REPORT

Crouchlands Farm, Whole Farm Plan

Environmental Impact Assessment Report

Client: Artemis Land and Agriculture

Reference: PB9500-RHD-ZZ-XX-RP-Z-0001

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Acronyms

Acronyms	Acronym description
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
AD	Anaerobic Digestor
ADMS	Atmospheric Dispersion Modelling System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
ASR	Annual Status Report
ATC	Automatic Traffic Counters
AW	Ancient Woodland
BBS	Breeding Bird Survey
BGS	British Geological Survey
BNL	Basic Noise Level
BoCC	Birds of Conservation Concern
BPM	Best Practicable Means
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
BS	British Standard
BSP	Building Services Plant
BTO	British Trust for Ornithology
CAS	Clean Air Strategy
CBC	Common Birds Census
CDC	Chichester District Council
CDM	Construction Design Management
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CFD	Computational Fluid Dynamics
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CL:AIRE	Contaminated Land Applications in Real Environments
CLP	Chichester Local Plan
CLR	Contaminated Land Report
CoCP	Code of Construction Practice

COSHH	Control of Substances Hazardous to Health
CRTN	Calculation of Road Traffic Noise
CTMP	Construction Traffic Management Plan
dB	Decibels
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DMP	Dust Management Plan
DMRB	Design Manual for Road and Bridges
DMT	Decision-Making Threshold
DoE	Department of the Environment
DoW CoP	Definition of Waste Code of Practice
DPF	Diesel Particulate Filters
DTM	Digital Terrain Model
EA	Environment Agency
EAL	Environmental Assessment Levels
EC	European Commission
EcIA	Ecological Impact Assessment
eDNA	Environmental DNA
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPS	European Protected Species
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
ERP	Emergency Response Plan
ETMP	Events Traffic Management Plan
EU	European Union
EV	Electric Vehicle
FAQ	Frequently Asked Questions
FTP	Framework Travel Plan
GCN	Great Crested Newts
GEART	Guidelines for the Environmental Assessment of Road Traffic
GPCL	Guiding Principles for Contaminated Land
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HMSO	Her Majesty's Stationary Office
HRA	Habitats Regulations Assessment

HSE	Health and Safety Executive
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
ILP	Institution of Lighting Professionals
INNS	invasive non-native species
IR	Infrared
ISO	International Standards Organisation
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LCA	Landscape Character Assessment
LDV	Light Duty Vehicle
LLPDE	liner of low-density polyethylene
LNR	Local Nature Reserve
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authority
LSE	Likely Significant Effect
LVIA	Lighting and Visual Impact Assessment
LWS	Local Wildlife Site
MAGiC	Multi-Agency Geographic Information for the Countryside
MCA	Mineral Consultation Area
MCC	Manual Classified Counts
MCLG	Ministry for Communities and Local Government
MMP	Materials Management Plan
MPH	Miles per Hour
MPS	Minerals Policy Statement
MSA	Mineral Safeguarding Area
NERC	Natural Environment and Rural Communities
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	Noise Policy Statement
NRMM	Non-Road Mobile Machinery
NSN	National Site Network
NSR	Noise Sensitive Receptor
NWP	Numerical Weather Prediction
OS	Ordnance Survey
P	Pathway
PA	Public Address

PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCOC	Potential Contaminants of Concern
PEA	Preliminary Ecological Appraisal
PHE	Public Health England
PM	Particulate Matter
PPE	Personal Protective Equipment
PPG	Pollution Prevention Guidance
PPG	Planning Policy Guidance
PRA	Preliminary Risk Assessment
ProPG	Professional Practice Guidance
PRoW	Public Rights of Way
R	Receptor
S	Source
SAC	Special Areas of Conservation
SDNP	South Downs National Park
SI	Statutory Instruments
SLM	Sound Level Meter
SOAEL	Significant Observed Adverse Effect Level
SoS	Secretary of State
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compound
SxBRC	Sussex Biodiversity Records Centre
TA	Transport Assessment
TAN	Technical Advice Note
TEMPro	Trip End Model Presentation Program
TG	Technical Guidance
TPC	Travel Plan Coordinators
TPH	Total Petroleum Hydrocarbons
TRIC	Trip Rate Information Computer System
UKAS	United Kingdom Accreditation Service
UKWIR	United Kingdom Water Industry Research
VOC	Volatile Organic Compound
WEL	Workplace Exposure Limit
WFD	Water Framework Directive

WHO	World Health Organisation
WRZ	Water Resources Zone
WSCC	West Sussex County Council
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility
ZV	Zone of Visibility

1 Introduction

1.1 The Proposed Development

Artemis Land and Agriculture Ltd. is proposing the development of a Whole Farm Plan at Crouchlands Farm, Plaistow, West Sussex (see **Figure 1-1** for a Location Plan).

The Whole Farm Plan (**Figure 1-2**) proposes commercial and high welfare, low impact and low intensity farming activity, the gradual development of a rural enterprise centre, a rural food and retail centre, equestrian centre, and glamping site (the 'Proposed Development'). Further information on each of these elements is provided below:

- **Farm Hub**: a small scale, high welfare, low impact, pasture-fed, low intensity livestock operation at the north of the existing farm site, supported by approximately 2,000 sq m of refurbished agricultural buildings for over-wintering of livestock;
- **Rural Enterprise and Education Centre**: the refurbished farm buildings to the south of the existing farm site would provide a range of commercial and education uses. This includes approximately 3,630 sq m use classes E and F1 together with the provision of approximately 230 sq m of live-work accommodation for students or staff who are staying at the site (use class C1);
- **Rural Food and Retail**: this new building, to the south of the access road, would provide up to 1,922 sq m of retail and education space (use class E and F1), including the development of a farm shop, the West Sussex Food Hall, café and cookery school with an associated kitchen garden;
- **Equestrian Centre**: this new leisure facility, also to the south of the main access road, would provide 40 livery boxes, indoor and outdoor arenas, a hay barn, circular horse walk, enclosed paddocks, a riding school and a club house covering approximately 7,788 sq m (use class F2). There will also be approximately 320 sq m of live-work accommodation for the welfare of the animals;
- **Hardnip's Barn:** this area would provide luxury and high-end custom built facilities in a serviced glamping site covering approximately 1,084 sq m (use classes sui generis and E). Hardnip's Barn will provide a restaurant space for glamping guests to relax, and will also host workshops and events such as weddings, subject to licensing;
- **Glamping**: This area would provide high end custom built cabins and a serviced glamping site covering approximately 1090 sqm (use classes sui generis, and E); and,
- **Maintenance and improvements to the on-site PROWs**: Notably the PROW 3519, 564, 633 and 643.

1.2 Requirement for Environmental Impact Assessment

An Environmental Impact Assessment (EIA) Screening Report (Royal HaskoningDHV, 2021) was submitted to Chichester District Council (CDC) along with a request for a Screening Opinion on 19 February 2021. The Screening Opinion was received on 20th May 2021 (see **Appendix 1.1**), which determined the Proposed Development to be EIA Development under paragraphs 10(b) and 12(c) of Schedule 2 of the EIA regulations which are detailed below:

- 10(b) *Urban development projects, including construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas:*

- *i The development includes more than 1 hectare of urban development which is not dwellinghouse development; or*
- *ii The development includes more than 150 dwellings; or*
- iii *The overall area of the development exceeds 5 hectares.*

- 12(c): *Holiday villages and hotel complexes outside urban areas and associated developments:*
  - i *The area of development exceeds 0.5 hectares.*

Given the EIA Screening exercise concluded that the Proposed Development was an EIA Development, a request for a Screening Direction was submitted to the Secretary of State (SoS) on 5 May 2021. The Screening Direction was received on 13th September 2021 (see **Appendix 1.2**), which also determined the Proposed Development to be EIA Development. As such, an EIA is required to support the planning application.

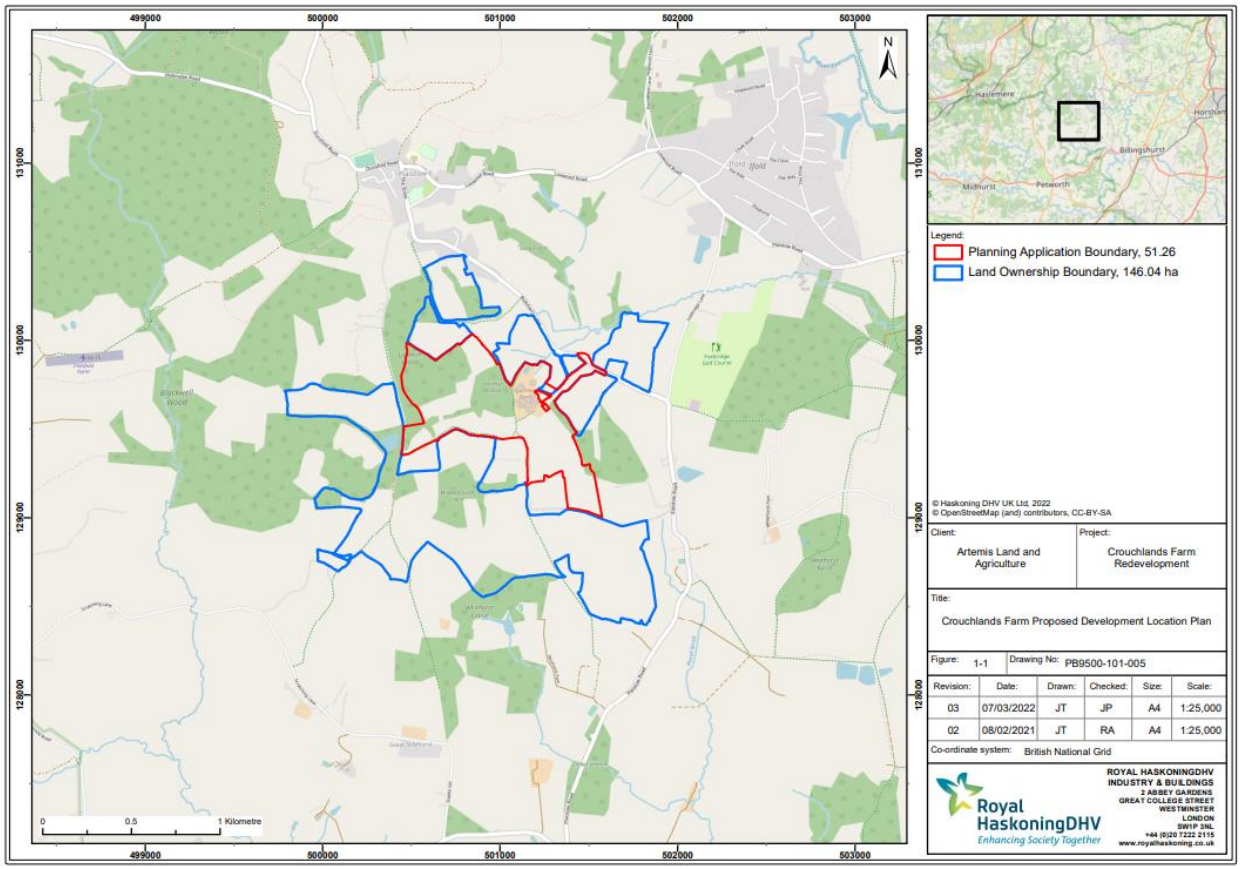


Figure 1-1 Crouchlands Farm Proposed Development Location Plan

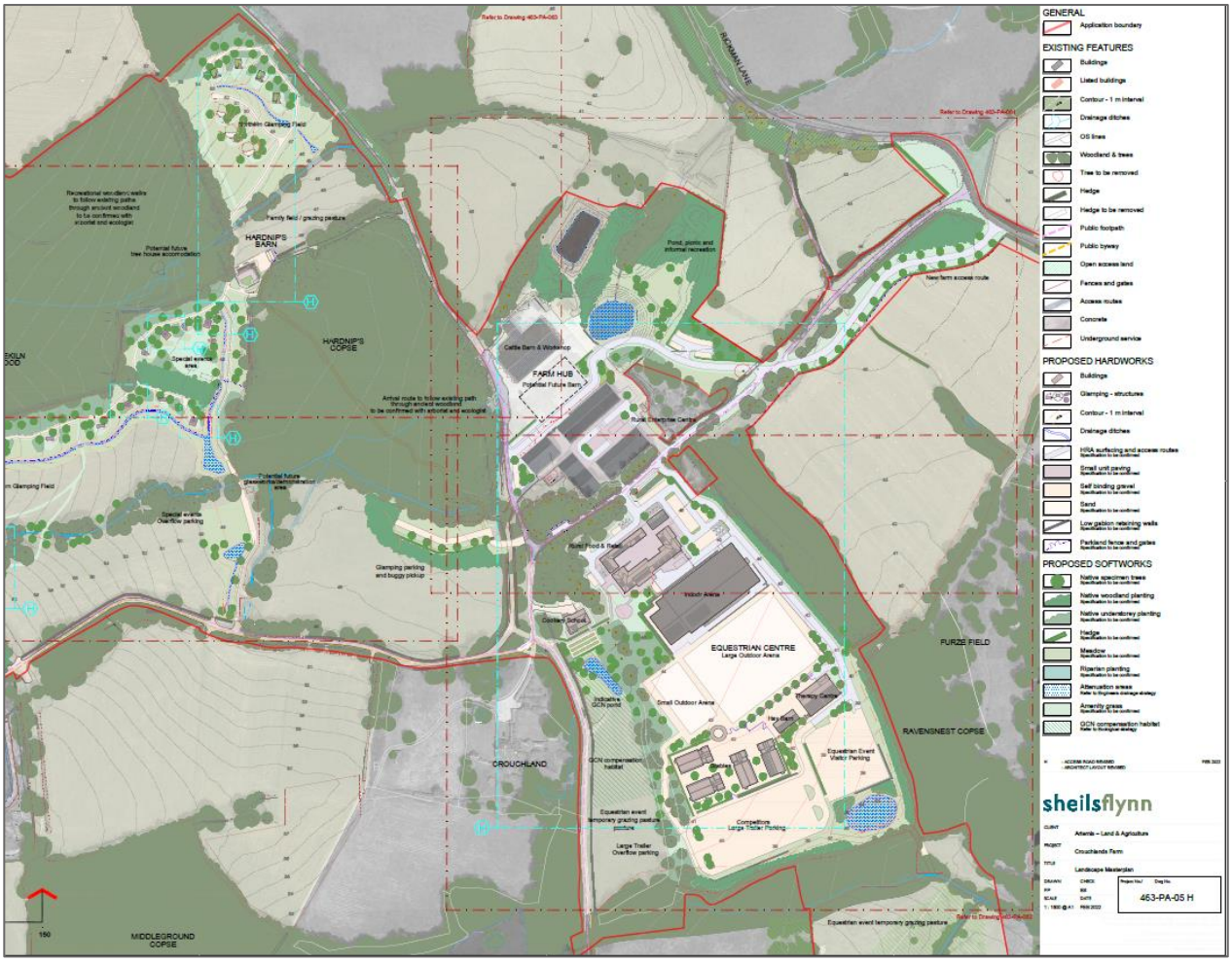


Figure 1-2 Proposed Whole Farm Plan

1.3 Background to Crouchlands Farm

Crouchlands Farm supported a dairy herd and produced biogas until 2017, when the herd was sold and the decommissioning process of the biogas plant (Anaerobic Digestor facility ("AD Facility") began, following an enforcement notice being served by Chichester District Council. Most of the farm comprises improved pasture fields, which have been grazed and/or used for silage production.

The management of the AD facility required the disposal of a waste product known as digestate, which was spread across fields on the farm as liquid fertiliser. Digestate is a nutrient rich material, a by-product from the use of slurry in the production of biogas. The farm buildings that supported the dairy herd are situated in the northern half of the farm, accessed via Rickman's Lane.

Prior to the enforcement notice being served, it is understood that operations at the farm and AD Plant resulted in significant environmental degradation and incidences of pollution, and a large lagoon (known as Lagoon 3) was established without planning permission. The new owners, Artemis Land and Agriculture Ltd, have spent two years remediating damage to the farm from previous activities at the site, and the Proposed Development aims to establish measures to help improve the biodiversity value of the farm and thus help to offset the effects of the historic damage.

The Crouchlands Farm site was put into Receivership in 2017, following the failure of two businesses operating on the site called Crouchland Farm Limited and Crouchland Biogas Limited, both of which were in Administration until 10 January 2019. West Sussex Agri Limited was the senior creditor in the Receivership and the Administrations. Artemis Land & Agriculture, owned by West Sussex Agri Limited, purchased the site, excluding the area known as Lagoon 3, from the Receiver in 2019.

Artemis' purpose in purchasing Crouchlands is to bring forward plans for the long-term development and operation of rurally orientated and environmentally sustainable business enterprises. This will aim to improve the use of the site, support the local community, and provide sound employment opportunities.

The plans have been developed in discussion with the Coast to Capital Local Enterprise Partnership, in the context of the Gatwick 360 Strategic Economic Plan and the emerging Local Industrial Strategy. The opportunities for the provision of land-based education and woodland enterprises are being discussed with Brinsbury College, part of the Chichester College Group.

1.4 Description of Study Area

The study area considered in this EIA Report is the Zone of Influence (ZOI) over which direct and indirect potential impacts of the Proposed Development may occur. In terms of the Proposed Development, this was determined by the ZOI of landscape and visual settings impacts, which radiate approximately 2km from the footprint of the Proposed Development. The existing baseline within the ZOI, in terms of relevant receptors, is described in the relevant sections of this report.

1.5 Production of the EIA Report

The EIA Regulations require an EIA Report to be prepared by competent persons. This report was compiled by Royal HaskoningDHV, a company which is a corporate member of the Institute of Environmental Management & Assessment (IEMA) (number 0001189) and also a Corporate Registered Assessor for EIA under IEMA's voluntary EIA Quality Mark scheme, through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in areas including EIA management, team capabilities, regulatory compliance, content, presentation, and improving practice. The technical chapters in this EIA Report were prepared by the authors set out in **Table 1-1**.

Table 1-1 Competence of authors of the technical chapters contained in this EIA Report

Chapter	Author
7. Land Quality and Hydrogeology	Royal HaskoningDHV
8. Transport and Access	Royal HaskoningDHV
9. Air Quality	Royal HaskoningDHV
10. Noise and Vibration	Royal HaskoningDHV
11.Nature Conservation and Biodiversity	Ecology Co-op
	Wards Associates Consulting Engineering (Water Neutrality)
12. Landscape and Visual Setting	Sheils Flynn (LVIA) Royal HaskoningDHV (Lighting Assessment)
13. Cultural Heritage and Archaeology	DLBP Ltd
14 Human Health	Royal HaskoningDHV

1.6 Purpose of this EIA Report

This document constitutes the EIA Report for the Proposed Development and presents the findings of the EIA process. It was prepared in accordance with the EIA Regulations to support an application for the required Planning Permission.

The objectives of the EIA process are to ensure that environmental factors are considered throughout the project development and the decision-making process, and that potential significant environmental effects are identified and assessed–both temporary and permanent, direct and indirect – during the construction and operation phases of the Proposed Development. As a result of this assessment process, mitigation measures that would prevent or reduce any adverse impacts have been identified.

1.7 Report Structure

Following this introductory chapter, **Chapter 2** describes the need for the Proposed Development.

Chapter 3 provides a detailed description of the Proposed Development and the alternatives considered.

Chapter 4 outlines the relevant legislation and policy taken into consideration when undertaking the EIA.

Chapter 5 describes the approach taken in producing the EIA, including the Cumulative Impact Assessment (CIA).

Chapter 6 outlines the consultation undertaken in relation to the Proposed Development.

Chapters 7 to 14 set out the environmental assessment of the Proposed Development. These sections describe the baseline environment for each of the environmental topics considered. Potential impacts that could arise during the Proposed Development are identified and, where appropriate, mitigation measures are defined. The predicted residual impacts (i.e. those potential impacts remaining, assuming the recommended mitigation measures are implemented) are also set out in each chapter.

Chapter 15 presents the CIA.

Chapter 16 presents a summary of the potential impacts and mitigation measures.

Chapter 17 lists the references cited within this EIA report.

2 Need for the Proposed Development

The various elements of the Proposed Development will contribute to a wide range of needs. It will deliver environmental regeneration of the site, following its previous use for biogas production, which resulted in three lagoons that were previously used for holding digestate, as well as the presence of equipment and apparatus associated with the AD facility.

In environmental terms, the Proposed Development would also deliver a net gain in biodiversity by conserving and enhancing the existing notable habitats and species present at the site. This includes protected species of both European and national importance, as well as nationally important habitats such as Ancient Woodland. The Proposed Development would also create new areas of high-value habitats and provide energy through renewable and low carbon technologies.

In economic terms, the Proposed Development seeks to provide a valued contribution to food production via high welfare, low impact, low intensity pasture fed livestock operations, outdoor and woodland reared rare breed pigs, high quality food production and crop cultivation. The agricultural use would also create and support jobs, as would the rural enterprise and education centre, and rural food and retail centre – both on the farm but also within wider, local, supply chains. The glamping accommodation also offers the opportunity to create and support jobs, as well generating inward investment to the local area (supporting local shops and services) through visits made by those staying in the glamping accommodation.

In social terms, the proposed education facilities would encourage farm visits and a wider understanding of agriculture and the surrounding habitat and ecology. The Proposed Development would also assist in meeting leisure and recreational needs, through the provision of the equestrian centre as well as the improvement and maintenance of existing Public Rights of Way (PROWs).

Therefore, the Proposed Development will lead to a number of local economic and social benefits at the local level. In the construction phase, the Proposed Development will support 34 person years of net additional employment and £4.14 million of net additional Gross Value Added (GVA). Once operational, the Proposed Development will generate important net additional benefits for the local economy, resulting in 118 net additional Full Time Employment (FTE) jobs and a net additional GVA impact of £5.9 million per annum once fully occupied. Furthermore, the Proposed Development will generate up to £300,000 of business rates income per annum to support the continued delivery of core services by local authorities.

3 The Proposed Development

3.1 Description of the Construction Phase

Construction of the Whole Farm Plan at Crouchlands Farm is anticipated to begin in 2023/2024 with an estimated completion date as soon as possible (desired by 2026). The main construction activities are anticipated to include:

- topsoil stripping;
- reduced level excavations and formation;
- erection of hoardings;
- refurbishment of existing buildings;
- site establishment;
- infrastructure/service installation (including drainage);
- import/export of materials and plant;
- construction of new access road, parking areas, and buildings; and,
- landscaping.

The existing access road from Rickman's Lane will remain, and an additional access route will be created to serve the site. There will also be new routes within the red line boundary to access each of the elements of the Whole Farm Plan. Heavy Goods Vehicles (HGVs) and plant servicing the construction phase, including delivery and / or removal of construction materials, would access the site from Rickman's Lane. All plant and materials would be contained within the site, or within parcels of land adjacent to the site (which is also in the applicant's ownership).

Normal working hours during construction would be Monday to Friday 07.30 - 17.30 and Saturdays 08.00 to 14.00. No works would take place on Sundays or Bank Holidays, unless in an emergency. In the event of any need to deviate from these agreed working hours, this would be agreed with CDC in advance.

A Construction Environmental Management Plan (CEMP) would be agreed with CDC prior to the commencement of development to avoid, minimise, and mitigate effects on both the environment and on people (including workers, local residents and the wider public). All construction would be carried out in line with good industry practice and the approved CEMP. The Plan would include details of mitigation for traffic (including traffic routing within the site and to the site), dust, noise, waste, odour, pollution prevention and response, as a minimum.

3.2 Description of the Operational Phase

The sections below set out the uses and activities that the Proposed Development will facilitate.

3.2.1 Farm Hub

The Farm Hub comprises the existing cattle barn and workshop at Crouchlands Farm, would be been refurbished to support and enhance the primary (and existing / lawful) farming use. The proposal seeks to facilitate and consolidate the move towards small scale, high welfare, low impact, low intensity livestock farming activities (sheep, pigs, and cattle) in accordance with its recent Red Tractor Farm Assurance accreditation. This is to increase the diversity and enhance the resilience of the farming enterprise, and ensure that the farming activity has a responsible environmental footprint, but also to provide an example of best practice. Specific activities the farming will facilitate include:

- speciality farming, such as traditional and rare breed pigs foraging within woodland;
- farm trips for other farmers to see the methods and practices undertaken;
- the Farm Hub's agricultural visitors benefiting from having equine specialists on-site allowing for cross-sector knowledge share between farmers and agriculturalists;
- food supply to the restaurant in Hardnip's Barn as well as offering glamping visitors an interesting peek into life on a working farm;
- agricultural field work using the land as an open-air laboratory to test innovative farming techniques; and,
- providing produce for use in the Cookery School and for butchery, and / or for sale or consumption in the Rural Food and Retail Centre farm shop and café.

It is anticipated that the working farm would continue to operate as per the existing arrangements. 'Normal Working hours' are 06.00 to 19.00 each day, but at peak times (such as lambing and/or calving), the farm will operate 24/7. This also allows farm works to respond to the needs for animal welfare.

3.2.2 Rural Enterprise and Education Centre

The Rural Enterprise and Education Centre will comprise five existing farm building to provide a mixture of commercial (office and light industrial uses) and education uses, include an AgriTech Centre. There will be four live/work accommodation units for staff and students that require overnight accommodation (for example, veterinary students). The courtyard will accommodate car parking. The 'enterprise' aspect of the Rural Enterprise and Education Centre will:

- provide accommodation for those enterprises linked to agriculture, including those within research and development, who may require access to agricultural produce;
- provide office and flexible working spaces for local businesses and entrepreneurs;
- provide accommodation for those enterprises that could utilise natural materials and produce sourced locally from Crouchlands Farm; and,
- support enterprises that might provide services associated with other elements of the Whole Farm Plan, e.g. blacksmiths and farriers to support the Equestrian Centre with much-needed high quality products such as horseshoes and tack, and artisan food producers and craftspeople that produce goods for the Rural Food and Retail Centre or the restaurant in Hardnip's Barn.

The 'education' aspect of the Rural Enterprise and Education Centre will support:

- the farming activity, by providing a basis for a sharing knowledge and information and drawing in academic and practical expertise, allowing new techniques and procedures to be trialled and adopted; and,
- courses (in topics that might also offer practical elements such as woodland management, habitat restoration and creation, or foraging) offered to students or visitors staying within the glamping accommodation.

It is anticipated that typical office hours would be 08.00 to 18.00, but the units could be opened by secure passcodes or keys by users.

3.2.3 Rural Food and Retail Centre

The main building, the Rural Food and Retail Centre, will act as an anchor by providing a farm shop and cafe. The farm shop will showcase the best of West Sussex food and drink (grown on-site and at other local farms). The produce sold, such as meat reared on the farm and organic food and beverages, will derive

value from its on-site production, low mileage, and connection to the wider Crouchlands Farm. The offer will be very much complementary to the existing produce available in the shops in the surrounding villages. Seating (including outdoor seating with a play area), toilet facilities and kitchen facilities are also provided alongside the cafe. There will also be five small retail units.

The Rural Food and Retail Centre will also include a Cookery School containing meeting space for non-practical work, a cookery demonstration area, and ten counter units with appliances for practical learning classes covering a range of cookery and related subjects such as butchery. The building will also have storage space, toilet facilities, an office, and a lounge for administration and student amenity. Outside the building, the Cookery School will have car parking, compost bins and refuse, an outdoor dining terrace, and a kitchen garden that facilitates vegetable and herb planting.

The Rural Food and Retail Centre will enable produce from the farming activity to be sold, and it supports businesses operating from the Rural Enterprise Centre and surrounding local food and drink producers. It will also provide leisure facilities for those using the facilities at the Glamping or Equestrian Centre.

It is anticipated that the farm shop, retail units and cafe would be open Monday – Friday, 08:00 - 18:00; Saturday 08:00 - 16:00; and Sunday 09:00 - 15:00. The opening hours of the Cookery School would be course dependent, with daytime classes between 10.00 and 15.00, and evening courses between 19.00 and 22.00.

3.2.4 Equestrian Centre

The Equestrian Centre will provide a variety of indoor and outdoor competition-standard facilities. There will be a therapy centre for equine rehabilitation, including a therapy pool, water treadmill and cold spa for horses in the local community. In addition, the Equestrian Centre will provide services those in need of short stays with veterinary referrals to offer a variety of treatments not available locally, and very rarely available under one roof. There will be a hay barn, and other buildings also provide storage for equipment such as jumps, harrows and rollers. Parking facilities will be provided for livery users and competitors. Equestrians would be able to utilise the extensive Public Rights of Way network at the Farm.

The Equestrian Centre will be a 24/7 facility, with one live/work unit above each of the four stable blocks, due to animal welfare and health and safety reasons.

3.2.5 Hardnip’s Barn and Glamping

The Proposed Development will include 21 luxury glamping units (underground bunkers, lodges, wigwams, treehouses and shepherd’s huts), centred around Hardnip’s Barn which will accommodate the glamping reception and a restaurant and bar. There will be an outdoor activity area which will facilitate scheduled activities and courses, such as woodland craft courses, and yoga and wellness activities.

The glamping accommodation will be a high quality visitor attraction for those wanting to use the facilities provided as part of the Whole Farm Plan at Crouchlands, and also access walking, cycling and equestrian routes towards the South Downs National Park or the Wey and Arun Canal and the extensive nearby tourist facilities.

The glamping pods will be able to be accessed 24/7, but the restaurant and bar in Hardnip’s Barn will be open from 12:00 – 22:30 each day.

3.3 Consideration of Alternatives

3.3.1 Do-Nothing Scenario

The do-nothing scenario would mean that the sole use of the Crouchlands Farm would remain as farming land. The on-site digestate lagoons would not be remediated, and the PROWs would not be improved, and neither would elements of the site's biodiversity be enhanced. The proposed job creation and support to local education and enterprises would not be realised. Consequently, the do-nothing scenario is not considered as part of the EIA.

3.3.2 Design

The design of the Proposed Development seeks to reflect the rural character of the area, and to differentiate between the elements of the Whole Farm Plan (**Figure 1-2**) while fitting within a coherent overall approach.

Traditional materials would be utilised as far as possible, reflecting some of those present of the farm already and where applicable utilising existing buildings / materials.

As an alternative, a more contemporary approach to the design of the buildings could be undertaken. The environmental performance of these buildings may be preferable (utilising more modern, more energy efficient design techniques and materials), but equally the landscape character and visual impact of these buildings may be greater as they would not sit within the existing rural landscape.

3.3.3 Site Layout

At the site-wide level, the Proposed Development seeks to locate new development within areas of existing development (utilising existing buildings where possible) and / or away from constraints such as ancient woodland. It also seeks to consolidate the development to create a 'nucleus' for the site to facilitate more effective visitor management.

As an alternative, the Proposed Development could locate development across the wider site. This would be likely to lead to greater landscape character and visual impacts, by spreading built form across the wider area, and would also result in less efficient visitor management with activity spread further and more disparately across the site. This alternative might also mean a requirement for a higher number of newer buildings, with the prospect that existing buildings might be demolished.

4 Regulatory Framework

4.1 Introduction

This section of the EIA Report provides details on the overarching legislative framework for the proposed works. Additional legislation specific to an environmental topic is described in the relevant chapter.

4.2 Town and Country Planning Act 1990

The Town and Country Planning Act 1990 is the principal legislation that governs planning permission and planning law in England and Wales. The procedural rules and regulations of this Act are set out in a number of Statutory Instruments (SIs).

4.3 Town and Country Planning (EIA) Regulations 2017

The requirement to carry out an EIA on certain planning proposals is contained within the Town and Country Planning (EIA) Regulations 2017. The Proposed Development has been screened in as requiring an EIA by both CDC and the Secretary of State under Clauses 10(b) and 12(c) of Schedule 2 of these regulations. As such an EIA is required to support the planning application.

4.4 The Conservation of Habitats and Species Regulations 2017

Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations') defines the procedure for the assessment of the implications of plans or projects on European sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)). Under these Regulations, if a proposed development is unconnected with site management and is likely to significantly affect a European site, the statutory regulator (the 'Competent Authority') of the proposed development must undertake an 'appropriate assessment' (Regulation 63(1)).

Changes to The Conservation of Habitats and Species Regulations 2017 (as amended) have been implemented by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The key changes are the creation of a 'National Site Network' (NSN) (which no longer forms part of the EU Natura 2000 network) and the establishment of management objectives for the NSN. The network objectives are to:

- Maintain or, where appropriate, restore habitats and species listed in Annexes I and II of the Habitats Directive to a favourable conservation status; and,
- Contribute to ensuring, in their area of distribution, the survival and reproduction of wild birds and securing compliance with the overarching aims of the Wild Birds Directive.

Whilst Ramsar sites do not form part of the NSN, they are subject to the same protections as SACs and SPAs.

Should the Proposed Development, either alone or in combination with other plans or projects, be deemed to have a Likely Significant Effect (LSE) on an SAC or SPA (or it cannot be determined that there would not be a significant effect), then, in accordance with Section 63 of the Habitats Regulations, the competent authority must undertake an 'Appropriate Assessment' (AA) of potential adverse effects, with input from the statutory nature conservation body (i.e. EA).

4.5 Wildlife and Countryside Act 1981, as amended

Under the terms of Section 28(4)b of the Wildlife and Countryside Act 1981, as amended by Schedule 9 to the Countryside and Rights of Way Act 2000, any operations within, or adjacent to, a Site of Special Scientific Interest (SSSI) require approval from Natural England.

Part 1 of the Wildlife and Countryside Act 1981 (Schedule 1 to 27), makes it illegal to deliberately kill, capture, or transport most species of mammals, birds, reptiles and amphibians, as well as to destroy or damage nesting sites, or habitats on which they rely for food, shelter or breeding. In addition, Section 14 relates to invasive non-native species, making it illegal to plant or allow to escape into the wild any invasive non-native species listed in Schedule 9.

4.6 The Planning and Compulsory Purchase Act 2004

The Planning and Compulsory Purchase Act 2004 carried forward the provisions of the Town and Country Planning Act 1990, giving statutory force to a planning led system of development control. Under Section 38 of the 2004 Act, the determination of planning applications must be in accordance with the approved Development Plan for the area, unless material considerations indicate otherwise.

4.7 Priority Substances Directive

The Priority Substances Directive (2013/39/EU) is implemented in England and Wales by the Water Framework Directive (WFD) (Standards and Classification) Directions (England and Wales) 2015. Compliance with these standards forms the basis of good surface water chemical status under the WFD.

The Environmental Quality Standards (EQSs) Directive (2008/105/EC) supersede EQSs initially introduced by the Dangerous Substances Directive (76/464/EEC); however, where EQSs are not listed for substances, limit values set by the Dangerous Substances Directive and its daughter Directives remain in force.

4.8 Waste Framework Directive

The Waste Framework Directive (2008/98/EC) consolidates earlier legislation regulating waste. The Directive sets out the general rules applying to all categories of waste. A key objective of which is to provide measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use.

Article 3(1) of the Directive defines waste as:

"*…any substance or object…which the holder discards or intends or is required to discard*".

More generally, the Directive provides a general duty to ensure that waste is dealt with in an environmentally friendly way. The key to this is the 'waste hierarchy', which emphasises prevention (in the first instance) and then re-use, recycling, and recovery of waste (see Plate 4-1). EU Member States and the UK must have regard to the waste hierarchy when dealing with waste. Disposal to landfill is the least favourable option.

Plate 4-1: Waste hierarchy

The Proposed Development has potential to generate waste during the construction and operation phases, this would be dealt with through standard site waste management planning. No unusual wastes would arise in terms of types of waste or quantity.

4.9 National Planning Policy Framework 2021

The National Planning Policy Framework (NPPF, 2021) ("the Framework") is a material consideration of significant weight to the Proposed Development.

Paragraph 84 of the Framework states:

Planning policies and decisions should enable:

- *(a) the sustainable growth and expansion of all types of business in rural areas, both through conversion of existing buildings and well-designed new buildings;*
- *(b) the development and diversification of agricultural and other land-based rural businesses;*
- *(c) sustainable rural tourism and leisure developments, which respect the character of the countryside; and*
- *(d) the retention and development of accessible local services and community facilities, such as local shops, meeting places, sports venues, open space, cultural buildings, public houses, and places of worship.*

Paragraph 85 of the Framework states:

"*Planning policies and decisions should recognise that sites to meet local business and community needs in rural areas may have to be found adjacent to or beyond existing settlements, and in locations that are not well served by public transport. In these circumstances it will be important to ensure that development is sensitive to its surroundings, does not have an unacceptable impact on local roads and exploits any opportunities to make a location more sustainable (for example by improving the scope for access on foot, by cycling or by public transport). The use of previously developed land, and sites that are physically well-related to existing settlements, should be encouraged where suitable opportunities exist*"

The Proposed Development cannot be delivered anywhere else because it is intrinsically linked to the remediation of the Farm, meaning there are no alternative sites that present such an opportunity. The Proposed Development seeks to improve and support the rural economy of West Sussex and Chichester, aiming to meet requirements for local employment, education, and new homes. The Proposed Development would enable new rural businesses to be created through the delivery of affordable workshops and

commercial units, give local young adults education opportunities that are not available elsewhere, and create an impressive new tourist destination that focuses on sustainability and environmental gain.

4.10 Local Planning Policy Context

The Development Plan for Chichester comprises:

- Chichester Local Plan (July 2015);
- Site Allocation Development Plan Document 2014 - 2029 (January 2019);
- West Sussex Waste Local Plan April 2014;
- West Sussex and South Downs Joint Minerals Plan (2018); and,
- Kirdford Neighbourhood Plan.

CDC is currently undertaking a Local Plan review which will shape where new development will go in the Chichester District up to 2034. The Preferred Approach version of the plan was consulted on until 7th February 2019. Artemis submitted representations to the Preferred Approach version of the plan which are now available on the Council's website. CDC has since undertaken extensive work on the Local Plan with regards to infrastructure and housing need. It is currently predicted that the Regulation 19 Local Plan will be published in July 2022 for public consultation. Following this, the plan could be submitted to the Secretary of State for examination. The earliest adoption is expected is in Spring/Summer 2023.

Crouchlands Farm spans across Kirdford Parish and Plaistow and Ifold Parish, but the application site is located only in Plaistow and Ifold Parish. The Ifold and Plaistow Neighbourhood Plan was submitted to the Local Planning Authority in August 2018 (Artemis submitted representations to the Neighbourhood Plan in April and October 2020 which are now available on CDC's website) but the examiner found that the plan could not proceed for a number of reasons. It is in the process of being withdrawn.

4.10.1 Chichester Local Plan 2015

The site is located in the North of the Plan Area, which is predominately rural with a few sizeable settlements. Whilst conserving the rural character of the area is a key objective in the Local Plan, there is an identified need to accommodate some development to address local housing and employment needs and to support village facilities.

Table 4-1 outlines the most important policies within the Local Plan which are relevant to the Proposed Development.

Table 4-1: Chichester Local Plan 2015 policies of relevance to the Proposed Development

Local Plan Policy	Relevance to Proposed Development
Policy 25: Development in the North of the Plan Area	The Proposed Development is predominately based around the existing agricultural uses, with rural diversification and tourism activities proposed to ensure the development is economically beneficial to the area and successful in terms of footfall and visitors. The Proposed Development would be sensitive to the rural character of the area, with low intensity uses being proposed in characteristically rural buildings that respect the natural environment and landscape. The existing local facilities in Plaistow and Kirdford would be protected and improved by an increase in visitors to the area. In redeveloping Crouchlands Farm, the aim is to improve accessibly to the site, but also out of the area and to nearby centres. The Proposed Development therefore complies with Policy 25.

Local Plan Policy	Relevance to Proposed Development
Policy 30: Built Tourist and Leisure Development	The Proposed Development includes both a glamping proposal in the countryside as well as aspects of the Farm which support tourism and leisure development in the area, the Proposed Development has been sensitively designed to maintain the tranquillity and character of the area; there would be minimal impact on the natural and historic environment. The Proposed Development would also provide a high-quality attraction and accommodation as well as being respectful of the beautiful landscape, the Ancient Woodland, and the rich and diverse ecology of the site, with the aim of generating ecological gain.
Policy 40: Sustainable Design and Construction	Through the identification and implementation of appropriate mitigation measures, the Proposed Development would take into consideration the criteria outlined in Policy 40 and therefore demonstrate compliance. Relevant criteria including environment protection & enhancement, compliance with relevant building standards and on-site waste management, sustainable design and development, energy consumption, adaption to climate change, historic and landscape protection and enhancement, reduce traffic impacts and the design to be in keeping with the tranquillity and local character and identity of the area.
Policy 45: Development in the Countryside	It is considered that the opportunity for a Rural Enterprise and Education Centre, with leisure and tourism activities, low intensity farming, rural food and retail cannot be met anywhere else in the local area because the Proposed Development is intrinsically linked to the remediation of the Farm. This is also a significant opportunity to enhance the local visitor economy, the rural economy and agricultural activity in the area. The Rural Enterprise Centre would relate well to the existing settlements, which surround the site to the north, east and south, will not prejudice existing viable agricultural activities, in fact the Proposed Development would increase the farming activity significantly. The design of new buildings would be sympathetic to the rural character of the area, in compliance with Policy 45.
Policy 46: Alterations, Change of Use and/or Re- use of Existing Buildings in the Countryside	The Proposed Development aims to reuse and refurbish as many of the existing buildings as possible in order to retain the agricultural nature of the Farm.
Policy 48: Natural Environment	The Proposed Development site is not within the landscape setting of the South Downs National Park and is not within a protected landscape or an area designated for scenic landscape value; however there are a number of landscape elements and features which would be sensitive to the this. The Proposed Development has therefore been carefully designed in conjunction with landscape and visual assessment studies as an iterative process in order to anticipate and minimise predicted landscape and visual effects.
Policy 55: Equestrian Development	The Proposed Development includes an equestrian centre; it is anticipated that the site would host equestrian events such as clinics, shows and gala evenings.

5 Approach to EIA

5.1 Introduction

This section sets out the approach for the assessment of potential impacts which has been adopted within this EIA Report. In summary, this section presents:

- The EIA process;
- The approach adopted to define the baseline environment (specific details are provided for each environmental topic considered in the relevant chapter);
- The generic approach taken to assess potential impacts, including the evaluation of significance (where a different approach has been adopted for a specific topic, this is set out in the relevant chapter);
- The generic approach taken to the derivation of mitigation measures and the assessment of residual impacts; and,
- The approach taken to the assessment of potential cumulative impacts.

5.2 EIA Guidance

This EIA has been undertaken in accordance with the requirements of the Town and Country Planning (EIA) Regulations 2017, and has taken into account key policies, legislation, guidance and advice, including but not limited to the following:

- Ministry for Communities and Local Government (MCLG) "*Guidance: Environmental Impact Assessment*" (2017);
- Chartered Institute of Ecology and Environmental Management (CIEEM) "*Guidelines for Ecological Impact Assessment in the UK and Ireland*" (2018); and,
- Institute of Environmental Management & Assessment (IEMA) "*Guidelines for Environmental Impact Assessment*" (2017).

It is noted that this list of guidance is not exhaustive, and the relevant guidance adopted for the assessment of each environmental parameter is described in the relevant topic chapter.

5.3 The EIA Process

EIA is an iterative tool for systematically examining and assessing the impacts and effects of the construction and operational phases of the Proposed Development on the environment.

Under the EIA Directive, the formal reporting mechanism for an EIA is the EIA Report. In accordance with Part 5, Section 18 of the Town and Country Planning (EIA) Regulations 2017, the EIA Report should include such information as is reasonably required to assess the likely significant environmental effects of the Proposed Development and which the applicant can reasonably be required to compile, including:

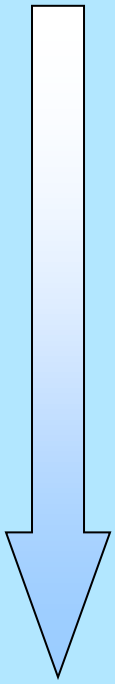
- a description of the proposed development comprising information on its site, design, size and other relevant features of the development;
- a description of the likely significant effects of the proposed development on the environment;
- a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the

option chosen, taking into account the environmental effects of the development on the environment; and,

- a non-technical summary of the above.

EIA is a process that systematically examines and assesses the potential impacts of a project on the environment. The process is outlined in **Table 5-1**.

Table 5-1: The EIA process

Stage	Task	Aim / objective	Work / output (examples)
Screening report (Optional)	Screening	To formally confirm route for EIA and lead responsible authority.	Appropriate level of information on proposals and approach.
Scoping study (Optional)	Scoping	To identify the potentially significant direct and indirect impacts of the proposed scheme.	Preliminary consultation with key consultees. Targets for specialist studies (e.g. benthic ecology survey).
EIA 	Consultation	Consult with statutory and non-statutory organisations and individuals with an interest in the area and the proposed scheme.	Local knowledge and information.
	Primary data collection	To characterise the existing environment.	Background data including existing literature and specialist studies.
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects.	Specialist reports.
	Impact assessment	To evaluate the existing environment, in terms of sensitivity. To evaluate and predict the impact (i.e. magnitude) on the existing environment. To assess the significance of the predicted impacts.	Series of significant adverse and beneficial impacts.
	Mitigation measures	To identify appropriate and practicable mitigation measures and enhancement measures.	The provision of solutions to minimise adverse impacts as far as possible. Feedback into the design process, as applicable.
	EIA Report	Production of the EIA Report in accordance with EIA guidance.	EIA Report.

The approach adopted for this EIA is summarised in the following sections. It should be noted that these stages are not consecutive and overlap. For example, iterative design changes may be made in light of emerging findings of the EIA process to prevent or reduce the significance of a potential impact. This would then require re-assessment of the potential impact, potentially informed by further survey work to adequately describe the baseline environment.

5.4 Screening

Screening is the official process by which the relevant planning / licensing authorities determine the requirement for a proposed scheme to undertake an EIA.

An Environmental Impact Assessment (EIA) Screening Report (Royal HaskoningDHV, 2021) was submitted to CDC along with a request for a Screening Opinion on 19th February 2021. The Screening Opinion was received on 20th May 2021 (see **Appendix 1.1**), which determined the Proposed Development to be EIA Development under paragraphs 10(b) and 12(c) of Schedule 2 of the EIA regulations.

Given the EIA Screening exercise concluded that the Proposed Development was not EIA Development, a request for a Screening Direction was submitted to the Secretary of State on 5th May 2021. The Screening Direction was received on 13th September 2021 (see **Appendix 1.2**), which also determined the Proposed Development to be EIA Development. As such, an EIA is required to support the planning application. See **Section 6** for further details.

5.5 EIA Report

5.5.1 Baseline environment

The term 'baseline environment' is used to describe the nature, scale, condition, and other relevant information to provide a detailed description of a given environmental receptor that falls within the scope of the EIA Report. Within this Report, the description of the baseline environment consists of the following aspects:

- the spatial location and extent of the environmental features or receptors;
- a description of the environmental features or receptors and their character;
- the context of the environmental features or receptors in terms of rarity, function, and population at the local, regional and national level;
- the sensitivity of the environmental features or receptors in relation to physical, chemical or biological changes; and,
- the value of the environmental features or receptors (e.g. designated status).

5.5.2 Impact identification

Where appropriate to do so, the assessment has used the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. This process provides an easy-to-follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent impact assessment. The aspects of this model are defined as follows:

- Source - the origin of a potential impact (i.e. an activity such as earthworks and a resultant effect e.g. contaminated run-off from the site);
- Pathway - the means by which the effect of the activity could impact a receptor (e.g. for the example above, changes to the water quality in the watercourses affected); and,
- Receptor - the element of the receiving environment that is impacted (this could either be a component of the physical, ecological or human environment such as water quality, e.g. for the above example, species living on or in the watercourses affected).

Where a different approach has been necessary to reflect the specific assessment requirements of a particular topic, this is described in the corresponding technical chapter.

5.5.3 Significance of the impact

The significance of impacts is evaluated with reference to definitive standards, accepted criteria, technical guidance or legislation where these exist, for each topic. Where it is not possible to quantify impacts, and

where a qualitative or semi-qualitative assessment is made, a reasoned framework for the assessment is provided in the technical chapter.

Where guidance is available for defining sensitivity and magnitude (whether from professional guidance or UK Government publications or bespoke definitions agreed with stakeholders) this is referred to. If such sources are available but have not been used, then a justification for not using these are given.

Specific significance definitions for impacts have been developed, giving due regard to both sensitivity of the receptor and magnitude of the effect.

5.5.4 Determining receptor value and sensitivity

The characterisation of the existing environment helps to determine the receptor sensitivity in order to assess the potential impacts upon it.

Receptor value considers whether, for example, the receptor is rare, has protected or threatened status, has importance at a local, regional, national or international scale and; in the case of biological receptors, whether the receptor has a key role in the ecosystem function.

The ability of a receptor to adapt to change, tolerate, and/or recover from potential impacts is key to assessing its sensitivity to the impact under consideration. For ecological receptors, tolerance could relate to short term changes in the physical environment; for human environment receptors, tolerance could relate to impacts upon community. The time required for recovery is an important consideration in determining receptor sensitivity.

The overall receptor sensitivity is determined by considering a combination of value, adaptability, tolerance and recoverability. This is achieved through applying known research and information on the status and sensitivity of the feature under consideration coupled with professional judgement and past experience.

Expert judgement is particularly important when determining the sensitivity of receptors. For example, an Annex II species (under the Habitats Directive) would have a high inherent value, but may be tolerant to an impact or have high recoverability. In this case, sensitivity should reflect the ecological robustness of the species and not necessarily default to its protected status. Example definitions of the different sensitivity levels for a generic receptor are given in **Table 5-2**.

Table 5-2: Example definitions of different sensitivity levels for a generic receptor

Sensitivity	Definition
High	Individual receptor has very limited or no capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Medium	Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Low	Individual receptor has some capacity to accommodate, adapt or recover from the anticipated impact.
Negligible	Individual receptor is generally can accommodate or recover from the anticipated impact.

The definitions of sensitivity given within each chapter are relevant to that particular EIA topic and are clearly defined by the assessor within the context of that assessment.

In addition, for some assessments the value of a receptor may also be an element to add to the assessment where relevant, for instance if a receptor is designated or has economic value.

Example definitions of the value levels for a generic receptor are given in **Table 5-3**.

Table 5-3: Example definitions of the value levels for a generic receptor

Value	Definition
High	Internationally / nationally important (for example internationally or nationally protected site).
Medium	Regionally important / regionally protected site.
Low	Locally important.
Negligible	Not considered to be important (for example common or widespread).

The terms 'high value' and 'high sensitivity' are not necessarily linked within a particular impact and it is important not to inflate impact significance specifically because a feature is 'valued'. For example, a receptor could be of high value (e.g. an Annex I habitat) but have a low or negligible physical / ecological sensitivity to an effect.

5.5.5 Determining magnitude of effect

In order to predict the level and significance of an impact, it is necessary to establish the magnitude of effect, as well as the probability of an impact occurring through consideration of:

- Scale or spatial extent (small scale to large scale or a few individuals to most of the population);
- Duration (short term to long term);
- Likelihood of impact occurring;
- Frequency; and,
- Nature of change relative to the pre-impact condition of the existing environment.

5.5.6 Evaluation of significance

Subsequent to establishing the sensitivity of the receptor and the magnitude of effect, the impact significance is predicted by using quantitative or qualitative criteria, as appropriate, to ensure a robust assessment. The matrix presented in **Table 5-4** has been used to provide transparency to the assessment process; however, it should be stressed that the assessments are based on the application of expert judgement.

Table 5-4: Impact assessment matrix

		Negative magnitude				Beneficial magnitude			
Sensitivity		High	Medium	Low	Negligible	Negligible	Low	Medium	High
	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

Table 5-4 provides an indication of the significance levels used in the assessment process for the majority of parameters. Any exceptions to these definitions are due to the application of best practice methodologies for a particular topic, as described above. In general, impacts which are of major or moderate significance are considered to be significant with respect to the EIA Regulations. It is also possible that a moderate impact may not be considered significant under the EIA Regulations however, in these cases a justification and rationale is provided in the impact assessment text.

Descriptions of the approach to impact assessment and the interpretation of significance levels are provided within the relevant chapters of this EIA. This approach ensures that the definition of impacts is transparent and specific to each topic under consideration.

Example definitions of the significance levels for a generic receptor are given in **Table 5-5**.

Table 5-5:Example impact significance definitions

Value	Definition
Major	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the particular receptor's character or distinctiveness. May include change to key environmental characteristics which are well in excess of the natural range of variability, and likely to occur some distance away from the development area.
Moderate	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness. May include change to key environmental characteristics which are in excess of the natural range of variability but may be largely restricted to the development area. Change occurs throughout the associated project development phase.
Minor	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness. May include change to key environmental characteristics which are similar to, but occasionally in excess of, the natural range of variability. Change occurs intermittently during associated project development phase and is likely to be restricted to the development area.
Negligible	Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptor's character or distinctiveness.

For each topic within the EIA, best practice methodology (based on the latest available guidance) has been followed, which may augment the assessment framework presented above. In all cases the specific approach taken to assess impacts is described within each technical chapter.

5.5.7 Mitigation

Where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, mitigation measures were proposed and discussed with the relevant authorities in order to avoid, prevent or reduce impacts to acceptable levels.

For the purposes of the EIA, two types of mitigation are defined:

- Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA; and
- Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts.

5.5.8 Residual impacts

Following initial assessment, if the impact does not require additional mitigation (or none is possible) the residual impact will remain the same. However, if additional mitigation measures are identified, impacts are re-assessed, and all residual impacts clearly described.

5.5.9 Assumptions and limitations

The EIA process requires an EIA Report to provide an indication of any difficulties (technical deficiencies or lack of expertise) encountered during the assessment process. Any such assumptions or limitations are identified within the relevant topic chapter, where appropriate.

5.6 Cumulative Impact Assessment

5.6.1 Impact inter-relationships

This EIA Report has given due consideration to the potential for different residual impacts to have a combined impact on key sensitive receptors. The objective is to identify where the accumulation of impacts on a single receptor, and the relationship between those impacts, potentially gives rise to a need for additional mitigation. Inter-relationships were assessed within the relevant sections of the topic chapters of the EIA Report.

5.6.2 Cumulative impacts

In line with IEMA's Guidelines for EIA (2017), cumulative impacts are defined as:

"…the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions …"

There is no legislation that outlines how cumulative impact assessments (CIAs) should be undertaken; however, the EIA and Habitats Regulations require the consideration of direct impacts and any indirect, secondary and cumulative effects of a project. Government guidance states that: "cumulative effects could refer to the combined effects of different development activities within the vicinity" (Ministry of Housing, Communities and Local Government, 2017). Guidance on CIA is provided in a number of good practice documents (e.g. the European Commission, 1999). This guidance is not prescriptive, but rather suggests various approaches which may be used, depending on their suitability to the project (for example the use of matrices, expert opinion, consultation, spatial analysis and carrying capacity analysis).

With respect to 'past' projects, a useful ground rule in CIA is that the environmental impacts of schemes that have been completed should be included within the environmental baseline; as such, these impacts will be taken into account in the EIA process and, generally, can be excluded from the scope of CIA. However, the environmental impacts of recently completed projects may not be fully manifested and, therefore, the potential impacts of such projects should be taken into account in the CIA.

6 Consultation

6.1 Introduction

The following sections outlines the EIA consultation that has been undertaken with CDC and key stakeholders.

6.1.1 EIA Screening Opinion

Details of the screening process that has been undertaken on the Proposed Development can be found in **Section 1.2**. The Screening Opinion issued by CDC (see **Appendix 1.1**) identified the potential significant environmental impacts that could arise as a result of the Proposed Development, as listed in **Table 6-1**.

Table 6-1 EIA Screening Opinion issued by CDC

Theme	Comment	Where Addressed in the EIA Report
Water resources and designated sites	*Characteristic of the development* *"With regard to the use of natural resources, in particular water, the site is located within the Sussex North water resource supply zone. After the submission of this Screening Opinion request and the associated consultation, the Local Planning Authority have received comments from Natural England relating to the Loxwood Neighbourhood Plan. The Parish of Loxwood is located approximately 1.8km to the east of the site and is also within the Sussex North water resource supply zone. The comments state that any developments in Chichester District which fall within the Sussex North water resource supply zone will need to be tested through an HRA. This is because the Sussex North area is supplied by a water extraction at Hardham, which Natural England have advised cannot with certainly conclude is not having an adverse impact on integrity on the Arun Valley SPA, SAC and Ramsar. The Local Planning Authority considers that the proposals would likely lead to an increase in water consumption which is likely to have a significant effect upon European Designated Sites and this should be addressed in the Environmental Statement."*	Potential impacts to water resources from the Proposed Development are considered in **Chapter 7, Land Quality and Hydrogeology**, in Sections **7.6.2** and **7.6.3** for construction, and **Section 7.7.2** for operation. In addition, the impacts of the Proposed Development to European Designated Sites is considered in **Chapter 11, Nature Conservation and Biodiversity**. A consideration of the water neutrality of the Proposed Development is provided in **Section 11.7.**
	Location of the development *"The site is within the SSSI Impact Zone for Chiddingfold Forest SSSI (Site of Special Scientific Interest) and also within the Zones of Influence of The Mens Special Area of Conservation (SAC) and Ebernoe Common SAC, both of which have been designated for their bat populations, particularly Bechstein and Barbastelle populations. There is extensive bat habitat and network in immediate proximity to the site, including Ancient Woodland directly to the south. The grassland and woodland to the West of the site has extensive bat records, including Bechstein and Barbastelle Bats records. The impact on the bat network and the integrity of the designated sites will need thorough investigation. The Council's Environmental Co-ordinator has been consulted and comments that EIA would be required.* *Natural England have commented that the proposed development is located within/partly within or has the potential for adverse effects on the following designated nature conservation sites or designated landscapes:* • *The Mens SSSI* • *Ebernoe Common SSSI* • *Chiddingfold Forest SSSI*	The impacts of the Proposed Development to European Designated Sites is considered in **Chapter 11, Nature Conservation and Biodiversity**. Potential impacts to bat populations are considered in **Section 11.5.4** (construction) and **Section 11.6.4** (operation).

Theme	Comment	Where Addressed in the EIA Report
	Natural England has commented that they have not assessed the significance of any impacts on these designated sites or landscapes. The proposed development may therefore be likely to have significant effects on the interest features for which these sites are notified or the purposes of designation and we advise you to consider further whether an Environmental Impact Assessment (EIA) is required. *Given the above designations and the precautionary approach, further information to assess the impact of the development would be required in the Environmental Statement.* *As identified in the above sections, the Local Planning Authority also considers that the impact on integrity on the Arun Valley SPA, SAC and Ramsar resulting from water extraction, and the impact with regard to pollution, the risk of major accidents and the risks to human health would be required in the Environmental Statement."*	
Pollution	*Characteristic of the development* *"Material to pollution, the risk of major accidents and the risks to human health is the uncertainty associated with lagoon 3, located immediately adjacent to the south east of the development site and surrounded by land shown to be within the applicant's control. The area of lagoon 3 is not shown to be in the applicant's control.* *The Council's Senior Environmental Protection Officer has commented that there are uncertainties associated with potential risks to human health, land and water quality from lagoon 3 resulting from the previous use of the site. Therefore an environmental impact assessment (EIA) should be undertaken covering land quality impacts from both on site and off site locations. Potential contaminants from lagoon 3 include gaseous and liquid contaminants which if released, could affect the development land, including human and ecological receptors. A full detailed human health risk assessment should be submitted as part of an EIA for the site which should include risk assessment for both gaseous phase and liquid phase contaminants. Gaseous phase risk assessment should include explosive and asphyxiant hazards.* *The Local Planning Authority considered that the impact with regard to pollution, the risk of major accidents and the risks to human health is unknown, and as such, further information to assess the impact of the development in this regard would be required in the Environmental Statement."*	The impacts of the Proposed Development to land and water quality are considered in **Chapter 7, Land Quality and Hydrogeology**. The impact of air emissions to human receptors and designated sites are considered in **Chapter 9, Air Quality**. The risks from pollution and gaseous sources from Lagoon 3 are considered in **Chapter 14 Human Health.**
Archaeology	*Location of the development* *"The Council's Archaeologist has commented that there should be a staged approach to archaeological conservation that should start with a detailed desk-based assessment of potential and lead on, where appropriate, to evaluation and preservation. However, it would be more appropriate for this process to be provided as part of a full planning application rather than, necessarily, in an EIA."*	A desk-based assessment has been provided in **Chapter 13, Cultural Heritage and Archaeology**.

Theme	Comment	Where Addressed in the EIA Report
General	*Characteristics of the potential impact* *"In terms of the magnitude and spatial extent of the impact the most significant impacts are expected to be the potential for ecological impacts, impact with regard to pollution, the risk of major accidents and the risks to human health as discussed above.* *There would be no transboundary impact as the application site is entirely within Chichester District however site is located close the South Downs National Park, the boundary of which runs to the west and south of the site, at a distance of approximately 2.25km to the west and 3.5km to the south and the setting of the National Park would need to be considered.* *There may be wider impacts associated with traffic generation, noise, air quality and lighting."*	The impacts of the Proposed Development on traffic generation, noise, air quality are considered in **Chapter 8, Transport and Access**, **Chapter 10, Noise and Vibration**, **Chapter 9, Air Quality.** A detailed assessment of the potential night time lighting impacts, to address the potential impact on the SDNP Dark Skies will be provided in a separate Addendum to the Lighting Impact Assessment following additional survey and assessment work.
Transport	*Characteristics of the potential impact* *"West Sussex County Council Highways were consulted and in terms of traffic generation they have commented that a fully comprehensive trip generation assessment of each use should be provided and this will determine the scope of junctions that require modelling. If additional traffic counts at other junctions are required then these should be factored up for pre-Covid levels. TRICs could be used for some of the more traditional uses though it is appreciated that farm shop/cafe, equestrian and glamping use may require a more bespoke trip assessment using similar sites/ previously approved planning applications or estimation from end user trips. It is also advised that worst case scenarios are assessed, including when a large equestrian event, weddings, glamping change-over etc. in addition to normal day-to-day trips, are taking place. This will allow the Local Highway Authority to assess the impact on the local road network when the most trips are expected (peak hours for different uses should be identified)."*	The impacts of the Proposed Development on traffic and transport are considered in **Chapter 8, Transport and Access**.
Noise and air quality	*Characteristics of the potential impact* *"The Council's Senior Environmental Protection Officer has commented that given the scale of the development (rural enterprise centre, rural food and retail centre, equestrian centre and glamping sites) and the increased traffic and plant associated with the proposals, it is considered that the increase in noise level could be significant and therefore noise should be assessed as part of an EIA. It is also considered that the proposed land uses at the site will impact local air quality (increased traffic movements and plant/equipment used within buildings). An air quality assessment should be included within the EIA covering both impacts during the construction and operational phases. The air quality assessment should include an assessment of the off-site gaseous sources referenced above in the response on Land Quality."*	The impact of air and noise emissions are considered in **Chapter 9, Air Quality** and **Chapter 10, Noise and Vibration** respectively. The risks of gaseous sources from Lagoon 3 are considered in **Chapter 14 Human Health.**
Lighting	*Characteristics of the potential impact* "*Lighting has the potential to cause impact to the protected sites, setting of the nearby South Downs National Park and the wider rural area. The Council's Senior Environmental Protection Officer*	A detailed assessment of the potential night time lighting impacts, to address the potential impact on the SDNP Dark Skies will be provided in a separate Addendum to the Lighting Impact Assessment

Theme	Comment	Where Addressed in the EIA Report
	considers that there is potential for impacts from lighting to be significant, given the rural nature of the area. A lighting impact assessment should be included within the EIA in order that appropriate mitigation measures can be designed into the future development."	following additional survey and assessment work
Landscape and Visual	*Characteristics of the potential impact* *"In terms of the built form, visually and in landscape terms, the extent of the impact is likely to be relatively localised. Nonetheless, further consideration should be given to landscape views."*	The impact of the Proposed Development on the Landscape and Visual setting within the ZOI is considered in the Lighting and Visual Impact Assessment (LVIA) which accompanies the Application (Shiels Flynn, 2022). The LVIA is summarised in **Chapter 12** of this EIA Report.

6.1.2 EIA Screening Direction

The Screening Direction issued by the Secretary of State (see **Appendix 1.2**) identified potentially significant environmental impacts that could arise as a result of the Proposed Development, as listed in **Table** 6-2.

Table 6-2: Screening direction issued by the Secretary of State

Theme	Comment	Where Addressed in the EIA Report
Biodiversity – designated ecological sites	*Characteristics and Location of Development* *"The proposal site is located within close proximity to the following designated ecological sensitive areas: The Mens Special Area of Conservation (SAC); The Mens Site of Special Scientific Interest (SSSI); Ebernoe Common SAC; Ebernoe Common SSSI; Arun Valley Special Protection Area (SPA); Arun valley Ramsar site; Amberley Wild Brooks SSSI; Pulborough Brooks SSSI; Waltham Brooks SSSI; Chiddingfold Forest SSSI. It is also within close proximity to Plaistow Designated Conservation area, which is located close to the northern site boundary."* *Characteristics of Potential Impacts* *"The developer, referring to Ebernoe Common and The Mens, along with Sparrwood Hanger & Roundwyke Copse Complex Woodland & Meadows Local Wildlife site (LWS) suggest mitigation measures to protect certain wildlife populations including bats and ancient woodland in and around the site. They also consider that the proposals would provide a net biodiversity gain.* *The Council consider that an EIA is required in order to provide thorough investigation into the impact of the proposals on biodiversity, including on the protected sites in the locality of the proposal site. The Council have formed this opinion in consultation with their Environmental Co-ordinator, and also on consultation with Natural England.* *The Secretary of State has consulted Natural England who consider that the proposal presents unknown potential significant adverse effects on all of the statutorily designated nature conservation sites or landscapes in the locality. Natural England have formed the opinion that EIA may be required on this basis.* *The Secretary of State agrees with the Council and Natural England that in order to fully assess the potentially significant impacts on*	The impacts of the Proposed Development to European, Nationally and Locally Designated Sites is considered in **Chapter 11, Nature Conservation and Biodiversity**.

Theme	Comment	Where Addressed in the EIA Report
	biodiversity, including several statutorily designated protected sites, an EIA is required."	
Environment – human health	*Characteristics of Potential Impacts* *"In general terms the proposal would be unlikely to produce significant risks to human health during construction, operation, and decommissioning. However, due to the unknown contents of Lagoon 3, there are unknown pollution risks to air and ground (including groundwater) which could be significant in terms of adverse effects on human health. This has been raised as a serious concern by the Council's Environmental Health Protection Officer."*	The risks from pollution from Lagoon 3 are considered in **Chapter 14 Human Health.**
Environment – water resources	*Characteristics of Potential Impacts* *"The proposal site is located within the Sussex North water resources supply zone (WRZ). In consultation with the Council, and also with the Secretary of State, Natural England cannot conclude that there will not be adverse impacts on the nearby Arun Valley SPA, SAC and Ramsar by unknown quantities of water required for the proposal. Natural England have stated that they are working with Environment Agency and Southern Water to try to identify a long term more sustainable water supply. In the meantime, with the uncertain adverse effects any development that impacts on Sussex North WRZ it must be demonstrated that there will not be added adverse effects on the supply of water resources."*	The impacts of the Proposed Development to land and water quality are considered in **Chapter 7, Land Quality and Hydrogeology.** A consideration of the water neutrality of the Proposed Development is provided in **Section 11.7.**
Heritage assets	*Characteristics of Potential Impacts* *"The developer has identified 52 listed buildings within 1km of the site boundary. Plaistow Conservation Area is located in close proximity to the North of the site, and also a scheduled ancient monument within 2km of the site. In addition to this they have identified non-scheduled ancient monuments within the site boundary and non-designated heritage assets within 150m of the site boundary. Due to the number of historical features in the area, the developer acknowledges that the potential for encountering archaeological remains is unknown. They suggest that mitigation measures particularly at construction stage would protect these heritage assets. In terms of archaeology alone, the Council's Archaeological Officer has commented that a detailed desk-based assessment with a view to potential evaluation and preservation of archaeological remains could be achieved within the planning application process. There have been no comments from the Council's Heritage Officer. The Secretary of State has consulted with Historic England who acknowledge the nearby proximity of the listed buildings / Plaistow Conservation Area. They state based on heritage impacts alone, the applicant should submit a heritage impact assessment as part of the application process, to ensure that NPPF Paragraphs 194 and 195 are complied with.* *The Secretary of State also considers that the redevelopment of existing buildings along with provision of new buildings will result in a change in the built form of the area. It will result in new buildings of a greater scale than previously. This will inevitably comprise a physical change to the locality. The effect of this on the surrounding landscape will require full and detailed assessment."*	The potential impacts to heritage assets is considered in **Chapter 13 Cultural Heritage and Archaeology**.

6.1.3 Statutory Consultation

Details of topic specific consultation that has been undertaken is descried in the relevant chapter.

