.6)

14.3.7 The Convention on Wetlands (commonly referred to as the Ramsar Convention) originally focused on the conservation and wise use of wetlands, primarily as habitat for waterbirds. However, the scope of implementation of the Convention has been broadened to cover all aspects of wetland conservation in recognition of the importance of wetland ecosystems for biodiversity conservation. Under the Convention, each country is required to designate sites ('Ramsar sites') that meet the Criteria for Identifying Wetlands of International Importance, which are based on Article 2.2 of the Convention.

b) European Legislation

i. Council Directive 2009/147/EC on the Conservation of Wild Birds (the European Union (EU) Birds Directive) (Ref. 14.7)

14.3.8 The EU Birds Directive requires Member States to take the requisite measures to maintain the population of all species of naturally occurring wild birds in the States' European territory at a level that corresponds to various requirements. Member States shall take special conservation measures concerning the habitat of species mentioned in Annex I of the Directive, and shall take similar measures for regularly occurring migratory species that are not listed in Annex I. Under the Directive, the most suitable areas for the conservation of these species (whether on land or at sea) are classified as Special Protection Areas (SPAs). In England and Wales the Directive is implemented under the Wildlife and Countryside Act 1981 (as amended) (Ref. 14.8) and the Conservation of Habitats and Species Regulations 2010 (Ref. 14.9).

ii. Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EU Habitats Directive) (Ref. 14.10)

14.3.9 The EU Habitats Directive requires Member States to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest (i.e. those listed in Annexes I, II, IV and/or V of the Directive). Member States are also required to contribute to a coherent European ecological network of protected sites by designating Special Areas of Conservation (SACs) for

the natural habitat types listed in Annex I and habitats of the species listed in Annex II.

14.3.10 Under the Directive, the conservation status of a habitat is defined as favourable when: its natural range, and the areas it covers within that range, are stable or increasing; the species structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and the conservation status of its typical species is favourable. The conservation status of a species is defined as favourable when: population dynamics data indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; its natural range is neither being reduced nor is likely to be reduced for the foreseeable future; and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

14.3.11 In England and Wales, the Directive is implemented through the Conservation of Habitats and Species Regulations 2010 (Ref. 14.9).

c) National Legislation

i. The Conservation of Habitats and Species Regulations 2010 (the Habitats and Species Regulations) (Ref. 14.9)

14.3.12 The Habitats and Species Regulations, which replace the Conservation (Natural Habitats, &c.) Regulations 1994 (Ref. 14.11) are the principal means by which the EU Habitats Directive and EU Birds Directive are transposed into national law for England, Wales and the territorial seas. The Habitats and Species Regulations, *inter alia*, provide for the designation and protection of European sites, and the protection of European protected species.

14.3.13 Under the Habitats and Species Regulations, a person who does any of the following in respect to a European protected animal species (those listed in Schedule 2) is guilty of an offence:

- deliberately captures, injures or kills any wild animal of a European protected species;
- deliberately disturbs wild animals of any such species;
- deliberately takes or destroys the eggs of such an animal; or
- damages or destroys a breeding site or resting place of such an animal.

14.3.14 It is also an offence under the Habitats and Species Regulations deliberately to pick, collect, cut, uproot or destroy a wild plant of a European protected species (those listed in Schedule 5 to those regulations).

14.3.15 However, these actions can be made lawful through the granting of licences by the appropriate authorities. Licences may be granted for a number of purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions would have no detrimental effect on the maintenance of the conservation status of the species concerned.

ii. The Wildlife and Countryside Act 1981 (the WCA) (Ref. 14.8)

14.3.16 The WCA (as amended, including by the Countryside and Rights of Way Act 2000 (Ref. 14.12)) strengthens provisions under the National Parks and Access to the Countryside Act 1949 (Ref. 14.13) to designate, protect and manage Sites of Special Scientific Interest (SSSIs) and to establish National Nature Reserves (NNRs) in England and Wales. These sites can be established on land down to the low water mark. SSSIs and NNRs can be designated for their flora, fauna or geological interests.

14.3.17 The WCA (subject to specified exceptions) makes it an offence to:

- intentionally kill, injure or take any wild animal included in Schedule 5;
- intentionally or recklessly:
  - damage or destroy any structure or place which any wild animal specified in Schedule 5 uses for shelter or protection; or
  - disturb any such animal while it is occupying a structure or place which it uses for shelter or protection; or
  - obstruct access to any structure or place which any such animal uses for shelter or protection;
- intentionally:
  - kill, injure or take any wild bird; or
  - take, damage or destroy the nest of a wild bird included in Schedule ZA1; or
  - take, damage or destroy the nest of any wild bird while that nest is in use or being built; or
  - take or destroy an egg of any wild bird.
- intentionally or recklessly:
  - disturb any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or
  - disturb dependent young of such a bird.
- intentionally pick, uproot or destroy any wild plant included in Schedule 8.

iii. The Protection of Badgers Act 1992 (Ref. 14.14)

14.3.18 Under the Protection of Badgers Act, it is an offence (subject to specified exceptions) to:

- wilfully kill, injure or take, or attempt to kill, injure or take, a badger; or
- cruelly ill-treat a badger; or
- interfere with a badger sett by doing any of the following things:
  - damage a badger sett or any part of it; or

- destroy a badger sett; or
- obstruct access to, or any entrance of, a badger sett; or
- cause a dog to enter a badger sett; or
- disturb a badger when it is occupying a badger sett.

iv. The Hedgerows Regulations 1997 (Ref. 14.15)

14.3.19 The Hedgerows Regulations make it an offence to remove or destroy certain hedgerows without the permission of the local planning authority.

v. The Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 14.16)

14.3.20 Section 40 of the NERC Act sets out a requirement for every public authority (including local authorities), in exercising their functions, to have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.

14.3.21 Section 41 of the NERC Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the purpose of conserving biodiversity in England. The list, which includes 56 habitats and 943 species, has been drawn up in consultation with NE, as required by the NERC Act.

vi. Countryside and Rights of Way (CRoW) Act 2000 (Ref. 14.12)

14.3.22 The CRoW Act provides for public access on foot to certain types of land, amends the law for public rights of way, increases protection for SSSIs, strengthens wildlife enforcement legislation and provides for better management of Areas of Outstanding Natural Beauty (AONB).

d) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (January 2005) (Ref. 14.17)

14.3.23 PPS1 was published in 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

14.3.24 Paragraph 5 states that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things, protecting and enhancing the natural and historic environment, the quality and character of the countryside, and existing communities.

ii. Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9) (2005) (Ref. 14.18)

14.3.25 PPS9 was published in 2005 and sets out planning policies on the protection of biodiversity and geological conservation through the planning system. The broad aim of the policies is to ensure that planning, construction, development and

regeneration should have minimal impacts on biodiversity and enhance it wherever possible.

14.3.26 Key objectives of PPS9 include (Page 2):

- *"to promote sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, environmental and economic development, so that policies and decisions about the development and use of land integrate biodiversity and geological diversity with other considerations.*

- *conserve, enhance and restore the diversity of England's wildlife and geology by sustaining and where possible improving the quality and extent of natural habitat and geological and geomorphological sites; and to conserve, enhance and restore the diversity of England's wildlife and geology by sustaining, and where possible improving, the quality and extent of natural habitat and geological and geomorphological sites; the natural physical processes on which they depend; and the populations of naturally occurring species which they support."*

14.3.27 Paragraph 8 states that, where a proposed development on land within or outside an SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), planning permission should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the proposed development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.

14.3.28 Paragraph 9 states that sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites, have a fundamental role to play in meeting overall national biodiversity targets; contributing to the quality of life and the well-being of the community; and in supporting research and education.

14.3.29 Paragraph 10 states that planning authorities should not grant planning permission for any development that would result in the loss or deterioration of ancient woodland, unless the need for, and benefits of, the development in that location outweigh the loss of the woodland habitat.

14.3.30 Paragraph 12 states that networks of natural habitats provide a valuable resource and should be protected from development, and, where possible, strengthened by or integrated within it.

14.3.31 Paragraph 16 states that planning authorities should ensure that protected species are protected from the adverse effects of development and refuse permission where harm to the species or their habitats would result, unless the need for, and benefits of, the development clearly outweigh that harm.

iii. Consultation Paper on a New Planning Policy Statement – Planning for a Natural and Healthy Environment (2010) (Ref. 14.19)

14.3.32 In its final form, it is intended that this PPS will replace PPS9. The draft PPS contains policies to maintain and enhance, restore or add to biodiversity and geodiversity through the planning system. It includes policies to promote opportunities for the incorporation of beneficial biodiversity and geological features within the design of development, and to maintain networks of natural habitats by avoiding their fragmentation and isolation.

14.3.33 A key objective of this PPS is to bring together related policies on the natural environment and on open space and green spaces in rural and urban areas to ensure that the planning system delivers healthy, sustainable communities which adapt to and are resilient to climate change and gives the appropriate level of protection to the natural environment (Page 10).

iv. The UK Biodiversity Action Plan (BAP) (Ref. 14.20)

14.3.34 The UK Government signed the Convention on Biological Diversity at the Earth Summit in Rio de Janeiro in 1992 (Ref. 14.4). Following this, the Prime Minister announced an eight point plan for the UK which included the production of the UK BAP. The UK BAP identifies the means by which the UK should contribute to the global conservation of biodiversity over the following 20 years. As part of the UK BAP, a list of priority species and habitats was developed, the conservation of which requires specific actions to be implemented.

e) Regional Planning Policy

14.3.35 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision-makers to decide on the weight to attach to the strategies (see **Volume 1**, **Chapter 4** of the ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West (RPG10) 2001-2016 (2001) (Ref. 14.21)

14.3.36 RPG10 sets out the broad development strategy for the period to 2016 and beyond. Policy EN1 (Landscape and Biodiversity) seeks the protection and enhancement of the region's internationally and nationally important landscape areas and nature conservation sites. The protection and, where possible, enhancement of landscape and biodiversity should be planned into new development.

ii. The Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes 2008-2026 (July 2008) (Ref. 14.22)

14.3.37 The draft Revised RSS for the South West looks forward to 2026 and sets out the Government's policies in relation to the development of land within the region. **Chapter 7** deals with Enhancing Distinctive and Cultural Life. Policy ENV1 (Protecting and Enhancing the Region's Natural and Historic Environment) states the following:

> *"The quality, character, diversity and local distinctiveness of the natural and historic environment in the South West will be protected and enhanced, and developments which support their positive management will be encouraged. Where development and changes in land use are planned which would affect these assets, Local Authorities will first seek to avoid loss of or damage to the assets, then mitigate any unavoidable damage, and compensate for loss or damage through off-setting actions. Priority will be given to preserving and enhancing sites of international or national landscape, nature conservation, geological, archaeological or historic importance. Tools such as characterisation and surveys will be used to enhance local sites, features and distinctiveness through development, including the setting of settlements and buildings within the landscape and contributing to the regeneration and restoration of the area."*

14.3.38 Policy ENV4 (Nature Conservation) states:

> *"The distinctive habitats and species of the South West will be maintained and enhanced in line with national targets and the South West Regional Biodiversity Action Plan. Local Authorities should use the Nature Map to help map local opportunities for biodiversity enhancement in LDDs, taking into account the local distribution of habitats and species, and protecting these sites and features from harmful development. Priority will be given to meeting targets for maintenance, restoration and recreation of priority habitats and species set out in **Appendix 1**, focusing on the Nature Map areas identified in Map 7.3. Proposals which provide opportunities for the beneficial management of these areas and habitats and species generally, should be supported, including linking habitats to create more functional units which are more resilient to climate change."*

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 14.23)

14.3.39 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000, with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53, which is unrelated to impacts on biodiversity. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

14.3.40 Policy STR1 (Sustainable Development) states that development in Somerset and the Exmoor National Park should, amongst other things, conserve biodiversity and environmental assets, particularly nationally and internationally designated areas.

14.3.41 Policy 1 (Nature Conservation) states that the biodiversity of Somerset and the Exmoor National Park should be maintained and enhanced. The greatest protection will be afforded to nature conservation sites of international and national importance. In addition, Local Plans should include policies to maintain and enhance sites and features of local nature conservation importance including landscape features which provide wildlife corridors, links or stepping stones between habitats.

iv. The South West Biodiversity Implementation Plan (SW BIP) (Ref. 14.24)

14.3.42 The SW BIP sets out a framework of policies, priorities and actions to assist in achieving a more integrated approach to the delivery of biodiversity aims within the South West. It contributes towards the Biodiversity Strategy for England (Ref. 14.25) and aims to influence regional strategies, plans and policies.

14.3.43 The overall aims of the SW BIP are to:

- help to meet biodiversity targets for priority habitats and species in the South West;
- ensure regional strategic plans incorporate biodiversity issues for the South West;
- provide a strategic framework for the work undertaken by regional and local biodiversity partnerships in conserving biodiversity and promoting the sustainable use of biological resources; and
- develop wider support and active engagement by increasing awareness and understanding of the importance of biodiversity to the region's health, quality of life and economic productivity.

v. Wild Somerset – The Somerset Biodiversity Strategy 2008-2018 (the Somerset Biodiversity Strategy) (Ref. 14.26)

14.3.44 The Somerset Biodiversity Strategy is intended to represent a long-term blueprint for successful biodiversity conservation in Somerset. It proposes a vision for biodiversity conservation locally and sets out a series of objectives and actions aimed at making significant progress towards achieving them. It also identifies those organisations that are best placed to implement the actions, either through their own endeavours or working in partnership with others.

vi. Somerset Local BAP (LBAP) (Ref. 14.27) and Sedgemoor LBAP (Ref. 14.28)

14.3.45 The Somerset LBAP has been produced in conjunction with the Somerset Biodiversity Strategy and identifies targets and actions for the following biodiversity receptors across Somerset:

- ditches and ponds;
- gardens and urban greenspace;
- hedgerows and hedgerow trees;
- road verges and green lanes;

- traditional orchards;
- water and wetlands;
- wood pasture, parkland and veteran trees;
- bats;
- otter *(Lutra lutra)*; and
- lapwing *(Vanellus vanellus)*.

14.3.46 The Sedgemoor LBAP incorporates targets and actions identified in the Somerset LBAP and specifies the following ecological receptors as requiring particular biodiversity targets within Sedgemoor:

- woodland;
- coastal and marine;
- heathland; and
- calcareous and neutral grassland.

f) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 14.29)

14.3.47 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific ecological designations. The site is within the defined Development Boundary.

14.3.48 There are no saved policies relating to impacts on biodiversity at the site.

ii. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission) (September 2010) (Ref. 14.30)

14.3.49 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission, which were proposed as a result of the consultation process, were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

14.3.50 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings.

Volume 1, **Chapter 4** of this ES provides a full summary of the position regarding the status of the Core Strategy.

14.3.51 The following Core Strategy (Proposed Submission) policies are of potential relevance to the proposed development:

- Policy S1 (Spatial Strategy for Sedgemoor) states that development must not adversely affect sites of international importance for nature conservation.
- Policy S3 (Sustainable Development Principles) states that development proposals will be expected to protect and enhance the quality of the natural environment.
- Policy S4 (Mitigating the Causes and Adapting to the Effects of Climate Change) states that development should not affect the ability of habitats and species to adapt to the adverse effects of climate change, and, if required, compensatory habitat should be provided.
- Policy D4 (Renewable or Low Carbon Energy Generation) states that the Council will support proposals that maximise the generation of energy from renewable or low carbon sources, provided that the installation would not have significant adverse impact taking into account the impact of the scheme, together with any cumulative impact on, amongst other things, biodiversity.
- Policy D10 (Managing the Transport Impacts of Development) states that development proposals that will have a significant transport impact should be supported by ecological surveys.

14.3.52 Policy D14 (Natural Environment) deals with terrestrial ecology and ornithology impacts more generally. It states:

"All development proposals should contribute to enhancing and maintaining biodiversity, taking into account climate change and the need for habitats and species to adapt to it. Particular regard should be had to:

- *The targets set out in the Somerset and Sedgemoor Biodiversity Action Plans*
- *The presence of, or potential impact on, European Protected Species.*
- *Potential impact on internationally and nationally designated sites of nature conservation importance.*
- *Enhancement opportunities within the Strategic Nature Areas identified in the South West Nature Map.*

Ecological Impact Assessments will be required where it is reasonably likely that species and/or habitats of nature conservation significance may be impacted on by the proposed development. In addition, a Construction Environmental Management Plan will be required where there is potential for significant environmental effects during the construction stage.

Development will be supported where:

- *as well as ensuring the protection of internationally and nationally designated sites, it protects the nature conservation interest of local sites designated for their nature conservation value;*
- *it retains or enhances features such as wetlands, watercourses, coastal features, hedgerows, trees, copses and ponds which provide wildlife corridors, links or stepping stones from one habitat to another; and*
- *it makes positive provision for wildlife through appropriate urban and rural habitat creation/restoration (having particular regard to BAP Habitats and Strategic Nature* Areas), including tree and hedgerow planting, and subsequent management.

In exceptional circumstances, where development is necessary and could result in significant indirect or direct adverse impacts to nature conservation appropriate mitigation and compensation measures should be provided."

14.3.53 Policy D20 (Green Infrastructure) states that Green Infrastructure will be safeguarded, maintained, improved, enhanced and added to, as appropriate, to form a multi-functional resource.

iii. Supplementary Planning Guidance

14.3.54 Whilst not forming part of the statutory development plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 14.31) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town. The document makes specific reference to HPC as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the HPC proposals both pre- and post-construction (Page 44).

14.3.55 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the 'draft HPC SPD') (Ref. 14.32) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. **Volume 1**, **Chapter 4** of this ES provides a full summary of the position regarding the status of the draft HPC SPD.

14.3.56 The draft HPC SPD does not set out any specific guidance in relation to biodiversity impacts at the site.

14.3.57 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1**, **Chapter 7** of this ES).

14.4 Methodology

a) Introduction

14.4.1 **Volume 1**, **Chapter 7** of this ES describes the generic assessment methodology for this EIA. The subject specific methodology that has been used for the assessment in this chapter draws upon the Institute of Ecology and Environmental Management's (IEEM's) guidelines on ecological impact assessment (Ref. 14.33), but also reflects the standardisation of aspects of the assessment across all the topics that are covered in this ES. The main elements of the impact assessment methodology for this chapter are listed in Section 14.2 of this chapter.

14.4.2 The remainder of this section outlines the methodologies that were adopted for baseline data gathering, consultation, scoping the assessment and the assessment methodology. The section concludes with information about limitations, constraints and assumptions.

b) Baseline Data Gathering

14.4.3 A desk study was undertaken in order to identify any requirement for further surveys and to inform the assessment process. The area[1] for which baseline biodiversity data were collected (the study area) is illustrated in **Figure 14.1**.

i. Desk Study

14.4.4 For the desk study, data were collected for the site and a 2km area around the site. Data for this 2km area had the potential to highlight notable species that could be present on the site as well as indicating off-site ecological resources that could be affected by the proposed development. The desk study area was extended to 10km around the site in relation to European designated nature conservation sites[2].

14.4.5 During February 2009, information about statutory nature conservation sites within the 2km area (and 10km area for European sites) around the site was obtained through the use of the following websites: www.magic.gov.uk; www.jncc.gov.uk; and www.naturalengland.org.uk. Also during February 2009, information about non-statutory nature conservation sites, and pre-existing biological records were obtained from the Somerset Environmental Records Centre (SERC). Information relating to designated sites was updated in April 2011. Of the large number of biological records that were received, only post-1990 records have been used to inform the assessment, as these are likely to be most relevant to the current conditions at the site.

[1] The study areas were defined to reflect the likely spatial scope of the impacts that would be caused by the proposed development, using information about the development proposals, knowledge of the local area and professional judgement.

[2] Under The Conservation of Habitats and Species Regulations 2010 (SI 2010 No. 490), European sites are defined as Special Areas of Conservation (SACs), candidate SACs, Sites of Community Importance and Special Protection Areas (SPAs). However, UK policy extends the requirements pertaining to European sites to include Ramsar sites and potential SPAs, and this would include proposed extensions or alterations to existing SPAs.

14.4.6 1:25,000 Ordnance Survey maps were studied in order to identify any water bodies located within 500m of the site, given the possibility that any great crested newts (*Triturus cristatus*) that breed in such water bodies could utilise terrestrial habitats on the site. The Great Crested Newt Mitigation Guidelines recommend that surveys of ponds up to 500m from a development may be required to determine the impact of the development on this species (Ref. 14.34).

ii. Extended Phase 1 Habitat Survey

14.4.7 An extended Phase 1 habitat survey of the site was undertaken on 26 January 2010 and updated on 23 June 2010. The survey methodology was based on the Joint Nature Conservation Committee (JNCC)'s Phase 1 habitat survey methodology (Ref. 14.35). This involved habitats, together with notable features of biodiversity conservation interest, being identified and mapped; each notable feature of biodiversity conservation interest was described in a target note. The survey was extended (Ref. 14.36) to collect additional information on the presence/potential presence of legally protected and other notable species and interest features such as hedgerows and water bodies.

iii. Other Surveys

14.4.8 Based on the results of the desk study and the Phase 1 habitat survey, it was concluded that no further ecological surveys were required to inform this assessment.

c) Consultation

14.4.9 Consultation has been undertaken throughout the EIA process and further information may be found in the **Consultation Report**. Consultation was undertaken with the organisations that are listed in **Table 14.1** in order to discuss the scope of, and approach to be taken to, biological surveys, the results of these surveys and the scope of any potential mitigation required.

Table 14.1: Consultation Undertaken to Inform the Assessment of Impacts on Biodiversity

Organisation	Date of Meeting	Primary Subject of Meeting
Natural England	07 October 2009	Survey programme and results
	11 December 2009	Survey programme and results Likely scope of the supporting ecological information for the ES
Natural England	14 April 2010	Preliminary survey results and potential mitigation measures
	17 March 2011	Full survey results and proposed mitigation measures
Somerset Wildlife Trust	01 October 2009	Survey programme and results
	17 March 2011	Full survey results and proposed mitigation measures
Somerset County Council	01 April 2010	Survey programme and results

Organisation	Date of Meeting	Primary Subject of Meeting
Somerset County Council	14 April 2010	Preliminary survey results and potential mitigation measures
	17 March 2011	Full survey results and proposed mitigation measures
Environmental Agency	27 October 2010	Preliminary survey results and potential mitigation measures
	18 March 2011	A summary report of the survey methods and results was provided to the EA, which provided comments on the report.
West Somerset and Sedgemoor District Councils (represented by Arup)	17 March 2011	Full survey results and proposed mitigation measures

d) Scoping the Assessment

14.4.10 The first part of the assessment process was to undertake a scoping exercise. This involved differentiating the biodiversity receptors (i.e. designated sites, habitats and species' populations) that could be significantly affected by the proposed development and that therefore required more detailed assessment, from those receptors that are not likely to be significantly affected and did not require further assessment (i.e. they were 'scoped-out' of the assessment).

14.4.11 The first stage of the approach that was used for determining which receptors have the potential to be significantly affected by the proposed development involved using baseline data (collected by the desk study and field surveys) for the site and up to 2km away (up to 10km away for European designated nature conservation sites)[3] to determine:

- which, if any of the species that have been recorded are legally protected or controlled (see **Appendix 14A**, Box 14A.2); and/or
- which, if any, sites, areas of habitat and species that have been recorded are of importance for biodiversity conservation, notwithstanding any legal protection that they may have (see **Appendix 14A**, Box 14A.1).

14.4.12 Use of these categories provides a robust and objective basis for focusing the assessment on receptors that are widely recognised to be important for the conservation of biodiversity in addition to those that are legally protected. It should be noted, however, that legally protected species may be protected for reasons other then for biodiversity conservation (e.g. badger).

14.4.13 For sites/habitats/species that are important for biodiversity conservation, the next stage of the scoping assessment was to determine whether the receptors are likely to be of sufficient 'value' that an impact upon them could be significant. In this context, value refers to a receptor being of sufficient quality (for sites and habitats) or size (for sites, habitats or species' populations). The distinction between importance and

[3] There was also the possibility that other receptors could be identified as potentially being affected, based on the study team's experience of the local area.

value can be illustrated by the great crested newt, which, as well as being legally protected, is important at a national level because it is a species of principal importance for biodiversity (Ref. 14.16). However, depending on the local abundance of this species, a small affected population might be anywhere between low or high biodiversity value.

14.4.14 The findings of the valuation of important receptors, together with information about whether receptors are legally protected, are set out in **Table 14B.1** in **Appendix 14B**. For those receptors that are assessed as being of insufficient value for impacts to be significant, this appendix provides a justification for this conclusion.

14.4.15 Important receptors that are of sufficient value that an impact upon them could be significant together with all legally protected species were then taken through to the next stage of the scoping assessment. This involved identifying, for each receptor, any environmental changes that are likely to be caused by the proposed development, which have the potential to lead to a significant impact. Then the area was determined within which the environmental change could cause a significant impact on the receptor; this area is referred to as an 'ecological zone of influence'. The area where the receptor occurs was then compared with the ecological zone of influence. If the receptor occurs or is likely to occur within the zone of influence it was 'scoped in' to further assessment (**Table 14B.2** in **Appendix 14B**).

14.4.16 The ecological zone of influence that is the most straightforward to define is the area affected by land take and land cover change associated with the development. This zone is the same for all affected receptors. By contrast, for each environmental change that can extend beyond the area affected by land take and land cover change (e.g. changes in noise), the zone of influence may vary between receptors dependent upon the receptors' sensitivity to the change and the precise nature of the change.

14.4.17 For example, one bird species might be unaffected by noise unless the noise is generated very close to where the bird nests, whilst another bird species might be disturbed at much greater distances; other species (e.g. of invertebrate) may be unaffected by changes in noise. A further complication is that the response of a receptor to a change associated with one development may differ to the response of the same receptor to a similar change on another development. This can occur as a result of the wide range of variables that influences the precise nature of any change (e.g. for noise this can include differing baseline noise conditions, specific magnitude, timing or other characteristics of the noise and the effects of screening and topography).

14.4.18 In view of these complexities, the definition of the zones of influence that extend beyond the land take area was generally based upon professional judgement, informed by discussions with the technical specialists who were working on other chapters of the ES. These specialists provided information about the environmental changes that they assessed in their ES chapter. This information was then combined with available ecological information about different receptors' sensitivity to different environmental changes in order to define the extent of each ecological zone of influence.

14.4.19 Having defined the ecological zones of influence, there was a need to review the original list of 'important' receptors that had been scoped-out because they were likely to be of insufficient value for an impact upon them to be significant. This requirement reflects the potential for a zone of influence to be so extensive that a larger than expected species population or area of habitat could be affected, which could lead to the potential for a significant impact. In this event, any relevant receptor was scoped back into the assessment.

14.4.20 Each relevant receptor (i.e. that is of sufficient value or is legally protected, as described above), which was located wholly or partly within one or more zones of influence, was then subject to further scoping assessment in relation to the relevant environmental change(s). The spatial extent of this assessment reflected the area occupied by the receptor. Thus, if part of a designated nature conservation site was located within a zone of influence, an assessment was made of the impacts on the site as a whole. A similar approach was taken for areas of notable habitat. For species that occur within an ecological zone of influence, an assessment was carried out on the total area that is used by the affected individuals of the species (e.g. for foraging or as a breeding territory)[4].

14.4.21 This final stage of the scoping assessment involved drawing upon available information about the magnitude and other characteristics of the environmental changes and the sensitivity of each relevant receptor to these changes, to arrive at a conclusion about the potential for a significant impact to occur. Where there was the potential for a significant impact, or contravention of protected species legislation, the receptor was taken forward for further 'post-scoping' assessment (see sub-section (d) below) as identified in the final column of **Table 14B.2** in **Appendix 14B**.

14.4.22 In undertaking the sequence of steps that are described above, it was recognised that if the environmental changes could significantly affect biodiversity resources further than 2km from the site (or 10km for European designed sites), the data-collection area would need to be extended. Further data collation would also be required if there were insufficient biological data for any receptor that could be significantly affected by the proposed development. However, neither scenario arose.

14.4.23 For each receptor, the impacts that are assessed arise as a result of a combination of the environmental changes (e.g. changes in noise, lighting etc.) that could contribute to a significant impact. In this sense, the impacts are already 'cumulative' and consequently, no further cumulative assessment is required in this section (recognising that wider cumulative impacts are assessed in **Volume 11** of this ES).

[4] The affected individuals may, for example, be a pair of birds, a badger clan associated with a main sett or the population of great crested newts in a pond. Where appropriate, the area for which data were required was extended (e.g. to include other pairs of birds in a discrete subpopulation, or a metapopulation of newts).

e) Assessment Methodology

14.4.24 The assessment of potentially significant biodiversity impacts in this ES draws upon:

- the results of desk study and field survey work;
- relevant published information on potential biodiversity receptors' status, distribution, biology and sensitivity to environmental changes (referenced in the text where used); and
- professional knowledge of ecological processes and functions.

14.4.25 Throughout the assessment process, the findings of the assessment were used to inform the design of the proposed development and identify requirements for any additional baseline data. As a result of this iterative process, environmental measures to avoid, reduce or off-set impacts on potential biodiversity receptors were incorporated into the scheme design or identified as mitigation.

14.4.26 The remainder of this section outlines the approach that has been adopted to assessing the significance of impacts, which draws upon information about biodiversity value and the magnitude of impacts. It should be noted that the assessment has been undertaken in relation to each biodiversity receptor that could be significantly affected and/or that is legally protected (as identified in the final column of **Table 14B.2** in **Appendix 14B)**), considering that the impact on each receptor could be the result of more than one type of environmental change caused by the proposed development. For example, a receptor might be affected by land take and construction noise.

i. Value of Receptor

14.4.27 Sites, species' populations and areas of habitats have been valued as shown in **Table 14.2**. It should be noted that in respect of species, the approach taken is to determine the value of the site for the species under consideration, rather than the biodiversity conservation importance of the species itself (as discussed above in relation to scoping).