6.2 Planned Consultation

Consultation will continue to be undertaken with both the public and stakeholders as part of the planning process (through CDC).

7 Land Quality and Hydrogeology

7.1 Introduction

This chapter of the EIA Report considers the likely effects of the Proposed Development with respect to land quality and hydrogeology, and how this could affect human health as well as the natural and built environment. It describes the methods used to assess potential effects, the baseline conditions currently existing within the Proposed Development's footprint and surrounding area. The mitigation measures required to prevent, reduce or off-set any significant adverse effects are presented together with the likely residual effects after these measures have been adopted.

This chapter is supported by the following appendix:

- Appendix 7.1 Land at Crouchlands Farm, Land Quality Desk Study and Preliminary Risk Assessment report; and,
- Appendix 7.2 The Crouchlands Farm Project, West Sussex, Qualitative Mineral Resource Risk Assessment.

7.2 Legislation, Planning Policy and Guidance

There are a number of overarching international, national and regional items of legislation, policy and guidance applicable to the Proposed Development, as detailed in **Chapter 4**, Regulatory Framework. The following sections build on the regulatory framework chapter by focusing on key legislation, policy and guidance with specific reference to land quality and hydrogeology.

7.2.1 Legislation

7.2.1.1 Environmental Protection Act 1990 (Part 2A): Contaminated Land Statutory Guidance

The Environmental Protection Act 1990 makes provision for the improved control of pollution arising from certain industrial and other processes. Part 2A of the Act provides the statutory definition of contaminated land: "*Contaminated Land is any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reasons of substances in, on or under the land that:*

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Significant pollution of controlled waters is being or is likely to be caused*."

The Act also provides the regulatory basis for the identification, designation and remediation of contaminated land. The Proposed Development could have an effect on land potentially affected by contamination. This requires assessment to ensure that the land is suitable for use following the construction of the Proposed Development, and that the land cannot be determined as contaminated land under Part 2A of the Act.

7.2.1.2 Environmental Permitting (England and Wales) Regulations 2016

The 2016 Regulations (as amended) set out an environmental permitting and compliance regime that applies to various activities and industries. The environmental permitting regime is a common framework for applying for, receiving, varying or transferring and surrendering permits, along with compliance, enforcement and appeals arrangements. It rationalises the previous permitting and compliance regimes into a common framework that is easier to understand and simpler to use. The framework introduces different levels of control, based on risk:

- Exclusions (lower risk activities which may be undertaken without any permit), standard rules permit (standard requirements and conditions for the relevant activities are set out so applicants can determine in advance whether the permit is applicable to their proposals) and bespoke permits (permits written specifically for activities which are unique or higher risk).

7.2.1.3 Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

The aim of the directive is for all waterbodies to achieve Good Status by 2027 (which is comprised of scoring of both Ecological and Chemical Status) and to ensure no deterioration from current status. This legislation is relevant to land quality and hydrogeology as it will assist in determining the sensitivity of water bodies in and around the Proposed Development.

7.2.1.4 Groundwater (Water Framework Directive) (England) Direction 2016

The aim of the directive is to set out instructions and obligations for the Environment Agency to protect groundwater, including monitoring and setting threshold values for both existing and new pollutants in groundwater. This legislation is relevant to land quality and hydrogeology assist will assist in determining the sensitivity of groundwater resources in and around the Proposed Development.

7.2.1.5 Water Resources Act. The Water Resources Act (1991) as amended by the Water Act (2003)

The Act provides the definition of and regulatory controls for the protection of water resources including the quality standard expected for controlled waters. This legislation is relevant to land quality and hydrogeology as it will assist in determining the sensitivity of controlled waters in and around the Proposed Development.

7.2.1.6 Environment Act 1995

The Act established the Environment Agency and gave it responsibility for environmental protection of controlled waters. This legislation is applicable to land quality and hydrogeology as it will help assess the sensitivity and potential effects associated with the construction and operation of the Proposed Development. It will also aid in the identification of suitable mitigation measures to provide protection of the controlled waters present.

7.2.1.7 Environmental Damage (Prevention and Remediation) (England Regulations (2015)

The regulations transpose into domestic law the EU Directive 2004/35/EC on environmental liability with regards to the prevention and remedying of environmental damage. The legislation is applicable to land quality and hydrogeology as it will aid in the identification of suitable preventative measures and mitigation techniques for the construction and operation of the Proposed Development.

7.2.1.8 Construction (Design and Management) Regulations 2015

The regulations are the main set of regulations used to manage the health, safety and welfare of construction projects. The legislation is applicable to land quality and hydrogeology as it ensures the safety of human receptors involved in the construction phase of the Proposed Development.

7.2.2 Planning Policy and Guidance

7.2.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, updated 2021 – now called the 'Department for Levelling Up, Housing and Communities') provides guidance to planning authorities on how to assess planning applications. Sections relevant to land quality and hydrogeology are summarised in **Table 7-1** below.

Table 7-1: National Planning Policy Framework guidance relevant to land quality and hydrogeology

NPPF Requirement	NPPF Reference	Section Reference
Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives): a) **an economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure; b) **a social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and c) **an environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.	NPPF2-8	Mineral resources and reuse of soils and achieving sustainable development is discussed in **Section 7.5.8.5**. Impacts and mitigation measures with respect to Sterilisation of future mineral resources are discussed in **Section 7.6.4.**
Plans and decisions should apply a presumption in favour of sustainable development. For **plan-making** this means that: a) all plans should promote a sustainable pattern of development that seeks to: meet the development needs of their area; align growth and infrastructure; improve the environment; mitigate climate change (including by making effective use of land in urban areas) and adapt to its effects; b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas, unless: i. the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area; or ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole. For decision-taking this means: c) approving development proposals that accord with an up-to-date development plan without delay; or d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless: i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.	NPPF2-11	Climate change mitigation and sustainability is discussed in **Section 7.5.8**.
Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.	NPPF11-119	Promotion of effective use of land in the context of previously developed land is discussed in **Section 7.5.8** Climate change, sustainability and natural settings.

NPPF Requirement	NPPF Reference	Section Reference
Planning policies and decisions should: … (c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;…	NPPF11-120 item (c)	Impacts with respect to potentially contaminated land and mitigation is discussed in **Sections 7.6** and **7.7** for construction and operation.
Planning policies and decisions should contribute to and enhance the natural local environment by: protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.	NPPF15-174	Existing environment in relation to sensitive sites is discussed in **Section 7.5.4**.
Planning policies and decisions should ensure that: • a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation); • after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and • adequate site investigation information, prepared by a competent person, is available to inform these assessments.	NPFF15-183	Existing ground conditions and potential sources of contamination are discussed within **Section 7.5**. Impacts and mitigation measures are discussed in **Sections 7.6** and **7.7**.
Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and / or landowner. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.	NPFF15-184 and NPPF15-185	Existing ground conditions and potential sources of contamination are discussed within **Section 7.5**. Impacts and mitigation measures aimed at minimising the potential impacts are discussed in **Sections 7.6** and **7.7**.
The focus of planning policies and decisions should be whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.	NPPF15-188	Existing ground conditions and potential sources of contamination are discussed within **Section 7.5**. Impacts and mitigation measures aimed at minimising the potential impacts are discussed in **Sections 7.6** and **7.7**.

NPPF Requirement	NPPF Reference	Section Reference
It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation. Planning policies should: • safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked); • set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place.	NPPF17-209 and NPFF17-210	Mineral consultation areas are discussed within **Section 7.5.5**. Potential impacts and mitigation measures are discussed in **Sections 7.6** and **7.7**.

7.2.2.2 Land Contamination Risk Management Framework 2021

The Environment Agency EA Land Contamination Risk Management Framework (2021) provides an update to the former Environment Agency Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11). The updated guidance aims to help those assessing potentially contaminated sites to identify and assess the risks posed to sensitive receptors, make appropriate decisions in relation to the outcome of the assessment and identify the required actions necessary e.g. implementation of remediation.

7.2.2.3 Guiding Principles for Contaminated Land

The Guiding Principles for Contaminated Land comprise three documents produced by the Environment Agency. The documents include GPCL 1 –Guiding principles for land contamination introduction, GPCL 2 –FAQs, technical information, detailed advice and references, and GPCL 3 –reporting checklist. The aims of these documents are to provide guidance to those who are involved with contaminated land, encourage good practice, promote compliance with regulatory requirements and to provide reference to applicable guidance.

7.2.2.4 The Environment Agency's Approach to Groundwater Protection Position Statements 2018

These position statements provide information relating to the Environment Agency's approach to managing and protecting groundwater. They detail how the Environment Agency delivers government policy for groundwater and adopts a risk-based approach where legislation allows. The primary aim of all of the position statements is the prevention of pollution of groundwater and protection of it as a resource.

7.2.2.5 Minerals Policy Statement 1: Planning and Minerals (MPS1)

The Minerals Policy Statement 1 (MPS1) aims to secure adequate and steady supplies of the minerals needed by society and the economy. Although this publication has been withdrawn, it is still deemed a relevant piece of guidance in the context of this assessment in the absence of any replacement guidance .

7.2.3 Local Plan

7.2.3.1 Chichester Local Plan, July 2015

Policy 49: Biodiversity states that "*Planning permission will be granted for development where it can be* ***demonstrated that all the following criteria have been met:***

1. *The biodiversity value of the site is safeguarded;*
2. *Demonstrable harm to habitats or species which are protected or which are of importance to biodiversity is avoided or mitigated;*
3. *The proposal has incorporated features that enhance biodiversity as part of good design and sustainable development;*
4. *The proposal protects, manages and enhances the District's network of ecology, biodiversity and geological sites, including the international, national and local designated sites (statutory and non-statutory), priority habitats, wildlife corridors and stepping stones that connect them;*
5. *Any individual or cumulative adverse impacts on sites are avoided;*
6. *The benefits of development outweigh any adverse impact on the biodiversity on the site. Exceptions will only be made where no reasonable alternatives are available; and planning conditions and/or planning obligations may be imposed to mitigate or compensate for the harmful effects of the development."*

Policy 55: Equestrian Development states that "*Planning permission for horse related development will be granted where it can be* ***demonstrated that all the following criteria have been considered*****:**

1. *There is adequate land for the number of horses kept;*
2. *Existing buildings are reused where possible but where new buildings are necessary, these are well-related to existing buildings, appropriate to the number of horses to be kept and the amount of land available;*
3. *There is minimal visual impact on the landscape caused by the proposed development either individually or cumulatively;*
4. *It does not result in the irreversible loss of the best and most versatile agricultural land;*
5. *There is an agreed comprehensive scheme of management for any ancillary development including lighting, storage, waste disposal, manèges and sub division of fields;*
6. *The proposal, either on its own or cumulatively, with other horse related uses in the area, is compatible with its surroundings, and adequately protects water courses, groundwater and the safety of all road users;*
7. *The proposal does not lead to the need for additional housing on site; and*
8. *The proposal is well related to or has improved links to the existing bridleway network, with no impact on the bridleway capacity to accommodate the growth."*

7.2.3.2 West Sussex Joint Minerals Plan, July 2018 (Partial Review March 2021)

Policy M9: Safeguarding Minerals of the West Sussex Joint Minerals Plan states:

"*(b) soft sand (including silica sand), sharp sand and gravel, brick making clay, building stone resources, and chalk reserves are safeguarded against sterilisation. Proposals for non-mineral development within MSAs […] will not be permitted unless:*

I. *Mineral sterilisation will not occur; or*
II. *It is appropriate and practicable to extract the mineral prior to the development taking place, having regards for the other policies in this Plan; or*

III. *The overriding need for the development outweighs the safeguarding of the mineral and it has been demonstrated that prior extraction is not practicable of environmentally feasible".*

7.3 Consultation

Consultation in relation to land quality and hydrogeology has not been undertaken.

7.4 Assessment Methodology

Chapter 5, Approach to EIA provides a summary of the general impact assessment methodology applied to the Proposed Development. The following sections confirm the methodology used to assess the potential impacts on land quality and hydrogeology.

7.4.1 Definitions of Sensitivity and Magnitude

For each effect, the assessment identifies receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions of sensitivity and magnitude for the purpose of the land quality and hydrogeology assessment are provided in **Table 7-2** and **Table 7-3** below.

7.4.1.1 Sensitivity

Receptor sensitivity has been defined with reference to the adaptability, tolerance, recoverability and value of individual receptors. **Table 7-2** provides an example of the likely criteria for appraisal of sensitivity for identified land quality and hydrogeology receptors based on professional judgement.

Receptor sensitivity considers, for example, whether the receptor:

- Is rare;
- Has protected or threatened status;
- Has importance at a local, regional or national scale; or,
- Has a key role in ecosystem function (in the case of biological receptors).

Generic receptor sensitivity examples based on the above criteria are presented below in **Table 7-2.**

Table 7-2: Receptor sensitivity criteria

Sensitivity	Examples
High - has very limited or no capacity to accommodate physical or chemical changes.	**General** • Receptor is internationally or nationally important / rare with limited potential for offsetting / compensation.
	Land quality – human health • Construction workers involved in below ground construction works / ground breaking activities; • Public and local residents / children (on and off-site within 50m); and, • Future end users (residential or allotment end use).
	Land quality – controlled waters and ecology • Groundwater source protection zones (SPZ) 1; • Public water supplies/ licensed surface water and groundwater abstractions for potable use; • Private water supplies for potable use (on and off-site within 50m); • Supports habitats or species that are highly sensitive to change in surface hydrology or water quality; and, • Surface and groundwaters supporting internationally designated sites (e.g. Site of Special Scientific Interest (SSSI), Ramsar sites).

Sensitivity	Examples
	Land quality – geological sites and mineral resources • Mineral Safeguarding Area – nationally important resource; and, • Designated geological sites of international importance.
	Built environment • Sites of international importance, World Heritage Sites and Scheduled Monuments.
	Property • Rare breeds of livestock ,horses and other domesticated animals of high commercial value.
Medium - has limited capacity to accommodate physical or chemical changes.	**General** • Receptor is regionally important / rare with limited potential for offsetting / compensation.
	Land quality – human health • Future end users (commercial / industrial end use/open space/ farmers and workers on agricultural land); • Public and local residents / children (off-site at distances >50m but <250m); • Commercial / industrial workers (off-site within 50m); and, • Construction workers (above ground).
	Land quality – controlled waters and ecology • Groundwater SPZ 2 and SPZ 3; • Principal Aquifers; • Secondary A and B Aquifers with private potable groundwater abstractions; • Private water supplies for potable groundwater abstraction (off site within 250m) and, • Surface and groundwaters supporting nationally designated sites (SSSI).
	Land quality – geological sites and mineral resources • Mineral Safeguarding Areas – regionally important resource; and, • Designated geological site of national importance e.g. SSSIs.
	Built environment • Commercial or residential buildings.
	Property • Important breeds of livestock, horses and other domesticated animals of moderate commercial value.
Low - has moderate capacity to accommodate physical or chemical changes.	**General** • Receptor is locally important / rare.
	Land quality – human health • Future end users (transport end use such as car parks or highways); • Public and local residents / children (off-site >250m); and, • Commercial / industrial workers (off-site at distances >50m but <250m).
	Land quality – controlled waters and ecology • Secondary A and B Aquifers without groundwater abstractions; and, • Groundwater or surface waters supporting locally important sites (e.g. Local Nature Reserve LNR)).
	Land quality – geological sites and mineral resources • Adjacent to a Mineral Safeguarding Area; and, • Low economically viable mineral resource.
	Built environment • Car parks, highways, transport infrastructure and utilities.
	Property

Sensitivity	Examples
	• Common breeds of livestock, horses and other domesticated animals of low commercial value.
Negligible - is generally tolerant of physical or chemical changes.	**General** • Receptor is not considered to be particularly important / rare.
	Land Quality – Human Health • Commercial / industrial workers (off-site >250m).
	Land Quality – Controlled Waters • Unproductive strata; and, • Supports or contributes to habitats that are not sensitive to changes in surface hydrology or water quality.
	Land quality – geological sites and mineral resources • No economically viable minerals.
	Built environment • Locally important roads and footpaths.
	Property • Common breeds of livestock, horses and other domesticated animals of minimal commercial value.

7.4.1.2 Magnitude of effect

Potential effects may be adverse, beneficial or neutral. The magnitude of an effect is assessed qualitatively, according to the criteria set out in **Table 7-3**. The following definitions apply to the time periods used in the magnitude assessment:

- Long-term: >5 years;
- Medium-term: 1 to 5 years; and,
- Short-term: <1 year.

For effects related to human health, magnitude reflects the likely increase or decrease in exposure risk for a receptor. For controlled waters, magnitude represents the likely effect that an activity would have on resource availability or value, at the receptor. Magnitude is therefore affected by the distance and connectivity between an impact source and the receptor.

Table 7-3: Definition of magnitude levels for land quality and hydrogeology

Magnitude	Definition
High - permanent or large-scale change affecting usability, risk or, value over a wide area, or certain to affect regulatory compliance.	**Land quality – human health** • Permanent or major change to existing risk exposure (adverse / beneficial); • Unacceptable risks/ severe harm to one of more receptors with a long-term or permanent effect (adverse); or • Remediation and complete source removal (beneficial).
	Land quality – controlled waters • Permanent, long-term or wide scale effects on water quality or availability (adverse / beneficial); • Permanent loss or long-term derogation of a water supply source resulting in prosecution (adverse); • Change in WFD water body status / potential or its ability to achieve WFD objectives in the future (adverse / beneficial); • Permanent habitat creation or complete loss (adverse / beneficial); or • Measurable habitat change that is sustainable / recoverable over the long-term (adverse / beneficial).
	Land quality - geological sites and mineral resources

Magnitude	Definition
	• Complete loss of designated sites; or • Complete sterilisation of mineral resource.
	Built environment • Catastrophic damage to buildings or structures.
	Property • Complete loss of livestock, horses and/or other domesticated animals.
Medium - Reversible change affecting usability, value, or risk, over the medium-term or local area: possibly affecting regulatory compliance.	**Land quality – human health** • Medium-term or moderate change to existing risk of exposure (adverse / beneficial); • Unacceptable risks to one or more of the receptors with a medium-term effect (adverse); or • Serious concerns or opposition from Statutory Consultees (adverse).
	Land quality – controlled waters • Medium-term or local scale effects on water quality or availability (adverse / beneficial); • Medium-term derogation of a water supply source, possibly resulting in prosecution (adverse); • Observable habitat change that is sustainable / recoverable over the medium-term (adverse / beneficial); or • Temporary change in status / potential of a WFD water body or its ability to meet objectives (adverse / beneficial).
	Land quality - geological sites and mineral resources • Partial loss of the designated geological sites; or • Medium-term or local scale loss of mineral resources.
	Built environment • Damage to buildings or structures.
	Property • Partial loss of livestock, horses and/or other domesticated animals.
Low - temporary change affecting usability, risk or value over the short-term or within the study area; measurable permanent change with minimal effect, usability, risk or value; no effect on regulatory compliance.	**Land quality – human health** • Short-term temporary or minor change to existing risk exposure (adverse / beneficial); or • Unacceptable risks to one or more receptors with a short-term effect (adverse).
	Land quality – controlled waters • Short-term or very localised effects on water quality or availability (adverse / beneficial); • Short-term derogation of a water supply source (adverse); • Measurable permanent effects on a water supply source that do not impact on its operations (adverse); • Observable habitat change that is sustainable / recoverable over the short-term (adverse / beneficial); or • No change in status / potential of a WFD water body or its ability to meet objectives (neutral).
	Land quality - geological sites and mineral resources • Temporary change in status of designated geological sites; or • Short-term or very localised effects on mineral resources.
	Built environment • Easily repairable damage to buildings or structures.
	Property • Minor impact on livestock and other domesticated animals.
	Land quality – human health

Magnitude	Definition
Negligible - minor permanent or temporary change, indiscernible over the medium to long-term. Short-term, with no effect on usability.	• Negligible change to existing risk of exposure; or • Activity is unlikely to result in unacceptable risks to receptors (neutral).
	Land quality – controlled waters • Very minor or intermittent impact on local water quality or availability (adverse / beneficial); • Usability of a water supply source will be unaffected (neutral); • Very slight local changes that have no observable impact on dependent receptors (neutral); or • No change in status / potential of a WFD water body or its ability to meet objectives (neutral).
	Land quality - geological sites and mineral resources • No change in status of designated geological site; or • Very minor impact on mineral resources.
	Built environment • Very slight non-structural damage or cosmetic harm to buildings or structures.
	Property • Negligible impact to livestock and other domesticated animals.

7.4.1.3 Impact Significance

In basic terms, the potential significance of an impact is a function of the sensitivity of the receptor and the magnitude of the effect see **Chapter 5**, Approach to EIA for further details.

7.5 Baseline Environment

The baseline environment for land quality and hydrogeology has been informed by the Land at Crouchlands Farm, Land Quality Desk Study and Preliminary Risk Assessment report (**Appendix 7.1**).

7.5.1 Geology

Information on the geological conditions has been collated from British Geological Survey (BGS) datasets, including 1: 50,000 scale geological mapping. The anticipated geological sequence is outlined in **Table 7-4** below.

Table 7-4: Geology within the Proposed Development

Stratum	Unit	Description
Bedrock	Weald Clay Formation	Dark grey thinly-bedded mudstones (shales) and mudstones with subordinate siltstone, fine to medium -grained sandstones, including calcareous sandstone, shelly limestones and clay ironstones predominantly of non-marine facies.

BGS mapping indicates an absence of artificial ground/Made Ground and superficial deposits across the Proposed Development and the surrounding area. Localised Made Ground is known to be present within areas associated with historical developments and land raising within the Proposed Development.

7.5.2 Hydrogeology

The Weald Clay Formation is classified by the Environment Agency as both a Secondary A Aquifer and unproductive strata.

Secondary A Aquifers are defined as permeable strata capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Unproductive strata comprise rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The unproductive strata are likely to be associated with lower permeability mudstone and siltstone layers within the Weald Clay Formation.

Areas designated as a Secondary A aquifer are only present within the south western corner of the Proposed Development, with the remaining areas classified as unproductive strata.

Information presented on the BGS hydrogeological map indicates that the Weald Clay is of little hydrogeological significance, but many domestic and farm wells exploit localised sources. Wells located within the sandstones and limestone beds within the formation often yield well initially but decrease rapidly due to the slow rate of recharge.

BGS information also indicates that there is limited potential for groundwater flooding to occur within the Weald Clay Formation.

The Environment Agency has assigned a high groundwater vulnerability risk to the Secondary A Aquifer. A high groundwater vulnerability designation indicates that the soil is easily able to transmit pollution to groundwater, which is characterised by high leaching potential in soils and an absence of low permeability superficial deposits.

There are no recorded groundwater abstractions located on or within 1km of the Proposed Development. It should however be noted that the data search within the PRA did not included identification of unlicensed water supplies abstracting less than 20m^3 of water per day (below 20m^3 per a day does not require a licence provided the abstraction is part of a single operation). It is therefore possible that smaller unlicensed groundwater supplies are present.

The Proposed Development is not located within a SPZ, or within 1km of one.

7.5.3 Hydrology and Surface Drainage

Ordnance Survey (OS) Water Network Data indicates that there are 12 records of water bodies located within the Proposed Development. Eight of the water bodies are recorded as rivers present at the surface and four as rivers underground. The water bodies are reported to vary in length from 5m to 194m with some recorded as drains and inland rivers.

A number of the on-site surface water features appear to be drainage channels, some of which drain into tributaries of the Boxal Brook (located approximately 850m to the south) and the River Kird (approximately 2.5km to the south west).

The OS Water Network Data also indicates that there are a total of 25 water bodies within 250m of the Proposed Development, this includes 18 inland rivers at the ground surface and seven underground rivers. The water bodies, which are not named in the information reviewed, vary in length from 3.8m to 194m. The closest inland river is recorded 1m south of the Proposed Development and is 90m in length. There are no lakes recorded within 250m of the Proposed Development.

Part of the Proposed Development area was previously occupied by an AD Facility which is understood to have been operational until 2017 (Planning Enforcement Report, Chichester District Council, 2018). There were three digestate lagoons associated with the AD Facility. Two of the digestate lagoons (Lagoons 2 and 4) are located within the redline planning boundary. Lagoon 3 is located to the immediate southwest. Lagoon 1, which is not associated with the former AD Facility, is located to the immediate west.

7.5.4 Sensitive Land Use

Sensitive land use sites are considered, by statutory agencies, to be of special importance due to their intrinsic qualities which are unique to those areas. There are no recorded sensitive sites located on or within 250m of the Proposed Development. There are, however, multiple areas of ancient woodland recorded both on and within 250m of the Proposed Development. Potential impacts to the ecology within and around the Proposed Development is discussed in **Chapter 10**, Nature Conservation and Biodiversity.

The Proposed Development is located within the River Arun (U/S Pallingham) Nitrate Vulnerable Zone.

7.5.5 Mineral Safeguarding and Consultation Areas

The land within the Proposed Development is underlain by clays associated with the Weald Clay Formation and falls within an area identified by West Sussex Council as a Mineral Safeguarding Area (MSA) and a Mineral Consultation Area (MCA). The resources present within the MSA includes brick clay, located within the MCA are oil and gas resources. Further details regarding the MSA and MCA are provided in **Appendix 7.2**.

An assessment of BGS recorded mineral sites identified four records of ceased mineral extraction sites within the Proposed Development (limestone extraction). Additional ceased mineral extraction sites for limestone are located within 250m.

7.5.6 Human Health

The required elements of the Proposed Development comprise those discussed in **Chapter 3**, The Proposed Development.

During construction, the critical human health receptors would be those involved in construction activities, adjacent off-site residents, nearby workers (e.g. agricultural workers) and visitors (e.g. those using Public Rights of Way). During the operational phase of the Proposed Development, the human receptors will be site visitors / workers and maintenance workers.

7.5.7 Historical Setting

The research undertaken to inform the PRA (**Appendix 7.1**) indicates the Proposed Development has comprised agricultural land and woodland since the earliest available OS map (1874). In the 2000s, Lagoons 2 and 4 and an AD Facility were recorded within the Proposed Development boundary. Information provided by the Client suggests the AD Facility ceased operation in 2017.

The area surrounding the Proposed Development has also largely been recorded as agricultural land and woodland since the earliest available mapping (1874). No significant changes were noted for the surrounding area until the mid-1970s when irrigation reservoirs and a pumphouse were recorded at distances up to 250m from the eastern boundary. In the 2000s, at a similar time to the creation of Lagoons 2 and 4, Lagoons 1 and 3 were constructed to the immediate west and south west of the Proposed Development, with Lagoon 3 utilised as part of the AD Facility operations.

A summary of the historical features that may give rise to potential sources of contamination is provided in **Table 7-5**.

Table 7-5: Potential sources of contamination

Potential Source	Potential Contaminants of Concern
Onsite	
Ground contamination associated with the use of site as a farm	A number of tanks have been recorded within the main farm area. It is not uncommon for tanks to be located on farms for the purpose of on-site storage of either heating oil or diesel. A number of modern fuel tanks were observed during a site walk over and it is likely that these would have replaced older tanks. Ground contamination associated with spillages or leakages from fuel tanks include polyaromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) and metals.
	Ground contamination may also be associated with potentially hazardous materials in discarded waste materials. During a site walkover mounds of Made Ground soils and waste materials were observed. Potential contaminants include, but are not limited to, asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, volatile and semi-volatile organic compounds (VOCs and SVOCs), inorganic and organic contaminants, herbicides, pesticides and polychlorinated biphenyls (PCBs).
	A pile of roof tiles potentially containing asbestos was observed within one of the barns located in the Main Farm Area during a site walkover. It is possible that asbestos roofing or pipe lagging was used in other areas of the farm. Asbestos rooftiles/ lagging can become broken and damaged over time and deposit asbestos fibres into the surrounding area creating a halo of asbestos fibres around the structures on which it was used.
	Herbicides and pesticides may also be stored on site. Nitrogen, ammonia and other organic nutrients associated with manure and slurry storage. Manure is also a potential source of methane.
Made Ground associated with infilled mineral extraction pits, infilled ponds, road construction and any areas of land raising that may have occurred.	Potential contaminants include, but are not limited to, asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, herbicides, PCBs and ground gases.
Lagoon 2 and Anaerobic Digestor	The contaminants of concern are largely dependent on the types of materials received at the site for digestion. Lagoon 1 has undergone drainage and has been infilled, it is noted that this lagoon was not used as part of the anaerobic digestion operations that were undertaken on the site. The infilling of Lagoon 2 has been undertaken recently. The Client has advised that Lagoon 4 contains rainwater.
'Rainbow Field'	Anecdotal evidence from the Client indicates that Rainbow Field was formerly used for the storage of household and farm wastes and materials. The field now contains a mound of Made Ground soils. The contaminants of concern associated with the Rainbow Field area are dependent on the materials stored and deposited within the area. Potential contaminants include, but are not limited to, asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, herbicides and PCBs.
Glassworks and kiln	The contaminants of concern are likely to localised to discreet areas within this historical feature and become overgrown with plants since the sites were operational in the 1600s. There is the potential for ashy ground to be present associated with the production of glass to still be present; PAHs associated with combustion and ash and metals associated with colouring glass.
Offsite	
Limestone pits (backfilled)	Asbestos, metals and metalloids, PAHs, fuel and oil hydrocarbons, VOCs and SVOCs, inorganic and organic contaminants, PCBs and ground gas.
Pump house	
Lagoon 3	The contaminants of concern depends on the types of materials received for digestion. At that time of writing the contents of the lagoon are not known, however previous assessments by local authorities and the Environment Agency suggest that the material is chemically unstable and is hazardous in nature. Evidence of ground gas generation has been observed during a site walkover (November 2020). Approximately 53,000 m^3 of material is thought to be present in the lagoon. Lagoon 3 is discussed further in Section 7.5.6

7.5.8 Climate change, sustainability and natural settings

7.5.8.1 Geology

No major changes to the underlying geology in relation to climate change and natural trends are anticipated to occur over the lifetime of the Proposed Development.

7.5.8.2 Hydrogeology

There is increased regulation of agricultural chemicals and catchment wide initiatives to reduce pressures on groundwater to achieve compliance with the Water Framework Directive (WFD). Therefore, baseline groundwater quality is likely to improve over time through the natural breakdown of chemicals that may currently be present in groundwater bodies.

7.5.8.3 Hydrology and Surface Drainage

Climate change is expected to result in wetter winters, drier summers and a greater number of convectional rainstorms. This means that the hydrology of the surface drainage network could change, with higher winter flows, lower summer flows and a greater number of storm-related flood flows. The risk of flooding will also be amplified as a result of the predicted increase in rainfall associated with climate change, with an increase in peak river flows and an increase in the magnitude of surface water flooding.

7.5.8.4 Possible Sources of Contamination

Climate change is expected to result in wetter winters and drier summers, which has the potential to mobilise pre-existing sources of contamination either through increased rates of infiltration due to heavier rainfalls or dust generation through drier summers. These changes have the potential to increase the exposure risks of receptors to pre-existing sources. Natural degradation of contaminants over time may result in a general improvement in ground conditions.

7.5.8.5 Mineral resources and reuse of soils

Climate change and natural trends are not anticipated to impact mineral resources present within the Proposed Development.

Adoption of a Contaminated Land Applications in Real Environments (CL:AIRE) Industry Definition of Waste Code of Practice (DoW CoP) could enable sustainable and cost-effective reuse and deposit of excavated soils on site. This would aid in maximising sustainability and provide an audit trial to demonstrate the appropriate use of materials. A Materials Management Plan (MMP) would be drafted in advance of any construction works, this would enable reuse of naturally occurring soil materials and reuse of both contaminated and uncontaminated materials.

7.6 Potential Impacts During Construction

7.6.1 Impact 1: Exposure of workforce, land owners, land users and neighbouring land users[1] to contaminated soils and groundwater and associated health impacts

The proposed earthworks as well as the movement and stockpiling of soils has the potential to mobilise pre-existing ground contamination. This could result in impacts to human health through dermal contact, inhalation and ingestion of contaminant.

[1] *Both land users and neighbouring land users comprise member of the public and local residents using public rights of way that are present within the Proposed Development and surrounding areas.*

A PRA (**Appendix 7.1**) has been undertaken for the Proposed Development to identify plausible linkages as a result of the potential presence of contaminants within soils and groundwater. The PRA identified areas associated with the historical use of the site as having the potential for contamination to be present (see **Table 7-5**).

The potential contaminants of concern (PCOC) that may be present within the Proposed Development could represent an unacceptable risk to construction workers, land owners, land users and neighbouring land users if exposed to the contaminants during construction works. Construction works, particularly earthworks, may disturb and expose construction workers and other site users to potential soil and groundwater contaminants associated with the historical uses. Construction works could create pollutant linkages through ingestion, inhalation and direct dermal contact pathways.

In the event of exposing soils and stockpiling construction waste (including excavated soils), dust could be generated during dry and windy conditions. Under these conditions, construction workers, land owners, users and neighbouring land users could temporarily be exposed to contamination via inhaling potentially contaminated dusts.

Additionally, the risks associated with soil contamination sources to human health could be altered by changes in migration pathways due to construction activities. A specific risk of concern is ground gases associated with areas of Made Ground. Construction activities have the potential to create preferential pathways for any gases to migrate and accumulate within the proposed infrastructure. The potential risk from ground gas could represent a risk to human health through asphyxiation and explosion.

Construction workers are considered to the most sensitive receptors as the activities they engage in constitute more direct exposure routes over longer periods of time.

7.6.1.1 Receptor Sensitivity

The sensitivity of construction workers, land owners, land users and neighbouring land users is considered to be **high**.

7.6.1.2 Magnitude of Effect

Impacts associated with construction activities (excavation works) on the health of construction workers, land owners, land users and neighbouring land users are predicted to be of local spatial extent (localised to work areas), of short-term duration (occurring during construction works only), of intermittent occurrence and high reversibility. The magnitude of effect is therefore considered to be **low**.

With regards to the potential risks posed to construction workers from the migration of ground gases, the magnitude of effect is considered to be **high**. This due to the potential for both acute and chronic health impacts. The magnitude of effect, however, is subject to the plausibility of a ground gas source and receptor contaminant linkage.

7.6.1.3 Impact Significance

The potential impact on human health associated with excavation works is considered to be of **moderate adverse** significance. With regards to risks to construction workers from ground gas, the potential impact is considered to be of **major adverse** significance.

7.6.1.4 Mitigation

Targeted ground investigations may be required within the areas identified in **Table 7-5** (refer also to Figure 3 of **Appendix 7.1**). The ground investigation may include the collection of soil / groundwater samples for laboratory analysis and the installation of ground gas / groundwater monitoring wells. This would assist in characterising the site conditions, identify unacceptable risks and determine whether remediation is

required. If areas of potential concern are identified, then a remediation strategy would be developed and agreed with the relevant bodies prior to the commencement of remedial works and construction activity. The ground investigation, risk assessment and remediation would follow guidance provided within the 2021 Environment Agency Land Contamination Risk Management Framework.

The development of, and adherence to, a CEMP would also be undertaken. The CEMP will be regularly reviewed and updated post consent, prior to and during the construction period. The CEMP would be informed by the findings of pre-construction site investigation and include an assessment of the potential risks to human health and controlled waters receptors from the Proposed Development. Based on the risk assessment, appropriate working methods would be developed to avoid, minimise or mitigate impacts relating to construction. The risk mitigation strategies incorporated into the CEMP would also include use of appropriate Personal Protective Equipment (PPE), provision of welfare facilities, monitoring of works including air quality and odour and implementation of relevant good working practices applied including stockpile management and dust suppression activities to reduce the risk relating to the creation and inhalation of wind-blown dusts.

The CEMP would incorporate legislation requirements including the Construction Design Management (CDM) Regulations (2015), Health and Safety at Work Act (1974) and Control of Substances Hazardous to Health (COSHH) Regulations (2002).

In addition, a plan for dealing with unexpected contamination would be developed as part of the CEMP. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention. These have been withdrawn, but still provide a useful best practice guide in the absence of any other replacement guidance, and include:

- Environment Agency Pollution Prevention Guidance (PPG) 01 - Understanding your environmental responsibilities;
- Environment Agency PPG 05 - Works and maintenance near water;
- Environment Agency PPG 06 - Working at construction and demolition: preventing pollution guidance;
- Environment Agency PPG 08 - Safe storage and disposal of used oils; and
- Environment Agency PPG 21 - Pollution incident response planning.

The CEMP would be submitted for approval with the relevant bodies in advance of implementation. Risks to construction workers in relation to ground gas would be mitigated by the use of appropriate working methods incorporated into the CEMP and use of suitable PPE.

7.6.1.5 Residual impact

Following the implementation of the measures identified above, the magnitude of effect would be reduced to **negligible**, and therefore represent a **minor adverse** significance for both construction workers and other human health receptors.

7.6.2 Impact 2: Direct impacts on groundwater quality and groundwater resources

Direct impacts to the Secondary A Aquifer associated with the more permeable areas of the Weald Clay Formation in the south western corner of the Proposed Development may occur due to the intrusive nature of earthworks. The significance of disturbance will be dependent on the depth of groundwater within the aquifer unit in relation to the proposed depth of earthworks.

During construction, surface layers will be excavated (e.g. as part of topsoil stripping and service installation), which could allow increased infiltration of rainwater and surface run-off to the subsurface. This could potentially mobilise any residual contamination already present within the overlying strata (including localised areas of Made Ground), which could potentially migrate into the underlying Secondary A Aquifer. Migration of contaminants into the Secondary A Aquifer has the potential to impact groundwater quality and any potentially unlicensed private groundwater abstractions.

If required, dewatering of perched water or groundwater within excavations could also affect groundwater flow and water quality, resulting in potential short term impacts to base flow of local watercourses or impact on groundwater abstractions (if present).

In addition, during construction there is the potential for the accidental release of contaminants from construction machinery. This can occur as a result of spillages, leakage or storage. These can enter into the ground and subsequently into groundwater impacting groundwater quality and associated groundwater abstractions (if present).

7.6.2.1 Receptor Sensitivity

The Proposed Development is partly underlain by a Secondary A Aquifer in the south western corner with no recorded groundwater abstractions or SPZs located on or within 1km of the Proposed Development. Therefore, the sensitivity of groundwater underlying the Proposed Development is considered to of **low** sensitivity.

7.6.2.2 Magnitude of Effect

Should there be any changes to infiltration rates, surface runoff or dewatering during construction works that may directly impact the Secondary A Aquifer, then the impacts are predicted to be of local spatial extent, of short-term duration and high reversibility (occurring during the works only). The magnitude of effect is therefore considered to be **low**.

7.6.2.3 Impact Significance

The overall significance on groundwater quality and resources is considered to be of **minor adverse** significance.

7.6.2.4 Mitigation

Although the overall impact significance is considered to be minor adverse, the mitigation measures discussed in **Section 7.6.1** would be implemented prior to and during construction. Should contamination be encountered that is considered to pose an unacceptable risk to groundwater, a remediation strategy proportionate to the level of risk would be developed and agreed with the relevant bodies. Once agreed, any required remediation works, which will be dependent on the type and level of contamination encountered would be undertaken.

In addition, the CEMP would also include specific measures relevant to the storage of fuels, oils, lubricants, waste water and other chemicals during construction works. This will include:

- Storing all fuels, oils, lubricants, waste water and other chemicals in impermeable bunds with at least 110% of the stored capacity, with any damaged containers being removed from site.
- Refuelling would take place in a dedicated impermeable area, using a bunded bowser.
- Biodegradable oils to be used where possible.
- Ensuring that spill kits are available on site at all times as well as sand bags and stop logs for deployment in case of emergency spillages.

7.6.2.5 Residual Impact

By incorporating the measures discussed above, the magnitude of effect would be reduced to **negligible**, which would result in an overall significance of **negligible.**

7.6.3 Impact 3: Impacts on surface water quality and the ecological habitats they support from contamination

A number of surface water features are located on and within 250m of the Proposed Development. As described in **Table 7-5**, potential sources of contamination have been identified within the Proposed Development area. Construction works have the potential to disturb pre-existing contamination which could migrate and be released into surface water bodies via the following pathways:

- Mobilisation and migration of free phase hydrocarbons, soil contaminants or dissolved phase contaminants in groundwater due to construction activities which may subsequently discharge into surface waters.
- Surface water runoff from contaminated Made Ground soils brought to surface during construction.
- Runoff from stockpiles of potentially contaminated soils.
- Migration of soil of groundwater contaminants into surface water drains during construction activities which may discharge into surface water bodies.
- Accidental spillage whilst handling, storing or treating contaminated water, fuels or other chemicals during construction.
- Changes to the hydraulic regime due to, for example, backfilling areas of excavation with less compacted/more porous materials that could potentially create preferential flow paths into surface water bodies.

7.6.3.1 Receptor Sensitivity

Any migration and discharge of contamination into surface waters could lead to a reduction in surface water quality and impact on the ecological habitats they support. As there are no designated sites located on or within 250m of the Proposed Development, the sensitivity of surface waters is considered to be **low**.

Additional impacts relating to surface water quality and ecological habitats are provided in **Chapter 10** Nature Conservation and Biodiversity.

7.6.3.2 Magnitude of Effect

Potential impacts to surface water quality and the ecological habitats which they support are considered to be of short-term duration and localised to those areas of the Proposed Development where construction is taking place. Therefore, the magnitude of effect is considered to be **low**.

7.6.3.3 Impact Significance

The overall impact significance to surface water quality is considered to be of **minor adverse** significance.

7.6.3.4 Mitigation

Mitigation measures discussed in **Sections 7.6.1** and **7.6.2** would also serve to prevent the migration of contamination into surface water bodies. Additional mitigation measures will also be implemented during construction previously identified as potential sources of contamination (**Table 7-5**). The measures will include collecting perched water within the Made Ground or groundwater from dewatering activities. The water will be stored prior to any treatment or discharge. This is also true of perched water/groundwater encountered in areas of unexpected contamination. The wastewater collected shall either be:

- Discharged to foul sewer under a trade effluent consent agreed with Southern Water; and/or

- Discharged to surface water under an environmental permit issued from the Environment Agency.

On site treatment plant may be required to treat the wastewater prior to disposal in order to meet discharge limits set by either the Environment Agency or Southern Water.

7.6.3.5 Residual Impact

Following the adoption of the mitigation measures described above, and in previous sections, the risk to surface water bodies would be reduced to a **negligible** magnitude of effect. This would therefore reduce the impact significance to **negligible**.

7.6.4 Impact 4: Sterilisation of Future Mineral Resources

As described in **Section 7.5.5**, the Proposed Development is located within a MSA for brick clay as well as a MCA for oil and gas. Further details regarding the MSA and its setting are provided in **Appendix 7.2**. Construction activities within the Proposed Development would prevent the extraction of brick clay and may impede oil and gas exploration.

7.6.4.1 Receptor Sensitivity

MSAs (and MCAs) are considered to be of regional importance. Therefore, the sensitivity of the mineral resources present within the Proposed Development is considered to be **medium**.

7.6.4.2 Magnitude of Effect

The potential impacts associated with sterilising part of the MSA (and MCA) located within the Proposed Development would be effective during the lifetime of the Proposed Development and so are considered to be long-term effects. The Qualitative Mineral Resource Risk Assessment for the Proposed Development (**Appendix 7.2**) states that as there is sufficient reserve for 45 years for the existing quarries, the proximity of the site to designated ecological sites and Listed Buildings and the nature of the Proposed Development itself would have a bearing on whether or not clay reserves could be defined, and therefore whether mineral sterilisation will actually occur. In addition, it states that it is unlikely that significant prior extraction on the site would be appropriate and practicable.

Therefore, the magnitude of effect is considered to be **low**.

7.6.4.3 Impact Significance

The overall impact significance to the mineral consultation area is considered to be of **minor adverse** significance.

7.6.4.4 Mitigation

The Qualitative Mineral Resource Risk Assessment for the Proposed Development (**Appendix 7.2**) advises that significant prior extraction on the site is unlikely to be appropriate and practicable. In addition, the area of the MSA (and MCA) present within the county that would be sterilised as a result of construction works is considered to be relatively small. It is considered unlikely that the Proposed Development would significantly impact resource availability. Therefore no further mitigation is recommended.

7.6.4.5 Residual Impact

As it is considered unnecessary to adopt mitigation measures due to the relatively small area that would be sterilised, and any prior extraction is not considered to be appropriate or practicable, the residual impact remains **minor adverse**.

7.6.5 Impact 5: Built environment

The construction phase of the Proposed Development has the potential to impact the existing built environment. This may be through creating new preferential pathways for contaminants or gases to migrate which could lead to the degradation of utilities and concrete from aggressive attack. This could potentially compromise the integrity of buildings or utilities or result in explosions in the case of ground gases.

7.6.5.1 Receptor Sensitivity

A number of buildings associated with main farm area are currently present. Residential properties are also located within 250m (to the east). Therefore, the sensitivity of the built environment is considered to be **medium**.

7.6.5.2 Magnitude of Effect

Potential impacts to the built environment are considered to be of short-term duration, localised to those areas where construction is taking place and easily repairable. Therefore, the magnitude of effect is considered to be **low**.

7.6.5.3 Impact Significance

The overall impact significance to the built environment is considered to be of **minor adverse** significance.

7.6.5.4 Mitigation

Pre-construction site characterisation works in areas identified as potential sources of contamination may be required. This would allow for the identification of potential contamination and the risks these may present to the built environment during construction works. Should it be deemed that risks to the built environment are present, appropriate remediation works would be undertaken to mitigate the potential impacts.

7.6.5.5 Residual Impact

Following the implementation of the measures described above, the magnitude of effect is reduced to **negligible** in relation to the built environment. Therefore, the residual impact to the built environment is considered to be of **negligible adverse** significance.

7.6.6 Impact 6: Property

The proposed earthworks, as well as the movement and stockpiling of soils, has the potential to mobilise existing ground contamination. This could result in impacts to property (livestock and horses) within and neighbouring the Proposed Development area through dermal contact, inhalation and ingestion of contaminants.

As mentioned previously, a PRA (**Appendix 7.1**) has been undertaken for the Proposed Development to identify plausible linkages as a result of the potential presence of contaminants within soils and groundwater. The PRA identified areas associated with the historical use of the site as having the potential for contamination to be present (see **Table 7-5**).

The PCOC identified within the PRA that may be present which could represent an unacceptable risk to livestock and horses both within the Proposed Development area and in neighbouring farms / livery yards. Construction works, particularly earthworks, may disturb and expose the animals to potential soil and groundwater contaminants associated with the historical uses. Construction works could create pollutant linkages through ingestion, inhalation and direct dermal contact pathways.

In the event of exposing soils and stockpiling construction waste (including excavated soils), dust could be generated during dry and windy conditions. Under these conditions, livestock and horses could temporarily be exposed to contamination via inhaling and ingesting potentially contaminated dusts.

7.6.6.1 Receptor Sensitivity

The sensitivity of property is considered to be **medium**.

7.6.6.2 Magnitude of Effect

Due to the nature of the proposed construction activities, the magnitude of effect with regards to property is considered to be **low**.

7.6.6.3 Impact Significance

The overall significance on property is considered to be of **minor adverse** significance.

7.6.6.4 Mitigation

Mitigation measures outlined in **Sections 7.6.1** and **7.6.2**would help reduce the potential for property to be impacted by construction works. Measures such as dampening down loose materials during dry periods will also aid in the prevention of potential contamination being transported via wind to areas of grazing used both within the Proposed Development and surrounding areas.

7.6.6.5 Residual Impact

Following the implementation of the mitigation measures described within this chapter, the risk to property will be reduced to a **negligible** magnitude of effect. A residual impact of **minor adverse** significance would remain following implementation of mitigation measures.

7.7 Potential Impacts During Operation

7.7.1 Impact 1: Exposure of workforce, land owners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts

During the operation of the Proposed Development, maintenance works (e.g. to services) may be required which would likely involve the excavation of inground materials. If contaminated materials are brought to the surface during maintenance works and no mitigation measures are implemented, there is the potential for these materials to remain permanently exposed at the surface. This creates the potential for maintenance workers, land owners, land users and neighbouring land users to come into direct contact with contaminated soils left in-situ via direct contact pathways.

Materials excavated during the construction of the Proposed Development are likely to be re-instated following the works. If however, a different source of material is required to backfill excavations that is not of a similar porosity as the surrounding environment (e.g. a more porous material is used), there is the potential for preferential pathways to be created which may lead to the migration of contaminants and/or ground gas. This may result in an accumulation of ground gases within buildings during its operation. Therefore, risks associated with asphyxia and explosion may be present.

7.7.1.1 Receptor Sensitivity

The sensitivity of maintenance workers, land owners, land users and neighbouring land users is considered to be **high**. The sensitivity of agricultural workers is considered to be **medium**.

7.7.1.2 Magnitude of Effect

The impacts associated with potential direct contact with contaminated soils are predicted to localised to areas where contamination may be present and where the excavation works are required. The impacts are considered to be of short-term duration, of intermittent occurrence (occurring only during maintenance works) and high reversibility. The magnitude of effect is therefore considered to be **low**.

In relation to the potential migration of contaminants and ground gas along newly created preferential pathways the magnitude of effect is considered to be **high**.

7.7.1.3 Impact Significance

Without mitigation, the potential impact significance associated with direct contact is considered to be **moderate adverse**. Potential impacts associated with ground gas migration is considered to be of **major adverse** significance.

7.7.1.4 Mitigation

As discussed in **Section 7.6.1**, should remedial works be required in areas identified as posing unacceptable risks following site characterisation works, these would be completed prior to the construction of the Proposed Development. If unexpected contamination was encountered during construction works, appropriate remediation works would also be undertaken. The remedial works, if required, undertaken prior to construction would reduce the potential for contaminated soils to be present and therefore reduce potential for impacts to occur to human health.

In addition, remediation works may also remove potential sources of gas generating materials and so reduce potential risks associated with asphyxia and explosion. By re-instating excavated materials or ensuring material with a similar porosity of the surrounding environment is used, risks associated with the creation of new preferential pathways are also reduced.

Maintenance workers that may be required to undertake ground excavations during the operation would be provided with information regarding the nature of the ground conditions. This will allow for the development of site and task specific risk assessments and method statements to be produced and implemented.

7.7.1.5 Residual Impact

With the incorporation of the measures described above, the risks to human health during the operation of the Proposed Development would be minimised as far as possible. The residual magnitude of effect is considered to be **negligible** for both direct contact and migration of ground gases. Therefore, the residual impact to human health is considered to be of **minor adverse** significance.

7.7.2 Impact 2: Impact on controlled waters (groundwater and surface waters)

Maintenance activities that may be required during the operational phase have the potential to mobilise pre-existing contamination or create new contamination through leakage or spills of fuel, oils or other chemicals from machinery, vehicles or operational equipment. This could affect water quality within the Secondary A Aquifer underlying parts of the Proposed Development as well as surface water receptors.

7.7.2.1 Receptor Sensitivity

The sensitivity of controlled waters is considered to be **low**.

7.7.2.2 Magnitude of Effect

Impacts to controlled waters during the operational phase of the Proposed Development are predicted to be localised to areas of maintenance/excavation activities where contamination may be present. The magnitude of effect is therefore considered to be **low**.

7.7.2.3 Impact Significance

The overall significance on controlled waters during operation of the Proposed Development is considered to be **minor adverse**.

7.7.2.4 Mitigation

Should ground excavations be required during the operational phase (e.g. maintenance of services), workers would be provided with information regarding the nature of ground conditions. This will aid in the development of site and task specific risk assessments and method statements that would protect controlled waters.

Fuels, oil lubricants and other chemicals required for maintenance works would be stored in an impermeable bund with at least 110% of stored capacity. Spill kits would be available on site at all times and an Emergency Response Plan (ERP) (or similar) would be developed which outlines mitigation measures to be undertaken in the event of an uncontrolled release of hazardous materials.

7.7.2.5 Residual Impact

Following the implementation of the mitigation measures described above, the magnitude of effect is reduced to **negligible**. The overall significance to controlled waters would remain **minor adverse**.

7.7.3 Impact 3: Sterilisation of future mineral resources

Future extraction of resources within the MSA and MCA would be prevented during the operational phase of the Proposed Development. The impacts are predicted to be permanent and impact the receptor directly, however, the proportion of the MSA and MCA that would be sterilised is considered to be relatively small.

7.7.3.1 Receptor Sensitivity

The sensitivity of future mineral resources is considered to be **medium**.

7.7.3.2 Magnitude of Effect

The Qualitative Mineral Resource Risk Assessment for the Proposed Development (**Appendix 7.2**) states that as there is sufficient reserve for 45 years for the existing quarries, the proximity of the site to designated ecological sites and Listed Buildings and the nature of the Proposed Development itself would have a bearing on whether or not clay reserves could be defined, and therefore whether mineral sterilisation will actually occur. In addition, it states that it is unlikely that significant prior extraction on the site would be appropriate and practicable.

Therefore, the magnitude of effect is considered to be **low**.

7.7.3.3 Impact Significance

The overall impact significance to the mineral consultation area is considered to be of **minor adverse** significance.

7.7.3.4 Mitigation

As mentioned within **Section 7.6.4**, the Qualitative Mineral Resource Risk Assessment for the Proposed Development (**Appendix 7.2**) advises that significant prior extraction on the site is unlikely to be appropriate and practicable. In addition, the area of the MSA (and MCA) present within the county that would be sterilised as a result of construction works is considered to be relatively small. It is considered unlikely that the Proposed Development would significantly impact resource availability. Therefore, no further mitigation is recommended.

7.7.3.5 Residual Impact

As it is considered unnecessary to adopt mitigation measures due to the relatively small area that would be sterilised, the residual impact remains **minor adverse**.

7.7.4 Impact 4: Built environment

Materials such as concrete used in the infrastructure have the potential to undergo degradation, such as chemical attack, from aggressive ground conditions due to the presence of acids or sulphates. This has the potential to compromise the integrity of structures.

In addition, the presence of contaminants in soils could also result in a risk of corrosion and permeation of utilities such as plastic water supply pipes.

Building built on or near sources of ground gas (e.g. Made Ground associated with infilling) could also be at risk from the accumulation of gases potentially causing explosion.

7.7.4.1 Receptor sensitivity

Due to the presence of commercial and residential buildings that will be present on and in close proximity to the Proposed Development, the sensitivity of the built environment is considered to be **medium**.

7.7.4.2 Magnitude of Effect

Due to the nature of the Proposed Development and the surrounding area, the magnitude of effect is considered to be **medium** during operation.

7.7.4.3 Impact Significance

The overall impact significance to the built environment is considered to be of **moderate adverse** significance.

7.7.4.4 Mitigation

Should unexpected sources of ground gas be identified prior to or during construction works, additional ground investigation works to those described in **Section 7.7.1** would be undertaken. This will allow for an assessment of the conditions and potential risks to be undertaken. Depending on the outcome of the assessment, mitigation measures such as the use of gas protection measures within buildings will be implemented.

Should utilities be located within areas affected by contamination, construction of clean or lined service corridors will be installed to protect human health and utilities. This would include, for example, the use of soils deemed not to contain contamination above human health generic assessment criteria or United Kingdom Water Industry Research (UKWIR) Water Supply Threshold Values.

In line with BRE Special Digest 1, materials suitable for the identified ground conditions would be used to ensure that the correct concrete type for the environment has been selected. This will mitigate against the potential for ongoing material degradation of infrastructure and utilities during the operation of the Proposed Development.

7.7.4.5 Residual Impact

Following the implementation of the mitigation measures described above, the magnitude of effect would be reduced to **low**. Therefore, the residual impact to the built environment during operation is considered to be of **minor adverse** significance.

7.7.5 Impact 5: Property

Property (livestock and horses) will be kept within the Proposed Development during operation. The animals will be both permanent residents and visiting during equestrian events. Should maintenance works be required that involves the excavation of soils, there is the potential for contaminated materials to be brought to the surface. If mitigation measures, such as dampening down of material to prevent them from becoming airborne, are not implemented direct impacts to property may occur via inhalation and ingestion of contaminated soils.

7.7.5.1 Receptor Sensitivity

The sensitivity of livestock and horses is considered to be **medium**.

7.7.5.2 Magnitude of Effect

The impacts associated with potential inhalation and ingestion of contaminated soils are predicted to localised to areas where contamination may be present and where the excavation works are required. The impacts are considered to be of short-term duration, of intermittent occurrence (occurring only during maintenance works) and high reversibility. The magnitude of effect is therefore considered to be **low**.

7.7.5.3 Impact Significance

The potential impacts to property associated with excavation works is considered to be of **minor adverse** significance.

7.7.5.4 Mitigation

Mitigation measures discussed in **Section 7.7.1** would also aid in reducing the risks to property during the operational phase

7.7.5.5 Residual Impact

Following the implementation of mitigation measures, the magnitude of effect to property would be reduced to **negligible**. The residual impact to property is considered to remain as **minor adverse** significance following implementation of mitigation measures.

7.8 Summary

This chapter has provided a characterisation of the existing environment for land quality and hydrogeology within and surrounding the Proposed Development. Impact assessments have identified that, with the exception of mineral resources, there will be some minor adverse impacts on receptors associated with land quality and hydrogeology during the construction and operational phase.

The assessment has established that the receptors relating to land quality and hydrogeology could be affected as a result of direct disturbance and mobilisation of existing contamination. The receptors may also be affected through the introduction of new sources of contamination and sterilisation of mineral resources during the construction and operation of the Proposed Development. However, residual impacts are not considered to be significant in EIA terms.

8 Transport and Access

8.1 Introduction

This chapter of the EIA Report considers the likely effects of the Proposed Development with respect to transport impacts of the diversification of the existing farm, to provide a rural food and retail centre, rural enterprise centre, equestrian centre and a 'glamping' site, in addition to the retention of the existing operational farm, and how this could affect human health and the natural and built environment.

It should be noted that the transport related assessment has accounted for the impact of the proposed development in a 'worst-case' scenario, when it is accommodating a large equestrian event (typically on a Saturday). This is consistent with the approach adopted in the Transport Assessment (TA) which is provided under separate cover, and it is made clear in both reports that this represents a worst-case scenario. The TA therefore provides greater detail on the baseline traffic flows, estimates of trips associated with the Proposed Development and their distribution on the local road network. It also sets out the means by which travel by walking, cycling and public transport would be accommodated by the proposals within the wider area.

This chapter describes the methods used to assess potential effects, before assessing the impact of the proposed development in the surrounding area.

Finally, any proposed mitigation measures required to prevent, reduce or off-set any significant adverse impacts are presented.

8.2 Legislation, Planning Policy and Guidance

8.2.1 National Policy

This section sets out the salient traffic and transport national and local policy that has informed the development of the EIA and identifies how the application has been shaped by the policy referenced.

National Planning Policy Framework

The National Planning Policy Framework (NPPF), revised in July 2021 by the Secretary of State for Ministry of Housing, Communities and Local Government (now the Department for Levelling Up, Housing and Communities) replaces the 2012 iteration of the NPPF and continues to focus on reducing development impact, with decisions taking account of whether:

> *"a) appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;*
>
> *b) safe and suitable access to the site can be achieved for all users;*
>
> *c) the design of streets, parking areas, other transport elements and the content of the associated standards reflects current national guidance, including the National Design Guide and the National Model Design Code; and*
>
> *d) any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree."*

Paragraph 104 states:

> *Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:*
>
> *a) the potential impacts of development on transport networks can be addressed;*
>
> *b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;*
>
> *c) opportunities to promote walking, cycling and public transport use are identified and pursued;*
>
> *d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains;"*

Crucially, Paragraph 111 states:

> *"Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe."*

This Proposed Development is consistent with the aims of this policy in that it promotes travel by more sustainable modes in addition to the private car.

8.2.2 Local Policy

West Sussex Transport Plan 2011 – 2026

The current West Sussex Transport Plan 2011-26 (2011) sets the strategy for guiding future investment in the highways and transport infrastructure within West Sussex. It also sets a framework for considering transport infrastructure requirements associated with future development across the county.

The Plan includes four strategies that guide the county's approach to maintaining, managing and investing in transport and for meeting the key objective of improving the quality of life for West Sussex residents:

- promoting economic growth;
- tackling climate change;
- providing access to services, employment and housing; and,
- improving safety, security and health.

These objectives form key elements of the Proposed Development and the supporting documents, with the TA and Framework Travel Plan presenting measures to ensure safe and efficient access and reduce trips and carbon emissions.

Adopted Chichester Local Plan: Key Policies 2014-2029

The Chichester Local Plan: Key Policies 2014-2029 document has been produced by CDC. The plan is designed to provide the vision and framework that will shape the future of Chichester District outside the South Downs National Park area. It provides clear guidance on how new development can address the

challenges we face and identifies where, when, how much, and how development will take place, incudes development management policies and guides other planning documents including Neighbourhood Plans and Site Allocation Plans.

The Plan addresses the need for employment, housing, community facilities and other forms of development. It details the strategic approach which will guide future development of the area, including the vision for how development and growth requirements will be met. The overarching framework contained therein provides a clear approach to ensuring that growth is delivered in the right places, and to the right character and quality, as well as establishes clear directions for change, in order to achieve this transformation.

Encouraging sustainable development is included within the strategic priorities of the Local Plan and is a key consideration which runs throughout document, noted specifically in Policy 1 - 'Presumption in Favour of Sustainable Development':

> *"To deliver sustainable development in Chichester that seeks to meet the social and economic needs of the area, whilst protecting and enhancing its environment for the enjoyment of future generations."*

Additionally, opportunities will be sought to liaise with transport, service providers and developers to improve accessibility to key services and facilities and to provide an improved and better integrated transport network:

> *"Ensuring that new development is well located and designed to minimise the need for travel, encourages the use of sustainable modes of travel as an alternative to the private car, and provides or contributes towards necessary transport infrastructure, including through travel plans;"*

This is set out specifically in Policy 8: 'Transport and Accessibility', which highlights the aspirations of locating development in the right places to promote, where possible, more sustainable travel patterns and encourage the increased use of sustainable modes of travel, such as public transport, cycling and walking.

Additionally, Policy 39: 'Transport, Accessibility and Parking' requires all proposals to provide for the access and transport demands they create, to minimise additional traffic generation and movement, provide a safe and adequate means of access and provide a level of parking for the development in accordance with the West Sussex County Council Guidance. The Proposed Development is located within a rural area with sufficient land to suitably meet the required criteria set out in the Chichester Local Plan relating developments of this nature.

8.2.3 Guidance

Guidelines for the Environmental Assessment of Road Traffic

The Guidelines for the Environmental Assessment of Road Traffic (GEART) was published in January 1993 by the Institute of Environmental Assessment. These guidelines provide a framework for the assessment of the environmental impacts of road traffic associated with new developments.

The purpose of the guidelines is to provide the basis for systematic, consistent and comprehensive coverage for the appraisal of traffic effects arising from development projects. Further details on the assessment methodology undertaken for the Proposed Development in relation to traffic and transport can be found in **Section 8.4.**

8.3 Consultation

WSCC were consulted for the EIA Screening Opinion and their response with regard to highways matters was as follows:

> *"a fully comprehensive trip generation assessment of each use should be provided and this will determine the scope of junctions that require modelling (…) it is also advised that worst case scenarios are assessed, including when a large equestrian event, weddings, glamping change over etc. in addition to normal trips, are taking place."*

It is also noted that in the Secretary of State's Screening Direction Written Statement, it is stated that:

> *"The Secretary of State considers the site to be reasonably standalone and considers any cumulative impacts can be considered throughout the planning application process through reports to assess Highway Impacts and any other potential cumulative impacts."*

As part of the planning application, a TA has been produced. The preparation of the TA involved proactive scoping discussions with West Sussex County Council (WSCC), in their capacity as the local highway authority, to understand their requirements for the proposals and the planning submission.

8.4 Assessment Methodology

This section describes the assessment methodology, including effects and assessment criteria that are used in this traffic and transport chapter.

As previously mentioned, the principal guidelines for the assessment of the environmental impacts of road traffic associated with new developments are GEART. The guidance provides a framework for the assessment of traffic borne environmental impacts, such as pedestrian severance and amenity, driver delay, road safety and noise, vibration and air quality.

8.4.1 Scale of Assessment

The following rules, taken from GEART, have informed the screening process and thereby the extent and scale of the assessment required:

- Rule 1: Include highway links where total traffic flows (or HGV component) are predicted to increase by more than 30%; and,
- Rule 2: Include any other specifically sensitive areas where total traffic flows (of HGV component) are predicted to increase by 10% or more.

In justifying these rules GEART examines the science of traffic forecasting and states:

"It is generally accepted that accuracies greater than 10% are not achievable. It should also be noted that the day to day variation of traffic on a road is frequently at least some + or -10%. At a basic level, it should therefore be assumed that projected changes in traffic of less than 10% create no discernible environmental impact.

(…) a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment."

Changes in traffic flows below the GEART rules (thresholds) are assumed to result in no discernible or negligible environmental effects and have therefore not been assessed further as part of this study.

Following initial screening, GEART sets out consideration and, in some cases, thresholds in respect of changes in the volume and composition of traffic to facilitate a subjective judgement of traffic impact and significance.

The following environmental effects were identified as being susceptible to changes in traffic flow and are appropriate to the local area.

8.4.2 Severance

Paragraph 4.27 of GEART describes severance as the '*perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe a complex series of factors that separate people from places and other place'*. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to relatively minor traffic flows if pedestrian access to essential facilities are impeded. Severance effects could equally be applied to residents, motorists, cyclists or pedestrians.

GEART suggests changes in total traffic flow of 30%, 60% and 90% are regarded as "slight", "moderate" and "substantial" changes in severance respectively.

8.4.3 Pedestrian and Cycle Amenity

Paragraph 4.39 of GEART broadly defines pedestrian amenity as '*the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/ separation from traffic'*. The guidance document highlights that a threshold for judging the significance of changes in pedestrian amenity, would be where traffic flows or HGVs are halved or doubled as a result of the proposed development.

8.4.4 Highway Safety

The salient GEART Guidance on highway safety is as follows:

"Where a development is expected to produce a change in the character of traffic (e.g. HGV movements on rural roads), then data on existing accidents levels may not be sufficient. Professional judgement will be needed to assess the implications of local circumstances, or factors which may elevate or lessen the risk of accidents, e.g. junction conflicts."

The supporting TA includes an examination of collisions occurring within the study area, which demonstrates that one collision occurred within the five-year period reviewed (01/03/2016 to 28/02/2021). The collision occurred at the Rickman's Lane / Foxbridge Lane / Plaistow Road junction.

The TA concludes that *"the vehicle and non-motorised user trips associated with the development are unlikely to further exacerbate any road safety problems at this location".*

Whilst the TA does not include an assessment of construction phase traffic demand, it is demonstrated in **Section 8.7** of this report that traffic during the construction phase would be less than during the 'worst case' operational phase.

It is therefore considered that the impacts of the proposed development on highway safety would not be significant.

8.4.5 Driver Delay

As outlined in paragraph 4.34 of GEART, delays are likely to be significant only when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

The supporting TA includes detailed analysis of the proposed development's operational vehicular trip impact upon the following four junctions, as agreed with WSCC:

1. Rickman's Lane / Crouchlands Farm
2. Rickman's Lane / Plaistow Road / Foxbridge Lane
3. The Street / Dunsfold Road / Loxwood Road
4. Plaistow Road / Kirdford Road

Two other junctions originally included in the study area – Plaistow Road (Ifold) / Foxbridge Lane and B1233 Vicarage Hill / Plaistow Road (Ifold) – were discounted from the assessment presented in the TA because they were forecast to accommodate negligible additional vehicles in the weekday peak hours as a result of the proposed development.

The TA considers the performance of the junctions in comparison to a 2027 future year, which represents give years after anticipated planning submission. Background traffic flows include forecast growth associated with changes in background traffic and committed developments and local plan allocations.

The TA concludes that the impact of the operational development traffic upon the operation of these junctions would be imperceptible during the weekday AM and PM network peak hours. It is therefore considered that the impacts of the Proposed Development operational traffic upon driver delay would not be significant and are therefore not considered further.

Whilst the TA does not include an assessment of construction phase traffic demand, it is evidenced in **Section 8.7** that traffic during the construction phase would be less than during the 'worst case' operational phase. Therefore, in this context and to present a proportional approach to assessment, it is considered that the impacts construction traffic associated with the Proposed Development would not be significant.

8.4.6 Other Impacts

Traffic-borne noise, vibration and air quality effects are assessed separately in **Chapter 9 Air Quality** and **Chapter 10 Noise and Vibration**.

8.4.7 Summary

Table 8-1 summarises the potential effects for both construction and operation of the proposed development.

Table 8-1 Summary of potential effects

Effect	Operation	Construction
Severance	Yes	Yes
Pedestrian and Cycle Amenity	Yes	Yes
Highway Safety	No	No
Driver delay	No	No
Notes: Scoped in (Yes) and scoped out (No)		

Information provided in GEART sets out the basis to measure each of the above environmental effects in relation to traffic. The measures to determine the significance of the potential environmental impacts shown in **Table 8-1** are outlined in the following subsections:

8.4.8 Sensitivity

The sensitivity of a road (link) can be defined by the quantum and type of user groups who may use it, e.g. elderly people or children. A sensitive area may be a village environment or where pedestrian or cyclist activity may be high, for example in the vicinity of a school. **Table 8-2** provides broad definitions of the different sensitivity levels which were applied to the assessment.

Table 8-2 Example definitions of the different sensitivity levels for a highway link

Sensitivity	Definition
Very High to High	High concentrations of sensitive receptors (e.g. hospitals, schools, areas with high tourist footfall etc.) and limited separation provided by the highway environment.
Medium	A low concentration of sensitive receptors (e.g. residential dwellings, pedestrian desire lines, etc.) and limited separation from traffic provided by the highway environment.
Low	Few sensitive receptors and / or highway environment can accommodate changes in volumes of traffic.
Very Low	Links that fall below GEART Rule 1 and 2 screening thresholds.
* High and Very High sensitivity links are considered to be 'specifically sensitive areas' for the purpose of GEART Rule 2	

8.4.9 Magnitude

Table 8-3 details the assessment framework used herein adapted from GEART. These thresholds are guidance only and provide a starting point from which additional evidence (for example more detailed traffic analysis and site observations) and professional judgement will inform an analysis of the magnitude of effect.

Table 8-3 Transport and Traffic assessment framework

Effect	Magnitude of Effect			
	Very Low	Low	Medium	High – Very High
Severance	Change in total traffic flow of less than 30%	Change in total traffic flows of 30-60%	Change in total traffic flows of 60-90%	Changes in total traffic flows of over 90%

Effect	Magnitude of Effect			
	Very Low	Low	Medium	High – Very High
Pedestrian / cycle amenity	Changes in traffic flow (or HGV component) less than 100%	Greater than 100% increase in traffic (or HGV component) and a review based upon the quantum of vehicles, vehicle speed and pedestrian/cycle demand.		

8.4.10 Impact Significance

Table 8-4 sets out the assessment matrix adopted for routes that meet the screening criteria (Rule 1 and 2). This combines the assessment of the magnitude of effect, derived from the framework included in **Table 8-3**, with the receptor value presented in **Table 8-2** order to determine the significance of the predicted impact.

Table 8-4 Impact assessment matrix

		Magnitude			
Sensitivity		High	Medium	Low	Negligible
	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

Note that for the purposes of the EIA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not strictly considered to be significant in their own right, it is important to distinguish these from other non-significant impacts, as they may contribute to significant impacts cumulatively or through impact interactions.

Embedded mitigation is referred to and included in the initial assessment of impacts. If the impact does not require mitigation (or none is possible) the residual impact remains the same. However, if mitigation is required, an assessment of the post-mitigation residual impacts is provided.

8.5 Study Area

The traffic and transport study area has been informed by determining the most probable routes for traffic during the operational phase of the Proposed Development.

Routes that extend outside of the traffic and transport study area are routes where the Proposed Development traffic will have dissipated and/or include roads with negligible sensitive receptors. These parameters combine and do not represent significant impacts on the highway network. The study area has been informed by the development traffic distribution exercise outlined in the TA.

The traffic and transport study area for this EIA is divided into seven separate highway sections known as links, which can be defined as sections of road with similar characteristics and traffic flows. These are summarised below:

1. Rickman's Lane;
2. Foxbridge Lane;
3. Plaistow Road (Ifold);
4. Dunsfold Road (Plaistow);
5. Loxwood Road (Plaistow);

6. Plaistow Road (Kirdford); and
7. Village Road (Kirdford).

8.6 Baseline Environment

8.6.1 Existing Vehicular Access

The primary means of vehicular access to the site is currently provided in the form of a simple priority junction off Rickman's Lane, serving the site from the east. The existing access road is aligned along Bridleway 643 and a horse bypass is provided adjacent to the gated access to the Farm. There is signage in place adjacent to the access directing HGVs to turn right (southbound on Rickman's Lane).

8.6.2 Existing Highway Network

Link 1 – Rickman's Lane

Rickman's Lane is an unclassified road that forms the eastern boundary of the site, routing between Plaistow in the north and Kirdford to the south, granting direct access to the site. Rickman's Lane is rural in nature with tall hedgerows present on both sides of the highway for the majority of its length. Synonymous with roads of this nature, no footways are present at the site frontage on Rickman's Lane.

At its northern extent, Rickman's Lane becomes The Street as it enters the village of Plaistow, and to the southeast, it becomes Plaistow Road at its junction with Foxbridge Lane, approximately 500m from the Crouchlands Farm site access junction.

In the vicinity of the site, Rickman's Lane grants direct frontage access to a small number of residential properties via private driveways which access directly off the highway.

Link 2 – Foxbridge Lane

Foxbridge Lane is a rural, single carriageway unclassified road that acts as a connector between Rickman's Lane and Plaistow Road in Ifold. It does not feature footways or street lighting and provides access to a small number of properties. It is subject to national speed limit along most of length, with a section subject to a 40mph speed limit on approach to the village of Ifold to the North.

Link 3 – Plaistow Road (Ifold)

Plaistow Road in Ifold is a single carriageway residential road with dwellings along most of its northern edge. The eastern section is more rural in nature and passes through woodland and fields. It is subject to a 30mph speed limit and does not feature footways or street lighting.

Link 4 – Dunsfold Road (Plaistow)

Dunsfold Road extends northwest out of the village of Plaistow and is a single carriageway road subject to a 30mph speed limit within Plaistow and national speed limit as it exits the village. Within Dunsfold there are sections with footway that provide access to residential dwellings.

Link 5 – Loxwood Road (Plaistow)

Loxwood Road extends between Plaistow and Ifold and is a single carriageway road subject to a 30mph speed limit in Plaistow and national speed limit to the east. In Plaistow, it features a footway and provides access to dwellings, a pre-school, school and public house.

Link 6 – Plaistow Road (Kirdford)

Plaistow Road (Kirdford) extends between Foxbridge Lane and the village of Kirdford. It is rural in nature and provides access to some dwellings and farms, though these have large setbacks from the carriageway. It is subject to national speed limit and does not feature footways or street lighting.

Link 7 – Village Road (Kirdford)

Village Road is aligned east-west through the village of Kirdford. It provides access to numerous residential dwellings, a public house and small businesses and has relatively wide footways which are set back from the carriageway.

8.6.3 Sustainable Transport

Rickman's Lane does not feature footways or street lighting, although several Public Rights of Way (PRoW) can be accessed from it, including Bridleway 643, Footpath 628 and Bridleway 633_2. These form part of a network of PROWs through and around the Proposed Development site, including Restricted Byway 633, which forms a north-south route through the site between Plaistow and Mackerel's Common.

Bus service 64 is routed past the site on Rickman's Lane; however, this operates at a once daily frequency on Mondays, Tuesdays and Fridays only (between Loxwood and Horsham). Service 64 stops adjacent to the Crouchlands Farm access junction on Rickman's Lane, although there are no formal bus stops present on either side of the carriageway.

8.6.4 Link Based Sensitive Receptors

A desktop exercise has been undertaken to identify the sensitive receptors in the traffic and transport study area utilising the definitions outlined in **Table 8-2**. **Table 8-5** details the routes and the rationale for the applied link sensitivity.

Table 8-5 Link based sensitive receptors

Link ID	Link Description	Link Sensitivity	Rationale
1	Rickman's Lane	High	Rural road serving village and dwellings to the north. No dedicated footway.
2	Foxbridge Lane	Low	Rural lane with very low number of receptors.
3	Plaistow Lane (Ifold)	High	Edge of village setting without dedicated footways but development only on one side of the road therefore limiting pedestrian crossing flows. Properties largely set back from the road with two-way width throughout.
4	Dunsfold Road (Plaistow)	High	Village setting with dedicated footways in parts. Moderate concentration of receptors with minimal set back between carriageway and properties.
5	Loxwood Road (Plaistow)	High	Village setting with dedicated footways in parts. Moderate concentration of receptors and proximity to village green and community hall likely to result in the presence of vulnerable users.

Link ID	Link Description	Link Sensitivity	Rationale
6	Plaistow Road (Kirdford)	Low	Rural road with low concentration of receptors and two-way carriageway throughout. No separate footways but limited pedestrian flows.
7	Village Road (Kirdford)	High	Village setting with multiple receptors, although footways are provided and set back from carriageway.

8.6.5 Baseline Traffic Data

Traffic surveys should be representative to typical neutral conditions e.g. outside of school holidays. Traffic flow data for the seven links within the traffic and transport study area were sourced via Manual Classified Counts (MCC) and Automatic Traffic Counters (ATC) undertaken in 2018 and 2021.

Since the peak of the pandemic 'lockdown' restrictions, which came into force during April and May 2020, traffic volumes have been slowly increasing, however, traffic levels had not returned to pre Covid-19 at the time of the 2021 surveys. Thus, traffic flows recorded by the surveys are likely to be lower than the considered 'typical neutral' periods for the traffic and transport study area.

To mitigate, various existing data sources were compared, allowing extrapolation of vehicle 'uplift' factors for vehicles for different road classifications which would account for the changes in traffic flows during the 2021 survey. The full details of the traffic survey data and the approach to uplifting surveys is contained in the TA and they are summarised in **Table 8-6.**

Table 8-6 Control surveys and uplift factors per link.

Link ID	Link description	Existing Traffic Flow Data	Date of Data	COVID-19 Baseline Uplift Factor	Data Confidence Level
1	Rickman's Lane	7-day ATC	w/c 6th June 2018	N/A	High
2	Foxbridge Lane	7-day ATC	w/c 6th June 2018	N/A	High
3	Plaistow Lane (Ifold)	7-day ATC	w/c 6th June 2018	N/A	High
4	Dunsfold Road (Plaistow)	Peak period MCC	24th May 2018	See note 1	Medium
5	Loxwood Road (Plaistow)	Peak period MCC	24th May 2018	See note 1	Medium
6	Plaistow Road (Kirdford)	Peak period MCC	24th May 2018	See note 1	Medium
7	Village Road (Kirdford)	Peak period MCC	31st March 2021	See note 1,2	Medium

Notes: Note 1: Peak period MCC data has been converted to daily flows by examining the daily totals of the three ATC surveys location and calculating a peak hour to daily factor.

Note 2: Comparison of surveys at the site access junction (Junction 1) between 2018 and 2021 revealed that the 2021 flows were slightly lower, suggesting that Covid-19 reduced background traffic growth on the link. The 2021 survey data has therefore been adjusted to align with the 2018 data (growthed to 2021) to remove Covid-19 impact. This approach is outlined in the TA.

To arrive at a 2022 (current) reference year, the 2021 background traffic flows were growthed to 2022 using a locally adjusted 'Average Day' growth factor from the Department for Transport 'Trip End Model Presentation Program' (TEMPro) software of 1.0324. The resultant factored baseline traffic flow data for a 2022 reference year were detailed in

Table 8-7**.**

Table 8-7 AADT 2020 reference baseline traffic flows

Link ID	Link description	Total Vehicles (2022 24hr AADT*)	Total HGVs (2022 24hr AADT*)
1	Rickman's Lane	745	9
2	Foxbridge Lane	800	11
3	Plaistow Lane (Ifold)	3,447	33
4	Dunsfold Road (Plaistow)	3,141	49
5	Loxwood Road (Plaistow)	3,489	53
6	Plaistow Road (Kirdford)	1,074	29
7	Village Road (Kirdford)	1,315	66
*Annual Average Daily Traffic			

Further details of baseline traffic and uplift factors are provided in the supporting TA.

8.6.6 Traffic Growth

To derive the future year baseline traffic flows, the baseline traffic flows were factored up to inform a 2027 future year scenario using a locally adjusted growth factor from TEMPro for an average day of 1.0331.

In addition, it is noted that a recently approved residential development for 54 residential dwellings on land east of Plaistow Road could materially affect traffic flows on link 6. The Transport Statement submitted to support CDC planning application 19/00086/FUL has been reviewed to establish the predicted increase in vehicle movements on Plaistow Road, which is the only link considered in the Transport Statement (there is no information provided on subsequent assignment of vehicles across the wider road network). Appendix 4 of the Transport Statement confirms a daily trip rate of 4.723, and therefore application of this to 54 dwellings results in 255 additional daily vehicles on Plaistow Road. No HGV trip rate is provided. The increase in total vehicles has been accounted for on link 6 in the remainder of this chapter.

It is acknowledged that a development of 50 residential dwellings on land south of Guildford Road, Loxwood has also recently been consented under 20/01481/FUL. The Transport Statement submitted to inform the application confirms that no significant impact would be generated on the links in the traffic and transport study area for this EIA. No additional traffic flows from 20/01481/FUL were included in the remainder of this chapter.

Table 8-8 provides a summary of the forecast 2027 future year baseline traffic flows, including committed development adjacent to link 6.

Table 8-8 Forecast 2021 and 2027 background flows

Link ID	Link description	Forecast 2022 Reference Flows (AADT)		Forecast 2027 Baseline Flows (AADT)	
		All vehicles	HGVs	All vehicles	HGVs
1	Rickman's Lane	745	9	769	9

Link ID	Link description	Forecast 2022 Reference Flows (AADT)		Forecast 2027 Baseline Flows (AADT)	
		All vehicles	HGVs	All vehicles	HGVs
2	Foxbridge Lane	800	11	826	12
3	Plaistow Lane (Ifold)	3,447	33	3,561	35
4	Dunsfold Road (Plaistow)	3,141	49	3,245	51
5	Loxwood Road (Plaistow)	3,489	53	3,605	55
6	Plaistow Road (Kirdford)	1,074	29	1,364	30
7	Village Road (Kirdford)	1,315	66	1,358	68

8.7 Potential Impacts During Operation

8.7.1 Embedded Mitigation

8.7.1.1 PRoW strategy

As previously acknowledged, there are numerous PRoW aligned through and adjacent to the site. These form a key element of the access strategy for the Proposed Development and it is anticipated that the network of PROW will continue to be well used, with increased usage by customers and visitors to the proposed land uses, as well as those making leisure trips through the area. To ensure that these opportunities are exploited and matters relating to PROW are considered coherently, a public access strategy will be implemented once the development is in place.

Ongoing dialogue and engagement with WSCC's PROW Officer have led to the production of a PROW strategy, which includes the following measures:

- Reinstatement of Footpath 564 once the existing Lagoon has been remediated. This reinstatement will include the removal of fences along its length where possible. Where this is not possible due to operational considerations, appropriate stiles will be provided such as the Centrewire, Icknield Stile;
- Footpath 633/2 will be improved, to provide reprofiled surface to facilitate drainage, culvert of the existing drainage ditch which traverses the Footpath, and provision of a firmer surface in accordance with West Sussex County Council's specification for PROW works;
- In conjunction with the Wildlife Trust a permissive path will be provided through Limekiln Wood. A further permissive path will be provided at Hardnip's Copse;
- The existing permissive route which has been made temporarily available to the south of Middleground Copse, will be established as a permissive route beyond the Covid-19 pandemic, subject to ground conditions and activities on the wider farm site; and
- Bridleway 643 will be widened in part to enable the movement of farm machinery.

As all other PROW are broadly in good condition, it is proposed to limit any works to these areas to standard maintenance processes. This is likely to comprise patch repair of surfaces in accordance with the WSCC's PROW specification.

As Footpath 633 to the north of Hardnip's Barn is within Common Land, West Sussex County Council has confirmed that improvement works to this route will be undertaken by the PROW team in due course as resources and the Council's capital works programme permits.

8.7.1.2 Improved Vehicular Access

The existing access to Crouchlands Farm on Rickman's Lane currently accommodates the volume and nature of vehicles in association with the existing use on the site; however, there is limited visibility at the existing site access due to the sinuous alignment of Rickman's Lane. As such, it is proposed to provide a new, separate access on Rickman's Lane to accommodate the intensification in vehicle movements associated with the proposed development.

The proposed site access junction is to serve all elements of the Whole Farm Plan with the existing access road aligned along Bridleway 643 being retained for the movement of agricultural vehicles and use by walkers, cyclists and equestrians.

It is proposed that the new access road subsequently re-joins the internal road network within the site. As it continues into the site, Bridleway 643 is to be widened to 5.5m to accommodate two-way vehicles within the central section of the development. Further into the site the existing network of roads and tracks is to be retained.

8.7.1.3 Events Traffic Management Plan

It is proposed that an Events Traffic Management Plan (ETMP) is conditioned as part of a planning consent for the site. The two principal aims of the ETMP will be to (1) reduce the numbers of total trips associated with each event and (2) set out how the traffic related to events at the equestrian centre and weddings at Hardnip's Barn would be managed to reduce impacts on the local highway network, including firm commitments and obligations for Artemis to adhere to. The key principles of the ETMP will include:

- Identification of the roads, tracks and PROW which may be affected by events traffic (including a refined events traffic distribution exercise once the reach of regional shows, for example, is confirmed);
- Confirmation of any necessary diversions or closures relevant to different events (while ensuring continuous access and minimal disruption for local residents), including positions and requirements for temporary signals;
- Permanent and temporary traffic management and signage strategies – both within and external to the site. Details of contractor(s) responsible for erection of signage;
- Ticketing strategy - including how ticket numbers will be limited or constrained (e.g. dependent on parking provision), time slots and management of arrivals and departures;
- Requirements for any appropriately licenced marshals, stewards, banksmen and other temporary and/or licenced staff;
- Confirmation of the parking strategy outlined in the TA;
- 'Back of house' set up (e.g. type and number of vehicles, parking) for events including coordination of consolidated travel planning arrangements such as coach travel for some events such as weddings or larger equestrian events;
- Confirmation of emergency access;
- Confirmation of disabled access;
- Provision of a risk assessment pro-forma for future events;
- Mechanisms for regular review and risk assessment, including site surveys of surrounding highway network prior to major events; and,
- Mechanisms for liaison with WSCC and CDC.

It is proposed that the format of the ETMP, communication channels and risk assessments are agreed with WSCC through a pre-occupation condition attached to the equestrian centre and Hardnip's Barn.

8.7.1.4 Construction Traffic Management Plan

It is proposed that a Construction Traffic Management Plan (CTMP) is conditioned as part of any planning consent, to be discharged prior to any works commencing, including that associated with demolition or enabling works.

The CTMP is to include details of the following and shall be adhered to throughout the construction period:

- Means by which trips will be consolidated for site operatives for the duration of the build;
- Arrangements for the parking of site operatives' and visitors' vehicles;
- Loading and unloading of plant and material;
- Storage of plant and materials used in constructing the development;
- Construction hours;
- Delivery routeing and hours;
- Recorded daily inspections of the highway adjacent to the site access; and,
- Wheel washing and measures to remove mud or debris carried onto the highway.

8.7.1.5 Travel Plan

A Framework Travel Plan (FTP) has been prepared for the Proposed Development which outlines the approach to reduce the dependency on single occupancy car trips and encouraging travel by sustainable modes and at the site during the operational phase. It is an 'umbrella' document which sets out the framework for the Full Travel Plan(s), to be prepared prior to occupation of the site. Given the scale of some land uses on the site, it is anticipated that individual Travel Plans would be prepared and managed by individual/unit-specific Travel Plan Coordinators (TPCs). A Site-Wide TPC would oversee and manage this process, as well as chairing a TPC working group and being the main point of contact with WSCC's Travel Plan Officer.

Due to the nature of the Proposed Development and its rural location, the measures identified in the FTP focus primarily on reducing the need to travel, car sharing / group travel and reducing emissions. Where there are opportunities to encourage walking and cycling in a safe manner these are exploited. The key measures proposed in the FTP are summarised below. Some are more relevant to specific land uses than others, and this is expanded upon in the FTP.

- Provision of car share preferential spaces and EV charging spaces;
- Preparation of an Events Traffic Management Plan (see above);
- Implementation of the measures identified in the PROW Note;
- Provision of a Sustainable Travel Information Pack for all staff;
- A digital strategy focussed on promoting sustainable travel on the Crouchlands Farm website;
- Offering one-to-one personalised travel planning to staff;
- Marketing, prize draws and special events;
- Operation of a dedicated Crouchlands Farm minibus to facilitate group travel;
- Encouraging and facilitating homeworking;
- Local recruitment; and,
- Sourcing of local produce.

The primary aim of the FTP will be to reduce vehicle trips to and from the site over time, therefore reducing the overall traffic and transport impacts of the Proposed Development.

8.7.2 Trip Generation

The TA provides detail of how operational traffic demand and distribution has been calculated. In summary, the trip generation has been calculated through a variety of methods, including use of the TRICS database and use of a 'first principles' method, which takes into account information such as staff/visitor numbers, shift times and event calendars.

The Proposed Development would result in a net increase in trips to and from the site, and the majority of trips generated would be vehicular, given the nature and location of the site. During typical operation, the total daily increase in trips associated with all uses is predicted to be in the region of 700 two-way trips during the weekdays, most of which are likely to be cars and light vehicles associated with the food, retail, glamping and employment land uses proposed.

On weekends, it is anticipated that the Proposed Development could generate between 660 and 1,000 daily trips, with the lower value associated with the food, retail and glamping land uses and the higher value taking into account the predicted weekend trip generation of the equestrian centre.

The aspiration is for events to take place reasonably frequently (two or more per month) and therefore to present a worst case, the analysis presented in the TA and this EIA chapter was prepared on this basis. This assumes the events generating the most intense number of trips (an eventing show) takes place on a Saturday. Other types of events such as dressage and cross-country shows will be just as regular but will generate fewer vehicles, and therefore a worst case is modelled. It is anticipated that eventing shows would take place up to two days per month.

Less frequently (e.g. once or twice a year), it is anticipated that the site would host larger equestrian events such as national / international clinics, shows and gala evenings. Whilst these events would generate larger volumes of vehicles, including heavy goods / commercial vehicles, it is considered that they would be better managed through the ETMP and appropriate temporary mitigation measures agreed with WSCC as and when required.

The resulting development trips are summarised in **Table 8-9** including the daily 'large vehicle' movements. The large vehicle trips are typically horse boxes or cars towing trailers associated with the equestrian arena and therefore do not have the same characteristics as a typical HGV. These were modelled as HGVs in the TA to ensure that the capacity modelling was based on a worst-case scenario, assuming that horse boxes/trailers are large and slow-moving through junctions. This chapter refers to horse boxes/trailers as 'large vehicles' to suggest some differentiation from HGVs, although they are added to the baseline AADT HGVs to provide a worst-case assessment.

Table 8-9: Proposed trip generation

Scenario	Total Vehicles	Large vehicles
Typical Weekday	729	29
Saturday (Eventing show)	1,060	320

8.7.3 GEART Screening

In accordance with GEART (Rule 1 and 2), a screening process has been undertaken for the traffic and transport study area to identify routes that are likely to have sufficient changes in traffic flows and therefore require further impact assessment.

Table 8-10 and **Table 8-11** summarise the assigned daily peak operational two-way vehicle movements (i.e. arrivals and departures) when assigned across the highway network using the trip distribution presented in the TA (AM and PM peak hour distributions are averaged to provide daily distribution). The percentage change is then shown.

Table 8-10 shows the typical weekday compared with the background traffic AADT whilst **Table 8-11** shows the typical Saturday traffic compared with AADT, given that a Saturday will have very different characteristics to a weekday at the Proposed Development.

Table 8-10 Link screening (typical weekday)

Link ID	Link description	Link Sensitivity	2027 Baseline Traffic (AADT)		Development Traffic (AADT)		% change	
			All vehicles	Large vehicles	All vehicles	Large vehicles	All vehicles	Large vehicles
1	Rickman's Lane	High	769	9	729	29	95%	328%
2	Foxbridge Lane	Low	826	12	49	2	6%	17%
3	Plaistow Lane (Ifold)	High	3,561	35	106	4	3%	12%
4	Dunsfold Road (Plaistow)	High	3,245	51	239	10	7%	19%
5	Loxwood Road (Plaistow)	High	3,605	55	60	2	2%	4%
6	Plaistow Road (Kirdford)	Low	1,364	30	382	15	28%	51%
7	Village Road (Kirdford)	High	1,358	68	191	8	14%	11%
	Links likely to exceed GEART screening thresholds.							

Table 8-11 Link screening (typical Saturday)

Link ID	Link description	Link Sensitivity	2027 Baseline Traffic (AADT)		Development Traffic (AADT)		% Impact	
			All vehicles	Large vehicles	All vehicles	Large vehicles	All vehicles	Large vehicles
1	Rickman's Lane	High	769	9	1060	320	138%	3621%
2	Foxbridge Lane	Low	826	12	72	22	9%	188%
3	Plaistow Lane (Ifold)	High	3,561	35	154	46	4%	135%
4	Dunsfold Road (Plaistow)	High	3,245	51	348	105	11%	207%
5	Loxwood Road (Plaistow)	High	3,605	55	87	26	2%	48%
6	Plaistow Road (Kirdford)	Low	1,364	30	556	168	41%	560%
7	Village Road (Kirdford)	High	1,358	68	278	84	20%	124%
	Links likely to exceed GEART screening thresholds.							

In accordance with GEART only those links that are showing greater than 10% increase in traffic flows (or HGV component) for sensitive areas, or greater than 30% increase in total traffic or HGV component for all other links, are considered when assessing the traffic impact upon receptors.

It is noted from **Table 8-10**, that links 2 and 5 are below the GEART screening thresholds and are therefore impacts are assessed as negligible on a typical weekday. Links 1, 3, 4, 6 and 7 are above GEART screening thresholds on a typical weekday and are therefore considered further.**Table** 8-11 shows that on a typical

Saturday, links 1 to 7 are above GEART screening thresholds as they exceed 30% additional large vehicles compared with the baseline. Links 1 and 6 also exceed the threshold for total vehicles.

The following paragraphs summarise the assessment for the operational phase traffic on these links.

8.7.4 Severance

The daily change in total traffic flows for links 2, 3, 4, 5 and 7 on weekdays and a Saturday is less than 30%, therefore applying the GEART severance threshold in **Table 8-3** the magnitude of effect is assessed as negligible on links of low to high sensitivity, resulting in a minor impact.

The peak daily change in traffic upon links 1 and 6 are greater than 30% and as such these links are considered further.

The daily change in total traffic flows on link 6 would be 28% on a weekday and up to 41% on a Saturday. A peak increase in total traffic of up to 40% could result in a low magnitude of change upon a receptor of low sensitivity, resulting in a minor impact. The impacts on link 6 are therefore not considered significant.

The daily change in total traffic flows on link 1 is over 90% on weekdays and Saturdays, which would result in high magnitude of effect in **Table 8-3**.

However, the total number of vehicles on Rickman's Lane with the development in place would be ~1,500 on a weekday and ~1,830 on a Saturday. Across 12 hours (when most Proposed Development trips are likely to occur), this would be around 125 total two-way vehicles an hour on a weekday. On a Saturday this would increase to around 150 total vehicles an hour. This equates to less than three vehicles a minute (in either direction).

There is a low volume of crossing movements on the majority of Rickman's Lane at present given that most of it is rural in nature, with very few dwellings or other trip attractors. This volume of hourly vehicles would therefore still provide adequate opportunity for the likely volume of pedestrians to find 'gaps' and cross Rickman's Lane.

It should be noted again here that the Saturday trip generation assumes that events are frequent (most weeks), that they fill the capacity of the equestrian centre, and that they are of the most intense type (eventing show). In practice this is likely to experience daily, weekly and seasonal fluctuations, with smaller and fewer events happening in the winter, for example.

On this basis the effects are assessed as negligible on a link of high sensitivity, resulting in a minor impact.

8.7.5 Pedestrian and Cycle Amenity

The operational daily change in total flows or HGV component for links 2, 3, 4, 5, 6 and 7 is less than the 100% GEART impact threshold on typical weekdays (**Table 8-10**). The magnitude of effect is therefore assessed as negligible on links of low or high sensitivity, resulting in minor impact on weekdays.

Link 1 experiences increases in traffic flows greater than the 100% GEART thresholds on weekdays, and on Saturdays links 1, 2, 3, 4, 6 and 7 experience increases over 100%. With the exception of link 1, this increase is only for the large vehicles' component of trips.

The nature of the types of equestrian event however means that competitors typically arrive in hourly slots to compete at set times/in set competitions, rather than arriving at the beginning of the day and leaving at

the end of the day. Furthermore, it should be noted that 'HGVs' generated by the Proposed Development are entirely comprised of horse boxes and towed trailers associated with equestrian events (synonymous with rural areas), rather than conventional goods vehicles, and therefore have different characteristics, which are likely to result in lower levels of fear and intimidation than articulated HGVs, or tipper trucks, for example.

The ETMP proposed as part of the package of mitigation associated with the proposals will include measures to control the routing, timing of arrival/departure and ticketing strategy of larger events. The primary aim will be to manage the flow of spectators and horse boxes/trailers into and out of the site on event days to ensure that 'peaks' in arrivals and departures are spread out and do not occur within very short time periods.

Considering the measures to manage the profile of arrivals and departures, as well as routing, it can be forecast that on link 1[2], the hourly flow of vehicles is unlikely to exceed 150 vehicles (of which between 20 and 40 would be horse boxes/trailers). These 150 vehicles will then dissipate over the network and therefore the impacts per hour on any other links (2, 3, 4, 6 and 7) will be less.

It is reasoned that a temporal increase of up to 150 vehicles per hour would have a low magnitude of effect on links with low or high sensitivity, resulting in minor impacts.

8.8 Potential Impacts During Construction

The construction phase is anticipated to start in 2023/24 with completion desired by 2026. The main construction activities are likely to include:

- Topsoil stripping, reduced level excavations and formation;
- Erection of hoardings;
- Refurbishment of existing buildings;
- Site establishment;
- Infrastructure/service installation (including drainage);
- Import/export of materials and plant;
- Construction of new access road, parking areas, and buildings; and,
- Landscaping.

The existing access road from Rickman's Lane, which is also a Bridleway, will remain, and the additional access route to serve the site will be constructed first to serve vehicles during the construction phase. There will also be new routes within the red line boundary to access each of the elements of the Proposed Development. HGVs and plant servicing the construction phase, including delivery and / or removal of construction materials, would access the site from Rickman's Lane. All plant and materials would be contained within the site, or within parcels of land adjacent to the site (which is also in the applicant's ownership).

Normal working hours during construction would be Monday to Friday 07.30 - 17.30 and Saturdays 08.00 to 14.00. No works would take place on Sundays or Bank Holidays, unless in an emergency. In the event of any need to deviate from these agreed working hours, this would be agreed with Chichester District Council in advance.

[2] *where the greatest impacts of 1,060 additional vehicles (including 320 horse boxes/trailers) are expected*

More generally, it should be noted that the proposals for the construction phase aim to adopt sustainable construction methods, including sourcing materials from the local area and indeed within the wider site itself. Actual vehicle impact is therefore likely to be lower than other sites of similar scale.

The assessment of impacts during the operational phase of the Proposed Development adopts a worst case where up to 1,060 daily vehicles, including 320 large, slow moving vehicles, would be generated. Considering the construction activities identifies and the proposal to source materials from the local area and within the site, it is reasoned that the construction phase of development will be less intense than the operational phase.

Noting that no significant operational phase impacts are identified, it is reasoned that the impacts of the construction phase will be no worse and can be deemed not significant.

In order to manage the impacts of the proposed developments construction phase, a CTMP would be agreed with CDC prior to the commencement of development. The CTMP would include details relating to vehicle routing, consolidation of trips, parking, hours of construction and programme, and the likely type and volume of construction vehicles.

8.9 Summary

This chapter of the EIA has assessed the potential impacts of the Proposed Development on the surrounding traffic sensitive receptors.

This chapter has been developed with regard to the legislative and policy framework outlined in **Section 8.2**. In accordance with national guidance, a traffic and transport study area has been defined, baseline conditions established and sensitive receptors within the study area identified. The traffic and transport study area were screened to identify routes that could be potentially impacted by the Proposed Development traffic generation.

A total of seven links within the traffic and transport study were assessed for the effects of severance and pedestrian and cycle amenity. Detailed assessment of the effects upon road safety and driver delay are provided in the supporting TA. This detailed assessment concluded that there will be no impacts resulting from the Proposed Development that are considered to be significant in EIA terms (i.e. moderate or major adverse) as shown in **Table 8-12**.

Table 8-12 Potential impacts identified for traffic and transport

Potential Effect	Receptor	Sensitivity	Magnitude	Significance	Additional Mitigation Measures	Residual Impact
Operation						
Severance	Links 2 & 6	Low	Negligible	Negligible	n/a	Negligible
	Links 1,3,4,5,7	High	Negligible	Minor	n/a	Minor
Amenity	Links 2 & 6	Low	Negligible	Negligible	n/a	Negligible
	Links 1,3,4,5,7	High	Negligible	Minor	n/a	Minor
Highway Safety	Links 2 & 6	Low	Negligible	Negligible	n/a	Negligible
	Links 1,3,4,5,7	High	Negligible	Minor	n/a	Minor
Driver Delay	Links 2 & 6	Low	Negligible	Negligible	n/a	Negligible
	Links 1,3,4,5,7	High	Negligible	Minor	n/a	Minor
Construction						

Potential Effect	Receptor	Sensitivity	Magnitude	Significance	Additional Mitigation Measures	Residual Impact
Impacts less than operational phase						

9 Air Quality

9.1 Introduction

This chapter of the EIA Report considers the likely effects of the Proposed Development with respect to air quality and how this could affect human health and the natural environment. It describes the methods used to assess potential effects, provides a review of the existing air quality in proximity to the application site and assesses the impact of the Proposed Development on local air quality. The mitigation measures required to prevent, reduce or off-set any significant adverse effects are presented together with the likely residual effects after these measures have been adopted.

This chapter is supported by the following appendices:

- Appendix 9.1 Construction Dust and Particulate Matter Assessment Methodology.

9.2 Legislation, Planning Policy and Guidance

9.2.1 Legislation

9.2.1.1 The Air Quality Strategy

The EU Air Quality Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management entered into force in September 1996 (European Parliament, 1996). This was a framework for tackling air quality through setting European-wide air quality limit values in a series of Daughter Directives, prescribing how air quality should be assessed and managed by the Member States. Directive 96/62/EC and the first three Daughter Directives were combined to form the new EU Directive 2008/50/EC (European Parliament, 2008) on Ambient Air Quality and Cleaner Air for Europe, which came into force June 2008.

The 1995 Environment Act (HMSO, 1995) required the preparation of a national Air Quality Strategy (AQS) which set air quality standards and Objectives for specified pollutants. The Act also outlined measures to be taken by local planning authorities in relation to meeting these standards and Objectives (the Local Air Quality Management (LAQM) system).

The UK AQS was originally adopted in 1997 (DoE, 1997) and has been reviewed and updated in order to take account of the evolving EU Legislation, technical and policy developments and the latest information on health effects of air pollution. The strategy was revised and reissued in 2000 as the AQS for England, Scotland, Wales and Northern Ireland (DETR, 2000). This was subsequently amended in 2003 (DETR, 2003) and was last updated in July 2007 (Defra, 2007).

The UK Government published its Clean Air Strategy (CAS) in January 2019 (Defra, 2019a), which reset the focus for the first time since the 2007 Air Quality Strategy revision. The CAS identifies a series of ‘new’ air quality issues, including biomass combustion, shipping emissions, and releases from agricultural activities. There is a recognition that the effects of pollutant deposition on sensitive ecosystems and habitats needs greater focus. The concept of an overall exposure reduction approach is raised, in recognition that numerical standards are not safe dividing lines between a risk and a safe exposure, within a population with a varying age and health profile. The CAS is supplemented by an Industrial Strategy, policy guidance for the ports sector, a developing approach for aviation, and by plans for road transport fuels shift to zero emissions by 2040.

The standards and Objectives relevant to the LAQM framework have been prescribed through the Air Quality (England) Regulations (2000) (HMSO, 2000), and the Air Quality (England) (Amendment) Regulations 2002

(HMSO, 2002); the Air Quality Standards Regulations 2010 set out the combined Daughter Directive limit values and interim targets for Member State compliance (HMSO, 2010).

The current air quality standards and Objectives (for the purpose of LAQM) of relevance to this assessment are outlined in **Table 9-1**. Pollutant standards relate to ambient pollutant concentrations in air, set based on medical and scientific evidence of how each pollutant affects human health. Pollutant Objectives however incorporate future dates by which each standard is to be achieved, taking into account economic considerations, practicability and technical feasibility.

Where an air quality objective (AQO) is unlikely to be met by the relevant deadline, local authorities must designate those areas as Air Quality Management Areas (AQMAs) and take action, along with others, to work towards meeting the Objectives. Following the designation of an AQMA, local authorities are required to develop an Air Quality Action Plan (AQAP) to work towards meeting the Objectives and improve air quality locally.

Possible exceedances of AQOs are usually assessed in relation to those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the Objective.

Table 9-1: Air Quality Strategy Objectives (England) for the purpose of local air quality management

Pollutant	AQO		To be Achieved by
	Concentration	Measured as*	
Nitrogen dioxide (NO_2)	200 µg.m^{-3}	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40 µg.m^{-3}	Annual mean	31/12/2005
Particles (PM_{10})	50 µg.m^{-3}	24-hour mean not to be exceeded more than 35 times per year	31/12/2004
	40 µg.m^{-3}	Annual mean	31/12/2004
Particles ($PM_{2.5}$)	25 µg.m^{-3}	Annual mean (target)	2020
	15% cut in annual mean (urban background exposure)		2010 – 2020
Note: * how the Objectives are to be measured is set out in the UK Air Quality (England) Regulations (2000)			

9.2.2 Planning policy and guidance

9.2.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) (MHCLG, 2019a) was updated in July 2021 and refers to the LAQM process by recognising that:

> *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas".*

The NPPF identifies that local planning authorities should maintain consistency within the Local Air Quality Management process and states that:

"Planning decisions should ensure that any new development within Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

9.2.2.2 Planning Practice Guidance

The UK Government Planning Practice Guidance (MHCLG, 2019b) provides guidance on how the planning process can take account of the impact new development may have on air quality.

The guidance states that air quality may be relevant to a planning application where:

- Traffic in the vicinity of the development may be affected by increasing volume or congestion or altering the fleet composition on local roads;
- New point sources of air pollution are to be introduced;
- People may be exposed to existing sources of pollution including dust;
- Potentially unacceptable impacts (such as dust) may arise during construction; and,
- Biodiversity may be affected.

9.2.2.3 Chichester Local Plan: Key Policies 2014-2029

The extant Local Plan was adopted in 2014. Policies relevant to air quality include:

- Policy 39, Transport, Accessibility and Parking: Planning permission will be granted for development where it can be demonstrated that all the following criteria have been considered:
  - "6. The proposal does not create residual cumulative impacts which are severe;" (Where development is likely to have an impact on an Air Quality Management Area, an air quality assessment will be required).
- Policy 40, The Environment, Sustainable Design and Construction: For all new dwellings or for new non-domestic buildings, evidence will be required by the developer to demonstrate that all of the following criteria have been considered (proportionate to the scale of development):
  - "10. The reduction of the impacts associated with traffic or pollution (including air, water, noise and light pollution) will be achieved, including but not limited to the promotion of car clubs and facilities for charging electric vehicles."
- Policy 41: Offsite Renewable Energy: Planning permission will be granted for off-site renewable energy (e.g. solar, biomass and energy crops, anaerobic digestion, wind and landfill gas) where it has been demonstrated that all the following criteria have been met:
  - "2. There is no significant adverse impact on local amenity, health and quality of life as a result of noise, emissions to atmosphere, electronic interference or outlook through unacceptable visual intrusion."
- Appendix A: Green Infrastructure:
  - "In addition, tree planting and landscaping has the potential to assist with improving air quality and biodiversity"

9.2.2.4 Sussex Air Quality Partnership Supplementary Planning Guidance

This document, "Air quality and emissions mitigation guidance for Sussex", published in 2020, contains a guide for developers which helps to:

- provide clarity to how authorities intend interpreting relevant Local Plan policies.
- provide advice for developers and their consultants on how to assess and mitigate the impact that new developments may have on local air quality.

- detail a consistent approach by developers and Local Planning Authorities (LPAs) to:
  - address impacts on local air quality
  - ensure optimum scheme design to reduce emissions and/or exposure and
  - avoid unnecessary delays in the planning process.

The guidance also incorporates an air quality mitigation and damage costs assessment module, which allows the calculation of the mitigation costs that would be payable to the planning authority by a developer, based upon 5 years of operation of the development. This is related to the number of daily car trips associated with the development and emissions of nitrogen oxides (NOx) and fine particulate matter ($PM_{2.5}$).

9.3 Consultation

Consultation was undertaken with Kate Simons, the Senior Environmental Protection Officer at CDC, to agree the assessment methodology[3] via email. Discussions concluded that the air quality assessment should include an odour assessment of activities at the Proposed Development to determine the odour impact on both on-site and off-site receptors.

Although the Proposed Development is classed as a 'major' development in accordance with the Sussex Air Quality Partnership Guidance (2020) as the site is >1 hectare, it was agreed that an emissions mitigation assessment was not required. This is due to the relatively low increase in vehicle trips associated with the Proposed Development (as detailed in **Table 9-12**), the site is not located within, or in close proximity to, an AQMA and, concentrations of air pollutants at the development site are well below the AQOs. Notwithstanding this, the Proposed Development incorporates a number of mitigation measures to reduce the impacts of emissions from the scheme on local air quality, as detailed in **Section 9.7.1.2.**

It was requested on 15th April 2021 that the air quality assessment include assessment of the potential risks to air quality, odour and associated public health that could arise from emissions to atmosphere from Lagoon 3, adjacent to the Crouchlands Farm site. The potential risks from the Lagoon on the Proposed Development were assessed separately in **Chapter 14** Human Health.

9.4 Assessment Methodology

9.4.1 Data Sources

The assessment was undertaken with reference to information from several sources, as detailed in **Table 9-2**.

Table 9-2: Data sources used in the air quality assessment

Data Sources	Reference
Chichester District Council, Annual Status Report (2020)	2020 Air Quality Annual Status Report (ASR) (CDC, 2020)
Department for Environment Food and Rural Affairs (Defra)	Local Air Quality Management (LAQM) Technical Guidance TG(16) (Defra, 2018)
Defra's LAQM Support Tools	LAQM 1km x 1km grid background pollutant maps (Defra, 2020)
Institute of Air Quality Management (IAQM)	Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2016)
Institute of Air Quality Management (IAQM)	Guidance on the assessment of odour for planning (IAQM, 2018)
IAQM and Environmental Protection UK (EPUK)	Land-use Planning and Development Control: Planning for Air Quality (IAQM & EPUK, 2017)

[3] *Consultation was initial held in April 2021 with further discussion taken place in January 2022.*

Data Sources	Reference
Joint Nature Conservation Committee (JNCC)	Guidance on Decision-making Thresholds for Air Pollution (Chapman & Kite, 2021)

9.4.2 Baseline Air Quality Conditions

The latest Air Quality ASR published by CDC is the 2020 ASR (CDC, 2020), this was downloaded from the CDC website and reviewed to establish baseline air quality conditions at, and in proximity to, the Proposed Development.

Background air pollutant concentrations corresponding to the 1 x 1km grid squares covering the study area were obtained from the latest 2018-based air pollutant maps provided by Defra (Defra, 2020). Background concentrations for the base year (2022) were obtained to establish baseline air quality conditions.

9.4.3 Construction Phase Assessment

An assessment of potential impacts associated with the construction phase was undertaken in accordance with the IAQM guidance (IAQM, 2016). A summary of the assessment process is provided below:

Construction phase assessment steps:

1. Screen the need for a more detailed assessment;
2. Separately for demolition, earthworks, construction and trackout:
    a. Determine potential dust emission magnitude;
    b. Determine sensitivity of the area; and,
    c. Establish the risk of dust impacts.
3. Determine site specific mitigation; and

4. Examine the residual effects to determine whether or not additional mitigation is required.

It should be noted that trackout is defined as the transport of dust and dirt from the construction site onto the public road network. Full details of the assessment methodology are provided in **Appendix 9.1**.

At this stage of the Proposed Development design, there is insufficient detail with regard to the construction of the development to enable construction phase traffic flows to be calculated. A Construction Environmental Management Plan (CEMP) will be produced for the development at post-determination stage which will include management of construction phase vehicle movements; this would minimise impacts on local air quality. It is therefore not anticipated that construction-phase vehicle movements would give rise to significant impacts at human or ecological receptors.

Defra technical guidance (Defra, 2018) states that emissions from Non-Road Mobile Machinery (NRMM)[4] used on construction sites are unlikely to have a significant impact on local air quality where relevant control and management measures are employed. As such, emissions from NRMM were not considered quantitively in this assessment, and the relevant control measures to be employed are detailed in **Section 9.8.2**.

[4] *Non-Road Mobile Machinery is defined as any mobile machinery, transportable industrial equipment or vehicle fitted with an internal combustion engine not intended for passenger or goods transport by road. Explanatory Memorandum to the UK Non Road Mobile Machinery (Emissions of Gaseous & Particulate Pollutants) (Amendment) Regulations (2006).*

9.4.4 Operational Phase Emissions Assessment

The Proposed Development will not include any on-site point sources of emissions, such as energy generation plant. The methodology for assessment of other operational phase emissions, both on site and off site, is detailed below.

9.4.4.1 Off-Site Emissions Sources

The site previously incorporated an anaerobic digestion facility. Two digestate lagoons (termed lagoon 2 and lagoon 4) are located within the site boundary, and a third lagoon (lagoon 3) is located outside the site boundary and situated on land outside the applicant's land ownership. A fourth lagoon, lagoon 1, is outside the site boundary but was not utilised as part of the anaerobic digestion operations and has been drained and infilled; this lagoon therefore is not a potential source of emissions. Lagoon 2 has been decommissioned and the land regraded, and lagoon 4, located within the main farm area, is small in scale and understood to be filled with rainwater. Therefore, there is also not expected to be any potential for emissions from these lagoons.

Lagoon 3, located to the south-west of the site, is a legacy asset, left over from a previous use of the site as an anaerobic digestion and energy recovery facility, and remains in the ownership of the previous owner of the farm, Mr William Luttman-Johnson. It has been identified as presenting potential risks to the surrounding environment as a result of its structure, size, location and potential for gas emissions. The Lagoon has a basal liner, underlain by impermeable Weald Clay, and there is a low-density polyethylene liner that covers the Lagoon surface, the edges of which are sealed in a trench along the crest of the Lagoon. The surface liner is inflated in parts, as a result of gases evolved from the digestate contained in the Lagoon. The potential risks to air quality, odour and associated public health that could arise from emissions to atmosphere from Lagoon 3 has been assessed separately in **Chapter 14**.

9.4.4.2 Development-Generated Road Traffic Emissions

The number of vehicle trips generated by the Proposed Development during its operation were screened using the criteria detailed in **Table 9-5** to determine whether a detailed air quality assessment was required.

Consideration was also given to potential impacts of emissions from vehicles on designated nature conservation sites. Impacts were screened using criteria provided in both the Natural England guidance (Natural England, 2018) and the JNCC guidance (Chapman & Kite, 2021). The assessment took into account the increase of vehicle movements and the distance to the receptor.

9.4.4.3 Operational Phase Odour Assessment

A qualitative odour assessment was undertaken to consider the potential for impacts to occur at nearby receptors as a result of operations at the farm hub, located to the north of the Proposed Development, which comprises the existing use of the farm. The farm hub will continue to include a small scale, low impact and low intensity livestock operation, which, depending on the activity, may produce odour. The assessment was undertaken using the risk-based source-pathway-receptor approach detailed in IAQM guidance (IAQM, 2018) to determine the odour impact. The approach is divided into a number of different steps, as follows:

Step 1 - Estimation of the odour-generating potential of the site activities, taking into account:

- The scale of release from the source (taking into account any mitigation measures in place);
- How odorous the emission is; and,

- The hedonic tone (pleasantness/unpleasantness) of the odour.

Step 2 - The scale of release from the source, taking into account:

- The distance from source to receptor;
- Whether receptors are downwind of the source;
- The effectiveness of odour dispersion from the point of release; and,
- The topography and terrain between source and receptor.

Step 3 - The source odour potential is combined with the pathway effectiveness to predict the risk of odour exposure at receptors, using the matrix in **Table 9-3**.

Table 9-3: Risk of odour exposure (impact) at the specific receptor location

		Source Odour Potential		
		Small	**Medium**	**Large**
Pathway effectiveness	Highly effective pathway	Low risk	Medium risk	High risk
	Moderately effective pathway	Negligible risk	Low risk	Medium risk
	Ineffective pathway	Negligible risk	Negligible risk	Low risk

Step 4 - The final step is to estimate the effect of the above impact on the receptor, taking into account its sensitivity, using the matrix in **Table 9-4**.

Table 9-4: Likely magnitude of odour effect at the specific receptor location

Risk of Odour Exposure	Receptor Sensitivity		
	Low	**Medium**	**High**
High risk of odour exposure	Slight adverse effect	Moderate adverse effect	Substantial adverse effect
Medium risk of odour exposure	Negligible effect	Slight adverse effect	Moderate adverse effect
Low risk of odour exposure	Negligible effect	Negligible effect	Slight adverse effect
Negligible risk of odour exposure	Negligible effect	Negligible effect	Negligible effect

Finally, having predicted the effect at individual representative receptors, the overall effect must be determined, taking into account the varying magnitude and the number of receptors experiencing the effects. IAQM guidance (IAQM, 2018) states that this should be undertaken by a competent and suitably experienced Air Quality Practitioner. This assessment was undertaken by members of the IAQM.

9.4.5 Operational Phase Odour Assessment

The IAQM assessment methodology (IAQM, 2018) determines the likely effect of odour impacts occurring at discrete receptors, with consideration of the overall effect with regard to the varying magnitude and number of receptors experiencing the effects. For the purposes of the assessment, where the overall effects are considered to be greater than ‘slight adverse’, these impacts are considered to be significant and would require the implementation of mitigation measures. Overall impacts of ‘slight adverse’ or lower are considered to be not significant.

9.4.6 Assessment Significance Criteria

9.4.6.1 Construction Phase Dust and Particulate Matter Assessment

In assessing the significance of construction dust impacts using the IAQM guidance (IAQM, 2016), the dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts prior to mitigation. Full details are provided in **Appendix 9.1**. Once appropriate mitigation measures were identified, the significance of construction phase impacts were determined.

9.4.6.2 Operational Phase Road Traffic Emissions Assessment

Human Health

The potential impact on local air quality of traffic movements generated by the Proposed Development were screened using the methodology detailed in the latest IAQM and EPUK guidance (IAQM and EPUK, 2017).

This document sets out criteria for increases in traffic flows for Light Duty Vehicle (LDV) and Heavy Duty Vehicle (HDV) movements, above which a detailed assessment of air quality impacts may be required. If increases in traffic flows are below the criteria, there are unlikely to be any significant air quality impacts as a result of the development and detailed assessment of air quality is not necessary.

If the criteria are exceeded, either a simple or detailed assessment should be undertaken. Where it can be concluded that a significant impact on local air quality is unlikely to occur, a simple assessment can be carried out. If significant impacts are possible, then detailed dispersion modelling may be required.

The assessment criteria are detailed in **Table 9-5**.

Table 9-5: IAQM and EPUK road traffic assessment criteria

Vehicle Type	Criteria
LDVs	A change in annual average daily traffic (AADT) of more than 100 within or adjacent to an AQMA, or more than 500 elsewhere
HDVs	An increase in HDV movements of more than 25 per day within or adjacent to an AQMA, or more than 100 elsewhere

Designated Nature Conservation Sites

IAQM guidance on assessment of impacts on ecological sites (IAQM, 2020) cites Natural England's guidance (Natural England, 2018) which references the screening criteria set out in the Design Manual for Road and Bridges (DMRB) document LA 105 – 'Air Quality' (Highways England, 2019). These criteria state that likely significant air quality effects may occur where the contribution of a project, either alone or in-combination with other plans or projects, exceeds 1,000 vehicles as an AADT flow on roads within 200m of a designated ecological site. Within this guidance, ancient woodlands are included within the definition of 'designated sites'.

Consideration was also given to the JNCC guidance which provides decision-making criteria to inform the assessment of air quality impacts on designated conservation sites (Chapman & Kite, 2021). This guidance focuses on the impact on European sites and A/SSSI, however, the guidance has also been applied to Ancient Woodlands for the purposes of this assessment. The criteria are intended to identify projects and plans for which a decision can be taken without the need for further assessment. The decision-making threshold (DMT) for road emissions is more stringent than the IAQM guidance (IAQM, 2020) with an

increase in project traffic contribution of 0.15% of existing AADT. The guidance also goes on to provide road-relevant thresholds based on the distance between the affected road and the nearest boundary of a European site. This approach details the increase in AADT required to trigger exceedance of 1 % of critical levels and critical loads as a function of distance from the edge of a road, as this is typically used as a threshold below which any effects can be regarded as insignificant.

9.5 Baseline Environment

9.5.1 Local Air Quality Management

The Proposed Development is not located within or in the vicinity of a statutory Air Quality Management Area (AQMA); the closest AQMA is located in Godalming, Waverley, approximately 14km to the north. The area is predominantly rural in nature with few pollutant sources.

9.5.2 Air Quality Monitoring

As mentioned previously, CDC undertakes ambient air quality monitoring within the district. A review of the most recent ASR (CDC, 2020) shows that there are no monitoring sites within the vicinity of the Proposed Development, with the closet location being DT21, approximately 14km south-west of the scheme. CDC undertakes PM_{10} monitoring at one automatic monitoring site approximately 29km south-west of the Proposed Development. Given the distance from the Proposed Development, concentrations monitored at these locations are not considered to be representative of conditions in the vicinity of the site and are therefore not reported.

CDC does not undertake any $PM_{2.5}$ monitoring within its area of jurisdiction.

9.5.3 Background Concentrations

2022 background concentrations of NO_2, PM_{10} and $PM_{2.5}$ were obtained from the latest 2018-based air pollutant concentration maps provided by Defra (Defra, 2020) for the grid squares covering the Proposed Development. Mapped background concentrations are detailed in **Table 9-6**.

Table 9-6: Background pollutant concentrations (µg.m^{-3})

Grid square	2022 Concentration (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$
499500,130500	6.10	12.05	8.03
500500,130500	6.40	12.37	8.15
501500,130500	6.41	12.06	8.03
502500,130500	6.67	12.09	8.16
499500,129500	6.07	12.31	8.06
500500,129500	6.11	12.04	7.98
501500,129500	6.19	12.28	8.06
502500,129500	6.23	12.62	8.15
499500,128500	6.10	12.15	8.01
500500,128500	6.07	12.27	8.02
501500,128500	6.17	12.89	8.20
502500,128500	6.21	13.13	8.26

Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ within the study area were ‘well below’ (less than 75% of) their respective annual mean AQO, which is to be expected in a rural area.

9.5.4 Identification of Receptor Locations

9.5.4.1 Construction Phase Dust and Particulate Matter Assessment

The IAQM guidance (IAQM, 2016) states that a Detailed Assessment is required if there are human receptors within 350m of the site boundary and / or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Internal guidance from Natural England recommends that ecological receptors within 200m of a site should be considered in a construction dust and particulate matter assessment, as opposed to only those ecological sites within 50m of the site (as stated in IAQM guidance). There are several AWs within the site boundary (Hardnip's Copse AW, Rumbold Wood AW and Limekiln Wood AW), there are also two unnamed AWs located approximately 70m and 160m from Rickman's Lane, which would be used by construction vehicles. The closest human receptors to construction phase works are located within 350m of the site, there are also some receptors located along Rickman's Lane. A Detailed Assessment was therefore required. The distance boundaries for the construction phase assessment are detailed in **Figure 9-1**.

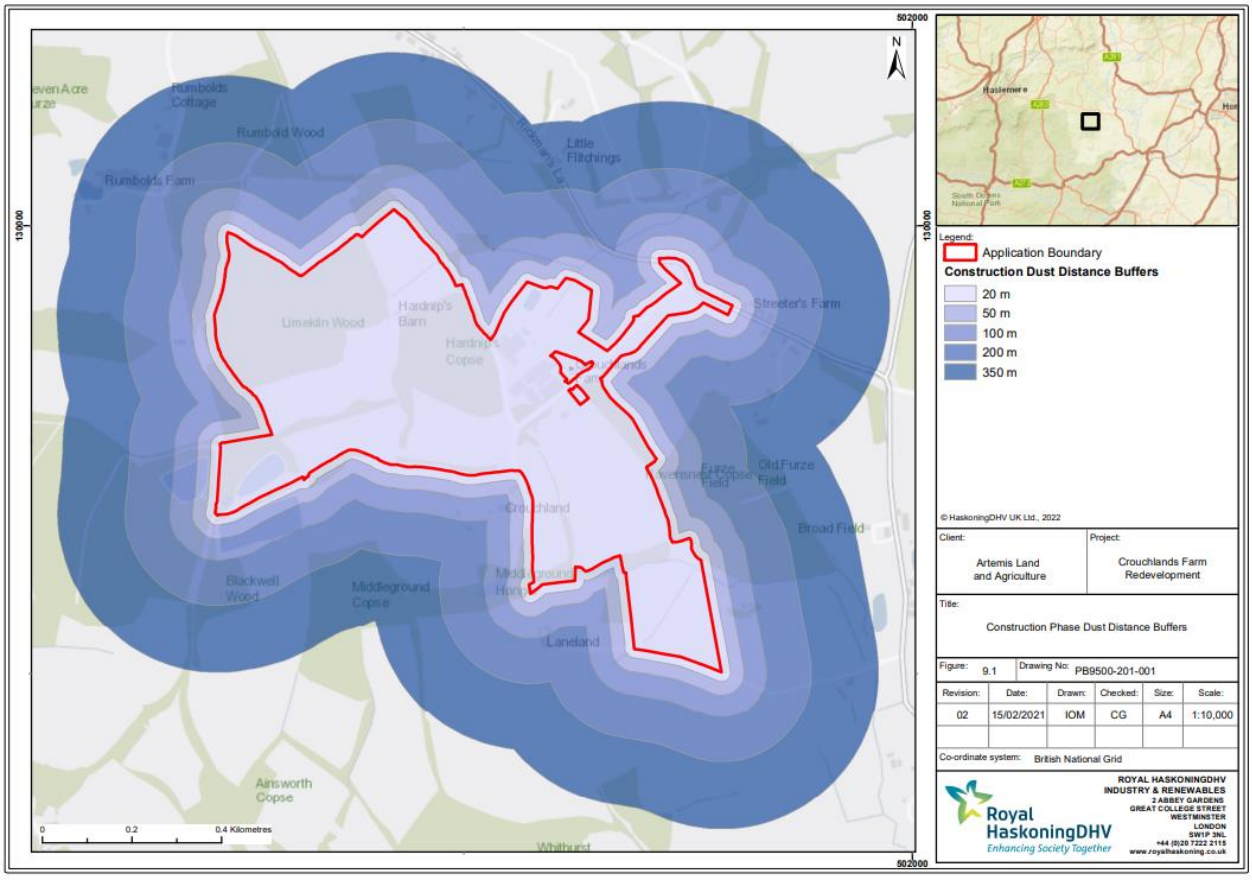


Figure 9-1: Construction Phase Dust Distance Buffers

9.5.4.2 Operational Phase Road Traffic Emissions Assessment

Human Receptors

There are a few scattered residential properties present along Rickman's Lane and at least one within 10m of the site boundary. The Proposed Development also includes a small number of units for student / staff accommodation for health, safety and security purposes, which were included as sensitive receptors for the purposes of the assessment. The area is predominantly rural, with residential dwellings set back from the road.

Ecological Receptors

MAGIC map[5] was used to identify ecological receptors in close proximity to the Proposed Development. **Table 9-7** details the nearest ecological receptors to the Proposed Development.

Table 9-7 Nearest ecological receptors to the Proposed Development

Site name	Designation	Habitat	Sensitive to traffic emission	Approximate Distance to Proposed Development	Direction from Proposed Development
Hardnip's Copse	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	Within the site boundary	-
Ravensnest Copse	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	Within the site boundary	-
Rumbold Wood	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	Within the site boundary	-
Limekiln Wood	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	Within the site boundary	-
Unnamed	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.06km	North-east
Unnamed	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.16km	North
Beggar'sCopse, Plaistow Wood	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.59km	North-west
Unnamed	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.61km	North-east
Foxbridge Plantation, Pitchgate Hangar & Copse	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.84km	North
Unnamed	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	0.95km	North-east
Berry Field Copse, Nell Ball Copse	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	1km	North-west

[5] *MAGIC website operated by DEFRA: https://magic.defra.gov.uk/*

Site name	Designation	Habitat	Sensitive to traffic emission	Approximate Distance to Proposed Development	Direction from Proposed Development
Quennell House Copse	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	1km	North
Chiddingfold Forest	SSSI	Broadleaved, mixed and yew woodland	Yes	1.3km	North-west
Ashpark Wood	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	2.1km	North-west
Kingspark Wood	Ancient Woodland	Broadleaved, mixed and yew woodland	Yes	2.3km	North-west
Ebernoe Common	SSSI / SAC	Broadleaved, mixed and yew woodland	Yes	2.7km	South-west

The above-mentioned ecological sites are shown on **Figure 9-2**. The search also identified a number of AWs which are located in close proximity to the site but >200m from the roadside as well as a number of unnamed woodlands present along roads which may be used by development generated traffic; however, they are located at some considerable distance from the Proposed Development.

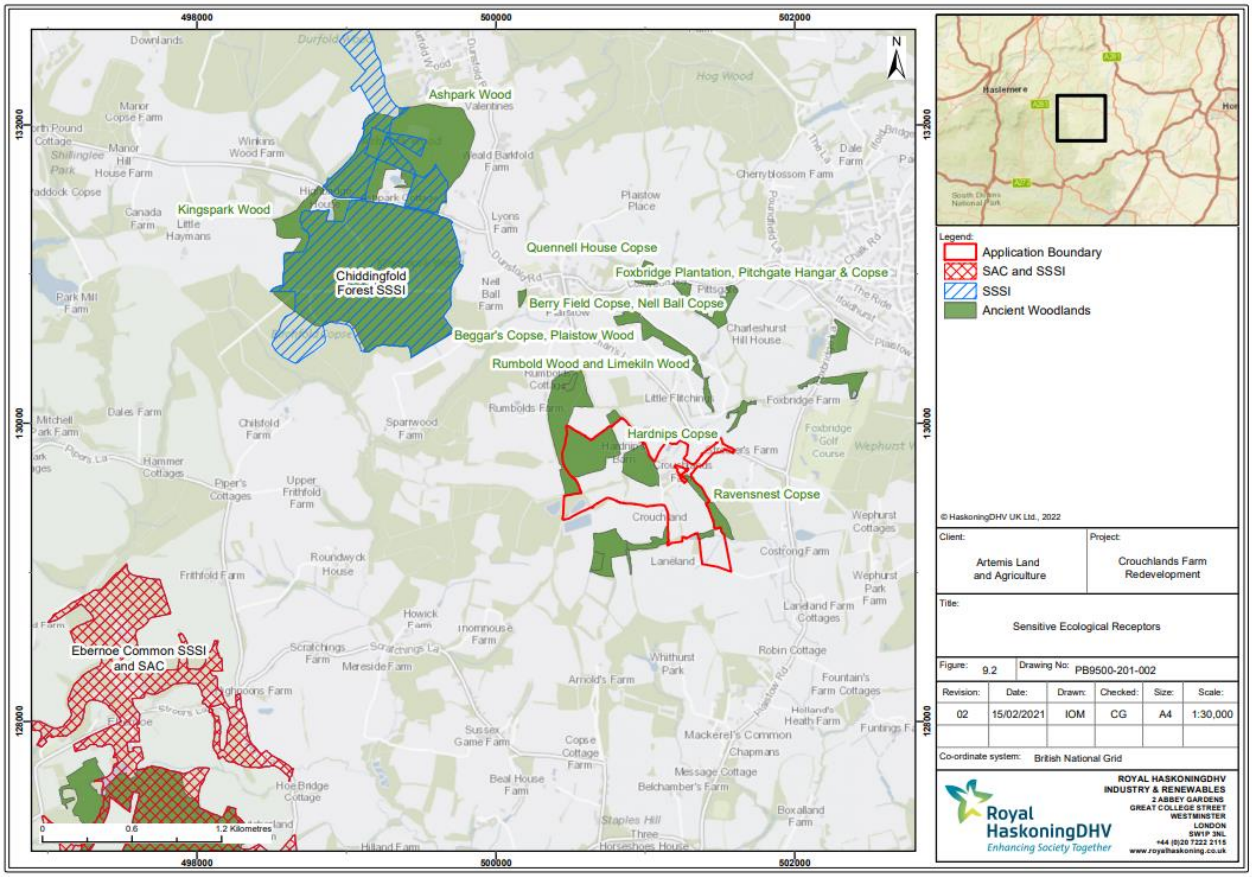


Figure 9-2: Sensitive Ecological Receptors

9.5.4.3 Operational Phase Odour Assessment

The odour assessment considered the closest receptors in all directions from the Farm Hub activities, as detailed in **Table 9-8**.

Table 9-8: Nearest receptors to the Farm Hub

Receptor ID	Receptor Location	Type	Approximate Distance to Farm Hub	Direction from Farm Hub
R1	Rumbolds Farm	Residential	935m	North-west
R2	Glamping facilities, onsite (North)	Residential[6]	280m	North
R3	Glamping facilities, onsite (West)	Residential	240m	West
R4	Residential accommodation (for staff and students)	Residential	51m	South-east
R5	Moores Green Cottage, Rickman's Lane	Residential	120m	South-east
R6	Crouchlands House	Residential	326m	South
R7	Birchlands, Rickman's Lane	Residential	450m	East
R8	Rickman's Lane	Residential	392m	North-east

9.6 Potential Impacts During Construction

9.6.1 Construction Dust and Particulate Matter Emissions

9.6.1.1 Impact Assessment

A qualitative assessment of construction phase dust and PM_{10} emissions was carried out in accordance with IAQM guidance (IAQM, 2016). Full details of the methodology and dust assessment undertaken are provided in **Appendix 9.1**.

The construction works associated with the Proposed Development have the potential to impact on local air quality conditions as follows:

- Dust emissions generated by demolition, excavation, construction and earthwork activities associated with the construction of the Proposed Development have the potential to cause nuisance to, and soiling of, sensitive receptors;
- Combustion emissions (especially NO_2, but also $PM_{2.5}$ and PM_{10}) generated by construction traffic travelling on the local road network have the potential to adversely impact local air quality at sensitive receptors situated adjacent to the routes utilised by construction vehicles; and
- Emissions of NO_2, $PM_{2.5}$ and PM_{10} from non-road mobile machinery (NRMM) operating within the Proposed Development site have the potential to adversely impact local air quality at sensitive receptors in close proximity to the works.

The potential for sensitive receptors to be affected will depend on where the dust-generating activity takes place within the application site, the nature of the activity and mitigation measures in place (controls), the meteorological dispersion conditions and the distance of the receptor from the dust emission source.

[6] *Use of the glamping facilities will be of short duration and are not permanent residence, however best fit the description of a residential receptor*

As described in **Section 9.4.3**, emissions from NRMM have not been considered in the assessment, but the relevant control and management measures are included in **Section 9.8.2**.

Step 1: Screen the need for a Detailed Assessment

The IAQM guidance states that a Detailed Assessment is required if there are human receptors located within 350m and ecological sites within 200m (from Natural England internal guidance) of the site boundary. There are human receptors present within 350m of the site boundary and ecological receptors adjacent to and within the site boundary, therefore a Detailed Assessment was undertaken.

Step 2A: Define the Potential Dust Emission Magnitude

The IAQM guidance recommends that the dust emission magnitude is determined for demolition, earthworks, construction and trackout. The dust magnitudes for these activities were determined from site plans and in accordance with the IAQM methodology, and are summarised in **Table 9-9**.

Table 9-9: Dust emission magnitude for the site

Construction Activity	Dust Magnitude	Justification
Demolition	Small	The Proposed Development would retain and refurbish a number of buildings on site, with few required to be demolished. As such it was assumed that the total volume of buildings to be demolished was less than 20,000m^2
Earthworks	Large	Total site area >10,000m^2.
Construction	Large	The rural food and retail and equestrian elements of the scheme would consist of new buildings. The total building volume was estimated to be greater than 100,000m^3.
Trackout	Large	There are anticipated to be >50 outward HDVs in any one day.

The risk of potential impact of construction phase dust and PM_{10} emissions during demolition, earthworks, construction and trackout is used to recommend appropriate mitigation measures. The dust magnitude for construction activities was categorised as '**Small'** for demolition and '**Large**' for earthworks, construction and trackout.

Step 2B: Define the Sensitivity of the Area

The sensitivity of human and ecological receptors to dust soiling and human health effects of PM_{10} associated with demolition, earthworks, construction and trackout activities during construction of the Proposed Development were determined and are summarised in **Table 9-10**.