Table 14.2: Definition of Terms Relating to Biodiversity Value

Definition	Value Guidelines
High	International/National designations – SACs, SPAs, Ramsar sites and SSSIs. Cited features of internationally/nationally designated sites. Species populations or habitat areas that are of major importance because of the quality/size of the habitat or the size of the species population in relation to the wider habitat resource/population – species/habitats are most likely to be species/habitats of principal importance under Section 41 of the NERC Act (and UK BAP priority habitats/species), species/habitats that are nationally rare and/or species that are legally protected. The regular occurrence of internationally/nationally important numbers of waterfowl (i.e. 1% or more of the relevant international or national population respectively).

Definition	Value Guidelines
Medium	County Wildlife Sites (CWSs). Features for which CWSs have been designated. Species populations or habitat areas that are of moderate importance because of the quality/size of the habitat or the size of the species population in relation to the wider habitat resource/population – species/habitats are most likely to be species/habitats of principal importance under Section 41 of the NERC Act (and UK BAP priority habitats/species), priority species/habitats in the Local BAP, species/habitats that are rare at the regional/county level and/or species that are legally protected.
Low	Other designated sites of district or local importance including Local Nature Reserves (LNRs), except where these have a higher additional designation. Species populations or habitat areas that are of some biodiversity value because of the quality/size of the habitat or the size of the species population in relation to the wider habitat resource/population – species/habitats are most likely to be species/habitats of principal importance under Section 41 of the NERC Act (and UK BAP priority habitats/species), priority species/habitats in the Local BAP, species/habitats that are rare at the district/local level and/or species that are legally protected species.
Very low	Species populations or habitat areas that are of very low biodiversity value, typically because they are common and/or are not species/habitats of principal importance under Section 41 of the NERC Act, UK BAP priority habitats/species, priority species/habitats in the Local BAP, species/habitats that are rare at the district/local level and/or legally protected species.

ii. Magnitude of Impact

14.4.28 Using information about the way in which sites/habitats/species are likely to be affected by the proposed development, each impact that is assessed has been assigned a level of 'magnitude', based on the definitions that are set out in **Table 14.3**.

Table 14.3: Guidelines for the Assessment of Impact Magnitude

Magnitude of Impact	Criteria
High	The change permanently (or over the long-term) adversely affects the conservation status of a habitat/species, reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a decrease in the level of biodiversity conservation value of the receptor.
Medium	The change permanently (or over the long-term) adversely affects the conservation status of a habitat/species reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a decrease in the level of biodiversity conservation value of the receptor.
Low	The quality or extent of designated sites or habitats, or the size of species' populations experience some small scale reduction. These impacts are likely to be within the range of natural variability and there is not expected to be any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its biodiversity conservation value.

Magnitude of Impact	Criteria
Very Low	Although there may be some impacts on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations would experience little or no reduction. Any impacts are likely to be within the range of natural variability and there would be no short-term or long-term effects on the conservation status of habitat/species receptors or the integrity of designated sites.
Beneficial	Improvement in the quality or extent of habitats, the size of species populations or the integrity of a designated site. This improvement must be achieved without compromising the integrity of the proposed development site or conservation status of the habitat/species that is present prior to development. Criteria for assessing the magnitude of beneficial effects can be derived from the definitions of adverse impacts.

14.4.29 The criteria in **Table 14.3** refer to the terms 'integrity' and 'conservation status'. The 'integrity' of a site, as referred to in **Table 14.3**, is defined as:

> *"The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified" (Ref: 14.33).*

14.4.30 Conservation status is defined differently for habitats and species:

> *"For habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species that may affect its long term distribution, structure and functions, as well as the long-term survival of its typical species within a given geographical area.*
>
> *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area" (*Ref. *14.33).*

iii. Significance of Impacts

14.4.31 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the resource. The approach to predicting impacts, without mitigation, is outlined in **Volume 1**, **Chapter 7** of this chapter. The only exception to this approach is for legally protected species, for which any contravention of the law is assessed as an impact of major significance irrespective of the magnitude of the impact or the biodiversity conservation value of the population that is affected. The terminology 'legally protected' (LP) is used in the summary impact assessment table (**Table 14.5**) to reflect this exception.

14.4.32 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

iv. Cumulative Impacts

14.4.33 **Volume 1**, **Chapter 7** of this ES refers to the methodology used to assess cumulative impacts. Additive and interactive effects between impacts generated within the site boundary and study area are assessed within this chapter. Cumulative impacts that consider activities and impacts generated at distance from the site and study area are considered in **Volume 11** of this ES; this assesses the project-wide cumulative impacts and in-combination impacts with other proposed or reasonably foreseeable projects.

f) Limitations, Constraints and Assumptions

14.4.34 No limitations, constraints or assumptions have been identified that would have a bearing on the assessment of likely significant impacts on biodiversity.

14.5 Baseline Environmental Characteristics

a) Introduction

14.5.1 This section of the ES describes the biodiversity baseline of the study area (**Figure 14.1**), which includes desk study information obtained for a 2km radius around the site (10km for European designated nature conservation sites) and field survey results from within the site and the immediate surrounding 50m. The protected and notable species records supplied by SERC are set out in **Appendix 14C**.

b) Study Area Description

i. Designated Sites

14.5.2 There are no statutory designated nature conservation sites within 2km of the site. However there are 11 non-statutory sites (County Wildlife Sites – CWSs) within a 2km radius of the site (see **Table 14.4** and **Figure 14.2**). There are five European designated nature conservation sites within 10km of the site (**Figure 14.3**).

Table 14.4: Designated Statutory and Non-statutory Nature Conservation Sites within 2km of the Site (within 10km for European Designated Sites)

Site	CWS Reference Number	Location in relation to the site	Reason for Designation
Statutory Designated Sites			
Severn Estuary SPA	N/A	4.4km to the north-west	This site has been designated for its wintering populations of Bewick's swan (*Cygnus columbianus*), white-fronted goose (*Anser albifrons*), shelduck (*Tadorna tadorna*), gadwall (*Anas strepera*), dunlin (*Calidris alpina*) and redshank (*Tringa totanus*) and its wintering waterfowl assemblage.

Site	CWS Reference Number	Location in relation to the site	Reason for Designation
Severn Estuary SAC	N/A	4.4km to the north-west	This site has been designated for the following habitats and species: • estuaries; • intertidal mudflats and sandflats; • Atlantic salt meadows; • sandbanks; • reefs; and • three species of migratory fish: sea lamprey (*Petromyzon marinus*); river lamprey (*Lampetra fluviatilis*); and twaite shad (*Alosa fallax*).
Severn Estuary Ramsar Site	N/A	4.4km to the north-west	This site has been designated for the following habitats and species: • all SAC Features (see above); • unusual estuarine communities associated with reduced productivity and diversity; • migratory fish, including salmon (Salmo salar), sea trout (Salmo trutta), allis shad (Alosa alosa), and eel (Anguilla anguilla) in addition to cited SAC species; • migratory birds in spring and autumn; • wintering waterfowl assemblage; and • internationally important wintering numbers of Bewick's swan, white-fronted goose, gadwall, shelduck, dunlin and redshank.
Somerset Levels and Moors SPA	N/A	6.9km to the north-east	This site has been designated for its wintering populations of Bewick's swan, golden plover (*Pluvialis apricaria*), shoveler (*Anas clypeata*), teal (*Anas crecca*) and wigeon (*Anas penelope*), and its wintering waterfowl assemblage.
Somerset Levels and Moors Ramsar Site	N/A	6.9km to the north-east	This site has been designated for the following habitats and species: • 17 species of British Red Data Book invertebrates; • internationally important wintering numbers of Bewick's swan, teal and lapwing; and • wintering waterfowl assemblage.

Site	CWS Reference Number	Location in relation to the site	Reason for Designation
Non-statutory Designated Sites			
Bridgwater College Ponds CWS	ST33/011	0.2km to the south	Pond surrounded by scrub.
Cellophane Pits CWS	ST33/001	0.9km to the north-east	Complex of water-filled gravel pits with surrounding grassland and scrub.
Chilton Trinity Ponds CWS	ST23/024	1.4km to the north-west	Complex of ponds, reedbeds, trees and scrub with rich bird and invertebrate populations.
Express Park CWS	ST33/062	1.7km to the north-west	Saltmarsh.
Brownes Pond CWS	ST23/102	1.4km to the south-west	Pond with legally protected species.
Dunwear Brick Pits CWS	ST33/027	1.3km to the south	Open water ponds, reedbeds, scrub and edge habitat vegetation.
The Meads CWS	ST33/109	1.7km to the south-west	Aquatic habitat supporting important riparian species.
Bridgwater and Taunton Canal CWS	ST33/025	1.9km to the south-west	Aquatic habitat with notable plant species and water vole *(Arvicola amphibius)*.
Somerset Bridge Ponds CWS	ST33/035	1.8km south	Open water, reedbeds and invertebrate habitat.
Dunwear Upper Brick Pits CWS	ST33/043	2.1km to the south-east	Legally protected fauna and swamp community.
Beeches Ponds CWS	ST33/059	1.6km to the south-east	Series of former brick pits with legally protected species.

c) Desk Study Information

14.5.3 SERC provided no records of legally protected or notable species from within the site. In 1990 and 2003, common toad *(Bufo bufo)*, a UK BAP priority species and Somerset Priority List species, was recorded breeding in the Bridgwater College Ponds CWS, located approximately 0.2km to the south of the site.

14.5.4 Within 2km of the site there is also one record each of brown long-eared bat *(Plecotus auritus)* and common pipistrelle *(Pipistrellus pipistrellus)*, and numerous records of otter and water vole using various watercourses and water bodies (e.g. the River Parrett and Beeches Ponds CWSs), primarily to the south of the site.

14.5.5 A wide range of notable bird species has been recorded from various CWSs within the desk study area, particularly those that include areas of wetland. These include kingfisher *(Alcedo atthis)*, bittern *(Botaurus stellaris)* and scaup *(Aythya marila)*.

14.5.6 Eight UK BAP priority moth species have been recorded at a single site in Bridgwater approximately 1.3km to the west of the site (a maximum of two records per species), with a further four UK BAP priority moth species recorded at Chiltern Trinity CWS,

2km north of the site. Four Somerset Priority List plant species have been recorded on single occasions between 1km and 2km from the site.

d) Extended Phase 1 Habitat Survey

i. Flora

14.5.7 The main habitat type within the site is amenity grassland (a rugby pitch). The site also includes a gravel car park, small areas of improved grassland, scrub and planted trees. To the north and east of the site is a road (College Way), to the south is a car park forming part of Bridgwater College and to the west is further amenity grassland (another rugby pitch). **Figure 14.4** illustrates the location of the habitat types within the site.

14.5.8 The frequently managed and regularly disturbed amenity grassland is species-poor, comprising low-growing species including greater plantain *(Plantago major)*, white clover *(Trifolium repens)*, perennial rye-grass *(Lolium perenne)*, common vetch *(Vicia sativa)* and daisy *(Bellis perennis)*. The small areas of improved grassland in the northern part of the site are managed less frequently and are slightly more diverse, with additional species including common grasses and herbs such as Yorkshire fog *(Holcus lanatus)*, common bent *(Agrostis capillaris)*, creeping cinquefoil *(Potentilla reptans)*, garlic mustard *(Alliaria petiolata)* and common mouse-ear *(Cerastium fontanum)*.

14.5.9 A small area of scrub in the northern part of the site is dominated by bramble *(Rubus fruticosus agg.)* and snowberry *(Symphoricarpus albus)*, with common nettle *(Urtica dioica)*, cock's-foot *(Dactylis glomerata)*, yarrow *(Achillea millefolium)* and cow parsley *(Anthriscus sylvestris)* also present. Two semi-mature white willow *(Salix alba)* trees, a sycamore *(Acer pseudoplatanus*) tree and buddleia *(Buddleja davidii)* were also recorded in this area.

14.5.10 The northern, southern and eastern boundaries of the site are fenced with post and rail, with small amounts of improved grassland and ruderal vegetation at the base. In addition, the northern boundary, and part of the eastern boundary, support semi-mature planted broad-leaved trees and shrubs including hazel *(Corylus avellana)*, field maple *(Acer campestre)* and hawthorn *(Crataegus monogyna)*. A small number of scattered silver birch *(Betula pendula)* and willow (*Salix* sp.) trees, also occur along the eastern boundary.

ii. Fauna

14.5.11 No evidence of legally protected or other notable fauna was found during the extended Phase 1 habitat survey. Based on the poor quality habitats that are present it is unlikely that any such species occur on the site, with the potential exception breeding birds, which may nest in the scrub habitats around the edge of the site. Bats may forage along the site boundary, although the habitats on site are of poor quality for foraging and limited in extent.

14.5.12 There is also no reason to believe that use of the site by legally protected or other notable species is likely to change.

14.6 Assessment of Impacts

a) Introduction

14.6.1 The starting point in this assessment is to define those biodiversity receptors that could be significantly affected by the proposed development and/or are legally protected (as concluded in **Table 14B.2** in **Appendix 14B**). In subsequent sections, these receptors are then taken forward for assessment in relation to the construction, operational and post-operational phases of the proposed development. The assessment reflects the form of the proposed development (see the site boundary in **Figure 1.1** in **Chapter 1** of this volume of the ES). The assessment also reflects the following aspects of the proposed development that were agreed as part of the iterative design process and incorporated into the scheme[5].

- The scrub and mature trees along the northern boundary of the site would be retained and protected from damage by fencing (see **Chapter 15** of this volume).
- Trees and shrubs would be planted along the site's eastern and western boundaries and through the centre of the site (see **Chapter 15** of this volume).
- 0.04ha of wildflower grassland would be sown along the eastern site boundary. This would comprise a diverse range of native plant species and be managed to maintain the diversity (see **Chapter 15** of this volume).
- The lighting strategy for the site has been designed with reference to the Bat Conservation Trust's (BCT) Bats and Lighting publication (Ref. 14.37). It involves lighting being directional, with minimal upwards or backwards light spill and ensuring that retained habitat features that are likely to be used by bats (such as tree lines) are not lit more than the current baseline.
- Measures have been incorporated into the scheme that are designed to avoid contravention of the legislation relating to legally protected species. These measures are outlined in Section 14.6(c) of this chapter.
- Best practice measures would be implemented to minimise dust deposition (see **Chapter 10** of this volume of the ES), polluted surface water run-off (see **Chapter 13** of this volume of the ES) and noise (see **Chapter 9** of this volume of the ES).

b) Identification of Receptors that could be Significantly Affected

14.6.2 The method described in Section 14.4(c) of this chapter has been used to determine whether any of the designated nature conservation sites, habitat areas or species' populations that have been recorded within the study area could be significantly affected by the proposed development and therefore need to be subject to further assessment. The environmental changes that are likely to be caused by the proposed development, which have the potential to cause significant impacts are:

[5] Some of these measures avoid or reduce impacts, but, as they form an integral part of the scheme, are not considered to be mitigation.

- land take/land cover change;
- noise and visual disturbance; and
- lighting disturbance.

14.6.3 The latter two changes only apply outside the land take/land cover change zone. Within this zone, it is only necessary to assess impacts caused by land take/land cover change. This is because, although there would be changes in lighting and noise within this zone, land takes and land cover change are the dominant factors influencing biodiversity receptors.

14.6.4 For receptors of sufficient value and/or that are legally protected, **Appendix 14B** of this chapter sets out the ecological zones of influence relating to these three changes. Based on these zones of influence, only breeding birds have been identified as requiring further assessment. As set out in **Table 14B.2** in **Appendix 14B**, bats were scoped out of further assessment as no roosts would be affected and habitat on and around the site is of poor quality for foraging and limited in extent (and it would be retained and not subjected to additional lighting). Hence there is no likelihood of a significant impact.

14.6.5 Breeding birds require further assessment only because they are legally protected (as described in Section 14.2 of this chapter). This influences the extent of the assessment that is carried out for this receptor, which does not need to be given a level of value (**Table 14B.1** in **Appendix 14B** explains why these and other potential receptors are of insufficient value for potential impacts to be significant).

c) Construction Impacts

i. Breeding Birds

14.6.6 If undertaken during the breeding bird season, site clearance activities would have the potential to destroy active bird nests, which would be in contravention of the WCA (Ref. 14.8). To avoid this, vegetation clearance and/or management would, wherever possible, be completed outside of the breeding bird season (which is generally considered to be March to August inclusive). Should vegetation clearance be required during this period, a suitability qualified ecologist would survey the vegetation prior to its removal in order to check for the presence of active nests. If an active nest is found, it would be left undisturbed until the young have fledged. With the adoption of these measures, there would be **no impact** on breeding birds in relation to legal protection.

14.6.7 In relation to biodiversity conservation value, the bird populations that would be affected are not of sufficient value for impacts to be significant (see **Appendix 14B**).

d) Operational Impacts

i. Breeding Birds

14.6.8 Vegetation management during the operational phase would have **no impact** on breeding birds. This is because the measures that are described above in relation to the construction phase would also be implemented once the scheme is operational.

e) Post-Operational Impacts

14.6.9 Following cessation of its use by EDF Energy as worker accommodation, the development is likely to be transferred to a third party for use as student accommodation or other alternative educational uses in connection with Bridgwater College. Therefore, there would be no impacts to those identified for the operational purpose.

14.7 Mitigation of Impacts

14.7.1 No impacts that are of moderate or major significance have been identified and hence there is no requirement for any additional mitigation measures to be adopted. However, standard good practice measures, which are not receptor-specific, would be implemented, including:

- provision of an Ecological Clerk of Works (ECoW) during all site clearance activities; and
- provision of an escape route for animals in any deep trenches excavated.

14.7.2 Environmental control measures described in this chapter are reflected in the **Ecological Management and Monitoring Plan (EcMMP)**.

14.8 Residual Impacts

14.8.1 The residual impacts at each phase of the proposed development would be identical to the impacts that are set out in Sections 14.6(c-e) of this chapter.

14.9 Summary of Impacts

14.9.1 **Table 14.5** provides summary information about the impacts that have been assessed.

Table 14.5: Summary of Impacts

Receptor	Potential Impact	Magnitude	Description	Value/Sensitivity	Significance	Proposed Mitigation/ Best Practices	Residual Impact
Construction Phase							
Breeding birds	Damage of active nests	No impact	No impact	LP	No impact	None required (measures within scheme design)	No impact
Operational Phase							
Breeding birds	Damage of active nests	No impact	No impact	LP	No impact	None required (measures within scheme design)	No impact

Key: *LP = Legally Protected*

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CHAPTER 15: LANDSCAPE AND VISUAL

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15. LANDSCAPE AND VISUAL

15.1 Introduction

15.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential landscape and visual impacts associated with the construction, operation and post-operational phases of the proposed 850-bed accommodation campus facilities at Bridgwater C referred to hereafter as the proposed development on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

15.2 Scope and Objectives of Assessment

15.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by on going consultation with statutory consultees, including Sedgemoor District Council (SDC), West Somerset Council (WSC), Somerset County Council (SCC), English Heritage and Natural England, the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

15.2.2 The assessment of landscape/townscape and visual impacts has been undertaken adopting the methodologies described in Section 15.4 of this chapter.

15.2.3 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through a desk-based assessment, field surveys and modelling, and are described in Section 15.5 of this chapter. The site location plan showing all Associated Development sites and HPC is shown in **Figure 1.2** of this volume.

15.2.4 Impacts to landscape/townscape and visual amenity are presented in Section 15.6 of this chapter, and appropriate mitigation measures identified in Section 15.7. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 15.8 of this chapter.

15.2.5 Cumulative impacts to landscape/townscape arising from the proposed development in combination with other elements of the Hinkley Point C (HPC) Project and other relevant projects are identified and assessed in **Volume 11** of this ES.

15.2.6 The objectives underlying the assessment were to assess the potential impacts on landscape/townscape and visual amenity, including:

- landscape/townscape character;
- landscape/townscape elements or features;
- landscape designations; and
- visual receptors as represented by a number of representative viewpoints.

15.3 Legislation, Policy and Guidance

15.3.1 This section identified and describes legislation, policy and guidance of relevance to the assessment of potential landscape/townscape and visual impacts associated with the construction, operational and removal/restoration phases of the proposed development.

15.3.2 As stated in **Volume 1, Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs.

15.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

15.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

i. European Landscape Convention (Ref. 15.1)

15.3.5 The European Landscape Convention (ELC), which was signed by the UK in February 2006 and became binding in 2007, is the first international convention to focus specifically on landscape issues and aims to protect, manage and plan landscapes in Europe. The ELC *"highlights the importance of developing landscape policies dedicated to the protection, management and creation of landscapes, and establishing procedures for the general public and other stakeholders to participate in policy creation and implementation."*

15.3.6 The ELC defines landscape as:

> *"An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."*

b) National Legislation

15.3.7 This assessment takes into account the following legislation and policy relevant to landscape/townscape and visual amenity, ecology and cultural heritage as stated in Guidelines for Landscape and Visual Assessment (GLVIA) produced by the Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) (Ref. 15.2).

"It is important for landscape assessments to consider the ecological, historical or cultural associations that contribute to the character and importance of a landscape."

and,

"planning policies for nature conservation and landscape are generally linked through a common approach to land use….there are also numerous interrelationships between landscape and cultural heritage and it is important that these links are not overlooked."

i. Countryside and Rights of Way (CRoW) Act 2000 (Ref. 15.3)

15.3.8 The CRoW Act provides a statutory framework for Areas of Outstanding Natural Beauty (AONB), provides further measures to protect the AONBs, and clarifies the role of local authorities which now includes the preparation of management plans to set out how they will care for their AONBs.

ii. National Parks and Access to the Countryside Act 1949 as amended by the Environment Act 1995 (Ref. 15.4)

15.3.9 The National Parks and Access to the Countryside Act provides for the designation of National Parks to conserve and enhance their natural beauty, wildlife and cultural heritage and promote opportunities for the understanding and enjoyment of the special qualities of those areas by the public. References in the Act to the preservation or the conservation of the natural beauty of an area are to be construed as including references to the preservation or, as the case may be, the conservation of its flora, fauna and geological and physiographical features.

15.3.10 Areas of Outstanding Natural Beauty (AONB) are designated under the provisions of the 1949 National Parks and Access to the Countryside Act, in order to secure their permanent protection against development that would damage their special qualities. AONBs are designated solely for their landscape qualities, for the purpose of conserving and enhancing their natural beauty.

iii. Hedgerow Regulations 1997 (Ref. 15.5)

15.3.11 The Hedgerow Regulations aim to protect hedgerows, which play an important role in supporting and enhancing biodiversity, as well as defining the character of English countryside.

15.3.12 According to the regulations, a hedgerow is important if it has existed for 30 years or more and it satisfies various wildlife, landscape or historical criteria specified in the regulations.

iv. Ancient Monuments and Archaeological Areas Act 1979 (Ref. 15.6)

15.3.13 Scheduled Monuments are designated under the Ancient Monuments and Archaeological Areas Act for archaeological sites or historic buildings that are considered to be of national importance by English Heritage. They are given protection against unauthorised change including changes to their visual setting.

c) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) (Ref. 15.7)

15.3.14 PPS1 was published in 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system. It advises that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things: protecting and enhancing the natural and historic environment, the quality and character of the countryside and existing communities; and ensuring high quality development through good and inclusive design, and the efficient use of resources (paragraph 5).

15.3.15 Paragraph 17 of PPS1 states:

> *"The Government is committed to protecting and enhancing the quality of the natural and historic environment, in both rural and urban areas. Planning policies should seek to protect and enhance the quality, character and amenity value of the countryside and urban areas as a whole. A high level of protection should be given to most valued townscapes and landscapes, wildlife habitats and natural resources. Those with national and international designations should receive the highest level of protection."*

ii. Consultation Paper on a New Planning Policy Statement: Planning for a Natural and Healthy Environment (March 2010) (Ref. 15.8)

15.3.16 In March 2010, the Government published a Consultation Paper for a new Planning Policy Statement: Planning for a Natural and Healthy Environment. The consultation period expired in June 2010.

15.3.17 At the outset, the document makes clear that in its final form, the PPS would replace paragraphs 21 to 23 in PPS7 which relate to landscape protection.

15.3.18 With specific reference to landscape protection, proposed Policy NE8.5 maintains the approach set out in Paragraph 21 of PPS7. In addition, proposed Policy NE8.5 advises that, in consideration of applications for major development proposals should include an assessment of:

> *(i) "the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
>
> *(ii) the cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some other way; and*
>
> *(iii) any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated."*

d) Regional Planning Policy

15.3.19 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1, Chapter 4** for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 for the South West 2001-2016 (RPG10) (2001) (Ref. 15.9)

15.3.20 RPG 10 sets out the broad development strategy for the period to 2016 and beyond. With specific reference to landscape character, paragraph 4.5 explains that the Countryside Agency and English Nature have identified and mapped the distinctive "character areas" (as shown on Map 4) for the South West as part of the testing of a new approach to "environmental capita" being promoted by the Countryside Agency, English Heritage, English Nature and the Environment Agency.

15.3.21 Policy EN 1 relates to Landscape and Biodiversity. It states that local authorities and other agencies, in their plans, policies and proposals, should, amongst other things:

- "provide for the strong protection and enhancement of the region's internationally and nationally important landscape areas and nature conservation sites;
- indicate that the protection and, where possible, enhancement of the landscape and biodiversity should be planned into new development;
- have regard to the significant landscape joint character areas of the region set out in this RPG (Map 4) and aim to conserve and enhance local character;
- take measures to protect the character of the countryside and the environmental features that contribute towards that character, including minimisation of light pollution."

ii. Draft Revised Regional Spatial Strategy (RSS) for the South West Incorporating the Secretary of State's Proposed Changes for Public Consultation (July 2008) (Ref. 15.10)

15.3.22 **Chapter 7** deals with Enhancing Distinctive and Cultural Life. Policy EN1 states:

> *"The quality, character, diversity and local distinctiveness of the natural and historic environment in the South West will be protected and enhanced, and developments which support their positive management will be encouraged. Where development and changes in land use are planned which would affect these assets, Local Authorities will first seek to avoid loss of or damage to the assets, then mitigate any unavoidable damage, and compensate for loss or damage through offsetting actions. Priority will be given to preserving and enhancing sites of international or national*

landscape, nature conservation, geological, archaeological or historic importance. Tools such as characterisation and surveys will be used to enhance local sites, features and distinctiveness through development, including the setting of settlements and buildings within the landscape and contributing to the regeneration and restoration of the area."

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref 15.11)

15.3.23 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to landscape/townscape and visual impacts. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

15.3.24 Policy 5 relates to Landscape Character and states:

"The distinctive character of the countryside of Somerset and the Exmoor National Park should be safeguarded for its own sake. Particular regard should be had to the distinctive features of the countryside in landscape, cultural heritage and nature conservation terms in the provision for development."

iv. Strategy for the Severn Estuary (2001) (Ref. 15.12)

15.3.25 Whilst not forming part of the statutory development plan for the proposed development site, the Strategy for the Severn Estuary was published by the Severn Estuary Partnership in 2001 and sets out policies and proposals for action for the estuary. **Chapter 12** deals with Landscape and Seascape and aims to conserve, promote and enhance and, where necessary, restore the special and distinctive character and quality of the estuary's landscape and seascape.

15.3.26 Strategy for the Severn Estuary influences the design of infrastructure and transport projects in relation to the estuary's landscape and seascape through its Policy L1c, which states:

"Plan and design all new developments including infrastructure and transport so that they conserve and enhance the character of the Severn Estuary landscape and seascape across authority boundaries."

e) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 15.13)

15.3.27 The Sedgemoor District Local Plan forms part of the development plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific landscape designations. The entire site (Bridgwater and Albion Rugby Football Club second team training pitch) is designated as an area of Recreational Open Space (Policy RLT1). The site is within the defined Development Boundary.

15.3.28 The following saved policies are considered to be potentially relevant.

15.3.29 Policy CNE2 (Landscape Character) states:

"Development which adversely affects local landscape character or scenic quality will not be permitted. In particular:

a) siting and landscaping should take account of visibility from publicly accessible vantage points;

b) the form, bulk and design of buildings should have proper regard to their context in respect of both the immediate setting and the defining characteristics of the wider local area.

In determining planning applications the important characteristics of landscape character areas described in the Sedgemoor Landscape Assessment and Countryside Design Summary and/or AONB Landscape Assessments will be a material consideration."

15.3.30 Policy CNE12 (Trees, Hedgerows and Woodlands) states:

"In considering proposals for development, the Council will seek to protect important trees and hedgerows. Planning permission may be refused where these would not be retained, or acceptably replaced. The Council will also encourage the planting and proper management of new trees and shrubs."

15.3.31 Policy RLT1 (Protection of Recreational Open Space) states:

"Development which would result in the loss of recreational open space will not be permitted unless:

a) the existing sports and recreation facilities can best be retained and enhanced through the redevelopment of a small part of the site;

b) a replacement facility of equivalent sports and/or recreation benefit is made available; or

c) the proposed development provides sports and/or recreation facilities of greater benefit than the long term recreational value of the open space that would be lost."

ii. Sedgemoor District Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 15.14)

15.3.32 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

15.3.33 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and

Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** for a full summary of the position regarding the status of the Core Strategy.

15.3.34 The following Core Strategy (Proposed Submission) policies are of potential relevance.

15.3.35 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, protect and enhance the quality of the natural, built and historic environment.