Sensitivity of People to Dust Soiling

- Demolition, earthworks and construction: there are between 1 and 10 high sensitivity residential receptors within 350m of the site boundary. The sensitivity is therefore **low**.
- Trackout: there are between 1 and 10 high sensitivity residential receptors within 50m of access roads, up to 500m from the site. The sensitivity is therefore **low**.

Sensitivity of People to Health Effects of PM_{10}

- Demolition, earthworks and construction: the annual background PM_{10} concentration at the site is less than 24µg.m^{-3}, and there are between 1 and 10 high sensitivity residential receptors within 350m of the site boundary. The sensitivity is therefore **low**.
- Trackout: the annual background PM_{10} concentration at the site is less than 24µg.m^{-3}, and there are between 1 and 10 high sensitivity residential receptors within 50m of the routes that construction vehicles will use to access the site, up to 500m from the site. The sensitivity is therefore **low**.

Sensitivity of Ecological Receptors to Dust Soiling

- Demolition, earthworks and construction: There are several AWs within the site boundary which are classed as locally designated sites and therefore a low sensitivity receptor. The sensitivity is therefore **low**.
- Trackout: There are no designated sites within 500m of the site access / exits which are within 50m of the road. As such, there are not anticipated to be any impacts on these sites as a result of trackout.

Table 9-10: Outcome of defining the sensitivity of the area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Low
Human Health	Low	Low	Low	Low
Ecological Effects	Low	Low	Low	N/A

Step 2C: Define the Risk of Impacts

The dust emission magnitude detailed in **Table 9-9** is combined with the sensitivity of the area detailed in **Table 9-10** to determine the risk of impacts with no mitigation applied. The risks concluded for dust soiling, human health and ecological effects are provided in **Table 9-11**.

Table 9-11: Summary dust risk table to define site-specific mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low risk	Low risk	Low risk	Low risk
Human Health	Low risk	Low risk	Low risk	Low risk
Ecological Effects	Low risk	Low risk	Low risk	N/A

The risk of dust soiling impacts and impacts on human health during the construction phase were therefore described as '**low risk**' for all activities. Step 3 and Step 4 of the guidance, which are the 'site specific mitigation' and 'determining the significant effects', are discussed in **Section 9.8.2** of this report.

9.6.1.2 Dust Mitigation

Step 3: Site-Specific Mitigation

Step three of the IAQM (IAQM, 2016) guidance identifies appropriate site-specific mitigation. These measures are related to the site risk for each activity.

The dust assessment determined that there was a risk of impacts resulting from construction activities without the implementation of mitigation measures. The IAQM guidance document also suggests a number of dust mitigation measures which could be implemented to reduce potential adverse effects associated with high, medium and low risk sites. It is recommended that the good practice measures outlined in the IAQM guidance are followed. In addition, best practice measures relating to control of emissions from NRMM are also included, as specified in Defra technical guidance (Defra, 2018).

The recommendations below should be detailed in a Dust Management Plan (DMP) as part of the CEMP to prevent or minimise the release of dust and / or dust being deposited at nearby receptor locations. Particular attention should be given to operations which shall unavoidably take place close to the site boundary. The effective implementation of the DMP will ensure that any potential dust releases associated with the construction phase will be reduced.

Highly Recommended Mitigation Measures

A list of mitigation measures that are highly recommended for a **low risk** site, as determined by Step 2 of the dust assessment, by the IAQM are provided below.

Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

Dust Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to CDC when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the CDC when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Avoid site runoff of water or mud.

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g., suitable local exhaust ventilation systems).
- Ensure an adequate water supply on the site for effective dust / particulate matter suppression / mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Avoid bonfires and burning of waste materials.

Measures Specific to NRMM

NRMM and plant would be well maintained. If any emissions of dark smoke occur, then the relevant machinery should stop immediately, and any problem rectified. In addition, the following controls should apply to NRMM:

- All NRMM should use fuel equivalent to ultralow sulphur diesel (fuel meeting the specification within EN590:2004);
- All NRMM should comply with the appropriate standards;
- All NRMM will be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- The ongoing conformity of plant retrofitted with DPF, to a defined performance standard, should be ensured through a programme of onsite checks; and,
- Fuel conservation measures should be implemented, including instructions to (i) throttle down or switch off idle construction equipment; (ii) switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded and (iii) ensure equipment is properly maintained to ensure efficient fuel consumption.

Desirable Mitigation Measures

A list of desirable mitigation measures that are recommended for a **low risk** site, as determined by Step 2 of the construction dust and particulate matter assessment, by the IAQM are provided below.

Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.

Dust Management

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to CDC when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Measure Specific to Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.

- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- The implementation of the appropriate mitigation measures will reduce the magnitude of dust emissions and the likelihood of their occurrence. The residual impacts from construction are considered to be **not significant**, in accordance with IAQM guidance (IAQM, 2016).

9.6.1.3 Residual Impacts

Step 4: Determine Significant Effects

With the implementation of the above mitigation measures, the residual impacts from the construction phase of the Proposed Development are considered to be **not significant**, in accordance with IAQM guidance (IAQM, 2016).

9.7 Potential Impacts During Operation

9.7.1 Operational Phase Road Traffic Emissions

9.7.1.1 Impact Assessment

Human Health

The number of vehicles generated by the Proposed Development during the operational phase was calculated by the project transport consultants. These calculations are based on the total number of vehicles expected to be generated during a typical weekday and weekend. To ensure assessment of reasonable 'worst-case' conditions, the Transport Assessment has assumed the most intense type of event will take place every weekend. In reality, events will fluctuate seasonally and some will result in much lower traffic flows than those detailed in **Table 9-12** below. The trip generation figures are therefore considered to be robust. The calculated number of average two-way LDV and HDV vehicle movements to the north and south of the site access on Rickman's Lane for a typical weekday and weekend are detailed in **Table 9-12**.

The equestrian centre would also hold infrequent special events. Due to the infrequency of these events and, as it is assumed that they would be considered via temporary events notices, their impact in traffic terms has not been considered.

Table 9-12: Development-generated daily two-way traffic flows

Period	Rickman's Lane Northbound		Rickman's Lane Southbound	
	LGVs	HGVs	LGVs	HGVs
Weekday	350	15	350	15
Weekend	370	160	370	160

As shown in Table **9-12**, the number of development-generated vehicles were below the IAQM and EPUK screening criteria detailed in **Table 9-5** on all road links on a typical weekday. The HGV threshold is exceeded when events take place; however, as an AADT flow the criterion would not be exceeded. Impacts of development-generated traffic flows are therefore considered to be insignificant.

In accordance with IAQM and EPUK guidance, a detailed air quality assessment is not considered to be required and the impact of development-generated traffic emissions at human receptors is considered to be **negligible** and **not significant**.

Designated Nature Conservation Sites

As shown in **Table 9-12**, the number of vehicles generated by the Proposed Development are well below the screening criterion of 1,000 AADT identified by Natural England (Natural England, 2018) and the IAQM (IAQM, 2020) as the threshold at which impacts on designated ecological sites may occur. However, this threshold should be applied to in-combination traffic flows with other plans and projects in the area.

The JNCC guidance (Chapman & Kite, 2021) also requires consideration of in-combination impacts and sets out more stringent screening criteria. It should be noted that the JNCC guidance is aimed at assessment of cumulative impacts upon European designated sites and A/SSSI; however, the guidance has also been applied to Ancient Woodlands for the purposes of this assessment. As detailed in **Section 9.4.6.2**, the guidance provides a DMT of 0.15% of existing AADT and road-relevant thresholds based on the distance between the affected road and the nearest boundary of a European site.

The transport study area does not extend beyond Plaistow and Kirdford; as such, there are no details of trip distribution from the Proposed Development onto roads which pass through Chiddingfold Forest SSSI and Ebernoe Common SAC/SSSI. In the case of these sites, it is assumed that development-generated traffic may travel along routes which run adjacent to or through both sites. As such, the distance-based thresholds cannot be applied and only the DMT is applicable.

Due to the rural nature of the area, the roads surrounding the site experience low baseline traffic flows. As such, it can be assumed the scheme would cause an exceedance the criterion of 0.15% of current AADT flows on the road link which passes through the Chiddingfold Forest SSSI. Ebernoe Common SAC/SSSI is located at a greater distance from the site, and it is expected that development-generated traffic would have dispersed further before travelling along roads adjacent to this site; however, in the absence of distribution data it is assumed, on a precautionary basis, that the 0.15% DMT would be exceeded. Exceedance of this threshold signifies the requirement for further assessment in combination with other plans and projects.

Two committed developments were identified as having the potential to result in cumulative impacts with the Proposed Development. These are detailed in **Section 13** and summarised as follows:

- Land on The East Side of Plaistow Road Kirdford West Sussex (planning ref: 21/01355/FUL) located approx. 2.4km to the south of the site.
- Land South West of Guildford Road Loxwood West Sussex (planning ref: 20/01481/FUL) located 3.4km to the northeast of the site.

Both of the above planning applications are accompanied by a Habitats Regulations Assessment (HRA) Screening Matrix and Appropriate Assessment Statement. The assessment for the Land on The East Side of Plaistow Road identified the scheme as having the potential to significantly impact a European site through water resource only. The Land South West of Guildford Road lies within a buffer area of a European Site protected under the Habitats Directive. However, it was deemed the development would not result in a significant effect on the qualifying features of a European Site. Therefore, emissions to air generated from both sites are not classed as posing a significant risk to designated nature conservation sites in the local area.

A Transport Assessment was not provided with the application documentation for the cumulative projects, and therefore it was not possible to identify the trip generation and distribution figures associated with either project. However, as both are small in scale with the largest of the two approved for 54 dwellings, it can be assumed development traffic associated with both schemes will be relatively low. In addition to this, the developments are located at distance from the Proposed Development (>2.4km) and roads surrounding the Proposed Development are minor and unlikely to be primary routes used by the cumulative development

traffic. It is therefore assumed there will not be a cumulative impact from project-generated traffic in-combination with the committed schemes and, traffic flows will remain well below the Natural England screening criterion of 1,000 AADT. Furthermore, the AWs located off Rickman's Lane, which will experience the highest increase in development-generated traffic flows, are located 70m and 160m from the road. As pollutant concentrations decrease rapidly with distance from the road edge, it is not expected that any significant impacts would occur at this distance and the distance-based DMTs presented in the JNCC guidance are unlikely to be exceeded (Chapman and Kite, 2021).

Hardnip's Copse AW, Rumbold Wood and Limekiln Wood are located within the boundary of the Proposed Development. Emissions from vehicles moving around the site and within on-site parking areas may affect these sites. However, as mentioned above, the total number of trips generated by the Proposed Development as a whole are below the Natural England screening criteria (Natural England, 2018), and therefore the number of vehicle movements to each of the parking areas in the vicinity of AWs would be lower still. In addition, intermittent emissions of a short duration in parking areas close to AWs, experienced predominantly during daytime hours, are unlikely to have a significant effect in the context of annual mean impacts.

The Proposed Development includes provision for routes through Hardnip's Copse for buggies travelling to and from the glamping areas; however, these buggies would be electrically powered and would therefore not generate emissions within the AW.

In accordance with Natural England and IAQM guidance, a detailed air quality assessment is not considered to be required. The scheme exceeds the DMT detailed in the JNCC guidance, however, it is not considered there will be an in-combination impact with committed developments in the local area on designated sites. The impact of development-generated traffic emissions at designated conservation sites is considered to be **negligible** and **not significant**.

9.7.1.2 Mitigation

Operational phase impacts of the Proposed Development are not expected to be significant and therefore mitigation measures are not required. However, the design of the Proposed Development includes a number of features which will promote sustainable modes of transport and minimise emissions, including:

- Car parking areas are proposed to include 20% of the total parking provision for electric vehicle charging facilities which will encourage the use of low-emission transport options and be beneficial for air quality;
- A travel plan will be produced with commitments to encourage car sharing and reduce vehicle usage;
- Photovoltaic systems will be provided to generate renewable power onsite, and
- Public rights of way will be repaired and reinstated to encourage nearby users to walk to the site.

9.7.1.3 Residual Impact

The residual impact of road traffic emissions associated with the operational phase of the Proposed Development are considered to be **not significant**, in accordance with the following guidance: IAQM & EPUK (IAQM & EPUK, 2017, IAQM), IAQM (IAQM, 2020) and JNCC (Chapman & Kite, 2021).

9.7.2 Operational Phase Odour Emissions

9.7.2.1 Impact Assessment

The Farm Hub is located north of the Proposed Development and includes approximately 2,000m^2 of refurbished agricultural buildings, and will mainly comprise existing operations at Crouchlands Farm. The Farm Hub has been purposely designed for a low intensity livestock operation, which, depending on the activity, may produce odour. A risk-based assessment was undertaken to determine the potential odour effects of the Farm Hub operations in accordance with IAQM guidance (IAQM, 2018).

The first step of the assessment requires an estimation of the odour-generating potential of the site activities, taking into account the magnitude of release, how inherently odorous the release is and the relative pleasantness/unpleasantness of the odour (hedonic tone).

The principal source of odour as a result of Farm Hub will be from the livestock; however, the effect would be sporadic depending on the activity (e.g., mucking out), the time of day and the duration. Given that the Proposed Development is located within a rural environment, with several farms in the vicinity, it is expected that odours associated with the Farm Hub would not be distinct from the existing odour character of the area, particularly as the site is currently used for agricultural practices. Furthermore, given the scale of the activities and that they would be high-welfare and low intensity, it is not anticipated that significant odour would be generated.

Given the above, although the potential for odours is short-lived and intermittent, the overall source odour potential is considered to be **small** based on the nature of the odour and character of the area.

The second step of the assessment requires consideration of the effectiveness of the odour pathway. The closest receptors to the Proposed Development were identified and presented in **Table 9-8** and **Figure 9-3**.

As shown in **Table 9-8** and **Figure 9-3**, the closest receptors are R4 and R5 located south-east of the Farm Hub. Within the UK, the prevailing wind is from the south-west; as such, these receptors would be upwind of the odour source. Receptor R8 is situated further from odour source, however it is located downwind. The odour pathway is considered to be **Moderately Effective** at receptors R4, R5 and R8 due to their respective proximity or location downwind of the source. All other receptors are situated upwind of the Farm Hub and therefore the odour pathway is considered **Ineffective** at these receptors.

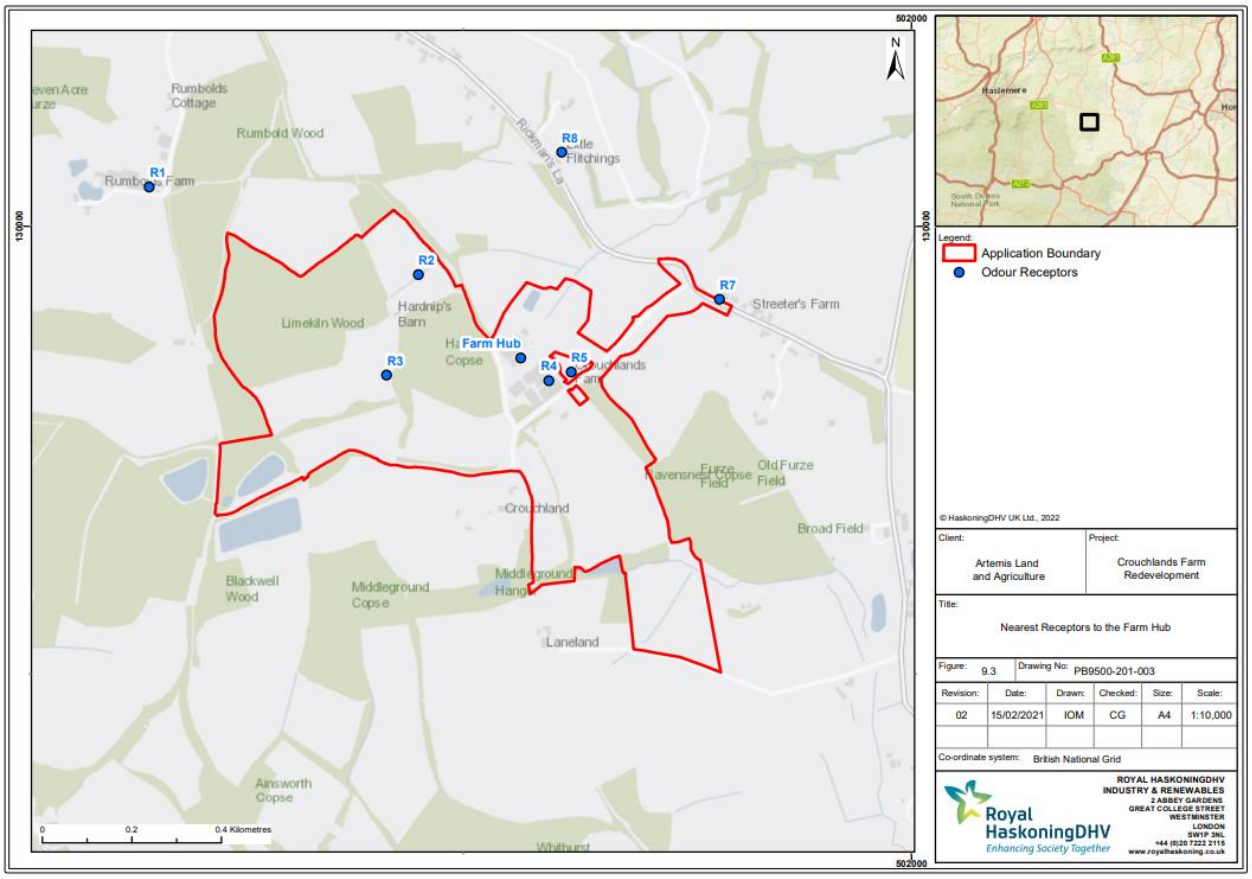


Figure 9-3: Nearest Receptors to the Farm Hub

The source odour potential is then combined with the pathway effectiveness to determine the risk of odour effect, using the matrix provided in **Table 9-3**. The sensitivity of the receptor is then included to determine the likely odour effect at each receptor, as detailed in **Table 9-4**. This is summarised in **Table 9-13**.

Table 9-13: Summary of likely odour effects at receptors

Receptor ID	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Receptor Sensitivity	Likely Odour Effect
R1	Low	Ineffective pathway	Negligible risk	High sensitivity	Negligible effect
R2	Low	Ineffective pathway	Negligible risk	High sensitivity	Negligible effect
R3	Low	Ineffective pathway	Negligible risk	High sensitivity	Negligible effect
R4	Low	Moderately effective pathway	Negligible risk	High sensitivity	Negligible effect
R5	Low	Moderately effective pathway	Negligible risk	High sensitivity	Negligible effect
R6	Low	Ineffective pathway	Negligible risk	High sensitivity	Negligible effect
R7	Low	Ineffective pathway	Negligible risk	High sensitivity	Negligible effect
R8	Low	Moderately effective pathway	Negligible risk	High sensitivity	Negligible effect

The assessment identified that there would be a negligible effect of odour impact at all receptors. As such, the overall effect is considered to be **not significant.**

9.7.2.2 Mitigation

The impact assessment showed that there would be a negligible effect of odour at all receptors. As such, mitigation measures are not considered to be required.

9.7.2.3 Residual Impact

As mitigation measures are not considered to be necessary based on the negligible impacts experienced, the residual impact is **not significant**.

9.8 Summary

This air quality report was prepared as part of a planning application for the proposed Crouchlands Farm redevelopment at Crouchlands Farm, Plaistow. The assessment considered the potential for the Proposed Development to impact on local air quality during its construction and operation.

The impact of the construction of the Proposed Development was considered in accordance with the latest guidance available from the Institute of Air Quality Management (IAQM, 2016). The assessment defined the sensitivity of the area and the risk of the construction of the development to cause dust and particulate matter impacts. Site-specific mitigation was recommended and with the implementation of this mitigation, the residual impacts from construction activities were considered to be **not significant** in accordance with IAQM guidance.

Development-generated traffic flows were screened to determine the requirement for further assessment. The number of trips generated by the development were below the relevant criteria in IAQM and EPUK guidance (IAQM and EPUK, 2017) on all affected roads. A simple assessment was therefore undertaken, and it was determined that significant air quality impacts were unlikely to occur given that air quality in the area is generally good and there is a very limited risk of the AQOs being exceeded. The number of traffic movements, in-isolation or in-combination with committed developments, were also not expected to lead to significant impacts on designated ecological sites, and all impacts were considered to be **not significant**.

Operational phase odour emissions from Farm Hub were considered using the risk-based assessment methodology detailed in IAQM guidance (IAQM, 2018). Given the nature and scale of the odour source, the existing character of the area and location of receptors with regard to prevailing wind conditions, the effect of any potential odour was considered to be **not significant.**

10 Noise and Vibration

10.1 Introduction

This chapter of the EIA Report considers the likely effects of the Proposed Development with respect to noise and how this could affect human health and the natural and built environment. It describes the methods used to assess potential effects, the baseline conditions currently existing within the Proposed Development's footprint and surrounding area. The mitigation measures required to prevent, reduce or off-set any significant adverse effects are presented together with the likely residual effects after these measures have been adopted.

10.2 Planning Policy and Guidance

10.2.1 Planning Policy

This report provides information relevant to the local planning authority, CDC, and its consultees as part of a planning application for the Proposed Development. Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF)[7].

With regard to noise and planning, the NPPF contains the following short statements in paragraphs 174 (part e) and 185 (parts a & b) and longer explanatory text (paragraph 187) regarding integration of developments:

Paragraph 174

e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.*

Paragraph 185

a) Mitigate and reduce to minimum potential adverse effects resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Paragraph 187

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities. Existing businesses and facilities should not have unreasonable restrictions placed upon them as a result of development permitted after they were established, Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant should be required to provide suitable mitigation before the development is completed.

The National Planning Practice Guidance (NPPG)[8] web-based resource was originally launched by the Department for Communities and Local Government (DCLG) on 6th March 2014[9], to support the National Planning Policy Framework and make it more accessible. The overall aim of the guidance, tying in with the

[7] *Ministry of Housing, Communities & Local Government, National Planning Policy Framework, February 2019, Her Majesty's Stationary Office, UK*
[8] *National Planning Practice Guidance: Noise, Ministry of Housing, Communities and Local Government, Last updated 22nd July 2019, last accessed 29th March 2021, https://www.gov.uk/guidance/noise--2*
[9] *Ministry now responsible for update of guidance is the Ministry of Housing, Communities and Local Government*

principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England[10], is to '*identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.'*

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the NPPG and reproduced in **Section 10.4.**

10.2.2 Local Policy Guidance

10.2.2.1 Chichester Local Plan: Key Policies 2014-2029[11]

The currently adopted Chichester Local Plan (CLP) outlines development management policies relating to or include clauses incorporating noise. The most relevant policies and sections to noise within the CLP are detailed below.

Policy 40, Clause 10

The reduction of impacts associated with traffic or pollution (including air, water, noise and light pollution) will be achieved, including but not limited to the promotion of car clubs and facilities for charging electric vehicles.

10.2.2.2 Planning Noise Advice Document: Sussex (March 2021)

This document is adopted by CDC and provides advice for developers to assist in making a planning application having regard to noise. This document outlines the appropriate British Standard or guidance document for various noise source types to be employed in the assessment and the criteria accepted by the CDC.

10.2.2.3 Camping and Glamping Technical Advice Note

The Camping and Glamping Technical Advice Note (TAN)[12], authored by the South Downs National Park is a guidance document released in 2021. It provides guidance on potential noise impacts associated with camping and glamping sites. The TAN was provided alongside the consultation response from the Environmental Protection Officer at CDC as guidance for the considerations to be considered for an example site management plan to reduce potential noise impacts at nearby existing premises. It should be noted that although this TAN is referenced, the Proposed Development site is outside the boundary of the South Downs National Park

10.2.2.4 Assessment Guidance

The guidance outlined in **Table 10-1** were employed for the noise impact assessment.

[10] *Department for Environment, Food and Rural Affairs (DEFRA), Noise Policy Statement for England (NPSE), March 2010, DEFRA, UK*
[11] *Chichester District Council, Chichester Local Plan: Key Policies 2014-2029, https://www.chichester.gov.uk/newlocalplan*
[12] *South Downs National Park Authority, Camping and Glamping Technical Advice Note, Published July 2021*

Table 10-1 Noise assessment methodology guidance

Document	Policy / guidance purpose
British Standard 4142:2014+A1:2019 – Method for Rating and Assessing Industrial and Commercial Sound (BS 4142)[13]	BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be outside a dwelling or premises used for residential purposes upon which sound is incident.
British Standard 5228-1:2009+A1:2014 Parts 1 and 2 - Code of Practice for Noise and Vibration Control on Construction and Open Sites (BS 5228)[14]	These documents provide recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The legislative background to noise and vibration control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and Local Planning Authorities. This British Standard provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.
British Standard 7445-1:2003 and BS 7445-2:1991 – Description and Measurement of Environmental Noise (BS 7445)[15]	Provides details of the instrumentation and measurement techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level (LAeq). BS 7445-2 replicates International Standards Organisation (ISO) 1996-2:1987.
British Standard 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings (BS 8233)[16]	Provides a methodology to calculate the noise levels entering a building through facades and façade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise levels which are provided for a variety of situations.
Building Bulletin 93 - Acoustic design of schools: performance standards (February 2015) (BB93)[17]	This guidance provides the minimum performance standards for the acoustics of school buildings to provide suitable internal noise levels within teaching spaces (such as the proposed Education Centre). At levels of education above secondary school, the document provides non-mandatory guidance to appropriate internal noise levels within the individual teaching areas.
Calculation of Road Traffic Noise, 1988 (CRTN)[18]	Provides a method for assessing noise from road traffic in the UK and a method of calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since publication in 1988 this document has been the nationally accepted standard in predicting noise levels from road traffic. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, accounting for the percentage of heavy goods vehicles (HGV), different road surfacing, inclination, screening by barriers and relative height of source and receiver.
Design Manual for Roads and Bridges, 2020 (DMRB)[19]	LA111 Noise and Vibration, Revision 2 (formerly HD 213/11, IAN 185/15) provides guidance on the environmental assessment of noise impacts from road schemes. DMRB contains advice and information on transport-related noise and vibration, which has relevance regarding the construction and operational traffic impacts affecting sensitive receptors adjacent to road networks. It also provides guideline significance criteria for assessing traffic related noise impacts.

[13] *British Standard 4142: 2014 +A1:2019, Methods for rating and assessing industrial and commercial sound*, 2019, BSI Standards Publication, UK
[14] *British Standard 5228: 2009 +A1:2014, Code of practice for noise and vibration control on construction and open sites – Part1 Noise, Part 2 Vibration*, 2014, BSI Standards Publication, UK
[15] *British Standard 7445-2: 1991, Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*, 1991, BSI Standards Publication, UK
[16] *British Standard 8233: 2014, Guidance on sound insulation and noise reduction for buildings, 2014*, BSI Standards Publication, UK
[17] *Acoustic design of schools: performance standards (Building bulletin 93),* 2015, Department for Education & Education Funding Agency, UK
[18] *Calculation of Road Traffic Noise, 1988, Department of Transport (Welsh Office), UK*
[19] *Design Manual for Roads and Bridges: LA 111 Noise and Vibration Revision 2, 2020, Highways England, UK*

Document	Policy / guidance purpose
Institute of Environmental Management & Assessment Guidelines for Environmental Noise Impact Assessment (November 2014) (IEMA)[20]	Provides guidance on undertaking an environmental noise impact assessment in addition to setting out current good practice for the scope, content and methodology of the assessment in order to facilitate greater transparency between assessments.
International Standards Organisation ISO 9613-2:1996 (ISO 9613)[21]	Specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a noise source.
ProPG: Planning & Noise (ProPG)[22]	The ProPG document is intended to supplement the NPPF and provide guidance on a recommended approach to the management of noise within the planning system in England for new residential development. It proposes a 2-stage approach for assessing the suitability of a site using an initial site noise risk assessment followed by a systematic consideration of: Good Acoustic Design Process; Noise Level Guidelines; External Amenity Area Noise Assessment; and Other Relevant Issues.
World Health Organisation Guidelines for Community Noise, 1999 (WHO 1999)[23]	These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55 dB L_{Aeq} during the day, related to annoyance, and 45 dB L_{Aeq} or 60 dB L_{Amax} at night, related to sleep disturbance.
World Health Organisation Environmental Noise Guidelines for the European Region, 2018 (WHO 2018)[24]	The guidance states: "The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise."

10.3 Consultation

The Proposed Development lies within the administrative boundary of CDC. Consultation was undertaken with the Environmental Protection Officer via email[25] to agree the methodologies for the baseline noise survey and noise impact assessment.

During consultation it was confirmed that the effects of the COVID-19 pandemic on the prevailing noise environment are not likely to be significant due to the rural nature of the area surrounding the Proposed Development. The agreed approach will assess the potential noise sources in accordance with the relevant guidance, as outlined in Annex 1 of the Planning Noise Advice Document: Sussex.

An additional assessment considering the change in absolute noise level, in accordance with the IEMA Guidelines for Environmental Noise Impact Assessment, was requested and undertaken; providing further context on potential noise impacts from all activities associated with the Proposed Development.

[20] *Institute of Environmental Management and Appraisal: Guidelines for Environmental Noise Impact Assessment, 2014, IEMA, UK*
[21] *ISO 9613-2, Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation, 1996, International Standards Organisation*
[22] *Professional Practice Guidance on Planning & Noise: New Residential Development, 2017, Institute of Acoustics et al, UK*
[23] *World Health Organisation, Guidelines for Community Noise, 1999, World Health Organisation, Geneva*
[24] *World Health Organisation, Environmental Noise Guidelines for the European Region, 2018, World Health Organisation, Denmark*
[25] *Email conversation between Royal HaskoningDHV and CDC, dated 23 March 2021.*

10.4 Assessment Methodology

10.4.1 EIA Methodology

10.4.1.1 Study Area

The study area for the noise and vibration assessment included the full extent of the Proposed Development. Noise and vibration during the construction and operation of the Proposed Development was assessed at receptors up to 300m from the site boundary.

Operationally, the assessment identified and considered the noise effects at the closest noise sensitive receptors (NSR's) around the Proposed Development.

10.4.1.2 Sensitive Receptors

Types of Receptors

Sensitive receptors, in the context of noise and vibration, are typically residential premises but can also include schools, places of worship and noise sensitive commercial premises. Vibration impacts can also affect structures, such as listed buildings and Scheduled Monuments.

Sensitivity of Receptors

The Noise Planning Practice Guidance (MHCLG, 2019) summarises the noise exposure hierarchy based on the likely average response, as summarised in **Table 10-2.**

Table 10-2 Noise exposure hierarchy based on the likely average response

Perception	Example of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Perception	Example of outcomes	Increasing effect level	Action
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

For each effect, the assessment will identify receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions of sensitivity for the purpose of the noise and vibration assessment are provided in **Table 10-3.**

Table 10-3 Definitions of sensitivity for noise and vibration

Sensitivity	Definition	Examples
High	Receptor has very limited tolerance of effect	Noise receptors will be categorised as high sensitivity where noise may be detrimental to vulnerable receptors. Such receptors include certain hospital wards (e.g. operating theatres or high dependency units) or care homes at night. Vibration receptors will be categorised as high sensitivity where the receptors are listed buildings or Scheduled Monument
Medium	Receptor has limited tolerance of effect	Noise receptors will be categorised as medium sensitivity where noise may cause disturbance and a level of protection is required but a level of tolerance is expected. Such subgroups include residential accommodation, private gardens, hospital wards, care homes, schools, universities, research facilities, national parks, (during the day); and temporary holiday accommodation at all times. Vibration receptors will be categorised as medium sensitivity where the structural integrity of the structure is limited but the receptor is not a listed building or Scheduled Monument.
Low	Receptor has some tolerance of effect	Noise receptors will be categorised as low sensitivity where noise may cause short duration effects in a recreational setting although particularly high noise levels may cause a moderate effect. Such subgroups include offices, shops (including cafes), outdoor amenity areas during the day (including recreation, public amenity space/play areas), long distance footpaths (including PRoW, dog walking routes, bird watching areas, footpaths and other walking routes, visitor attractions, cycling routes including rural roads), doctor's surgeries, sports facilities and places of worship. Vibration receptors will be categorised as low sensitivity where the structural integrity of the structure is expected to be high.
Negligible	Receptor generally tolerance of effect	Noise receptors will be categorised as negligible sensitivity where noise is not expected to be detrimental. Such subgroups include warehouses, light industry, car parks, and agricultural land. Vibration receptors will be categorised as negligible sensitivity where vibration is not expected to be detrimental.

10.4.1.3 Definition of Impact Magnitude and Significance

Noise guidance documents provide topic-specific magnitude of effect criteria, the method for determination of significance of impacts for the key assessments are detailed in **Section 10.4.3**.

10.4.2 Construction Phase Noise

To quantify the likely noise from construction works in accordance with the methods and guidance in BS 5228-1, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. The construction noise levels at NSRs will depend upon a number of variables, the most significant of which are:

- the noise generated by plant or equipment used on site, generally expressed as a sound power level;
- the periods of operation of the plant on the site, known as its 'on-time';
- the distance between the noise source and the receptor; and
- the attenuation due to ground absorption and barrier effects.

At the stage of assessment, detailed information regarding construction activities and plant requirements was not available, Therefore, instead of a quantitative assessment, methods of noise control specifically for this type of development – including best practice methods and information suitable for inclusion in a construction management plan are presented in **Section 10.6.**

10.4.3 Operational Phase Noise Criteria

10.4.3.1 Building Service Plant

Noise associated with the operational phase of the Proposed Development was assessed in accordance with BS 4142, which involves a comparison of the rating level ($L_{Ar,Tr}$) and the measured background (L_{A90}) noise level at NSR's.

The standard applies to industrial/commercial and background noise levels outside residential buildings and for assessing whether existing and new industrial/commercial sound sources are likely to give rise to significant adverse impacts on the occupants living in the vicinity.

The assessment is undertaken by subtracting the measured background noise level from the derived rating level; the greater this difference, the greater the magnitude of the impact.

BS 4142 refers to the following:

"A difference of around + 10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level relative to the measured background sound level the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Taking the above guidance into account, the effect level criteria presented in **Table 10-4** were applied to this assessment.

Table 10-4 Operational noise magnitude of effect for industrial / commercial noise sources

Rating level ($L_{Ar, Tr}$ dB)	Magnitude of effect	NPSE/PPG effect level
< Measured L_{A90}	Very low	NOAEL
= Measured L_{A90} dB to + 3 dB	Low	LOAEL
Measured L_{A90} + 3 dB to 5 dB	Medium	OAE
Measured L_{A90} + 5 dB to 9.9 dB	High	SOAEL
≥ Measured L_{A90} + 10 dB	Very high	UAE

To predict the noise levels associated with the operational phase of the Proposed Development, SoundPLAN noise modelling software was used. The software implements accepted national and international acoustic calculation standards. More detail relating to this is set out in **Section 10.4.5**.

10.4.3.2 Internal Noise Assessment

Assessment of noise ingress from external sources was undertaken in line with the guidance set out in BS 8233. This document provides guidance on the recommended indoor ambient noise levels for various types of room when unoccupied i.e. only noise ingress and noise from building services is considered. Recommended noise levels which apply to the proposed development are shown in **Table 10-5** below.

Table 10-5: Indoor ambient noise levels for dwellings (Reproduced from BS8233 Table 4)

Activity	Location	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

The standard also highlights the potential impact of noise events on sleep with the following statement:

"NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."

BS 8233 also provides a methodology to calculate the noise levels entering a building through facades and façade elements.

On external noise, the standard states the following: "*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

10.4.3.3 Offsite Road Traffic Noise Assessment

LA111 Noise and Vibration, Revision 2 (formerly HD 213/11, IAN 185/15) provides guidance on the environmental assessment of noise impacts from road schemes. It also provides guideline significance criteria for assessing traffic related noise impacts.

Automatic Traffic Counter data for 2018 that encompassed Rickman's Lane, Foxbridge Lane and Plaistow Lane was provided by the Royal HaskoningDHV Transport team, displayed in **Table 10-6.** Using a growth factor from TEMPRo this was factored to be representative of 2021.

18-hour Annual Average Weekday Traffic (AAWT) vehicle flows for the Proposed Development were screen against thresholds detailed in DMRB LA111 revision 2. As the weekend period falls outside of this parameter no information relating to weekend traffic flows is presented in **Table 10-6.**

Table 10-6 Offsite traffic data

Link	2018 (Baseline)			2021		
	AAWT	%HGV	Speed (kph)	AAWT	%HGV	Speed (kph)
Rickmans Lane	767	1	58	791	1	58
Foxbridge Lane	846	2	50	873	2	50
Plaistow Road	3676	1	56	3793	1	56

Due to the low traffic flows on Rickman's Lane and Foxbridge Lane (defined as <1000 vehicles per 18-hour day), no assessment of road traffic noise was undertaken as below this level CRTN considers the results to be "unreliable".

The traffic volume on Plaistow Road as a result of the development is predicted to increase (over an 18-hour day) by 4%, this is below the 20% threshold detailed in the DMRB LA111 revision 2 and so is scoped out of further assessment.

10.4.3.4 Cumulative Noise Assessment

Based on the guidance set out the IEMA document, an assessment of absolute noise change which compares the total source noise contribution at a noise sensitive receptor against the average noise level ($L_{Aeq,T}$) at that location.

Table 10-7 Absolute noise level change assessment thresholds (based upon IEMA guidance) indicates the magnitude of effect resulting from the change in absolute noise level.

Table 10-7 Absolute noise level change assessment thresholds (based upon IEMA guidance)

Magnitude of Effect	Noise Change
Major	>10dB
Moderate	5dB – 9.9dB
Minor	3 – 4.9dB change at
Negligible	<2.9 dB

10.4.4 Receptor Sensitivity

Definitions relating to the sensitivity of receptors considered within this noise assessment are presented in **Table 10-3.**

10.4.5 Noise Modelling

To predict the noise levels associated with the Proposed Development, the assessment utilised SoundPLAN (version 8.2) noise modelling software. The software implements accepted national and international acoustic calculation standards, the predictions were undertaken in accordance with ISO 9613-2.

A three-dimensional model was created using geo-referenced Ordnance Survey mapping data, topographical data of the local area incorporating buildings, plans and elevations of the site. All identified receptor points within the noise model were positioned at heights of 1.5m above the local ground level. Ground surfaces within the study area are generally considered 'soft' with much of the intervening ground between the NSRs and the existing site consisting of grassland and vegetated areas; therefore, an assumed ground factor of 0.6 was included. The model domain is presented in **Figure 10-1.**

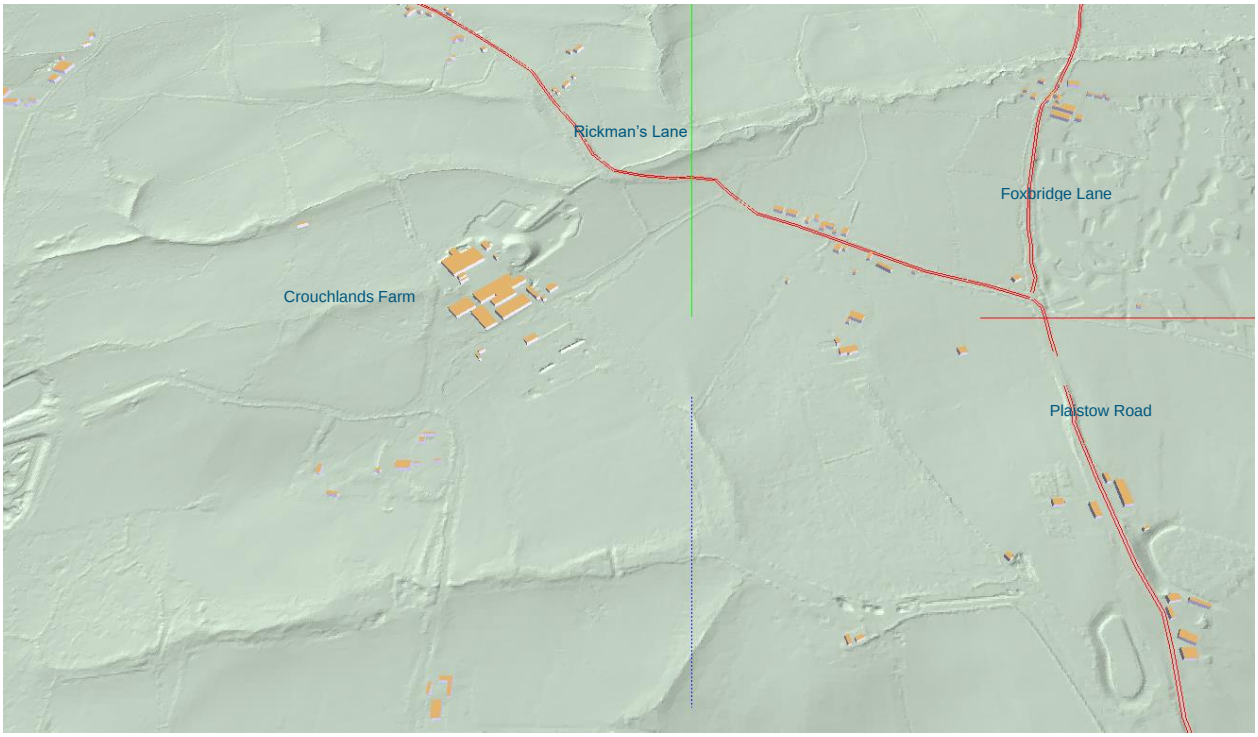


Figure 10-1 SoundPLAN Noise Model – Crouchlands Farm

The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions and model settings as given in **Table 10-8** were used.

Table 10-8 Modelling parameters, sources and assumptions

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey Open Source Mapping
Ground Levels	Lidar data from environment.data.gov.uk	Lidar data at 2m resolution DTM used

Parameter	Source	Details
Building Heights – around site	Observations	6m height for two storey residential properties, 4m for Bungalows
Receptor Positions/Baseline Noise Survey	Royal HaskoningDHV	See Section 10.5
Proposed Layout and General Arrangements	Taylor Architecture & Urbanism SheilsFlynn	Drawing No PL031 Proposed Block Plan Dated 09/03/21 Drawing No 463-PA-05 H Landscape Masterplan Dated Feb 2022
Proposed Building Elevations	RHDHV Observations Project Description of Development	Glamping Area Pods 3m, Indoor Arena 10m, All other associated development site buildings 6m

10.4.6 Assessment Scenarios

Three assessments were undertaken to determine potential noise impact for the Proposed Development site. These are described as:

- 'General Operation' – This scenario is not influenced by the parameters of either the 'typical' weekday assessment scenario or the 'worst-case' Saturday assessment scenario. This is presented as a site suitability assessment for the Proposed Development based on existing noise levels.
- 'Typical Operation' – This scenario is based on normal weekday usage of the Proposed Development site.
- 'Worst-case Operation' – This scenario is based on the use of the Proposed Development site (primarily the equestrian centre) on a Saturday for equestrian events.

10.4.7 Operational Noise Sources

Details of the noise sources utilised within this assessment are set out in the sections below. Unless otherwise specified the noise level of the source is the same for both the 'typical' weekday assessment scenario and the 'worst-case' Saturday assessment scenario.

10.4.7.1 External Building Services Plant

Details pertaining to the locations of any potential building services plant (BSP) will be determined at the detailed design of this planning application and will be assessed fully at that stage. However, based on the consultation responses received from the Environmental Protection Officer at CDC it is understood that the rating level at the nearest NSR (as identified in **Table 10-10**) should be targeted to meet prevailing background noise levels.

Therefore, the cumulative assessment set out in **Section 10.7.2.2** and **Section 10.7.3.4** considers the background noise level (as measured during March 2021) to be the target noise level for all on-site derived source noise from building services plant around the Proposed Development Site at each of the identified NSRs.

10.4.7.2 Onsite Vehicle Movements

Noise levels used in the assessment of onsite vehicle movements (both cars and HGV) were undertaken using sound power levels from within the SoundPLAN library database.

The presented sound power levels were then recalculated taking into consideration the total number of vehicles, classification type and proportions of the vehicles utilising the internal roads during the busiest hour.

For the benefit of this assessment, the busiest hour is defined as the hour during which the greatest number of vehicles is present onsite. Scenarios were derived from the traffic data provided by the Royal HaskoningDHV Transport team. For the 'typical' weekday assessment scenario this was identified to be between the hours of 09:00 and 10:00; and for the 'worst-case' Saturday assessment scenario, this was identified as occurring between the hours of 12:00 and 13:00.

10.4.7.3 Noise Sources Associated with the Rural Enterprise and Education Centre

Within the REEC, it is understood that the noise generating activities will be associated with the proposed 'light industry' use within one of the buildings. Within the definition of planning use class E it states:

"…for any industrial process (which can be carried out in any residential area without causing detriment to the amenity of the area)"

At this time, it is not known what specific light industrial processes will be located within the REEC and so it is not possible to reasonably assess them in terms of their potential noise impact to the surrounding area. However, as part of the definition of planning class E is to avoid 'detriment to the amenity of the area' it is unlikely that any of the uses will be noise generating to a sufficient level to cause significant noise effects at the nearest noise sensitive locations.

Once further details are known with regard to potential end users of these units, an appropriate noise assessment can be undertaken using the appropriate guidance and methodology to both confirm this, and if needed recommend appropriate noise mitigation to ensure the amenity of the area is reasonably maintained.

In addition, it is considered that there may be sources of building service plant associated with the light industry units as well as the other buildings within the REEC. The assessment of building service plant is discussed in **Section 10.4.7.1**.

10.4.7.4 Noise Sources Associated with the Rural Food and Retail Area

There are a number of proposed uses within the Rural Food and Retail area, including a farm shop, a café/restaurant and a cookery school. Of these uses, it is considered that the main sources of noise from this area other than onsite vehicle movements would relate to building services plant associated with the units.

Assessment of building service plant is discussed in **Section 10.4.7.1.**

10.4.7.5 Noise Sources Associated with the Equestrian Centre

There are a number of buildings and potential activities that could occur around the proposed equestrian centre; however, it is considered that the potential sources of noise (excluding onsite vehicle movements) could include:

- External building service plant (see **Section 10.4.7.1**);
- Loudspeakers and/or Public Address (PA) systems; and
- Spectators.

It is understood that there could be loudspeakers associated with both the indoor and outdoor arenas. Guidance given within Annex 1 of "The Planning Noise Advice Document: Sussex (March 2021)" states in relation to entertainment premises (defined as clubs, pubs, bars, places of entertainment and other recreational uses):

"Any amplified sound (to include music and speech) will be inaudible within any noise sensitive premises with our without one or more windows open"

Therefore, in line with the above planning guidance and in order to incorporate the effects of using loudspeakers within the arenas associated with the equestrian centre, loudspeaker noise levels are assumed to be at least 10dB(A) below the measured external noise level considered relevant to that NSR. The cumulative noise assessment considers the noise effect of the loudspeakers at the closest residential NSR.

As the numbers of attendees that may gather for events is currently unknown, noise from spectators is proposed to be managed through the use of a noise management plan. In line with the Transport Assessment and **Chapter 8** of this EIA Report, Transport and Access, associated with this application, the number of spectators associated with the proposed development is not anticipated to have a significant effect on road traffic flows in the vicinity.

10.4.7.6 Noise Sources Associated with the Glamping Area

It is understood that there are no plans for additional building services plant to be associated either with the glamping areas at Hardnips Barn or the Northern/Southern Glamping areas. Therefore, in terms of noise sources only onsite traffic associated with glamping has been considered.

In terms of noise arising from occupants of the glamping areas, this is proposed to be managed through the use of a noise management plan.

10.5 Baseline Environment

Consideration of the prevailing noise environment was initially conducted by undertaking a desk-based study of available geographical information (including aerial and satellite photography, mapping data and masterplans for the Proposed Development) to determine the nearest Noise Sensitive Receptors (NSRs) and noise sources within the vicinity of the Proposed Development.

From the desk-based study and consultation with CDC, the existing NSR locations outlined in **Table 10-9** and presented in **Figure 10-2** were identified.

Table 10-9 Existing residential NSR locations

Receptor ID	X	Y	Description
NSR1	501088	129376	Crouchland House
NSR2	501186	129069	Laneland
NSR3	501651	129560	Redlands Farm
NSR4	501582	129839	Properties adjacent to Streeter's Farm
NSR5	501249	129670	Moore's Green Cottage
NSR6	501062	130263	Nuthurst Cottage
NSR7	500163	130038	Rumbolds Farm

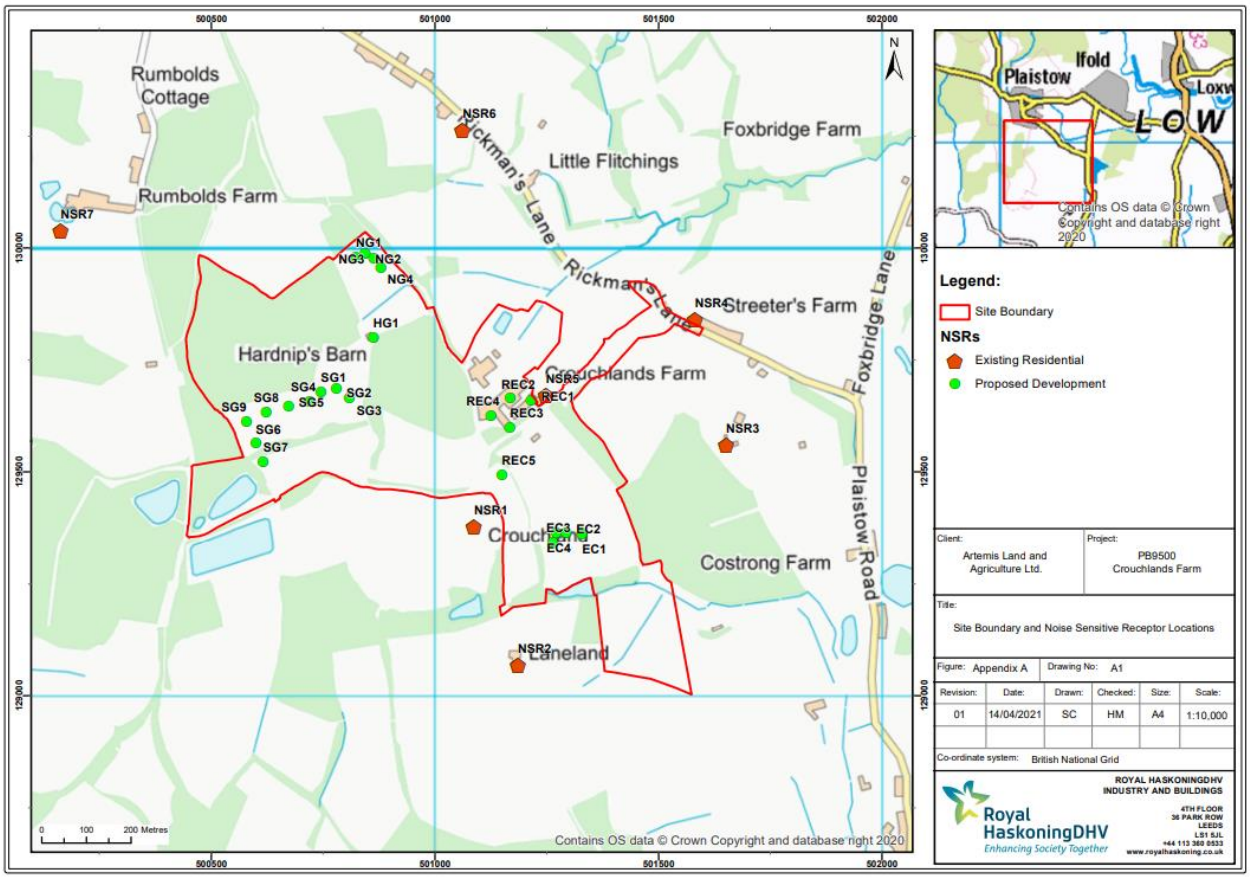


Figure 10-2: NSR Locations

NSR locations associated with the Proposed Development are detailed in **Table 10-10,** and displayed in **Figure 10-2.**

Table 10-10 NSR locations associated with the Proposed Development

Receptor ID	X	Y	Description
NG1	500824	129981	Northern Glamping Area (Pod 1)
NG2	500844	129989	Northern Glamping Area (Pod 2)
NG3	500864	129977	Northern Glamping Area (Pod 3)
NG4	500879	129957	Northern Glamping Area (Pod 4)
HG1	500863	129800	Hardnips Barn
SEA1	500761	129727	Special Events Area (Glamping) Pod 1
SEA2	500779	129741	Special Events Area (Glamping) Pod 2
SEA3	500795	129749	Special Events Area (Glamping) Pod 3
SEA4	500815	129751	Special Events Area (Glamping) Pod 4
SEA5	500818	129738	Special Events Area (Glamping) Pod 5
SG1	500746	129680	Southern Glamping Area (Pod 1)
SG2	500780	129686	Southern Glamping Area (Pod 2)
SG3	500809	129665	Southern Glamping Area (Pod 3)

Receptor ID	X	Y	Description
SG4	500720	129659	Southern Glamping Area (Pod 4)
SG5	500673	129648	Southern Glamping Area (Pod 5)
SG6	500600	129564	Southern Glamping Area (Pod 6)
SG7	500616	129523	Southern Glamping Area (Pod 7)
SG8	500623	129635	Southern Glamping Area (Yurt 1)
SG9	500579	129613	Southern Glamping Area (Yurt 2)
REC1	501216	129660	REEC - Building C (Live/Work Accommodation)
REC2	501169	129664	REEC - Building B (Offices), sensitive during the weekday daytime period only.
REC3	501168	129600	REEC - Building E (Offices), sensitive during the weekday daytime period only.
REC4	501126	129626	REEC - Building F (Education), sensitive during the weekday daytime only.
RFR1	501151	129495	RFR - Cookery School (Education), sensitive during the weekday daytime period only.
EC1	501329	129361	Equestrian Centre (Stable 1) (Live/Work Accommodation)
EC2	501294	129365	Equestrian Centre (Stable 2) (Live/Work Accommodation)
EC3	501263	129343	Equestrian Centre (Stable 3) (Live/Work Accommodation)
EC4	501272	129365	Equestrian Centre (Stable 4) (Live/Work Accommodation)

A baseline noise survey was undertaken between 25th March 2021 and 30th March 2021 to determine the existing noise environment at the site and the surrounding area. A combination of unattended long-term and attended short-term measurements of the ambient noise level were taken both on-site and at off-site locations that were representative of nearby NSRs and dominant noise sources in the area.

Baseline noise survey monitoring locations are detailed in **Table 10-11** and displayed in **Figure 10-3**. Also shown in the table is the sources noted to be contributing to the ambient noise climate at the measurement location. For the unattended measurements, these observations were made during equipment set up and collection only.

Table 10-11 Baseline noise survey locations

ID	Start time	Duration (hh:mm:ss)	Description	Dominant noise sources
MP1	25/03/2021 14:15:00	121:50:00	Long-term unattended term measurement location representative of noise at NSR1, NSR2 and EC1 to EC4.	Non-anthropogenic noise (birds) and overhead aircraft. Road noise barely distinguishable over other noise sources.
MP2	25/03/2021 12:39:59	123:40:00	Long-term unattended measurement location representative of noise at NSR3 and NSR4.	Non-anthropogenic noise (birds), intermittent overhead aircraft and farming activity. Road noise barely distinguishable over other noise sources.
MP3	25/03/2021 12:09:59	26:50:00	Long-term unattended measurement location representative of noise at NSR5 and REC1 to REC4.	Non-anthropogenic noise (birds and livestock) in nearby field, overhead aircraft and farming activity from adjacent site. Road noise barely distinguishable over other noise sources.

ID	Start time	Duration (hh:mm:ss)	Description	Dominant noise sources
MP4	25/03/2021 13:45:07	122:05:00	Long-term unattended measurement location representative of noise at NSR6, HG1 and NG1 to NG4.	Non-anthropogenic noise (birds and livestock) in nearby field. Intermittent overhead aircraft and farming activity. Road noise not audible.
MP5	25/03/2021 14:50:00	120:40:00	Long-term unattended measurement location representative of noise at NSR7 and SG1 to SG9.	Non-anthropogenic noise (birds) and intermittent overhead aircraft and farming activity. Road noise not audible.
ST1	30/03/2021 12:51:41	00:17:54	Short-term attended measurement location representative of RFR1.	Non-anthropogenic noise (birds and livestock) and intermittent farming activity.
ST2	30/03/2021 13:37:00	00:03:00	Short-term attended measurement at existing electrical inverter plant within cattle sheds.	Noise from electrical inverter plant.
ST3	30/03/2021 13:51:28	00:15:23	Short-term attended measurement along Rickman's Lane.	Road noise along Rickman's Lane, farming activity and non-anthropogenic noise (birds).
ST4	30/03/2021 14:13:23	00:15:49	Short-term attended measurement along Rickman's Lane, representative of noise at NSR6.	Road noise along Rickman's Lane, farming activity, overhead aircraft, and non-anthropogenic noise (birds).
ST5	30/03/2021 14:42:58	00:16:02	Short-term attended measurement at Crouchlands Farm entrance, representative of noise at NSR4.	Road traffic noise along Rickman's Lane and overhead aircraft.
	30/03/2021 19:18:07	00:16:11	Short-term attended measurement during the evening (when farming activity is reduced) at Crouchlands Farm entrance, representative of noise at NSR4.	Road traffic noise along Rickman's Lane and overhead aircraft. Non-anthropogenic noise (birds) audible in lulls of traffic.
ST6	30/03/2021 15:04:23	00:15:17	Short-term attended measurement at junction between Plaistow Road, Rickman's Lane and Foxbridge Lane.	Road traffic noise along Plaistow Road, Rickman's Lane and Foxbridge Lane. Overhead aircraft and non-anthropogenic noise (birds and livestock).
	30/03/2021 18:59:20	00:15:56	Short-term attended measurement at junction between Plaistow Road, Rickman's Lane and Foxbridge Lane.	Road traffic noise along Plaistow Road, Rickman's Lane and Foxbridge Lane and non-anthropogenic noise (birds and livestock).
ST7	30/03/2021 15:37:18	00:15:15	Short-term attended measurement at Rumbolds Lane, representative of noise at NSR7.	Activity in nearby horse field and barns and faint hum from farming plant. Overhead aircraft and industrial noise intermittent and distinguishable.
	30/03/2021 19:40:39	00:16:31	Short-term attended measurement during the evening (when farming and	Activity in nearby horse field. Non-anthropogenic noise (birds and horses).

ID	Start time	Duration (hh:mm:ss)	Description	Dominant noise sources
			other nearby activity is reduced) at Rumbolds Lane, representative of noise at NSR7.	
ST8	30/03/2021 16:07:36	00:15:03	Short-term attended measurement to the west of the Proposed Development.	Faint hum from nearby farming noise audible. Overhead aircraft and noise from nearby horse field.

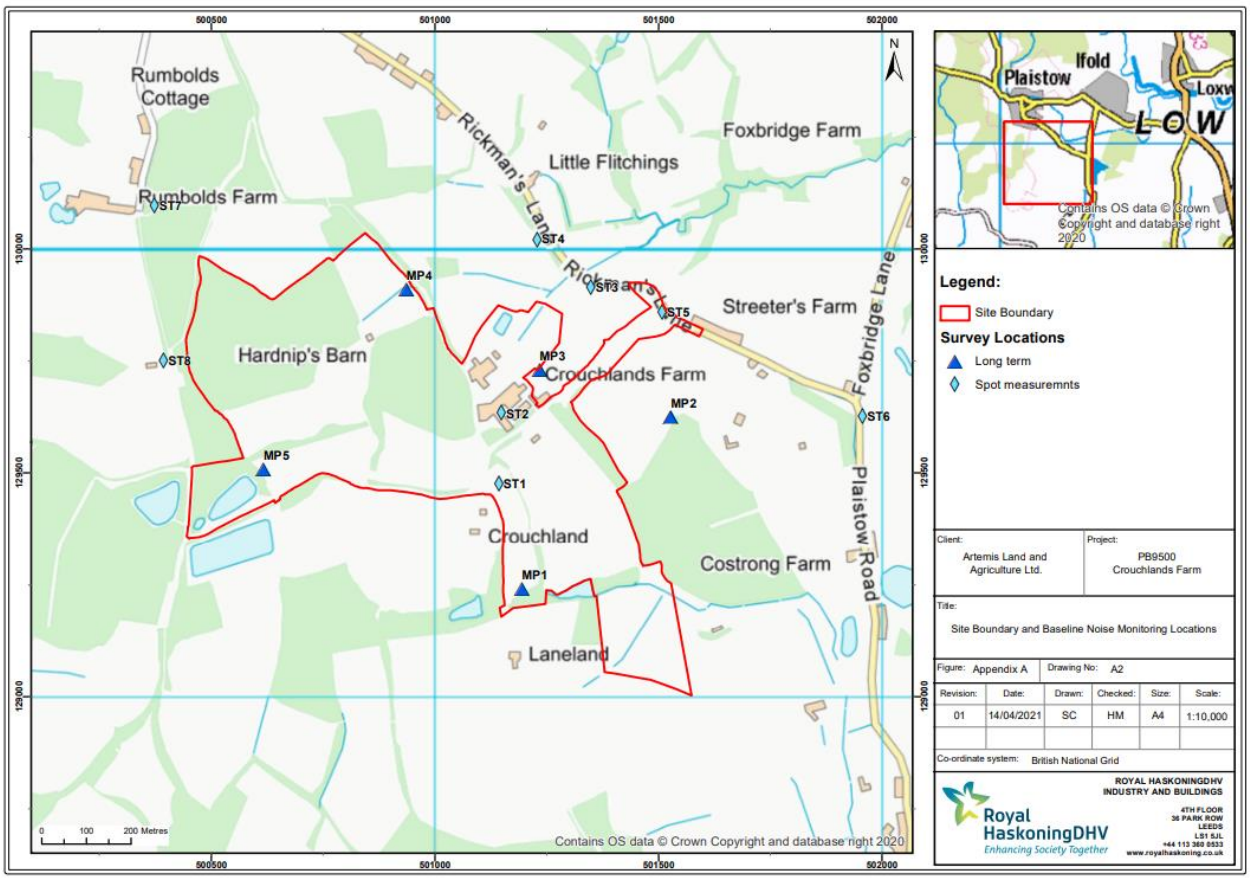


Figure 10-3: Baseline Noise Monitoring Locations

The table above sets out the noise sources observed during the measurement survey. Due to seasonality, some sources such as hedge cutting or agricultural machinery may be more prevalent at other times of year. In addition, economic restrictions in response to the Covid-19 pandemic were in place at the time of the survey; hence, the noise levels from some anthropogenic sources such as road traffic and overhead aircraft are likely to have been lower than typical.

Sound Level Meters (SLMs) were fully calibrated, traceable to UKAS standards and satisfied the requirements of BS EN 61672-1:2013 for a 'Class 1' SLM. The measurements were taken using the SLMs and associated equipment detailed in **Table 10-12.**

Table 10-12 Noise survey instrumentation

Instrument	Type	Serial number
Sound Level Meter	Rion NL-52	898320
Sound Level Meter	Rion NL-52	710288
Sound Level Meter	Rion NL-52	420662
Sound Level Meter	Rion NL-52	620867
Sound Level Meter	Rion NL-52	864982
Sound Level Meter	Rion NL-52	864983
Calibrator	Rion NC-75	01020506

Baseline survey measurements were conducted in accordance with the procedure described in BS 7445 parts 1 & 2 and BS 4142, with the SLMs mounted on tripods at a height of between 1.2m and 1.5m above ground level, and 3.5m away from any reflecting surface other than the ground, i.e. in free-field conditions. The instruments were calibrated before and after the survey using a portable calibrator with no significant drift noted.

For all measurement locations during the noise survey, SLMs were set to record the following:

- L_{Aeq} – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445;
- L_{Amax} – the maximum sound pressure level occurring within the defined measurement period;
- L_{A90} – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level; and,
  L_{A10} - the sound pressure level exceeded for 10% of the measurement period. The L_{A10} index is used within CRTN as an appropriate descriptor of traffic noise.

A weather station was employed to record of the meteorological conditions during the survey. All noise monitoring periods during adverse weather conditions (i.e. precipitation or when wind speeds exceed 5 m/s) were removed and were not considered within the baseline noise survey results; as per the guidance within BS 7445.

Results from the baseline noise survey undertaken are displayed in **Table 10-13** for daytime, night-time, weekend and weekday periods. For clarity, weekend data were considered between 00:00 on Saturday 27th March to 23:59 on Sunday 28th March.

Table 10-13 Baseline noise survey results summary

Measurement location	Period	$L_{Aeq,T}$	L_{AFmax}	L_{A10}*	L_{A90}*
MP1	Weekday daytime	44.0	86.0	40.6	30.8
	Weekend daytime	44.6	99.9	39.4	30.6
	Weekday night-time	39.9	84.9	33.8	27.0
	Weekend night-time	40.9	80.1	36.1	28.8
MP2	Weekday daytime	43.6	85.2	41.4	32.7
	Weekend daytime	44.8	86.6	42.7	33.4
	Weekday night-time	39.7	69.9	36.4	28.3

Measurement location	Period	$L_{Aeq,T}$	L_{AFmax}	L_{A10}*	L_{A90}*
	Weekend night-time	39.0	64.9	39.8	30.3
MP3	Weekday daytime	49.2	90.3	45.7	35.3
	Weekday night-time	43.7	83.4	37.4	30.8
MP4	Weekday daytime	47.6	84.6	45.1	32.8
	Weekend daytime	46.0	77.1	43.6	33.0
	Weekday night-time	44.8	76.4	36.6	29.0
	Weekend night-time	44.2	74.4	39.7	31.0
MP5	Weekday daytime	48.4	79.1	45.6	32.8
	Weekend daytime	46.4	78.6	44.6	32.9
	Weekday night-time	45.7	80.9	38.5	29.5
	Weekend night-time	46.1	75.5	42.9	31.8
ST1	Weekday daytime	46.4	66.3	41.7	35.2
ST2	Weekday daytime	49.8	56.1	50.2	48.9
ST3	Weekday daytime	53.4	75.3	42.8	38.2
ST4	Weekday daytime	47.1	66.3	38.9	34.9
ST5	Weekday daytime	50.5	66.8	40.4	36.5
	Weekday evening	50.9	67.9	42.7	39.3
ST6	Weekday daytime	59.8	79.6	47.6	44.5
	Weekday evening	55.8	75.6	45.2	40.2
ST7	Weekday daytime	43.1	59.2	41.2	35.6
	Weekday evening	43.0	62.2	41.2	34.6
ST8	Weekday daytime	44.0	63.8	37.8	34.9

** Displayed as the arithmetic mean of the results during the reference period*

10.5.1 Background Sound Level (L_{A90}) Analysis

In order to assess potential noise impacts in accordance with BS 4142 the 'typical' existing background sound level, L_{A90}, should be determined.

It is understood that that mechanical plant, vehicle movements and other onsite activities (and including associated building services plant) associated with the on-site operational phase of the Proposed Development will be limited to daytime hours only. Therefore, only the daytime reference period is considered in the BS 4142 assessment.

This understanding relates only to new activities associated with the Proposed Development and not any existing or continuing agricultural activities that will take place.

Statistical analysis, including the arithmetic average, modal distribution and median are presented in **Table 10-14** for the daytime reference period.

Table 10-14 Background sound level statistical analysis, daytime (dBA)

Measurement location	Period	Most repeated (mode)	Mean average	Median	L_{A90} used in assessment
MP1	Weekday daytime	32	30.8	31.2	32
	Weekend daytime	32	30.6	31.2	32
MP2	Weekday daytime	33	32.7	33.3	33
	Weekend daytime	35	33.4	33.9	35
MP3	Weekday daytime	37	35.3	36.1	37
MP4	Weekday daytime	34	32.8	33.3	34
	Weekend daytime	32	33.0	32.8	32
MP5	Weekday daytime	33	32.8	33.0	33
	Weekend daytime	31	32.9	32.9	31

From the data in **Table 10-14,** it can be determined that during the daytime the modal value is constant with the mean average and median L_{A90} at all measurement locations. Therefore, the modal vales during the daytime were used in the assessment.

10.6 Potential Impacts During Construction

As stated in **Section 10.4.3.1** a detailed quantitative construction phase assessment was not undertaken as there were no specific details of the construction works that will be undertaken or an appointed contractor at the time of assessment. Therefore, the information presented below sets out standard mitigation measures that can be employed on site to manage noise levels from the site.

Noise and vibration associated with the construction phase of the Proposed Development has the potential to impact upon nearby residential receptors. Construction activities will take place during typical day time construction hours only, assumed to be 07:30 to 18:00 during weekdays only; Saturday 08:00 to 13:00hrs, with no work on Sunday or Bank Holidays.

Due to the transient nature of construction activities the potential for receptors to be affected will depend on where within the application site the noisy activity takes place, the nature of the activity and controls and meteorological conditions.

To minimise the potential for noise impacts, mitigation measures are provided in the form of a Construction Noise Management Plan within **Section 10.6.1**. It is considered that the measures set out below could form part of an overarching CEMP. These include Best Practicable Means (BPM) as defined in The Control of Pollution Act 1974, which are provided for inclusion in the site Construction and Environmental Management Plan (CEMP).

Once detail is known concerning the construction phase working a noise assessment to determine and mitigate any noise effects should be undertaken.

10.6.1 Construction Noise Management Plan

The Control of Pollution Act and BS5228 define a set of Best Practice working methods and mitigation measures, referred to as BPM. Examples of these measures include:

- Where possible, locating temporary plant so that it is screened from receptors by on-site structures, such as site cabins;
- Using modern, quiet equipment and ensuring such equipment is properly maintained and operated by trained staff;
- Applying enclosures to particularly noisy equipment where possible;
- Ensuring that mobile plant is well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Ensuring plant machinery is turned off when not in use;
- Providing local residents with 24-hour contact details for a site representative in the event that disturbance due to noise from the construction works is perceived;
- Informing local residents about the construction works, including the timing and duration of any particularly noisy elements, and providing a contact telephone number to them; and,
- Keeping noisy deliveries, such as skips and concrete, to the middle of the day where possible.

Although the effect of adopting such methods cannot be precisely quantified, it is possible that these methods would reduce noise levels by between 5 - 10 dB.

10.6.1.1 Training

The site induction programme and site rules should include good working practice instructions for site staff, managers, visitors and contractors to help minimise noise whilst working on the site.

Good working practice guidelines/instructions could include, but not be limited to, the following points:

- Avoiding unnecessary revving of engines;
- Plant used intermittently should be shut-down between operational periods, where possible;
- Avoiding reversing wherever possible;
- Reporting any defective equipment/plant as soon as possible so that corrective maintenance can be undertaken; and,
- Handling material in a manner that minimises noise.

10.6.2 Maintenance

Maintenance of temporary plant should be carried out routinely and in accordance with the manufacturers' guidance.

A regular inspection of all plant and equipment could be undertaken to ensure that:

- All plant is in a good state of repair and fully functional;
- Any plant found to be requiring interim maintenance has been identified and taken out of use;
- Acoustic enclosures fitted to plant are in a good state of repair;
- Doors and covers to such enclosures remain closed during operation; and,
- Any repairs are being undertaken by a fully qualified maintenance engineer.

10.7 Potential Impacts During Operation

10.7.1 Impact Assessment – General

The outcome of the assessment below is not influenced by the parameters of the 'typical' weekday assessment scenario or the 'worst-case' Saturday assessment scenario, therefore it is presented in a standalone section.

10.7.1.1 Glamping Areas Site Suitability

A review of the measured background noise levels (from the March 2021 survey) across the Proposed Development site did not show a wide range of variability. It was therefore considered reasonable, that the unattended noise measurements made at locations MP4 and MP5 would be used to indicate suitability for the two new glamping areas (northern glamping area and southern glamping area). It is also noted that the locations of both the northern and southern glamping areas are set away from nearby roads and sources of noise.

There are no current guidelines for the assessment of glamping areas, however as solid structures are proposed for the individual pods guidance from ProPG was utilised to provide an indication for site suitability. This guidance presents the outcome of the site suitability assessment in terms of a 'noise risk assessment', the results of this is presented in **Table 10-15.**

With respect to context of the site, it is assumed that visitors to the Crouchlands Farm site, and especially the glamping area would be aware that the site will remain a working farm and that there will be a level of inherent associated noise from both livestock and from agricultural vehicles moving around the site. This level of context should allow for some flexibility in respect to the noise levels, however the aim will still be to reduce and minimise potential effects wherever possible.

Table 10-15 Proposed glamping areas outline site risk assessment

Location	Time Period	Measured Noise Levels ($L_{Aeq,T}$)	ProPG Risk Assessment Outcome	Action Needed	Justification
Northern Glamping Area	Weekday daytime	47.6	Negligible	None	Negligible risk
	Weekend daytime	46.0	Negligible	None	Negligible risk
	Weekday night-time	44.8	Negligible – Low	None	See paragraph above Table
	Weekend night-time	44.2	Negligible – Low	None	
Southern Glamping Area	Weekday daytime	48.4	Negligible	None	Negligible risk
	Weekend daytime	46.4	Negligible	None	Negligible risk
	Weekday night-time	45.7	Low	None	See paragraph above Table
	Weekend night-time	46.1	Low	None	

Consideration has also been given to 'maximum' or sudden noises that could occur, especially during the night-time hours. The advice in the ProPG document suggests that frequent noise events (ten or more) above 60dB $L_{Amax,f}$ could disrupt sleep and therefore increases the risk of the site.

The glamping area is located away from roads and the main farm area, however observations made of activities around the site during the measurement survey noted that there could be livestock near the glamping area. These are reflected in the number of noise events above 60dB $L_{Amax,f}$ that occurred at positions MP4 and MP5 overnight. which both indicatively exceed or are around the threshold indicated by ProPG.

Further review of the timings of these exceedances indicate that they mainly occur in the early hours of the morning (post 5am) with very few being between the hours of 11pm and 5am. Due to the timing of the baseline survey (March) this correlates with the dawn chorus, and so it is probable that these noise events are associated with that and with the waking of livestock. The time of the dawn chorus and livestock waking will adjust throughout the year, due to the changing of the seasons. Although these noise levels could be considered disturbing in absolute terms (ProPG thresholds), they are natural in their occurrence and therefore in context of the overall site.

It is considered that the application of the ProPG thresholds should be applicable to sources of anthropogenic noises instead of the natural sounds that occur around the Proposed Development site.

Based on the above and considering the $L_{Amax,f}$, the two locations proposed for glamping are considered to be of negligible risk in noise terms.

10.7.2 Impact Assessment – 'Typical' Operational

10.7.2.1 Onsite Vehicle Movements

Utilising the noise propagation software SoundPLAN, line sources considered representative of the access and traffic routes around the Proposed Development site were used to predict the noise levels from onsite vehicle movements at identified existing and future site NSR's.

The results of this modelling are set out below and assessed in accordance with the relevant guidance in terms of the receiver and their respective uses.

Typically, it is understood that the Proposed Development would be operational between 7am and 8pm during the week. As a result of this, the assessment focus was on daytime impacts only. The assessments present noise levels from a single hour (defined as the busiest hour) and not over a 16-hour period; therefore, it is important to consider that the outcomes and levels of effect indicated by these assessments are not reflective of the whole daytime period.

Following consultation with the Environmental Proctection Officer at CDC, the assessment of the noise levels at residential noise sensitive receptors was undertaken using the methodology set out in BS 4142 and supported by an additional assessment in accordance with guidance suitable for the use of that noise sensitive location. It is considered that this additional assessment will provide context in regard to noise levels experienced within the various receptor locations.

Where the residential noise sensitive receptor is 'live/work' accommodation, no BS 4142 assessment was undertaken as these units would not be occupied when the Proposed Development is operational.

To assess the Proposed Development noise impacts in accordance with BS 4142, it is necessary to determine whether a penalty (referred to as a character correction) should be applied to the predicted Proposed Development noise level. A character correction is required if the noise is tonal, impulsive, intermittent or contains other sound characteristics which are readily distinctive against the residual acoustic environment. The noise of onsite vehicles does not meet these criteria and is similar to the noise sources

already present at the NSRs; hence, no character correction is needed, so the rating level is equal to the specific sound level.

In accordance with BS 8233, and giving consideration to the different building envelope constructions, buildings around the site have a reduction of 15dB applied in the calculation of internal noise levels from external free-field noise levels. As the construction of the glamping cabins, pods and yurts is thinner it is considered that a lower reduction of 10dB is applied in the calculation of internal noise levels from external free-field noise.[26]

The following sections set out the individual assessments and provides commentary on the results.

Existing NSR's

Table 10-16 and **Table 10-17** set out the results of the BS 4142 and BS 8233 noise assessment at existing receptors around the Proposed Development site.

Table 10-16 BS 4142 assessment - onsite traffic, existing receptors

Receptor Ref	Relevant Baseline Noise Measurement Position	Measured Representative Weekday Daytime Background L_{A90} (dB)	Rating Level (dB)	Difference in Noise Level (L_{A90} – Rating Level)	Magnitude
NSR1	MP1	32	29.1	-2.9	Negligible
NSR2	MP1	32	19.3	-12.7	Negligible
NSR3	MP2	33	28.2	-4.8	Negligible
NSR4	MP2	33	37.3	4.3	Minor
NSR5	MP3	37	48.6	11.6	Major
NSR6	MP4	32	24.2	-7.8	Negligible
NSR7	MP5	31	14.8	-16.2	Negligible

Table 10-17 BS 8233 assessment – onsite traffic, existing receptors

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) (dB $L_{Aeq,1h}$)	Predicted Onsite Vehicle Noise Level (Internal) (dB $L_{Aeq,1h}$)	Criteria Met
NSR1	BS 8233	35dB (Internal)	29.1	14.1	Yes
NSR2	BS 8233	35dB (Internal)	19.3	4.3	Yes
NSR3	BS 8233	35dB (Internal)	28.2	13.2	Yes
NSR4	BS 8233	35dB (Internal)	37.3	22.3	Yes
NSR5	BS 8233	35dB (Internal)	48.6	33.6	Yes
NSR6	BS 8233	35dB (Internal)	24.2	9.2	Yes
NSR7	BS 8233	35dB (Internal)	14.8	-0.2	Yes

[26] *This relates to the reduction of noise through of a partially open window and not the reduction of the building envelope itself.*

As can be seen in **Table 10-16**, with the exception of noise sensitive receptors NSR5 and NSR4, the predicted noise levels at each of the receptors above will be below background.

At all NSRs, the predicted external noise levels are below the "desirable" noise level criteria in BS 8233[27] (50 dB $L_{Aeq,16h}$) for external amenity areas.

The results in **Table 10-17** indicate that the internal daytime noise levels within the existing noise sensitive properties will be within the criteria set out in Table 4 of BS8233 (see **Table 10-5**).

The access road (located adjacent to NSR5) will also be resurfaced as part of the Proposed Development. This is likely to reduce the existing road traffic noise levels at NSR 5 and to a lesser extent at NSR4. These reductions are not accounted for in the above assessment.

In EIA terms and based on the above mitigation, the effect of associated onsite traffic on existing receptors is considered to be **Major Adverse** at NSR5 and **Negligible to Minor Adverse** at all other existing receptor locations

However on the basis of the contextual analysis above, the impact of the Proposed Development noise is considered to be **Not Significant**, irrespective of the initial conclusion of the BS 4142 numerical assessment.

Proposed NSR's

Table 10-18 and **Table 10-19** set out the results of the noise assessment at NSR's associated with the three glamping areas.

Table 10-18 BS 4142 Assessment - onsite traffic, proposed glamping receptors

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime LA90 (dB)	Specific Noise Level (dB)	Difference in Noise Level (dB)
NG1	MP4	32	26.1	-5.9
NG2	MP4	32	25	-7
NG3	MP4	32	24.8	-7.2
NG4	MP4	32	25.8	-6.2
HG1	MP4	32	25.5	-6.5
SEA1	MP5	31	23.7	-7.3
SEA2	MP5	31	24.2	-6.8
SEA3	MP5	31	24.4	-6.6
SEA4	MP5	31	24.9	-6.1
SEA5	MP5	31	22.7	-8.3
SG1	MP5	31	24.3	-6.7
SG2	MP5	31	24.9	-6.1
SG3	MP5	31	23.6	-7.4
SG4	MP5	31	23	-8

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime LA90 (dB)	Specific Noise Level (dB)	Difference in Noise Level (dB)
SG5	MP5	31	22.1	-8.9
SG6	MP5	31	21.8	-9.2
SG7	MP5	31	21.5	-9.5
SG8	MP5	31	22.3	-8.7
SG9	MP5	31	23.7	-7.3

Table 10-19 BS 8233 assessment - onsite traffic, proposed glamping receptors

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) (dB $L_{Aeq,1h}$)	Predicted Onsite Vehicle Noise Level (Internal) (dB $L_{Aeq,1h}$)	Criteria Met
NG1	BS8233	35dB (Internal)	26.1	16.1	Yes
NG2	BS8233	35dB (Internal)	25	15	Yes
NG3	BS8233	35dB (Internal)	24.8	14.8	Yes
NG4	BS8233	35dB (Internal)	25.8	15.8	Yes
HG1	BS8233	35dB (Internal)	25.5	15.5	Yes
SEA1	BS8233	35dB (Internal)	23.7	13.7	Yes
SEA2	BS8233	35dB (Internal)	24.2	14.2	Yes
SEA3	BS8233	35dB (Internal)	24.4	14.4	Yes
SEA4	BS8233	35dB (Internal)	24.9	14.9	Yes
SEA5	BS8233	35dB (Internal)	22.7	12.7	Yes
SG1	BS8233	35dB (Internal)	24.3	14.3	Yes
SG2	BS8233	35dB (Internal)	24.9	14.9	Yes
SG3	BS8233	35dB (Internal)	23.6	13.6	Yes
SG4	BS8233	35dB (Internal)	23	13	Yes
SG5	BS8233	35dB (Internal)	22.1	12.1	Yes
SG6	BS8233	35dB (Internal)	21.8	11.8	Yes
SG7	BS8233	35dB (Internal)	21.5	11.5	Yes
SG8	BS8233	35dB (Internal)	22.3	12.3	Yes
SG9	BS8233	35dB (Internal)	23.7	13.7	Yes

The results in **Table 10-18** and **Table 10-19** show that onsite vehicle noise is not anticipated to have an adverse noise impact at the glamping areas.

Table 10-20 and **Table 10-21** set out the results of the “live/work” and non-residential noise sensitive receptors. This assessment is presented for completeness and transparency, it is understood that these accommodations will only be occupied outside of operational hours by persons working within the Proposed Development; therefore, any exceedances would not result in significant impacts.

Table 10-20 Noise levels associated with onsite vehicle movements (proposed live/work accommodation receptors)

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) (dB $L_{Aeq,1h}$)	Predicted Onsite Vehicle Noise Level (Internal) (dB $L_{Aeq,1h}$)	Criteria Met
REC1	BS8233	35dB (Internal)	54.8	39.8	No
EC1	BS8233	35dB (Internal)	31.8	16.8	Yes
EC2	BS8233	35dB (Internal)	32	17	Yes
EC3	BS8233	35dB (Internal)	26.5	11.5	Yes
EC4	BS8233	35dB (Internal)	31.1	16.1	Yes

With the exception of REC1, the results indicate that the noise levels from onsite traffic during the busiest hour will be within guidance levels set out in BS 8233.

The assessment results for non-residential noise sensitive locations around the site are displayed in **Table 10-21.**

Table 10-21 Noise levels associated with onsite vehicle movements (proposed non-residential receptors)

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External)	Predicted Onsite Vehicle Noise Level (Internal)	Criteria Met
REC2	BS8233	35dB – 45dB (Internal)	52.1	37.1	Yes
REC3	BS8233	35dB – 45dB (Internal)	45.1	30.1	Yes
REC4	BB93	40dB (Internal)	40.1	25.1	Yes
RFR1	BB93	35dB(Internal)	36.5	21.5	Yes

Table 10-21 shows that for onsite vehicle movements the noise levels received are within the guidance levels.

In EIA terms, the effect of associated onsite traffic on proposed noise sensitive receptors is considered to be **Negligible** and therefore **Not Significant** at all locations.

10.7.2.2 Cumulative Noise Assessment

In accordance with the consultation, a cumulative noise assessment based upon the principles set out within the IEMA guidance document is presented in **Table 10-22** and **Table 10-23**.

This assessment considers the absolute predicted noise change that could result from the operation of the Proposed Development. As set out in **Section 10.4.7**, noise sources were predicted in line with either modelling results (onsite vehicle movements) or within local planning authority criteria (building service plant and loudspeakers).

This assessment compares the predicted noise level at that could result from all of the events happening simultaneously against the existing L_{Aeq} noise levels. The tables below set out the results for the existing noise sensitive receptors and for those within the proposed glamping area (including Hardnips Barn).

As set out in **Section 10.7.2.1**, the results of these assessments represent noise levels from a single hour (defined as the busiest hour) and not over a 16-hour period. Therefore, presenting the noise level as a 16-hour noise level instead of a 1-hour is considered worst-case.

Table 10-22 Cumulative noise assessment, existing NSR's

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Ambient Sound Level $L_{Aeq,16h}$(dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NSR1	MP1	44	32	34	29.1	44.8	0.8
NSR2	MP1	44	32	34	19.3	44.7	0.7
NSR3	MP2	43.6	33	33.6	28.2	44.4	0.8
NSR4	MP2	43.6	33	33.6	37.3	45.1	1.5
NSR5	MP3	49.2	37	39.2	48.6	52.3	3.1
NSR6	MP4	47.6	32	37.6	24.2	48.1	0.5
NSR7	MP5	48.4	31	38.4	14.8	48.9	0.5

As can be seen in **Table 10-22**, the maximum noise level change predicted is 3.1dB. According to the IEMA guidelines, a change of 3 dB is perceptible under most normal conditions. Further analysis of the results show that this level of noise change is driven by onsite vehicle movements, predominantly those along the access road located in front of NSR5. There is proposed to be a new access road to the rear of NSR5, however this has not been included in the assessment as using the current alignment of traffic will present a worst case. Traffic on the new access road traffic will be predominantly agricultural vehicles with only a few cars utilising the car park near the start of the road.

The predicted noise level change is only over the worst-case single hour used to represent a 16-hour day. When averaged out over an entire day, the change in noise level will be much lower and therefore would be unlikely to be perceptible. There is an added contextual element in that there are already vehicles on the access road. Hence, significant adverse impacts are not anticipated.

When the cumulative noise levels are compared against those set out in BS 8233 in regard to external amenity areas indicates that the levels of noise received at all the above identified receptors would still be below that defined as "desirable" and NSR5 below the level defined as "acceptable in noisier environments" (55 dB $L_{Aeq,16h}$).

In addition to the consideration of context, it is understood that the access road (located adjacent to NSR5) will benefit from resurfacing. This will have greatest effect at NSR 5, although some limited noise attenuation will also be seen at NSR4.

Table 10-23 sets out a cumulative noise assessment in respect to noise levels received from the Proposed Development at the onsite glamping noise sensitive receptors

Table 10-23 Cumulative noise assessment, proposed glamping receptors

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime $L_{Aeq,16h}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NG1	MP4	47.6	32	37.6	26.1	48.1	0.5

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime $L_{Aeq,16h}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NG2	MP4	47.6	32	37.6	25	48.1	0.5
NG3	MP4	47.6	32	37.6	24.8	48.1	0.5
NG4	MP4	47.6	32	37.6	25.8	48.1	0.5
HG1	MP4	47.6	32	37.6	25.5	48.1	0.5
SG1	MP5	48.4	31	38.4	23.7	48.9	0.5
SG2	MP5	48.4	31	38.4	24.2	48.9	0.5
SG3	MP5	48.4	31	38.4	24.4	48.9	0.5
SG4	MP5	48.4	31	38.4	24.9	48.9	0.5
SG5	MP5	48.4	31	38.4	22.7	48.9	0.5
SG6	MP5	48.4	31	38.4	24.3	48.9	0.5
SG7	MP5	48.4	31	38.4	24.9	48.9	0.5
SG8	MP5	48.4	31	38.4	23.6	48.9	0.5
SG9	MP5	48.4	31	38.4	23	48.9	0.5

The results of the cumulative noise assessment, in terms of the proposed glamping areas indicate that with the operational use of the site will result in a change in noise level of less than 1dB. Given the context of the site and the expectations in terms of noise of occupants within this area, this level of change is not one that would be considered perceptible or significant.

The above cumulative assessments indicate that when sources of noise from the Proposed Development are considered in absolute noise terms at the worst affected noise sensitive receptor, the maximum effect would lead to a **Minor adverse** impact which is considered to be **not significant**.

10.7.3 Impact Assessment – 'Worst-Case' Operational

10.7.3.1 Weekend Usage of the Proposed Development

The equestrian centre within the Proposed Development could host a range of events on a Saturday over the course of a year. Each of these different types of events would have different associated development traffic flows.

These events range from ones that could occur frequently, to ones that occur two or three times per year. The infrastructure and the use of the Proposed Development site outside of the equestrian centre would remain the same, however the onsite vehicle movements associated with the equestrian centre would change. Therefore, it is on the basis of the development traffic flows for the equestrian centre that a 'worst-case' scenario was determined.

This determination took into consideration factors such as

- Hourly spread of the additional onsite traffic; and

- The proportion of light vehicles (such as cars) compared to heavy vehicles (such as lorries and horse boxes).

A review of the development flows determined that the 'worst-case' is associated with eventing (either unaffiliated or affiliated). Eventing is considered to potentially occur around five times per year.

The assessments presented below consider these vehicle movements (both onsite and offsite) with respect to the development flows associated with eventing, as well as those associated with other areas, such as the Retail Farm Shop and Café within the Proposed Development that would be operational on a Saturday.

It is understood that 'out of hours' use of the REEC could occur during the weekend, but this would not be regular or formally used, with access to that area being provided through use of a key or a card. As this use is anticipated to be minimal, the use of the REEC at the weekends has not been considered within this part of the assessment.

More information regarding these events in terms of vehicle movements can be found within the transport report accompanying this application.

As with the 'typical' assessment in the previous section, the assessments presented below consider a worst-case in terms of source noise level, as the assessments utilise a 1-hour noise level as representative of the full 16 hours. In reality this noise level is exaggerated and over a 16 hour day the noise level received from the site at the individual receptors would be lower.

10.7.3.2 Offsite Road Traffic Assessment – Saturday 'Worst-Case'

As stated in **Section 10.4**, the assessment of road traffic noise is undertaken utilising 18-hour AAWT vehicle flows. As the weekend period falls outside of this parameter no information relating to weekend traffic flows is presented.

10.7.3.3 Onsite Vehicle Movements – Saturday 'Worst-Case'

The following sections set out the individual assessments and provides commentary on the results.

On a Saturday it is understood that the REEC would not be in regular use, but accessed by key/card for occasional use, therefore non – residential noise sensitive receptors associated with the REEC have not been assessed.

Existing NSR's (Saturday 'Worst-Case')

Table 10-24 and **Table 10-25** set out the results of the noise assessment at existing receptors around the Proposed Development site.

Table 10-24 BS 4142 assessment - onsite traffic, existing receptors (Saturday)

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Background Sound Level L_{A90} (dB)	Rating Level $L_{Ar,Tr}$ (dB)	Difference in Noise Level (dB)	Magnitude
NSR1	MP1	31	36.5	5.5	Moderate
NSR2	MP1	31	29.3	-1.7	Negligible
NSR3	MP2	33	38.6	5.6	Moderate

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Background Sound Level L_{A90} (dB)	Rating Level $L_{Ar,Tr}$ (dB)	Difference in Noise Level (dB)	Magnitude
NSR4	MP2	33	47.4	14.4	Major
NSR5	MP3	33	59.1	26.1	Major
NSR6	MP4	33	33.3	0.3	Minor
NSR7	MP5	33	14.8	-18.2	Negligible

Table 10-25 BS 8233 assessment - onsite traffic, existing receptors (Saturday)

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Predicted Onsite Vehicle Noise Level (Internal) $L_{Aeq,1h}$ (dB)	Criteria Met
NSR1	BS8233	35dB (Internal)	36.5	21.5	Yes
NSR2	BS8233	35dB (Internal)	29.3	14.3	Yes
NSR3	BS8233	35dB (Internal)	38.6	23.6	Yes
NSR4	BS8233	35dB (Internal)	47.4	32.4	Yes
NSR5	BS8233	35dB (Internal)	59.1	44.1	No
NSR6	BS8233	35dB (Internal)	33.3	18.3	Yes
NSR7	BS8233	35dB (Internal)	14.8	-0.2	Yes

As can be seen in **Table 10-24**, with the exception of noise sensitive receptors NSR1, NSR3, NSR4 and NSR5, the predicted noise levels at each of the receptors above will be below background in terms of the BS 4142 assessment. Given the context of the site, NSR's and the current level of road noise in the local area it is considered that the effect of the predicted increase in noise level will not be as adverse as the results indicate especially as this is only representative of a single hour of the day instead of the full 16 hours.

When the cumulative noise levels are compared against those set out in BS 8233 in regard to external amenity areas indicates that the levels of noise received at all the above identified receptors would still be below that defined as "desirable" and NSR5 below the level defined as "good".

In addition to the consideration of context, it is understood that the access road (located adjacent to NSR5) will benefit from resurfacing. This will have greatest effect at NSR 5, although some limited noise attenuation will also be seen at NSR4.

In EIA terms the noise levels during the worst-hour have the potential to have a **Major Adverse** impact at the closest receptors (NSR4 and NSR5), which is considered to be **significant**. As stated above, the BS4142 noise level assessment does not take into account the benefit received from the resurfacing of the access road which would reduce the noise levels and potentially the magnitude of impact at these locations.

The results in **Table 10-25** indicate that with the exception of NSR5, the internal daytime noise levels within the existing noise sensitive properties will be within the criteria set out in Table 4 of BS 8233 (see **Table 10-5**).

In EIA terms the BS8233 noise assessment indicates the noise levels during the worst-hour have the potential to have a **Negligible** impact and are therefore **Not Significant**.

Proposed NSR's (Saturday 'Worst Case')

Table 10-26 and **Table 10-27** set out the results of the noise at NSR's associated with the three glamping areas.

Table 10-26 BS 4142 assessment - onsite traffic, proposed glamping receptors

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Background Sound Level L_{A90} (dB)	Rating Level $L_{Ar,Tr}$ (dB)	Difference in Noise Level (dB)
NG1	MP4	33	34.4	1.4
NG2	MP4	33	33.4	0.4
NG3	MP4	33	33.1	0.1
NG4	MP4	33	34	1
HG1	MP4	33	33	0
SEA1	MP5	33	30.8	-2.2
SEA2	MP5	33	31.8	-1.2
SEA3	MP5	33	31.1	-1.9
SEA4	MP5	33	30.2	-2.8
SEA5	MP5	33	31.2	-1.8
SG1	MP5	33	29.6	-3.4
SG2	MP5	33	24.8	-8.2
SG3	MP5	33	24.4	-8.6
SG4	MP5	33	24.1	-8.9
SG5	MP5	33	24	-9
SG6	MP5	33	30.7	-2.3
SG7	MP5	33	23.3	-9.7
SG8	MP5	33	30.5	-2.5
SG9	MP5	33	30.2	-2.8

Table 10-27 BS 8233 assessment - onsite traffic, proposed glamping receptors

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Predicted Onsite Vehicle Noise Level (Internal) $L_{Aeq,1h}$ (dB)	Criteria Met
NG1	BS8233	35dB (Internal)	34.4	24.4	Yes
NG2	BS8233	35dB (Internal)	33.4	23.4	Yes
NG3	BS8233	35dB (Internal)	33.1	23.1	Yes
NG4	BS8233	35dB (Internal)	34	24	Yes
HG1	BS8233	35dB (Internal)	33	23	Yes

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Predicted Onsite Vehicle Noise Level (Internal) $L_{Aeq,1h}$ (dB)	Criteria Met
SEA1	BS8233	35dB (Internal)	30.8	20.8	Yes
SEA2	BS8233	35dB (Internal)	31.8	21.8	Yes
SEA3	BS8233	35dB (Internal)	31.1	21.1	Yes
SEA4	BS8233	35dB (Internal)	30.2	20.2	Yes
SEA5	BS8233	35dB (Internal)	31.2	21.2	Yes
SG1	BS8233	35dB (Internal)	29.6	19.6	Yes
SG2	BS8233	35dB (Internal)	24.8	14.8	Yes
SG3	BS8233	35dB (Internal)	24.4	14.4	Yes
SG4	BS8233	35dB (Internal)	24.1	14.1	Yes
SG5	BS8233	35dB (Internal)	24	14	Yes
SG6	BS8233	35dB (Internal)	30.7	20.7	Yes
SG7	BS8233	35dB (Internal)	23.3	13.3	Yes
SG8	BS8233	35dB (Internal)	30.5	20.5	Yes
SG9	BS8233	35dB (Internal)	30.2	20.2	Yes

In terms of the glamping areas, onsite vehicle noise is not anticipated to have an adverse noise impact at these locations

Table 10-28 and **Table 10-29** provide the results of the “live/work” and non-residential NSR’s.

Table 10-28 Noise levels associated with onsite vehicle movements (proposed live/work accommodation receptors)

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Criteria Met
REC1	BS8233	35dB (Internal)	53.5	38.5	n/a
EC1	BS8233	35dB (Internal)	42.6	27.6	n/a
EC2	BS8233	35dB (Internal)	42.5	27.5	n/a
EC3	BS8233	35dB (Internal)	37.4	22.4	n/a
EC4	BS8233	35dB (Internal)	42	27	n/a

The assessment in **Table 10-29** is presented for completeness and transparency. It is understood that these accommodations will only be occupied outside of operational hours by persons working within the Proposed Development. With the exception of REC1, the results largely indicate that the noise levels from onsite traffic during the busiest hour will be within guidance levels.

Table 10-29 Noise levels associated with onsite vehicle movements (proposed non-residential receptors)

Ref	Guidance Document	Guidance Level	Predicted Onsite Vehicle Noise Level (External) $L_{Aeq,1h}$ (dB)	Predicted Onsite Vehicle Noise Level (Internal) $L_{Aeq,1h}$ (dB)	Criteria Met
RFR1	BB93	35dB (Internal)	39	24	Yes

The assessment results for non-residential noise sensitive locations around the site are displayed in **Table 10-29.** As only RFR1 would potentially be operational on a Saturday, this is the only receptor that has been assessed.

The results indicate that for onsite traffic the predicted internal noise levels experienced would be within the guidance levels.

In EIA terms, the effect of associated onsite traffic on proposed noise sensitive receptors is considered to be **Negligible** and therefore **Not Significant** at all locations.

10.7.3.4 Cumulative Noise Assessment – (Saturday 'Worst Case')

In accordance with the consultation, a cumulative noise assessment based upon the principles set out within the IEMA guidance document is presented in the tables below.

This assessment considers the absolute predicted noise change that could result from the operation of the Proposed Development. As detailed **Section 10.7**, noise sources were predicted in line with either modelling results (onsite vehicle movements) or within local planning authority criteria (building service plant and loudspeakers).

This assessment compares the predicted change in noise level at that could result from all of the events happening simultaneously, against the existing L_{Aeq} noise levels. The tables below set out the results for the existing noise sensitive receptors and for those within the proposed glamping area (including Hardnips Barn). Of the identified noise sensitive locations around the Proposed Development site, these locations are considered to be the most sensitive and potentially affected by changes in noise level.

As set out in **Section 10.7** the results of these assessments represent noise levels from a single hour (defined as the busiest hour) and not over a 16-hour period. Therefore, presenting the noise level as a 16-hour noise level instead of a 1-hour is considered worst-case.

The results of the cumulative noise assessment for existing NSR's are presented in **Table 10-30.**

Table 10-30 Cumulative noise assessment, existing NSR's

Recept or Ref	Relevant Noise Measurement Position	Weekday Daytime Ambient Sound Level $L_{Aeq,T}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NSR1	MP1	44.6	32	34	36.5	45.7	1.1
NSR2	MP1	44.6	32	34	29.3	45.3	0.7
NSR3	MP2	44.8	35	33.6	38.6	46.3	1.5

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Ambient Sound Level $L_{Aeq,T}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NSR4	MP2	44.8	35	33.6	47.4	49.6	4.8
NSR5	MP3	44.8	35	39.2	59.1	59.3	14.5
NSR6	MP4	47.6	32	37.6	33.3	48.3	0.7
NSR7	MP5	48.4	31	38.4	14.8	48.9	0.5

The results in **Table 10-30**, the maximum noise level change predicted is 14.5dB, which is a level of change considered to be perceptible under short term conditions. Further analysis of the results show that this level of noise change is driven by onsite vehicle movements, predominantly those along the access road located in front of NSR5.

Given that the results represent a single hour, an infrequent event, context of the site and the existing noise sources, which already includes vehicles on the access road, it is considered that this level of change – although potentially perceptible is not one that would cause significant detriment to the receptor in terms of increase in noise level.

In addition to the above, it is understood that the access road (located adjacent to NSR5) will benefit from resurfacing. This has the potential to reduce noise levels at NSR5 and to a limited degree at NSR4.

Similarly to **Section 10.7.3**, when the cumulative noise levels are compared against those set out in BS 8233 in regard to external amenity areas indicates that the levels of noise received at all the above identified receptors would still be below that defined as “desirable” and NSR5 below the level defined as “acceptable in noisier environments”.

In addition to the consideration of context, it is understood that the access road (located adjacent to NSR5) will benefit from resurfacing. This will have greatest effect at NSR 5, although some limited noise attenuation will also be seen at NSR4.

Table 10-31 sets out a cumulative noise assessment in respect to noise levels received from the Proposed Development at the onsite glamping noise sensitive receptors.

Table 10-31 Cumulative noise assessment, proposed glamping receptors

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Ambient Sound Level $L_{Aeq,T}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
NG1	MP4	47.6	32	37.6	34.4	48.3	0.7
NG2	MP4	47.6	32	37.6	33.4	48.3	0.7
NG3	MP4	47.6	32	37.6	33.1	48.3	0.7
NG4	MP4	47.6	32	37.6	34	48.3	0.7

Receptor Ref	Relevant Noise Measurement Position	Weekday Daytime Ambient Sound Level $L_{Aeq,T}$ (dB)	Source Noise - BSP (dB)	Source Noise – Loudspeakers (dB)	Source Noise – Onsite Roads (dB)	Combined Noise Level (dB)	Difference Between Existing and Combined (dB)
HG1	MP4	47.6	32	37.6	33	48.3	0.7
SEA1	MP5	48.4	31	38.4	30.8	49.0	0.6
SEA2	MP5	48.4	31	38.4	31.8	49.0	0.6
SEA3	MP5	48.4	31	38.4	31.1	49.0	0.6
SEA4	MP5	48.4	31	38.4	30.2	48.9	0.5
SEA5	MP5	48.4	31	38.4	31.2	49.0	0.6
SG1	MP5	48.4	31	38.4	29.6	48.9	0.5
SG2	MP5	48.4	31	38.4	24.8	48.9	0.5
SG3	MP5	48.4	31	38.4	24.4	48.9	0.5
SG4	MP5	48.4	31	38.4	24.1	48.9	0.5
SG5	MP5	48.4	31	38.4	24	48.9	0.5
SG6	MP5	48.4	31	38.4	30.7	49.0	0.6
SG7	MP5	48.4	31	38.4	23.3	48.9	0.5
SG8	MP5	48.4	31	38.4	30.5	48.9	0.5
SG9	MP5	48.4	31	38.4	30.2	48.9	0.5

The results of the cumulative noise assessment, in terms of the proposed glamping areas indicate that with the operational use of the site could result in a change in noise level of less than 1dB. Given the context of the site and the expectations of people staying within this area, this level of change is not one that would be considered perceptible by people within those areas.

The above cumulative assessments indicate that when sources of noise from the Proposed Development are considered in absolute noise terms at the worst affected noise sensitive receptor, the maximum effect, would lead to a **Major adverse** impact at NSR5, and a maximum of **Minor Adverse** all others. However given the context that this is a single hour assessment, with the embedded mitigation this considered to be **Not Significant**.

10.7.4 Operational Noise Management Plan

Noise from the Proposed Development site has the potential to cause adverse effects to nearby noise sensitive receptors. As such the following measures are recommended for consideration as part of a wider site management plan that would include the control of noise.

The purpose of a noise management plan would be to provide additional controls for operational noise sources that are outside of the usual remit of a noise assessment.

It should be noted that the measures set out below are not exhaustive and there may be other options specific to the operation of the Proposed Development that could be implemented.

10.7.4.1 Glamping

In regard to the occupants of the glamping areas, the following measures are considered reasonable to provide additional control on potential noise sources:

- No amplified music at any time
- No percussive instrumentation
- No unauthorised use of motor vehicles
- Information clearly setting out the times when people can arrive/depart the site

The above does not include noise generated by events within the 'Special Events' area located between the two glamping sites. This area would be subject to controls depending on the event type, duration and time of day/year.

It is anticipated that these controls could be managed through the use of an "Events Management Plan" which could apply to events occurring in both the 'Special Events' and the Equestrian Centre areas.

10.7.4.2 Equestrian Centre

There are a number of 'best practice' measures that should always be implemented so as to be a "good neighbour" and protect the amenity of nearby residential receptors. These include:

- Switching off any noise generating equipment when not required;
- Careful design of the PA system to prevent the need for high volume announcements (except in an emergency)
- Consideration given to directivity of noise sources i.e. speakers; types and numbers used/mounting location/angle
- Noise limiters on the PA system to prevent operators increasing the level above acceptable levels
- Avoiding unnecessary announcements
- Traffic management measures to reduce the impact at nearby noise sensitive receptors during events
- Crowd management measures before and after the event determined by the type of and timing of the event to disperse the crowd quickly and effectively
- Low noise road/parking surface
- Effective parking design to minimise idling engines, revving engines
- Prompt finish to events

Special events occurring within the Equestrian Centre could be managed using an "Event Management Plan" which would incorporate the points set out within this section.

10.7.4.3 Rural Food and Retail Centre

There are a number of 'best practice' measures that can be implemented so as to be a "good neighbour" and protect the amenity of nearby residential receptors. These include:

- Reducing the number of deliveries during the most sensitive periods of the day/night and/or restricted times of deliveries

- Suitable unloading/loading methods and locations i.e. preferably internal unloading in retail units, avoid dragging cages across car parks/uneven surfaces, prolonged use of forklifts
- Broadband vehicle reversing alarms where possible
- Avoiding use of horns and unnecessary revving of engines
- Switching engines off during prolonged stationary periods
- Reducing the need for vehicles to reverse to loading/unloading bays
- Pre-defined access/egress routes
- Low vehicle speed limits
- Maintaining access roads to avoid clunks and clatters from potholes/uneven surfaces
- Partial enclosure of areas where noise sources are likely to be operating
- Avoiding unnecessary communications i.e. staff shouting in external spaces; which may be in proximity to NSR's during sensitive periods of the day
- Screening from vehicle activity may also be provided by the buildings and site layout
- Minimise the number of noise sources operating at any one time

10.8 Summary

The following conclusions can be drawn from the noise assessment:

- From cumulative noise assessments undertaken, the increase in onsite vehicle movements within the busiest hour will lead to an increase in noise level at the some of the identified existing noise receptors. However, given the context of the site in terms of existing noise sources (agriculture and vehicle movements) and that no different noise sources to that that already occur within the site, it is not considered that the noise effects are significantly adverse. This is conclusion is considered relevant for both the 'typical' and 'worst-case' assessment scenarios.
- The results of the cumulative assessment for the proposed noise sensitive receptors indicate an indicate a negligible increase over the existing noise levels.

Therefore, there is predicted to be limited adverse impacts when context is considered.

The initial numerical findings of the BS 4142 assessment of onsite vehicle noise indicate the potential for significant impacts. However, when considering context, in particular that the predicted internal and external noise levels are compliant with relevant guidance (BS 8233), these impacts are considered to be **not significant.**

A noise management plan detailing additional noise control measures that could be implemented for both the construction and operation of the proposed site is set out. It is considered that with these measures, and control of noise from any external building services plant (should it be necessary) will ensure that any adverse effects that may be predicted are minimised as far as possible.

Overall, it is considered that with appropriate noise control and mitigation measures implemented the Proposed Development at Crouchlands Farm, Plaistow is not expected to have a 'significant adverse impact' on the health or quality of life.

Therefore, it is considered that based on the assessment above, noise impacts associated with the Proposed Development are considered to be **not significant**.

11 Nature Conservation and Biodiversity

This chapter of the EIA Report considers the likely effects of the Proposed Development with respect to ecology and how this could affect priority habitats and/or protected/notable species of wildlife. It describes the methods used to assess potential effects, the baseline conditions currently existing within the Proposed Development's footprint and the surrounding area. The mitigation measures required to prevent, reduce or off-set any significant adverse effects are presented together with the likely residual effects after these measures have been adopted.

This chapter is supported by the following appendices:

- Appendix 11.1, *P2645a EcIA - Crouchlands Farm (Rural Food & Retail & Equestrian Centre) Plaistow (REV 08)*;
- Appendix 11.2, *P2645d EcIA - Crouchlands Farm (Hardnip's Barn Glamping) Plaistow (REV 08)*;
- Appendix 11.3, *P2645e EA - Crouchlands Farm (Farm Hub Rural Enterprise and Education Centre) Plaistow (REV 06)*; and
- Appendix 11.4, *Biodiversity Enhancement Strategy - Crouchlands Farm (Rev 3.0).*

11.1 Legislation, Planning Policy and Guidance

11.1.1 Legislation

The legal protection applying to relevant bird, mammal, herpetofauna and invertebrate species and current nature conservation planning policy used to steer this assessment includes:

- The 'Birds Directive', 'Habitats Directive' and 'Natura 2000 Sites';
- The 'Habitats Regulations' (2017) as amended;
- Wildlife and Countryside Act (1981) as amended;
- Natural Environment and Rural Communities (NERC) Act (2006);
- Protection of Badgers Act (1992);
- UK Post-2010 Biodiversity Framework; and
- Birds of Conservation Concern (BoCC).

11.1.2 Planning Policy and Guidance

11.1.2.1 National Planning Policy Framework

The National Planning Policy Framework[28] sets out the Government's view on how planners should balance nature conservation with development and helps ensure that Government meets its biodiversity commitments with regards to the operation of the planning system.

Paragraph 174d, states that council policies and decisions should:

- *"contribute to and enhance the natural and local environment by: minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures"*

[28] *HM Government (2021). National Planning Policy Framework. Department for Communities and Local Government. Available online at: https://www.gov.uk/government/publications/national-planning-policy-framework--2*

Paragraph 179b, states that local plans should:

- *"promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity".*

Paragraph 180d states that when determining planning applications:

- *"development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate".*

Circular 06/2005 provides further guidance in respect of statutory obligations for biodiversity and geological conservation and their impact within the planning system[29].

In accordance with the NPPF, it is important that developments should contribute to local policies that enhance the natural environment by:

- Minimising impacts on existing biodiversity and habitats and designated features,
- Establishing coherent ecological networks that are more resilient to current and future pressures.
- Providing net gains in biodiversity and habitats, wherever possible.

11.1.2.2 Chichester District Council Local Plan 2014-2029

Policy Number/Title	Policy Summary
Policy 40 - Sustainable design and construction	The developer must evidence for dwellings and non-domestic buildings, that the development will protect and enhance the natural environment. The natural environment/biodiversity will be protected and where appropriate provisions should be made for green infrastructure and biodiversity areas.
Policy 45 -Development in the countryside	Outside settlement boundaries, development will be granted if it is small-scale and locally needed or cannot be added to existing settlements.
Policy 49 - Biodiversity	Planning permission will be granted where it is demonstrated that: the biodiversity of the site is safeguarded, damage to protected species and habitats is mitigated, the proposal has incorporated features that enhance biodiversity as part of a good design and sustainable development, it enhances and manages the District's network of ecology, biodiversity and geological sites and the corridors which connect them.

11.2 Consultation

The following Screening Opinion was received from CDC on 5th March 2021 in response to the submission of an EIA Screening Report:

"*The EIA Screening Report correctly identifies that the proposed development exceeds the thresholds for requiring EIA as follows:*

[29] *HM Government (2005) ODPM Circular 06/05 Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7692/147570.pdf.*

10. (b) Infrastructure Projects: Urban development projects, including the construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas:

(iii) the overall area of the development exceeds 5 hectares.

9c) Tourism and Leisure: Holiday villages and hotel complexes outside urban areas and associated developments:

The area of the development exceeds 0.5 hectare.

Therefore EIA will be required.

The report also details that habitat and protected species surveys will be required. The impact on designated sites will be a key consideration within the EIA and information will be needed to inform an appropriate assessment for the proposals. The site is within the SSSI Impact Zone for Chiddingfold Forest SSSI (Site of Special Scientific Interest) and also within the Zones of Influence of The Mens Special Area of Conservation (SAC) and Ebernoe Common SAC, both of which have been designated for their bat populations, particularly Bechstein's and Barbastelle populations. There is extensive bat habitat and network in immediate proximity to the site, including Ancient Woodland directly to the south. The grassland and woodland to the West of the site has extensive bat records, including Bechstein's and Barbastelle Bats records. The impact on the bat network and the integrity of the designated sites will need thorough investigation."

The assessment covers the requirements set out in the EIA Screening Report.

11.3 Assessment Methodology

The following sections describe the methods used in the desk study and protected species/habitat survey(s). All survey methods are in accordance with current best practice guidance for the respective species/taxonomic group and any limitations encountered during the survey are explained in **Section 11.3.15**.

11.3.1 Desk Studies

A search for pre-existing records of protected species, priority species for conservation and invasive non-native species was requested from the Sussex Biodiversity Records Centre (SxBRC) within a radius of 2km of Crouchlands Farm.

A search of on-line mapping resources was undertaken to identify the location of any features of potential ecological interest including ponds within 500m (relevant to great crested newts), watercourses (relevant to riparian mammals and crayfish, for example) and connectivity to woodland, scrub, and hedgerow networks (relevant to bats and dormice, for example) in the wider landscape around the site. The connectivity of the site to these features, buildings and other semi-natural habitats are also relevant to species such as bats, great crested newts and reptiles.

The MAGIC website resource (www.magic.gov.uk) was used to identify the location of designated sites for nature conservation and European Protected Species (EPS) licences granted in relation to the survey site.

11.3.2 Phase 1 Habitat Survey

A site walkover survey was undertaken over several days in June 2018 and was supplemented with an updated survey on 10th July 2019. During the surveys, habitats contained within the site were described and

evaluated in accordance with standard Phase 1 Habitat Survey methodology[30]. The dominant species and indicators of important habitat types, such as ancient woodland or unimproved grassland, were recorded.

A Phase 1 habitat survey presents a standardised system for classifying and mapping wildlife habitats in all parts of Great Britain, including urban areas. The aim of Phase 1 survey is to provide, relatively rapidly, a record of the vegetation and wildlife habitats present over large areas of countryside. The habitat classification is based principally on vegetation, augmented by reference to topographic and substrate features, particularly where vegetation is not the dominant component of the habitat.

Data was gathered through a site walkover survey and use of on-line aerial photography to broadly categorise the habitats present using the JNCC Phase 1 classifications. The results are presented as a map showing the distribution of habitat categories across the site. Target notes are used to describe specific features of biodiversity interest and record indicator species where appropriate. In addition to this, notable habitats, such as local and national Biodiversity Action Plan habitats are highlighted.

The Phase 1 survey methodology is a recognised tool for initial scoping of potential ecological constraints and opportunities in relation to a proposed development, and feeds into the assessment process of identifying potential impacts and the significance of effects, which is required as part of the planning application process.

As part of the 'Extended' Phase 1 Habitat Survey, the site features were evaluated for their potential to support legally protected species and observations of any important plant communities, bird assemblages or other potentially valuable ecological features were recorded. Details of the preliminary survey methods for each legally protected species are detailed below and any specific limitations to the survey, such as access constraints, are recorded in **Section 11.3.15.**

11.3.3 Updated Walkover Survey

An updated site walkover was undertaken on 16th June 2020, and a further subsequent walkover survey of Fields 3b & 4 within the proposed Hardnip's Barn Glamping site was conducted on 10th February 2021. The aim of these surveys was to update the results of the previous Phase 1 habitat survey, to confirm any changes in the nature and condition of the habitats since the visit of June 2019, and to survey areas not previously included within the 2019 study.

11.3.4 Badgers

Badgers tend to live in family groups with clearly defined territories, with the main sett used throughout the year, as a focal point. The territory often also contains a number of 'annex', 'subsidiary' and 'outlier' setts that are used intermittently. Badgers can exist in a variety of habitats, but a mixed farmland landscape containing pasture and arable land, studded with woodland, scrub and hedgerows support the highest population density.

Evidence of badger activity was recorded during the Phase 1 habitat survey, during which, surveyors searched for badger setts, latrines, foraging marks, footprints, worn pathways, and trapped hairs on fences, with special attention paid to linear features.

[30] JNCC (2010) Handbook for Phase 1 habitat survey: A technique for environmental audit. Joint Nature Conservation Committee, Peterborough.

11.3.5 Bats

11.3.5.1 Natural Roost Features - Trees

All trees likely to be affected directly or indirectly by the Proposed Development were subject to a ground-based visual inspection to identify potential roost features. Each tree/feature was categorised for its potential to support roosting bats as shown in **Table 11-1** in accordance with best practice guidance[31].

Table 11-1. Characterising bat roost potential in trees[31].

Category	Description
Negligible	A tree with negligible roosting habitat features likely to be used by bats.
Low	A tree of sufficient size to potentially support roosting features, but with none seen from the ground or features identified of limited roosting potential.
Medium	A tree with one or more potential roost sites that could be used by bats due to their size, conditions and surrounding habitat, but unlikely to support a roost of high conservation status such as a maternity or hibernation roost.
High	Trees with one or more potential roost sites that appear suitable for large numbers of bats or use as maternity or hibernation roosts.

11.3.5.2 Built Structures

A detailed ground based visual assessment of buildings within the site was carried out, looking for features with potential to support roosting bats (e.g. gaps under tiles, soffits, cracks or gaps in brickwork, cladding) and any evidence indicating the presence of bats, such as rub marks, staining or droppings beneath potential roost features. Where possible and safely accessible, internal inspections of potentially suitable enclosed loft spaces were made to search for evidence of use by bats (live bats, dead bats, droppings, rub marks or staining of timbers). The study included the following built structures:

- Agricultural barn – Rural Food & Retail & Equestrian Centre;
- Hardnip's Barn – Hardnip's Barn Glamping; and
- Nine former farm buildings and anaerobic digestors – Farm Hub, Rural Enterprise & Education Centre.

11.3.5.3 Trapping

Three trapping surveys for bats were carried out by AEWC Ltd on the 2nd June, 30th July and 21st August 2018 at the proposed Hardnip's Barn Glamping site ascertain which bat species the site supports and the breeding status of any individuals present.

A site walkover was first conducted during the day in order for surveyors to familiarise themselves with the site.

The trapping surveys were carried out at sixteen locations across the site, using three harp traps for the first survey visit and five harp traps on the subsequent two visits. The locations were selected on the basis of habitats of value to bats within and adjacent to the proposed glamping site.

[31] *Collins, J.(ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.*

Harp traps were set up at each location and were fitted with a sonic lure (Sussex Autobat or Binary Acoustic Technology AT100) that produced simulations of a variety of bat social calls, to increase the likelihood of trapping bats. The trapping commenced from dusk to just before dawn, and lasted for between four and six hours on each survey night.

The bats caught in the harp traps were removed from the traps, by or under the direction of Daniel Whitby (bat licence number 2017-28263-CLS-CLS) and transferred to a clean cloth bag. At the end of each trapping session the biometric information was obtained from all bats caught. Biometric data collection included, sex of the bat and the reproductive status.

All bats were released immediately after processing, in close proximity to the site of capture, during the hours of darkness.

11.3.5.4 Radiotracking

In order to identify the location of maternity colonies of bats and rare or possible tree roosting bats, radiotracking was undertaken by AEWC Ltd at the proposed Hardnip's Barn Glamping site. Two bats were radio tracked on the 30th July 2018.

Radio tags (Biotrack UK and Hollohil) including Pip and PicoPip radiotags (0.23–0.4g tags) were fixed to bats using latex-based adhesive (Torbot bonding cement). Radio telemetry was then used in the daytime to track the bat location and identify day roosts where possible. Full night tracking was not conducted as part of this project.

Once roost locations had been identified, if they were accessible and suitable, emergence surveys were conducted using professional night vision cameras and infrared (IR) illuminators to accurately identify and record bats emerging. This allows for a roost count, which can indicate colony size and roost characterisation.

11.3.5.5 Roost Monitoring – Bat Emergence Survey

As a result of the trapping/radiotracking effort, a significant bat roost was identified within a tree located within the immediate surroundings of the proposed Hardnip's Barn Glamping site, which was monitored in 2020. Two dusk emergence surveys were undertaken in accordance with guidance set out in the best practice guidelines prepared by the Bat Conservation Trust[5].

The survey utilised two surveyors and one infrared camera. The surveyor recorded any bat activity around the roost feature previously identified. The surveyors used full spectrum handheld bat detectors to identify species through call frequencies. The bat calls were logged and recorded as sonograms for later confirmation of species where necessary.

11.3.5.6 Bat Activity Surveys – Walked Transects

A series of bat activity surveys were undertaken within the proposed Rural Food & Retail & Equestrian Centre site; activity surveys followed best practice guidelines[6]. Pre-determined transect routes were followed by surveyors, focussing on linear features within the site boundary (tree lines, woodland edge and hedgerows). The transect routes were walked at a slow pace during the period from sunset up to two hours after sunset by a team of surveyors, such that each part of the route was passed approximately every twenty minutes. All surveys were undertaken during weather conditions suitable for bat activity and at ambient temperatures above 10°C. The surveyors recorded bat activity using 'Echo Meter Touch' bat detectors featuring auto-identification of bat species and automatically triggered recording for later review. The

locations of all bat 'registrations' were recorded onto a field map during the survey to correspond with all sound recordings.

11.3.5.7 Bat Activity Surveys – Static Detector Deployment

Four Elekon Batlogger A static bat detectors were deployed across Crouchlands Farm on three occasions – May/June, July & September 2019 – and left in the field for a minimum of five days: the expected maximum lifetime of the battery. Static bat detectors comprise a passive recording device with real-time full-spectrum calls that can be viewed in detail once downloaded on analysis software, allowing accurate identification of most bat calls to species level (or genus level in the case of *Myotis* and *Plecotus* spp.).

The data sets collected by the static bat detectors were interpreted using ECOBAT32 - an online resource, which is used to interpret static detector data by calculating percentiles through comparison of the data with a national database of bat activity data. Levels of bat activity were qualified according to **Table 11-2**.

Table 11-2. Qualification of bat activity levels detected by static bat detectors and using ECOBAT outputs.

Bat activity level	Bat passes/night (median percentile range)
Low	0–-20th Percentile
Low–moderate	21st–40th Percentiles
Moderate	41st–60th Percentiles
Moderate–high	61st–80th Percentiles
High	81st–100th Percentiles

The walked transect and static bat detector ('bat logger') survey methods complement each other with the transect surveys providing information on foraging and commuting patterns, and distribution across the site; and automated static detector surveys giving more prolonged coverage through consecutive nights, thus increasing the likelihood of detecting scarce species.

11.3.6 Breeding Birds

Breeding bird surveys were undertaken within the wider landholding at Crouchlands Farm between May and June 2018.

The method used for the breeding bird survey was adapted from the Breeding Bird Survey (BBS) methodology, designed by the British Trust for Ornithology (BTO)[33] as an accessible means of monitoring British bird population trends over the UK using volunteers and frequently adapted for EcIA. The original methodology requires two visits per season to be carried out over many seasons, allowing data sets to be built up. The number of visits has been increased to three for this survey to provide a more representative 'snapshot' of the bird assemblages present at the site during one survey season.

Pre-determined transect routes were walked on each visit, during which the observer recorded all birds encountered. As recommended in the BTO guidelines, all bird survey visits were carried out between 6am and 11am and were only undertaken during favourable weather conditions for bird activity, with periods of persistent or heavy rain, high winds or fog avoided. The transect route was walked at a constant slow pace by a competent bird observer, recording all birds detected either by sight or calls/song. The transect route was split into numbered sections and birds were counted within each of these sections. Notes regarding the

[32] *http://www.ecobat.org.uk*
[33] *https://www.bto.org/about-birds/birdtrends/2018/methods/breeding-bird-survey*

behaviour of birds identified were made, to determine their breeding status. Birds were said to be 'confirmed as breeding' if they were observed carrying nesting material, food or faecal pellets; or nests, eggs, or recently fledged young were discovered. Birds were recorded as 'likely breeding' if observed singing or displaying, repeatedly visiting the same locations and showing agitated or distraction behaviour. Each bird 'registration' was recorded on a field map of the survey site using standard BTO Common Birds Census (CBC) notation, which includes behaviours and flight movements.

11.3.7 Common Dormouse

Dormouse surveys were undertaken by attaching purpose-built 'nest tubes' on trees and shrubs in suitable habitat such as woodland, scrub and hedgerows. Nest tubes are used by dormice as places of shelter and they will often construct their nests within them during their periods of activity (typically between April and November). In accordance with current best practice guidelines [34], 70 nest tubes were deployed approximately 20m apart in woodland and hedgerows in March 2018 and left *in situ* for the survey season. These were checked on a monthly basis for presence of animals and evidence of dormouse presence (distinctively woven nests) from July to October 2018. Since the likelihood of use by dormice varies through the year, an index of probability score is used to determine confidence in a particular survey (see **Table 11-3**) comprising checks over several months. A minimum score of 21 is normally accepted to establish 'likely absence' in the event that no signs of dormice are found during the survey.

Table 11-3. Search effort score for each month that dormouse tubes are out on the site and subject to checks for occupation.

Month of check	Index of probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

Dormice checks were undertaken in the mornings and commenced one month after the nest-tubes were positioned. Surveys were undertaken under the supervision of licensed surveyors: Paul Whitby BSc MCIEEM CEcol (2016-21456-CLS-CLS) and Dan Bennet BSc MCIEEM (2016-21740-CLS-CLS).

11.3.8 Great Crested Newts

11.3.8.1 Habitat Suitability Assessment

The Phase 1 and PEA identified a number of waterbodies within Crouchlands Farm with the potential to support breeding amphibians. The former slurry lagoons were identified as having water quality too poor to support tadpoles. All three of these ponds underwent an Environmental DNA (eDNA) survey to determine presence of great crested newts within the waterbodies.

[34] *Bright, B., Morris, P., Mitchell-Jones, A.J. and Mitchell-Jones, T (1997) The Dormouse Conservation Handbook. English Nature.*

Those ponds within 250m of the site's boundaries, and with 'average' or above average suitability for breeding great crested newts, were carried forward for eDNA sampling and/or presence/likely absence surveys.

11.3.8.2 Environmental DNA Sampling Analysis

This relatively new technique allows a quick and reliable qualitative measure of the presence/likely absence of great crested newts. It involves collection of water samples from a pond, using a standard protocol set out by Natural England[35]. The samples are sent to an approved laboratory to isolate and amplify environmental DNA (eDNA) shed into the water by amphibians during the breeding season.

The eDNA samples of ponds within the local area were taken on 2nd June 2018 & 25th June 2019, whilst the eDNA sample from the pond located within the Farm Hub Rural Enterprise and Education Centre was collected on 1st June 2021.

Ponds that were confirmed as positive for great crested newt DNA were then carried forward to full field survey (population size class assessment).

11.3.8.3 Population Size-class Assessment

The survey methodology followed standard guidance for great crested newts[36]. Four survey visits were undertaken initially, using a combination of bottle-trapping, torchlight searching and egg searching during each survey visit. All surveys were undertaken during weather conditions suitable for great crested newts – above the minimum temperature of 5°C – and at least two of the survey visits were undertaken during the 'peak activity period' for breeding great crested newts (i.e. between 15th April and 15th May). Weather conditions, temperature and pond turbidity was recorded during each survey visit. If great crested newts were confirmed present by either of the above methods at a given pond, the field survey was extended to six separate visits to allow the population size to be assigned to one of the following population classes[36]:

- 'Small' – peak count of 1–10
- 'Medium' – peak count of 11–100
- 'Large' – peak count of >100

11.3.9 Invertebrates

Two moth-trapping sessions were undertaken within Hardnip's Copse (located to the immediate east of the proposed Hardnip's Barn Glamping site) on 14th June and 5th September 2018. During the trapping session of 14th June 2018, a single Robinson's Moth Trap was deployed overnight and collected the following morning. Two moth traps were deployed during the trapping session of 5th September 2018. All moths captured were identified to species level the following morning and then released.

11.3.10 Reptiles

Standard reptile presence/likely absence surveys involve setting out artificial refugia (reptile 'mats' or 'tins') in potentially suitable habitat. Reptile mats are pieces of roofing bitumen felt and reptile tins are pieces of corrugated metal sheet approximately 1m x 0.5 m in size, which absorb heat from the sun more rapidly than

[35] *Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.*
[36] *English Nature (2001) Great Crested Newt Mitigation Guidelines. English Nature, Peterborough.*

the surrounding vegetation, and provide cover and basking places attractive to reptiles. These are then checked for presence of animals under suitable weather conditions. They are placed in areas of potentially suitable habitat approximately 20m apart along linear features. There are no up-to-date best practice guidelines for reptile surveys, but a minimum of seven survey visits under suitable weather conditions is generally considered to be adequate when determining their presence/likely absence, and 15–20 visits are used to calculate a 'peak count' for population size class assessment.

A total of 71 roofing felt mats were used in this survey (20 within the proposed Rural Food & Retail & Equestrian Centre, 35 within the proposed Hardnip's Barn Glamping site and 16 within the proposed Farm Hub, Rural Enterprise & Education Centre). The mats were left *in situ* for a minimum of one week to 'bed in' and allow reptiles to locate them before the first check. The mats within the Rural Food & Retail & Equestrian Centre and the proposed Hardnip's Barn Glamping site were checked at least seven times over the period May–July 2019, whilst those within the proposed Farm Hub, Rural Enterprise & Education Centre were checked the same number of times between June and September 2018. All observations of reptiles were recorded, together with the weather conditions, temperature and time of day.

11.3.11 Other Notable Species

The site's habitats were broadly assessed for their potential to support species of principal importance for nature conservation (Section 41 NERC Act 2006) and other notable species. This includes mammals such as harvest mouse *Micromys minutus*, hedgehog *Erinaceus europaeus*, brown hare *Lepus europaeus* and many bird species. The site was broadly assessed for its potential to support important invertebrate assemblages with specific attention paid to features such as standing deadwood, wet flushes, bare earth banks and botanically rich areas.

11.3.12 Invasive Non-native Species

No specific surveys for invasive non-native species (INNS) were undertaken. However, the presence of any invasive non-native species encountered during other fieldwork was recorded.

11.3.13 Impact Assessment Methodology and Mitigation

The assessment of ecological impacts and effects, and mitigation recommendations in this report follow CIEEM Guidelines for Ecological Impact Assessment (EcIA)[37]. This involves evaluating the importance of an 'ecological feature' (habitat, vegetation community, population of a single species or assemblages of species) in terms of nature conservation priority, followed by the application of the 'mitigation hierarchy'.

11.3.13.1 Importance of Ecological Features

A level of importance was assigned to all existing ecological features, through consideration of the rarity and distribution of a habitat or species, the population size, ecological function, and trends (declining/expanding), together with any designations, legal status, or conservation policies. CIEEM recommend that the importance of an ecological feature, in terms of nature conservation priority, should be considered within a defined geographical context (for definitions see **Appendix 2** of **Appendix 11.1**):

- international and European;
- national;
- regional;

[37] *CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.*

- county;
- local or parish; and
- site / negligible.

Where protected species are present and there is the potential for a breach of the legislation as a result of the development proposals, those species are considered as 'important' features and included in the assessment. However, the level of importance assigned to the affected population of a protected species will vary depending on contextual information about the population size, distribution, abundance and trends across the range of geographical scales.

Similarly, irreplaceable habitats such as ancient broadleaved woodland are considered as 'important features and included in the assessment. The level of importance will vary depending on the size of the habitat parcel, its distribution and abundance at different geographical scales.

Features that are considered to be important at site level only, or are of negligible importance, (such as paved ground or amenity grassland) are excluded from this assessment and it should be reasonable to assume that if a feature is not mentioned, it is not ecologically important.

For consistency with the rest of the ES and the significance criteria outlined in **Section 5.5.6** the significance established using the CIEEM criteria has been equated with the categories below:

- Major Beneficial: the effect is of a magnitude likely to permanently benefit a nationally/internationally valued ecological receptor;
- Moderate Beneficial: the effect is of a magnitude likely to permanently benefit a borough/metropolitan and/or locally valued ecological receptor;
- Minor Beneficial: the effect is of a magnitude likely to benefit a borough/metropolitan and/or locally valued ecological receptor, but there will be no permanent effect on its integrity/conservation status;
- Negligible: no significant effects to any receptor, or significant effects to receptors valued only in the immediate vicinity
- Minor Adverse: the effect is of a magnitude likely to be adverse to a borough/metropolitan and/or locally valued ecological receptor, but there will be no permanent effect on its integrity/conservation status;
- Moderate Adverse: the effect is of a magnitude likely to be adverse to a borough/metropolitan and/or locally valued ecological receptor permanently affecting its integrity; and
- Major Adverse: the effect is of a magnitude likely to be adverse to a nationally/internationally valued ecological receptor.

11.3.14 The 'Mitigation Hierarchy'

The assessment of the significance of an impact is made initially in the absence of mitigation. This is followed by a sequential process of determining the most appropriate way to remove or minimise significant impacts and effects. The preferred option is to avoid impacts in the first place, for example by redesigning the scheme to retain an important area of habitat, or timing works sensitively. Mitigation measures such as translocation or displacement of populations is only applied as a last resort where significant impacts and effects are unavoidable.

When residual significant adverse impacts and effects remain after all practicable measures to avoid and/or minimise these have been applied, compensation measures are required. Compensation measures include habitat creation in alternative locations that offset unavoidable habitat loss.

Finally, enhancements are proposed that do not relate to a specific impact and effect but provide net gains in biodiversity – taking advantage of opportunities in the design and operation of the development. These measures are intended to ensure that the Proposed Development contribute towards national and local biodiversity objectives.

11.3.15 Limitations and Assumptions

Surveys record any flora or fauna that is present at the time of the survey visits. It is therefore possible that some species may not have been present during the survey but may be evident at other times of the year and may appear or disappear from the site if habitat conditions change. If the habitat conditions change substantially in the intervening period, then it is recommended that the surveys be updated.

11.4 Baseline Environment

11.4.1 Designated Sites

There are no statutory or non-statutory designated sites within or immediately adjacent to the proposed glamping site. A summary of designated sites is presented in **Table 11-4, Figure 11-1** and **Figure 11-2**.

Table 11-4: Statutory and non-statutory designated sites within 2km of Crouchlands Farm. Note: Special Areas of Conservation beyond 2km, but which are potentially relevant, are also included.