15.3.36 Policy D4 relates to proposals for Renewable or Low Carbon Energy Generation. It states the Council will support proposals that maximise the generation of energy from renewable or low carbon sources, provided that the installation would not have significant adverse impact taking into account, amongst other factors:

> *"The impact of the scheme, together with any cumulative impact (including associated transmission lines, buildings and access roads), on landscape character, visual amenity, historic features and biodiversity."*

15.3.37 Policy D14 (Natural Environment) deals with landscape and visual impacts more generally. It states:

> *"Development proposals within the Mendip Hills AONB or the Quantock Hills AONB will only be supported where they enhance or maintain the natural beauty, or the exceptional character or quality of the landscape in these areas.*
>
> *Elsewhere in the District proposals should ensure that they enhance the landscape quality wherever possible or that there is no significant adverse impact on local landscape character, scenic quality and distinctive landscape features as identified in the Sedgemoor Landscape Assessment and Countryside Design Summary. In particular through:*
>
> - *siting and landscaping that takes account of visibility from publicly accessible vantage points;*
> - *the form, bulk and design of buildings having proper regard to their context in respect of both the immediate setting and the defining characteristics of the wider local area.*
>
> *Where there are reasonable grounds to suggest that a development proposal may result in a significant adverse impact on the landscape, the Council will require planning applications to be supported by landscape impact assessments.*
>
> *In exceptional circumstances, where development is necessary and could result in significant impact on the landscape, appropriate mitigation and compensation measures should be provided."*

15.3.38 Policy D16 (Pollution Impacts of Development and Protecting Residential Amenity) states that development proposals that are likely to result in, amongst other things, light pollution that would be harmful to other land uses will not be supported. Policy

16 also states that development proposals that would unacceptably impact upon the residential amenity of occupants of nearby dwellings and any potential future occupants will not be supported. Particular consideration will be given to the extent that the proposal could result in overshadowing, overlooking and/or visual dominance.

15.3.39 Policy D20 (Green Infrastructure) states that green infrastructure will be safeguarded, maintained, improved, enhanced and added to, as appropriate, to form a multi-functional resource which, amongst other things, maintains or enhances amenity, landscape character and the image of the area.

iii. Supplementary Planning Guidance

15.3.40 Whilst not forming part of the statutory development plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 15.15) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

15.3.41 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area.

15.3.42 The site falls within the 'Sydenham and Bower' character area. Page 83 describes the vision for 'The Knowledge Quarter', stating:

> *"Sydenham and Bower would become a mixed residential, employment and educational area with a focus on the East Bridgwater Community School and Bridgwater College, linked to new employment and knowledge based industries."*

15.3.43 SDC and WSC have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD. With regard to the approach to the rugby club training pitch, Box 26 in the draft HPC SPD states:

> *"Development on the Rugby Club Training Pitch should seek to contribute to the profile of the College along the Bath Road, address long-term issues of access and provide a gateway to the College. Development should front the college access road and create a high quality built form which is fit for purpose for College use. Design constraints and opportunities that should inform the master-planning of the site are illustrated in figure 8.6.*
>
> *Any development at this site should seek to anchor Bridgwater College and the Community School as the focus of activity and create landmark structures that provide a gateway to these establishments. The design should address access and street safety."*

15.3.44 In September 2003, SDC adopted the Sedgemoor Landscape Assessment and Countryside Design Summary (Ref. 15.16) as an SPD. The SPD sets out guidance on how the character areas identified by the Countryside Commission and English

Nature in The Character of England (1996) have been interpreted locally. The SPD is considered below.

15.3.45 In February 2009, SDC adopted the North East Bridgwater Draft Design Principles Report as an SPD. The SPD relates to the "area of search" to the north east of Bridgwater identified in the Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of State's Proposed Changes 2008 – 2026 (July 2008) where it is proposed to provide significant housing and employment growth as part of a major mixed use extension to the town. The report sets an overall vision for the site, a detailed analysis of the constraints and opportunities, illustrative material suggesting design responses to these, and clear objectives.

15.3.46 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4**) and the Introduction chapter (**Volume 4**, **Chapter 1**).

f) Designated Area Management Plans and Guidance

i. Quantock Hills Area of Outstanding Natural Beauty Management Plan 2009-2014 (2009) (Ref. 15.17)

15.3.47 Whilst not forming part of the statutory development plan for the proposed development site, the **Quantock Hills Area of Outstanding Natural Beauty (AONB) Management Plan** was published by the Quantock Hills AONB Joint Advisory Committee in 2009 and sets out policies, objectives and action points over a range of subjects, including landscape, wildlife, historic environment and cultural influences and development and planning. Of relevance are the following development and planning policies:

- Policy D1 – "To protect the wild character, wildlife sites and species, cultural landscape and architectural heritage of the AONB."
- Policy D2 – "To ensure AONB involvement and influence in planning processes affecting the AONB."
- Policy D3 – "To protect the views out from the AONB through involvement in the planning process."
- Policy D4 – "To support the local distinctiveness in AONB settlements."

15.4 Methodology

15.4.1 The Landscape and Visual Impact Assessment (LVIA) and supporting studies and surveys were conducted for all phases of the proposed development, in accordance with the principles set out by the Landscape Institute (LI) and Institute of Environmental Management Assessment (IEMA) in the Guidelines for LVIA (GLVIA) (Ref. 15.2) and guidance on Landscape Character Assessment from the Countryside Agency (now Natural England) and Scottish Natural Heritage (Ref. 15.18).

15.4.2 GLVIA (Ref. 15.2) states:

> *"Landscape encompasses the whole of our external environment, whether within villages, towns, cities or in the countryside. The nature and pattern of buildings, streets, open spaces and trees – and their interrelationships within the built environment – are equally important parts of our landscape heritage."*

15.4.3 Accordingly, the approach taken for the assessment of townscape is the same as that undertaken for the assessment of landscape.

a) LVIA Study Area

15.4.4 The LVIA study area defines the geographic extent of the landscape and visual impact assessment of the proposed development.

15.4.5 The LVIA study area has been defined through a staged process which has included desk study and field survey. Consultation has also been undertaken with a range of statutory and non-statutory consultees on the extent of the LVIA study area.

15.4.6 Following the analysis of Ordnance Survey mapping at a range of scales, field surveys and consultation, the study area was refined to exclude areas from which the proposed development would not be visible or was judged not to have potential to cause significant landscape and visual impacts, for reasons including screening provided by landform, vegetation or urban form, distance from the proposed development or a combination of these factors.

15.4.7 A summary of the maximum extents of the study area is as follows:

- landscape to the north of the site, up to the edges of Bridgwater along Bristol Road (A38) up to 1.5km;
- landscape to the south of the site, up to and including Colley Lane Industrial Estate up to 1.5km;
- landscape to the east of the site, up to the western edge of Victoria Park up to 1.5km; and
- landscape to the west of the site, up to the M5 motorway corridor up to 1.5km.

15.4.8 The final LVIA study area is illustrated on **Figure 15.1**.

b) Baseline and Assessment Methodology

15.4.9 The approach to assessing and describing the impacts on landscape and visual receptors is similar to that used for other environmental topics in this **ES** and is based on determining impact significance through consideration of the potential magnitude of change in relation to the sensitivity of a particular receptor to change. As such the LVIA is similar to the overall assessment approach set out in **Volume 1, Chapter 7** of this ES.

15.4.10 There are, however, some differences, which largely relate to the landscape/townscape and visual impact assessment process being more complex than other environmental topics (such as water or air quality), since: *"it is determined through a combination of quantitative and qualitative elements"*. It includes a combination of objective and subjective elements; therefore it adopts a structured and consistent approach, incorporates consultation findings and has been undertaken by experienced landscape architecture and assessment professionals.

15.4.11 The methodology used in the assessment of landscape/townscape and visual impacts draws significantly upon professional judgment to accurately establish an understanding of baseline conditions, the sensitivity of landscape/townscape and

visual receptors, the magnitude of impacts arising from the proposed development and the significance of impacts arising.

15.4.12 The detailed methodology for this assessment was subject to consultation with a range of consultees.

15.4.13 There are four key stages in the assessment process:

- Stage 1: Baseline data collection and analysis
- Stage 2a: Receptor Sensitivity – Landscape/Townscape
- Stage 2b: Receptor Sensitivity – Visual
- Stage 3: Magnitude of Impacts
- Stage 3a: Magnitude of Landscape/Townscape Impacts
- Stage 3b: Magnitude of Visual Impacts
- Stage 4: Assessment of Significance

i. Stage 1: Baseline Data Collection and Analysis

15.4.14 This stage establishes the baseline conditions for the LVIA study area and identifies the relevant landscape/townscape and visual receptors. Key activities during the baseline data collection and analysis stage included:

- Desk study to identify potential representative viewpoints.
- Desk study of national landscape/townscape character within the LVIA study area to understand the broad landscape/townscape character context for the proposed development.
- Desk study of local (district and designated landscape/townscape) character assessments to gain a detailed understanding of the landscape/townscape character context of the LVIA study area.
- Field survey to review the selection of representative viewpoints to gain a broad understanding of the visual context of the LVIA study area.
- Field work to verify the desk study of national and local landscape/townscape character assessments and to gain a detailed understanding of the landscape/townscape character of the site and its immediate landscape/townscape context, including analysis of landscape/townscape elements and features for the site.

15.4.15 Representative viewpoints have been selected on the basis of locations that represent a receptor type (such as a group of residential properties). To ensure that selected viewpoints represent the 'worst-case scenario' view for a given receptor, viewpoints were selected which provide the clearest views of the proposed development (e.g. because of their proximity to the proposed development or the absence of visual barriers between the viewpoint and the proposed development) and which are also the most accessible to the public. All representative viewpoints have been agreed with relevant consultees during consultation.

15.4.16 A total of eight representative viewpoints were selected. Initial baseline photographs illustrating views from a series of viewpoints were taken using a Nikon D100 digital

camera, set to the equivalent of a 35mm focal length, which is the equivalent of 50mm film camera lens (equivalent of human eye). Where viewpoints consisted of more than one frame, the relevant frames were merged together using Photovista software (version 2.0).

15.4.17 For the purpose of the assessment of lighting impacts a lighting assessment was commissioned. This Baseline Lighting Report is available in **Appendix 15C**.

15.4.18 The viewpoint panoramas were scaled according to the Advice Note 01/11 from the Landscape Institute, Photography and Photomontage in Landscape and Visual Impact Assessment (Ref. 15.19). The panoramas on the viewpoint sheets have been scaled to be viewed at a distance of 400mm.

15.4.19 Where possible, the selected photographs were taken in winter and show the 'worst-case scenario' (views without foliage). For some views, where vegetation does not obscure views of the site, or it has limited screening effect, views with foliage were considered sufficient for the purpose of the assessment.

ii. Stage 2a: Receptor Sensitivity – Landscape/Townscape

15.4.20 The determination of landscape/townscape sensitivity is an important part of the landscape/townscape and visual impact assessment process. Sensitivity combined with the potential magnitude of impact allows assessment of the overall significance of the landscape/townscape impacts to be made.

15.4.21 According to the GLVIA (Ref. 15.2), the sensitivity of the landscape resource is described as *'The degree to which a particular landscape type or area can accommodate change arising from a particular development without detrimental effects on its character'.* The overall sensitivity of the existing landscape resource will vary with:

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

15.4.22 In addition to the above list of considerations, GLVIA also considers that sensitivity of the landscape resource is based on evaluation of factors such as quality, value, contribution to landscape character and degree to which elements can be replaced or substituted.

15.4.23 Evaluation of value or importance often refers to policy or designations as an indicator. Importance relates to the contribution of the landscape/townscape element/feature, character or views within the local area and is a factor of its scenic quality, condition, sense of place, visibility, accessibility and special qualities such as remoteness. Not all characteristics are uniformly spread throughout designated landscapes so the importance of the site is considered within the designated area.

15.4.24 For assessment purposes, the sensitivity of a landscape/townscape receptor is based on the application of the above criteria, informed by field surveys undertaken by landscape professionals, professional judgment of the assessor and consultation.

15.4.25 **Table 15.1** shows the potential gradations of sensitivity of landscape/townscape receptors (high, medium, low or very low).

Table 15.1: Guidelines for the Assessment of Landscape/Townscape Sensitivity

Sensitivity	Description
High	A landscape/townscape of particularly distinctive character and scenic quality. Nationally and regionally designated landscape/townscape for its scenic quality and character.
Medium	A landscape/townscape of moderately distinctive character and scenic quality. Locally designated landscape/townscape for its scenic quality and character.
Low	A landscape/townscape of no distinctive character and scenic quality. A landscape/townscape not subject to any form of landscape/townscape designation.
Very low	A landscape/townscape that is damaged, neglected or poor character and lacking scenic quality. A landscape/townscape not subject to any form of landscape/townscape designation.

15.4.26 By way of an example, a landscape/townscape that is nationally designated, such as an AONB, is regarded as being the most sensitive to change. A landscape/townscape that is relatively intact, of some scenic quality and locally designated would be judged to be of medium sensitivity. A landscape/townscape that is neglected and damaged or lacking scenic quality, such as a brownfield site, might be judged to be of low or very low sensitivity.

iii. Stage 2b: Receptor Sensitivity – Visual

15.4.27 Visual sensitivity is established in relation to visual receptors. Visual receptors are interest or viewer groups that may experience an impact arising from the proposed development. According to GLVIA, the sensitivity of visual receptors depends on:

- *"The location and context of the viewpoint.*
- *The expectations and occupation or activity of the receptor.*
- *The importance of the view (which may be determined with respect to its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art)."*

15.4.28 **Table 15.2** shows the potential gradations of sensitivity of visual receptors (high, medium, low or very low).

Table 15.2: Guidelines for the Assessment of Visual Receptor Sensitivity

Sensitivity	Description
High	Viewers with a proprietary interest, specific interest in the view and prolonged viewing opportunities. Examples include: • Occupiers of residential properties. • Visitors to tourist attractions. • Recreational receptors using recreational facilities such as National Cycle Routes, National Trails, and designated long distance footpaths. • Recreational receptors using PRoW or viewpoints in nationally or locally designated landscapes/townscapes.
Medium	Viewers with a moderate interest in their surroundings such as : • Users of schools. • Users of outdoor recreational facilities where landscape/townscape appreciation is unlikely to be a primary motive. • Local viewpoints. • Users of local Public Rights of Way.
Low	Viewers with a passing interest in their surroundings such as: • Road or other transport users.
Very low	Viewers with no interest in their surroundings such as: • People at their place of work.

15.4.29 By way of an example, residential receptors are generally considered to be the most sensitive receptor group owing to their propriety interest and their prolonged exposure. Recreational receptors, such as people engaged in outdoor sports are considered of medium sensitivity although recreational receptors whose attention or interest is focused on the landscape/townscape may also be considered to be highly sensitive. The least sensitive group are those with no interest in their surroundings or those which are already affected by similar types of visual impact to those arising from the proposed development or those which have a passing interest in the surroundings, such as motorists on a busy motorway.

15.4.30 It should be noted that for each of the representative visual receptors used in the assessment, a range of visual receptor types may be represented. In all cases the highest sensitivity will be taken forward to the assessment of significance.

15.4.31 For assessment purposes, the sensitivity of representative visual receptors is based on the application of the above criteria, informed by field surveys undertaken by landscape professionals, the professional judgment of the assessor and consultation with statutory and non-statutory consultees.

iv. Stage 3: Magnitude of Impacts

15.4.32 According to GLVIA, the magnitude of impacts is a *"combination of the scale, extent and duration of an effect".* The magnitude of landscape/townscape and visual impacts are judged separately using the criteria set out below.

v. Stage 3a : Magnitude of Landscape/Townscape Impacts

15.4.33 The magnitude of landscape/townscape impacts is defined as high, medium, low or very low and depends upon the following factors:

- scale or degree of change to the existing landscape/townscape resource;
- nature and duration of the change caused by the proposed development (for example beneficial or adverse); and
- timescale or phasing of the proposed development.

15.4.34 Guidelines for the assessment of magnitude of landscape/townscape impacts are presented in **Table 15.3**.

Table 15.3: Guidelines for the Assessment of Magnitude of Landscape/Townscape Impacts

Magnitude	Description
High	Total or widespread loss or major alteration to key landscape/townscape elements/characteristics.
Medium	Partial loss or alteration to one or more key landscape/townscape elements/characteristics.
Low	Limited loss or alteration to one or more key landscape/townscape elements/characteristics.
Very low	Extremely limited loss or alteration to one or more key landscape/townscape elements/characteristics.

vi. Stage 3b: Magnitude of Visual Impacts

15.4.35 The magnitude of visual impacts is defined as high, medium, low or very low and depends upon the following factors:

- the scale of change or proportion of the existing view that would change as a result of the proposed development;
- the loss or addition of features or elements within the view;
- the degree of contrast or integration of the proposed development with the existing or remaining landscape/townscape elements and characteristics within the view;
- the nature of the impact, whether it is adverse, beneficial or neutral;
- duration of the impact, whether it is temporary or permanent, continuous or intermittent;
- the angle of the view in relation to the main activity of the receptor; and
- the distance of the viewpoint from the proposed development.

15.4.36 Guidelines (Ref 15.2) for the assessment of magnitude of visual impacts are presented in **Table 15.4**.

Table 15.4: Guidelines for the Assessment of Magnitude of Visual Impacts

Magnitude	Description
High	Complete change or widespread alteration to the existing view.

Medium	Noticeable but localised alteration to the existing view.
Low	Partial and very localised alteration the existing view.
Very low	Barely perceptible change to the existing view. It may be difficult to differentiate the proposed development from its surroundings.

vii. Nature and Duration of Impacts

15.4.37 The nature of impacts contributes to the assessment of magnitude of landscape/townscape and visual impacts.

15.4.38 The nature of impacts can be adverse, beneficial or neutral. In the situation where no or little change is predicted the impact is assessed as neutral.

15.4.39 With regard to the duration of landscape/townscape and visual impacts, short to medium-term impacts are normally considered to be temporary and associated with the construction of the proposed development; and long-term impacts are normally associated with a fully occupied and operational scheme. Permanent impacts are those which result in an irreversible change to baseline conditions or will last for the foreseeable future. For more details on the methodology applied see **Volume 1**, **Chapter 7** of the ES.

15.4.40 The duration of landscape/townscape and visual impacts is typically categorised as follows:

- long-term – 15 years plus;
- medium-term – 5 to 15 years; and
- short-term – 0 to 5 years.

viii. Stage 4: Assessment of Significance

15.4.41 The potential significance of landscape/townscape and visual impacts is determined by assessing the magnitude of the identified impacts against the sensitivity of the landscape and visual receptors affected. The Impact Assessment Matrix (IAM) presented in **Volume 1**, **Chapter 7** of the ES provides a guide to decision-making but is not a substitute for professional judgement and interpretation, particularly when sensitivity or impact magnitude levels are not clear or are borderline between categories.

15.4.42 **Table 15.5:** provides a brief definition of the significance criteria which are specific to landscape/townscape and visual impact assessment and are in accordance with the overall EIA sensitivity criteria outline in **Volume 1**, **Chapter 7** of the ES.

Table 15.5: Significance Criteria

Level of Significance	Description
Major	Very important or substantial change in landscape/townscape and visual conditions. Impacts may be adverse or beneficial.
Moderate	Noteworthy or medium change in landscape/townscape and visual conditions. Impacts may be adverse and beneficial.
Minor	Inconsiderable or small change in landscape/townscape and visual conditions.

	Impacts may be adverse, neutral or beneficial.
Negligible	No discernable change in landscape/townscape and visual conditions. Impact is likely to have a negligible (neutral) influence, irrespective of other impacts.

15.4.43 By way of an example, major landscape/townscape and visual impact may occur where a large scale development is proposed within a nationally designated landscape/townscape leading to partial loss or alteration to one or more key landscape/townscape elements/characteristics. In visual terms, a major impact may arise where a large number of residential receptors would experience noticeable but localised alteration to the existing view.

15.4.44 With reference to the EIA methodology (see **Volume 1**, **Chapter 7** of the ES), predicted impacts of major and moderate significance equate to a significant impact in planning terms.

ix. Residual Impact Assessment

15.4.45 Where no mitigation has been proposed residual impacts remain the same as those initially assessed.

x. Cumulative Impacts

15.4.46 The HPC project-wide cumulative impacts and in-combination impacts with other proposed, or reasonably foreseeable development or projects, are assessed in **Volume 11**.

c) Consultation

15.4.47 Comments from the formal stages of consultation (Stage 1, Stage 2 and Stage 2 Update) have been taken into account within the assessment (see the **Consultation Report** for details).

15.4.48 Consultation undertaken outside the Stage 1, Stage 2 and Stage 2 Update consultations was also carried out. It included meetings and correspondence exchanged with a variety of organisations to discuss all stages of the LVIA, such as extents of study area, the landscape/townscape and visual baseline and landscape/townscape and visual impacts, including lighting, development footprint and design, and mitigation proposals.

15.4.49 The principal assumptions and limitations for the LVIA are described below:

- Landscape/townscape and visual surveys that contribute to the assessment were undertaken between December 2008 and May 2011.
- The assessment of the lighting impacts of the proposed development on visual amenity is based on the construction and operational lighting strategies and health and safety requirements. The lighting strategy is considered part of the design of the proposed development.

15.5 Baseline Environmental Characteristics

a) Introduction

15.5.1 This section describes the landscape/townscape and visual baseline environmental within the 1.5km study area.

b) Site Description

15.5.2 The site is located to the north-east of Bridgwater, the largest town within the administrative area of Sedgemoor District Council. The site is approximately 12km south-east of the HPC development site (see **Chapter 2** of this volume for details; and **Figure 1.2** of this volume).

15.5.3 The site covers an area of approximately 1.9ha. It is currently used by Bridgwater and Albion Rugby Football Club as its second team training pitch; vehicle parking for the Club and Bridgwater College; and highways land.

15.5.4 College Way runs along the north-eastern and eastern boundary of the site, with green space located on the eastern side of College Way. The gardens of residential properties on Fairfax Road back on to this green space.

15.5.5 The site is bounded to the south by an access road into Bridgwater Town Football Club. Bridgwater College campus is located to the south of this access road, which includes: educational buildings, recreational facilities, car parking, a bus terminus and other related development.

15.5.6 The Bridgwater and Albion Rugby Football Club's first team pitch, clubhouse and two spectator stands are located immediately adjacent to the western boundary of the site. Beyond this is the Bridgwater to Highbridge railway line, with Bridgwater railway station approximately 1.3km to the south-west of the site.

c) Statutory Designations

i. International and National

15.5.7 There are four Scheduled Monuments within 1.5km of the site, which include:

- Horsey Deserted Medieval Village.
- A telescopic rail bridge over River Parrett.
- The Chandos Glass Cone.
- The Brick and Tile Kiln.

ii. Regional and Local

15.5.8 Regional and local designations within 1.5km of the site are shown on **Figure 15.2** and include the following.

15.5.9 The nearest Green Wedge designation is located approximately 500m to the north-west of the site, within Bridgwater.

15.5.10 Part of proposed development site is located within a designated area of Recreational Open Space (see **Chapter 1** of this volume of the ES for details).

15.5.11 A Locally Important Nature Conservation Site is located approximately 920m north-east of the site.

15.5.12 The nearest Conservation Area is located approximately 540m to the south-west of the site.

15.5.13 Listed Buildings are present in the area, the nearest one being approximately 540m north of the site boundary (i.e. Little Sydenham Manor).

d) Landscape/Townscape Character

i. National Landscape Character

15.5.14 At the national level, the landscape character assessment for the site and landscape character study area is defined by the Countryside Agency's own assessment work (Ref. 15.20). This document identifies the site and study area within Area 142/143: Somerset Levels and Moors/Mid Somerset Hills. The key characteristics are:

- *"Flat, open landscape of wet pasture, arable and wetland divided up by wet ditches or 'rhynes'.*
- *Absence of dispersed farmsteads or any buildings on levels and moors. Nucleated settlements on ridges/islands.*
- *Surrounded, and divided up, by low hills, ridges and islands which form distinctive skylines.*
- *Peat working and nature reserves contrasting with the rectilinear planned landscape of the Moors.*
- *Dramatic and prominent hills such as Brent Knoll, the Isle of Avalon and Barrow Mump, rising above the Levels and Moors.*
- *Sparse tree cover on Levels and Moors contrasting with woodland, hedges and orchards of surrounding hills.*
- *Sparsely populated Moors but settlements common on hills, ridges and islands.*
- *Historic landscape strongly evident in features ranging from prehistoric trackways and lake villages, to post-medieval enclosures and peat working.*
- *International nature-conservation significance for wetland, waders and waterfowl.*
- *Narrow dune belt fringing Bridgwater Bay.*
- *Raised rivers and levées, with main roads and causeways flanked by houses. Flooding in winter over large areas."*

ii. Evaluation of County and District Landscape Character

15.5.15 There are no county level character assessments, but at the more detailed district level, the landscape character has been described in a number of landscape character studies. The 'Sedgemoor Landscape Assessment and Countryside Design Summary' (Revised edition 2003) (Ref. 15.16) has been reviewed to inform the baseline.

15.5.16 Although the site is within the urban area of Bridgwater, the key characteristics of the relevant landscape character area around Bridgwater are summarised below.

Levels and Moors

15.5.17 Somerset Levels and Moors are a vast area of drained wetland with limited tree cover and a strong sense of openness. The Moors are an area of summer pastures criss-crossed with a geometric pattern of rhynes, long straight access droves and distinctive pollarded willows (Salix spp.) or hawthorn (Crataegus monogyna) hedgerows. The sub-area of this landscape character area that is of particular relevance to the proposed development site is:

- Levels sub-area – lowland areas, largely flat landscape, irregular field pattern defined by a combination of drainage channels and hedges; hedgerows and hedgerow trees; inhabited and civilised character; the Levels have a long history of settlement being higher than the Moors, despite being the location for the district's main urban areas much of the countryside retains a sense of quiet and unspoilt rural charm. Historically, brick and tile making has been an important local industry using the extensive clay deposits, Bridgwater is particularly renowned for its brick and tile industry. Although no longer in operation these works have left their mark in the local built environment. The M5 motorway and the railway from Bridgwater to Highbridge run through the Levels and constitute important view corridors in terms of perceptions of the landscape. The approach to the urban area of Bridgwater is one where industrial activities create a negative impression of the town. Careful choice of colours for roofing and cladding of buildings is important and landscaping should be undertaken with screening in mind. Development proposals should examine the relationship between locations and the use of local stone or bricks as principal building materials. Careful consideration should be made of rooflines and the retention or creation of soft edge characteristics.

15.5.18 The site is located within the urban area of Bridgwater. Therefore, no county or district landscape character studies are available. Instead, the local townscape of Bridgwater has been examined (see below).

iii. Evaluation of Local Landscape/Townscape Character

15.5.19 The Bridgwater Vision (Ref. 15.15) is a blueprint for the future of Bridgwater to 2060. It has been created by the 'Bridgwater Challenge', a partnership of local, county and regional organisations, led by SDC. The report has informed the preparation of the Core Strategy as part of the Sedgemoor Local Development Framework (Ref. 15.14).

15.5.20 The Vision for the town is supported by a series of design principles. The Vision also incorporates a Strategic Spatial Diagram which presents the preferred spatial approach to delivering new development and possible future areas of growth across the town as well as encompassing existing projects. A description of the specific character areas that together make up the Spatial Plan as a whole is provided with a mini vision for each area. Those townscape character areas which lie within 1.5km of the site are shown on **Figure 15.3**. An outline description of the townscape character areas from the Bridgwater Vision which are relevant to the baseline are described below. A summary of the Vision is included at **Appendix 15A**. Sensitivity ratings and descriptions of condition have not been assigned to townscape character areas within the Vision. However, in order to establish a baseline against which to assess

potential impacts of the proposed development, ratings have been given as part of this assessment following site visits and further consideration of the relative sensitivity and condition of each of the townscape character areas relevant to the baseline.

15.5.21 The site is located within the townscape character area of Sydenham and Bower. Of relevance to the site are the townscape character areas of North East Bridgwater, Wyld's Road, the Town Centre and Eastover.

15.5.22 The townscape character areas of North Bridgwater and Bristol Road and Colley Lane are not considered to be affected by the proposed development given their distance of approximately 950m and 700m away from the site, respectively, albeit their local character is described since they lie within the study area. Similarly the townscape character areas of Hamp and Newtown and Victoria lie across the River Parrett and because of this are considered to avoid significant impact, at a distance of approximately 830m and 1000m away from the site, respectively, and so are not assigned a sensitivity. However a brief description of the areas is included below:

Sydenham and Bower Townscape Character Area

15.5.23 Sydenham was developed as a major expansion of Bridgwater during the 1960s and is now one of the largest residential districts of the town. The area lies to the east of the town centre between the railway line and the M5 motorway corridor, with the A38 (Bristol Road) running along its northern boundary. The Parkway, a local road, is a key central feature with a strong line of electricity pylons running along the road. Housing within Sydenham is predominantly Council owned, post-war, of prefabricated construction, two storey, semi-detached houses, with some rows of Victorian terraced properties. The East Bower area which lies adjacent to the M5 motorway corridor comprises more recent housing development based around a series of cul-de-sacs.

15.5.24 This character area's sensitivity has been assessed as low. The condition of residential areas within this character area is considered to be poor with little scenic quality and the area is disturbed by heavy traffic along the A39 (Bath Road). The are no national, regional or local designations of importance.

North East Bridgwater Townscape Character Area

15.5.25 This area includes the BCL/Innovia site, Little Sydenham Farm and undeveloped land extending north to King's Sedgemoor Drain just south of Junction 23 of the M5 motorway. The railway line forms the western boundary and the M5 motorway corridor to the east. The boundary to the south is formed by the A39 (Bath Road) which provides the current access into the area. The land forms part of the foreground view of Bridgwater from the M5 motorway and the edge of the Polden Hills and as such new development will provide an important image of Bridgwater.