Site name	Designation	Features listed on citation	Proximity (at closest point)	Ecological importance
Sparrwood Hanger & Roundwyke Copse Complex Woodland & Meadows	Local Wildlife Site (LWS)	Habitats: neutral grassland woodland streams	Adjacent to site boundary	County
Whithurst Park	LWS	Habitats: Ancient Woodland species-rich grassland lake Species: small heath *Coenonympha pamphilus*	375m SW	County
Steers Common	LWS	Habitats: Ancient Woodland Species: nightingale *Luscinia megarhynchos* brown hairstreak *Thecla betulae* purple emperor *Apatura iris* wood white *Leptidea sinapsis*	700m SW	County
Chiddingfold Forest	Site of Special Scientific Interest (SSSI)	Chiddingfold Forest consists of several areas of woodland, which together form the largest continuous area of woodland on the Weald Clay. It consists of a mixture of woodland types ranging from ancient oak woodland to coniferous plantation and includes many semi-natural types of woodland supporting a wide range of floristic communities. Many of the streams on the site cut deep into the clay and support a relict gill flora and fauna. The variety of woodland types, the gills, and the well-maintained rides provide habitats for a rich variety of insects and the site supports many nationally rare invertebrates and several regionally scarce bryophytes and lichens. The site is also noted for its diverse community of breeding birds.	970m NW	National
Kymmings Hill Farm Meadows & Woodland	LWS	Habitats: neutral grassland woodland ponds Species:	1.25km SW	County

Site name	Designation	Features listed on citation	Proximity (at closest point)	Ecological importance
		wild service tree *Sorbus torminalis* small-leaved lime *Tilia cordata* bluebell *Hyacinthoides non-scripta* narrow-leaved bitter-cress *Cardamine impatiens*		
Headfoldswood Meadow	LWS	Habitats: neutral grassland acid grassland	1.6km NE	County
Ebernoe Common	Special Area of Conservation (SAC)	Ebernoe Common consists of an extensive area of beech woodland. The site Is of international importance for rare species of bat including Bechstein's bat *Myotis bechsteinii* and barbastelle bat *Barbastella barbastellus*.	2.5km SW	International
The Mens	SAC	Supports the following Annex I habitats: Atlantic acidophilous beech forests with holly *Ilex* sp. and some Taxus sp. in the shrub layer. This site is an extensive area of mature beech woodland rich in lichens, bryophytes, fungi and saproxylic invertebrates, and is one of the largest tracts of Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range. This woodland supports barbastelle, but this is not the primary reason for the site selection.	3.4km SE	International

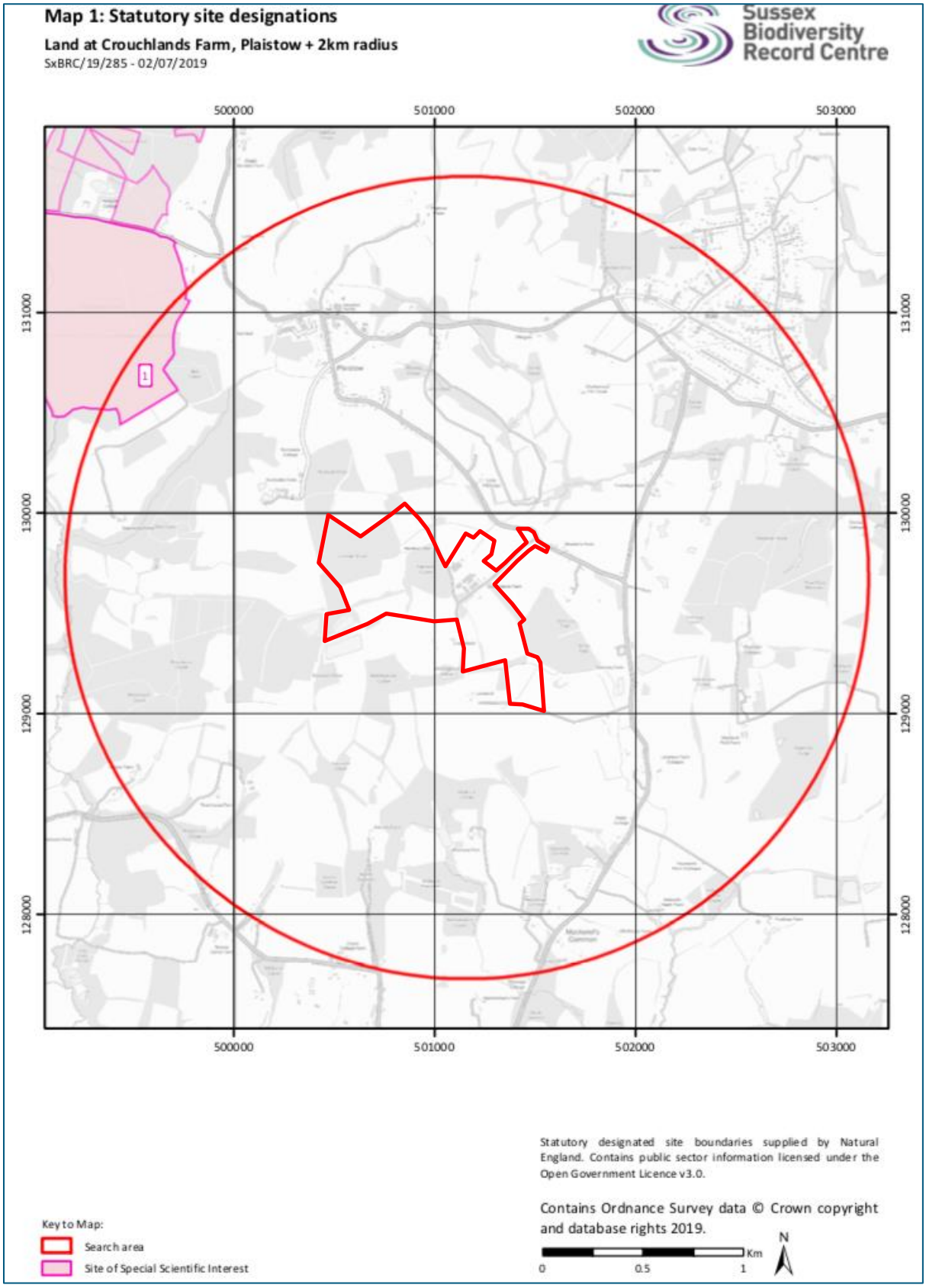


Figure 11-1. Statutory designated sites within a radius of 2km of the proposed development site (outlined in red) ©SxBRC.

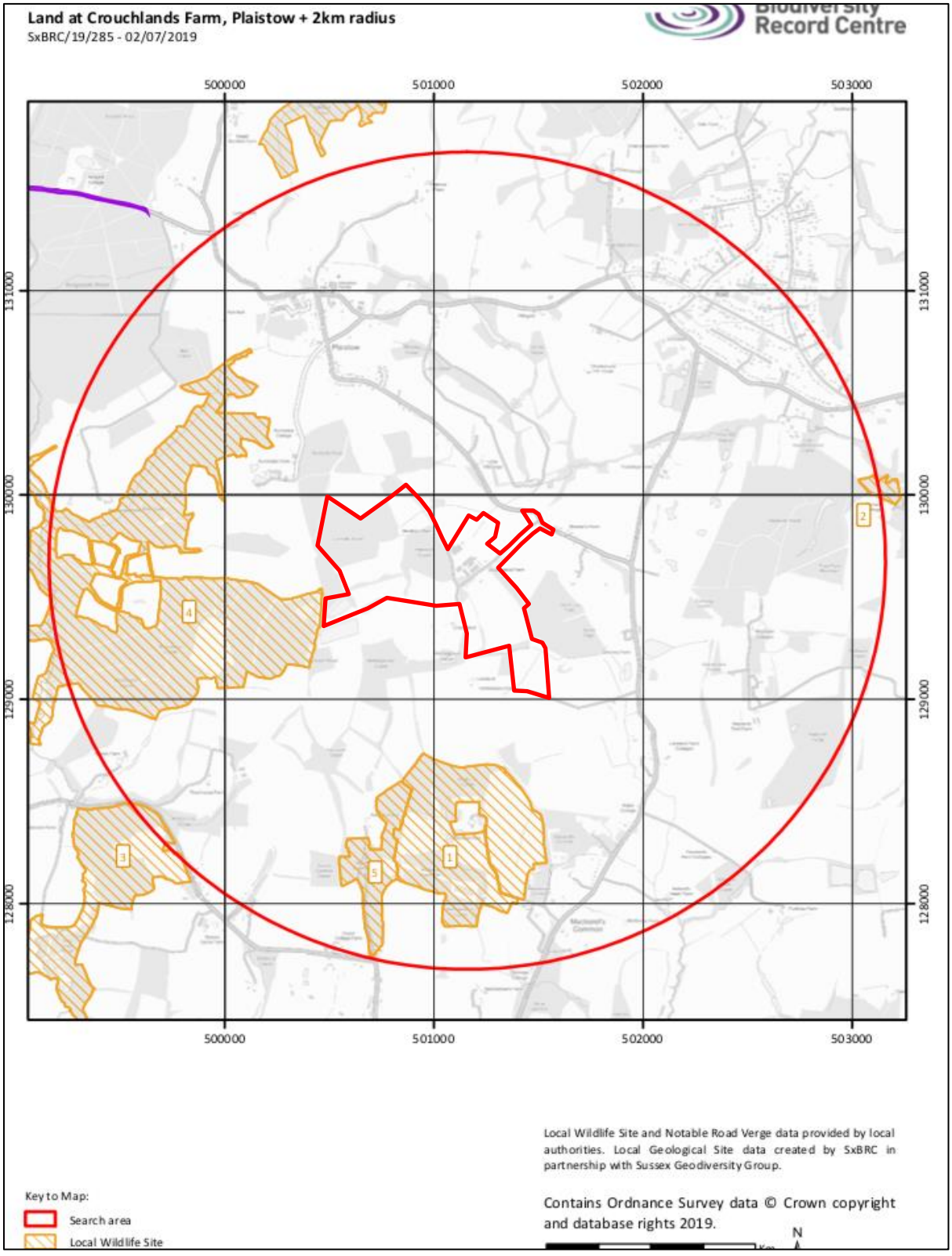


Figure 11-2. Non-statutory designated sites within a radius of 2km of the proposed development site (outlined in red) ©SxBRC.

There are no granted EPS licences for mitigation projects within 1km of the site boundary.

11.4.2 Habitats

11.4.2.1 Rural Food & Retail & Equestrian Centre

The site consists of several agricultural field of improved grassland (which are regularly ploughed a re-sowed) with an associated working yard within the north-western half of the site. Much of the site's north-western half contains disturbed soil which has become largely overgrown by ruderal vegetation. A single modern agricultural barn is present within the yard and is currently used for hay storage and housing of livestock. Significant areas of woodland are present within the site and border the previously described fields. A former orchard exists within the southern area of the site.

Table 11-5 below lists the Phase 1 Habitat Survey categories found within the site of the proposed Rural Food & Retail & Equestrian Centre, with target notes on specific features of interest and the general species composition. The Phase 1 Habitat Map for the proposed Rural Food & Retail & Equestrian Centre and key to the standard mapping symbols used are presented as Figure 12 and Figure 13 respectively within **Appendix 11.1**.

Table 11-5. The Phase 1 habitats contained within the site of the proposed Rural Food & Retail & Equestrian Centre at Crouchlands Farm.

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Broadleaved semi-natural woodland	A1.1.1	2.53ha	An area of woodland is included within the boundary at the north-eastern edge of the site's main body. A smaller copse is also included at the north-western corner of the site. Woodland also exists at the southern boundary. The main canopy is dominated by oak *Quercus robur* and ash *Fraxinus excelsior*. Species recorded within the woodland's understorey include: elder *Sambuccus nigra*, hawthorn *Crataegus monogyna*, field maple *Acer campestre*, blackthorn *Prunus spinosa*, willows *Salix* spp., rose *Rosa* spp. and hazel *Corylus avellane*. Ground flora visible from within the site included: stinging nettle *Urtica dioica*, cleavers *Galium aparine* and dog's mercury *Mercurialis perennis*. The woodland edges within the site consist of common grasses including Yorkshire fog *Holcus lanatus*, rough meadow grass *Poa trivialis* and meadow foxtail *Alopecurus pratensis*. The site's woodland habitat is considered to qualify as priority habitat under Lowland Mixed Deciduous Woodlands within Section 41 of the NERC Act, 2006. The adjacent woodland is also shown as designated Ancient Woodland habitat by SxBRC	County

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Improved grassland	B4	6.65ha	The south-eastern half of the site's main body consists of an area of improved grassland. Much of the habitat had been ploughed prior to the updated walkover survey in 2019, creating extensive areas of bare soil amongst the grasses. In 2020 the sward had reached an approximate height of 15-20cm. Additional areas of improved grassland include a long thin field at the western edge of the site, as well as a small area within a field to the north-east of the site's main body, adjacent to the access to Crouchlands Farm.	Negligible/site
Poor semi-improved grassland	B6	3.1ha	An area of poor-semi-improved grassland exists at the southern part of the site and comprises several sheep grazed field which are contiguous with the former orchard. The habitat is heavily grazed to a short sward height and is composed of common grasses with a low abundance of common herbs red clover Trifolium pratense, lesser trefoil Trifolium dubium, and meadow buttercup Ranunculus acris.	Negligible/site

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Tall ruderal vegetation	C3.1	1.5ha	Much of the site's north-western half has become dominated by tall ruderal vegetation which has developed on areas of disturbed ground and heaped spoil. The habitat is dominated by broad-leaved dock *Rumex obtusifolius* with the following species also recorded: sow thistle *Sonchus oleraceus*, greater willowherb *Epilobium hirsutum*, black meddick *Medicago lupulina*, nipplewort *Lapsana communis*, spear thistle *Cirsium vulgaris*, greater plantain, bristly ox-tongue *Helminthotheca echioides*, dandelion *Taraxacum officinale*, cranesbill *Geranium* spp., cleavers, willow (saplings) *Salix* sp., ragwort *Senecio jacobaea*, scarlet pimpernel *Anagallis arvensis*, creeping buttercup *Ranunculus repens*, teasel *Dipsacus fullonum*, forget-me-not *Myosotis* sp. and scentless mayweed *Tripleurospermum inodorum*. Common grasses present amongst the ruderal vegetation include: rough meadow grass, Timothy grass *Phleum pratense*, perennial rye *Lolium perenne* and soft brome *Bromus hordeaceus*.	Negligible/site
Disturbed land – ephemeral/short perennial vegetation	J1.3	0.7ha	An area of disturbed ground exists within the northern half of the site, to the rear of the barn building. The habitat consists of an area of gravel, which has become colonised by ephemeral vegetation and is largely dominated by fat hen *Chenopodium album*. Other species recorded within the habitat include: daisy *Bellis perennis*, scentless mayweed and redshank *Persicaria maculosa*. During the 2020 updated walkover survey several large waste piles (wood) were observed within the disturbed ground habitat.	Negligible/site

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Buildings	J3.6	0.02ha	A large open-sided agricultural building is present within the yard towards the north-western edge of the site. The barn is constructed from a steel frame. The barn is open on three sides with the south-eastern elevation created from an arrangement of wooden slats with gaps between. The building displays a pitched roof of corrugated asbestos and does not contain any roof voids. Three metal shipping containers are present within an area of ruderal vegetation at the north-western site boundary.	Negligible/site
Bare ground	J4	0.25ha	The main working yard around the barn is created by an area of gravel and bare ground. An access track used by farm machinery extends past the yard and towards the field to the south.	Negligible/site
Scattered trees	A3.1	260m 1.19ha	A row of mature oak trees exits towards the western side of the site and separate two field of improved grassland. Ground flora beneath the trees is contiguous with adjacent areas of improved grassland. An old orchard exists at within the south of the site. The habitat contains with decaying plum Prunus spp. and apple Malus species.This parcel of old orchard trees is identified as a traditional orchard priority habitat on Magic maps, making it a Section 41 habitat under the NERC Act. Poor-semi-improved grassland, which is sheep grazed, dominates the ground beneath and around the orchard.	Local County

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Intact hedge – species-poor	J2.1.1	240m 400m (200m + 200m)	The western site boundary is defined by a heavily managed hedge composed of bramble and hawthorn. Similar lengths of hedgerow line the access road to the north-east of the site's main body and separate the small area of field included in the site from Rickmans Lane at the entrance to Crouchlands Farm.	Local
Hedgerow with trees (native species-rich)	J2.3.1	280m	The majority of the northern site boundary is marked by sections of hedgerow that contains semi-mature trees – a number of which are dead. The hedge sections which run adjacent to an existing access road contain, oak, blackthorn, rose *Rosa* sp., maple *Acer* sp., bramble *Rubus fruticosus* agg., hawthorn, oak and dogwood *Cornus sanguinea*. The hedges are considered to qualify as priority habitat under 'Hedgerows' within Section 41 of the NERC Act, 2006.	Local
Hedgerow with trees (native species-poor)	J2.3.2	85m	A species-poor hedge with trees exists towards the south-eastern edge of the site and separates areas of semi-improved grassland. The hedge is comprised exclusively of willow Salix sp. and hawthorn. The hedge is considered to qualify as priority habitat under 'Hedgerows' within Section 41 of the NERC Act, 2006.	Local

11.4.2.2 Hardnip's Barn Glamping

The proposed glamping site itself consists of five fields of agriculturally improved grassland and Field 1 to the north-west comprises the same habitat. Though not included within the proposed glamping site, Field 1 was included within the Phase 1 habitat survey and is therefore included within the assessment below. Field margins within the proposed glamping site consist of a combination of areas of improved grassland, species-poor semi-improved grassland, disturbed ground and tall ruderal vegetation.

A disused residential dwelling (a converted barn) is present at the centre of the site (between Field 2b & Field 3) and is set within an area of disturbed ground.

Two mature tree belts are present within the proposed glamping site and are associated with dry ditches. These tree belts are present between Field 2a & Field 2b and along the southern boundary of Field 3a. The southern boundary is marked by a hedgerow, with all remaining boundaries marked by mature woodland habitat.

Table 11-6 below lists the Phase 1 Habitat Survey categories found within the site of the proposed Hardnip's Barn Glamping, with target notes on specific features of interest and the general species composition. The Phase 1 Habitat Map for the site and key to the standard mapping symbols used are presented as Figure 9 and Figure 10 respectively within **Appendix 11.2**.

Table 11-6. The Phase 1 habitats contained within the proposed Hardnip's Barn Glamping site at Crouchlands Farm.

Habitat type	JNCC code	Area (ha)/ length (m/km)	Target note including species composition	Ecological importance
Broadleaved semi-natural woodland	A1.1.1	5.3ha (Harnips Copse) + 11.4ha (Limekiln Wood/Kiln Platt)	The proposed glamping contains extensive areas of mature woodland. Hardnips Copse exists at the eastern edge of the site. The woodland canopy is dominated by pedunculate oak *Quercus robur*, sessile oak *Q. petraea* and ash *Fraxinus excelsior*. The understorey within the copse is comprised largely of hazel *Corylus avellana* coppice with the following species also present: holly *Ilex aquilifolium*, hawthorn *Crataegus monogyna*, field maple *Acer campestre*, honeysuckle *Lonicera periclymenum* and cherry *Prunus* species. Ground flora within Harnips Woods contains: false wood-brome *Brachypodium sylvaticum*, self-heal *Prunella modularis*, dog's mercury *Mercurialis perennis*, primrose *Primula vulgaris*, lords and ladies *Arum maculatum*, wild strawberry *Fragaria vesca*, bracken *Pteridium aquilinium*, broad-leaved dock *Rumex obtusifolius* and bluebells *Hyacintoides non-scripta*. Limekiln Wood & Kiln Platt exists at the western side of the site and a significant portion of the wood is included within the site boundary. The canopy is composed primarily of oak *Quercus* species with lesser amount of beech Fagus sylvatica. The understorey is dominated by hornbean *Carpinus betulus*, with the following species also present: hazel (coppice), cherry *Prunus* spp., holly, honeysuckle, birch *Betula* sp., scots pine *Pinus sylvestris* and hawthorn.	County

Habitat type	JNCC code	Area (ha)/ length (m/km)	Target note including species composition	Ecological importance
			The ground flora within the woodland contains: pendulous sedge *Carex pendula*, bluebells, wood spurge *Euphorbia amygdaloides*, false wood-brome, dog's mercury, primrose and brambe *Rubus fruticosus*. The woodland habitat within the site, is categorised as priority habitat under Lowland Mixed Deciduous Woodlands. The areas of woodland contained within the site are shown as Ancient Woodland on the government's woodland inventory (www.magic.go.uk).	
Improved grassland	B4	14.2ha	The main body of the proposed glamping site is composed of five fields of improved grassland. At the time of the updated walkover survey on 10th July 2019 the fields had been recently mown. During the 2020 walkover surveys it was noted that Field 1 was being grazed by cattle and during the 2021 survey both Field 3b & Field 4 were being grazed by sheep. Taller areas of grassland exist along the peripheries of the field and consist of common grasses such as: cocksfoot *Dactylis glomerata*, perennial rye *Lolium perenne*, rough meadow grass *Poa trivialis*, Timothy grass *Phleum pratense*, common bent *Agrostis capillaris* and Yorkshire fog *Holcus lanatus*. Herbaceous species of plant within the main areas of the field are limited to white clover *Trifolium pratense* and creeping buttercup *Ranunculus repens*. Broad-leaved dock *Rumex obtusifolius* is the dominant species of herb within the taller areas of grassland along the peripheries. The habitat does not meet the criteria of any priority grassland habitat listed under Section 41 of the NERC Act, 2006.	Site/ negligible
Poor semi-improved grassland	B6	0.25ha	Small areas of semi-improved grassland occur along the peripheries of the site's fields as well as to the immediate south-west of Hardnip's Barn. Species present within these areas include: perforate St John's wort *Hypericum perforatum*, bird's-foot trefoil *Lotus corniculatus*, compact rush *Juncus conglomeratus*, sedge *Carex* sp., common vetch *Vicia sativa* and hedge woundwort *Stachys sylvatica*. The habitat does not meet the criteria of any priority grassland habitats listed under Section 41 of the NERC Act, 2006.	Site/ negligible
Cultivated/disturbed land – ephemeral/short perennial	J1.3	0.1ha	Two strips of disturbed ground border the tree belt, which runs between Field 2a and Field 2b. Additional areas of disturbed ground exist around the building of Hardnip's Barn. The areas of bare ground have been colonised by ruderal and ephemeral species of vegetation amongst scattered areas of tall grass. Species recorded include: Yorkshire fog, rough meadow grass, redshank *Persicaria maculosa*, common vetch, broad-leaved dock, field bindweed *Convolvulus arvensis*, hogweed *Heracleum sphondylium*, nipplewort *Lapsana communis*, stitchwort *Stellaria* sp., greater burdock *Arctium lappa*, groundsel *Senecio vulgaris*,	Site/ negligible

Habitat type	JNCC code	Area (ha)/ length (m/km)	Target note including species composition	Ecological importance
		0.8ha	bracken *Pteridium aquilinum*, forget-me-not *Myosotis*sp. and common figwort *Scrophularia nodosa*. A significant area of disturbed ground exists at the south-western corner of the site. This area was formerly a lagoon during the sites previous operation as a biogas facility but has singce been infilled with earth and rubble resulting in a large mound of disturbed ground. Ephemeral and ruderal species present within the bare earth include: spear thistle *Cirsium vulgare*, teasel *Dipsacus fullonum*, broad-leaved dock, creeping buttercup, *Gernaium* sp., greater willowherb *Epilobium hirsutum*, cleavers *Gallium aparine*, cat's-ear *Hypochaeris radicata*, pineapple weed *Matricaria discoidea*, germander speedwell *Veronica chamaedrys*, stingin nettle, bristly oxtongue *Helminthotheca echioides*, vetch *Vicia* sp and weld *Reseda luteola*.	
Tall ruderal vegetation	C3.1	0.04ha	A strip of tall ruderal vegetation exists along a section of Field 1's northern boundary. The habitat is dominated by broad-leaved dock, thistles *Cirsium* spp. and bramble *Rubus fruticosus* agg.	Site/ negligible
Broad-leaved parkland – scattered trees	A3.1	0.7ha	A mature tree belt runs south-west to north-east between Field 2a and Field 2b. The linear feature contains young, semi-mature and mature specimens of pedunculate oak, with young/semi-mature ash and willow *Salix* sp. also present. A mature tree belt exists between Field 2b and Field 3a. Specimens of semi-mature and mature trees consist of the following species: pedunculate oak, ash, hazel, willows *Salix* spp., plum *Prunus* sp. and blackthorn *Prunus spinosa*.	Local
Dry ditch	J2.6	350m	Dry ditches are associated with the tree belts between Field 2a and Field 2b, and between Field 2b and Field 3a. Neither ditch contained any water during the updated walkover survey undertaken in July 2019; the ditches are likely to be ephemeral in nature and may contain small amounts of water during periods of extended rainfall. No aquatic vegetation was observed within the ditches during the survey, the flora within the ditches consists mostly of tall ruderal vegetation including: Himalayan balsam *Impatiens glandulifera*, stinging nettle *Urtica dioica*, broad-leaved dock, bramble, cleavers, thistle *Cirsium* sp. and cow parsley *Anthriscus sylvestris*. Bluebells were also recorded along the banks of the ditches. An additional ditch is associated with the woodland belt which divides Field 3b and Field 4. In 2021 the ditch contained approximately 10cm of water and was fed by an outflow pipe. The habitats do not meet the criteria of 'Rivers and Streams': a priority habitat listed under Section 41 of the NERC Act, 2006.	Site/ negligible
Buildings	J3.6	0.01ha	A single uninhabited dwelling is present at the centre of the site, between Field 2a & Field 3.	Site/ negligible

Habitat type	JNCC code	Area (ha)/ length (m/km)	Target note including species composition	Ecological importance
			The building consists of a converted barn constructed from red brick and clad with wooden weatherboarding. The dwelling consists of two sections: the north-western (main) section displays a half hip roof of clay tiles, whereas the south-eastern section contains a pitched roof of clay tiles. The building contains vaulted ceilings with no enclosed roof spaces.	
Intact hedge – species-poor	J2.1.2	85m	The eastern boundary of Field 4 is marked by a heavily managed hedgerow comprised of hawthorn and bramble. The habitat is considered to meet the criteria of 'Hedgerows': a priority habitat listed under Section 41 of the NERC Act, 2006.	Local
Intact hedge with trees – specie-rich	J2.3.1	450m	The southern boundary of Field 3b and Field 4 is marked by a hedgerow with a number of mature standard trees. Species recorded were: oak, ash, hawthorn, rose and ash. The habitat is considered to meet the criteria of 'Hedgerows': a priority habitat listed under Section 41 of the NERC Act, 2006.	Local

11.4.2.3 Farm Hub, Rural Enterprise & Education Centre

The south-western half of the proposed Farm Hub, Rural Enterprise & Education Centre site comprises a working yard of modern agricultural buildings and industrial infrastructure amongst extensive areas of concrete hard standing. The north-eastern half of the area comprises cleared land with two waterbodies. Linear belts of woodland exist at the north-eastern and north-western edges of the site.

Table 11-7. The Phase 1 habitats contained within the site of the proposed Farm Hub, Rural Enterprise & Education Centre at Crouchlands Farm.

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Buildings	J3.6	0.6	Numerous modern agricultural buildings exist within the site (see **Table 11-9**)	Site/ negligible
Bare ground	J4	1.23	The habitats within the south-western half of the site consist exclusively of bare ground and modern agricultural buildings within the immediate boundaries of the Farm Hub. There is a small area of ephemeral/short perennial grassland that has grown between crevices in the concrete screed and in shingle borders around the base of agricultural buildings. Species in these areas include wall barley *Hordeum murinum,* perennial ryegrass *Lolium perenne* and greater plantain *Plantago major*.	Site/ negligible

Habitat type	JNCC code	Area (ha)/ length (m)	Target note including species composition	Ecological importance
Poor semi-improved grassland	B6	0.77	In 2018, the north-western half of the site was covered by poor semi-improved grassland. Where earthworks had disturbed the ground as part of the construction of the anaerobic digester facility, this has exposed the less nutrient-rich subsoil at the surface, allowing ruderals such as bristly ox-tongue *Helminthotheca echioides* and a small number of common herbs such as red clover *Trifolium pratense*, lesser trefoil *Trifolium dubium*, and meadow buttercup *Ranunculus acris*, to establish. An earth bund, which was dominated by tall ruderal vegetation, partially enclosed Building 10. Remnant areas of this habitat remained at the north-eastern edge of the site and around the peripheries of the lagoon. Species observed during the 2021 walkover survey included: false oat-grass *Arrhenatherum elatius*, spear thistle *Cirsium vulgare* and broad-leaved dock.	Site/ negligible
Tall ruderal vegetation	C3.1	0.71	Following the clearance of the majority of the poor semi-improved grassland habitat in 2019 and subsequent re-profiling of the land, the north-western half of the site now consists primarily of disturbed land, comprising of bare earth with patchy coverage of ruderal and ephemeral species, such as bristly ox-tongue and sow thistle Sonchus oleraceus.	Site/ negligible
Broadleaved semi-natural woodland	A1.1.1	0.55	A linear woodland belt exists to the east of the lagoon, within the north-eastern half of the site, which follows a drainage ditch that feeds into the newly created pond. The habitat contains mature specimens of oak *Quercus robur*, ash *Fraxinus excelsior* and willow *Salix* spp. The understorey is created by hawthorn *Crataegus monogyna* and bramble *Rubus fruticosus* agg. The belt connects to an additional area of woodland which marks the north-western site boundary. The habitat is considered to qualify as priority habitat under 'Lowland mixed deciduous woodland' within Section 41 of the NERC Act, 2006.	County
Standing water	G1	0.25	The re-profiling of the land within the site's north-western half has resulted in the creation of a large deep and circular pond, which is located to the north-east of the farm buildings. No visible aquatic vegetation exists within pond, which contains heavily discoloured water as a result of run-off from the surrounding disturbed ground. Scattered rush *Juncus* spp. exists around the peripheries of the pond. An additional waterbody (the lagoon) is present towards the northern edge of the site. The rectangular lagoon was previously used for storage of digestate (a by-product of biogas production). No aquatic vegetation is visible within the lagoon and a layer of viscous film covers half of the water's surface.	Site/ negligible

11.4.3 Badgers

No evidence of any badger activity was found during any surveys, although there are habitats of value for this species within the site and surrounding landscape. It is likely that if any setts were situated within 30m of the site boundary, evidence of badger activity would have been identified.

There are no records of badgers from within the search area.

The survey results indicate that badgers are not sheltering within the site or within adjacent habitat. However, badgers may move on to the site for foraging. Habitats within the site are considered to be of value to badgers at the **site** level only.

11.4.4 Bats

11.4.4.1 Natural Roost Features – Trees

Details of trees assessed as having bat roost potential are provided in **Table 11-8** below.

Table 11-8. Descriptions of trees within the application site at Crouchlands Farm assessed as having bat roost potential.

Tree ref.	Species	Description of features	Assessment of bat roost potential
Rural Food & Retail & Equestrian Centre			
T1	Dead tree	Dead tree with flaking bark	Moderate
T2	Oak	Mature tree with rot at base of trunk and cavity extending upwards	High
T3	Dead tree	Knothole in trunk; a non-echolocating pipistrelle species (possibly a soprano pipistrelle) seen to emerge	Confirmed bat roost
T4	Dead tree	Dead tree with flaking bark	Moderate
T5	Oak (dead)	Dead tree with flaking bark	Moderate
T6	Oak	Semi-mature tree with two wounds on stem	High
G1	Dead trees	Group of 4 dead trees, no PRFs observed, however NE aspects of trees not visible	Low
G2	Dead trees	Group of 2 dead trees, no PRFs observed	Low
Hardnip's Barn Glamping			
T1	Oak	The tree is mature and is of suitable size and age that it may contain obscured PRFs. No PRFs were observed from ground level. Some areas of deadwood were noted.	Low
T2	Ash	Confirmed maternity roost of Bechstein's bat within cavity accessed through rot hole in trunk.	Confirmed bat roost
T3	Oak	Young tree with a single rot hole observed in trunk.	Moderate
T4	Oak	Semi-mature tree with 3 rot holes associated with limb scars on trunk.	High
T5	Oak	Young tree with tear out on trunk.	Moderate

Tree ref.	Species	Description of features	Assessment of bat roost potential
T6	Dead Tree	Standing deadwood with a number of partial rot holes, these do not, however, appear to lead to crevices or cavities.	Low
T7	Ash	Semi-mature tree with rot hole leading to a cavity within trunk.	Moderate
T8	Oak	Semi-mature tree with a rot hole leading to cavity directly above limb scar on trunk.	Moderate
T9	Plum	Semi-mature tree containing a rot hole leading to cavity as well as basal rot.	Moderate
T10	Oak	Mature tree with rot hole at base.	High
T11	Ash	Mature tree with rot hole at base.	High
T12	Oak	Mature tree with possible cavity.	Low
T13	Oak	Mature tree with possible cavities associated with pruning wounds.	High
T14	Maple	Semi-mature tree with large wound.	High
T15	Ash	Semi-mature tree with two wounds.	Low
T16	Ash	Young tree with basal rot.	Moderate
T17	Oak	Mature tree with multiple broken limbs in crown and exposed heartwood.	Moderate
Farm Hub, Rural Enterprise and Education Centre			
No suitable PRFs were identified in association with trees present within the tree line located within the north-eastern half of the site.			

11.4.4.2 Built Structures

Assessments of the bat roost potential of buildings contained within the site are provided in **Table 11-9** below.

Table 11-9. Descriptions of buildings within the application site at Crouchlands Farm and assessment of their bat roost potential.

Buildings	Description of features	Assessment of potential
Rural Food & Retail & Equestrian Centre		
Agricultural barn	No evidence of roosting bats was identified within the agricultural barn present within the working yard at the northern half of the site.	Negligible
Hardnip's Barn Glamping		
Hardnip's Barn	No evidence of roosting bats was identified during the external inspection of Hardnip's Barn. Opportunities for roosting bats exist within the roof structure of the building's eastern section where traditional hand-made clay tiles create numerous naturally occurring gaps.	Moderate
Farm Hub, Rural Enterprise and Education Centre		

Buildings	Description of features	Assessment of potential
Building 1	Modern barn with lean-to extension, comprising a steel sub-structure with corrugated chrysotile roofing material	Negligible
Building 2	Covered bunker used for car parking and storage of agricultural hardware. Thick, stacked concrete blocks separated the bunker into two single bays and one double bay. A steel frame is bolted to the concrete blocks with a corrugated aluminium roof to provide shelter. A second tier is added to the roof of this structure, which supported three generators and electrical input. No suitable bat roosting features were identified.	Negligible
Building 4	Cattle barn comprising a steel sub-structure with posts and rafters supporting corrugated iron roof-sheeting. The walls of the building are constructed from solid concrete blockwork. No potential roosting features were identified.	Negligible
Building 5	Large cattle barn/former dairy unit – this building is of a similar construction to Building 6, used to hold cattle, with wooden slats on the upper flanks of the building. A sub-section houses the former milking parlour. No suitable bat roosting features were identified.	Negligible
Building 6	Large cattle barn – Semi-derelict agricultural building with corrugated chrysotile as a roofing material and exterior wall material. Partly damaged on the roof. Similar construction methods to Building 5 with steel sub-structure. No suitable bat roosting features present.	Negligible
Building 7	Cattle barn – The building is of similar construction to Buildings 6, 7 and 8. The building is open to the surroundings at its gable ends with side walls of concrete blockwork. A steel substructure supports the corrugated chrysotile roof, with numerous corrugated plastic skylights present. The two-tier arrangement of the pitched roof creates an open vented section. Spaced wooden slats have been fitted at the gable ends and upper exterior of the building's other elevations. No bat roosting features were identified.	Negligible
Building 8	Covered bunker – Breezeblocks form the base of the building with internal walls separating the building into four bays whilst also supporting the roof. A steel frame provides additional structural integrity to the walls and roof. The outside layer shell is formed of corrugated metal sheeting, protecting the northern, southern and western elevations. Internally, the building has a layer of plywood covering breeze-block sections of walls. A small cavity hole was identified on the inside of the northern-facing elevation, which was made of plywood, although this was not deemed to provide suitable sheltering opportunities for bats. No suitable bat roosting features were identified.	Negligible
Building 9	Open cattle barn – The building is open on all elevations with a steel frame, including posts and rafters. The roof of the building is created from chrysotile sheeting with spaced wooden slats fitted to the gables and upper exterior of the other elevations. No suitable bat roosting features were identified.	Negligible

11.4.4.3 Trapping

The full results of the trapping survey are presented in Table 6 of **Appendix 11.2**. Overall, 73 individuals of nine species were caught, these were: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *P. pygmaeus*, brown long-eared bat *Plecotus auritus*, Bechstein's bat, Natterer's bat *Myotis nattereri*, whiskered bat *Myotis mystacinus*, Alcathoe bat *Myotis alcathoe*, barbastelle and noctule *Nyctalus noctula*.

11.4.4.4 Radiotracking

Bat 1 – Alcathoe bat (post-lactating female)

The bat had finished lactating and suckling as 2018 was a very early breeding year. The bat moved north once released and foraged within woodland. The following day the bat was recorded roosting within woodland, close by in an oak tree with numerous potential roost features (see Figure 12 in **Appendix 11.2**).

Bat 2 – Bechstein's bat (juvenile female)

This bat was fully grown and weighed 8.25g as a result of early breeding in 2018. After releasing the bat, it moved north and was foraging within woodland to the west of the proposed glamping site and then may have moved further north-west into an adjacent woodland block. On the 31st of July this bat was observed roosting within T2 (see Figures 11 & 12 in **Appendix 11.2**). T2 contains an obvious rot hole and within the tree a number of Bechstein's bats could be seen inside the roost.

On the 1st August 2018 the bats moved to a new roost (see Figure 12 in **Appendix 11.2**) and an emergence survey on the 3rd of August revealed two bats emerging from partly obscured features. The night-vision camera revealed 62 individuals emerging from this roost.

11.4.4.5 Roost Monitoring – Bat Emergence Survey

Details of the emergence surveys including timings, weather conditions and personnel are provided in Table 7 within **Appendix 11.2**.

29th June 2020

No bats were seen to emerge from the tree roost during the emergence survey. Foraging and commuting passes by the following species were recorded: common pipistrelle, soprano pipistrelle, noctule and barbastelle.

27th July 2020

A total of 43 Bechstein's bats were seen to emerge from the tree roost during the survey

11.4.4.6 Bat Activity Surveys – Walked Transects

Full results of the emergence surveys including timings, weather conditions and personnel are provided in in Figure 15 and Table 8 within **Appendix 11.1**.

At least six bat species were recorded during the five bat activity transects. Sustained foraging activity by common and soprano pipistrelles was recorded and the levels of highest bat activity was concentrated along the site's southern woodland boundary.

11.4.4.7 Bat Activity Surveys – Static Detector Deployment

The activity surveys conducted to date have demonstrated that the habitats contained within the site and local surroundings support a variety of foraging bat species. High levels of activity by common pipistrelle bats were recorded. This species is the most common and widespread of all British species, occur in a wide variety of habitats and are relatively tolerant of human activity. Other common and widespread species include noctule and brown long-eared bat which were recorded at low to moderate-high levels of activity.

The serotine bat was recorded at low to low-moderate levels of activity. This species is only found in southern England and the very southern edge of Wales.

The recording of low to moderate-high levels of activity of barbastelle within Crouchlands Farm is considered significant. Barbastelle is a woodland species that is largely restricted to the south of England, southern wales and East Anglia and is listed on Annex II of the Habitat Regulations, 2017.

The recording of Nathusius' pipistrelle at low to moderate levels of activity within the local surroundings is considered significant as this species is relatively uncommon and is a migratory species.

Myotis spp. were recorded at low to moderate-high activity levels. The results of the trapping survey have confirmed the presence of at least four species of *Myotis* bat including two very rare species (Bechstein's bat and Alcathoe bat).

Full results of the emergence surveys including timings, weather conditions and personnel are provided in in Table 9 and Figure 16 within **Appendix 11.1**.

11.4.4.8 Pre-existing Records

SxBRC provided a large number of bat records in the search area, comprising ten identified species. The number of records for each species is presented in **Table 11-10**.

Table 11-10. Number of pre-existing records of each bat species within 2km of Crouchlands Farm.

Species	No. of records
Common pipistrelle	20
Soprano pipistrelle	7
Brown long-eared *Plecotus auritus*	11
Whiskered bat *M. mystacinus*	2
Alcathoe's bat *M. alcathoe*	8
Daubenton's Myotis *M. daubentonii*	1
Natterer's bat *M. nattereri*	2
Bechstein's bat *M. bechsteinii*	1
Barbastelle	4
Serotine *Eptesicus serotinus*	2
Unidentified bat species etc	8

11.4.4.9 Interpretation

The conservation status and distribution of bat species recorded within Crouchlands Farm are presented in **Table 11-11** below.

Table 11-11. Conservation status and distribution of bats recorded on site[38].

Species	Conservation status in England	Distribution in England
Common pipistrelle	Least concern	Widespread
Soprano pipistrelle	Least concern	Widespread
Nathusius' pipistrelle	Near threatened	Widespread
Brown long-eared bat	Least concern	Widespread

[38] *The Mammal Society (2020). https://www.mammal.org.uk/science-research/red-list/*

Species	Conservation status in England	Distribution in England
Noctule	Least concern	Widespread
Serotine	Vulnerable	Southern England only
Barbastelle	Vulnerable	Southern Britain only
Bechstein's bat	Least concern	Southern England only
Whiskered bat	Data deficient	Widespread
Natterer's bat	Least concern	Widespread
Alcathoe bat	Data deficient	Unknown

The site and its immediate surroundings contain multiple confirmed tree roosts (Bechsteins bat, alcathoe bat and soprano pipistrelle) including a maternity colony of Bechstein's bat. A further 25 trees are assessed as having 'low'–'high' bat roost potential.

Bechstein's bat is an Annex II listed species (Habitat Regulations, 2017): a species of community interest whose conservation requires the designation of SACs. The application site exists approximately 2.6km from a SAC for which Bechstein's bat and barbastelle (another Annex II species) are a primary reason for designation. The site's tree roost resource for bats is considered to be of **national** importance.

Hardnip's barn has been assessed as having 'moderate' roost potential, whilst all other built structures within the site are considered to have 'negligible' potential to support roosting bats. Without further survey effort, the site's roost resource associated with buildings, cannot be fully assessed.

The use of the site by a minimum of eleven different species (least concern/widespread – near threatened/restricted range), including two Annex II listed species (Habitat Regulations, 2017): Bechstein's bat and barbastelle for foraging and commuting at low – moderate/high levels is considered significant at the **national** level as these bats may form part of the populations using Ebernoe Common SAC and The Mens SAC within the wider landscape.

11.4.5 Breeding Birds

Full results of the breeding bird surveys including timings, weather conditions and personnel are provided in Table 12 & 13 within **Appendix 11.1**.

In total, 33 species of bird were recorded during the breeding bird surveys; of these, nine species are 'red' listed under the Birds of Conservation Concern (BoCC) and three are 'amber' listed. The following species recorded during the survey are also listed under Section 41 of the NERC Act (2006): marsh tit *Poecile palustris*, bullfinch *Pyrrhula pyrrhula*, starling *Sturnus vulgaris,* linnet *Linaria cannabina*, cuckoo *Cuculus canorus* and skylark *Alauda arvensis*.

SxBRC provided numerous bird records for the search area concerning a total of 102 species. Most of these species are relatively common and widespread, but the list includes 22 species of principal importance for conservation (S41 NERC Act 2006), and 18 species listed on Schedule 1 of the Wildlife and Countryside Act. In addition, 20 species are red-listed on the Birds of Conservation Concern.

The breeding bird assemblage at Crouchlands Farm consists largely of garden, woodland and farmland species. The breeding bird surveys have confirmed the likely breeding of five notable (UK Priority/red-list) species as well as common and widespread species within the application site's immediate zone of influence.

With regard to the application site the most notable species (i.e. notable species which may breed within the application site) are: cuckoo, song thrush, starling, marsh tit and house sparrow. No nightingale territories were recorded within the site's limited areas of scrub, and the habitats are considered unsuitable for nesting by other notable species of bird.

Based on these findings, the breeding bird assemblage supported by the application site, is considered to be important for the conservation of birds at the **local** level.

11.4.6 Common Dormouse

No dormice or evidence of dormice were recorded during the nest tube survey undertaken at Crouchlands Farm. Detailed results of each check are presented in **Appendix 11.1**.

SxBRC provided a single dormouse record in the search area from 2007 in Wephurst Wood – a large parcel of woodland situated to the east of Crouchlands, beyond Foxbridge Golf Course. The exact grid reference point is located approximately 1.5km from the application site.

Dormice are considered to be absent from the application site and the immediate zone of influence of the proposed development.

11.4.7 Great Crested Newts

A total of nine ponds within the site and the local surroundings were assessed for suitability and/or surveyed to determine the presence of great crested newts; these results are summarised in **Table 11-12** below. For full results including survey metadata please refer to **Appendices 11-1, 11-2 and 11-3**.

Table 11-12. Summary of ponds and GCN survey results for ponds at Crouchlands Farm.

Pond	NGR	Proximity to application site	Surveys completed	Results	Survey date
Rural Food & Retail & Equestrian Centre					
1	TQ 0106 2939	80m W	Population size class assessment	Peak count of 4 GCN	2019
2	TQ 0114 2934	10m W	Population size class assessment	Peak count of 2 GCN	2019
3	TQ 0127 2965	On-site	eDNA survey	GCN eDNA present	2018
Hardnip's Barn Glamping					
5	TQ 0085 3036	280m N	eDNA survey	GCN eDNA present	2019
6	TQ 0053 2962	On-site	HSI assessment	Below average suitability (HSI score = 0.55)	2020
7	TQ 0030 2971	250m W	Population size class assessment	Peak count of 12 GCN	2019
8	TQ 0061 2943	On-site	HSI Assessment	Excellent suitability (HSI score = 0.86)	2022
Farm Hub, Rural Enterprise & Education Centre					
4	TQ 0118 2975	On-site	eDNA survey	GCN eDNA absent	2021

Pond	NGR	Proximity to application site	Surveys completed	Results	Survey date
Lagoon	TQ 0115 2983	On-site	HSI assessment	0.53 = below average suitability	2021

SxBRC provided 17 records for great crested newt, six records for smooth newt, six records for palmate newt, seven records for common frog and eight records for common toad *Bufo bufo* from within the search area.

The results of the population size class assessments have confirmed the presence of 'small' populations of great crested newt in both Pond 1 and Pond 2. The results of the eDNA sampling have confirmed the past presence of GCN within Pond 3 & Pond 5

The areas of tall ruderal vegetation within the proposed Rural Food & Retail & Equestrian Centre site are considered to provide suitable habitat for great crested newts during the terrestrial phase of their lifecycle.

Prior to the clearance and re-profiling works, the poor semi-improved grassland within the proposed Farm Hub Rural Enterprise & Education Centre may have provided suitable terrestrial habitat for great crested newts. However, no great crested newts were recorded within the habitat during the reptile presence/likely absence survey – the use of refugia during terrestrial searches is a recognised survey method for the species when used in conjunction with other methods such as pond surveys. Furthermore, given that Pond 3 (located approximately 100m south-east of the proposed Farm Hub Rural Enterprise & Education Centre but within the Rural Food & Retail & Equestrian Centre) was dry in the spring/summer of 2019, this is considered to further reduce the likelihood of newts being present within the site during clearance/re-profiling works.

Suitable terrestrial habitat currently present within the proposed Farm Hub Rural Enterprise & Education Centre site is limited to small amounts of remnant poor semi-improved grassland and ruderal vegetation at the north-eastern site boundary and peripheries of the lagoon.

Given the result of the HSI assessment of Pond 8, it is considered reasonably likely that this waterbody supports a breeding population of the species. Whilst the woodland and disturbed ground habitat within the boundary of the Hardnips Barn Glamping site provides highly suitable terrestrial habitat for newts, the proposed siting of the development (improved grassland) is considered unsuitable as terrestrial habitat for great crested newts.

Overall, the application site is considered to be of importance to the great crested newt at the **local** level.

11.4.8 Invertebrates

A total of 60 species of moth were recorded within Hardnip's Copse, within the application site, eight of which are listed as priority species within Section 41 of the NERC Act, 2006.

Full results of the moth trapping undertaken within woodland of the site are provided in Table 8 within **Appendix 11.2**.

A single white admiral *Limenitis camilla* was observed within the proposed Hardnip's Barn Glamping site during the updated walkover survey of 10th July 2019.

The SxBRC holds the following records pertaining to other notable invertebrate species from within the search area:

- 104 records pertaining to 9 species of butterfly
- 27 records pertaining to 22 species of moth
- 4 records pertaining to 3 species of bee
- 5 records pertaining to 3 species of beetle

The site's woodland supports a rich diversity of common and widespread species of moth, including at least eight priority species. White admiral has been confirmed as present within the application site's adjacent woodland habitat. The woodland creates suitable habitat for other notable species of woodland butterflies including wood white *Leptidea sinapsis* and purple emperor *Apatura iris*. The improved grassland, tall ruderal vegetation and disturbed ground habitats are considered unsuitable for other notable species of butterfly. The woodland is also likely to support stag beetle *Lucanus cervus* and other notable species of beetle.

The site's overall invertebrate assemblage is considered to be of importance at the **local** level.

11.4.9 Reptiles

No reptiles were recorded during the surveys of the application site. For full results including survey metadata please refer to **Appendices 11-1, 11-2 and 11-3**.

SxBRC provided 21 records for slow worm, 13 records for grass snake *Natrix helvetica* and 6 records for adder *Vipera berus* from within the search area.

The results of the reptile surveys indicate the likely absence of reptiles from within the application site. However, it should be noted that concurrent studies have identified a population of grass snake, slow worm *Anguis fragilis* and common lizard *Zootoca vivipara* elsewhere within the landholding of Crouchlands Farm.

The site is not considered to be of value to reptiles beyond the **site** level.

11.4.10 Other Notable Species

Native bluebells were recorded within the site's adjacent woodland and within the dry ditches of the proposed Hardnip's Barn Glamping site. The site is considered to be of value to native bluebells at the **site** level only.

No evidence of other protected/notable species was recorded within the application site.

The habitats within the application site are considered to provide suitable foraging habitat for hedgehogs *Erinaceus europaeus* and are considered to be of importance for this species at the **local** level.

11.4.11 Invasive/Non-native Species

An area of Himalayan balsam was recorded along the dry ditch which separates Fields 2b and 3a of the proposed Hardnip's Barn Glamping site.

The SxBRC provided 97 records of invasive/non-native species, comprising: plants, invertebrates and birds from within the search area.

The presence of invasive Himalayan balsam within the application site presents an ecological risk: the plant grows rapidly and spreads quickly outcompeting other species of vegetation. The presence of this invasive species is considered significant at the **local** level.

11.4.12 Constraints/Limitations to Surveys

Surveys record any flora or fauna that is present at the time of the survey visits. It is therefore possible that some species may not have been present during the survey but may be evident at other times of the year and may appear or disappear from the site if habitat conditions change. For this reason, CIEEM has advised that survey data less than twelve months old, usually remains valid. Data between twelve months and eighteen months old is also, in the main, considered likely to be valid, unless there has been a significant change in circumstance on site or within the zone of influence.

Pond 3 did not hold water during the 2019 survey period and therefore could not be subjected to a great crested newt population size class assessment. Due to a prolonged period of dry weather, Pond 2 had dried up almost completely and as a result could not be surveyed on 3rd/4th June (visit 5/6) as part of the great crested newt population size class assessment.

11.5 Potential Impacts During Construction

11.5.1 Designated Sites

Without the adoption of appropriate mitigation, the construction phase of the development has the potential to negatively impact upon Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS through the creation of dust which then may be blown into the LWS and settle within the woodland damaging the ground flora. Unmitigated, this could result in a **negligible – moderate adverse** impacts on the LWS.

Impacts on designated sites resulting from dust production will be avoided by limiting dust pollution. This will be achieved by localised moistening (applied to ground or building materials) on very hot, dry days and works ceasing in high winds.

11.5.2 Habitats

The creation of a new access road and associated visibility splay will result in the removal of approximately 115m of priority hedgerow.

Without the adoption of precautionary measures, the proposed development has the potential to impact on retained priority woodland and hedgerow habitat resulting from root damage during the construction phase.

In the absence of appropriate avoidance, mitigation and compensation, the described loss of hedgerow habitat and potential damage/degradation to woodland would constitute a certain **moderate adverse** effect.

A 15m buffer will be established between all development and woodland habitat along the site boundaries.

With the adoption of the above avoidance measure, this will see a **negligible** effect on the site's woodland habitat during the construction phase of the development.

The loss of up to 115m of hedgerow within the development cannot be avoided or mitigated for. Therefore, a moderate adverse residual impact remains. Compensation will be required in the form of habitat creation. A minimum of 400m of new native hedgerow planting will be incorporated into the developed site. Species-composition and management of new hedgerow habitat are set out in the Biodiversity Enhancement

Strategy (see **Appendix 11.4**). This will ultimately see a **moderate beneficial** effect on the site's hedgerow habitat resource.

11.5.3 Badgers

Given the likely absence of active badger setts within the site and the immediate surroundings, the proposed development will not result in any foreseeable impacts on sheltering badgers or their setts.

Without the adoption of precautionary measures there is potential for badgers to become trapped/injured/killed by uncovered excavations during construction.

Uncovered excavations pose a risk of possible **moderate adverse** effects on individual badgers as a result of entrapment/killing/injury.

All excavations should be covered at night to prevent badgers falling into any pits; failing that, an escape mechanism should be provided to allow badgers (and other wildlife) to climb out of an excavation.

Updated badger surveys should be conducted every six months in order to confirm the continued absence of active setts or to inform a badger mitigation strategy.

Should badgers move on to the site and take up residence within a sett in the construction zone or its immediate zone of influence (within 30m), a badger mitigation strategy will be required which will include consideration of the need for a development licence from Natural England to close the sett.

With the adoption of the above avoidance/mitigation measures, the potential for residual effects on badgers resulting from the construction phase of the development is considered to be **negligible**.

11.5.4 Bats

The construction phase of the development has the potential to result in the temporary loss of foraging/commuting habitat. With the exception of the hedgerow loss, habitats to be impacted (improved grassland/tall ruderal vegetation) are largely sub-optimal for foraging/commuting bats. Without appropriate compensation, the loss of a 115m section of hedgerow is considered to present a possible **minor adverse** effect.

New habitat creation, including the planting of 400m of new hedgerow habitat is considered to result in a possible **minor beneficial** effect on commuting/foraging bats.

11.5.5 Breeding Birds

Without the adoption of avoidance/mitigation measures, any clearance of vegetation during the breeding season could result in the destruction of active nests and the killing/injury of eggs/young.

Vegetation clearance during the breeding bird season is considered likely to result in a likely **moderate adverse** effect on breeding birds.

Any vegetation removal should only be undertaken outside of the breeding bird season (avoiding March–August inclusive).

With the adoption of the above avoidance measure impacts on breeding birds during the construction phase of the development is considered to be **negligible**.

In addition to extensive habitat creation as a result of native planting, the construction phase of the development will see the provision of the following as detailed within **Appendix 11.4**:

- 40 traditional wooden nest boxes installed on trees;
- four sparrow terraces installed on new buildings;
- seven swallow nest cups installed within new buildings;
- two barn owl boxes installed on trees.

With the adoption of the above enhancement measures, the construction phase of the development is considered to result in a likely **minor beneficial** effect on breeding birds.

11.5.6 Common Dormouse

Given the likely absence of the species from the site and its immediate surroundings. The construction phase of the development will result in a **negligible** impact on dormice.

11.5.7 Great Crested Newts

Without appropriate mitigation, the proposed development will potentially result in significant adverse effects to great crested newts from the destruction of terrestrial habitat likely to be used by a 'small' population of great crested newts. Furthermore, if newts are present during works there is potential for accidental killing/injury.

Impacts on great crested newts also have the potential to result in an accumulative effect on the local population of great crested newts through additional development affecting metapopulations within the wider landholding of Crouchlands Farm.

Without appropriate mitigation the construction phase of the proposed development would result in a likely **moderate adverse** effect on great crested newts.

Impacts on great crested newts as a result of habitat loss cannot be avoided and mitigation measures (secured through an EPS Mitigation Licence) will be required.

Impacts on great crested newts through killing/injury will be avoided through exclusion of newts from suitable habitat within the construction zone.

A great crested newt EPS Mitigation Licence will be secured to permit the loss of great crested newt terrestrial habitat within the application site. A method statement will be required as part of the licence application and will include the following measures:

- exclusion works to be timed outside of the great crested newt hibernation period (avoiding October–February inclusive)
- installation of newt drift fencing and pitfall traps to allow newts to be translocated from the construction zone to a suitable receptor area
- pitfall traps will be set at a density of 50/ha
- pitfall traps will be checked daily by a suitably qualified ecologist for a minimum of 30 'trapping nights' (night air temperature >5^{o}C with rain in the last few days)
- trapping will take place from February–October (inclusive)
- following the completion of the trapping process, tall grassland will be strimmed to a low height to reduce cover for sheltering newts and allow a finger-tip search by a suitably qualified ecologist

- prior to the commencement of construction works within areas of suitable great crested newt terrestrial habitat, a fingertip search will be undertaken by a suitably qualified ecologist whom is licensed to handle great crested newts. Any amphibians encountered during the works will be translocated to a receptor site outside of the construction zone.

Without appropriate compensation, the loss of approximately 1.5ha of terrestrial habitat during the construction phase of the development represents a likely moderate adverse effect on great crested newts. Compensation will be required in the form of habitat creation. A minimum of 0.7ha of new great crested newt terrestrial habitat will be created within the developed site. This will be achieved through replacement of existing improved grassland with an area of species-rich rough grassland.

Three new ponds will be created within the developed site. These water bodies will be designed to offer new breeding habitat for amphibians including the great crested newt.

With the adoption of the above compensation and enhancement measures, the construction phase of the development is considered to result in a possible **moderate beneficial** effect on the great crested newt.

11.5.8 Invertebrates

With the retention of the site's woodland, there are no foreseeable impacts on notable invertebrates, including notable butterflies, moths and beetles.

The construction phase of the development will see the creation of three new ponds and significant areas of species-rich grassland which will provide new high-value habitat for a wide variety of invertebrate species. In addition, 20 insect houses (incorporating smaller features and several large bespoke features) will be installed within areas of newly created species-rich grassland.

The enhancement measure detailed above are considered to result in a likely **moderate beneficial** effect on the site's invertebrate assemblage.

11.5.9 Reptiles

Given the likely absence of reptiles from the site, the proposed development will have no foreseeable impacts on these species. The construction phase of the development is therefore considered to result in a **negligible** effect on reptiles.

11.5.10 Other Notable Species

The scheme has potential to impact on hedgehogs through habitat loss, though no evidence of this species was found during other survey fieldwork. Most of the existing habitat is sub-optimal for this species due to a lack of ground cover for resting hedgehogs, although the improved grassland habitat could potentially be used for foraging.

Suitable foraging habitat will remain within the developed site and areas of new planting would, in time, become suitable for hedgehogs and largely replace the habitat lost.

The hedgehog has suffered dramatic declines in population in recent decades, although it remains fairly widespread and has declined less in urban areas than rural areas[39]. There is a high degree of uncertainty

[39] Warwick, H. (2016) Britain's Hedgehogs: research and the conservation effort in the face of serious decline. British wildlife Vol. 28, pp78-86)

of impacts occurring but based on the relatively low habitat quality habitat contained on the site for hedgehogs, and the fact that significant areas of potentially suitable habitat will be retained habitat loss is considered to present a **negligible** effect on the species.

In the absence of appropriate avoidance measures, there remains a risk of direct harm to hedgehogs through killing/injury during construction activities, if present on the development site. This is considered to constitute a **moderate adverse** effect on the species.

All excavations should be covered at night to prevent hedgehogs falling into any pits; failing that an escape mechanism should be provided to allow hedgehogs (and other wildlife) to climb out of an excavation.

With the adoption of the above avoidance measures the overall effect of the proposed development's construction phase on hedgehogs is considered to be **negligible**.

11.5.11 Invasive/Non-native Species

In the absence of sufficient effort to remove Himalayan balsam from the proposed glamping site there is potential for this invasive species to spread elsewhere within Crouchlands Farm and potentially beyond, resulting in a significant cumulative impact on the local area.

Spread of Himalayan balsam within Crouchlands Farm and the local area of Plaistow is considered to present a likely **moderate adverse** effect on the local area and native wildlife.

In order to avoid the spread of Himalayan balsam, an eradication programme will be initiated and will utilise contractors versed in the eradication of invasive species. Eradication of the species will likely involve targeted glyphosate (a herbicide) spraying of plants.

The eradication of Himalayan Balsam during the construction phase of the development and prevention of its spread beyond the site is considered to represent a **moderate beneficial** effect.

11.6 Potential Impacts During Operation

11.6.1 Designated Sites

Impacts on internationally important assemblages of roosting/foraging/commuting bats (Bechstein's bat and barbastelle) through light-spillage, could potentially result in a **possible moderate adverse** effect**.** These effects on Ebernoe Common SAC and The Mens SAC (barbastelle only) are possible, should bats move between the application site and the SACs.

All trees with potential for roosting bats will be retained within the development.

The proposed scheme will incorporate a 'sensitive lighting plan' developed as part of the detailed design, in accordance with guidelines set out by the Bat Conservation Trust. Any future lighting design must include the following measures:

- External lighting must be avoided where possible, with reflective white line marking used to highlight the new access road and paths where required.
- All external lighting and internal lighting spill must be directed away from known roosts.
- A 'dark corridor' will be created along the northern and eastern boundaries of the site. Suggested locations for this dark corridor are presented within **Appendix 11.4**. No light amounting to over 1

lux must be detectable within this corridor, and any lighting will be positioned outside of these areas.

- All external lighting should be directed downwards, with low-level bollards with hoods or baffles used where feasible.
- Light sources must be of a spectrum and type which bats are their invertebrate prey are not sensitive to.
- Lighting spill should be directed away from any woodland, hedgerows and other semi-natural habitats.

There will be no vehicle access within the proposed Hardnip's Barn Glamping site and therefore street lighting will not be required. This area is considered to be the most sensitive area for bats within the application site given the proximity of significant known roosts and extensive adjacent woodland habitat.

The increased levels of human activity associated with the proposed development during its operational phase have the potential to indirectly impact on upon Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS.

Increased human recreational activity could lead to a degradation of Lowland Mixed Deciduous Woodland for which the LWS is designated, through damage to vegetation, compaction and erosion of soils, localised nutrient enrichment (deposition of dog waste), disturbance to wildlife and litter accumulation/fly tipping. Unmitigated, identified impacts on Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS present a possible **moderate adverse** effect**.**

There should be a review of the current management regime of the Site, and introduction of management to maximise biodiversity value of the woodland (e.g. coppicing). An appropriate monitoring regime can be put in place to ensure that the management measures for the LWS are successful and if necessary, can be altered to achieve the desired outcomes.

A Habitat and Visitor Management Plan for Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS site will be prepared in order to manage recreational pressure on the designated site. This plan should be secured by planning condition. The plan will include control measures such as fencing, dead hedging as 'soft barriers', signage and appropriate access restrictions to reduce damage to the most important habitats. The plan should also show where existing public rights of way exist and how these will be maintained and improved where necessary.

With the adoption of the above mitigation, residual effects on Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS are considered to be **negligible**.

The proposed development will not see an increase in the residential capacity of the site and is therefore unlikely to result in a significant increase in visitors to other designated site's within the wider landscape. Furthermore, the nature of the development has been designed to provide recreational space within the site and the wider landholding of Crouchlands Farm, thus diluting the likelihood and significance of off-site impacts resulting from increased visitors.

11.6.2 Habitats

Increased human recreational activity could lead to degradation of adjacent woodland, through damage to vegetation, compaction and erosion of soils, localised nutrient enrichment (deposition of dog waste), disturbance to wildlife and litter accumulation/fly tipping.

Based on the above, in the absence of mitigation, the proposed development represents a possible a **moderate adverse** effect on woodland habitat.

The proposed scheme will see extensive areas of new planting including buffer planting along the woodland edges of the Hardnip's Barn Glamping site. This is designed to strengthen the woodland edge as well as to create a stronger barrier between areas of development and high-value woodland habitat.

There should be a review of the current management regime of the Site, and introduction of management to maximise biodiversity value of the woodland (e.g. coppicing). An appropriate monitoring regime can be put in place to ensure that the management measures for the Site's woodland habitat resource are successful and if necessary, can be altered to achieve the desired outcomes.

A Habitat and Visitor Management Plan for Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS site will be prepared in order to manage recreational pressure on the designated site. This plan should be secured by planning condition. The plan will include control measures such as fencing, dead hedging as 'soft barriers', signage and appropriate access restrictions to reduce damage to the most important habitats. The plan should also show where existing public rights of way exist and how these will be maintained and improved where necessary.

With the adoption of the above mitigation measures, effects on woodland during the operational phase of the development are considered to be negligible.

Without the adoption of appropriate avoidance/mitigation, the use of the southern part of the site for the temporary grazing of horse could result in the damage/degradation of priority traditional orchard habitat as a result of grazing/browsing by horses, this would be considered to present a **moderate adverse effect.**

Avoidance of impacts on the traditional orchard habitat will be avoided through the exclusion of horses from the orchard through the installation of fencing. As well as avoiding any further degradation this will allow for the natural regeneration of ground flora within the orchard which is currently heavily grazed by sheep. This is considered to present a **minor beneficial effect**.

11.6.3 Badgers

The scheme will result in the temporary loss of grassland habitats that is potentially important to badgers for foraging. However, suitable foraging habitat for badgers exists all around the construction zone and this loss represents a small proportion of the total resource available.

Badgers are generally quite adaptable to some degree of human disturbance, with foraging, commuting routes and occupation or establishment of new setts, constantly adjusting in response to new food sources and disturbance, so this impact is considered to be **negligible**.

11.6.4 Bats

Unsympathetic lighting within the developed site could result in the disruption of flight lines and potentially negatively impact upon foraging and commuting behavior by a variety of species including Bechstein's bat and barbastelle.

Unmitigated, indirect impacts on designated sites would result in a possible **moderate – major adverse** effect**.**

The Proposed Development will incorporate a 'sensitive lighting plan' developed as part of the detailed design, in accordance with guidelines set out by the Bat Conservation Trust. Any future lighting design must include the following measures:

- External lighting must be avoided where possible, with reflective white line marking used to highlight the new access road and paths where required.
- All external lighting and internal lighting spill must be directed away from known roosts.
- A 'dark corridor' will be created along the northern and eastern boundaries of the site. Suggested locations for this dark corridor are presented within **Appendix 11.4**. No light amounting to over 1 lux must be detectable within this corridor, and any lighting will be positioned outside of these areas.
- All external lighting should be directed downwards, with low-level bollards with hoods or baffles used where feasible.
- Light sources must be of a spectrum and type which bats are their invertebrate prey are not sensitive to.
- Lighting spill should be directed away from any woodland, hedgerows and other semi-natural habitats.

There will be no vehicle access within the proposed Hardnip's Barn Glamping site and therefore street lighting will not be required. This area is considered to be the most sensitive area for bats within the application site given the proximity of significant known roosts and extensive adjacent woodland habitat.

With the adoption of a sensitive lighting scheme, the Proposed Development will have a negligible effect on foraging/commuting bat behaviour.

11.6.5 Breeding Birds

Increased human activity within the site has the potential to result in the disturbance and/or displacement of breeding birds. The results of the surveys indicate that this would likely impact upon common and widespread species. The overall effect on breeding birds is considered to be **minor adverse** within the context of the site.

Given the extent of habitats within the site, the wider landholding of Crouchlands Farm and the local surroundings, as well as creation of new nesting habitat within the Proposed Development, displacement of common nesting birds is considered to represent an overall negligible effect.

11.6.6 Common Dormouse

Given the likely absence of the species from the site and its immediate surroundings. The construction phase of the development will result in a **negligible** effect on dormice.

11.6.7 Great Crested Newts

The operational phase of the development has the potential to negatively impact upon great crested newt habitat through degradation as a result of littering and trampling of grassland as well as damage/disturbance of newly created ponds as a result of people and/or dogs entering the margins or water. The effects are considered significant at the **site** level.

Degradation of great crested newt habitat during the operational phase of the development will be avoided through appropriate signage, pathways and fencing around ponds to deter visitors away from sensitive areas.

The operational phase of the development will see appropriate ongoing management of three new ponds and significant areas of species-rich grassland which will provide new high-value habitat for great crested newts.

The avoidance/mitigation, including the habitat management, is considered to result in an overall likely **minor beneficial** effect on great crested newts.

11.6.8 Invertebrates

The operational phase of the development has the potential to impact on the site's invertebrate assemblage through an increase in artificial light which can alter invertebrate behaviour. Furthermore, in the absence of appropriate avoidance/mitigation measures, increased human activity within the site could result in the degradation of invertebrate habitat including the site's woodland and newly created areas of species-rich grassland. Such an effect on invertebrates is considered significant at the **site** level

Effects from artificial lighting will be avoided through the adoption of a sensitive lighting scheme as detailed in **Section 11.6.4**.

Degradation of great crested newt habitat during the operational phase of the development will be avoided through appropriate signage, pathways and fencing around ponds to deter visitors away from sensitive areas.

The operational phase of the development will see appropriate ongoing management of three new ponds and significant areas of species-rich grassland which will provide new high-value habitat for a wide variety of invertebrate species.

The habitat management is considered to result in a likely **minor beneficial** effect on the site's invertebrate assemblage.

11.6.9 Reptiles

Given the likely absence of reptiles from the site, the proposed development will have no foreseeable impacts on these species. The operational phase of the development is therefore considered to result in a **negligible** effect on reptiles.

11.6.10 Other Notable Species

The design of the proposed site does not involve the compartmentalisation of the site through installation of extensive fencing which can cause habitat fragmentation for hedgehogs.

The operational phase of the development will see a **negligible** impact on hedgehogs

11.6.11 Invasive/Non-native Species

Without the adoption of suitable avoidance measures, operations within the site could see the introduction of invasive/non-native species through ornamental planting within the site. This is considered to present a possible **moderate adverse** effect on site ecology.

Avoidance of impacts resulting from introduction of invasive/non-native species will be achieved through adoption of planting regimes as specified in the Biodiversity Enhancement Strategy (**Appendix 11.4**). Additionally, the site will be monitored annually through a walkover by a suitably qualified ecologist who will

identify the presence of any invasive/non-native species. Should any species be identified by the ecologist, appropriate measures will be put into place for their eradication.

With the adoption of the above measures, there is considered to be a likely **negligible** effect from invasive/non-native species during the operational phase of the site.

11.7 Water Neutrality

Natural England is concerned that existing water abstraction in the Sussex North Water Resource Zone (which supplies part of the north of the district) is having an impact on protected sites in the Arun Valley, which could be adversely harming internationally protected species. In response to this, Natural England has advised that new developments within this zone must not add to this impact. Development must therefore be 'water neutral'.

Existing and proposed demand values estimated for the Proposed Development are set out within the supporting Water Neutrality Report (**Appendix 11.5**).

The Proposed Development would result in a 7,204 m^3 / annum increase in water demand on the site if no water usage reduction measures were implemented. Therefore, there would be a significant impact on the Arun Valley if left untreated.

The Proposed Development comprises a number of mitigation measures to reduce water demand, including (but not limited to): rainwater harvesting, the use of eco compatible appliances, use of water butts, and smart metering. Theses measure will reduce the water demand to 4,103 m^3 / annum. In addition to this, rainwater harvesting will be utilised to serve the livestock.

The implementation of the mitigation measures will reduce the overall water demand for the site by 534 m^3 / annum. There will be no increase in overall water abstraction from Hardham Treatment Works as a result of the Proposed Development and the residual impact is therefore negligible.

11.8 Summary

Table 11-13. Summary of effects, avoidance/mitigation measures and enhancement in relation to biodiversity with regard to the development's construction and operational phases.

Receptor	Value / sensitivity of receptor	Activity or Impact – effect on receptor	Significance of effect before embedded design mitigation	Embedded design avoidance/mitigation	Significance of effect	Enhancement	Residual magnitude of Impact	Significance of residual effect
Construction								
Designated sites	County - national	Dust production and accumulation	Negligible – moderate adverse	Dust control	Negligible	None	None	Negligible
Habitats	Negligible/site – county	Hedgerow loss Woodland/hedgerow /orchard damage	Moderate adverse	Compensatory habitat creation Adoption of buffer zones Exclusion of grazing/browsing livestock	Negligible	Additional habitat creation	None	Moderate beneficial
Badgers	Negligible/site	Killing/injury	Moderate adverse	Covering of excavations at night	Negligible	None	None	Negligible
Bats	National	Foraging/commuting habitat (hedgerow) loss	Minor adverse	Compensatory habitat creation	Negligible	Additional habitat creation Installation of bat boxes	None	Minor beneficial
Breeding birds	Local	Destruction of active nests killing/injury of eggs/young Displacement	Moderate adverse	Vegetation clearance undertaken outside of nesting season	Negligible	Installation of bird boxes	None	Minor beneficial
Common dormice	Negligible	N/A	Negligible	N/A	N/A	N/A	N/A	Negligible

Great crested newts	Local	Killing/injury Habitat loss	Moderate adverse	EPS Licence Implementation of GCN mitigation strategy	Negligible	Habitat creation	None	Moderate beneficial
Invertebrates	Local	N/A	Negligible	N/A	N/A	Habitat creation	N/A	Moderate beneficial
Reptiles	Negligible/site	N/A	Negligible	N/A	N/A	N/A	N/A	Negligible
Hedgehogs	Local	Killing/injury	Moderate adverse	Covering of excavations at night	N/A	N/A	N/A	Negligible
Invasive/non-native species	Local	Spread of Himalayan balsam	Moderate adverse	Eradication programme	Moderate beneficial	None	None	Moderate beneficial
Operation								
Designated sites	County - international	Light spillage impacting upon bats moving between the site and Ebernoe Common and The Mens SACs Degradation pf woodland through human activity within Sparrwood Hanger & Roundwyke Complex Woodland and Meadows LWS	Moderate – major adverse Moderate adverse	Adoption of a sensitive lighting strategy Woodland management and adoption of a visitor management plan	Negligible	None	None	Negligible
Habitats	Negligible/site – county	Degradation of woodland habitat through human activity	Moderate adverse	Woodland management and adoption of a visitor management plan Buffer zone planting	Negligible	None	None	Negligible
Badgers	Negligible/site	N/A	Negligible	N/A	N/A	N/A	N/A	Negligible

Bats	International	Light spillage impacting upon foraging/commuting bats	Moderate – major adverse	Adoption of a sensitive lighting strategy	Negligible	None	None	Negligible
Breeding birds	Local	Disturbance to nesting birds	Negligible	None	Negligible	None	None	Negligible
Common dormice	Negligible	N/A	Negligible	N/A	N/A	N/A	N/A	Negligible
Great crested newts	Local	Habitat degradation	Site	Appropriate signage, pathways, litter bins and fencing of new ponds	Negligible	Habitat management	None	Minor beneficial
Invertebrates	Local	Increased artificial lighting Habitat degradation	Site	Sensitive lighting scheme Appropriate signage and pathway provision	Negligible	Habitat management	None	Minor beneficial
Reptiles	Negligible/site	N/A	Negligible	N/A	N/A	N/A	N/A	Negligible
Hedgehogs	Local	N/A	Negligible	N/A	Negligible	N/A	N/A	Negligible
Invasive/non-native species	Local	Introduction of invasive/non-native species through ornamental planting	Moderate adverse	Native planting scheme Monitoring by an ecologist	Negligible	None	None	Negligible

12 Landscape and Visual Setting

12.1 Introduction

A Landscape and Visual Setting chapter was required as part of the EIA Report to address the following comments from CDC set out in the Screening Opinion:

"In terms of the built form, visually and in landscape terms, the extent of the impact is likely to be relatively localised. Nonetheless, further consideration should be given to landscape views.

"Lighting has the potential to cause impact to the protected sites, setting of the nearby South Downs National Park and the wider rural area. The Council's Senior Environmental Protection Officer considers that there is potential for impacts from lighting to be significant, given the rural nature of the area. A lighting impact assessment should be included within the EIA in order that appropriate mitigation measures can be designed into the future development"

In addition, the Secretary of State made the following comment as part of the Screening Direction.

"The Secretary of State also considers that the redevelopment of existing buildings along with provision of new buildings will result in a change in the built form of the area. It will result in new buildings of a greater scale than previously. This will inevitably comprise a physical change to the locality. The effect of this on the surrounding landscape will require full and detailed assessment."

Landscape and Visual matters relating to the Proposed Development are considered in detail in the Landscape and Visual Impact Assessment (LVIA) (Sheils Flynn, 2022) and the Lighting Impact Assessment Report (Royal HaskoningDHV, 2022, document reference: PB9500-ZZ-XX-RP-E-0001).

The Landscape and Visual Chapter of the EIA Report provides a summary of these reports, both of which should be read in conjunction with this section. A high level overview of the relevant legislation, planning policy and guidance, assessment methodology, baseline environment and impact assessment for both the LVIA and Lighting Impact Assessment is presented in this section. The assessments considered the impact of the Proposed Development on landscape and visual effects during construction, at completion of the development (1 year) and 15 years post completion. The lighting impact of the Proposed Development was considered for both the construction and operational phases.

12.2 Legislation, Planning Policy and Guidance

A summary of the relevant planning legislation, planning policy and guidance documents related to Landscape and Visual Setting are presented in **Table 12-1**. The LVIA (Sheils Flynn 2022) and Lighting Impact Assessment Report (document reference: PB9500-ZZ-XX-RP-E-0001) provide further details and context of where these aspects are addressed in the assessments.

Table 12-1: Relevant legislation, planning policy and guidance documents to Landscape and Visual Setting

Document	Policy / Guidance	Where Addressed
National Planning Policy Framework	• Promoting healthy and safe communities (Paragraph 92 and 97) • Considering development proposals (Paragraph 112)	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)

Document	Policy / Guidance	Where Addressed
	• Ground conditions and pollution (Paragraph 185)	
Plaistow and Ifold Parish Neighbourhood Plan (2014-2029)	Policy EH2 - Protection of the Natural Environment	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy EH3 – Protection of Trees, Woodlands and Natural Vegetation	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy EH5 – Artificial Light Emissions	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)
	Aim 2 – External Lighting on Buildings and Structures	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)
South Downs National P ark: D ark Skies Technical Advice Note (April 2018)	General Lighting Principles	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)
Guidance on Undertaking Environmental Lighting Impact Assessments, Institution of Lighting Professionals (2013)	Assessment guidance	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)
Bats and artificial lighting in the UK – Bats and the Built Environment series", Guidance Note 08/18 (ILP (Institution Of Lighting Professionals), 2018)	Assessment guidance	Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001)
Chichester District Council	The Vision for Places – North of Plan Area	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
Chichester District Council Adopted Local Plan	Policy 40 – Sustainable Design and Construction	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy 45 – Development in the Countryside	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy 46 – Alterations, Change of Use and/or Re-use of Existing Buildings in the Countryside	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy 47 – Heritage and Design	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
	Policy 48 – Natural Environment	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)
Guidelines for Landscape and Visual Impact Assessment Third Edition, 2013	Assessment guidance	Landscape and Visual Impact Assessment (Sheils Flynn, 2022)

12.3 Assessment Methodology

12.3.1 Landscape and Visual Effects

The LVIA (Sheils Flynn, 2022) considers the landscape and visual effects resulting from the construction and operation of the Proposed Development. Landscape and visual effects are independent but related issues. Landscape assessment judges effects on the landscape as a resource in its own right, (regardless of whether it is, or can be, viewed by people or not) and particularly focuses on effects to landscape character. The visual assessment judges the effects on specific views and on the general amenity of the landscape as experienced by people. It explains how particular views of the landscape might change and how the enjoyment and visual amenity of those using it might be affected by a development. It also considers

whether cumulative impacts from other proposed developments are likely to result. These two components of the LVIA are assessed separately.

The LVIA was carried out in accordance with the approach outlined in the Guidelines for Landscape and Visual Impact Assessment Third Edition 2013[40], and the full methodology is set out in the LVIA.

The LVIA process has been an integral component of the design process, which was undertaken in an iterative way, with the layout and design of the development proposals shaped by the preliminary findings of the LVIA. The process has been repeated to test alternative design scenarios with the objective of reducing predicted adverse effects and achieving the optimal balance of benefits and constraints.

The significance of landscape and visual effects was determined by considering a number of factors, including:

- The sensitivity of the receptor;
- The geographic extent of the impact;
- The scale of change (adverse or beneficial); and,
- The magnitude of effect.

Further details regarding the significance criteria for landscape and visual effects are presented in the LVIA (Sheils Flynn, 2022).

12.3.2 Lighting Impact Assessment

The following approach was adopted to carry out the lighting assessment:

- A lighting technical assessment was undertaken in accordance with the Institution of Lighting Professionals Guidance on Undertaking Environmental Lighting Impact Assessments ((ILP), Institution of Lighting Professionals, 2013);
- A site visit was undertaken on the 30th March 2021, to ascertain the context of the study area by night. This included assessment of seven viewpoints;
- An assessment from the coordinated viewpoints was undertaken in accordance with Sheils Flynn Landscape and Visual Impact Assessment selected photo viewpoints; and
- An appraisal of the proposed lighting for the site was carried out, which included the lighting design principles and strategies to be adopted to form the lighting proposals for the Proposed Development.

The information obtained from the various viewpoints and adjacent locations was sufficient to clearly illustrate the local situation. This assessment is therefore, based on the data obtained and evaluated at accessible points, site photographs and other images.

Full details of the methodology that was adopted for the assessment, including the identification of receptors, characterisation of impact and significance criteria are provided in the Lighting Impact Assessment Report (document reference: PB9500-ZZ-XX-RP-E-0001). The assessment considered the potential impacts to Sky Glow, Light Intrusion and Luminaire intensity during construction and operation.

[40] *Guidelines for Landscape and Visual Impact Assessment, 3rd edition Landscape Institute and Institute of Environmental Management & Assessment, 2013*

12.3.3 Embedded Mitigation

The Lighting Impact Assessment contains embedded mitigation measures that will be included as part of the design to minimise lighting impacts during both construction and operational phases of the Proposed Development.

These include details of lighting regulations, standards and guidance, as well as areas associated with the Proposed Development which will require lighting during both construction and operation.

12.4 Baseline Environment

12.4.1 Landscape

12.4.1.1 Landscape character

The county-wide Landscape Character Assessment[41] (LCA) identifies the landscape character areas within the vicinity of the Site. Each reflects variations in landscape character which relate to the underlying geology and soils of the area and the evolving patterns of settlement and land use.

The Site is situated within the North Western Low Weald landscape character area (LW2), which *"comprises a gentle, rolling, enclosed rural landscape, with a sense of unity conferred by strong patterns of woodland, streams and rolling pasture interspersed with more open arable fields. Natural colours and textures of mature semi-natural woodland and pasture predominate. Many pastures contain field oak trees and are enclosed by sometimes dense networks of hedgerows, hedgerow trees, shaws, and frequent small and medium sized woodlands. Overall, the area has a remote and tranquil character[42].*

The LCA identifies the following key characteristics of the North Western Low Weald landscape character areas which are relevant within the context of the LVIA:

- Gently undulating pastoral landscape.
- Dense network of medium sized woodlands, shaws and hedges with mature hedgerow trees.
- Mature and over-mature oak trees.
- Woodlands often following winding streams.
- Ancient semi-natural woodland and old woodland pasture.
- Oak - hazel coppice.
- Small and medium sized fields of predominantly pasture with some larger arable fields.
- Wealden villages, some centred on village greens, scattered farmsteads and cottages.
- Varied local building materials of stone, brick, weatherboard and half-timber.
- Dominant east-west pylon line.
- Winding narrow lanes linking scattered hamlets and farms.

The adopted LCA records the following landscape and visual sensitivities that are relevant within this landscape character area:

- Loss of tranquillity.
- Loss of individual trees in fields and hedgerows.
- Over maturity of hedgerow trees with little evidence of new young trees.
- Unsympathetic development, changes in settlement pattern and addition of suburban features.

[41] *The West Sussex Landscape – Land Management Guidelines, West Sussex County Council, 2005*
[42] *Op. cit. Footnote 10*

- Changes in farming practices leading to the expansion or addition of modern farm buildings.
- Quality of public rights of way network vulnerable to reduced drainage management and increased use.

The set of land management guidelines in the adopted LCA begins with a principal objective to conserve existing tranquil rural and predominantly wooded character of the area. Other relevant guidelines are:

- Encourage conversion of arable fields to permanent pasture.
- Encourage the conservation and management of existing hedgerows and shaws.
- Replant hedgerows with a diverse mix of native species where these have been removed or depleted.
- Encourage the planting of hedgerow oaks to ensure a new generation of individual specimens.
- Restore historic field patterns where possible and maximise linkages with existing small woods.
- Plant and manage isolated trees in pasture.
- Conserve and encourage sound management of all woodland. Support and promote woodland industries.
- Conserve species rich pasture.
- Conserve and manage streamside vegetation and ponds. Encourage appropriate management to perpetuate conservation and landscape interests.
- Seek to reduce the extent, intensity and impact of horse grazing. Encourage the planting of tree belts and hedgerows around paddocks.
- Promote the use of current Stewardship schemes or equivalent.
- Consider the cumulative impact on landscape character of small developments and change. Avoid the introduction of suburban styles and materials.
- Increase tree cover in and around villages, agriculture and other development.
- Minimise the effects of adverse incremental change by seeking new development of high quality that sits well within the landscape and reflects local distinctiveness.
- Protect the character of rural lanes and manage road verges to enhance their conservation value.

There is a hierarchy of landscape character areas which are relevant within the context of the Site: the North Western Low Weald landscape character area (described above) sits within the wider Low Weald landscape character area that is classified in the West Sussex Landscape Character Guidelines[43] and this in turn sits within the *Low Weald* National Character Area[44]. Relevant extracts from these broader scale LCA studies are:

- **Low Weald (West Sussex LCA**) notes (within the list of key characteristics) the "*small-scale, intimate and pastoral character of the landscape, the natural character of watercourses and the numerous field ponds. The notes on historic character include reference to historic glassworks and ancient routes, including droveways and associated linear fields";* and
- **Low Weald National Character Area Profile** notes the industrial heritage of this landscape which supported iron working, brick and glass making, lime kilns and quarries from Roman times through to the early 19th century. It highlights the diversity of tree cover within the matrix of woodlands and hedgerows, including "*extensive broadleaved oak over hazel and hornbeam coppice, shaws, small field copses and tree groups, and lines of riparian trees along water courses and notes that veteran trees are a feature of hedgerows and in fields. The profile states that many of the frequent north-south routeways and lanes originated as drove roads along which livestock were moved to downland grazing or to forests to feed on acorns. It also notes the many small rivers, streams and*

[43] *Op. cit. Footnote 10*
[44] *National Character Area Profile: 121, Low Weald, Natural England, 2013*

watercourses with associated watermeadows and wet woodland and the abundance of ponds, including many that are a legacy of the Wealden iron industry."

The elevated wooded slopes of the South Downs National Park (SDNP) form a distant backdrop in views to the south and west of this Low Weald landscape. A detailed visual analysis in the LVIA demonstrates that the Proposed Development would not be visible from the SDNP, but the Low Weald landscape (including the Site) nevertheless contributes to the wider landscape setting of the SDNP because the distinctive landscape pattern of this area has been shaped by contrasts in historic land use between the chalklands of the South Downs and the enclosed woodlands, pastures and settlements of the Low Weald. For example, some of the PROW that cross the Site are a remnant of the historic droveways that connect the pastures of the downlands and the Low Weald.

The LVIA (Sheils Flynn, 2022) provides an overview of detailed LCA work which was undertaken in 2011 to consider landscape sensitivity and capacity for residential development around settlements in Chichester District[45]. A small area of woodland and farmland on the northern edge of the Site is covered by this detailed assessment: the local landscape character area (156) which covers part of the Site is assessed as having 'substantial' landscape sensitivity, 'moderate' landscape value and 'low' capacity to accommodate development.

The LVIA (Sheils Flynn, 2022) describes the character and condition of the existing Low Weald landscape in the vicinity of the Site. The dense matrix of mature woodlands, shaws and hedgerows defines an enclosed, irregular landscape pattern within a gently undulating clay vale drained by small streams and ponds that are typically hidden within the trees. There is a dispersed settlement pattern; the larger villages of Plaistow, Ifold and Kirdford are connected by a network of narrow hedged lanes and woodland tracks (public rights of way and byways) which also link individual farmsteads, cottages and hamlets. Examples are Rumbolds Farm to the north of the Site, Streeter's Farm and the row of dwellings along Rickman's Lane to the east and the hamlet of Mackerel's Common to the south. Many of the farmsteads in the countryside surrounding the Site comprise a cluster of large farm buildings but all are well hidden from public view.

Parts of the landscape on the Site are in a degraded condition. Extensive areas of woodland have been neglected and left unmanaged (or even in one area, planted with conifers) and some areas (including the slurry lagoon known as 'Lagoon 2') are undergoing a process of decontamination and restoration following the closure of the former biogas processing plant. For many years this area has been an industrial site and it therefore does not display the remote, tranquil character that is typical of other parts of the Low Weald landscape.

Within the broader Site, the character and condition of the areas that would be the site of specific development proposals are:

- Hardnip's Barn - a converted farm barn complex accessed by a wide track and surrounded by pasture and woodland, including the ancient woodlands of Hardnip's Copse to the south east and Limekiln Wood to the north west. Hardnip's Barn is not in a habitable state nor safe and is in need of repair.
- Crouchlands Farm - the site of the former biogas plant. The biogas plant buildings and structures have been cleared and its site is currently occupied by farm buildings, including extensive hard standing and large cattle sheds which have been refurbished to a high standard. There is a small tributary valley and depression to the west of the farm buildings.
- The land immediately to the south of the Crouchlands Farm buildings and to the south of the access road from Rickman's Lane is an area of hardstanding with one large agricultural building. This part

[45] *Chichester District Landscape Capacity Study Extension, HDA, 2011*

of the site is in poor condition, with areas of hard core and scrub. However it is bordered to the east by a narrow belt of ancient woodland which links the access road with Ravensnest Copse.

An arboricultural constraints report maps the locations of the ancient woodlands and their buffer zones, assesses the main areas of woodland that relate to the glamping element of the proposals and compartmentalises and describes Limekiln Wood and Hardnip's Copse[46].

12.4.2 Visual

12.4.2.1 Visibility and Visual Receptors

The existing visibility of the Site was assessed by a desktop study of Ordnance Survey maps, digital visibility mapping and [Google Earth] aerial photograph coverage to identify the area in which the Proposed Development may be visible, the different groups of people who may experience views of the Proposed Development, the viewpoints where they will be affected and the nature of views at those points.

This enabled the generation of a Zone of Theoretical Visibility (ZTV) for the Site, which shows the areas from which the Proposed Development may theoretically be visible on the basis of combined data for topography ('bare earth') and modelled height for selected blocks of woodland in the vicinity of the site[47].

In addition, a zone of visibility (ZV) for the Site was generated, which defines the area within which receptors might reasonably expect to be visually affected by the Proposed Development. The extent of the ZV was influenced by the ZTV and the analysis of views from the scoping viewpoints.

Given the importance of tree cover within this well wooded landscape, the visual assessment was undertaken during the winter months to give a 'worst case scenario', when the screening provided by tree canopies would be at a minimum level.

Within the ZV, the people who would be likely to experience changes in views and visual amenity are:

- Residents of the properties accessed via the farm access road – Crouchland, Moore's Green Cottage and Lanelands
- Pedestrians and farm traffic using the PROW (including byways) which cross the Site.
- Motorists, cyclists and walkers travelling along Rickman's Lane.
- Residents in the group of dwellings adjacent to Streeter's Farm on Rickman's Lane.

12.4.3 Lighting

Baseline lighting conditions were determined during a survey carried out on 30 March 2021, which considered seven viewpoints, as detailed in the Lighting Impact Assessment Report (PB9500-ZZ-XX-RP-E-0001). The viewpoints that were included in the baseline survey for the lighting assessment are presented in **Table 12-2.**

Table 12-2; Viewpoints included in the baseline lighting survey

Viewpoint	Sensitivity of Receptor	Details of Ecological Receptors	Details of Human Receptors
Viewpoint 2	Medium to High	Tree belt located along Public Right of Way	Pedestrian utilising the Public Right of Way

[46] *Arboricultural Constraints Report for Pre-Application Advice at Crouchlands Farm, Plaistow, SJA Trees, July 2019*
[47] *Note LiDAR data was not used because this type of data was not available for parts of the area and, where it was available, did not include the heights of relevant vegetation*

Viewpoint	Sensitivity of Receptor	Details of Ecological Receptors	Details of Human Receptors
Viewpoint 3	Medium to High	Trees / green belt along the Access Road	Pedestrian utilising the pedestrian access path / vehicles utilising site access road.
Viewpoint 4	Low to Medium	Tree belt located along Public Right of Way	Pedestrian / cyclists utilising the Public Right of Way
Viewpoint 5	Medium to High	Tree belt located along Public Right of Way	Pedestrian / cyclists utilising the Public Right of Way
Viewpoint 7	Medium to High	Tree belt located along Public Right of Way	Pedestrian / cyclists utilising the Public Right of Way
Viewpoint 11	Medium to High	Tree belt adjacent to viewpoint	Pedestrian / cyclists utilising the Public Right of Way
Viewpoint 13	Low to Medium	Tree belt adjacent to viewpoint	Pedestrian utilising the Public Right of Way / Residential Dwelling adjacent to the viewpoint

12.5 Potential Impacts During Construction

12.5.1 Landscape and Visual Assessment

Full details regarding the approach and context for the assessment landscape and visual effects to at identified receptor locations (representative viewpoints) are presented in the Landscape and Visual Impact Assessment (Sheils Flynn, 2022), but are summarised below. Landscape and visual effected were considered separately, and are detailed in **Section 12.5.1.1** and **Section 12.5.1.2** respectively.

12.5.1.1 Landscape Effects

Predicted landscape effects of the Proposed Development during construction are detailed in **Table 12-3**.

Table 12-3: Construction phase landscape effects

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Extensive ancient semi-natural woodlands	Moderate	Moderate	Moderate	Moderate Adverse	Medium / Low
Strong network of mature woodland, copses shaws and hedgerows	Moderate	Minor	Moderate	Moderate Adverse	Medium / Low
Rural character of narrow enclosed tracks and lanes	High	Major	Major	Major Adverse	High
Small-scale intimate pastoral character	High	Moderate	Major	Major Adverse	High

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Time depth of the landscape	High	Moderate	Major	Major Adverse	High
Landscape setting of the SDNP	Moderate	Minor	Minor	Minor Adverse	Low
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

The impact on landscape effects during construction at the identified landscape receptors ranged from Low to High. The assessment predicted that there would be a significant but temporary adverse landscape effect on three landscape receptors during the Construction stage of the Proposed Development: – the rural character of narrow, enclosed tracks and lanes; the small-scale, intimate pastoral character of the Low Weald landscape and its time-depth.

A CEMP will be implemented during construction works which would include specific consideration to traffic and noise matters would be implemented to mitigate any potential adverse landscape impacts.

12.5.1.2 Visual Effects

Predicted visual effects of the Proposed Development during construction are detailed in **Table 12-4**.

Table 12-4: Construction phase visual effects

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Representative Viewpoint 1	Moderate	Major	Major	Major Adverse	Medium - High
Representative Viewpoint 2	Moderate	Moderate	Moderate	Moderate Adverse	Medium - Low
Representative Viewpoint 3	Moderate	Minor	Minor	Minor Adverse	Low
Representative Viewpoint 4	High	Minor	Moderate	Moderate Adverse	Medium - High
Representative Viewpoint 5	High	Major	Major	Major Adverse	High
Representative Viewpoint 6	High	Moderate	Moderate	Moderate Adverse	Medium - High
Representative Viewpoint 7	Moderate	Moderate	Moderate	Moderate Adverse	Medium - Low
Representative Viewpoint 8	High	Major	Major	Major Adverse	High
Representative Viewpoint 9	Moderate	Minor	Minor Negligible	Minor Negligible Adverse	Low
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

The LVIA assessment shows that there are predicted to be adverse effects from Viewpoint 1, Viewpoint 5, and Viewpoint 8 during the construction phase. However, these effects are considered to be of a temporary nature.

A CEMP will be implemented during construction works will be implemented to mitigate any potential adverse visual impacts.

12.5.1.3 Lighting Impact Assessment

Full details and context of lighting impacts during construction are provided in the Lighting Impact Assessment (document reference: PB9500-ZZ-XX-RP-E-0001). The assessment considered impacts on Sky Glow, Light Intrusion and Luminaire Intensity associated with construction works for the Proposed Development.

Sky Glow

The impact associated with the sky glow ranges from **Minor Adverse** to **Moderate Adverse** during construction, with the overall impact determined to be a **Moderate Adverse**, due to the site been screened by various tree/vegetation lines, the envisaged lighting levels associated with construction and the limitations on hired external lighting in terms of lighting shields, baffles.

Sky Glow - Mitigation Measures

The good practice principles of construction lighting design and management will be applied, and given the Moderate outcome and the envisaged period of construction activity, the following mitigation measures would be applicable to any additional lights installed during construction:

- Switch off lighting at night where possible, while ensuring sufficient illumination for a safe and secure working environment; and,
- Reduced mounting heights of any additional construction lighting and limiting the tilt on the fittings to avoid upward spillage of light.

Sky Glow - Residual Impacts

The residential impacts remain as **Moderate Adverse**, due to the envisaged noticeable visibility of sky glow from the site. This would be more visible from viewpoints such as Viewpoint 4 and 13. There will be a reduced impact during the summer months, would be due to the longer day time hours and the assumption construction works would be undertaken mainly within normal working hours. Viewpoints located at elevated positions to the site, would have a higher visibility of the sky glow, noting that the planned usage of any construction lighting would only be during the hours of darkness where work activities were taking place.

Light Intrusion

The impact associated with the light intrusion is predicted to be **Minor Adverse** to **Moderate Adverse** during construction and is based on good lighting practices been followed during construction. Lighting intrusion would be more adverse at the receptors located closer and with direct views of the site, such as Viewpoints 2, 3, 5, 7 and 11. Due to the site being screened by surrounding tree and vegetation lines, and the limited use of artificial lighting to when construction works were taking place, the potential impact is envisaged to be limited.

Light Intrusion - Mitigation Measures

The good practice principles of construction lighting design and management will be applied, and given the overall Minor to Moderate effects, and the period of construction activity, the following mitigation measures would be applicable to reduce light instruction during construction:

- Reduced mounting heights of all construction lighting and limiting the output of lighting (where possible) introduced for construction activities.

Light Intrusion - Residual Impacts

The residual impact would be relative to the viewpoint and receptor, but it is envisaged that the overall impact would remain as **Minor** to **Moderate Adverse**. It should be noted however that the receptors most impacted by light intrusion, identified as Viewpoints 2, 3, 5, 7 and 11, would be limited to pedestrians and cyclists utilising the PROWs. As such, the impact would be deemed temporary in nature to human based receptors. There will be a reduced impact during the summer months, would be due to the longer day time hours and the assumption construction works would be undertaken mainly within normal working hours.

Luminaire Intensity

The impact associated with the luminaire intensity is foreseen to be **Minor Adverse** to **Moderate Adverse** during construction and is based on good lighting practices been followed.

Luminaire Intensity - Mitigation Measures

The good practice principles of construction lighting design and management will be applied, and given the **Minor** to **Moderate** effects, and the period of construction activity, the following mitigation measures would be applicable to any additional lights installed during construction:

- Limiting the output of all lighting (where possible) introduced for construction activities.

Luminaire Intensity - Residual Impacts

The residual impact would be relative to the viewpoint and receptor, but it is envisaged that the overall impact would remain as **Minor** to **Moderate Adverse**. It should be noted however that the receptors most impacted by luminaire intensity, identified as Viewpoints 2, 3, 5, 7 and 11, would be limited to pedestrians and cyclists utilising the PROW/footpaths. As such, the impact would be deemed temporary in nature to human based receptors.

There will be a reduced impact during the summer months, would be due to the longer day time hours and the assumption construction works would be undertaken mainly within normal working hours.

12.6 Potential Impacts During Operation

12.6.1 Landscape and Visual Assessment

Full details regarding the approach and context for the assessment landscape and visual effects to at identified receptor locations (representative viewpoints) are presented in the Landscape and Visual Impact Assessment (Sheils Flynn, 2022), but are summarised below.

12.6.1.1 Landscape Effects

Predicted landscape effects of the Proposed Development at completion of the Proposed Development (Year 1) and after 15 years are detailed in **Table 12-5** and **Table 12-6**.

Table 12-5: Landscape effects at completion of the Proposed Development

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Extensive ancient semi-natural woodlands	Moderate	Moderate	Minor	Minor Adverse	Low
Strong network of mature woodland, copses shaws and hedgerows	Moderate	Minor	Minor	Minor Adverse	Low
Rural character of narrow enclosed tracks and lanes	High	Major	Moderate	Moderate Adverse	Medium / High
Small-scale intimate pastoral character	High	Moderate	Major	Major Adverse	High
Time depth of the landscape	High	Moderate	Minor	Minor Adverse	Medium / Low
Landscape setting of the SDNP	Moderate	Minor	Minor	Minor Adverse	Low
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

Table 12-6: Landscape effects after 15 years of the Proposed Development

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Extensive ancient semi-natural woodlands	Moderate	Moderate	Moderate Beneficial	Beneficial	Beneficial
Strong network of mature woodland, copses shaws and hedgerows	Moderate	Moderate	Moderate Beneficial	Beneficial	Beneficial
Rural character of narrow enclosed tracks and lanes	High	Moderate	Minor	Minor Adverse	Medium / Low
Small-scale intimate pastoral character	High	Moderate	Minor	Minor Adverse	Medium / Low
Time depth of the landscape	High	Moderate	Minor Beneficial	Beneficial	Beneficial
Landscape setting of the SDNP	Moderate	Minor	Negligible	Neutral	Neutral
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

The LVIA predicted that there would be significant adverse impacts for two receptors upon Completion (1 Year) of the Proposed Development; Rural character of narrow enclosed tracks and lanes and Small-scale intimate pastoral character, as shown in **Table 12-5.**

The results in **Table 12-6** these significant adverse landscape effects are predicted to reduce to an insignificant level after 15 years, once the extensive proposed tree and woodland planting has matured.

12.6.1.2 Visual Effects

Predicted visual effects of the Proposed Development at completion of the Proposed Development (Year 1) and after 15 years are detailed in **Table 12-7** and **Table 12-8**.

Table 12-7: Visual effects at completion of the Proposed Development

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect*
Representative Viewpoint 1	Moderate	Major	Moderate	Moderate Adverse	Medium - Low
Representative Viewpoint 2	Moderate	Moderate	Moderate	Moderate Adverse	Medium - Low
Representative Viewpoint 3	Moderate	Minor	Minor	Minor Adverse	Low
Representative Viewpoint 4	High	Minor	Minor	Minor Adverse	Medium - Low
Representative Viewpoint 5	High	Major	Major	Major Adverse	High
Representative Viewpoint 6	High	Minor	Moderate	Moderate Adverse	Medium - High
Representative Viewpoint 7	Moderate	Moderate	Minor	Minor Adverse	Low
Representative Viewpoint 8	High	Minor	Minor	Minor Adverse	Medium - Low
Representative Viewpoint 9	Moderate	Moderate	Minor	Negligible – Neutral	Neutral
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

Table 12-8: Visual effects after 15 years of the Proposed Development

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect
Representative Viewpoint 1	Moderate	Moderate	Minor Negligible	Minor Negligible Adverse	Low
Representative Viewpoint 2	Moderate	Moderate	Moderate Beneficial	Moderate Beneficial	Beneficial
Representative Viewpoint 3	Moderate	Minor	Minor	Minor Beneficial	Beneficial
Representative Viewpoint 4	High	Minor	Minor	Minor Adverse	Medium - Low
Representative Viewpoint 5	High	Minor	Minor	Minor Adverse	Medium - Low
Representative Viewpoint 6	High	Minor	Minor	Minor Adverse	Medium - Low
Representative Viewpoint 7	Moderate	Minor	Minor Negligible	Minor Negligible Adverse	Low
Representative Viewpoint 8	High	Minor	Minor Negligible	Minor Negligible Adverse	Low

Landscape Receptor	Receptor Sensitivity	Geographic Extent	Size or Scale of Change	Magnitude of Effect	Significance of Effect
Representative Viewpoint 9	Moderate	Minor	Minor	Minor Beneficial	Beneficial
* Refer to the LVIA (Sheils Flynn, 2022) for Significance Criteria for the LVIA Assessment					

The results in **Table 12-7** show that there would be significant adverse visual effects from Viewpoint 6 at the Completion Stage (1 Year) of the Proposed Development.

However, after 15 years, when the new planting would have matured, there are not predicted to be any significant residual visual effects, as shown in **Table 12-8.**

12.6.1.1 Landscape and Visual Effects Mitigation

The LVIA presents the mitigation strategy for the predicted landscape and visual effects associated with the Proposed Development. This mitigation strategy is summarised below.

Mitigating Predicted Landscape Effects

The Proposed Development has incorporated the following landscape design principles to minimise negative landscape effects on the identified landscape receptors:

- **The extensive network of ancient semi-natural woodlands –** all components of the Proposed Development should be sited beyond a 15m wide ancient woodland buffer zone to ensure that there is no damage to the root protection zones of veteran and ancient woodland trees. The exception is the route through Hardnip's Copse that connects the visitor glamping parking with Hardnip's Barn and the Glamping Fields, which follows an existing track through this ancient woodland.
- **The strong network of mature woodland, copses, shaws and hedgerows –** The layout of the proposals has been designed to integrate with the existing pattern of fields and woodlands on the Site. The proposals incorporate extensive new woodland and shaw planting, including the restoration of historic connections between existing ancient woodlands, and a programme for the sustainable management of all the woodlands within the wider (blue line) landownership boundary.
- **The rural character of the narrow, enclosed tracks and lanes –** The Proposed Development would lead to some loss of rural character, because of the need to comply with visibility (sight line) requirements for vehicles at the site entrance from Rickman's Lane and the health and safety requirements for visitors, horse riders and the public. The proposed native woodland, tree and hedgerow planting would restore the enclosed character of tracks and lanes and drainage, surfacing, fencing, lighting and signage should be selected and designed to minimise disruption to rural character.
- **The small scale, intimate and pastoral landscape character –** The buildings and infrastructure (eg. vehicular access, car parks, fencing, lighting, signage) associated with the Proposed Development would reduce the small-scale, intimate character of the landscape on part of the Site. The proposed extensive woodland, tree and hedgerow planting would restore the landscape structure in areas where it has become degraded and would partially screen and soften local views to the new buildings so that they are well integrated within their landscape context. The continuity of working farm operations on the Site and a programme of landscape restoration and management would support the conservation and long term sustainability of the distinctive pastoral Low Weald character.
- **The time-depth of the landscape –** The Proposed Development would result in some adverse impacts on the time-depth of the local landscape, including (temporary impacts) on the landscape

setting of a Grade II Listed buildings (at Crouchland and Lanelands) during the construction stage and the introduction of new built infrastructure which is larger in scale than that associated with traditional Low Wealden farmsteads. However, the masterplan retains and reflects the existing pattern of fields, woodlands, shaws and tracks on the Site and the proposed ambitious landscape restoration programme would bring opportunities to reinstate lost landscape elements, including field ponds, wetlands, hedgerows, shaws, orchards, species-rich meadows and green lanes, and to reintroduce traditional sustainable modes of woodland management, including coppicing.

Mitigating Predicted Visual Effects

The masterplan for the Proposed Development has incorporated the following landscape design principles, to minimise negative visual effects on the identified visual receptors:

- **Views towards the northern and eastern parts of the Site (Access Road, Farm Hub and Rural Enterprise Centre), Representative Viewpoints 1, 2, 3 and 9 –** The proposed hedgerow, tree and woodland planting would provide enclosure and a backdrop to views along Rickman's Lane and the access road to Crouchlands Farm; the new junction (with new hedgerow planting set back from the road and new woodland planting between the two junctions) would be perceived as one of the sequence of irregular small 'greens' that are characteristic of the settled Low Weald landscape. Extensive proposed woodland planting would screen the operational Farm Hub and part of the Rural Enterprise Centre in views from the east and would partially enclose the new picnic area, creating a more enclosed landscape and reinforcing the characteristic matrix of woodland and pasture on the Site
- **Views to the southern and eastern parts of the Site (Rural Food and Retail Centre, Cookery School and Equestrian Centre), Representative Viewpoints 4, 5 and 6 –** There are sensitive views to these areas of built development from the PROW that crosses the centre of the Site (north-south). This is a historic drove road adjacent to two Grade II listed buildings with a distinctive narrow pasture alongside. Part of the foreground narrow pasture alongside the PROW/drove road would be managed as meadow and wetland habitat and, as it matures, the proposed woodland and tree planting along the eastern boundary of the narrow pasture would close down the view to buildings within the Rural Food and Retail Centre and Equestrian Centre. Small parts of the buildings of the Cookery School, the Rural Food and Retail Centre and the Indoor Arena may be glimpsed through the trees and amidst the tree canopy, particularly during the winter months. However no buildings would break the skyline and, given the existing character of this landscape, which has a mix of woodland and farm buildings, such residual visual effects are judged to be insignificant.
- **Views to the western parts of the Site (Glamping Fields and Hardnip's Barn), Representative Viewpoints 7 and 8 –** The woodland tree belt surrounding the Glamping Parking area (to the south of Hardnip's Copse) would completely screen parked vehicles from view; occasional filtered views to vehicles parked in the Special Events Overflow Parking area are predicted to remain when this is area is used (a few times per year). The glamping pods (including service pathways) should be sited beyond the 15m wide ancient woodland buffer zone and within new woodland edge planting. The proposed glamping pods have been carefully sited to mitigate visual impacts from PROW and proposed areas of woodland in the north-east part of the Northern Glamping Field and to the south west of Hardnip's Barn (connecting Limekiln Wood and Hardnip's Copse) are critically important in screening such views. The sunken glamping pods in the Northern Glamping Field would be screened by landform and by the specimen trees within the field.

Residual Landscape and Visual Effects

With the incorporation of the mitigation measures set out in **Section 12.6.1.1**, there are not predicted to be any significant residual landscape and/or visual effects following completion

12.6.1.2 Lighting Effects

Sky Glow

The impact associated with the overall sky glow is foreseen to be **Minor Adverse** to **Moderate Adverse** during the operational phase, when assessed against the current baseline. This was based on the current baseline assessed from the seven viewpoints and lighting levels envisaged for the Proposed Development.

Sky Glow - Mitigation Measures

The good practice principles of operational lighting design and management will be applied, and given the Moderate sky glow effects, the following general mitigation factors will be implemented:

- Illumination of only areas that require artificial lighting, for the purposes of safety and security.
- Selection of lower lighting levels where possible, while ensuring a safe working environment.
- Fitment of lighting control systems to allow dimming of external lighting to lower levels when areas not in full use.
- Selection of PC Amber (1750K) LED's for all permanent light fixtures.
- Restricting mounting heights of all external light fittings and limiting the tilt on any fittings to avoid upward spillage of light.

Sky Glow - Residual Impacts

A **Minor** to **Moderate** residual impact is expected to remain based on the above proposed mitigation measures, due to the nature of the current baseline conditions and the noticeable increase envisaged in sky glow from the site.

This is expected to be mitigated further, through dimming and /or switching all external lighting off that isn't required to be on.

While the site is screened through various tree and vegetation lines surrounding it, viewpoints with elevated positions to the site will have still have visibility of the site and the operational lighting, hence will be viewpoints with a **Moderate** residual impact associated with it.

Light Intrusion

The impact associated with the light intrusion is foreseen to be **Minor** to **Moderate Adverse** during the operational phase, when assessed against the current baseline. This is due to the identified receptors potentially impacted by light intrusion, been limited to pedestrians/cyclists who would be travelling through the area and would not be stationary for extended periods.

Light Intrusion - Mitigation Measures

The good practice principles of operational lighting design and management will be applied, and given the predicted light intrusion effects, the following general mitigation factors would be proposed:

- Illumination of only areas that require artificial lighting, for the purposes of safety and security.
- Fitment of lighting control systems to allow dimming of external lighting to lower levels when areas not in full use.
- Select lighting fixtures with lower wattage/lumen outputs where possible.
- Selection of PC Amber (1750K) LED's for all permanent light fixtures.

- Restricting mounting heights of all external light fittings.
- Placement of external lighting such they are screened by the new structures and/or current tree line surrounding the site (where possible).
- Fitment of lighting baffles to all external lighting fittings along the perimeter of the site.

Light Intrusion - Residual Impacts

An overall **Minor** to **Moderate Adverse** residual impact is expected based on the above proposed mitigation measures. Viewpoints and their expected Receptors that are located with a direct view of the site, might experience higher impacts, noting the more impacted viewpoints would have human receptors that are temporary in nature to their exposure.

Luminaire Intensity

The impact associated with the luminaire intensity is foreseen to be **Minor** to **Moderate Adverse** during the operational phase, when assessed against the current baseline.

Luminaire Intensity - Mitigation Measures

The good practice principles of operational lighting design and management will be applied, and given the possible **Minor** to **Moderate** light intrusion effects, the following general mitigation factors would be proposed:

- Illumination of only areas that require artificial lighting, for the purposes of safety and security.
- Fitment of lighting control systems to allow dimming of external lighting to lower levels when areas not in full use.
- Select lighting fixtures with lower wattage/lumen outputs where possible.
- Selection of PC Amber (1750K) LED's for all permanent light fixtures.
- Restricting mounting heights of all external light fittings.
- Placement of external lighting such they are screened by the new structures and/or current tree line surrounding the site (where possible).
- Fitment of lighting baffles to all external lighting fittings along the perimeter of the site.
- Selection of road lighting and bollard light fittings for areas, where external lighting is proposed, and minimising the use of flood lighting for external areas.

Luminaire Intensity - Residual Impacts

An overall **Moderate** residual impact is expected based on the above proposed mitigation measures. The Moderate residual impact would be limited to the receptors with direct line of site of the proposed external operational lighting scheme.

Viewpoints such as viewpoint 13, would be less impacted with luminaire intensity concerns, due to the current screening of the site with the existing vegetation and tree lines around the site.

12.7 Summary

This chapter provided an overview of the impacts predicted in the LVIA (Sheils Flynn, 2022) and the Lighting Impact Assessment Report (document reference: PB9500-ZZ-XX-RP-E-0001) within the Landscape and Visual Setting chapter of the EIA.

The site is not within a protected landscape or an area designated for scenic landscape value. However, there are distinctive landscape elements and features as identified in the LVIA.

The impact on landscape and visual effects during construction at the identified landscape receptors ranged from Low to High, however these effects are considered to be of a temporary nature. A CEMP will be implemented during construction works which would include specific consideration to traffic and noise matters would be implemented to mitigate any potential adverse visual impacts.

There were predicted to be adverse landscape and visual effects to some of the Viewpoints considered in the LVIA at the Completion Stage (1 Year) of the Proposed Development. However, after 15 years, when the new planting would have matured, there are not predicted to be any significant residual visual effects

The impact of the Proposed Development's lighting was considered in accordance with industry recognised best practices, guidelines, and standards applicable for lighting such environments. Based upon the Baseline Lighting Assessment of the seven viewpoints and the information available at the time of the assessment, the overall artificial lighting impacts associated within the Proposed Development on the surrounding area will be **Minor Adverse** to **Moderate Adverse**, if recommended mitigation measures are implemented. In terms of the **Moderate Adverse** Impacts, this is envisaged to be associated with sky glow.

In terms of impact associated with light intrusion and luminaire intensity, the construction phase would be deemed to have a slightly more adverse impact, localised to the site, due to the possibility of more floodlights been in use, during this phase. The degree of adverse impact would impact viewpoints closer to the site, noting that luminaire intensity can still be an issue if a viewpoint has a direct line of site of the lighting fixture. Mitigation of potential adverse impacts in terms of lighting intrusion and luminaire intensity, was undertaken in terms of both design and operational mitigation measures.

13 Cultural Heritage and Archaeology

13.1 Introduction

This chapter identifies all of the heritage assets in close proximity to Crouchlands Farm, and considers the likely impacts of the Proposed Development on each of these. The archaeological significance of Crouchlands Farm is also outlined along with any potential sources of harm resulting from the Proposed Development. Consideration is then given for the mitigation measures that will be required to prevent or reduce harm being caused to existing heritage assets and archaeological remains, during both the temporary construction and permanent operational stages. This chapter concludes by evaluating the overall potential impacts of the Proposed Development on the heritage and archaeology of Crouchlands Farm, and its surroundings.

13.2 Legislation, Planning Policy and Guidance

13.2.1 Legislation

13.2.1.1 Planning (Listed Buildings and Conservations Areas) Act 1990

Section 1(5) of the Planning (Listed Buildings and Conservations Areas) Act 1990 ("*the Act*") defines a listed building as:

> *In this Act "listed building" means a building which is for the time being included in a list compiled or approved by the Secretary of State under this section; and for the purposes of this Act —*
>
> *a) any object or structure fixed to the building;*
>
> *b) any object or structure within the curtilage of the building which, although not fixed to the building, forms part of the land and has done so since before 1st July 1948.*

Section 7(1) of the Act sets out the restrictions on works affecting listed buildings, stating:

> *Subject to the following provisions of this Act, no person shall execute or cause to be executed any works for the demolition of a listed building or for its alteration or extension in any manner which would affect its character as a building of special architectural or historic interest, unless the works are authorised.*

With regards to the preservation of Conservation Areas, Section 72(1) of the Act states:

> *In the exercise, with respect to any buildings or other land in a conservation area, of any functions under or by virtue of any of the provisions mentioned in subsection (2) , special attention shall be paid to the desirability of preserving or enhancing the character or appearance of that area.*

13.2.2 Planning policy and guidance

13.2.2.1 National Planning Policy Framework

Section 15 of the National Planning Policy Framework (2021) ("*the Framework*") relates to the conservation and enhancement of the historic environment. Paragraphs 194 and 195 of the Framework set out that:

In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this into account when considering the impact of a proposal on a heritage asset, to avoid or minimise any conflict between the heritage asset's conservation and any aspect of the proposal.

Paragraph 199 of the Framework states:

When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation (and the more important the asset, the greater the weight should be). This is irrespective of whether any potential harm amounts to substantial harm, total loss or less than substantial harm to its significance.

13.2.2.2 Chichester Local Plan: Key Policies 2014-2029

Policy 47 of the Chichester Local Plan (2015) relates to heritage and design, and states:

The Local Planning Authority will continue to conserve and enhance the historic environment through the preparation of conservation area character appraisals and management plans and other strategies, and new development which recognises, respects and enhances the local distinctiveness and character of the area, landscape and heritage assets will be supported. Planning permission will be granted where it can be ***demonstrated that all the following criteria have been met and supporting guidance followed:***

1. The proposal conserves and enhances the special interest and settings of designated and non-designated heritage assets including:

- *Monuments, sites and areas of archaeological potential or importance;*
- *Listed buildings including buildings or structures forming part of the curtilage of the listed building;*
- *Buildings of local importance, including locally listed and positive buildings;*
- *Historic buildings or structures / features of local distinctiveness and character;*
- *Conservation Areas; and*
- *Historic Parks or Gardens, both registered or of local importance and historic landscapes.*

2. Development respects distinctive local character and sensitively contributes to creating places of a high architectural and built quality;

3. Development respects existing designed or natural landscapes; and

4. The individual identity of settlements is maintained, and the integrity of predominantly open and undeveloped character of the area, including the openness of the views in and around

Chichester and Pagham Harbours, towards the city, the Cathedral, local landmarks and the South Downs National Park, is not undermined.

Policy 46 of the Chichester Local Plan relates to alterations to, the change of use of, and / or the re-use of existing buildings in the countryside. Policy 46 states:

Proposals for the conversion or reuse of a building in the countryside, outside Settlement Boundaries, will be granted where it can be ***demonstrated that all the following criteria have been met:***

[…]

6. The proposal will not damage the fabric or character of any traditional building or the historic character and significance of the farmstead and in the case of a Heritage Asset, whether designated or not, the proposal will not damage the architectural, archaeological or historic interest of the asset or its setting.

13.2.2.3 Draft Plaistow and Ifold Neighbourhood Plan (2019)

Emerging policy EH1 of the draft Plaistow and Ifold Neighbourhood Plan (2019) relates to the protection of heritage assets, and states:

Development proposals within the boundary of, or within the setting of Heritage Assets (both designated and non-designated) will be encouraged in the Parish where it is demonstrated that such development will not adversely impact upon the unique character, heritage or setting of the heritage assets and is not in conflict with the NPPF, CLPKP, SDNPA Local Plan policies, the Plaistow Conservation Area Character Appraisal and Management Proposals (May 2013) or the requirements as set out in this Neighbourhood Plan.

This policy does however need to be read in the context that the draft Plaistow and Ifold Neighbourhood Plan (2019) is not proceeding any further at the current time due to water neutrality considerations. The policy therefore carries very limited weight at this stage.

13.3 Consultation

In May 2021, a request was made to Chichester District Council ("*the Council*") to determine whether an Environmental Impact Assessment would be required for the Proposed Development at Crouchlands Farm. In its response **Appendix 1.1,** the Council confirmed that an EIA would be required although there was no reference to the existing heritage assets within or surrounding the application site being of particular significance.

With regards to the potential for significant archaeological remains being present on the application site, the Council's response states:

"… there should be a staged approach to archaeological conservation that should start with a detailed desk-based assessment of potential and lead on, where appropriate, to evaluation and preservation. However, it would be more appropriate for this process to be provided as part of a full planning application rather than, necessarily, in an EIA."

Alongside the request to the Council, a request was also made to the Secretary of State for a Screening Direction. The Secretary of State's response and Written Statement **Appendix 1.2** confirmed that, due to

its scale and sensitive location, the Proposed Development would likely have significant effects on the environment, and that an EIA would therefore be required. With regards to heritage and archaeological remains, the Secretary of State Written Statement notes that (at pages 2-3):

> *The developer has identified 52 listed buildings within 1km of the site boundary. Plaistow Conservation Area is located in close proximity to the North of the site, and also a scheduled ancient monument within 2km of the site. In addition to this they have identified non-scheduled ancient monuments within the site boundary and non-designated heritage assets within 150m of the site boundary. Due to the number of historical features in the area, the developer acknowledges that the potential for encountering archaeological remains is unknown. They suggest that mitigation measures particularly at construction stage would protect these heritage assets.*
>
> *In terms of archaeology alone, the Council's Archaeological Officer has commented that a detailed desk-based assessment with a view to potential evaluation and preservation of archaeological remains could be achieved within the planning application process. There have been no comments from the Council's Heritage Officer.*
>
> *The Secretary of State has consulted with Historic England who acknowledge the nearby proximity of the listed buildings / Plaistow Conservation Area. They state based on heritage impacts alone, the applicant should submit a heritage impact assessment as part of the application process, to ensure that NPPF Paragraphs 194 and 195 are complied with.*
>
> *The Secretary of State also considers that the redevelopment of existing buildings along with provision of new buildings will result in a change in the built form of the area. It will result in new buildings of a greater scale than previously. This will inevitably comprise a physical change to the locality. The effect of this on the surrounding landscape will require full and detailed assessment.*

The Written Statement goes on to conclude that (at page 3):

> *Having considered all of the evidence, the Secretary of State accepts that the potential impact of the proposal on Environment Agency and Historic England matters within their remit alone may be satisfactorily mitigated through the use of appropriate planning conditions.*
>
> *However, in the absence of a detailed assessment, the Secretary of State cannot conclude that due to the scale of the development, the setting of Heritage assets and the Plaistow Conservation Area will not be significantly adversely affected by the proposal.*

13.4 Assessment Methodology

The assessment methodology outlined below has been used to identify and evaluate the potential impacts of the Proposed Development on existing heritage assets and archaeological remains associated with Crouchlands Farm. This, in turn, informs the mitigation measures that will be implemented to ensure the preservation and enhancement of these features. The assessment has been informed by the documentation submitted with the planning application, and site visits in 2020-2021.

The assessment methodology is broken down into the following stages detailed below.

13.4.1 Stage 1. Identify Baseline Environment

The first stage of the assessment is to identify all heritage assets and the archaeological remains ("*the receptors*") located within or adjacent to the application site that could be affected by development. A search

of Historic England's National Heritage List for England revealed the nationally statutory listings, and a search of Chichester District Council's Local Buildings List revealed no non-designated heritage assets. A review of the Plaistow Conservation Area Character Appraisal and Management Proposal (2013) has also been conducted.

13.4.2 Stage 2. Impact Identification

The potential impacts of the Proposed Development on heritage assets are considered. This assesses the degree to which the settings of the heritage assets and views make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated.

When considering the setting of heritage assets (which do not form part of the heritage designation), it is important to consider the asset's physical surrounds; the asset's intangible associations and patterns of use; the contribution made by noises and smells; and the ways views allow the significance of an asset are to be appreciated.

13.4.3 Stage 3. Establish Sensitivity

In order to establish the magnitude of the effect that the potential impacts might have, one must consider the sensitivity of each receptor based on its significance and proximity to the site.

13.4.4 Stage 4. Assess Level of Harm

The impact of the proposed development, whether beneficial or harmful, on the significance of the heritage assists is considered. There are three levels of harm that can be identified:

- substantial harm or total loss - this would be harm that would 'have such a serious impact on the significance of the asset that its significance was either vitiated altogether or very much reduced' (R DCLG and Nuon UK Ltd v Bedford Borough Council, EWHC 2847);

- less than substantial harm - harm of a lesser level that that defined above. The Planning Practice Guide stipulates that the extent of the harm within this category should be clearly articulated (reference ID: 18a-018-20190723); and

- no harm (preservation) - the principle that preserving means doing no harm was clearly articulated in South Lakeland District Council Appellants v Secretary of State for the Environment and Another Respondents, [1992], and EWHC 1895, R (Forge Field Society, Barraud and Rees) v Sevenoaks DC, West Kent Housing Association and Viscount De L'Isle which concluded that with regard to preserving the setting of a Listed building or preserving the character and appearance of a Conservation Area, 'preserving' means doing 'no harm'.

13.4.5 Stage 5. Mitigation Hierarchy

The assessment of the significance of an impact is made initially in the absence of mitigation. Where harm is identified, a sequential process of determining the most appropriate way to remove or minimise significant impacts and effects is applied. The preferred option is to avoid impacts in the first place, for example by redesigning the scheme to retain or avoid altering a heritage asset.

Where significant impacts and effects are unavoidable, mitigation measures are integrated into the design to ensure the preservation and enhancement of heritage assets and archaeological remains, with a particular focus on the most highly sensitive assets.

When residual significant adverse impacts and effects remain after all practicable measures to avoid and/or minimise these have been applied, compensation measures are required.

13.5 Baseline Environment

The below sets out the heritage assets in geographical proximity to Crouchlands Farm.

The significance of each heritage asset has been determined. The National Planning Policy Framework (2021) defines heritage significance as (pages 71 and 72):

> *The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.*

The Planning Practice Guidance (reference 18a-006-20190723) interprets archaeological, architectural, artistic or historic interest as:

- *archaeological interest: As defined in the Glossary to the National Planning Policy Framework, there will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point;*
- *architectural and artistic interest: These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is an interest in other human creative skill, like sculpture; and*
- *historic interest: An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history, but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.*

Significance results from a combination of any, some, or all of the values described above. For the purpose of this assessment, the scale for each significance is negligible, low, moderate, high, very high. Each heritage asset (including any archaeological remains) has then been given a sensitivity score, depending on the proximity of the heritage asset to the site, and other factors such as its historic association with the site and visual screening and buffers.

A full list of all heritage assets referred to below is provided at **Appendix 13.1**.

13.5.1 Conservation Areas

The site is not located within a Conservation Area. The Plaistow Conservation Area, located approximately 0.7 miles to the north of the site, is the closest one to the Proposed Development and contains 27 grade II listed buildings and is characterised as a small tranquil rural village with an attractive setting of undulating woodland and fields.

The Plaistow Conservation Area Character Appraisal and Management Proposal (2013) seeks to identify the special interest of the Plaistow Conservation Area, the issues which threaten its special qualities, and provides guidelines to prevent harm and also achieve the enhancement of the Conservation Area in the form of a proactive strategy for the conservation and enjoyment of the area.

The Plaistow Conservation Area is centred around the historic core of the village, with special features identified in the appraisal being the triangular street pattern and large green, the areas of woodland and tree lined fields around the village, and three important buildings - Holy Trinity Church, The Sun Public House, and the village Primary School. The appraisal also refers to the high concentration of listed buildings grouped mainly in The Street which are recognised for their varied form but similar use of traditional materials and details.

Furthermore, the appraisal describes the rural setting of Plaistow as contributing to its character, "*which provides the village with a high degree of tranquillity and a slight sense of isolation, reinforced by the countryside setting and the predominantly residential uses*.". Possible impacts could therefore be associated with changes to this rural setting through the introduction of more urban forms of development.

The Plaistow Conservation Area Character Appraisal and Management Proposal (2013) makes a reference to Crouchlands Farm as a site owned by an early industrialist, but does not refer to the site as contributing directly to the character or setting of the Conservation Area.

The significance of Plaistow Conservation Area is high, but due to it being 0.7 miles from the site, the overall sensitivity score to the Proposed Development at Crouchlands is low.

13.5.2 Statutorily Listed Buildings

There are no statutorily listed buildings located within the site.

There are a total of 40 statutorily listed buildings within 1km of the site boundary. Six grade II listed buildings are located within close geographical proximity to the site and are considered to have the potential to be of higher sensitivity to the development. They are:

- Crouchlands House, Rickman's Lane;
- Outbuilding to Crouchlands House, Rickman's Lane;
- Lanelands, Kirdford Road;
- Little Flitchings, Rickman's Lane;
- Nuthurst, Rickman's Lane; and,
- Old House, Rickman's Lane.

The significance of Crouchlands House is high due to the historical association of the building to Crouchlands Farm and the surrounding agricultural land. Although now under separate ownership, Crouchlands House was constructed to sit within a wider landholding that would have been in agricultural use. Changes to this setting of open agricultural land could therefore impact upon the significance of the house. Further impacts might arise from different land uses, such as the lighting, and possible noise and odours associated with the rural food and retail centre. There may however also be positive impacts through the landscape and planting included within the proposal. The outbuilding to Crouchlands House is of less significance (but still moderate to high) as its relationship is defined more by the house itself than of the wider setting of the house. Overall, the sensitivity score of these two listed buildings to Proposed Development at Crouchlands is moderate to high.

The site is located in close proximity to Lanelands, Little Flitchings, Nuthurst, and Old House. The significance of these listed buildings is high. None of these buildings are recognised for their historical association to Crouchlands Farm, with the heritage value related to the architectural detailing and materials used across all four. Furthermore, there are sufficient separation distances (100, 300, 375, and 395 metres respectively) between the site and the listed buildings, and considerable tree planting which acts as screening too. Due to these factors, the site is not located within the setting of these listed buildings. The sensitivity of these listed buildings is therefore low.

The significance of the remaining 46 listed buildings is high, but the listed buildings being a suitable distance from the site (over 500 metres), so not within the setting of the site. The sensitivity of these listed buildings is therefore negligible.

13.5.3 Scheduled Monuments

There are no scheduled monuments within the site. One scheduled monument, a 15th century glassworks, is located within 1km of the site boundary but is over 650 metres to the east.

There are limited details available regarding the monument, but its designation indicates that it is of a high significance. Its sensitivity is, however, negligible.

13.5.4 Archaeology

As set out in the supporting Archaeological Desk-Based Assessment, the potential for:

- encountering remains of prehistoric date has been assessed as low, reflecting the general paucity of evidence for features, deposits and finds of this date in the immediate vicinity of the site, although it should be noted that evidence for a focus of Bronze Age/Iron Age activity (represented by scatters of lithic and pottery finds) has been identified on the southern periphery of the study area;

- encountering Romano-British remains has been assessed as low, reflecting the lack of evidence of activity from this period both in the immediate vicinity of the site and its wider environs. It appears that the site lay at some distance from any major focus of Romano-British settlement during this period, although some evidence of Romano-British occupation has been identified further to the south near Kirdford;

- encountering remains associated with medieval activity has been assessed as moderate to high. This reflects the fact that the site lies within a landscape exhibiting extensive evidence of medieval rural settlement (represented by several farmstead sites including Crouchland and Hardnip's Barn) and a pattern of field boundaries which broadly reflects the gradual assarting (enclosure and clearance) of the woodland of the Low Weald during the later medieval period. Significant evidence for the exploitation of woodland resources for industrial activities (in particular glassworking) has also been identified within the western half of the site, including the remains of a late medieval glassworks to the south of Hardnip's Copse (found in 1931) and there is potential for further evidence of glassworking to be identified in this specific area; and,

- revealing archaeological remains of post-medieval date has been assessed as moderate to high. There is potential to encounter sub-surface remains of early post-medieval industrial activities within the site (particularly focused within the more heavily wooded central and western portions of the site) including evidence of glassworking and iron-smelting, as well as features associated with extractive activities (ie. quarrying) and the manufacture of lime as evidenced by the presence of several former kiln sites in close proximity to the site.

To conclude, the significance of archaeological remains are moderate. The sensitivity to prehistoric and Roman-British remains is low. The sensitivity of medieval and post-medieval remains is moderate to high.

13.5.5 Non-designated Heritage Assets

There are three non-designated heritage assets[48] within the site. They are:

- Hardnips Barn;
- 16th century glass working site; and,
- Kiln Platt quarry.

A further eight non-designated heritage assets[48] are located within 150 metres of the site boundary. They are:

- site of a limekiln at Crouchland Farm;
- site of limekiln at Laneland;
- site of limekiln within Limekiln Wood;
- site of a former courtyard outfarm, Kirdford;
- 19th century regular courtyard farmstead at Streeters farm, Plaistow;
- 19th century regular courtyard farmstead at Redland, Plaistow;
- 19th century loose courtyard farmstead at Crouchland, Plaistow; and,
- 19th century regular courtyard farmstead at Laneland, Plaistow.

The significance of all non-designated heritage assets is low, and so too is the sensitivity.

13.5.6 World Heritage Sites

There are no World Heritage Sites in close proximity to the site. Significance and sensitivity is therefore not relevant.

13.6 Potential Impacts During Construction

13.6.1 Potential Impacts

Further to those set out in **Chapter 3,** the temporary potential impacts during construction to cultural heritage and archaeology include increased numbers of construction vehicles and dust, noise, and lighting associated with the construction works.

13.6.1.1 Conservation Area

The application site is not located within a Conservation Area and no works are proposed within the Conservation Area, so there will be no direct impact on this heritage asset during construction of the Proposed Development.

There is potential for indirect impact to the Conservation Area caused by the movement of construction vehicles through the village of Plaistow. Whilst additional traffic will pass through Plaistow during construction, the actual number of additional vehicles will be low in relative terms. There will be no significant impacts resulting from this traffic. Further details are provided in **Chapter 8**, Transport and Access.

[48] *Obtained from the West Sussex Historic Environmental Record (HER), 2019*

13.6.1.2 Listed buildings

There are no listed buildings within the application site, and no works are proposed to nearby listed buildings or their curtilages. Therefore, there is no direct risk of any listed buildings being harmed (i.e. direct impacts to the fabric of the listed buildings) during construction of the proposed development.

There is potential for the setting of the six nearby heritage assets to be adversely impacted during construction of the Proposed Development.

To the south of the site, the setting of Lanelands could potentially be adversely impacted by dust, noise, and lighting during construction, but is unlikely to be impacted by the movement of construction vehicles due to its proximity to Rickmans Lane and Plaistow Road.

To the north of the site, the setting of Little Flitchings, Nuthurst, and Old House could potentially be adversely impacted by dust, noise, lighting during construction, and there is also potential for the setting of these buildings to be impacted by the movement of construction vehicles due to their proximity to Rickmans Lane and Plaistow Road.

Immediately adjacent to the site, the setting of Crouchlands House and associated outbuildings could potentially be impacted by dust, noise, lighting, and the movement of construction vehicles.

13.6.1.3 Archaeology

The Archaeological Desk-Based Assessment prepared for the Proposed Development found that the archaeological potential of the application site would not present an impediment to the proposed development, but further investigatory works will be required prior to the commencement of development, including demolition (and this will be appropriately secured by condition).

13.6.2 Mitigation

An extensive amount of mitigation features have been integrated into the scheme to reduce the impact of the Proposed Development on nearby heritage assets during construction, as set out below:

- in order to reduce the potential for harm to nearby listed buildings during construction, a CEMP will be produced and enforced to avoid, minimise and mitigate potential impacts from noise, vibrations, and other pollutants such as dust, waste, and odours. This will also include details of restricted working hours;
- a Construction Transport Plan will also be produced and enforced to control the number of vehicular movements going to / from the application site. This will seek to route construction vehicles, so far as is practicable, away from the Conservation Area, as well as consolidating the number of trips required by site operatives. HGVs and plant servicing the construction phase, including delivery and / or removal of construction materials, would access the site from Rickman's Lane only;
- as set out in the supporting Noise Assessment, a CEMP will be produced prior to the commencement of development. To reduce noise impacts, measures such as locating temporary plant appropriate distance away from the sensitive heritage assets, and ensuring that modern and quiet equipment will be used by trained staff will be enforced throughout the construction stage; and,
- to ensure that no harm is caused to any archaeological remains, an appropriate programme of site investigation and recording will be undertaken prior to construction work commencing (to be dealt with via planning condition) to confirm the findings of the Archaeological Desk-Based Assessment.

13.6.3 Residual Impact

The significance of nearby listed buildings is high, however the sensitivity is low. The Proposed Development will not have any direct impact on these buildings during construction and, where there is potential for the setting of these buildings to be adversely impacted, sufficient mitigation measures will be put in place to ensure that no harm is caused during the construction stage.

The significance of Crouchlands House is high, and the significance of the associated outbuildings is moderate to high. The sensitively of these heritage assets is moderate to high. The Proposed Development will not have any direct impact on these buildings during construction and, where there is potential for the setting of these buildings to be adversely impacted, sufficient mitigation measures will be put in place to ensure that no harm is caused during the construction stage.

As the archaeological potential of the application site will not present an impediment to the Proposed Development, there will be no harm to archaeological remains on site during construction.

As such there are no significant adverse environmental effects to heritage assets during construction.

13.7 Potential Impacts During Operation

13.7.1 Potential Impacts

The potential impacts during operation to cultural heritage and archaeology include increased visitors to the site and associated noise and lighting. The Proposed Development will also result in the loss of agricultural land and a permanent change to the surrounding landscape with the potential to impact the setting of nearby heritage assets.

13.7.1.1 Conservation Area

The site is not located within a Conservation Area, and the nearest one is 0.7 miles away, and also cannot be seen from the Plaistow Conservation Area. Therefore, there will be no direct harm caused to these heritage assets during operation.

There is potential for indirect impact on the Conservation Area caused by the movement of visitor traffic through the village of Plaistow. Additional traffic will pass through Plaistow during the operation of the proposed development, however the number of additional vehicles will remain low in relative terms. There will be no significant impacts resulting from this traffic. Further details are provided in **Chapter 8**, Transport and Access.

There is also potential for the Proposed Development to impact on the setting of the Conservation Area. The Proposed Development will result in the changes to the current, open, agricultural land, permanently changing the rural setting that is identified as contributing to the character of Plaistow.