15.5.26 The sensitivity of this character area has been assessed as low. Much of the area is made up of industrial buildings which are in poor condition and now mostly derelict. The area has a disturbed feel created by the combination of the M5, the main railway line and the A39 (Bath Road). Sydenham Manor House is a Listed Building of local importance, however, it is not publically accessible and its setting is already affected by industrial buildings around it (see **Chapter 16** of this volume for details on the historic environment).

Wylds Road Townscape Character Area

15.5.27 Lying to the north-east of the town centre, this industrial and business area has attracted some renewal of premises in recent years. Industrial and warehousing uses dominate in the Castle Field Industrial and Business Estate. A few office buildings are located in the area and a significant number of 'trade counters' and commercial trade uses, including car and motorcycle sales and DIY/bulky goods retailers. The area between the A38 (Bristol Road) and the railway lines includes the former Cattle Market, the Bristol Road playing field, allotment gardens and residential uses. The southern part of the area is close to the town centre and is bordered by the Bridgwater Retail Park. The area is a key gateway into the town centre and occupies a prestigious position on the river. Most of the existing industrial buildings back onto the river and present a poor image of the town to users passing on Wylds Road towards the town centre. The Bridgwater Northern Distributor Road runs through the area to join the A38 (Bristol Road) and links the area with the A39 (Bath Road) to the west.

15.5.28 The sensitivity of this character's area has been assessed as low. The area has an industrial character and is in a poor condition. Four locations have been noted as archaeological sites of county importance in the area but are located between the main railway line and the A38 (Bristol Road).

Town Centre Townscape Character Area

15.5.29 The Town Centre character area is currently defined by the area around the High Street, Fore Street and St Mary Street, incorporating the Angel Place Shopping Centre and parts of Eastover to the east of the river. The core of the town centre has a major part to play in the future of Bridgwater. Some regeneration works have been implemented including traffic management and paving schemes for the High Street, the refurbishment of the Cornhill Building and improvements in Angel Place. The area on the eastern side of the River Parrett has increasingly become a marginal part of the town centre with the secondary retail area along Eastover. The eastern part of the town centre also incorporates an Asda superstore, the town's bus station, Bridgwater Retail Park and a number of potential development sites (which are presently underutilised).

15.5.30 The River Parrett runs north-south through the town centre with a number of buildings of interest along its banks, combined with some poorer quality and vacant units along the water's edge. The river is currently underutilised; there is a lack of direct access to the water's edge, discontinuous connections along the waterside and a dominance of traffic across the town bridge and along West Quay/Binford Place and East Quay/Salmon Parade which directly front the river.

15.5.31 The townscape character area's sensitivity has been rated as high. A large proportion of the area has been designated with Conservation Area status, there is a high number of Listed Buildings and three nationally designated Scheduled Monuments. The general condition of the area, with its recent improvements, is high.

Eastover Townscape Character Area

15.5.32 This area lies to the east of the A38 (Broadway) and west of the railway line, bordered to the north and south by the industrial estates around Wylds Road and Colley Lane. The area is predominantly residential in character with rows of terraced

housing built at the same time as the railway. Business uses have become established over time in this traditional residential area, particularly along the A38 (Broadway) and around the railway line. This area has become an increasingly marginal part of the town with rising numbers of vacant properties, rundown buildings and poor quality streetscape. The area is dominated by through traffic along St John Street and the A38 (Broadway) which creates a strong physical boundary between the area and the town centre and also divorces the railway station, which is located at the eastern end of St John Street, from the centre.

15.5.33 Cranleigh Gardens/Eastover Park is located at the centre of the area and consists mainly of open grass spaces which are surrounded by mature and semi-mature trees and incorporates a fenced play area, Eastover Park tennis centre, bowling club and football pitch.

15.5.34 The character area's sensitivity has been assessed as medium. Whilst some of this area has become rundown, the strong character of Victorian terraces and the significance of Cranleigh Gardens/Eastover Park locally, along with a number of Listed Buildings, makes this an important area within the town.

North Bridgwater and Bristol Road Townscape Character Area

15.5.35 The northern approach to Bridgwater has seen the most dramatic changes in recent years with the development of Express Park between the A38 (Bristol Road) and the River Parrett. Express Park was established in 1999 and has attracted larger scale warehousing and manufacturing businesses and substantial office development along with conference and other facilities. The character area extends between the River Parrett and the railway from the outskirts of the town to Dunball and Junction 23 on the M5 motorway. This includes a significant area of land that has not been allocated for development, sites which are or have been the subject of major proposals and established employment areas on the A38 (Bristol Road) on the edge of Bridgwater and either side of the A38 (Bristol Road) at Dunball. The area covers a significant section of the river bank and is prominent on the A38 (Bristol Road) frontage.

Colley Lane Townscape Character Area

15.5.36 Colley Lane is situated south-east of the town centre, east of Taunton Road, with the railway line forming the eastern boundary of the site and the River Parrett the western edge. It is one of the principal employment areas in the town incorporating a mix of old industrial and warehouse units, many of which have been subdivided into smaller units. Existing development largely ignores the long river frontage.

Hamp Townscape Character Area

15.5.37 This area is predominantly residential in character and includes the large post-war estate of Hamp and more recent housing developments to the south, along Wills Road. There is also a more mixed area of development between the A38 (Taunton Road) and the River Parrett. The Bridgwater and Taunton Canal and the River Parrett run through the Hamp area.

Newtown and Victoria Townscape Character Area

15.5.38 The Newtown and Victoria character area is situated north of the town centre and is defined by the River Parrett and the Bridgwater and Taunton Canal along the eastern

boundary and the route of Western Way (the Bridgwater Northern Distributor Road (BNDR)) along its western edge which then passes through Chilton to cross the river. Newtown and Victoria comprises an estate of local authority homes, although many are now privately owned. It is well located just to the north-west of the town centre. Chilton is also primarily residential and lies further north of Western Way.

iv. Evaluation of Site-specific Townscape/Landscape

Landform

15.5.39 The site and surrounding area is generally flat and lies within the Bridgwater floodplain.

15.5.40 Vegetation cover and surrounding development mask the landform and this is not considered an important feature of its character. The sensitivity of the landform has therefore being assessed as low.

Land Use/Settlement

15.5.41 The site consists of a small surfaced car park (on the northern edge of the site) and a sports training pitch. The site forms part of a wider Recreational Open Space which incorporates additional land to the west including the Bridgwater and Albion Rugby Football Club facilities, which include: sports pitches, supporter stands and a clubhouse. The proposed development site and land to the north and south are predominantly open in character. Bridgwater College campus to the south comprises a cluster of large scale red brick buildings surrounded by surfaced car parking areas and open space. To the west of the site across the railway lines is a business area consisting of a number of large scale, single storey light industrial buildings. To the east of the site, Sydenham is a residential suburb comprising predominantly council-owned post-war housing.

15.5.42 As the land use is determined by the local designation of Recreational Open Space its sensitivity is assessed as medium.

Landcover and Vegetation

15.5.43 The main habitat type within the site is species-poor amenity grassland (a rugby pitch). The site also includes small areas of rough grassland and planted trees. The northern boundary and part of the eastern boundary support planted stands of young broad-leaved trees including field maple (*Acer campestre*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), apple (*Malus domestica*) and spindle trees (*Euonymus europaeus*) along with mature willows (*Salix spp.*) and poplars (*Populus alba*) (see Tree Survey in **Appendix 15B**). All but three of the trees surveyed are of category B (trees of moderate quality and value from an arboricultural perspective) with the remaining three classed as category C (trees of low quality and value from an arboricultural perspective). There are no trees subject to a Tree Preservation Order (TPO) within the site boundary. Vegetation along the eastern boundary consists mainly of dense bramble (*Rubus fruticosa*). Two silver birch (*Betula pendula*) are located within the bramble along the eastern boundary, the most southerly of which has had its top removed and is of poor landscape and arboricultural quality.

15.5.44 The quality of the vegetation and landcover within the site results in a low sensitivity.

Watercourses/Water Bodies

15.5.45 There are two shallow drainage ditches within the site to the eastern boundary, parallel with a hedgerow.

15.5.46 These are not considered to be important elements within the site and therefore sensitivity is considered to be very low.

Public Rights of Way

15.5.47 There are no PRoW within the site.

e) Visual Receptors

15.5.48 A combination of desktop study and field survey has confirmed a range of visual receptors who would be affected by the proposed development. These are listed below:

- pedestrians and drivers on the A39 (Bath Road);
- users of the Bridgwater and Albion Rugby Football Club;
- residential properties along Fairfax Road;
- users of Bridgwater College and associated car park;
- users of Bridgwater College sports grounds; and
- train passengers on the Bridgwater to Highbridge main railway line.

15.5.49 Long distance views of the town are available from the Puriton Hill to the north-east of the site and from the Quantock Hills AONB to the west. The site would be not be visible from these areas. The potential impact of lighting on the AONB has been considered; however any effect would be imperceptible in the context of the presence of lighting within the urban area.

15.5.50 These are represented by a series of viewpoints. The Visibility and Viewpoint Location Plan for the proposed development is shown on **Figure 15.4**. The viewpoints selected are shown on **Figures 15.5** to **15.12**.

i. Viewpoint Descriptions

Viewpoint 1 – Bath Road, Footway

15.5.51 This viewpoint is located on a footway and is representative of views experienced by pedestrian users of the A39 (Bath Road). The viewpoint is at an elevation of 13m (including 1.7m eye level) and is positioned approximately 180m from the site within an employment area of the town. The view is experienced predominantly by pedestrians but also by motorists on the A39 (Bath Road). The Bridgwater and Albion Rugby Football Club spectator stands and a small garage are distinctive urban features within the view and, combined with surrounding vegetation, screen the site from this viewpoint. At night highway lighting illuminates the area. A railway line running in cutting in the north-south direction is screened by topography, a garage and shrubs, however passing trains are visible from this viewpoint.

15.5.52 A glimpsed view of the site is available through a gap between the existing football club buildings. Lighting columns used to illuminate the football pitch adjacent to the

western boundary of the site are visible above the rooftops both during the day as clutter along the skyline and at night when illuminated. The sensitivity of visual receptors at this viewpoint has been rated as low due to its location on a footway of low importance running along a local road (**Figure 15.5**).

Viewpoint 2 – Bath Road, Footbridge

15.5.53 This viewpoint is located on a footbridge over the railway and is representative of drivers on the A39 (Bath Road) (A39). The viewpoint is at an elevation of 15m (including 1.7m eye level) and is positioned approximately 110m from the site. The view is experienced predominantly by motorists, but also by pedestrians, using the A39 (Bath Road). Glimpsed views of the site are available through dense hedgerow and tree planting along Bath Road, which would almost completely screen the site in summer, when vegetation is in leaf. The football pitch adjacent to the western boundary of the site is visible in the right part of the view. A telecommunications mast is visible in the middle of the view. A wooden fence, the access road to the football club and lighting columns are visible in the left part of the view. At night highway lighting illuminates the area. A residential housing area located to the east of the site is partially visible in the far distance.

15.5.54 The view is simple due to the density and quantity of the planting visible in the foreground which screens views towards the site from this part of the A39 (Bath Road). The sensitivity of visual receptors at this viewpoint has been rated as low due to its location on a footway of low importance running along a local road (**Figure 15.6**).

Viewpoint 3 – Bath Road/College Way

15.5.55 This viewpoint is located at the corner of the A39 (Bath Road) and College Way and is representative of pedestrians, cyclists and drivers on the A39 (Bath Road) to the north of the College. The viewpoint is at an elevation of 12m (including 1.7m eye level) and is positioned approximately 90m from the site. The main features within this view are the road, small areas of grassland and dense vegetation which screens the site. Other elements include basic road infrastructure, such as lamp posts and road signs. The dense hedgerow and tree planting along College Way screens the site, even in winter. The effectiveness of this screen is increased in the summer when the vegetation is in leaf. A very limited, glimpsed view of the large football club buildings/structures, located to the west of the site, is available. At night highway lighting illuminates the area. The sensitivity of visual receptors at this viewpoint has been rated as medium due to its location on a frequently used cycleway of local importance (**Figure 15.7**).

Viewpoint 4 – Access Road to Sport Grounds

15.5.56 This viewpoint is located on the access road to the sports ground and is representative of views experienced by members of the adjacent Bridgwater and Albion Rugby Football Club. The viewpoint is at an elevation of 12m (including 1.7m eye level) and is positioned at the site boundary, adjacent to the car park located within the northern part of the site. The view is experienced by drivers and pedestrians entering the car park. Open views into the site are available from this viewpoint. A gravel car park and a football pitch with associated lighting columns are clearly visible. A group of trees with some understory obscures views towards the football pitch adjacent to the western boundary of the site. Bridgwater College and

the residential housing of Fairfax Road are visible in the background, however a vegetation buffer along College Way and tree planting within the College's car park adjacent to the southern boundary of the site screen the majority of built form. The sensitivity of visual receptors at this viewpoint has been rated as low due to its location on an access road (**Figure 15.8**).

Viewpoint 5 – Footway/Backs of Residential Properties on Fairfax Road

15.5.57 This viewpoint is located on a footway, off College Way, to the rear of residential properties on Fairfax Road and is representative of these properties. The viewpoint is at an elevation of 11m (including 1.7m eye level) and is positioned approximately 30m from the site. The view is experienced by users of the footway and the residents of Fairfax Road. The viewpoint provides open views into the southern part of the site from the east. The site and the adjacent football club with its two large buildings occupy the majority of the view. College Way and adjacent grassed areas are visible in the foreground and the nearest planting is limited to an unmanaged, poor quality, hedgerow and some tree planting along College Way. A distinctive tree line of lombardy poplars (*Populus nigra)* is aligned with the railway and is visible, in the far distance, in the right hand side of the view. Stadium floodlighting masts, lamp posts, telecommunications masts and goal posts are distinctive vertical elements within the view which punctuate the skyline. At night lighting levels are high with intermittently used stadium floodlights and constant highway lighting. The sensitivity of visual receptors at this viewpoint has been rated as medium due to its location on a frequently used footway (**Figure 15.9**).

Viewpoint 6 – Bridgwater College Car Park

15.5.58 This viewpoint is located within Bridgwater College's car park and is representative of users of the College and its associated car parks. The viewpoint is at an elevation of 10m (including 1.7m eye level) and is positioned at the southern edge of the site. The view is experienced by car park users and pedestrians. The rugby pitch within the site occupies the majority of the view. Security fencing is visible in the foreground. Limited views of Bridgwater residential and commercial areas are available from this viewpoint due to tree and hedgerow planting along College Way and the A39 (Bath Road). A few of the highest structures within the industrial area are to the west of the A39 (Bath Road). Car park lighting is lit until 22.00. The sensitivity of visual receptors at this viewpoint has been rated as low due to its location within the local car park (**Figure 15.10**).

Viewpoint 7 – Bridgwater College Northern Car Park

15.5.59 This viewpoint is located within the northern car park at Bridgwater College and is representative of users of the College and its associated car parks. The viewpoint is at an elevation of 10m (including 1.7m eye level) and is positioned approximately 90m from the southern boundary of the site. The view is experienced by car park users and pedestrians. The view is dominated by a large area of tarmac, and is cluttered by a variety of vertical elements, such as pitch and street lighting columns, road signs and goal posts. It has a complex character due to high number of elements within the view. Views of vegetation are limited to tree and hedgerow planting along College Way and the A39 (Bath Road) visible in the far distance. Car park lighting is lit until 22.00. Direct views into the site are partially screened by a managed hedgerow planted at the edge of the college car park. The sensitivity of

visual receptors at this viewpoint has been rated as low due to its location within the College car park (**Figure 15.11**).

Viewpoint 8 – Bridgwater College Western Car Park

15.5.60 This viewpoint is located within the western car park at Bridgwater College and is representative of users of the College and its associated car parks and users of the College sports grounds. The viewpoint is at an elevation of 10m (including 1.7m eye level) and is positioned approximately 170m from the southern boundary of the site. The view is experienced by car park users and pedestrians. The view is dominated by a large area of tarmac within the college car park and a college building. It is cluttered by a variety of elements, such as lamp posts within the sports pitches and the car park, road signs and goal posts. It has a complex character due to the high number of elements within the view. Views of vegetation are limited to tree and hedgerow planting along College Way and the A39 (Bath Road) visible in the far distance and some amenity tree planting within the car park visible in the left hand side of the view. Car park lighting is lit until 22.00. Direct views into the site are partially screened by a managed hedgerow, planted at the edge of the College car park, cars within the car park and the College building. The sensitivity of visual receptors at this viewpoint has been rated as low due to its location within the College car park (**Figure 15.12**).

ii. Summary

15.5.61 The site and surrounding area are generally flat. The most significant views into the site are experienced from the neighbouring Bridgwater College to the south (Viewpoints 6, 7 and 8), Bridgwater and Albion Rugby Football Club to the west and residential areas and College Way to the east (Viewpoint 5). The site's visibility is generally limited to a very short distance. Views from the A39 (Bath Road) (Viewpoints 3 and 4) are partially screened by the existing commercial developments and vegetation, which would provide dense screening within the summer months (Viewpoints 1 and 2).

15.5.62 **Table 15.6** provides a summary of the viewpoints.

Table 15.6: Summary of Viewpoints

ID	Viewpoint Name	Figure number	Receptor	Distance from Site	Sensitivity
1	Bath Road, footway	15.5	Drivers, pedestrians	180m	Low
2	Bath Road, footbridge	15.6	Drivers, pedestrians	110m	Low
3	Bath Road/College Way Gyratory	15.7	Drivers, pedestrians, cyclists	90m	Medium
4	Access road to sport grounds	15.8	Drivers, pedestrians	0m	Low
5	Footway/backs of residential properties on Fairfax Road	15.9	Footpath users	30m	Medium
6	Bridgwater College car park	15.10	Visitors to Bridgwater and Albion Rugby Football Club, pedestrians, drivers	0m	Low
7	Bridgwater College northern car park	15.11	Car park users, pedestrians	90m	Low
8	Bridgwater College western car park	15.12	Car park users, pedestrians	170m	Low

15.6 Assessment of Impacts

a) Introduction

15.6.1 This section assesses the potential impacts on landscape character and representative visual receptors (as identified in Section 15.5) which would result from the construction, operational and post-operational phases relating to the proposed development.

15.6.2 The proposed development includes measures to mitigate the impacts on landscape and visual amenity within its design.

15.6.3 The design (including the temporal nature of the proposed development) has evolved so as to minimise the impacts on landscape and visual amenity, informed by an understanding of the character and visual structure of the landscape and an understanding of the functional and operational objectives of the proposed development.

b) The Proposed Development

15.6.4 The landscape proposals for the proposed development include the following measures:

- Outdoor amenity, seating and circulation spaces have been organised along a central hard paved pedestrian spine running on a north/south axis through the site. This has been designed to support connections through the site.
- A linear grove of silver birch under planted with ivy (*Hedera helix*) is proposed against the western edge of the central spine to buffer the interface against the car park and sports pitches.

- The area to the north of the new car park would be retained as an amenity grass open space to provide an informal kick around area for workers during occupation.
- The eastern boundary of the site would be enhanced with new tree and shrub planting to provide a strong landscape frontage to College Road which acts as the main gateway to Bridgwater College, as well as mitigating views from residential receptors to the east. Tree planting is proposed to be field maple and ash heavy standards informally grouped to complement the existing native tree groups to the north-east of the site. The existing swale along College Way would be retained and the road verge enhanced with wildflower meadow planting.
- New informal hedgerow and tree planting would be provided against the western boundary of the site as a buffer/screen against the rugby pitch and its spectators stand.
- New tree and shrub planting will be provided to the southern boundary of the site to improve the appearance of the access road into the Bridgwater Town Football Club.

15.6.5 Native species have been used where possible to enhance the value of the site to wildlife. Species have been selected to be robust, relatively fast growing, drought tolerant and tolerant of the ground conditions.

15.6.6 The proposed development would use a simple palette of hard paving materials with warm tones chosen to complement the proposed building facades and nearby red brick façade of Bridgwater College. Permeable paving units are proposed to pedestrian areas to support the drainage strategy.

15.6.7 The proposed development would include the removal of the current training pitch for the Rugby Club. However, the Rugby Club is progressing a planning application for a replacement facility and it is assumed that it would be in place before the end of the construction phase.

15.6.8 It is proposed to locate a single 5-a-side football pitch in the northern part of the site between the existing Bridgwater and Albion Rugby Football Club car park and the car park within the proposed accommodation campus.

15.6.9 The landscape proposals and 5-a-side pitch are considered part of the design and are taken account of in this section when impacts before mitigation are assessed.

15.6.10 Environmental impacts and disturbance arising from construction activities will be managed through a range of control measures and monitoring procedures, the principles of which are outlined in the **Environmental Management and Monitoring Plan (EMMP)** and detailed in associated **subject-specific management plans** (SSMPs) for the proposed development site.

15.6.11 A detailed description of the proposed development, including mitigation measures inherent within the design, is provided in **Chapter 2** of this volume.

15.6.12 Post-operation, the accommodation campus would be re-used in connection with Bridgwater College. For the purposes of this assessment, it has been assumed that all facilities, except signage, would remain in place (see **Chapter 5** of this volume).

15.6.13 The potential impacts are summarised in tables showing sensitivity of receptors, nature, duration, magnitude and significance of impact.

i. National and Regional Landscape Character

15.6.14 The proposed development is located within Area 142/143 Somerset Levels and Moors/Mid Somerset Hills.

15.6.15 The national landscape character description considered rural areas as representative. The proposed development would have no impact on the key characteristics of this character area as described in the baseline. The proposed development is small in scale, within an urban area and is not unusual for the localised area.

ii. County and District Landscape Character

15.6.16 Although the proposed development is located within the urban area of Bridgwater, which is not explicitly considered within the district landscape character assessment, Bridgwater sits within the Somerset Levels and Moors character area and more specifically, to the east of the town, within the sub-area of the Levels.

15.6.17 Historically, the Levels are an area marked by industrial development and through which the M5 motorway and the railway from Bridgwater to Highbridge runs. The scale of the proposed construction activities, the nature of the development and its location in the midst of the urban area of Bridgwater, would result in no impact.

iii. Local and Site-specific Landscape/Townscape Character

Sydenham and Bower Townscape Character Area

15.6.18 The sensitivity of this townscape character area is assessed as low.

15.6.19 The Sydenham and Bower townscape character area is already marked by high levels of existing traffic, being bounded to the east by the M5 motorway and to the north by the A39. However, the addition of heavy construction traffic would still have a detrimental impact on the character of the area during the years of construction. Even if the training pitch at the Rugby Club were not replaced until sometime during the construction phase this would not affect the overall character of the area. Impacts during the construction phase would be adverse, short-term, of medium magnitude and of **minor** significance.

15.6.20 As the Sydenham and Bower townscape character area is characterised by residential housing, the proposed accommodation blocks would not be out of character once construction activities were complete. The external appearance of the buildings has been designed to be complementary to the nearby, existing, Bridgwater College buildings to ensure that they would sit well within the area (see the **Bridgwater C Design and Access Statement**). Impacts during operation are assessed an adverse, medium-term, of low magnitude and of **minor** significance.

15.6.21 Since the proposed development would be retained once EDF Energy's operational phase was complete, impacts during the post-operational phase are deemed to remain the same as during the operational phase. Although the landscape, considered inherent to the design, would mature over time it is not thought that this

would change the level of impacts. Impacts during the post-operational phase are considered to be adverse, long-term, of low magnitude and of **minor** significance.

15.6.22 **Table 15.7** provides a summary of impacts on Sydenham and Bower townscape character area.

Table 15.7: Impacts on Sydenham and Bower Townscape Character Area

ID	Phase	Sensitivity	Nature	Magnitude	Significance
1	Construction	Low	Adverse, short-term	Medium	Minor
2	Operation	Low	Adverse, medium-term	Low	Minor
3	Post-operation	Low	Adverse, long-term	Low	Minor

North East Bridgwater Townscape Character Area

15.6.23 The sensitivity of this townscape character area is assessed as low.

15.6.24 The townscape character area is separated from the proposed development by the A39 and a buffer of residential development. The construction of the proposed development is unlikely to have much effect on the townscape character area. During the construction phase the character area would be potentially adversely affected by increased construction traffic travelling along the A39. The impact would be adverse, short-term and of low magnitude. The significance of the impact would be **minor**.

15.6.25 During the operation and post-operational phases, the proposed development would be unlikely to affect the townscape character area since any impacts associated with construction traffic would be removed. Impacts are therefore assessed as neutral, medium and long-term, respectively, of very low magnitude and of **negligible** significance.

15.6.26 **Table 15.8** provides a summary of impacts on North East Bridgwater townscape character area.

Table 15.8: Impacts on North East Bridgwater Townscape Character Area

ID	Phase	Sensitivity	Nature	Magnitude	Significance
1	Construction	Low	Adverse, short-term	Low	Minor
2	Operation	Low	Neutral, medium-term	Very low	Negligible
3	Post-operation	Low	Neutral, long-term	Very low	Negligible

Wylds Road Townscape Character Area

15.6.27 The sensitivity of this townscape character area is assessed as low.

15.6.28 The Wylds Road townscape character area is made up predominantly of industrial and business areas. The area is separated from the site by the Bridgwater to Highbridge (part of the Bristol to Penzance) railway line and the A38. The degree of separation is considered strong enough to ensure that there is minimal potential for the proposed development to impact the area.

15.6.29 During construction the townscape character area would potentially be impacted by increased traffic although it is assumed that the majority of this traffic would travel along the A39 to the north of the railway line outside of the character area. The impact is considered to be adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.30 Operation and post-operational phases are unlikely to affect the townscape character area due to the distance away from the proposed development site and location of the railway line and the A38 separating it from the site. Any additional traffic associated with construction would have been removed. The impact associated with the proposed development is therefore considered to be neutral, medium to long-term respectively, of very low magnitude and of **negligible** significance.

15.6.31 **Table 15.9** provides a summary of impacts on Wylds Road townscape character area.

Table 15.9: Impacts on Wylds Road Townscape Character Area

ID	Phase	Sensitivity	Nature	Magnitude	Significance
1	Construction	Low	Adverse, short-term	Very low	Negligible
2	Operation	Low	Neutral, medium-term	Very low	Negligible
3	Post-operation	Low	Neutral, long-term	Very low	Negligible

Town Centre Townscape Character Area

15.6.32 The sensitivity of this townscape character area is assessed as high.

15.6.33 The Town Centre townscape character area has been assessed as having a high sensitivity due to the local Conservation Area, which is designated across much of it, three nationally designated Scheduled Monuments, the large quantity of Listed Buildings and the high quality condition of the area.

15.6.34 As with the townscape character area of Wylds Road the distance of the site, the main railway line and the residential townscape character area of Eastover all act as a buffer of separation and suggest that the proposed development is unlikely to have an impact on the Town Centre townscape character. The impact has been assessed as neutral, short-term, of very low magnitude and of **negligible** significance.

15.6.35 During the operational and post-operational phases the proposed development is very unlikely to have an impact for the same reasons as above. Impacts have therefore been assessed as neutral, medium to long-term respectively, very low magnitude and of **negligible** significance.

15.6.36 **Table 15.10** provides a summary of impacts on Town Centre townscape character area.

Table 15.10: Impacts on Town Centre Townscape Character Area

ID	Phase	Sensitivity	Nature	Magnitude	Significance
1	Construction	High	Neutral, short-term	Very low	Negligible
2	Operation	High	Neutral, medium-term	Very low	Negligible
3	Post-operation	High	Neutral, long-term	Very low	Negligible

Eastover Townscape Character Area

15.6.37 The sensitivity of this townscape character area is assessed as medium.

15.6.38 Eastover lies across the railway line adjacent to the Sydenham and Bower townscape character area. The sensitivity of the area has been rated as medium due to the strong character of Victorian residential areas and the high quality of open space within the area.

15.6.39 The location of the railway line between the townscape character area and the site provides a buffer zone which minimises any potential impacts. It is, however, possible that the tranquillity of the area would be impacted by increased traffic levels during the construction although it is likely that impacts from traffic would be contained within the area north-east of the railway line. Impacts have been assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.40 During the operational and post-operational phases, it is unlikely that there would be any impacts associated with the proposed development. Any increase in traffic levels experienced during construction would reduce during operation and there would be no direct impacts on the character area due to its separation from the proposed development site. Impacts have been assessed as neutral, medium to long-term respectively, of very low magnitude and of **negligible** significance.

15.6.41 **Table 15.11** provides a summary of impacts on Eastover townscape character area.

Table 15.11: Impacts on Eastover Townscape Character Area

ID	Phase	Sensitivity	Nature	Magnitude	Significance
1	Construction	Medium	Adverse, short-term	Low	Minor
2	Operation	Medium	Neutral, medium-term	Very low	Negligible
3	Post-operation	Medium	Neutral, long-term	Very low	Negligible

iv. Site-specific Landscape/Townscape Elements/Features

Landform

15.6.42 The sensitivity of this landscape/townscape element is assessed as low.

15.6.43 The site consists of flat open space which lies within Bridgwater floodplain. To enable appropriate drainage and amelioration of ground conditions the level of the ground would rise by a maximum of 250mm in places. The construction impact has been assessed as being adverse, short-term, of low magnitude and of **minor** significance.

15.6.44 The flattening out and raising of the site in places by 250mm undertaken during the construction phase would remain into the operational and post-operational phases. However, the hard and soft landscaping undertaken as part of the design, the placing of campus accommodation on the site, added to the masking qualities of existing development in the vicinity of the proposed development would result in a adverse, medium to long-term respectively impact, of very low magnitude and of **negligible** significance.

Land Use/Settlement

15.6.45 The sensitivity of this landscape/townscape element is assessed as medium.

15.6.46 The site forms part of a locally designated area of Recreational Open Space used as a practice pitch by the adjacent Bridgwater and Albion Rugby Football Club. The proposed development therefore constitutes a complete change in use. An existing sports ground, of high community value (albeit not public), would become campus accommodation.

15.6.47 Impacts would be most severe during the construction phase when the site would be a busy, changing, construction site. Impacts during this phase have been assessed as adverse, short-term, of high magnitude and of **major** significance.

15.6.48 Within the direct vicinity of the site the area is characterised by residential development and educational buildings/accommodation. During the operational phase the proposed development would consist of campus accommodation buildings, which would fit with the character of the adjacent Bridgwater College buildings and would be in keeping with nearby residential areas, and a new 5-a-side football pitch which would be open for public use. The rugby training pitch would have been replaced in the local area. The 5-a-side football pitch would be available until extensive facilities opened at the Bridgwater A site.

15.6.49 The impact during the operational phase is assessed as an adverse, medium-term impact of low magnitude and of **minor** significance.

15.6.50 The post-operational phase impacts would be similar to those experienced during the operational phase and area assessed as an adverse, long-term impact of low magnitude and of **minor** significance.

Landcover and Vegetation

15.6.51 The sensitivity of this landscape/townscape element is assessed as low.

15.6.52 As detailed in the baseline assessment the existing vegetation is a mixture of species-poor amenity grassland, small areas of rough grassland, bramble and native trees and hedgerow. Construction requires the removal of approximately 140m of hedgerow, along the eastern boundary, the majority of which is made up of bramble. A single silver birch tree, also located along the eastern boundary, would be removed. This tree has been recorded as being of Grade C2 quality within the arboricultural report due to the loss of its top. The species-poor amenity grassland which makes up the practice rugby pitch would also be lost as a result of the proposed development.

15.6.53 The removal of a large section of vegetation along the eastern boundary of the site and the loss of species-poor amenity grassland is considered to be adverse, short-term, of medium magnitude and of **minor** significance.

15.6.54 At the end of the construction phase, in the first appropriate season, all soft landscaping would be implemented. Along the eastern boundary, where vegetation was removed for construction purposes, a mix of native trees including field maple (*Acer Campestre)* and ash (*Fraxinus Oxycarpa 'Raywood')* would be planted as 'Heavy Standards'. These would be planted within amenity shrub planting consisting

of a mix of native species up to 1.5m high and set within wildflower meadow. Along the western boundary an informal hedge consisting of a mix of hazel (Corylus avellana), blackthorn (*Prunus spinosa*), dogwood (*Cornus sanguinea*) and privet (*Ligustrum ovalifolium*), with field maple and ash hedgerow trees planted as 3m feathers would be planted. Along the southern boundary field maple and ash trees, as 'Heavy Standards', would planted within a native amenity shrub mix planted at up to 1.5m high. Low evergreen shrub planting and clipped hedging would be planted to soften the edges of buildings located beneath ground floor windows. A central spine of silver birch (3.6m tall) would be planted at 2m centres, under-planted with ivy (*Hedera helix*).

15.6.55 There would be an overall net gain in soft landscape and this would be retained as part of the post-operational phase. The impact of the proposed development on landcover is considered to be neutral, medium to long-term, respectively, of low magnitude and of **minor** significance.

Watercourses/Water Bodies

15.6.56 The sensitivity of this landscape/townscape element is assessed as very low.

15.6.57 There are two shallow drainage ditches located along the eastern boundary of the site parallel to the existing hedgerow. These would not be affected by the construction, operational or post-operational phases of the proposed development. The impact during the construction phase has been assessed as neutral, short-term, of very low magnitude and of **negligible** significance.

15.6.58 The impact during the operational and post-operational phases has been assessed as neutral, medium and long-term respectively, of very low magnitude and of **negligible** significance.

Public Rights of Way

15.6.59 There are no PRoW within the site. No assessment has, therefore, been made.

15.6.60 **Table 15.12** provides a summary of impacts on landscape elements/features.

Table 15.12: Impacts on Landscape/Townscape Elements/Features.

ID	Phase	Sensitivity	Nature	Magnitude	Significance
Landform					
1	Construction	Low	Adverse, short-term	Low	Minor
2	Operation	Low	Adverse, medium term	Very low	Negligible
3	Post-operation	Low	Adverse, long-term	Very low	Negligible
Land Use/Settlement					
1	Construction	Medium	Adverse, short-term	High	Major
2	Operation	Medium	Adverse, medium-term	Low	Minor
3	Post-Operation	Medium	Adverse, long-term	Low	Minor
Landcover and Vegetation					
1	Construction	Low	Adverse, short-term	Medium	Minor
2	Operation	Low	Neutral, medium-term	Low	Minor

ID	Phase	Sensitivity	Nature	Magnitude	Significance
3	Post-operation	Low	Neutral, long-term	Low	Minor
Watercourses/Water Bodies					
1	Construction	Very low	Neutral, short-term	Very low	Negligible
2	Operation	Very low	Neutral, medium term	Very low	Negligible
3	Post-operation	Very low	Neutral, long-term	Very low	Negligible
Public Rights of Way					
1	Construction	N/A	N/A	N/A	N/A
2	Operation	N/A	N/A	N/A	N/A
3	Post-operation	N/A	N/A	N/A	N/A

c) Visual Impacts

15.6.61 The potential visual impacts are summarised in tables showing the sensitivity of receptors, nature, duration, magnitude and significance of impact of the proposed development during the day and at night. Rendered images of the proposed development are included within the **Bridgwater C Design and Access Statement**.

i. Viewpoint 1: Bath Road, Footway

15.6.62 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.63 The Bridgwater and Albion Rugby Football Club's spectator stands and existing vegetation filter views allowing only glimpses of the proposed development. During construction any tall equipment such as mobile cranes and telescopic handlers may be visible and prominent due to movement. The impact of the proposed development would be adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.64 External lighting and CCTV masts would be one of the last elements installed on the site. Lighting impacts during construction would, therefore, only be associated with any lighting required during working hours. Lighting would not be required before 06:00 or after 20:00. Lighting between these hours would be visible through the gaps between the Bridgwater and Albion Rugby Football Club's spectator stands, increasing the level of ambient light in the area. However, ambient light levels are already intermittently high due to existing stadium floodlighting used during rugby football practices and events. Night-time impacts during construction have been assessed as adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.65 During the operational and post-operational phases additional lighting poles and CCTV masts installed during the construction phase would impact on the receptor, although the impacts associated with the machinery used for construction would be removed. The proposed development would be screened from this viewpoint by the Bridgwater and Albion Rugby Football Club's spectator stands and existing vegetation so impacts would still be minimal. The impact of the proposed development during the operational and post-operational phases has been assessed as adverse, medium and long-term respectively, of very low magnitude and of **negligible** significance.

15.6.66 This site would be lit on a 24 hour basis. Security lighting at night would be visible through the Bridgwater and Albion Rugby Football Club stadium and existing vegetation increasing the levels of ambient light. Existing highway lighting along the A39 (Bath Road) and existing floodlighting within the sports ground would minimise the perceived change in lighting levels. The night-time impact, of the proposed development during the operational phase has been assessed as adverse, medium-term, of low magnitude and of **minor** significance.

15.6.67 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of very low magnitude and of **negligible** significance.

15.6.68 **Table 15.13** provides a summary of impacts on Viewpoint 1.

Table 15.13: Impacts on Viewpoint 1

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short term	Very low	Negligible	Very low	Negligible
2	Operation	Low	Adverse, medium-term	Very low	Negligible	Low	Minor
3	Post-operation	Low	Adverse, long-term	Very low	Negligible	Very low	Negligible

ii. Viewpoint 2: Bath Road, Footbridge

15.6.69 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.70 During the construction phase glimpsed views of construction activities and machinery would be possible through the existing vegetation to the north of the proposed development and adjoining the site. The impacts associated with the proposed development during the construction phase have been assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.71 As with Viewpoint 1, external lighting and CCTV masts would be one of the last elements installed on the site. Lighting impacts during construction would, therefore, only be associated with any lighting required during working hours. Lighting would not be required before 06:00 or after 20:00. The level of ambient light in the area would potentially be increased during these hours. However, existing highway lighting and stadium lighting in the background have already resulted in relatively high levels of ambient light in the local area. Night-time impacts during the construction phase have been assessed as adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.72 During the operational and post-operational phase glimpsed views of the completed development, including the proposed buildings, security fencing, lighting and CCTV masts would be possible through existing vegetation to the north of the proposed development and adjoining the site. Impacts during the operational and post-

operational phases are assessed as adverse, medium and long-term respectively, of low magnitude and of **minor** significance.

15.6.73 This site would be lit on a 24 hour basis. At night, lighting for the proposed development would be visible through existing vegetation increasing ambient lighting levels in the area. However, highway lighting along the A39 (Bath Road) would minimise the perceived change in light levels. Night-time impacts, during the operation phase have been assessed as adverse, medium-term, of low magnitude and of **minor** significance.

15.6.74 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assesses as adverse, long-term, of very low magnitude and of **negligible** significance.

15.6.75 **Table 15.14** provides a summary of impacts on Viewpoint 2.

Table 15.14: Impacts on Viewpoint 2

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short-term	Low	Minor	Very low	Negligible
2	Operation	Low	Adverse, medium-term	Low	Minor	Low	Minor
3	Post-operation	Low	Adverse, long-term	Low	Minor	Very low	Negligible

iii. Viewpoint 3: Bath Road/College Way Gyratory

15.6.76 The sensitivity of visual receptors at this viewpoint is assessed as medium.

15.6.77 During the construction phase glimpsed views of construction activities and heavy machinery within the site would be possible although existing, retained, planting would screen the majority of the view. Potential impacts have been assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.78 Lighting impacts at night would be limited to potential construction lighting during the hours of 06:00 and 20:00 which would potentially be visible through retained vegetation increasing existing ambient light levels. However, existing highway lighting and stadium lighting in the background have already resulted in relatively high levels of ambient light in the local area. Night-time impacts have been assessed as adverse, short-term, of very low magnitude and of **minor** significance.

15.6.79 During the operational and post-operational phases glimpsed views of the completed development including proposed buildings, security fencing and gates, CCTV masts, road entrance security barriers and the security office would potentially be visible. Existing, retained, planting would screen the majority of the view. Potential impacts during the operational and post-operational phases have been assessed as adverse, medium and long-term respectively, of low magnitude and of **minor** significance.

15.6.80 This site would be lit on a 24 hour basis. Security lighting would potentially be visible at night through retained vegetation increasing existing ambient light levels. Night-time impacts, during the operation phase have been assessed as adverse, medium-term, of low magnitude and of **minor** significance.

15.6.81 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of very low magnitude and of **minor** significance.

15.6.82 **Table 15.15** provides a summary of impacts on Viewpoint 3.

Table 15.15: Impacts on Viewpoint 3

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Medium	Adverse, short-term	Low	Minor	Very low	Minor
2	Operation	Medium	Adverse, medium-term	Low	Minor	Low	Minor
3	Post-operation	Medium	Adverse, long-term	Low	Minor	Very low	Minor

iv. Viewpoint 4: Access Road to Sports Ground

15.6.83 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.84 During the construction phase there would be open views of construction activities and heavy machinery within the site through the Bridgwater and Albion Rugby Football Club car park from the access road, although the car park would be retained in its current form. Construction impacts would include the erection of a 1.8m high security fence surrounding the site with associated gates and road entrance barriers, drainage works and the levelling of the landform, the construction of four accommodation buildings which would be three storeys high (approximately 10.5m high and 26m by 13m wide) and a security office, the construction of a new asphalt car park beside the accommodation buildings, the loss of existing vegetation including amenity grass, perimeter hedgerows and a single hedgerow tree and the installation of additional lighting and CCTV masts. Movement of construction traffic within the site would also be visible. During the construction phase impacts have been assessed as adverse, short-term, of high magnitude and of **moderate** significance.

15.6.85 Lighting impacts would be confined to any lighting required for construction between the hours of 06:00 and 20:00. Night-time impacts are assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.86 During the operational and post-operational phases there would be open views of the completed development, including all the elements listed above. The level of disturbance within the view would be less that that during construction as the view would no longer be evolving but instead static. However, the make-up of the view would be altered from open amenity grassland to one of a built environment with a

sports pitch. Impacts, during the operation and post-operation phases, have been assessed as adverse, medium and long-term, of medium magnitude and of **minor** significance.

15.6.87 Lighting associated with the proposed development would be lit throughout the night, with the exception of the sports pitch. This would increase light levels throughout the operational phase. Night-time impacts, during the operation phase, have been assessed as adverse, medium-term, of medium magnitude and of **minor** significance.

15.6.88 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of low magnitude and of **minor** significance.

15.6.89 **Table 15.16** provides a summary of impacts on Viewpoint 4.

Table 15.16: Impacts on Viewpoint 4

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short-term	High	Moderate	Low	Minor
2	Operation	Low	Adverse, medium-term	Medium	Minor	Medium	Minor
3	Post-operation	Low	Adverse, long-term	Medium	Minor	Low	Minor

v. Viewpoint 5: Footway/Backs of Residential Properties on Fairfax Road

15.6.90 The sensitivity of visual receptors at this viewpoint is assessed as medium.

15.6.91 During the construction phase construction activities and moving heavy machinery within the proposed development site would be clearly visible. The removal of existing vegetation along the eastern boundary of the proposed development site would increase the visibility of construction works. The composition of the view would change from one of amenity grassland enclosed by low post and rail fencing and scrub to a changing, busy, view with heavy machinery, active development and removal of vegetation. Impacts have been assessed as adverse, short-term, of high magnitude and of **major** significance.

15.6.92 Lighting associated with the construction phase would be limited to potential lighting during the working day, confined to the hours of 06:00 and 20:00. Existing highway nearby car park lighting and stadium floodlighting have already resulted in relatively high levels of ambient light in the local area. Night-time impacts have been assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.93 During the operational and post-operational phases the view would be composed of views of new perimeter vegetation and accommodation blocks of high quality design. Security fencing would be screened by proposed perimeter vegetation, although CCTV masts, external lighting poles and road entrance security barriers would

potentially be visible. Trees along the eastern boundary would be planted as 'Heavy Standards' for immediate impact and shrub planting along this boundary would be planted at 60-80cm high to allow immediate screening properties. Accommodation buildings would be designed to assimilate with existing nearby buildings of Bridgwater College with high quality materials. The view would also be static which would reduce the impacts experienced in the construction of the proposed development. It is considered that the view of proposed perimeter vegetation and accommodation blocks would improve on the current view of poor quality vegetation, post and rail fence and views of the rugby stadium and associated flood lighting masts. Impacts, during the operation and post-operation phases, have been assessed as beneficial, medium and long-term respectively, of low magnitude and of **minor** significance.

15.6.94 At night, lighting associated with CCTV, which would be lit throughout the night, would increase lighting levels affecting residential receptors on the Fairfax Road. Night-time impacts, during the operation phases, have been assessed as adverse, medium-term, of high magnitude and of **major** significance.

15.6.95 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of low magnitude and of **minor** significance.

15.6.96 **Table 15.17** provides a summary of impacts on Viewpoint 5.

Table 15.17: Impacts on Viewpoint 5

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Medium	Adverse, short-term	High	Major	Low	Minor
2	Operation	Medium	Beneficial (Adverse-night) medium-term	Low	Minor	High	Major
3	Post-operation	Medium	Beneficial (Adverse-night) long-term	Low	Minor	Low	Minor

vi. Viewpoint 6: Bridgwater and Albion Rugby Football Club Car Park

15.6.97 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.98 During the construction phase there would be open views of construction activities and the gradual progress of construction of the proposed development. Clear views would be available through the existing chain link fence. The composition of the view would completely change from one of an intermittently used practice rugby pitch of open amenity grassland to a busy view with heavy machinery and gradually increasing scale of built development. Impacts have been assessed as adverse, short-term, of high magnitude and of **moderate** significance.

15.6.99 Lighting impacts would be confined to those associated with lighting required for construction which would be restricted to the hours of 06:00 to 20:00. There would be a potential increase in lighting levels during these hours within the view, although existing lighting within the car park, which is lit until 22:00, would minimise the perception of this change. Night-time impacts have been assessed as adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.100 During the operational and post-operational phases the view would be composed of views of new perimeter vegetation, amenity planting and accommodation buildings of high quality design. Security fencing would be visible, but this would not constitute a significant change from the current view of fencing. A belt of standard silver birch planted in a grid at 2m centres in the centre of the view, tree and shrub planting in the western corner with trees planted as 'Heavy Standards' and shrubs planted at 60-80cm height to ensure immediate impact, and low clipped hedging beneath ground floor windows of accommodation buildings would all be visible in the foreground of the view. Although the composition of the view would change, the change is considered to have a positive impact and integrate the site into the wider landscape. Impacts, during the operation and post-operation phases, have been assessed as beneficial, medium and long-term respectively, of low magnitude and of **minor** significance.

15.6.101 Night-time views would be affected by additional security lighting installed at the end of the construction phase. However, the perception of the change in lighting levels would be affected by existing car parking lighting. The biggest would be perceived after 22:00 when existing car park lighting was switched off. Night-time impacts, during the operation phase have been assessed as adverse, medium-term, of high magnitude and of **moderate** significance.

15.6.102 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of very low magnitude and of **negligible** significance.

15.6.103 **Table 15.18** provides a summary of impacts on Viewpoint 6.

Table 15.18: Impacts on Viewpoint 6

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short-term	High	Moderate	Very low	Negligible
2	Operation	Low	Beneficial, (Adverse-night) medium-term	Low	Minor	High	Moderate
3	Post-operation	Low	Beneficial, (Adverse-night) long-term	Low	Minor	Very low	Negligible

vii. Viewpoint 7: Bridgwater College Northern Car Park

15.6.104 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.105 During the construction phase there would be open views of construction activities and the heavy machinery associated with this. The distance from the viewpoint softens the impact, as does a low native hedgerow and low bund on the northern edge of the car park. Impacts have been assessed as adverse, short-term, of high magnitude and of **moderate** significance.

15.6.106 Lighting impacts experienced are limited to working hours. There would be no lighting after 20:00 and existing lighting within the car park, lit until 22:00, would soften the perception of any increase in lighting. Night-time impacts have been assessed as adverse, short-term, of very low magnitude and of **negligible** significance.

15.6.107 During the operational and post-operational phases open views of completed campus accommodation buildings, security fencing, CCTV masts, external lighting poles, and a new security office change the composition of the view. As above the distance from the viewpoint and the existing hedgerow and bund, parked cars and existing lighting masts minimise the magnitude of the change. Planting inherent within the proposed development, which includes a belt of standard silver birches planted on a 2m centred grid and additional tree and shrub planting in the south-western corner, with trees planted as 'Heavy Standards' for immediate effect, further softens the impact of the change. Impacts, during the operation and post-operation phases, have been assessed as adverse, medium and long-term respectively, of medium magnitude, and of **minor** significance.

15.6.108 Lighting associated with CCTV would increase lighting levels at night, but existing car park lighting would mitigate the perception of the change. Night-time impacts, during the operation phase, have been assessed as adverse, medium-term, of medium magnitude and of **minor** significance.

15.6.109 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of very low magnitude and of **negligible** significance.

15.6.110 **Table 15.19** provides a summary of impacts on Viewpoint 7.

Table 15.19: Impacts on Viewpoint 7

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short-term	High	Moderate	Very low	Negligible
2	Operation	Low	Adverse, medium-term	Medium	Minor	Medium	Minor
3	Post-operation	Low	Adverse, long-term	Medium	Minor	Very low	Negligible

viii. Viewpoint 8: Bridgwater College Western Car Park

15.6.111 The sensitivity of visual receptors at this viewpoint is assessed as low.

15.6.112 During the construction phase partial views of construction activities would be available including the building of campus accommodation and the movement of heavy machinery. Impacts would be ameliorated by the distance from the viewpoint and existing lighting poles, parked cars and vegetation and low bunding in the space between. Impacts have been assessed as adverse, short-term, of low magnitude and of **minor** significance.

15.6.113 During construction, lighting levels would be increased only within working hours (up to 20:00), as necessary. The perception of any change in lighting levels would be lessened by the existing impact of car park lighting which would be lit until 22:00. Night-time impacts have been assessed as adverse, medium-term, of low magnitude and of **minor** significance.

15.6.114 During the operational and post-operational phases partial views of completed accommodation buildings, security fencing, CCTV masts, external lighting poles and a new security office would be available, but planting inherent within the design planted at larger sizes would minimise these views. The view would become static and parked cars, existing vegetation, low bunding and existing lighting poles in between would filter the view. Impacts, during the operation and post-operation phases, have been assessed as adverse, medium and long-term respectively, of low magnitude and of **minor** significance.

15.6.115 Lighting levels during the operational phase would increase due to additional security lighting which would be lit throughout the night. However, existing lighting within the car park, which is currently lit until 22:00, would lessen the perception of the impact. Night-time impacts, during the operation phase, have been assessed as adverse, medium-term, of medium magnitude and of **moderate** significance.

15.6.116 During the post-operational phase it is assumed that the site would not be lit on a 24 hour basis. Night-time impacts during the post-operational phase are therefore assessed as adverse, long-term, of low magnitude and of **minor** significance.

15.6.117 **Table 15.20** provides a summary of impacts on Viewpoint 8.

Table 15.20: Impacts on Viewpoint 8

ID	Phase	Sensitivity	Nature	Magnitude	Significance	Magnitude (Night)	Significance (Night)
1	Construction	Low	Adverse, short-term	Low	Minor	Low	Minor
2	Operation	Low	Adverse, medium-term	Low	Minor	Medium	Moderate
3	Post-Operation	Low	Adverse, long-term	Low	Minor	Low	Minor

15.7 Mitigation of Impacts

a) Introduction

15.7.1 Landscape and visual mitigation measures are proposed as an inherent part of the design of the proposed development and have been designed to reflect the character of the landscape. No further mitigation is proposed.

15.8 Residual Impacts

a) Introduction

15.8.1 This section identifies and assesses the potential residual impacts on landscape character and representative visual receptors (as identified in Section 15.5 of this chapter), which would result from the construction, operation and post-operational phases, relating to the proposed development after implementing any proposed further mitigation measures. No additional mitigation measures have been proposed so a full residual impact assessment is unnecessary, as all impacts would remain as initially assessed.

15.9 Summary of Impacts

15.9.1 **Table 15.21** summarises the predicted impacts of the identified landscape/ townscape and visual receptors without further mitigation during daylight hours and the residual impacts remaining after further mitigation.

Table 15.21: Summary of Impacts

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Construction Phase Impacts								
Sydenham and Bower townscape character area	Low	Change in townscape character	Adverse, short-term	Medium	Minor	None proposed	Medium	Minor
North East Bridgwater townscape character area	Low	Change in townscape character	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Wylds Road townscape character area	Low	Change in townscape character	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Town Centre townscape character area	High	Change in townscape character	Neutral, short-term	Very low	Negligible	None proposed	Very low	Negligible
Eastover townscape character area	Medium	Change in townscape character	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Landform	Low	Change in landform	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Land Use/Settlement	Medium	Change in land use/settlement	Adverse, short-term	High	Major	None proposed	High	Major
Landcover and Vegetation	Low	Change in landcover and vegetation	Adverse, short-term	Medium	Minor	None proposed	Medium	Minor
Watercourses/water bodies	Very low	Changes to watercourses/water bodies	Neutral, short-term	Very low	Negligible	None proposed	Very low	Negligible
Public Rights of Way	N/A	Change to PRoW	N/A	N/A	N/A	N/A	N/A	N/A
Viewpoint 1: Bath Road, Footway	Low	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Construction Phase Impacts								
Viewpoint 1: Bath Road, Footway (Night)	Low	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 2: Bath Road, Footbridge	Low	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Viewpoint 2: Bath Road, Footbridge (Night)	Low	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 3: Bath Road/College Way	Medium	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Viewpoint 3: Bath Road/College Way (Night)	Medium	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 4: Access road to sports ground	Low	Change in composition of view	Adverse, short-term	High	Moderate	None proposed	High	Moderate
Viewpoint 4: Access road to sports ground (Night)	Low	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Viewpoint 5: Footway/backs of residential properties on Fairfax Road	Medium	Change in composition of view	Adverse, short-term	High	Major	None proposed	High	Major
Viewpoint 5: Footway/backs of residential properties on Fairfax Road (Night)	Medium	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Construction Phase Impacts								
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park	Low	Change in composition of view	Adverse, short-term	High	Moderate	None proposed	High	Moderate
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park (Night)	Low	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 7: Bridgwater College northern car park	Low	Change in composition of view	Adverse, short-term	High	Moderate	None proposed	High	Moderate
Viewpoint 7: Bridgwater College northern car park (Night)	Low	Change in composition of view	Adverse, short-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 8: Bridgwater College western car park	Low	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor
Viewpoint 8: Bridgwater College western car park (Night)	Low	Change in composition of view	Adverse, short-term	Low	Minor	None proposed	Low	Minor

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Operational Phase Impacts								
Sydenham and Bower townscape character area	Low	Change in townscape character	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
North East Bridgwater townscape character area	Low	Change in townscape character	Neutral, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Wylds Road townscape character area	Low	Change in townscape character	Neutral, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Town Centre townscape character area	High	Change in townscape character	Neutral, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Eastover townscape character area	Medium	Change in townscape character	Neutral, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Landform	Low	Change in landform	Adverse, medium-term	Very low	Negligible	None proposed	Low	Negligible
Land Use/Settlement	Medium	Change in land use/settlement	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Landcover and Vegetation	Low	Change in landcover and vegetation	Neutral, medium-term	Low	Minor	None proposed	Low	Minor
Watercourses/water bodies	Very low	Changes to watercourses/water bodies	Neutral, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Public Rights of Way	N/A	Change to PRoW	N/A	N/A	N/A	N/A	N/A	N/A

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Operational Phase Impacts								
Viewpoint 1: Bath Road, Footway	Low	Change in composition of view	Adverse, medium-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 1: Bath Road, Footway (Night)	Low	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 2: Bath Road, Footbridge	Low	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 2: Bath Road, Footbridge (Night)	Low	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 3: Bath Road/College Way	Medium	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 3: Bath Road/College Way (Night)	Medium	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 4: Access road to sports ground	Low	Change in composition of view	Adverse, medium-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 4: Access road to sports ground (Night)	Low	Change in composition of view	Adverse, medium-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 5: Footway/backs of residential properties on Fairfax Road	Medium	Change in composition of view	Beneficial, medium-term	Low	Minor	None proposed	Low	Minor

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Operational Phase Impacts								
Viewpoint 5: Footway/backs of residential properties on Fairfax Road (Night)	Medium	Change in composition of view	Adverse, medium-term	High	Major	None proposed	High	Major
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park	Low	Change in composition of view	Beneficial, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park (Night)	Low	Change in composition of view	Adverse, medium-term	High	Moderate	None proposed	High	Moderate
Viewpoint 7: Bridgwater College northern car park	Low	Change in composition of view	Adverse, medium-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 7: Bridgwater College northern car park (Night)	Low	Change in composition of view	Adverse, medium-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 8: Bridgwater College western car park	Low	Change in composition of view	Adverse, medium-term	Low	Minor	None proposed	Low	Minor
Viewpoint 8: Bridgwater College western car park (Night)	Low	Change in composition of view	Adverse, medium-term	Medium	Moderate	None proposed	Medium	Moderate

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Post-operation Phase Impacts								
Sydenham and Bower townscape character area	Low	Change in townscape character	Adverse, long-term	Low	Minor	None proposed	Low	Minor
North East Bridgwater townscape character area	Low	Change in townscape character	Neutral, long-term	Very low	Negligible	None proposed	Very low	Negligible
Wylds Road townscape character area	Low	Change in townscape character	Neutral, long-term	Very low	Negligible	None proposed	Very low	Negligible
Town Centre townscape character area	High	Change in townscape character	Neutral, long-term	Very low	Negligible	None proposed	Very low	Negligible
Eastover townscape character area	Medium	Change in townscape character	Neutral, long-term	Very low	Negligible	None proposed	Very low	Negligible
Landform	Low	Change in landform	Adverse, long-term	Very low	Negligible	None proposed	Low	Negligible
Land Use/Settlement	Medium	Change in land use/settlement	Adverse, long-term	Low	Minor	None proposed	Low	Minor
Landcover and Vegetation	Low	Change in landcover and vegetation	Neutral, long-term	Low	Minor	None proposed	Low	Minor
Watercourses/water bodies	Very low	Changes to watercourses/water bodies	Neutral, long-term	Very low	Negligible	None proposed	Very low	Negligible
Public Rights of Way	N/A	Change to PRoW	N/A	N/A	N/A	N/A	N/A	N/A
Viewpoint 1: Bath Road, Footway	Low	Change in composition of view	Adverse, long-term	Very low	Negligible	None proposed	Very low	Negligible

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Post-operation Phase Impacts								
Viewpoint 1: Bath Road, Footway (Night)	Low	Change in composition of view	Adverse, long-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 2: Bath Road, Footbridge	Low	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 2: Bath Road, Footbridge (Night)	Low	Change in composition of view	Adverse, long-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 3: Bath Road/College Way	Medium	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 3: Bath Road/College Way (Night)	Medium	Change in composition of view	Adverse, long-term	Very low	Minor	None proposed	Very low	Minor
Viewpoint 4: Access road to sports ground	Low	Change in composition of view	Adverse, long-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 4: Access road to sports ground (Night)	Low	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 5: Footway/backs of residential properties on Fairfax Road	Medium	Change in composition of view	Beneficial, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 5: Footway/backs of residential properties on Fairfax Road (Night)	Medium	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor

Receptor	Sensitivity	Potential Impact	Nature	Magnitude	Impact Significance	Proposed further Mitigation	Magnitude	Residual Impact Significance
Summary of Post-operation Phase Impacts								
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park	Low	Change in composition of view	Beneficial, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 6: Bridgwater and Albion Rugby Football Club car park (Night)	Low	Change in composition of view	Adverse, long-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 7: Bridgwater College northern car park	Low	Change in composition of view	Adverse, long-term	Medium	Minor	None proposed	Medium	Minor
Viewpoint 7: Bridgwater College northern car park (Night)	Low	Change in composition of view	Adverse, long-term	Very low	Negligible	None proposed	Very low	Negligible
Viewpoint 8: Bridgwater College western car park	Low	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor
Viewpoint 8: Bridgwater College western car park (Night)	Low	Change in composition of view	Adverse, long-term	Low	Minor	None proposed	Low	Minor

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CHAPTER 16: HISTORIC ENVIRONMENT

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Appendix 16A: Heritage Gazetteer

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16. HISTORIC ENVIRONMENT

16.1 Introduction

16.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential historic environment impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus and associated facilities (the proposed development) on land referred to by EDF Energy as the Bridgwater C site (the site).

16.1.2 Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

16.2 Scope and Objectives of Assessment

16.2.1 The scope of the assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by ongoing consultation with statutory consultees (including Sedgemoor District Council (SDC), West Somerset Council (WSC), Somerset County Council (SCC) and English Heritage), the local community and the general public in response to the Stage 1, Stage 2, Stage 2 Update and M5 Junction 24 and Highway Improvements consultations.

16.2.2 The assessment of the historic environment impacts has been undertaken adopting the methodologies described in Section 16.4 of this chapter.

16.2.3 The existing baseline conditions, against which the potential impacts of the proposed development are assessed, have been determined through a desk-based assessment and field reconnaissance survey and are described in Section 16.5 of this chapter. The study area for this assessment is illustrated in **Figure 16.1**.

16.2.4 Impacts to the historic environment are presented in Section 16.6 and appropriate mitigation measures aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance are identified in Section 16.7 of this chapter. An assessment of residual impacts following implementation of these mitigation measures is presented in Section 16.8 of this chapter.

16.2.5 Cumulative impacts to the historic environment arising from the proposed development in combination with other proposed developments as part of the Hinkley Point C (HPC) Project and other relevant plans and projects are identified and assessed in **Volume 11** of this ES.

16.2.6 The objectives of this assessment were to:

- identify all known historic environment assets that may be affected by the proposed development;
- assess the potential for buried archaeological remains to be present and their likely level of preservation;
- assess the likely extent of previous impacts on the historic environment resource;

- assess the potential impacts of the proposed development on the historic environment resource;
- propose mitigation strategies aimed at preventing, reducing or off-setting any potential adverse impacts that are identified to be of significance in respect of the proposed development, if necessary; and
- determine the residual impacts, where appropriate.

16.3 Legislation, Policy and Guidance

16.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential impacts to the historic environment associated with the construction, operational and post-operational phases of the proposed development.

16.3.2 As stated in **Volume 1, Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs.

16.3.3 Notwithstanding this, the IPC may consider other matters that are both important and relevant to its decision-making. This could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

16.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents where relevant to the technical assessment which are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

16.3.5 The scope of assessment is not affected by European or other international legislation.

b) National Legislation

16.3.6 Aspects of national legislation of relevance to the site and to the historic environment are presented below.

i. Ancient Monuments and Archaeological Areas Act 1979 (Ref. 16.1)

16.3.7 Under the terms of this Act an archaeological site or historic building of national importance can be designated as a Scheduled Monument and is registered with the Department of Culture, Media and Sport (DCMS).

16.3.8 Any development that might affect either the Scheduled Monument or its setting is subject to the granting of Scheduled Monument Consent. English Heritage advises the Government on individual cases for consent and offers advice on the management of Scheduled Monuments.

ii. Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref. 16.2)

16.3.9 This Planning (Listed Buildings and Conservation Areas) Act 1990 covers the registration of Listed Buildings (that is those buildings that are seen to be of special architectural or historic interest) and designation of Conservation Areas (areas of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance).

16.3.10 A Listed Building may not be demolished or altered or extended in any manner which would affect its character as a building of special architectural or historic interest without Listed Building Consent being granted. There are three grades of listing (in descending order):

- Grade I: buildings of exceptional interest.
- Grade II*: particularly important buildings of more than special interest.
- Grade II: buildings of special interest, warranting every effort to preserve them.

iii. The Hedgerows Regulations 1997 (Ref. 16.3)

16.3.11 Important hedgerows, as defined by the Hedgerows Regulations 1997, enjoy statutory protection.

c) National Guidance

i. English Heritage's Register of Parks and Gardens in England

16.3.12 The Register of Parks and Gardens of Special Historic Interest in England is maintained by English Heritage and divides the sites into three grade bands similar to those used for Listed Buildings.

ii. English Heritage's Register of Historic Battlefields in England

16.3.13 The English Heritage Register of Historic Battlefields in England presently identifies 43 important English battlefields. Its purpose is to offer them protection and to promote a better understanding of their significance, but it does not offer any statutory protection.

iii. Ancient Woodlands

16.3.14 Ancient woodlands consist of land that has been continuously wooded since AD 1600. Areas of ancient woodland can be protected as nationally important Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SAC) or as Wildlife Sites recognised at a local level.

16.3.15 Ancient woodland is not a statutory designation in that it does not give the wood legal protection. However, increasingly, national, regional and local planning policies mention protection of ancient woodland in planning documents. The Woodland Trust (the UK's leading woodland conservation charity) acts wherever possible to secure protection of ancient woodland.

d) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (January 2005) (Ref. 16.4)

16.3.16 PPS1 sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

16.3.17 Paragraph 5 states that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things: protecting and enhancing the natural and historic environment, the quality and character of the countryside, and existing communities.

ii. Planning Policy Statement 5: Planning for the Historic Environment (PPS5) (March 2010) (Ref. 16.5)

16.3.18 PPS5 sets out planning policies on the conservation of the historic environment. It states that planning has a central role to play in conserving our heritage assets and utilising the historic environment in creating sustainable places. The policies contained within PPS5 will enable the Government's vision for the historic environment to be implemented through the planning system.

16.3.19 PPS5 introduces the concept of a "heritage asset", which is defined as those parts of the historic environment that have significance because of their historic, archaeological, architectural or artistic interest (page 5). Heritage assets include designated heritage assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields and Conservation Areas) and assets identified by the local planning authority during the process of decision-making or through the plan-making process (including local listing) (page 13).

16.3.20 Policy HE1.3 states that, where conflict between climate change objectives and the conservation of heritage assets is unavoidable, the public benefit of mitigating the effects of climate change should be weighed against any harm to the significance of heritage assets in accordance with the development management principles in this PPS and national planning policy on climate change.

16.3.21 Policy HE6.1 states that local planning authorities should require an applicant to provide a description of the significance of the heritage assets affected and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage asset and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset. Policy HE6.2 states this information together with an assessment of the impact of the proposal should be set out in the application as part of the explanation of the design concept. Policy HE6.3 states that local planning authorities should not validate applications where the extent of the impact of the proposal on the significance of any heritage assets affected cannot adequately be understood from the application and supporting documents.

16.3.22 Policy HE7.2 states that, in considering the impact of a proposal on any heritage asset, local planning authorities should take into account the particular nature of the significance of the heritage asset and the value that it holds for this and future generations.

16.3.23 Policy HE7.7 states that, where loss of significance is justified on the merits of new development, local planning authorities should not permit the new development without taking all reasonable steps to ensure the new development will proceed after the loss has occurred by imposing appropriate planning conditions or securing obligations by agreement.

16.3.24 Policy HE8.1 considers non-designated heritage assets and states that the effect of an application on the significance of such a heritage asset or its setting is a material consideration in determining the application.

16.3.25 Policy HE9.1 states that there should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. Loss affecting any designated heritage asset should require clear and convincing justification.

16.3.26 Policy HE9.4 states that, where a proposal has a harmful impact on the significance of a designated heritage asset which is less than substantial harm, in all cases local planning authorities should:

> *"(i) weigh the public benefit of the proposal (for example, that it helps to secure the optimum viable use of the heritage asset in the interests of its long-term conservation) against the harm; and*
>
> *(ii) recognise that the greater the harm to the significance of the heritage asset the greater the justification will be needed for any loss."*

16.3.27 Policy HE9.6 states that there are many heritage assets with archaeological interest that are not currently designated as Scheduled Monuments, but which are demonstrably of equivalent significance. The absence of designation for such heritage assets does not indicate lower significance and they should be considered subject to the policies in HE9.1 to HE9.4 and HE10.

16.3.28 Policy HE10.1 states that, when considering applications for development that affect the setting of a heritage asset, local planning authorities should treat favourably applications that preserve those elements of the setting that make a positive contribution to or better reveal the significance of the asset. When considering applications that do not do this, local planning authorities should weigh any such harm against the wider benefits of the application. The greater the negative impact on the significance of the heritage asset, the greater the benefits that will be needed to justify approval.

16.3.29 Policy HE12.3 states that, where the loss of the whole or a material part of a heritage asset's significance is justified, local planning authorities should require the developer to record and advance understanding of the significance of the heritage asset before it is lost, using planning conditions or obligations as appropriate. The extent of the requirement should be proportionate to the nature and level of the asset's significance. Developers should publish this evidence and deposit copies of the reports with the relevant historic environment record.

e) Regional Planning Policy

16.3.30 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies. **Volume 1, Chapter 4** of this ES provides a full summary of the position regarding the status of regional planning policy.

i. Regional Planning Guidance 10 for the South West (RPG10) 2001-2016 (2001) (Ref. 16.6)

16.3.31 RPG 10 sets out the broad development strategy for the period to 2016 and beyond. Policy EN3 (The Historic Environment) seeks the protection of historic and archaeological areas, sites and monuments of international, national and regional importance. This policy also advises that new development should preserve or enhance historic buildings and conservation areas and important archaeological features and their settings.

ii. The Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of State's Proposed Changes 2008- 2026 (July 2008) (Ref. 16.7)

16.3.32 The draft Revised Regional Spatial Strategy (RSS) looks forward to 2026 and sets out the Government's policies in relation to the development of land within the region.

16.3.33 Policy SD3 (The Environment and Natural Resources) seeks to protect and enhance the region's environment and natural resources by, amongst other things, positive planning and design to set development within, and to enhance, local character (including setting development within the landscape of the historic environment), and bringing historic buildings back into viable economic use and supporting regeneration.

16.3.34 Policy ENV1 (Protecting and Enhancing the Region's Natural and Historic Environment) states that, where development and changes in land use are planned which would affect the natural and historic environment, local authorities will first seek to avoid loss of or damage to the assets, then mitigate any unavoidable damage, and compensate for loss or damage through offsetting actions.

16.3.35 Policy ENV5 (Historic Environment) states that the historic environment of the South West will be preserved and enhanced.

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 16.8)

16.3.36 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to historic environment impacts.

The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

16.3.37 Policy 9 (The Built Historic Environment) states that the setting, local distinctiveness and variety of buildings and structures of architectural or historic interest should be maintained and where possible enhanced. The character or appearance of Conservation Areas should be preserved or enhanced.

16.3.38 Policy 11 (Areas of High Archaeological Potential) states that development proposals should take account of identified Areas of High Archaeological Potential or, elsewhere where there is reason to believe that important remains exist, so that appropriate assessment and necessary protection can be afforded to any archaeological remains identified.

16.3.39 Policy 12 (Nationally Important Archaeological Remains) states that there should be a presumption in favour of the physical preservation in situ of nationally important archaeological remains. The setting and amenity value of the archaeological remains should be protected.

16.3.40 Policy 13 (Locally Important Archaeological Remains) states that development proposals which affect locally important archaeological remains should take account of the relative importance of the remains. If the preservation in situ of the archaeological remains cannot be justified, arrangements should be sought to record those parts of the site that would be destroyed or altered.

f) Local Planning Policy

i. Sedgemoor District Local Plan 1991-2011 (2004) (Policies 'saved' from 27 September 2007) (Ref. 16.9)

16.3.41 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is not subject to any specific historic environment designations. The site is within the defined Development Boundary.

ii. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission) (September 2010) (Ref. 16.10)

16.3.42 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

16.3.43 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to Chapter 4 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. **Volume 1, Chapter 4** provides a full summary of the position regarding the status of the Core Strategy.

16.3.44 The following Core Strategy (Proposed Submission) policies are of potential relevance:

16.3.45 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, protect and enhance the quality of the historic environment.

16.3.46 Policy D4 (Renewable or Low Carbon Energy Generation) states that the Council will support proposals that maximise the generation of energy from renewable or low carbon sources, provided that the installation would not have significant adverse impact taking into account the impact of the scheme, together with any cumulative impact on, amongst other things, historic features.

16.3.47 Policy D17 (Historic Environment) states that all development proposals should contribute to enhancing and maintaining the historic environment, ensuring a continued role in distinguishing the District's unique sense of identity and place. In all cases proposals should take into account the need for buildings and landscape (including archaeological remains, battlefields and historic parks and gardens) to adapt to climate change and the positive contribution heritage makes to regeneration. Where development is proposed within the vicinity of historical assets (including archaeological sites) the Council will support schemes that promote management, interpretation and improved public access.

16.3.48 Policy D17 also states that development will be supported where it proposes: appropriate design, including contemporary solutions which positively enhance the character and quality of Conservation Areas; the development of local skills and crafts relevant to the historic environment; a viable use for Listed Buildings, consistent with their historic character, with a clear presumption against their demolition; an emphasis on the importance of the setting of Listed Buildings and other historic assets; appropriate energy efficiency measures where the principles of minimum intervention and reversibility are adopted. Where development resulting in the loss of an historic asset is exceptionally permitted, the Council will require the recording of features of interest that would be destroyed in the course of any proposed work.

g) Supplementary Planning Guidance

16.3.49 Whilst not forming part of the statutory development plan for the Sedgemoor, Bridgwater Vision (2009) (Ref. 16.11) sets out a regeneration framework for the Bridgwater comprising a 50 year vision and seven transformational themes for the town.

16.3.50 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the Hinkley Point C Project both pre and post-construction (page 44).

16.3.51 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which

object to the draft HPC SPD. See **Volume 1, Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD.

16.3.52 The draft HPC SPD does not set out any specific guidance in relation to historic environment impacts at the site.

16.3.53 Further planning policy context is provided in the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4**) and the Introduction chapter (**Volume 4, Chapter 1**).

16.4 Methodology

16.4.1 The baseline assessment has been undertaken in accordance with the published guidelines set out by the Institute for Archaeologists' (IfA) Standards and Guidance for Archaeological Desk-Based Assessment (Ref. 16.12).

16.4.2 There is, as yet, no standard or guidance published by the IfA or English Heritage specifically relating to EIA for the historic environment. In the absence of this, therefore, use has been made (as appropriate) of guidance on assessing the effects of roads schemes on heritage, given in the Design Manual for Roads and Bridges (DMRB), Volume 11: Environmental Assessment, Section 3, Part 2, Cultural Heritage (Ref. 16.13).

16.4.3 Within this chapter, the generic descriptions used to define the level of significance and the likelihood of occurrence are those given in **Volume 1, Chapter 7** of this ES. This provides a matrix comparing the magnitude of an impact with the value and sensitivity (importance) of the receptor, to determine the level of significance of predicted impacts.

a) Study Area

16.4.4 The geographical extent of the study area comprises:

- the site; and
- a 500m area around the site.

16.4.5 The study area is illustrated in **Figure 16.1**.

b) Baseline Assessment

16.4.6 Heritage assets were identified through (Ref.16.14):

- a search of the records held at the National Monuments Record (NMR) and the Somerset Historic Environment Record (HER), both conducted in December 2009;
- analysis of the Historic Landscape Characterisation (HLC) data for Somerset, conducted in December 2009;
- a search of historical maps and documentation at the Somerset Record Office, including aerial photography (APs) and the South West Archaeological Research Framework (SWARF) (Ref. 16.15), also conducted in December 2009; and
- consultation with SCC Historic Environment Service (HES) and English Heritage.

16.4.7 A non-intrusive field reconnaissance survey was carried out at the site in order to identify both known and previously unrecorded heritage assets (for example historic landscape features, extant earthworks).

16.4.8 The full list of identified archaeological and historical sites, features and finds identified within the study area are presented in a gazetteer, attached as **Appendix 16A.**

c) Consultation

16.4.9 Consultation has been undertaken throughout the EIA process and further information may be found in the **Consultation Report**. Meetings were held with SCC HES and English Heritage to discuss all stages of the assessment including specific aspects of the proposed development.

d) Assessment Methodology

16.4.10 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. In addition the following specific methodology was applied for the historic environment in the determination of receptor value and sensitivity (see **Table 16.1**) and of impact magnitude (see **Table 16.2**).

i. Value and Sensitivity

16.4.11 All of the heritage assets that may be impacted by the proposed development have been assigned a level of importance (value) in accordance with those definitions set out in **Volume 1, Chapter 7** of this ES and with the historic environment definitions given in **Table 16.1**.

16.4.12 Assessment of the importance, or value, of heritage assets is based upon existing designations, the potential to contribute to the aims of SWARF (Ref. 16.15) and the criteria described in **Table 16.1**, which is based on the DMRB (Ref. 16.13).

16.4.13 As there are no internationally important sites within the study area (e.g. World Heritage sites), the DMRB category of “Very High Importance” has not been applied.

16.4.14 PPS 5 uses the phrase “*significance of a heritage asset*” to mean “*the value of a heritage asset*” (Ref.16.5).

16.4.15 Sensitivity, with regard to the historic environment, is a subjective term which describes the potential for a heritage asset to absorb change. It reflects the current setting of an asset and the extent to which changes to that setting would affect the significance of the asset. The importance of a Scheduled Monument, for example, is always high (as shown in **Table 16.1**), regardless of its setting. The sensitivity of a Scheduled Monument in a developed or semi-urban environment would usually be lower than the sensitivity of a similar monument in a remote, or unspoilt, setting. Consequently, sensitivity has been taken into account in the assessment of impacts on setting.

16.4.16 Setting is defined in PPS 5 (Ref.16.5) as:

> *"The surroundings in which an asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral."*

16.4.17 In terms of considerations which may affect setting, Paragraph 114 of the PPS 5 Practice Guide (Ref.16.16) highlights that:

> *"The extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset would play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration; by spatial associations; and, by our understanding of the historic relationship between places."*

Table 16.1: Criteria Used to Determine Importance (Value)

Importance	Description
High	Ancient monuments scheduled under the Ancient Monuments and Archaeological Areas Act 1979, or archaeological sites and remains of comparable quality, assessed with reference to the Secretary of State's non-statutory criteria, as set out in DCMS Guidance on Scheduled Monuments, Annex 1 (Ref. 16.1). Historic buildings that can be shown to have exceptional qualities in their fabric or historical association (for example Grade I or II* Listed Buildings). Well preserved historic landscapes preserving visible elements from medieval or earlier patterns.
Medium	Archaeological sites and remains which, while not of national importance, fulfil several of the Secretary of State's criteria and are important remains in their regional context. Historic buildings that can be shown to have important qualities in their fabric or historical association (for example many Grade II Listed Buildings). Averagely well-preserved historic landscapes.
Low	Archaeological sites and remains that are of low potential or minor importance. Historic buildings of modest quality in their fabric or historical association. Historic landscapes with specific and substantial importance to local interest groups, but with limited wider importance.

Importance	Description
Very low	Buildings of no architectural or historical merit. Areas in which investigative techniques have produced negative or minimal evidence for archaeological remains, or where previous large-scale disturbance or removal of deposits can be demonstrated. Almost wholly modern landscapes created through the removal of historic boundaries.

ii. Magnitude of Impacts

16.4.18 The magnitude of impacts has been based on the consequence that the proposed development would have on the historic environment resource and has been considered in terms of high, medium, low and very low (see **Table 16.2**, adapted from DMRB (Ref. 16.13)).

16.4.19 Potential impacts have also been considered in terms of permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

16.4.20 A permanent impact is considered irreversible and consequently often represents an impact of high magnitude. The sources of impact may arise during construction, operational and/or post-operational phases.

Table 16.2: Guidelines for the Assessment of Magnitude

Magnitude	Impact
High	Complete removal of an archaeological site. Severe transformation of the setting or context of a heritage asset or significant loss of key components in a monument group.
Medium	Removal of a major part of an archaeological site's area and loss of research potential. Partial transformation of the setting or context of a heritage asset or partial loss of key components in a monument group. Introduction of significant noise or vibration levels to a monument leading to changes to amenity use, accessibility or appreciation of a heritage asset. Diminished capacity for understanding or appreciation (context) of a heritage asset.
Low	Removal of a heritage asset where a minor part of its total area is removed, but that the site retains a significant future research potential. Minor change to the setting of a monument.
Very low	No significant physical impact or change. No significant change in setting or context. No impact from changes in use, amenity or access.

iii. Significance of Impacts

16.4.21 The significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the resource. The methodology for assessing predicted significance of the impacts, without mitigation, is outlined in **Volume 1, Chapter 7**.

16.4.22 For the purpose of this assessment, mitigation measures have been proposed where there is an impact of greater than minor adverse significance and are appropriate given their magnitude, spatial scope and temporal nature.

iv. Cumulative Impacts

16.4.23 **Volume 1, Chapter 7** of this ES refers to the methodology used to assess cumulative impacts. Additive and interactive effects between impacts generated within the site boundary are assessed within this chapter. Cumulative effects that consider activities and impacts generated at distance from the site are considered in **Volume 11**. This assesses the project-wide cumulative impacts and in-combination impacts with other proposed, or reasonably foreseeable projects.

e) Limitations, Constraints and Assumptions

16.4.24 There are no limitations, constraints or assumptions relevant to the assessment of the historic environment at this site.

16.5 Baseline Environmental Characteristics

a) Introduction

16.5.1 Baseline environmental information is drawn from the Gazetteer presented in **Appendix 16A** of this volume. A total of 24 heritage assets were identified within the study area and each has been assigned a unique identification number. These are referred to in the text in **bold**, listed in the Gazetteer and shown on the Archaeological Site Location Map (**Figure 16.1**). The periods and dates used largely follow the terminology included in the Department for Transport's (DfT's) Transport Assessment Guidance (Ref. 16.17).

b) Site Description and Topography

16.5.2 The site lies in the town of Bridgwater, in the County of Somerset. Bridgwater town is a semi-industrial settlement, spanning low-lying land either side of the River Parrett. The town is bypassed by the M5 Motorway to the east.

16.5.3 The site includes approximately 1.9ha of land. It encompasses the area of Bridgwater and Albion Rugby Football Club and is bounded to the east by College Way and to the north by the A39 (Bath Road). The western boundary is bounded by a rugby pitch with the mainline railway beyond, while the southern edge borders the wider Bridgwater College complex (**Figure 16.1**). The road junction to the north-west is also included within the site.

16.5.4 A description of the geology of the site is presented in **Chapter 12** of this volume of the ES.

c) Statutory Constraints

16.5.5 There are no Scheduled Monuments, Conservation Areas, Registered Parks and Gardens, Registered Battlefields, important hedgerows or ancient woodlands within the site or the study area.

16.5.6 Approximately 50m south of the study area boundary is the Grade II* Listed Bridgwater Railway Station (**2**). This is deemed to be at sufficient distance from the site, beyond previously developed land, not to warrant further discussion. It is not considered that its setting would be affected by the proposed development.

d) Archaeological and Historical Background

16.5.7 There are two recorded heritage assets identified within the site; post-medieval brick pits used for clay extraction (**5**) and the Nether Stowey to Ashcott road which was turnpiked in 1730 (**Table 16.3**). The clay pits have since been filled in and are no longer visible and the road has been modernised and developed. There are a total of 24 heritage assets within the study area (**Figure 16.1**).

Table 16.3: Archaeological Sites within the Site

ID Number	Name	Designation	Description	Importance
5	Brick Pits	Undesignated	Clay extraction pits dating to the post-medieval period.	Low
12	Nether Stowey to Ashcott road	Undesignated	Nether Stowey to Ashcott – turnpiked in 1730.	Low

i. Lower Palaeolithic to Medieval (pre 30,000 BP–AD 1540)

16.5.8 There are no known heritage assets that date from these periods within the site boundary or study area.

ii. Post-medieval (AD 1540 onwards)

16.5.9 Within the site boundary, much of the land may have already been enclosed by the beginning of the post-medieval period, and there is evidence for the utilisation of the site during this time.

16.5.10 There are two heritage assets dating from the post-medieval period within the site. The brick pits (**5**) relate to the extraction of clay during the post-medieval period and are recorded in the vicinity of the area occupied by the present day Bridgwater and Albion Rugby Football Club. No visible remains were noted during the field reconnaissance survey.

16.5.11 The Nether Stowey to Ashcott road (**12**) which was turnpiked in 1730 runs along the north-western edge of the site boundary. It has been developed and modernised and none of the original post-medieval road survives.

e) Historic Buildings

16.5.12 There are no surviving historic buildings within the confines of the site or the study area.

f) Historic Landscape

16.5.13 The Bridgwater Tithe map *c*.1840 (Ref. 16.18) shows the site and study area as open fields, and the Somerset HLC describes the confines of the site boundary as 'Settlement post-Tithe map *c*.1840' (**HLC 14**).

16.5.14 By the time of the Ordnance Survey (OS) First Edition 1887-1890 (Ref. 16.19), 'Bath Bridge' and 'Grandfield's Buildings' are depicted in the northern section of the site. The rectangular building shown in the southern section is most likely associated with the railway. In general the site appears relatively undeveloped, within open

recreational land, peripheral to more densely built up areas within the historic urban centre of Bridgwater.

16.5.15 The 1962 OS map (Ref. 16.20) shows that the majority of the site was occupied by clay pits and it is later shown as a refuse tip on the 1968 edition OS map (Ref. 16.21). The site appears to have been converted into playing fields by 1979 (see **Chapters 11** and **12** of this volume of the ES).

g) Previous Impacts

16.5.16 The majority of the land within the confines of the site is currently used for sports facilities (rugby pitches and associated buildings). Major adverse impacts to any archaeological remains would have occurred during the working of the site for clay extraction during the post-medieval period (**5**). The site was subsequently backfilled with associated waste material during the 1960s and 1970s.

16.5.17 The Bristol and Exeter Railway (**8**), to the west of the site, would also have had a major impact on any archaeological remains in the immediate vicinity.

16.5.18 The modernisation of the Nether Stowey to Ashcott road would have removed all material traces of the turnpike road (**12**) although the alignment remains the same.

16.6 Assessment of Impacts

a) Construction Impacts

16.6.1 This section identifies and assesses the potential effects of the construction phase on the historic environment resource in and around the site. A detailed description of the construction area of the proposed development is supplied within **Chapter 3** of this volume of the ES.

i. On-site Heritage Assets

16.6.2 Surface destruction of any older heritage assets would have already occurred as a result of the post-medieval clay extraction carried out across the site. Furthermore, the record of these brickpits used for clay extraction (**5**) refers to the location of a heritage asset and does not imply the survival of the asset itself. The more recent extraction and landfilling during the 1960s and 1970s would have significantly degraded and probably destroyed any features associated with the asset, which may previously have been present. The modernisation of the Nether Stowey to Ashcott road (**12**) will have done the same for the post-medieval turnpike road that was on the same alignment. Consequently **no impact** is expected to either of these assets and the recorded assets will not be discussed further.

16.6.3 The site has been classified as 'Settlement post-Tithe map *c*.1840' (**HLC 14**). The part of **HLC 14** that lies within the site boundary would not change in character classification as result of the proposed development. Therefore there would be **no impact** to the character of **HLC 14**.

ii. Off-site Heritage Assets

16.6.4 There are not anticipated to be any impacts to off-site heritage assets associated with the proposed development.

b) Cumulative Construction Impacts

16.6.5 There would be no cumulative construction impacts to heritage assets.

c) Operational Impacts

16.6.6 This section addresses the potential effects of the operational phase of the proposed development on the historic environment resource. A description of the operational phase of the proposed development is supplied within **Chapter 4** of this volume.

i. On-Site Heritage Assets

16.6.7 There are not anticipated to be any operational impacts to on-site heritage assets.

ii. Off-Site Heritage Assets

16.6.8 There are not anticipated to be any operational impacts to off-site heritage assets.

d) Cumulative Operational Impacts

16.6.9 There would be no cumulative operational impacts to heritage assets.

e) Post-Operational Impacts

16.6.10 This section identifies and assesses the potential impacts to the historic environment associated with this phase of the proposed development. A description of the post-operational phase is supplied within **Chapter 5** of this volume of the ES.

i. Disturbance to On-Site Heritage Assets During Post-Operational Phase

16.6.11 It is considered that there would be **no impact** to on-site heritage assets, as all the development would be left in situ within areas previously disturbed during construction of the proposed development.

ii. Disturbance to Off-Site Heritage Assets During Post-Operational Phase

16.6.12 It is not considered there would be any impact to off-site heritage assets during the post-operational phase.

f) Cumulative Post-operational Impacts

16.6.13 There would be no cumulative impacts to heritage assets during the post-operational phase.

16.7 Mitigation of Impacts

16.7.1 For the purpose of this assessment, mitigation measures have been proposed where there is an impact of greater than minor adverse significance and are appropriate given their magnitude, spatial scope and temporal nature.

16.7.2 There are no impacts to heritage assets during the construction, operational or post-operational phases of the proposed development. Therefore there is no proposed mitigation.

16.8 Residual Impacts

a) Construction Impacts

16.8.1 There are no impacts affecting heritage assets during the construction, operational or post-operational phases and therefore there are no residual impacts.

16.9 Summary of Impacts

16.9.1 This assessment has identified no impacts upon the historic environment. **Table 16.4** has been retained for consistency with the chapters within this and other volumes of the ES.

Table 16.4: Summary of Impacts

Receptor	Potential Impact	Magnitude	Description	Value/ Sensitivity	Significance	Proposed Mitigation	Residual Impact
Construction Phase							
On-site heritage assets	None	N/A	N/A	N/A	N/A	N/A	N/A
Off-site heritage assets	None	N/A	N/A	N/A	N/A	N/A	N/A
Operational Phase							
On-site heritage Assets	None	N/A	N/A	N/A	N/A	N/A	N/A
Off-site heritage assets	None	N/A	N/A	N/A	N/A	N/A	N/A
Post-operational Phase							
On-site heritage assets	None	N/A	N/A	N/A	N/A	N/A	N/A
Off-site heritage assets	None	N/A	N/A	N/A	N/A	N/A	N/A

References

16.1 DCMS. Scheduled Monuments: Identifying, protecting, conserving and investigating nationally important archaeological sites under the Ancient Monuments and Archaeological Areas Act 1979, Department for Culture, Media and Sport, 2010.

16.2 Planning (Listed Buildings and Conservation Areas) Act, HMSO, 1990.

16.3 Hedgerow Regulations, HMSO, 1997.

16.4 ODPM. Planning Policy Statement 1: Delivering Sustainable Development. HMSO, 2005.

16.5 CLG. Planning Policy Statement 5: Planning for the Historic Environment. HMSO, 2010.

16.6 Government Office of the South West. Regional Planning Guidance (RPG 10) for the South West 2001-2016, 2001.

16.7 Government Office for the South West. The Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of State's Proposed Changes 2008 - 2026. HMSO, July 2008.

16.8 SCC. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011, 2000.

16.9 SDC. Sedgemoor District Local Plan (1991-2011 Adopted Version), 2004.

16.10 SDC. Sedgemoor District Local Development Framework Core Strategy (Proposed Submission), September 2010.

16.11 SDC. Bridgwater Vision – Delivering a Strategic Framework, 2009.

16.12 Institute for Archaeologists (IfA). Standard and Guidance for Archaeological Desk Based Assessment, Institute for Archaeologists, Reading, 2008.

16.13 Highways Agency. Design Manual for Roads and Bridges (DMRB), Volume 11: Environmental Assessment, Section 3, Part 2, Cultural Heritage, 2007.

16.14 AMEC. Bridgwater Associated Development: Cultural heritage Desk-based Assessment, 2010.

16.15 Webster, C.J. (ed.). The Archaeology of South West England: South West Archaeological Research Framework Resource Assessment and Research, 2008.

16.16 CLG. Planning Policy Statement 5: Planning for the Historic Environment: Historic Environment Planning Practice Guide. HMSO, 2010.

16.17 DfT. Transport Assessment Guidance (WebTag) Unit 3.3.9 The Heritage of Historic Resources, Table 2. HMSO, 2003.

16.18 SCC. Bridgwater Tithe Map, c. 1840.

16.19 Ordnance Survey 1st Edition Map (1:10,560 - Somerset), 1887-1890.

16.20 Ordnance Survey Map (1:10,560 - Somerset), 1962.

16.21 Ordnance Survey Map (1:2,500 - Somerset), 1968.

CHAPTER 17: AMENITY AND RECREATION

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17. AMENITY AND RECREATION

17.1 Introduction

17.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the potential amenity and recreation impacts associated with the construction, operational and post-operational phases of the proposed Bridgwater C accommodation campus (the proposed development) on land referred to by EDF Energy as the Bridgwater C site (the site). Detailed descriptions of the site, proposed development, construction, operational and post-operational phases are provided in **Chapters 1** to **5** of this volume of the ES.

17.2 Scope and Objectives of Assessment

17.2.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Infrastructure Planning Commission (IPC). It has also been informed by consultation with statutory consultees, including Sedgemoor District Council (SDC), West Somerset Council (WSC) and Somerset County Council (SCC), local residents and members of the general public, in response to EDF Energy's Stage 1, Stage 2, and Stage 2 Update, M5 Junction 24 and Highway Improvements consultations for the Hinkley Point C Project Development Consent Order (DCO) application.

17.2.2 The assessment of amenity and recreation impacts has been undertaken adopting the methodologies described in Section 17.4 of this chapter.

17.2.3 The existing baseline conditions, against which the likely environmental impacts of the proposed development are assessed, have been determined through desk-based data collation, field surveys and consultation with various sports and recreation organisations and are described in Section 17.5 of this chapter.

17.2.4 The study area for this assessment is illustrated in **Figure 17.1** and comprises:

- the site;
- the surrounding Public Rights of Way (PRoW) network (within a 1km area around the site); and
- the surrounding amenity and recreational resource (within a 1km area around the site).

17.2.5 Section 17.6 of this chapter assesses the potential impacts to amenity and recreation including obstruction to PRoW, sports and recreation facilities, open access land and public open space.

17.2.6 Disturbance to users of PRoW, sports and recreation facilities, open access land and public open space as a result of noise, air quality and visual impacts during the various phases of the development (including construction, operational, and post-operational) is considered in the relevant topic chapters and summarised herein.

17.2.7 The impacts of the construction workforce on amenity and recreation is not considered in this chapter. **Chapter 7** (Socio-economics) of this volume of the ES considers impacts of the construction workforce.

17.2.8 Appropriate mitigation measures are presented in Section 17.7 of this chapter. Residual impacts following implementation of these mitigation measures are presented in Section 17.8 of this chapter.

17.2.9 Cumulative impacts to the amenity and recreation resource arising from the proposed development in combination with other elements of the Hinkley Point C Project, and other relevant projects are identified and assessed in **Volume 11** of this ES.

17.2.10 The objectives of this assessment were to:

- identify the location and importance of the existing amenity and recreation resource within the study area that would be affected by the proposed development;
- assess the impacts of the proposed development during the construction, operational and post-operational phases on the amenity and recreation resource;
- identify mitigation, if determined necessary, to reduce the impacts of the proposed development on the amenity and recreation resource; and
- assess the residual impacts of the proposed development during the construction, operational and post-operational phases on the amenity and recreation resource after implementation of the proposed mitigation measures.

17.3 Legislation, Policy and Guidance

17.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of potential amenity and recreation impacts associated with the construction, operational and post-operational phases of the proposed development.

17.3.2 As stated in **Volume 1**, **Chapter 4**, the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) when combined with the NPS for Nuclear Power Generation (NPS EN-6) provides the primary basis for decisions by the IPC on applications for nuclear power generation developments that fall within the scope of the NPSs. NPS EN-1 Section 5.1, draws attention to the need to identify the impact of nationally significant energy infrastructure on existing land uses near the project including open spaces, green infrastructure and sports and recreation facilities.

17.3.3 In addition, the IPC may consider other matters that are both important and relevant to its decision-making. These could include Planning Policy Statements (PPSs), Planning Policy Guidance Notes (PPGs), regional and local policy documents, although, if there is a conflict between these and the NPS, the NPS prevails for the purposes of IPC decision making.

17.3.4 Further, the Planning Act 2008 provides that the IPC must, in making its decision on an application, have regard to any Local Impact Report (LIR) prepared by relevant local authorities. It is anticipated that the LIRs will rely in part on PPSs, PPGs, regional and local policy to provide a context for their assessment. On this basis, regard has been given to these documents (where relevant to the technical assessment) since they are likely to inform the LIRs prepared by the relevant local authorities.

a) International Legislation

17.3.5 The scope of this assessment is not affected by European or other international legislation.

b) National Legislation

i. The Countryside and Rights of Way (CRoW) Act 2000 (Ref. 17.1)

17.3.6 Part I of the CRoW Act is intended to give greater freedom for people to explore open countryside. It contains provisions to introduce a new statutory right of access for open-air recreation to mountain, moor, heath, down and registered common land. It also includes a power to extend the right to coastal land by order and enables landowners voluntarily to dedicate irrevocably any land to public access.

17.3.7 Part II of the CRoW Act contains provisions designed to reform and improve rights of way. It introduces measures for the strategic review, planning and reporting of improvements to rights of way, and the promotion of increased access for people with mobility problems. A new category of right of way - restricted byway - having rights for walkers, cyclists, horse riders and horse drawn vehicles, is provided which replaces the previous category of Roads Used as Public Paths. Under Section 69, local authorities are required to have regard to the needs of disabled people when authorising the erection of gates and other barriers across rights of way to control livestock. There is also provision for occupiers of any land to temporarily divert a footpath or bridleway which passes over that land where works are likely to cause danger to users of the right of way.

ii. The Highways Act 1980 (Ref. 17.2)

17.3.8 The statutory provisions for creating, diverting and extinguishing public rights of way are enshrined in the 1980 Act, in order to protect both the public's rights and the interests of owners and occupiers. The Act also protects the interests of bodies such as statutory undertakers. The requirements for making, confirming and publicising orders are set out in Schedule 6 to the 1980 Act, and include requirements for consulting widely on such changes.

17.3.9 The duty to maintain highways rests with local highway authorities under the 1980 Act, though the authorities may also maintain public rights of way that are not publicly maintainable. Maintenance should be such that ways are capable of meeting the use that is made of them by ordinary traffic at all times of the year (Ref. 17.3), and this can include surfacing.

17.3.10 Under the Act, landowners are responsible for any structures across the public rights of way, including gates, stiles, and other structures, as well as ensuring that trees, shrubs and hedges do not overhang or obstruct the passage of pedestrians, horse-riders, and vehicles subject to the status of the public right of way.

iii. The Wildlife and Countryside Act 1981 (Ref. 17.4)

17.3.11 Part III of the Wildlife and Countryside Act 1981 places a duty on surveying authorities to keep the definitive map and statement under continuous review and to modify the map. For example, if it becomes known to the surveying authority that a right of way being a public path not shown on the map subsists over land in the area to which the map relates. It also contains other elements of protection of PRoW,

such as the prohibition against keeping bulls on land crossed by PRoW and the appointment of wardens for PRoW. The Act also includes enactment for making and confirmation of certain orders creating, extinguishing or diverting footpaths and bridleways.

iv. Equality Act 2010 (Ref. 17.5)

17.3.12 The Equality Act 2010 received Royal Assent in April 2010. The purpose of the Act was to harmonise discrimination law and to strengthen the law to support progress on equality. The Act brings together and re-states domestic discrimination law as contained in a number of pieces of legislation, including the Disability Discrimination Act 1995. The Equality Act 2010 provides that every public authority shall, in carrying out any of its functions, have due regard to the provisions of this Act. It must therefore be taken into account by public authorities when exercising their functions in respect of the provision of public footpaths and other rights of way.

17.3.13 Whilst there are no mandatory specifications laid down in the Equality Act 2010 for structures such as gaps, gates and stiles, the British Standards Institute has developed a comprehensive standard, the current version of which has been published as BS5709:2006 (Ref. 17.6).

c) National Planning Policy

i. Planning Policy Statement 1: Delivering Sustainable Development (PPS1) (2005) (Ref. 17.7)

17.3.14 PPS1 sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system.

17.3.15 Paragraph 5 states that planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by, amongst other things: protecting and enhancing the natural and historic environment, the quality and character of the countryside and existing communities.

ii. Planning Policy Guidance 17: Planning for Open Space, Sport and Recreation (2002) (PPG17) (Ref. 17.8)

17.3.16 PPG17 sets out the role of the planning system in assessing opportunities and needs for open space, sports and recreation provision in development proposals. It also describes the necessity of safeguarding open space which has recreational value.

17.3.17 Paragraph 10 of PPG17 states that existing open space, sports and recreational buildings and land should not be built on unless an assessment has been undertaken which has clearly shown the open space or the buildings and land to be surplus to requirements.

17.3.18 In respect of any planning applications involving development on playing fields, paragraph 15 of PPG17 states that, where a robust assessment of need in accordance with PPG17 has not been undertaken, planning permission for such developments should not be allowed unless: the proposed development is ancillary to the use of the site as a playing field and does not adversely affect the quantity or quality of pitches and their use; the proposed development only affects land which is incapable of forming a playing pitch (or part of one); the playing fields that would be lost as a result of the proposed development would be replaced by a playing field or

fields of equivalent or better quantity and quality and in a suitable location; or the proposed development is for an outdoor or indoor sports facility of sufficient benefit to the development of sport to outweigh the loss of the playing field.

17.3.19 In respect of planning applications, either within or adjoining open space, paragraph 16 of PPG17 states that local authorities should weigh any benefits being offered to the community against the loss of open space that will occur. It states that planning authorities may wish to allow small scale structures where these would support the existing recreational uses, or would provide facilities for new recreational uses.

17.3.20 Paragraph 32 of PPG17 states that recreational rights of way are an important resource and local authorities should seek opportunities to provide better facilities for walkers, cyclists and horse-riders, for example by adding links to existing rights of way networks; and protect and enhance those parts of the rights of way network that might benefit open space.

iii. Consultation Paper on a New Planning Policy Statement – Planning for a Natural and Healthy Environment (2010) (Ref. 17.9)

17.3.21 In its final form, it is intended that this PPS will replace PPG17. A key objective of this PPS is to bring together related policies on the natural environment and on open space and green spaces in rural and urban areas to ensure that the planning system delivers healthy sustainable communities which adapt to and are resilient to climate change and gives the appropriate level of protection to the natural environment (page 10).

17.3.22 The consultation document explains that the Government continues to support the need to make adequate provision of land and facilities for sport, recreation and children's play, and intends to maintain the existing policies in PPG17. Local planning authorities will continue to be required to protect from development existing land and facilities unless it can be demonstrated that they are surplus to requirements. Where deficits are identified, local planning authorities should identify opportunities to improve provision either by providing new facilities or by making better use of existing ones (page 11).

d) Regional Planning Policy

17.3.23 The Government's revocation of regional strategies was quashed in the High Court on 10 November 2010. However, on that same date the Government reiterated in a letter to Chief Planners its intention to revoke regional strategies through the Localism Bill. This letter was also challenged but, on 7 February 2011, the High Court held that the Government's advice to local authorities that the proposed revocation of regional strategies was to be regarded as a material consideration in their planning development control decisions should stand. The decision of the High Court was upheld by the Court of Appeal on 27 May 2011. Therefore, the regional strategies remain in place but in the case of development control decisions it is for planning decision makers to decide on the weight to attach to the strategies (see **Volume 1, Chapter 4** of this ES for a full summary of the position regarding the status of regional planning policy).

i. Regional Planning Guidance 10 (RPG10) for the South West 2001-2016 (RPG10) (2001) (Ref. 17.10)

17.3.24 RPG10 sets out the broad development strategy for the period to 2016 and beyond. Policy TCS2 (Culture, Leisure and Sport) states that local authorities and other agencies in their plans, policies and proposals should, amongst other things: identify and protect recreational open spaces and playing fields; identify sites and opportunities for the provision of new cultural, leisure and community sports facilities and ensure that new facilities are readily accessible by sustainable modes of transport.

ii. The Draft Revised Regional Spatial Strategy for the South West Incorporating the Secretary of State's Proposed Changes 2008-2026 (July 2008) (Ref. 17.11)

17.3.25 The draft Revised Regional Spatial Strategy (RSS) looks forward to 2026 and sets out the Government's policies in relation to the development of land within the region. Policy SD4 (Sustainable Communities) states that growth and development will be planned and managed positively to create and maintain Sustainable Communities throughout the region by, amongst other things, providing networks of accessible green space for people to enjoy.

17.3.26 Policy D (Infrastructure for Development) states that the planning and delivery of development should ensure efficient and effective use of existing infrastructure and should provide for the delivery of new or improved transport, education, health, culture, sports and recreation and green infrastructure in step with development.

iii. Somerset and Exmoor National Park Joint Structure Plan Review 1991-2011 (2000) (Policies 'saved' from 27 September 2007) (Ref. 17.12)

17.3.27 The Somerset and Exmoor National Park Joint Structure Plan was adopted in 2000 with relevant policies saved from 27 September 2007. All policies have been saved with the exception of Policy 53 which is unrelated to amenity and recreation impacts. The Plan provides a strategic base for all land use planning within the plan area for the period up to 2011.

17.3.28 Policy 37 (Facilities for Sport and Recreation within Settlements) states that provision should be made for the protection, maintenance and improvement of the range of facilities for sports and recreation, where they are compatible with the size and function of the settlement involved. New developments which would generate substantial transport movements should be accessible by public transport.

17.3.29 Policy 42 (Walking) states that facilities for pedestrians should be improved by maintaining and extending the footpath network, particularly between residential areas, shops, community facilities, workplaces and schools and by ensuring that improvements to the highway provide for safe use.

iv. Somerset's Future Transport Plan 2011 - 2026 (2011) (Ref. 17.13)

17.3.30 Somerset's Future Transport Plan sets out SCC's long-term strategy for delivering the County's transport priorities for the period between 2011 and 2026.

17.3.31 The document recognises the value of Somerset's PRoW network and commits to maintain it and to improve the information available for people to use it. The

document also states that it will seek to help people make more trips on foot and help people see the benefits of walking.

v. Somerset County Council Rights of Way Improvement Plan (2006) (Ref. 17.14)

17.3.32 The SCC Rights of Way Improvement Plan (RoWIP) sets out SCC's proposals to improve the provision of PRoW in Somerset for walkers, cyclists, equestrians and those with visual or mobility impairments. The RoWIP is based on the following six key aims which are supported by policy statements and prioritised actions (RoWIP, Section 9):

- raise the strategic profile of the PRoW network;
- improve how the PRoW network is maintained;
- improve how Definitive Map Modification and Public Path Orders are processed;
- improve access information provision;
- work in partnership with key organisations (page 10); and
- develop a safe access network.

17.3.33 The RoWIP recognises that walking is the most popular reason for the general public to visit the countryside in Somerset (page 26).

e) Local Planning Policy

i. Sedgemoor District Local Plan (1991-2011 Adopted Version) (2004) (Policies 'saved' from 27 September 2007) (Ref. 17.15)

17.3.34 The Sedgemoor District Local Plan forms part of the Development Plan for Sedgemoor. The Local Plan was adopted in 2004 (with relevant policies 'saved' from 27 September 2007). The Proposals Map (Inset Map No. 1) indicates that the site is designated as an area of Recreational Open Space (Policy RLT1). An area of Recreational Open Space (Policy RLT1) is situated to the immediate west of the site and an Off-road Cycle Route (Policy TM1) linking College Way with Fairfax Road is located to the south-east of the site. The site is within the defined Development Boundary.

17.3.35 The following saved policies are considered to be potentially relevant.

17.3.36 Policy RLT1 (Protection of Recreational Open Space) states:

"Development which would result in the loss of recreational open space will not be permitted unless:

a) the existing sports and recreation facilities can best be retained and enhanced through the redevelopment of a small part of the site; or

b) a replacement facility of equivalent sports and/or recreation benefit is made available; or

c) the proposed development provides sports and/or recreation facilities of greater benefit than the long term recreational value of the open space that would be lost."

17.3.37 Policy TM1 (Safe and Sustainable Transport) states that development will not be permitted which would prejudice the construction of cycle and pedestrian routes and bus lanes defined on the Proposals Map, unless suitable alternative routes are provided by the developer. Likewise, development will not be permitted which would reduce the convenience and safety of existing rights-of-way, bridle paths and cycle paths unless suitable alternative routes are provided by the developer.

ii. Sedgemoor District Local Development Framework (LDF) Core Strategy (Proposed Submission) (September 2010) (Ref. 17.16)

17.3.38 The Sedgemoor LDF Core Strategy (Proposed Submission) was consulted on from September to November 2010. Changes prior to submission proposed as a result of the consultation process were reported and endorsed by the Council's Executive Committee on 9 February 2011. The Core Strategy (Proposed Submission) was submitted to the Secretary of State on 3 March 2011 and an Examination in Public (EiP) was held in May 2011. Once adopted, the Core Strategy will form part of the Development Plan for Sedgemoor.

17.3.39 EDF Energy submitted representations objecting to the Core Strategy (Proposed Submission), relating to **Chapter 4** 'Major Infrastructure Projects' (and policies MIP1, MIP2 and MIP3 contained in that chapter) and those sections relating to housing and Hinkley Point. EDF Energy also participated at the relevant EiP hearings. See **Volume 1, Chapter 4** for a full summary of the position regarding the status of the Core Strategy.

17.3.40 The following Core Strategy (Proposed Submission) policies are of potential relevance.

17.3.41 Policy S1 (Spatial Strategy for Sedgemoor) states that development proposals will be expected to support the delivery of required infrastructure, including such things as community and cultural facilities and green infrastructure.

17.3.42 Policy S2 (Infrastructure Delivery) states that all new development that generates a demand for infrastructure will only be permitted if the necessary on and off-site infrastructure required to support and mitigate the impact of the development site is either already in place or there is a reliable mechanism to in place to ensure that it will be delivered at the time and in the location it is required.

17.3.43 Policy S3 (Sustainable Development Principles) states that development proposals will be expected to, amongst other things, promote greater self containment of settlements by contributing to communities that are supported by adequate services, cultural, sporting and leisure activities.

17.3.44 Policy D2 (Promoting High Quality and Inclusive Design) states, amongst other things, that development will need to demonstrate high quality, sustainable and inclusive design that responds positively to the characteristics of the site and surrounding area.

17.3.45 Policy D10 (Managing the Transport Impacts of Development) states that development proposals that will have significant transport impacts should, amongst other things, not reduce the convenience and safety of existing rights-of-way, bridle paths and cycle paths, unless suitable alternative routes are provided.

17.3.46 Policy D16 (Pollution Impacts of Development and Protecting Residential Amenity) states, amongst other things, that development proposals that would result in the loss of land of recreational and/ or amenity value will not be supported.

17.3.47 Policy D19 (Healthy Lifestyles) states that development proposals, where appropriate, should promote healthy and active living. Proposals which promote the following will be supported: walking and cycling; accessibility of green spaces and contributing to enhancing the green infrastructure network; enhancement of the quality and quantity of recreational, sport and leisure facilities and children's play space and access to them.

17.3.48 Policy D20 (Green Infrastructure) states that green infrastructure will be safeguarded, maintained, improved, enhanced and added to, as appropriate, to form a multi-functional resource which, amongst other things, provides an accessible network of green spaces which meet recreational needs, cultural needs including education and interpretation, are safe and secure, and support physical health and mental wellbeing.

17.3.49 Policy D20 goes on to state that development should include green infrastructure of an appropriate type, standard and size, and make appropriate provision for future maintenance. Where on-site provision is not possible, contributions will be sought for appropriate off-site provision. Furthermore, if loss of existing green infrastructure assets is unavoidable in order to accommodate necessary development, appropriate mitigation of the loss will be required.

iii. Supplementary Planning Guidance

17.3.50 Whilst not forming part of the statutory Development Plan for Sedgemoor, Bridgwater Vision (2009) (Ref. 17.17) sets out a regeneration framework for Bridgwater, comprising a 50 year vision and seven transformational themes for the town.

17.3.51 The document makes specific reference to Hinkley Point as a strategic project and acknowledges the opportunities and challenges such development will have on the area. It goes on to state that it will be essential to evaluate the environmental impact of the Hinkley Point proposals both pre and post construction (page 44).

17.3.52 Sedgemoor District Council and West Somerset Council have jointly prepared draft supplementary planning guidance in relation to the HPC Project. Public consultation on the Consultation Draft version of the Hinkley Point C Project Supplementary Planning Document (the draft HPC SPD) commenced on 1 March 2011 and concluded on 12 April 2011. EDF Energy has submitted representations which object to the draft HPC SPD. See **Volume 1, Chapter 4** for a full summary of the position regarding the status of the draft HPC SPD.

17.3.53 In relation to PRoW, Box 16 in the draft HPC SPD states that strategic enhancements and maintenance of the PRoW network, which provides links between attractions and points of interest, should be undertaken to mitigate and compensate for cumulative obstruction and disturbance impacts (page 31).

17.3.54 In relation to sports and recreation provision, Box 17 in the draft HPC SPD states that the Hinkley Point C Project promoter should provide sports facilities to cater for the construction workforce and should seek to align proposals with the plans and strategies of existing providers. It states that sports facilities are expected to be located and designed to provide convenient access for the Hinkley Point C Project

workforce and the local community, while also ensuring the facilities can be sustained beyond the construction phase as a long term legacy benefit for the communities and/or settlements with which they are connected (page 32).

17.3.55 With regards to the approach to accommodation campuses in north east Bridgwater, Box 25 in the draft HPC SPD advises that opportunities for improved connectivity through provision of cycle paths, pedestrian routes and public realm enhancements should be incorporated into development proposals including a pedestrian link across the railway (page 46). In relation to the existing sports ground at the site, the document states:

> *"Proposals should seek to retain existing sports and recreation facilities or open space, or set out proposals for the provision of replacement facilities of equivalent benefit. It will be necessary to deliver the replacement facilities prior to the removal of the existing.*
>
> *Any proposals for on-site sports and leisure facilities, including open space and green infrastructure, should be positioned so that they could be retained as an element of permanent development.*
>
> *Sports and recreation facilities and open space should be located and operated where they can be accessed by members of the local community as well as the construction workforce." (Page 47)*

17.3.56 Further planning policy context is provided in the Introduction chapter (**Chapter 1** of this volume) and the Legislative Planning Policy Context chapter (**Volume 1, Chapter 4** of the ES).

17.4 Methodology

17.4.1 The assessment and all supporting surveys have been undertaken in accordance with the relevant EIA Directive, regulations, and various guidance documents as identified in **Volume 1, Chapter 7** of the ES, in particular the Guidelines for Environmental Impact Assessment (Ref. 17.18). The methodology and criteria adopted for the assessment is described in detail in **Volume 1, Chapter 7** of the ES.

a) Study Area

17.4.2 For the purpose of this assessment, the geographical extent of the study area under consideration includes the site itself, and a 1km buffer area around the site, to ensure that the relevant implications of the proposed development on the wider amenity and recreation resource are identified. However, the study areas for disturbance (indirect impacts) such as noise and vibration, air quality, and landscape and visual are identified in the relevant topic chapters (**Chapters 9**, **10** and **15** of this volume of the ES).

17.4.3 The study area for this assessment is illustrated in **Figure 17.1**.

b) Baseline Assessment

17.4.4 Baseline environmental characteristics for the site and study area with specific reference to amenity and recreation were identified through:

- a review of existing information, including Ordnance Survey (OS) maps and relevant websites (Ref. 17.19, 17.20, 17.21, 17.22, 17.23, 17.24 and 17.25) carried out in March 2010;
- consultation with appropriate statutory consultees and non-statutory consultees including SCC's Rights of Way Team and local sports and recreation clubs that may be affected by, or have an interest in, the proposed development;
- information from the Bridgwater and Wembdon Green Space Strategy (Ref. 17.26); and
- a site visit.

c) Consultation

17.4.5 A number of meetings were held with SCC's Rights of Way Officers between November 2009 and September 2011, in which discussions centred on recreational use of PRoW, the likely impacts of PRoW diversions/closures and potential mitigation measures for any impacts.

d) Assessment Methodology

17.4.6 **Volume 1, Chapter 7** of this ES describes the assessment methodology for this EIA. In addition the following specific methodology was applied for the determination of receptor value and sensitivity (see **Table 17.1**) and impact magnitude (see **Table 17.2)**.

i. Value and Sensitivity

17.4.7 All of the amenity and recreation receptors that may be impacted by the proposed development have been assigned a level of importance in accordance with those definitions set out in **Volume 1, Chapter 7** and with the Institute of Environmental Management and Assessment (IEMA) guidelines (Ref. 17.18). The value or potential value of a receptor is a function of a variety of factors (e.g. community value or whether it is designated) and can be determined within a defined geographical context.

17.4.8 The sensitivity of an amenity or recreation facility/receptor is defined by its ability to continue to function and/or maintain its intrinsic value subject to any change caused by a development and its related activities. Sensitivity is therefore a function of the nature of the amenity or recreation receptor and its current environmental setting. It is also the case that each amenity or recreation receptor will have different sensitivities to differing types of impacts. Hence the nature of direct and indirect impacts is also an important factor in the assessment.

17.4.9 Determination of the sensitivity of an amenity or recreation receptor is based on two basic analyses:

- Could the activity or any aspect of the development fundamentally affect the use and function of a facility/receptor? (e.g. obstructing a public right of way or obstructing areas used for formal recreational activities such as angling and wildfowling).
- Could the activity or any aspect of the development significantly reduce the enjoyment of the users of the facility/receptor? (e.g. through visual intrusion in what was an area of open countryside or though increased noise levels in previously quiet and peaceful areas).

17.4.10 In order to help define the importance of relevant receptors, the guidance provided in **Table 17.1** has been adopted for the purposes of the evaluation of amenity and recreation assets. Within this assessment, the sensitivity of each relevant receptor is set out within the baseline section (Section 17.5 of this chapter) in relation to each individual impact considered.

Table 17.1: Criteria Used to Determine Importance

Importance/ Sensitivity	Description
High	Feature/receptor possesses key characteristics which contribute significantly to the distinctiveness and character of the site, e.g. PRoW of national significance such as the West Somerset Coast Path, and receptor is identified as having very low capacity to accommodate proposed form of change (i.e. is very highly sensitive). Feature/receptor possesses very significant social/community value. Feature/receptor is extremely rare.
Medium	Feature/receptor possesses key characteristics which contribute to the distinctiveness and character of the site, e.g. PRoW of regional significance, and receptor is identified as having low capacity to accommodate proposed form of change (i.e. is moderately sensitive). Feature/receptor possesses significant social/community value. Feature/receptor is rare.
Low	Feature/receptor only possesses characteristics which are locally significant, e.g. local PRoW network. Feature/receptor not designated or only designated at a local level. Feature/receptor identified as having some tolerance of the proposed change subject to design and mitigation (i.e. is of low sensitivity). Feature/receptor possesses moderate social/community value. Feature/ receptor is relatively common.
Very low	Feature/receptor characteristics do not make a significant contribution to the character or distinctiveness of the site and surroundings at a local scale. Feature/receptor not designated. Feature/receptor identified as being generally tolerant of the proposed change (i.e. of very low sensitivity). Feature/receptor possesses low social/community value. Feature/receptor is common.

ii. Magnitude

17.4.11 The magnitude of impact has been based on the consequences that the proposed development would have upon the amenity and recreation resource and has been considered in terms of high, medium, low and very low (see **Table 17.2**). Potential impacts have been considered in terms of permanent or temporary, adverse (negative) or beneficial (positive) and cumulative.

17.4.12 Where an impact could reasonably be placed within more than one magnitude rating, conservative professional judgement has been used to determine which rating would be applicable.

Table 17.2: Guidelines for the Assessment of Impact Magnitude

Magnitude	Guidelines
High	Significant, permanent loss or obstruction/irreversible changes to key characteristics, features or the function of amenity and recreation assets. Impact may occur over the whole asset. Impact certain or likely to occur.
Medium	Obstruction or change to key characteristics, features or the function of amenity and recreation assets in the medium term. Impact may occur over the majority of the asset. Impact likely to occur.
Low	Noticeable but not significant obstruction or change (temporary/potentially reversible), over a part of the asset, to key characteristics, features or the function of amenity and recreation assets in the short-term. Impact possibly would occur.
Very low	Barely discernible obstruction or changes over a small area, to key characteristics, features or the functions of amenity and recreation assets, which are infrequent or temporary. Impact unlikely to occur.

iii. Significance of Impacts

17.4.13 The approach to assessing the significance of the impact is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the resource. The predicted significance of the impacts, without mitigation, is outlined in **Volume 1, Chapter 7**.

17.4.14 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

iv. Cumulative Impacts

17.4.15 The cumulative influence of changes on the amenity and recreational resource, together with noise, air quality and visual related disturbance, on local communities and users cannot be assessed objectively for the reasons set out in **Volume 11** of this ES. That is, there is no established EIA methodology for assessing the interactive or combined impact of 'change' or 'disturbance' (e.g. the combined effect of increased noise and dust) on human receptors and quality of life. Human receptors tend to respond to different potential disturbances in many different ways and to varying degrees, which typically reflect personal perception and valuation of the relevant amenity and recreation resource. Therefore, combined responses cannot be assessed; however, direct cumulative impacts on amenity and recreation are assessed in **Volume 11** of this ES.

e) Limitations, Constraints and Assumptions

17.4.16 Where a recreation or amenity asset is privately owned, it has been assumed that the impact of its loss would be mitigated by the relocation of said provision. For example, this would relate to any impact on the Bridgwater and Albion Rugby Football Club (considered below).

17.4.17 The assessment does not examine the impact of the construction workforce on the amenity and recreation provision within the study area. Impact of the construction workforce is addressed in **Chapter 7** of this volume of the ES.

17.4.18 Given the existing volume of traffic on the A39 (Bath Road) that runs to the north of the site, the potential for traffic disturbance (noise, air quality, visual and severance

impacts) to users of PRoW, sports and recreation facilities, open access land and public open space has not been assessed.

17.4.19 The assessment of disturbance to users of amenity and recreation assets that may arise from noise, air quality visual impacts is examined, where relevant, in the topic chapters (**Chapters 9, 10** and **15** of this volume of the ES). This chapter only provides a summary of the disturbance impacts. Sensitivity of receptors and the criteria used in each disturbance assessment is also presented in the relevant environmental topic chapter.

17.5 Baseline Environmental Characteristics

a) Introduction

17.5.1 This section presents the baseline environmental characteristics for the site and the study area.

b) Study Area Description

17.5.2 The study area lies within Bridgwater, Somerset.

17.5.3 As shown in **Figure 17.1**, the site covers approximately 1.9ha of land, predominantly owned by Bridgwater and Albion Rugby Football Club (Site 11 on **Figure 17.1**) and used as a second team practice pitch. It is bounded to the north and east by College Way (with residential areas beyond), to the west by the Bridgwater and Albion Rugby Football Club's main pitch (with the Bridgwater to Highbridge section of the Bristol to Penzance railway line beyond that), and to the south by Bridgwater College.

17.5.4 The study area includes the site and the surrounding urban area of Bridgwater, extending for up to 1km from the site boundary. In addition, the overall amenity and recreation provision for the Bridgwater urban area has been examined with respect to the Bridgwater and Wembdon Green Space Strategy (Ref. 17.26) as this provides context to the baseline environment.

i. PRoW

17.5.5 The site does not contain any PRoW. However, a number of PRoW are located within 1km of the site boundary. These are shown on **Figure 17.1** and are listed in **Table 17.3** with the distance from the site boundary also identified. The nearest PRoW to the site is PRoW BW38/28, which lies 290m to the south of the site at its nearest point.

Table 17.3: PRoW within the Study Area

PRoW Number (SCC) and distance from site boundary		
BW3/4 – 690m	BW38/2 – 810m	BW38/31 – 470m
BW3/5 – 510m	BW38/3 – 950m	BW38/32 – 560m
BW10/12 (River Parrett Trail) – 880m	BW38/4 – 500m	BW38/33 – 560m
BW38/1 – 520m	BW38/28 – 290m	

Source: SCC (http://webapp1.somerset.gov.uk/SCCPROW/Index.asp?showalerts=1)

17.5.6 There are c.7.6km of PRoW within the study area, with an average length of around 580m. The PRoW along the River Parrett (both banks in some locations) forms a significant length of the network within 1km of the site boundary, linking the River Parrett trail to the Somerset Coast Path.

17.5.7 The PRoW within the study area comprise a locally important network of footpaths, except for the River Parrett Trail (PRoW 38/2) which is of national importance. The PRoW are sensitive to obstruction which would prevent their use.

ii. Equestrians

17.5.8 There is no provision for equestrians (bridleways or restricted byways) within the study area.

iii. Cyclists

17.5.9 There is limited off-road cycling or protected cycling routes along roads within Bridgwater (one section of off-road cycling connects Bridgwater College with the A372). Cycling takes place on the local roads predominantly as a means of access within the town, but there are no indications of popular cycle routes within the study area. Recreational cycling typically takes place outside Bridgwater (often routes from Bridgwater to other locations) and is organised by local clubs such as Bridgwater Cycling Club or by individuals. An audit of routes from the site has been undertaken (see **Chapter 8** of this volume of the ES for details).

17.5.10 The North East Bridgwater development contains provision for approximately 2km of dedicated combined footway and cycleway along the main route through the development (see **Figure 17.2**), though the actual routing may be subject to change when the reserved matters detailed are submitted to and approved by the local planning authority.

iv. Sports and Recreation Facilities, Open Access Land, and Public Open Space

17.5.11 A search of the Sport England Active Places database (Ref. 17.20) indicated that there are a number of existing sports and recreation facilities (including playing fields and sports clubs) within the study area:

- Bridgwater and Albion Rugby Football Club (Site 11 on **Figure 17.1**) – partially within the site. Facilities include two rugby football pitches and ancillary buildings/structures.
- Bridgwater Town Football Club (Site 10 on **Figure 17.1**) – located c.60m to the south-west of the site. Facilities include three outdoor football pitches.
- Bridgwater College Sports Centre (Site 8 on **Figure 17.1**) – located c.130m to the south of the site. The centre provides indoor and outdoor facilities, including a synthetic turf pitch, which are used by students and the general public.
- Bridgwater Sports and Social Club (Site 12 on **Figure 17.1**) – located at Cellophane Packing Factory Site, to the north of the A39 (Bath Road), c.150m to the north of the site. Facilities include a bowling green, a cricket net, two outdoor football pitches and a clubhouse with indoor sports facilities (due to be lost as a result of the North East Bridgwater development).
- Drove House (Site 3 on **Figure 17.1**) – a health and fitness centre located approximately 530m north-west of the site. Facilities include three health suites with a range of gym equipment, as well as treatment rooms for rehabilitation.
- East Bridgwater Sports Centre (Site 9 on **Figure 17.1**) – located off Parkway, approximately 300m east of the site. The centre offers a variety of activities to the public, including badminton, squash and five-a-side football.
- Eastover Park Tennis Centre and Eastover Park Bowling Club (Site 5 on **Figure 17.1**) – located approximately 730m south-west of the site. The clubs lease the land from Sedgemoor District Council to provide tennis facilities and bowling greens to members and occasional users.
- Trim Wise (Site 4 on **Figure 17.1**) – a health and fitness centre located in Eastover, approximately 700m south-west of the site. Facilities include a gym and hall for fitness classes.
- Wembdon Cricket Club (Site 2 on **Figure 17.1**) – located approximately 900m north-west of the site. The club contains an outdoor cricket ground, practice nets and a clubhouse.

17.5.12 The outline planning permission for the North East Bridgwater development (Planning Application Reference: 09/08/00017), to the north of the site imposes an obligation to provide around 8.5ha of 'outdoor sites for sports' mainly located to the south-east and north-east of Sydenham Manor (see **Figure 17.2**). The range of sports facilities to be provided within the North East Bridgwater development will be detailed as part of the submission and approval of reserved matters details for that scheme. This could include: four junior football pitches, three senior football pitches, a cricket green and other associated facilities.

17.5.13 There are no areas of open access land within the study area. A search of Natural England's Common Rights of Way database (Ref. 17.21) indicated that the nearest

areas of open access land are located over 3km to the south-west of the site (on the eastern edge of the Quantocks).

17.5.14 There are no areas of public open space, such as formal parks and gardens within the site. The nearest formal areas of public open space within the study area, as identified in the Bridgwater and Wembdon Green Space Strategy (Ref. 17.26), include:

- Cellophane or Glasshouse Ponds (fishing ponds) (Site 55 on **Figure 17.1**) – located 980m to the north-east of the site.
- Chamberlin Avenue Children's Play Area (Site 36 on **Figure 17.1**) – located 480m to the east of the site.
- Coronation Park (Site 37 on **Figure 17.1**) – located 460m to the south-east of the site.
- Cranleigh Gardens/Eastover Park (Site 56 on **Figure 17.1**) – located 720m to the south-west of the site, comprising a 3ha park that contains mainly open grass areas which are surrounded by mature and semi mature trees, as well as a fenced play area for toddlers and juniors in the north of the park, which is inspected on a weekly basis by the SDC's Parks Department and a football pitch which is available for hire from Sedgemoor District Council's Clean Surroundings Department.
- Pollard Road Children's Play Area (Site 46 on **Figure 17.1**) – located 620m to the east of the site.
- Union Street Children's Play Area (Site 48 on **Figure 17.1**) – located 330m to the west of the site.
- Whitfield Road Children's Play Area (Site 35 on **Figure 17.1**) – located 860m to the east of the site, includes Bower Ponds.

17.5.15 The North East Bridgwater development site to the north of the site would also provide public open space, including outdoor play and open space of 2.1ha around the Willow Man to the north; open space around the Cellophane Ponds (see above); three Local Equipped Areas of Play (LEAP) and one Neighbourhood Equipped Area of Play (NEAP). In addition, a significant proportion of the areas within the North East Bridgwater development site are identified structural landscape and woodland and grassland provision which would be regarded as public open space. The actual location of each area would be determined by future reserved matters details to be submitted to and sponsored by the local planning authority.

17.6 Assessment of Impacts

a) Introduction

17.6.1 This section identifies and assesses the potential impacts associated with the proposed development throughout its construction, operational and post-operational phases. A description of the construction, operational and post-operational phases is presented in **Chapters 3**, **4** and **5** respectively of this volume of the ES.

b) Construction Phase Impacts

i. Obstruction to PRoW

17.6.2 There are no PRoW within or immediately adjacent to the site. Consequently, there would be **no impact** on PRoW arising from obstruction during the construction phase.

ii. Disturbance to Users of PRoW

17.6.3 The construction works could result in disturbance impacts to PRoW in the study area for up to 12 months.

17.6.4 **Chapter 9**, Noise and Vibration, considers that PRoW in the study area are sufficiently distant from the proposed works and screened by built development or by significant background noise sources (such as the A39 (Bath Road)), such that no significant impacts are expected. For this reason, noise impacts upon users of PRoW are scoped out of the Noise and Vibration assessment and consequently from the remainder of this assessment.

17.6.5 **Chapter 10**, Air Quality, considers that the sensitivity of users of PRoW to air quality impacts is low because adverse health impacts are not expected due to the transient short-term exposure to potentially elevated air pollutant concentrations. For this reason air quality impacts upon users of PRoW are scoped out of the Air Quality assessment and consequently from the remainder of this assessment.

17.6.6 **Chapter 15**, Landscape and Visual, does not identify PRoW as sensitive receptors for this site. For this reason visual impacts upon users of PRoW are scoped out of the Landscape and Visual assessment and consequently from the remainder of this assessment.

iii. Loss of Sports and Recreation Facilities

17.6.7 **Figure 17.1** shows the location of the sports and recreation facilities within the study area. One existing facility is located within part of the site; the Bridgwater and Albion Rugby Football Club (Site 11 on **Figure 17.1**).

17.6.8 The proposed development would result in the loss of the Club's training pitch, but no other impacts (such as obstruction to access to the rest of the Club) would arise. The loss of the training pitch would be considered a high magnitude impact on a receptor of medium importance and sensitivity. This would cause a direct **major adverse** impact during the construction phase, before mitigation (which could be delivered either before or during the construction phase).

17.6.9 There are no other formal sports and recreation facilities within the site and therefore, **no impact** on other sports and recreation facilities is predicted.

iv. Disturbance to Users of Sports and Recreation Facilities

17.6.10 The construction works could also result in disturbance impacts to sports and recreation facilities in the study area for up to 12 months.

17.6.11 **Chapter 9**, Noise and Vibration identifies the Bridgwater and Albion Rugby Football Club (Site 11 on **Figure 17.1**) and the Bridgwater Town Football Club (Site 10 on

Figure 17.1) as the key sensitive receptors. In relation to these receptors, the assessment concludes that **minor adverse** impacts would occur during weekdays with **no impact** on evenings and weekends, when the majority of the clubs' activities take place.

17.6.12 **Chapter 10,** Air Quality scopes out sports and recreation facilities, including the closest receptors, the Bridgwater and Albion Rugby Football Club pitch (Site 11 on **Figure 17.1**) and the Bridgwater Town Football Club (Site 10 on **Figure 17.1**), as construction works would not be taking place when the majority of the clubs' activities take place. Air quality impacts on sports and recreation facilities are therefore scoped out of the remainder of this assessment.

17.6.13 **Chapter 15**, Landscape and Visual identifies the Bridgwater and Albion Rugby Football Club as the most sensitive receptor and assesses that users of this facility would experience a short-term **moderate adverse** impact during the construction phase.

v. Obstruction to Open Access Land and Public Open Space

17.6.14 No open access land or public open space is located within the site of the proposed development and no obstruction would occur. Therefore, **no impact** is predicted.

vi. Disturbance to Users of Open Access Land and Public Open Space

17.6.15 **Chapter 9**, Noise and Vibration, **Chapter 10**, Air Quality and **Chapter 15**, Landscape and Visual have not identified any areas of open access land and public open space as sensitive receptors and therefore disturbance impacts are scoped out of these assessments and the remainder of this assessment.

c) Operational Phase Impacts

i. Obstruction to PRoW

17.6.16 There are no PRoW within or immediately adjacent to the site. Consequently, there would be **no impact** on PRoW arising from obstruction during the operational phase.

ii. Disturbance to Users of PRoW

17.6.17 Disturbance impacts to PRoW have been scoped out of this assessment (see Construction Phase above).

iii. Loss of Sports and Recreation Facilities

17.6.18 No physical disturbance or obstruction (either to extent, facilities, or access) would occur to any (remaining) sports and recreation facilities in the study area during the operational phase. It has been assumed that the Bridgwater and Albion Rugby Football Club's training pitch would have been replaced before or during the construction phase and therefore **no impact** is predicted during the operational phase.

iv. Disturbance to Users of Sports and Recreation Facilities

17.6.19 **Chapter 9**, Noise and Vibration, does not identify the Bridgwater and Albion Rugby Football Club (Site 11 on **Figure 17.1**) and the Bridgwater Town Football Club (Site 10 on **Figure 17.1**) as sensitive receptors during the operational phase and they are therefore scoped out of the noise and vibration assessment.

17.6.20 Disturbance impacts to sports and recreation facilities have been scoped out of the Air Quality assessment (see Construction Phase above).

17.6.21 As for the construction phase, **Chapter 15**, Landscape and Visual identifies the Bridgwater and Albion Rugby Football Club as the most sensitive receptor and assesses that this would experience a **minor adverse** impact during the operational phase.

v. Obstruction to Open Access Land and Public Open Space

17.6.22 Operation of the proposed development would result in no physical disturbance or obstruction (either to extent, facilities, or access) to open access land or public open space and therefore, **no impact** is predicted.

vi. Disturbance to Users of Open Access Land and Public Open Space

17.6.23 Disturbance impacts to open access land and public open space have been scoped out of this assessment (see Construction Phase above).

d) Post-operational Impacts

17.6.24 Following cessation of its use by EDF Energy as worker accommodation, it is envisaged that the development would be transferred to a third party for use as student accommodation or other alternative educational uses in connection with Bridgwater College. See **Chapter 5** of this volume of the ES for details.

17.6.25 Given this, the post-operational phase impacts on PRoW, sports and recreation facilities, and open access land and public open space (due to obstruction and disturbance), are predicted to be no greater than those set out above for the operational phase.

17.7 Mitigation of Impacts

17.7.1 This section identifies specific mitigation measures to avoid, minimise or off-set any of the potential impacts on amenity and recreation associated with the proposed development throughout the construction, operational and post-operational phases.

17.7.2 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so.

17.7.3 The only mitigation proposed is in respect of the Bridgwater and Albion Rugby Football Club. Following discussions and agreement, a planning application would be submitted by the Bridgwater and Albion Rugby Football Club for a replacement training pitch. A replacement pitch is expected to be provided either before or during the construction phase and therefore any impact would be mitigated during this phase.

17.7.4 In addition, during the early part of the operational phase and until the facilities at the Bridgwater A accommodation campus becomes available, public access would be permitted to the five-a-side football pitch as part of the proposed development.

17.8 Residual Impacts

17.8.1 This section identifies the residual impacts associated with the proposed development throughout the construction, operational and post-operational phases, following the implementation of the mitigation measures.

17.8.2 No mitigation has been proposed, except in the case of the Bridgwater and Albion Rugby Football Club and therefore all other impacts would remain as initially assessed.

17.8.3 The impact experienced by the Bridgwater and Albion Rugby Football Club would be compensated for during the construction phase.

17.9 Summary of Impacts

17.9.1 **Table 17.4** presents a summary of the potential impacts associated with the proposed development.

Table 17.4: Summary of Impacts

Receptor	Potential Impact	Potential Magnitude	Description	Value or Sensitivity	Significance	Proposed Mitigation	Residual Impact Assessment
Construction Phase							
PRoW	Obstruction	N/A	N/A	N/A	N/A	N/A	N/A
	Noise, air quality, visual disturbance	N/A	N/A	N/A	N/A	N/A	N/A
Sports and recreation facilities	Loss of Bridgwater and Albion Rugby Football Club training pitch	High	Direct Adverse	Medium	Major adverse	Provision of replacement pitch	Negligible
	Noise disturbance to Bridgwater and Albion Rugby Football Club and Bridgwater Town Football Club	Low	Indirect Short-term Adverse	Low	Minor adverse during weekdays; no impact on evenings and weekends	None proposed	Minor adverse during weekdays; no impact on evenings and weekends
	Air quality, visual disturbance	N/A	N/A	N/A	N/A	N/A	N/A
Open Access Land and Public Open Space	Obstruction	N/A	N/A	N/A	N/A	N/A	N/A
	Noise, air quality, visual disturbance	N/A	N/A	N/A	N/A	N/A	N/A
Operational and Post-operational Phases							
PRoW	Obstruction	N/A	N/A	N/A	N/A	N/A	N/A
	Noise, air quality, visual disturbance	N/A	N/A	N/A	N/A	N/A	N/A
Sports and recreation facilities	Obstruction	N/A	N/A	N/A	N/A	N/A	N/A
	Noise, air quality disturbance	N/A	N/A	N/A	N/A	N/A	N/A
	Visual disturbance to Bridgwater and Albion Rugby Football Club	Medium	Medium-term Adverse	Low	Minor adverse	None proposed	Minor adverse
Open Access Land and Public Open Space	Obstruction	N/A	N/A	N/A	N/A	N/A	N/A
	Noise, air quality, visual disturbance	N/A	N/A	N/A	N/A	N/A	N/A

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CHAPTER 18: SUMMARY OF ENVIRONMENTAL MITIGATION

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18. SUMMARY OF ENVIRONMENTAL MITIGATION

18.1 Introduction

18.1.1 This chapter of the Environmental Statement (ES) provides a summary of environmental mitigation measures proposed for the construction and operational phases of the proposed Bridgwater C accommodation campus (the proposed development) at the Bridgwater C site (the site) (see **Chapters 1** to **5** of this volume of the ES for details).

18.1.2 This chapter summarises the significant environmental impacts predicted as a result of the construction and operation of the proposed development. A summary of predicted impacts on local residents ('community impacts', in terms of transport, amenity and recreation, noise, air quality, landscape and visual and socio-economics) and proposed mitigation measures, is provided in the **Community Impact Report** (see **Volume 2**, **Chapter 27**, **Appendix 27A**). This report describes the impacts of the HPC Project on the community (e.g. Bridgwater).

18.1.3 Environmental impacts which are predicted to be negligible or minor have, for the purposes of this ES, been considered to be not significant and therefore no additional mitigation is proposed. Protective measures and a number of iterations and refinements to the design have been built into the proposed development which, in many cases, prevent, reduce or offset potential impacts to a not significant level.

18.1.4 The design of the proposed development includes:

- Replacement pitch elsewhere in Bridgwater.
- Provision of a number of landscaping and ecological measures, including: enhanced tree and shrub planting along the eastern, western and southern boundaries of the site, using British native species; a linear grove of trees through the centre of the site, and wildflower meadow planting along the road verge along the eastern boundary.
- Provision of one 5-a-side all weather football pitch which would be lit, when required, between 08:00 and 22:00 each day, and available for use by the local public until the facilities at the Bridgwater A site become available.
- Requirement for occupants to comply with a Code of Conduct to limit adverse impacts on the local community and ensure high standards of conduct.

18.1.5 The proposed development would be implemented in accordance with regulatory requirements and standard good construction and operational practices which are not generally considered to be mitigation. Impacts which are assessed as not significant are not included in this summary.

18.1.6 Implementation of the proposed development would, where appropriate, also be controlled through the overarching **Environmental Management and Monitoring Plan** (**EMMP**) and the following subject-specific management plans, submitted with the application for Development Consent:

- **Land Contamination Management Plan (LCMP)**;
- **Noise and Vibration Management Plan (NVMP)**;
- **Air Quality Management Plan (AQMP)**;
- **Materials Management Plan (MMP)**;
- **Soil Management Plan (SMP)**;
- **Water Management Plan (WMP)**;
- **Ecology Mitigation and Monitoring Plan (EcMMP)**; and
- **Environmental Pollution Incident Control Plan (EICP)**.

18.1.7 The **Framework Travel Plan**, appended to the **Transport Assessment**, has been developed to minimise vehicle movements during the construction and operational phases of the HPC Project. The transport strategy for the HPC Project reduces road traffic and the associated impacts from vehicle noise, vibration and exhaust emissions to air. Measures would include, but not be limited to, car sharing schemes, bus transport for the workforce and highway improvements.

18.1.8 Mitigation measures have been proposed where there is likely to be an adverse impact of greater than minor significance and the impact magnitude, spatial scope and temporal nature make it appropriate to do so. Significant impacts predicted and the corresponding proposed mitigation measures are summarised in this chapter and are identified by project phase: construction, operation or post-operation, as applicable. All impacts listed are adverse unless otherwise stated.

18.1.9 The environmental impact assessment for all topics except air quality, noise and vibration, and soils and land use has been based on measures included in the design, best practices and regulatory compliance. However, for these three topics best practice and site-specific measures are considered as mitigation.

18.1.10 No significant impacts have been predicted in the following topics:

- Socio-economics;
- Soils and Land Use;
- Geology, Land Contamination and Groundwater;
- Surface Water;
- Terrestrial Ecology and Ornithology; and
- Historic Environment.

18.1.11 These topics are therefore not discussed further in this chapter.

18.2 Transport

18.2.1 During 2013 (construction phase) and 2016 (operational phase), there are no significant transport impacts identified, due to the highway improvements proposed as part of the HPC Project. However, in 2021 (post-operational phase) average speeds through the assessment network would improve due to these highway

improvements. This decrease in driver delay would result in a significant beneficial impact during the post-operational phase.

18.3 Noise and Vibration

18.3.1 During construction, significant impacts are predicted on nearby residential receptors and Bridgwater College. These predicted impact levels are based on a worst case assessment, with all plant working at the closest approach to the receptor. In reality, the nature of the construction phase means that the worst case situation predicted may exist for only a matter of days, or even hours. The duration of the construction works is expected to be 12 months.

18.3.2 A number of standard good working practices would be implemented as part of the **NVMP** for the construction of the site. Measures would include restricted working hours during construction and good construction working practices, including a large number of measures, such as: loading/unloading away from residential properties, use of electrical rather than diesel plant where possible, use of acoustic enclosures for continuous noisy plant, noisy activities and plant start-up would be staggered, all plant and vehicles would be switched off when not in use, haul roads would be located away from residential properties as far as is practicable and would be well maintained.

18.3.3 A formal system would be put in place during the works which identifies the roles and responsibilities of site staff regarding the procedures to be applied to respond to any complaints relating to noise. Site logs would be maintained, detailing any complaints received relating to noise, investigations of the complaints, and the corresponding action taken including the response.

18.4 Air Quality

18.4.1 Prior to mitigation significant impacts are predicted on local air quality and amenity at assessed human receptors on the A39 (Bath Road) and Fairfax Road from fugitive dust and PM_{10} originating from construction activities. Best practice guidance control methods and mitigation measures would be implemented to manage fugitive nuisance dust and PM_{10} emissions during the construction works.

18.4.2 EDF Energy is committed to implementing best practice measures to minimise dust impacts, especially in the vicinity of sensitive receptors. These measures would be used during construction and in this sense are part of the proposed development. However, the risk based methodology for assessing dust impacts requires that such measures must be taken into account as mitigation. These measures would be managed through implementation of the **AQMP**.

18.4.3 A range of good practice measures for managing fugitive dust and PM_{10}, implemented via the **AQMP**, would be employed during construction, including: vehicles carrying loose aggregate would be covered over during periods of dry and windy weather, completed earthworks/stockpiles would be covered or seeded as soon as is practicable, mobile or fixed spray units would be used to dampen surfaces as dictated by weather conditions; wheel washing facilities would be used at all exits; effective cleaning and inspection of vehicles, including total vehicle washing and ticketing of vehicles; use of dust-suppressed tools for all operations; and use of dust extraction techniques where available.

18.4.4 Best practice methods and mitigation measures implemented via the **AQMP** to control on-site exhaust emissions from plant and machinery (NRMM) during construction would include, but not be limited to: minimising idling times of plant and machinery; ensuring all equipment is in good working order and working efficiently; use of ultra low sulphur diesel (ULSD) in all equipment and plant, where practicable; and ensuring that all equipment is fitted with appropriate particulate filters or any other appropriate exhaust after-treatments.

18.4.5 A formal system would be put in place during the works which identifies the roles and responsibilities of site staff regarding the procedures to be applied to respond to any complaints relating to air quality. Site logs would be maintained, detailing any complaints received relating to air quality, investigations of the complaints, and the corresponding action taken including the response made to each complainant.

18.4.6 The extent to which dust mitigation would be implemented on site during the construction works would be flexible and responsive, with additional recommendations and measures introduced, particularly during dust generating activities, sensitive periods, or upon receipt of substantiated dust complaints. Working practices would be systematically audited and revised where necessary in order to ensure fugitive dust impacts are mitigated to an acceptable level at the identified sensitive receptor locations.

18.5 Landscape and Visual

18.5.1 The site forms part of a locally designated area of Recreational Open Space used as a practice pitch by the Bridgwater and Albion Rugby Football Club. The proposed development therefore constitutes a complete change in use and a significant impact on land use/settlement.

18.5.2 During construction and operation significant visual impacts are predicted from four view points; the most significant changes would be from a footpath and properties on Fairfax Road. Enhanced tree and shrub planting along the eastern, western and southern boundaries of the site would provide screening during construction, which would mature during operation.

18.6 Amenity and Recreation

18.6.1 A significant impact is predicted to users of the Bridgwater and Albion Rugby Football Club resulting from the loss of facilities. Mitigation for the loss of the playing field will be provided through financial compensation, to enable the replacement of the pitch elsewhere in the Bridgwater area, subject to planning permission.

18.6.2 A significant visual impact is identified to users of the Bridgwater and Albion Rugby Football Club during the construction, operational and post-operational phases. There is no mitigation available to reduce the level of significance, although it should be recognised that users are either players or are attending the Club to watch sporting events.