13.7.1.2 Listed buildings

There are no listed buildings on site, and no works are proposed to any listed buildings as part of the planning application. Therefore, there will be no direct harm caused to these heritage assets during operation.

There is potential for the setting of the six nearby heritage assets to be adversely impacted during operation of the proposed development, particularly with regards to residential amenity. The settings of Lanelands to

the south and Little Flitchings, Nuthurst, and Old House to the north could all be harmed by noise and light produced by the proposal.

As identified above, the heritage asset most sensitive to the development is Crouchlands House and its associated outbuilding. The Proposed Development would result in loss of the open agricultural land that forms the current setting of the house (albeit that agricultural land will still remain to the north, west and south of the heritage asset) through the introduction of build development. There is also the potential for the setting of Crouchlands House and associated outbuilding to be impacted by noise, lighting, and odours (from the café) during operation of the site. Positive impacts may also arise, including the extensive tree planting and scheme of landscape improvements including the restoration of historic hedgerow boundaries. The specific restoration to the east of Crouchlands House serves to also provide screening of some of the new buildings, reducing the level of harm to the heritage asset to less than substantial.

13.7.1.3 Archaeology

There would be no risk to archaeological remains during the operational stage as an appropriate programme of site investigation and recording would be undertaken prior to construction work commencing.

13.7.2 Mitigation

An extensive amount of mitigation features have been integrated into the scheme to reduce the impact of development on the Plaistow Conservation Area and nearby listed buildings (particularly Crouchlands House and the associated outbuilding) during operation, as set out below:

- the architectural style of proposed buildings are sensitive to the local vernacular (as well as taking cues from the Plaistow Conservation Area and other nearby listed buildings) as set out in the supporting Design and Access Statement and Planning Statement;
- the opening hours of different elements will be controlled to control the level of noise and manage the impacts to residential amenity;
- extractor equipment will installed where required to control the release of odours from the site (eg. café);
- a sensitive lighting scheme will be designed in accordance with the supporting Lighting Impact Assessment and Lighting Spill Strategy; and,
- an Events Traffic Management Plan will be prepared (as a planning condition) to reduce impacts on the local highway network and Plaistow Conservation Area, including (but not limited to) details such as erecting permanent and temporary traffic management and signage strategies.

13.7.3 Residual impact

The significance of the Plaistow Conservation Area is high, but its sensitivity is low. The Proposed Development will not have any direct impact on the Conservation Area during its operation and, where there is potential for the setting of the Conservation Area to be adversely impacted, the application site forms a small portion of the setting and will ultimately remain as an agricultural enterprise incorporating areas of open agricultural land.

The significance of nearby listed buildings is high, however the sensitivity is low. The Proposed Development will not have any direct impact on these buildings during its operation and, where there is potential for the setting of these buildings to be adversely impacted, sufficient mitigation measures will be put in place to ensure that harm is limited during the operational stage.

Of these listed building, the significance of Crouchlands House is high, and the significance of the associated outbuildings is moderate to high. The sensitivity of these heritage assets is moderate to high. The Proposed Development will not have any direct impact on these buildings during operation and, where there is potential for the setting of these buildings to be adversely impacted through changes to the character of the site, sufficient mitigation measures will be put in place to ensure that only less than substantial harm is caused during the operational stage.

As the archaeological potential of the application site will not present an impediment to the proposed development, there will be no harm to archaeological remains on site during construction.

As such there are no significant adverse environmental effects to heritage assets during operation.

13.8 Summary

This chapter has identified all of the heritage assets in close proximity to Crouchlands Farm, and considered the likely impacts of the Proposed Development on each of these.

After all mitigation measures are put in place, there will be no residual impact to the Plaistow Conservation Area, nearby statutorily listed buildings, scheduled monuments, or any non-designated heritage assets during the construction stage.

For the operation stage, the only residual impact after mitigation measures are put in place relates to the change in the setting of the Crouchlands House. This impact is limited by the tree planting and landscape enhancements included within the proposed development, which seek to restore elements of the historic landscape in the setting of the house. As such this impact would not constitute a significant adverse environment effect. Mitigation measures mean that there will be no residual impacts in terms of noise, odour and light.

On the whole, the proposal will have no significant adverse environmental effects on heritage assets.

14 Human Health

The Human Health chapter of the EIA Report considers the potential risks to Human Health as a result of a release of gaseous and liquid contaminants from Lagoon 3, as requested in the Screening Opinion issued by CDC, and the Screening Direction issued by the Secretary of State, as listed below:

CDC Screening Opinion:
"Potential contaminants from lagoon 3 include gaseous and liquid contaminants which if released, could affect the development land, including human and ecological receptors. A full detailed human health risk assessment should be submitted as part of an EIA for the site which should include risk assessment for both gaseous phase and liquid phase contaminants. Gaseous phase risk assessment should include explosive and asphyxiant hazards".

Secretary of State Screening Direction:
"In general terms the proposal would be unlikely to produce significant risks to human health during construction, operation, and decommissioning. However, due to the unknown contents of Lagoon 3, there are unknown pollution risks to air and ground (including groundwater) which could be significant in terms of adverse effects on human health. This has been raised as a serious concern by the Council's Environmental Health Protection Officer".

The Human Health chapter comprises two sections, firstly a consideration of potential air quality and odour impacts from Lagoon 3 was undertaken as detailed in **Section 14.2**. Secondly the potential impacts to Land Quality and Hydrogeology receptors were considered in **Section 14.3.**

Both sections were informed by spill modelling for Lagoon 3, which assesses the effects of a structural failure of the bunds that contain the liquid in the Lagoon, and this is presented in **Appendix 14.1**.

14.1 History of the Site and Lagoon 3

Crouchlands Farm supported a dairy herd and produced biogas until 2017, when the herd was sold and the decommissioning process of the biogas plant (Anaerobic Digestor facility ("AD Facility")) began, following an enforcement notice being served by CDC. Most of the farm comprises improved pasture fields, which have been grazed and/or used for silage production.

The management of the AD Facility required the disposal of a waste product known as digestate, which was spread across these fields as liquid fertiliser. Digestate is a nutrient rich material, a by-product from the use of slurry in the production of biogas.

Prior to the enforcement notice being served, it is understood that the operation of the farm and AD Facility resulted in significant environmental degradation and incidences of pollution and the establishment of a large lagoon (known as Lagoon 3) without planning permission. The new owners, Artemis Land and Agriculture Ltd, have now spent two years remediating damage to the farm from this poor practice, and the Proposed Development aims to establish measures to help improve the biodiversity value of the farm and thus help to offset the effects of the historic damage.

Crouchlands Farm site was put into Receivership in 2017, following the failure of two businesses operating on the site called Crouchland Farm Limited and Crouchland Biogas Limited, both of which were in Administration until 10 January 2019. West Sussex Agri Limited was the senior creditor in the Receivership and the Administrations. Artemis Land & Agriculture, owned by West Sussex Agri Limited, purchased the site, excluding the area known as Lagoon 3, from the Receiver in 2019.

Lagoon 3 is left over from a previous use of the site as an anaerobic digestion and energy recovery facility, and remains in the ownership of the previous owner of the farm (not the applicant).

14.2 Lagoon 3 Risk Assessment - Air Quality and Odour

This section considers the potential risks to air quality, odour and associated public health that could arise from emissions to atmosphere from Lagoon 3, adjacent to the south-west of the Proposed Development. It describes the methods used to assess potential effects and the baseline conditions currently existing at the Lagoon 3 site and surrounding area. The mitigation measures required to prevent, reduce or off-set any significant adverse effects are presented together with the likely residual effects after these measures have been adopted.

14.2.1 Legislation, Planning Policy and Guidance

14.2.1.1 Legislation

Relevant legislation to this section is included in **Chapter 76:** Air Quality.

14.2.2 Consultation

The Environmental Protection Manager at CDC identified the potential adverse effects that could arise on infrastructure and users of the Proposed Development, should there be emissions of gas and odour to atmosphere, resulting from a failure of the surface liner, or a failure of the Lagoon bund, which could release liquid onto the surrounding land and gas into the atmosphere[49].

Discussions were held to agree the scope of the assessment in February 2022. The full comments are included in **Appendix 14.2** but key points are summarised as follows:

- Provide sufficient justification for model selection, input parameters as well as meteorological data choice.
- Undertake sensitivity testing to assess the potential range of pollutant concentrations within the gas contained over the lagoon.

14.2.3 Assessment Methodology

14.2.3.1 Data Sources

The assessment was undertaken with reference to information from several sources, as detailed in **Table 14-1.**

Table 14-1: Data sources used in the Air Quality Assessment

Data Sources	Reference
Institute of Air Quality Management (IAQM)	Guidance on the assessment of odour for planning (IAQM, 2018)
Environment Agency (EA)	Joint Incident Response Plan for Crouchland AD Plant Lagoon Three, Sussex (Lisle *et al*, 2019)
Atkins and EA	Crouchlands AD Lagoon (Atkins, 2018)

[49] *A meeting was held with Simon Ballard and Kate Simons from CDC on 21/02/2022 to discuss our proposed scope with comments subsequently received via email on 23/02/2022.*

A literature review has been carried out to determine the likely composition of the gas that is contained beneath the membrane covering Lagoon 3, in the absence of any specific information. All references are included in the appropriate section.

14.2.3.2 Assessment Objectives

The Proposed Development will introduce additional human receptors within 150 m of the existing Lagoon 3 site which has the potential to result in air quality and odour impacts should failure of the containment system occur. The future users of the glamping and the residential/security accommodation on site are classed as high sensitivity as people are expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. This assessment will explore the potential risks associated with Lagoon 3 for the Proposed Development and attempt to quantify the potential impact these risks may have on future users. This was achieved using a two-staged approach comprising of qualitative and quantitative assessment techniques.

14.2.3.3 Stage 1 – Qualitative Assessment

An initial qualitative risk-based assessment has been undertaken to assess the likelihood of impacts on the Proposed Development from emissions of gas and odour to atmosphere from Lagoon 3, should failure of the containment system occur. A summary of the qualitative assessment process is provided below:

Qualitative assessment steps:

- Establish current conditions of Lagoon 3 including the likely contents of gas and digestate, composition and critical chemical components, and the structural soundness of the containment system;
- Identify sensitive receptors within the Crouchlands Farm development and surrounding area;
- Undertake meteorological data analysis (5 years of Numerical Weather Prediction (NWP) hourly sequential data meteorological data centred at Crouchlands Farm);
- Identify potential risk scenarios and undertake Source-Pathway-Receptor (S-P-R) analysis; and,
- Establish potential incident scenarios causing loss of containment of pollutants.

Upon qualitatively determining the pollutants of concern and the potential risk to future uses, the assessment progressed to quantify the risk.

14.2.3.4 Stage 2 – Quantitative Assessment

Using the information gained in Stage 1, numerical dispersion modelling evaluation was carried out to enumerate the potential concentrations of Lagoon-origin air contaminants at the identified sensitive receptor locations within the Crouchlands Fam development, enabling a comparison with established air quality and odour benchmarks.

This assessment was carried out using the Atmospheric Dispersion Modelling System 5.2 (ADMS 5.2), a commercially available software in the form of a “new generation” Gaussian plume dispersion model, produced by Cambridge Environmental Research Consultants (CERC). It can model the three-dimensional dispersion of pollutants released to atmosphere and calculates predicted concentrations at specified locations. The ADMS family of models are recognised, and in some cases used, by UK regulatory authorities including the Environment Agency (EA) and many Local Authorities. Further details on the choice of model are included in **Section 14.2.5.1**.

Quantitative assessment steps:

- Calculate source terms for the incident scenarios established in Stage 1 based upon an assumed biogas composition;
- Undertake dispersion modelling to identify likely worst-case concentrations resulting at sensitive receptors under the established incident scenarios;
- Compare predicted results with relevant assessment criteria;
- Assess the significance of the impacts at sensitive receptors;
- Recommend appropriate and practicable mitigation measures to address any unacceptable risk to health or amenity at existing and future receptors; and,
- Assess residual impacts after mitigation.

14.2.4 Qualitative Risk Assessment of Air Pollution

14.2.4.1 Introduction

Before an effect upon human health or a nuisance can occur from air pollution, there must be exposure to emissions. The S-P-R concept presents the hypothetical relationship between the source (S) of the emissions, the pathway (P) by which exposure might occur, and the receptor (R) that could be adversely affected.

For exposure of emissions of gas and odour to occur, all three links in the S-P-R chain must be present:

- An emission source - a means for the emissions to get into the atmosphere.
- A pathway - for the emissions to travel through the air to locations off site.
- The presence of receptors (people) that could experience an adverse effect.

14.2.4.2 Source Emissions Potential

Lagoon 3 is approximately 192 m long by 63 m wide (west end) and 70 m wide (east end) and contains approximately 53,000 m^3 of digestate. The Lagoon has a basal liner, underlain by impermeable Weald Clay, and there is a liner of low-density polyethylene (LLPDE) that covers the Lagoon surface, the edges sealed in a trench along the crest of the Lagoon. The surface liner is inflated in parts, as a result of gases evolved from the digestate contained in the Lagoon. Based on photographs contained within the Atkins Report (Atkins, 2018), it has been estimated the lagoon is inflated by an average of 0.5 m, resulting in very approximately 6,384 m^3 of trapped gas.

Two previous reports have been produced on Lagoon 3 and are contained within **Appendix 14.3**. The first was carried out by Atkins in 2018 to assess the integrity of the lagoon, and the second was a Joint Incident Response Plan produced in response to the findings of the Atkins report. Several meetings were held between the Crouchland Farm Lagoon 3 Multiagency Group to discuss the safety of the local community and environment from risks posed by Lagoon 3 at Crouchland Farm. Plaistow and Ifold Parish Council also held a meeting on 12 January 2022 to discuss the progress of Enforcement action on Lagoon 3. Details of each report and meeting, and their findings are discussed in the following section.

Previous Assessments

Atkins Report

Atkins undertook an assessment of the integrity of the Lagoon in 2018 (Atkins, 2018a). It was noted that there had been a slippage of material on the outer face of the eastern embankment to the lagoon. As a result of the inspection in January 2018 by Atkins, the following key conclusions/recommendations were made in the report:

- *"The performance of the embankment shows that it is inadequate for the purpose for which it was intended."*
- *"It is recommended that, as soon as practicable, either properly designed stabilising measures be installed, or the lagoon be emptied."*
- *"It is recommended that measures be implemented to ensure that the lagoon cannot store water (rainfall and/or run-off) above the lowest level of the surrounding ground after the digestate has been removed."*
- *"The implementation of the above measures shall be overseen by a competent person."*
- *"It is recommended that, while the lagoon is storing digestate, the current practice of three surveillance visits a day be continued for every day of the week including weekends. Once the digestate has been removed, the frequency of visits may be reduced to once per day, including weekends, until the lagoon has been placed in a condition such that it cannot store liquid above the lowest level of the surrounding ground."*
- *"It is recommended that, while the lagoon is storing digestate, an emergency plan be developed to manage events should the lagoon start to display signs of failure."*

On the basis of the report contents and the conclusions drawn and recommendations made, it would appear that the Atkins competent engineer was of the opinion that there was a risk of embankment failure and a loss of lagoon contents containment, and that this should be addressed as a matter of urgency.

Atkins Report Addendum

An additional assessment of the condition of Lagoon 3 was carried out by an Atkins representative in December 2018 (Atkins, 2018b). The inspection concluded:

"*Although observations made during the visit on 6th December 2018 suggested no further movements of the lagoon had taken place since the visit in March 2018, the embankments around the lagoon remain in an unsatisfactory condition. Sudden further movements, with the potential to release part of the contents of the lagoon cannot be ruled out and our advice remains unchanged i.e. the lagoon should be drained or properly designed embankment stabilising measures implemented as soon as practicable. Until such time as either of these measures has been implement, the current surveillance regime should remain in place*."

The Technical Note went on to say "*the safety of the lagoon would be improved if the level of contents was drained down to below the original ground level so that the digestate is not stored above the original ground level. Based on available information and a level of the contents at 1 m below the crest, the volume of digestate stored above the original ground level is estimated at about 20,000 m³*."

From the findings of the Addendum Technical Note, it can be concluded that although the condition of the AD pit had not deteriorated since the previous inspection in January 2018, the engineer still deemed there to be a risk of failure of the containment system and therefore measures should be taken to reduce the safety risk.

Joint Incident Response Plan

In October 2019, a Joint Incident Response Plan was published in response to the final recommendation, above, of the Atkins report, by the Environment Agency, CDC, West Sussex County Council, West Sussex Fire and Rescue and Public Health England (now the UK Health Security Agency). The plan detailed the various risks to water, air and land quality from a failure incident at the Lagoon and detailed the roles and responsibilities of the different agencies in the event of an incident.

The major thrust of the report was in relation to dealing with a release of liquid from the Lagoon onto surrounding land and into watercourses. In relation to air quality, however, it was concluded:

- "*The breakdown or degradation of the digestate in the lagoon can be odorous and some of the gases (e.g. methane, hydrogen sulphide and ammonia) are known to have very strong odour.*
- *Biogas facilities and digestate involve a mixture of gases predominantly consisting of methane and carbon dioxide (and some hydrogen sulphide and ammonia amongst others). The main risks associated with biogas are likely to be asphyxiation (this would require a high concentration or confined space) or explosion.*
- *PHE hold publicly available details for hydrogen sulphide and many other chemicals, which can be accessed here: https://www.gov.uk/government/collections/chemical-hazards-compendium. This record contains general specific chemical information and incident management.*
- *Taking consideration of the available information, including the distance to public health receptors and the main risks associated with the anticipated gases in air (asphyxiation and explosion) and the surrounding land use typically being green open space, PHE would not expect any significant public health risk associated with air quality during an incident*."

It should be noted that these conclusions were made based upon potential effects upon existing receptors in the area. The Crouchlands Whole Farm Plan Development will introduce new receptors closer to Lagoon 3 than existing receptors (with exception to transient use of land by farm workers) and, therefore, Lagoon 3 potentially poses a risk to future users of the Proposed Development.

Crouchlands Farm Lagoon 3 Multi-agency Incident Plan Review Meetings

Records of three meetings held between the Lagoon 3 Multi-agency Group have been obtained. The aim of the meetings was to agree an approach to ensuring that lagoon 3 does not pose an unmanaged risk to the local community and environment. The notes from each meeting are included in **Appendix 14.3** with information relevant to this assessment is included below.

February 2020

The notes of the meeting held in February 2020 refer to an inspection which took place in January 2020. The inspection notes conclude *'The risk of loss of containment identified within the Atkins Engineer's report remains. The risk will only be removed following compliance with the Anti-pollution works notice. Failing to maintain the external banks of the lagoon bund will lead to continued erosion eventually leading to the loss of containment provided by the bund wall of the lagoon."*

Potential modes of loss of containment were discussed within the meeting with the main mode identified as rotational slope failures resulting from steepness of the slope and change in strength of material making up the slope. The notes go on to say "*Continued propagation of the slope instability into the bund will eventually lead to a condition where the mass of the bund will not be sufficient to prevent a full failure of the bund wall. This loss of containment will be increase through erosion from the flow through the bund. This loss of containment will increase with continued escape of the digestate until the level within the lagoon reaches the base level of the failure. This could lead to emptying of the lagoon within 24 hours.*

The rate of loss of containment could be slowed by the presences of the liner and the viscosity of the digestate."

From the finding of the inspection, the following conclusions were made:

"The Group's assessment of the likelihood of loss of containment has not changed due to the latest assessment above in that it is not imminent. The risk increases over time should erosion of the bunds continue.

… There is potential for the 2 farm properties to be surrounded by about 5 cm of digestate, similar to surface water flooding impacts. Loss of containment would be very unlikely to lead to impacts on human health. This is because loss of containment would be likely to happen over 24 hours."

March 2021

Another inspection of the lagoon took place in February 2021 with the observations remaining mostly consistent with those observed previously. Within the notes of the Group's meeting, reference was made to comments made by WSCC Fire and Rescue which state:

"No significant change in the lagoon from gas containment and integrity of the cover from previous visits. Gas bubbles ensure surface water drains off the cover at various shedding points rather than at one point reducing the risk of the bund being undermined by water egress. Gas is low risk as overall risk of gas release is low, no ignition source, remoteness of location, footpath remains closed. If the cover was damaged, gas would dissipate to air and disperse in the immediate vicinity with no impact to closest receptor."

Further modes of containment system failure were also discussed which included the following:

"Modes of failure in relation to gas:

- ***Lagoon Cover Failure*** *– …Cover is currently 7 years old, manufacturers guarantee is 10 years however, given that it is thick HDPE* [High Density Polyethylene], *which doesn't degrade quickly, the expected lifespan could be 60-100 years so very low likelihood of failure. Deterioration would be small holes appearing (through which gas would be released and dissipate) rather than catastrophic failure. Gas odour would be identified if the cover was leaking.*
- ***Pressure and movement of gas*** *- … Area under the cover is currently at a very low pressure, only slightly higher than atmospheric pressure (approx. 1 bar), so this factor does not pose a risk.*

The Group Considered the 3 scenarios where the gas digestate could be released:

1. ***Deliberate event****- A deliberate act that causes a large release. The gas would dissipate upwards and readily, into the atmosphere. As there are no sources of ignition nearby, any ignition of the gas would have to be deliberate. This is considered very low risk. Domestic dwellings are a significant distance and are very unlikely to be affected, footpath remains closed removing potential receptors.*
2. ***Slow release failure*** *– a failure in the cover that results in a slow release of gas. Would likely be informed by a member of the public (due to the smell) before the release becomes significant thus low risk."*

November 2021

The notes of the most recent meeting refer to an inspection which took place in September 2021. The following observations were made during the site inspection:

'It was evident that gas has been moving around under the cover. Bubbles lower and more spread out. Line of bubbles down the north and southern bank of the lagoon.

East bank rotational slip sizes has not changed. Excess of 5.5m of undisturbed bank. Hard to see if there had been further rotation of the slip due to vegetation.

On northern bank none of the slips had progressed further, although the area was overgrown.

On the SW side of the lagoon, there was a small leak of gas bubbling up (about a bubble a minute). This was near the area that had been cut for the sampling. The Group concluded that it was likely that the leak is through patching over the sample point. The gas did not register on the gas alarm and there was no odour.

The group considered if this leak could worsen and concluded that the force required to tear it would be large and that an increase in leakage would be unlikely.'

The following conclusions were made by the Multi-agency Group based on the findings of the inspection:

'*The Group's assessment of the likelihood of loss of containment liquid material has not changed due to the latest assessment above in that it is not imminent.*

The likelihood of release of gas remains very low. The potential impact from loss of containment of gas remains low.'

Plaistow and Ifold Parish Council meeting

A meeting was held between Plaistow and Ifold Parish Council on 12 January 2022 to discuss the progress of Enforcement action on Lagoon 3 (Report FC/001/22). During the meeting it was stated '*3.4 An experienced engineer regularly inspects the dam structure and continues to conclude that the risk of material escaping remains low.*'

Contents of Lagoon 3

The contents of Lagoon 3 are unknown (the applicant is unable to test the contents due to not being the landowner). However, as the lagoon was previously used to store digestate from a biogas production facility, it has been assumed the AD Facility treated both organic waste and crop feedstocks which are typically used in farm-based AD facilities[50]. A literature review was undertaken on this basis to establish the possible contents and the composition of gases and associated odour levels.

Anaerobic digestion produces a gas mixture of mainly 50 to 70 % methane (CH_4) and 30 to 50 % carbon dioxide (CO_2) together with trace levels of other gases including hydrogen sulphide (H_2S) [51]. Depending on the sulphur content of the feed materials and acidity of the digestate, H_2S is usually found in the region of 0.1 to 3 % of the biogas content[52].

CH_4 is a highly flammable gas. Methane is considered biologically inert and low-level exposure to CH_4 in the environment is not expected to cause any adverse health effects; however, at high levels (>50 % methane in air), CH_4 can cause mood changes, slurred speech, vision problems, memory loss, nausea,

[50] Section 3: Anaerobic digestion. DEFRA, 2021 (website: https://www.gov.uk/government/statistics/area-of-crops-grown-for-bioenergy-in-england-and-the-uk-2008-2020/section-3-anaerobic-digestion)
[51] Anaerobic Digestion and its Applications, EPA, 2015
[52] Hydrogen sulfide formation control and microbial competition in batch anaerobic digestion of slaughterhouse wastewater sludge: Effect of initial sludge pH. Li Yan *et al*, 2018.

vomiting, facial flushing and headaches[53]. The main risk of CH_4 for the Proposed Development is considered to be the risk of explosion.

CO_2 poses a threat to life through asphyxiation when it displaces oxygen to low levels. Evidence shows that CO_2 creates an immediate threat to life at concentrations of 4 % in air due to the toxicological impact it has on the body[54] [55]. By volume, CO_2 makes up 0.04 % of the air in the atmosphere so it is unlikely these levels will be routinely experienced.

Inhalation of high concentrations of H_2S may lead to collapse, and potential death within minutes. Exposure to lower concentrations can cause skin discolouration, pain, itching, skin redness and local frostbite may occur if skin is exposed to compressed hydrogen sulphide liquid. Eye exposure may cause irritation, inflammation, tearing, sensitivity to light and conjunctivitis[56].

Whilst both CH_4 and CO_2 are odourless, H_2S and other odorous compounds are generated during anaerobic biotransformation[57]. Given the uncertainties at the presence of other odorous gases within Lagoon 3, H_2S was assumed to be the primary source of odour and therefore used as a proxy for odour concentrations resulting from loss of the biogas contained above the lagoon.

Table 14-2 to **Table 14-4** summarise the impacts of the gases identified as being contained within Lagoon 3.

Table 14-2: Human health impacts of CO_2[58]

CO_2 concentration %	Effect
0.5	Slightly deeper breathing
1	Typically no effects, possible drowsiness
1.5	Mild respiratory stimulation for some people
3	Moderate respiratory stimulation, increased heart rate and blood pressure
4	Immediately Dangerous to Life or Health
5	Strong respiratory stimulation, dizziness, confusion, headache, shortness of breath
8	Dimmed sight, sweating, tremor, unconsciousness, and possible death

Table 14-3: Explosive limits impacts of CH_4[59]

Concentration %	Effect
5.53	Lower explosive limit
15	Upper explosive limit

[53] Methane General Information, Public Health England (PHE), 2019
[54] Assessment of the major hazards potential of carbon dioxide (CO_2), HSE
[55] IDLH Values. The National Institute for Occupational Safety and Health.
[56] Hydrogen Sulphide General Information, Public Health England
[57] Odour measurements at Different Methanisation Sites. Bayle *et al*, 2018.
[58] Carbon Dioxide Health Hazard Information Sheet, FSIS Environmental, Safety and Health Group
[59] Methane Incident Management, PHE, 2015

Table 14-4: Human health impacts of H_2S. 60

Hydrogen sulphide concentration		Effect
mg/m³	ppm	
1400-2800	1000-2000	Immediate collapse with paralysis of respiration
750-1400	530-1000	Strong central nervous system stimulation, hyperpnoea followed by respiratory arrest
450-750	320-530	Pulmonary oedema with risk of death
210-350	150-250	Loss of olfactory sense
70-140	50-100	Serious eye damage
15-30	10-20	Threshold for eye irritation

Whilst odour is classed as a nuisance, it does not negatively impact human health, unless there is repeated exposure.

The information presented in **Table 14-2** to **Table 14-4** along with professional judgement was used to determine the significance of potential impacts of a release of the contents of Lagoon 3**.**

Potential failure scenarios of the containment system

The potential ways in which the lagoon containment system might fail have been considered. The lagoon containment system is formed of the bunds around the perimeter to contain the digestate and a gas membrane over the top of the lagoon to trap gases produced in the anaerobic process. Therefore, the release of potentially harmful gases could occur through either failure of the gas membrane or bund.

The loss of gas through the failure of the gas membrane could potentially occur through the complete loss of the membrane, a large puncture or a small puncture. Due to the size of the membrane (~ 12,500 m^2), the complete loss of the gas membrane is not a realistic scenario. In the event of a small puncture equivalent to that of a tiny hole, the release of gas will be so insignificant it will not pose a threat to human health. This was confirmed during the site inspection which took place in September 2021, as detailed in the Crouchlands Farm Lagoon 3 Multi-agency Incident Plan Review Meeting notes included **Appendix 14.3** and detailed above in **Section 14.2.4.2** above. Therefore, the scenarios considered within the assessment are a large puncture and a small puncture (above a tiny hole) to the gas membrane. To replicate the conditions experienced in the event of these scenarios, it is considered holes of 5 m x 5 m and 0.1 m x 0.1 m are adequate, respectively.

Similar to the complete loss of the gas membrane, it is considered unrealistic all of the bunds would fail simultaneously. Therefore, this assessment considers the failure of each directional bund in isolation.

Summary of Source Emission Potential

The Proposed Development will introduce receptors in closer proximity to Lagoon 3 than existing receptors (with exception to transient use of land by farm workers), and therefore they are at risk of impact.

[60] Table extracted from WHO air quality guidelines for Europe, 2nd Edition (2000), Chapter 6.6, Table 1.

It was established the main pollutants of concern are CH_4, H_2S, CO_2 and H_2S-related odour. Based on the likely volume of gases and digestate contained within Lagoon 3, in the event of failure of the lagoon's containment system, it is considered there is a potential risk to future users of the site.

The scenarios to be considered as part of this assessment are therefore as follows:

- **Scenario 1**: Minor leak – a small puncture of the gas membrane resulting in a minor loss of gas containment (a hole of 0.1 x 0.1 m);
- **Scenario 2**: Major leak – a large puncture of the gas membrane resulting in a major loss of gas containment (a hole of 5 x 5 m); and,
- **Scenario 3**: Major leak plus failure of bund - loss of liquid & gas containment.

The impact of CH_4, H_2S, CO_2 and odour on receptors will be assessed for all of the above scenarios.

From the findings of the previous reports carried out on Lagoon 3, it can be concluded there is a possibility for failure of the containment system in the future. The Joint Incident Response Plan concluded the risk of failure to harm existing human receptors is considered to be unlikely. The meetings held between the Multi-agency Incident Group concluded '*The likelihood of release of gas remains very low. The potential impact from loss of containment of gas remains low'* (discussed in **Section 14.2.4.2**).

In addition, it was confirmed within the meeting held in March 2021 that the gas membrane is not under great pressure (slightly above atmospheric pressure)**.** A site inspection carried out in September 2021 observed that the bund slips had not progressed further signifying that the bunds have stabilised. On this basis, it can be concluded the risk of occurrence of Scenarios 2 and 3 are very low.

It can therefore be determined that if failure of the containment system was to occur, it would most likely be through a small puncture of the gas membrane (Scenario 1).

14.2.4.3 Pathway Effectiveness

The location, significance, and severity of an impact from air pollution is dependent *inter alia* on the prevailing weather conditions. 'Worst-case' conditions will occur during stable atmospheric conditions with low wind speeds or calm conditions, which result in poor dispersion and dilution of gases released into the atmosphere. Receptors close to the source in all directions can be affected under these conditions. When conditions are not calm, it will be the downwind receptors that are affected. Overall, therefore, receptors that are downwind with respect to the prevailing wind direction tend to be at higher risk of impact.

Five (2016 to 2020) years of NWP hourly sequential meteorological data for the Crouchlands Farm site were acquired from ADM Ltd. It was determined that NWP data were more representative of the study area due to the distance to the nearest meteorological weather station (25 km to the north-east) as well as the site's location downwind of the South Downs, which has significant potential to impact on meteorological conditions at the Proposed Development site. A wind rose illustrating the meteorological data for 2016 to 2020 is presented in **Figure 14-1,** which shows that the most frequent and strongest winds are from the south and south-west.

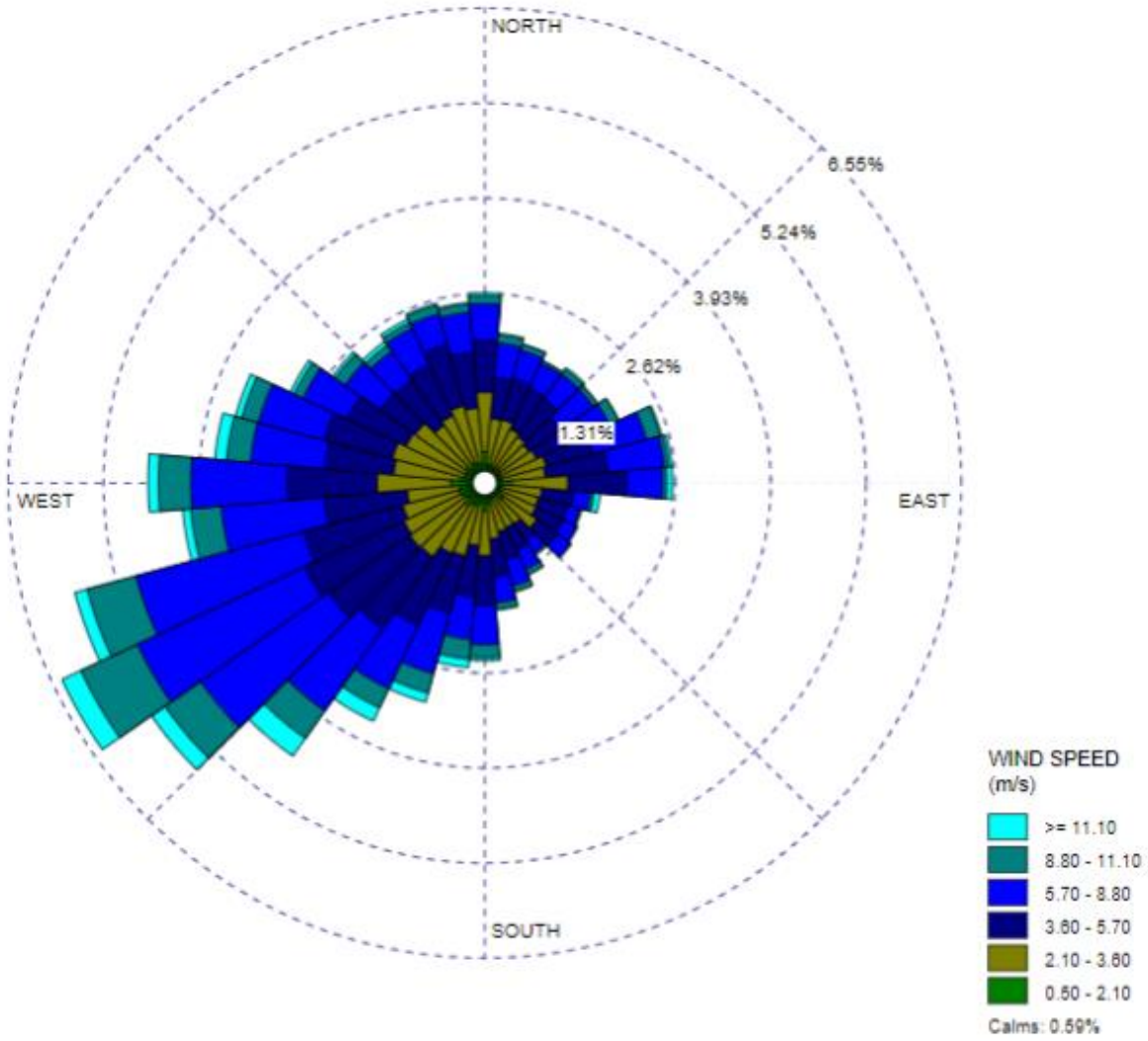


Figure 14-1: Five-year average wind rose for Crouchlands Farm (2016 to 2020)

The factors affecting pathway effectiveness include:

- Distance from source to receptor;
- The direction of receptors from source with respect to prevailing wind;
- The effectiveness of dispersion/dilution in reducing emissions to the receptor; and,
- Topography and terrain.

The Proposed Development is located to the north and east of Lagoon 3 and therefore all winds blowing from between 180 and 270º travel towards the development site. Over the five years, the portion of total hourly meteorological data travelling between 180 and 270º and, therefore, towards the location of the Proposed Development, was 40.54 %. This demonstrates that the site is situated down prevailing wind of Lagoon 3.

Further analysis of the data was undertaken to establish the range in wind speeds blowing towards the site. **Figure 14-2** shows the frequency distribution of meteorological data for all five years in the direction of the Proposed Development.

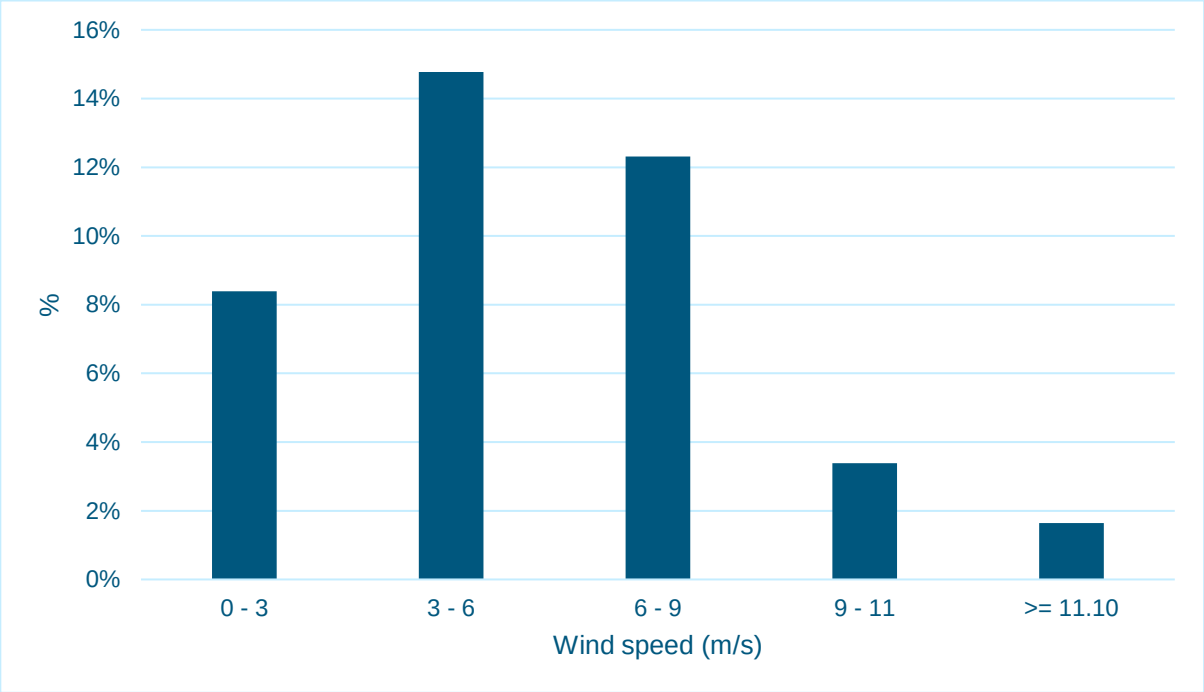


Figure 14-2: Percentage of the total meteorological data occurring at varying wind speeds in the direction of the Proposed Development (180 to 270º)

With reference to the Pasquill-Gifford atmospheric stability categories, the most stable meteorological conditions typically occur between 0 to 3 m/s, with a boundary layer height of less than 400 m. As can be seen from **Figure 14-2,** only 8.4 % of the total meteorological data travels towards the site (from the south-west) at wind speeds of at 3 m/s and lower. It has been assumed all metrological conditions occurring at these wind speeds are stable in order to provide a robust assessment. Therefore, 8.4 % of hourly meteorological conditions are 'worst-case' for impacting upon future users of the Proposed Development.

In addition to this, dispersion will not be compromised by building effects or terrain as there is no built development between Lagoon 3 and the subject site, and the topography surrounding the lagoon falls to the north-east towards the Proposed Development. Therefore, it is considered there is an effective pathway in which emissions of gas and odour released from the lagoon can travel through the atmosphere and impact receptors at the Proposed Development.

As well as emissions of gas and odour travelling through the atmosphere directly from the lagoon in the event of failure of the gas membrane, there is the potential that failure of the bund will cause digestate to flow towards the Proposed Development with air pollutants entrained. In this scenario, most emissions of gas will be released immediately after failure resulting in emission release at the lagoon site. However, the digestate will remain odorous with small amounts of gases still released.

As mentioned in **Section 14.2.5.2,** the underlying geology comprises impermeable Weald Clay. Therefore, in the event of breach of the bund, the digestate will not penetrate deep into the ground so will travel further from the lagoon. The spill modelling has assumed that a bund failure would occur after prolonged rainfall, such that infiltration would be minimal.

Spill modelling has been carried out to identify the likely flow path of digestate in the event of breach of the bunds. A description of the technique and results are contained within **Appendix 14.1**.

As can be seen from the spill modelling results in **Appendix 14.1**, digestate released from the failure of the northern or eastern bunds runs in a downward north-easterly direction towards the location of the Farm Hub. Whereas, in the event of failure of the western and southern bunds, digestate runs away from the Proposed Development to the southwest. The 'worst-case' scenarios for impacts on the Proposed Development are therefore failure of the northern or eastern bunds.

In the event of breach of the northern or eastern bunds, it is predicted that the majority of digestate which escapes from Lagoon 3 will have passed beyond the Proposed Development to the north-east in approximately 1.5 minutes. However, small volumes of digestate would pool around the location of the Farm Hub.

The pathway for emissions from Lagoon 3 to impact the Proposed Development is therefore considered to be effective.

14.2.4.4 Sensitivity of Receptors

The Proposed Development will introduce several different types of receptors downwind of Lagoon 3, as summarised in **Table 14-5**. The future receptors considered most at risk of impact from Lagoon 3 are the glamping pods located to the north and north-east due to their proximity and duration of occupancy. There are also several existing receptors in the vicinity of Lagoon 3 which have also been included. It is noted there is a Public Right of Way which runs adjacent to Lagoon 3; however, this is currently closed to the public. With reference to the Multi-agency Incident Group's meeting minutes, it states '*Should the rights of way reopen, this will trigger a review of the incident plan. This is because one of the risk controls in the plan is to close nearby rights of way*.' Therefore, users of the Public Right of Way have not been considered within this assessment as it is assumed the revised incident plan will consider impacts on users of the Public Right of Way.

Table 14-5: Sensitive receptors surrounding Lagoon 3

Proposed / Existing receptor	Receptor Type	Approximate distance to Lagoon 3 (km)	Direction from Lagoon 3
Existing	Farm workers	0.03	East (at the closest point)
	Crouchland House	0.44	East
	Rumbold's Farm	0.79	North-west
	Laneland Farm	0.59	South-east
	Moore's Green Cottage	0.67	North-east
Proposed	Glamping	0.14	North
	Glamping	0.24	North-east
	Special events area	0.35	North-east
	Glass house / demonstration	0.32	North-east
	Cattle Barn & Workshop	0.57	North-east

Proposed / Existing receptor	Receptor Type	Approximate distance to Lagoon 3 (km)	Direction from Lagoon 3
	Rural Enterprise Centre / Security accommodation	0.54	North-east
	Cookery School	0.53	East
	Equestrian Centre	0.58	East
	Equestrian Centre	0.62	East

14.2.4.5 Likely Magnitude of Effects and Conclusions

Although the risk of failure of the Lagoon 3 containment system is considered to be low, in the event of failure, gases and digestate contained within could cause adverse effects upon human health or create a nuisance. As human receptors are proposed to be introduced within 150 m downwind and downhill of the lagoon, there is the potential for impact on future users of the site.

14.2.5 Quantitative Risk Assessment of Air Pollution

The qualitative risk assessment concluded that, due to the relative locations of the existing and future sensitive receptors in the context of the prevailing wind direction and the likely content of Lagoon 3, there is a potential risk to future users of the site from CH_4, CO_2, H_2S & odour. A dispersion modelling exercise was therefore undertaken to provide greater detail on the level of risk that emissions of gas and odour from Lagoon 3 pose on proposed sensitive receptors.

Scenario 3 has not been explicitly modelled due the uncertainties associated with the release of gas from the digestate. In the event of failure of the bunds, the majority of gases would be emitted at the lagoon site with only a small amount continuing to be released from escaped digestate away from Lagoon 3. It can therefore be assumed Scenario 2 (major leak of gas) captures the reasonable 'worst-case' impacts of gas released in the event of a major leak or partial failure of the bund.

The main difference between impacts of air pollution from Scenario 2 and those experienced in Scenario 3 would be odour emissions from the released digestate. However, as odour doesn't provide a threat to life and, in the event of breach of the bund, the site would immediately be evacuated (as discussed below in **Section 14.2.5.6**), it is not considered to have a significant impact on future users of the Proposed Development. The impacts of Scenario 3 have therefore been explored with the modelling results from Scenario 2.

As the content of odorous gases within the lagoon is unknown, H_2S has been used to estimate the impact of odour in the event of failure of the lagoon system. Due to the low odour threshold of H_2S (0.76 µg m^{-3}), this is considered a robust approach as H_2S is most likely to be the gas with the highest odour potential contained within the lagoon.

14.2.5.1 Choice of Dispersion Model

A number of different mathematical dispersion model codes are available to simulate the dilution and dispersion of gases and particles released into the atmosphere. These range in complexity from simple, single source Gaussian or new generation Gaussian based screening codes through to specific software packages designed to simulate industrial accidents, such as PHAST, DEGADIS, SLAB and detailed dispersion models for environmental impact assessment, AERMOD and ADMS, through to computational fluid dynamics (CFD) modelling, including PHOENICS and FLUENT.

Models such as PHAST, DEGADIS and SLAB use typical fixed meteorological data cases, allied to combinations of particular wind speeds and atmospheric stability. For example, the typical cases used in PHAST are 2F (a wind speed of 2 m s^{-1} with a stable atmosphere) and 5D (a wind speed of 5 m s^{-1} and a neutral atmospheric stability). The former case represents a worst-case for dilution and dispersion of gases released into the atmosphere, the latter an average case, typical of UK meteorological conditions. These models have been specifically developed to analyse the consequences of industrial accident scenarios and concentrate upon determining short-term, near-field effects upon people and the environment.

AERMOD and ADMS are both new-generation Gaussian model codes, modified to better represent dispersion under convective (unstable) atmospheric conditions than their original Gaussian predecessors. These models are widely used for assessing the air quality impacts of gases and particles discharged into the atmosphere and assessing the impact upon people and the environment in the near and distant fields, with an operational spatial range from approximately 100 m up to 50 km. Both can use either synthesised meteorological data sets, like PHAST, or, more usually, will incorporate hourly sequential multi-parameter meteorological data sets, derived from measured or modelled data.

CFD is the branch of fluid mechanics that makes use of computers to analyse the behaviour of fluids and physical systems. CFD modelling and analysis became a popular online simulation solution as the difficulty grew in applying the laws of physics directly to real-life scenarios in order to make analytical predictions. CFD models can be used to simulate, at a very detailed level and scale, the way that gases and particles behave in the atmosphere under the influence of wind and other atmospheric turbulence parameters. They work best on a micro-scale and are not specifically formulated for simulating dispersion over hundreds of metres, which will require significant processing power and times and particular effort in setting-up the model domains and boundary conditions. Like PHAST, they are limited in the range of meteorological conditions that can be considered, whilst achieving acceptable model run and study times.

For this assessment of potential risks that could arise from discharges of gases from Lagoon 3 close to the Crouchlands Farm site, it was decided to use the ADMS 5.2 dispersion model, for the following reasons:

- The model uses a continuous parameterisation of the atmosphere, rather than the traditional discrete Pasquill-Gifford stability classes, based upon the Monin-Obukhov length and the atmospheric boundary layer height.
- The sensitive receptors on and adjacent to the Crouchlands Farm site lie in the range between 140 m and 790 m distant from Lagoon 3, in the near to medium field which falls within the intended dispersion calculation range for this model.
- The model can encompass small and large point sources, small and large area sources and a range of emission parameters that can cater for the different emission scenarios to be used in the assessment.
- The model outputs module has a flexible range of concentration/pollutant averaging times, from 15-minute to 24 hours, which are appropriate for this assessment.
- Whilst the model can input fixed wind speed and stability class meteorological data (in the same way as PHAST, for example), sequential hourly meteorological data is more normally used. This is representative of the actual site location conditions, in terms of localised meteorological conditions and also reflects the frequency of occurrence of wind directions on an hour-by-hour basis throughout the year, which is important in considering the effects upon receptors at different compass directions from Lagoon 3.

14.2.5.2 Input Parameters

The input parameter assumptions used within the ADMS 5.2 model are summarised in **Table 14-6** below with calculations included in **Tables A14-1 to A14-2** in **Appendix 14.4**.

Table 14-6: Input parameters

Parameter	Input for Dispersion Model		
	Scenario 1	Scenario 2	Justification
Release height (m)	At ground level	At ground level	The lagoon is located at a higher topography than the proposed development. By keeping the source height at the same level as the receptors it provides a robust assessment as plumes rise.
Source diameter (m)	0.1	5	Please refer to Section 14.2.4.2.
Exit velocity (m/s)	0.1	0.1	Both Scenarios 1 and 2 were modelled as a point source to allow for consideration of an exit velocity. A low exit velocity of 0.1 m/s was used for both Scenarios 1 and 2 as gases will not be released at a high velocity as the gas membrane is not fully inflated and therefore not under great pressure (as shown on pictures contained within the 2018 Atkins report).
Efflux temperature (°C)	Ambient	Ambient	Gas contained within Lagoon 3 is likely to be at a higher temperature due to the exothermic properties of anaerobic digestion; however, as the temperature is unknown, ambient temperature has been used. This provides a reasonable 'worst-case' assessment as the gases will have no thermal buoyancy.
Calculated Emissions			
CO_2 emission rate (g/s)	0.7	1740.34	On the basis of the literature search, it has been assumed that the gas consists of a methane content of 50 % by volume, carbon dioxide 47 % by volume and hydrogen sulphide between 0.1% and 3% by volume. The central "base case" for hydrogen sulphide is 0.5% by volume, with sensitivity tests between 0.1% and 3% by volume (discussed in Section 14.2.5.3).
CH_4 emission rate (g/s)	0.27	673.25	
H_2S emission rate (g/s)*	0.006	14.35	
*0.5 % by volume H_2S			

To model reasonable 'worst-case', it was assumed failure of the gas membrane would occur in the north-east corner of the lagoon closest to the Proposed Development.

Due to the uncertainties around the volume of gas contained with Lagoon 3, it has been assumed there would be a constant flow of gas release, whereas in reality there is a finite amount of gas contained within the lagoon. Therefore, the results reported in **Section 14.2.5.4** are considered to be robust.

14.2.5.3 Sensitivity Test

H_2S Concentration within Lagoon 3

Sensitivity tests were carried out to assess the potential range in H_2S concentration contained within Lagoon 3. In addition to the 0.5 % by volume concentration assessed, an additional two concentrations have been modelled to capture the range of potential impacts. The additional concentrations modelled are 3 % and 0.1 % of the total volume of gases contained within the lagoon. It is considered that the 0.5% base case is a reasonably conservative estimate, and that a composition of 3% is highly unlikely and will provide a very worst case. The emission rates for the additional concentrations are included in

Table 14-7.

Table 14-7: Sensitivity test emission rates - additional H_2S emission rates

Sensitivity test H_2S emission rates (g/s)			
Concentration	**Scenario 1**	**Scenario 2**	**Justification**
0.1 % by volume	0.01	2.87	To assess the potential range of impacts
3 % by volume	0.34	86.09	

Scenario 1 exit velocity

For Scenario 1 (a minor leak of gas from the gas membrane), an additional exit velocity of 1 m/s has been modelled as a sensitivity test to ensure reasonable 'worst-case' conditions have been assessed. All other input parameters were kept constant with those detailed in **Table 14-6**. The emission rates used in this sensitivity test are detailed in **Table 14-8**.

Table 14-8: Sensitivity test emission rates – Scenario 1 with exit velocity of 1 m/s

Sensitivity test Scenario 1 – Exit velocity 1 m/s		
Pollutant	**Emission rate (g/s)**	**Justification**
CO_2	6.96	To assess the reasonable 'worst-case'
CH_4	2.69	
H_2S	0.06*	
*0.5 % by volume H_2S		

14.2.5.4 Meteorological data

ADMS 5 requires meteorological data, which it uses to simulate the behaviour of exhaust emission plumes in different weather conditions.

The closest meteorological observation stations to the Proposed Development are located at distance (> 24.9 km) and, due to the location of the South Downs national park in close proximity to the west, it was not considered any weather station is representative of the meteorological conditions experienced at the development site.

The closest meteorological Office recording stations to the Crouchlands Fam site are:

- Gatwick Airport/Charlwood, 24.9/27.6 km to the east-north-east
- Odiham, 33 km to the north-west.
- Farnborough Airport, 29.4 km to the north-north-west.
- Thorney Island, 36.8 km to the south-west.
- Shoreham, 30.5 km to the south-east.

None of these locations provide data that are truly representative of the Crouchlands Farm site, given the distances from the Proposed Development and the intervening topographical features (such as the South Downs National Park). In addition, some of the recording sites are in coastal locations.

Accordingly, for this particular assessment, given the remote location of the site from meteorological recording stations, it was decided to make use of numerical weather prediction (NWP) met data. This consists of hourly sequential data that are synthesised by the UK Meteorological Office from their global weather model systems. The data, which can be generated for the entire UK land area, on a resolution of a 3 km by 3 km grid, have been widely available for the last 15 years and are now widely used for air quality impact modelling assessments in areas remote from active recording stations. A further advantage of using these data is that the records are always 100 % complete, being uncompromised by equipment outages and the detection limits of instruments, particularly some of the older wind anemometers, which can have lower cut-off wind speeds of 1 m s^{-1}.

Research carried out by Lucas and Bethan[61], demonstrated that NWP data produces no significant changes on the accuracy of short- and long-term dispersion modelling predictions when compared to observed weather data. A literature review carried out by Ball, Hill and Jenkinson (2008) stated an advantage of NWP data over meteorological measurement data is the absence of gaps in the data series[62]. Therefore, it is considered reliable for this assessment.

In this instance, the NWP data has been centred at the site and therefore takes into account the general topography of the local area. Five years of NWP data was used in the form of an hourly sequential dataset for years 2016 to 2020. All five years were modelled.

14.2.5.5 Terrain

Surface roughness is a value (in metres) which is used to modify the wind profile within the model to represent the spatial density, orientation and height of obstacles to the approaching wind. A surface roughness of 0.2 m was selected to represent the dispersion and met site which is representative of ‘Agricultural areas (min)’.

Only terrain gradients steeper than 1 in 10 need to be incorporated into the model, therefore detailed terrain was not used within the model.

14.2.5.1 Modelled Receptors

The Proposed Development will introduce a number of sensitive human receptors upwind of Lagoon 3. To ensure the assessment is robust, ten sensitive receptors were selected in reasonable ‘worst-case’ locations to represent each future use, i.e., upwind and at the closest point within the Proposed Development to Lagoon 3. Four existing residential receptors have also been explicitly modelled.

As detailed in **Section 14.2.4.4**, users of the Public Right of Way adjacent to Lagoon 3 were not considered in this assessment.

Modelled receptor heights were taken as 1.5 m above ground level (agl) to correspond with exposure (breathing) height.

[61] *NWP parameters for use in ADMS 3.1 dispersion modelling. Lucas V and Bethan, S., 2004*
[62] *Integration of air quality modelling and monitoring methods: review and applications., EA, 2008.*

The receptors included in the assessment are shown on **Figure 14-3** and detailed in **Table 14-9**. Future proposed receptors are prefixed with 'FR' and existing receptors are prefixed with 'ER'.

Table 14-9: Future sensitive receptors included within the Lagoon 3 risk assessment

Receptor ID	Receptor Type	Approximate distance to Lagoon 3 (km)	Direction from Lagoon 3	X	Y	Z
FR1	Glamping	0.14	North	500592	129530	1.5
FR2	Glamping	0.24	North-east	500638	129634	1.5
FR3	Special events area	0.35	North-east	500788	129708	1.5
FR4	Glass house / demonstration	0.32	North-east	500848	129617	1.5
FR5	Cattle Barn & Workshop	0.57	North-east	501090	129716	1.5
FR6	Rural Enterprise Centre / Security accommodation	0.54	North-east	501107	129623	1.5
FR7	Cookery School	0.53	East	501134	129498	1.5
FR8	Equestrian Centre	0.58	East	501200	129436	1.5
FR9	Equestrian Centre	0.62	East	501248	129318	1.5
FR10	Hardnip's Barn	0.46	North-east	500846	129798	1.5
ER1	Crouchland House	0.44	East	501077	129370	1.5
ER2	Rumbold's Farm	0.79	North-west	500383	129735	1.5
ER3	Laneland Farm	0.59	South-east	501173	129065	1.5
ER4	Moore's Green Cottage	0.67	North-east	501242	129674	1.5

Due to the transient nature of farm work, the impact on farm workers has been assessed using the contour plots detailed in **Appendix 14.3,** and therefore no specified points have been included to represent them, as detailed in the following section.

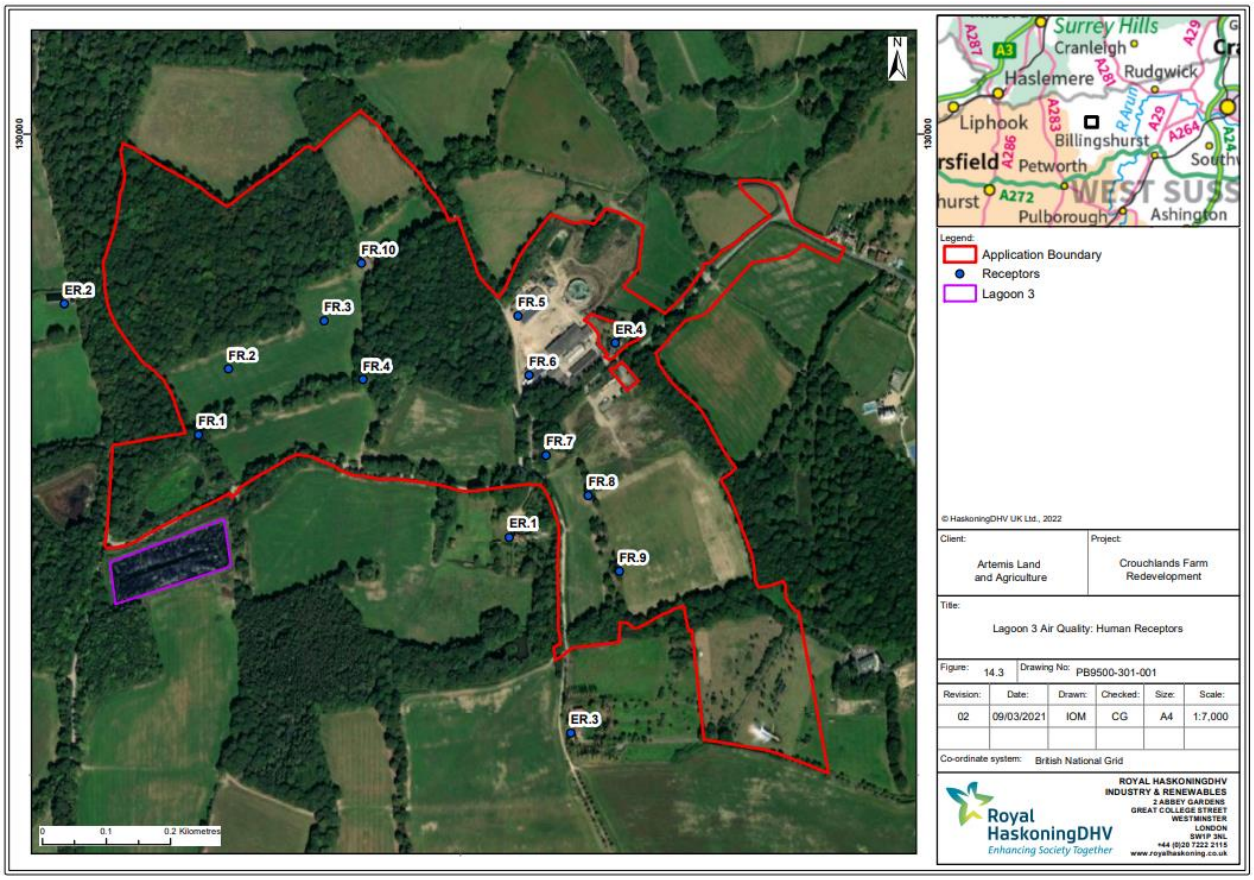


Figure 14-3: Lagoon 3 Air Quality, Human Receptor Locations

14.2.5.2 Gridded Output

In addition to specified receptors, the model has been used to predict concentrations at breathing height (1.5 m agl) on a regular grid across the modelled domain. The modelled domain extends over an area of 1,420 x 790 m and covers Lagoon 3 and the Proposed Development. The receptor grid resolution that has been selected results in spacing of 10 m between output points which is considered an appropriate resolution for this assessment.

14.2.5.3 Assessment Criteria

Emissions of Gas

In **Section 14.2.4.2** it was determined the gases of concern from Lagoon 3 are CO_2, CH_4 and H_2S. In all scenarios considered within this assessment, the exposure to the gases of concern will be of limited duration. On this basis, the short-term exceedance criteria for all pollutants were used.

For H_2S, there are published environmental standards as well as workplace exposure limits (WELs). There is also a WEL for CO_2. There is no published environmental standard for CO_2 and CH_4, or a WEL for CH_4; therefore, the assessment levels used for these pollutants have been ascertained from literature values.

The WELs have been used to assess existing and future receptors which use the surrounding land for work purposes. Existing and future residential users as well as recreational users will be assessed against the environmental standards or literature values.

A summary of the relevant assessment criteria for the pollutants of concern are detailed in **Table 14-10**.

Odour

Assessment of the potential impacts upon air quality and people of emissions of odour to atmosphere is covered comprehensively in the guidance document issued in 2018 by the IAQM. Odour is measured in terms of the number of times a sample of odorous air has to be diluted with clean air, so that no odour can be reliably detected in the diluted sample. This is described as a concentration of odour of 1 European odour Unit per cubic metre of air (1 $ou_E\ m^{-3}$).

The sensitivity of the human population to odours varies from insensitive (anosmic) to very sensitive (hyperosmic) but, in simple terms, the point at which an individual of average sensitivity will begin to detect an odour under laboratory conditions will be between 2 and 3 $ou_E\ m^{-3}$. 5 $ou_E\ m^{-3}$ is acknowledged to be a faint odour, 10 $ou_E\ m^{-3}$ is described as a distinct odour, the nature and source of which may be recognisable, and odour concentrations above this level are described as strong.

In terms of what may be described as odour concentration criteria with which to categorise the level of impact arising from an emission, for long-term emissions, the metric used is a 98th percentile of hourly average odour concentrations at a receptor over a calendar year.

However, in the case of potential failure incidents associated with Lagoon 3, it is highly unlikely that emissions of odour would persist over a calendar year – action would be taken by agencies to solve the problem soon after an incident arose. Therefore, these longer-term odour benchmarks would not be applicable. On the basis that any impacts would be therefore unlikely to be allowed to persist for greater than a few days (< 175 hours), it is proposed that short-term odour concentrations of between 10 and 50 $ou_E\ m^{-3}$ should be tolerable in an incident/emergency situation, as long as these are not associated with simultaneous concentrations of other air pollutants at or above established air quality standards.

Table 14-10: Assessment criteria for the pollutants of concern

Pollutant	Air Quality Objective		Effect	Source
	Concentration	Measured as		
CH_4	5.53 %	1 hour mean	Lower explosive limit	PHE, 2015[58]
	15 %		Upper explosive limit	
CO_2	1 %	15-minute mean	Slightly deeper breathing	FSIS Environmental, Safety and Health Group[57]
	4 %		Immediate Risk to Life and Health	
	27,400 $mg.m^{-3}$		WEL for short-term exposure	EH40/2005 WEL
H_2S	150 $\mu g.m^{-3}$	1 hour mean	Health criteria value for inhalation derived by the Environment Agency	Environmental Assessment Levels (EALs), EA, 2021
	14 $mg.m^{-3}$	15-minute mean	WEL for short-term exposure	EH40/2005 WEL
Odour	10 to 50 $ou_E\ m^{-3}$	1 hour mean	Nuisance	Professional judgement

14.2.5.4 Results and Impact Assessment

As discussed in **Section 14.2.4.5,** predicted concentrations were assessed against the short-term assessment criteria for each pollutant as exposure to emissions of gas and odour will only be of short duration.

As mentioned in **Section 14.2.5.2**, H_2S has been used to estimate the impact of odour in the event of failure of the lagoon system.

Contour plots showing the spatial distribution of CH_4, H_2S and CO_2 concentrations at breathing height (1.5 m) are provided in **Appendix 14.5**. Contour plots were produced using 2020 meteorological data as this was shown to predict the highest overall concentrations at the specified points. Although concentrations fluctuate marginally between years, the pattern of dispersion will be roughly consistent. As noted above, exposure of workers within the area has not been assessed using discreet receptor points due to their transient nature. As such, effects on these receptors have been identified using contour plots. Assessment in relation to the WELs is presented in a separate section below.

Scenario 1

The results of the assessment of Scenario 1 are presented in **Table 14-11**, and are presented as the maximum concentrations from the five-year meteorological dataset.

Table 14-11: Scenario 1 (exit velocity 0.1 m/s): Maximum predicted concentrations at each modelled receptor

Receptor ID	Maximum 15-minute concentration of CO_2 (%)	Maximum hourly mean concentration of CH_4 (%)	Maximum hourly mean concentration of H_2S - 0.5 % H2S concentration ($\mu g\ m^{-3}$)
FR1	0.00014	0.00011	14
FR2	0.00007	0.00005	6
FR3	0.00004	0.00003	3
FR4	0.00004	0.00003	4
FR5	0.00002	0.00001	1
FR6	0.00002	0.00001	2
FR7	0.00002	0.00001	2
FR8	0.00002	0.00001	1
FR9	0.00001	0.00001	1
FR10	0.00003	0.00002	2
ER1	0.00003	0.00002	2
ER2	0.00003	0.00002	2
ER3	0.00001	0.00001	1
ER4	0.00001	0.00001	1
Assessment criteria	1.00	5.53	150

In the event of a minor leak, the maximum 15-minute concentration of CO_2 is predicted to be 0.00014 % occurring at receptor FR1. This is significantly below the lower assessment criteria of 1 %. FR1 is located 0.14 km to the north of Lagoon 3 and is representative of the western glamping area. The maximum hourly mean concentration of CH_4 and H_2S is also predicted at FR1 with concentrations of 0.00011 % and 14 µg.m^{-3}, respectively, which are also well below their respective assessment criteria. Therefore, there is no risk of asphyxiation from CO_2, explosion from CH_4 or impacts to human health from H_2S across the Proposed Development.

In the event of a minor leak, it is assumed the odour detection threshold of H_2S will be exceeded in close proximity to the lagoon. However, should gas monitors be placed in close proximity to lagoon, as discussed later in **Section 14.2.5.6**, the detection of H_2S odours will alert the necessity for a response.

As the predicted concentrations for CO_2 and CH_4 are so low, contour plots have only been produced for the sensitivity scenario with an exit velocity of 1 m/s as this predicts the highest concentrations, these are discussed below. With reference to **Figure A14-1**, the contour plot for H_2S indicates there are no exceedances of 150 µg.m^{-3} across the whole Proposed Development. A small area immediately to the north-east of Lagoon 3 does exceed the EAL however a review of aerial mapping indicates that this area is not currently farmed. Therefore, transient receptors (farm workers) are not likely to be at risk from H_2S.

Therefore, there is unlikely to be a risk to human health in the event of a small puncture to the gas membrane.

Scenario 2 and 3

The results of the assessment of Scenario 2 are presented in **Table 14-12**, and are presented as the maximum concentrations from the five-year meteorological dataset. These results were also used in consideration of Scenario 3, as previously explained.

Table 14-12: Scenario 2: Maximum predicted concentrations at each modelled receptor

Receptor ID	Maximum 15-minute concentration of CO_2 (%)	Maximum hourly mean concentration of CH_4 (%)	H_2S (0.5 % by volume)	
			Maximum hourly mean concentration of H_2S (µg m^{-3})	Percentage of hours between 2016 and 2020 which results in an exceedance of 150 µg m^{-3} (%)
FR1	0.37	0.28	40959	13
FR2	0.17	0.12	17582	12
FR3	0.10	0.06	9300	13
FR4	0.11	0.08	11137	20
FR5	0.05	0.03	4251	8
FR6	0.05	0.03	4722	10
FR7	0.05	0.03	4933	9
FR8	0.05	0.03	4170	7
FR9	0.04	0.02	3520	6
FR10	0.06	0.04	6017	9

Receptor ID	Maximum 15-minute concentration of CO_2 (%)	Maximum hourly mean concentration of CH_4 (%)	H_2S (0.5 % by volume)	
			Maximum hourly mean concentration of H_2S (µg m^{-3})	Percentage of hours between 2016 and 2020 which results in an exceedance of 150 µg m^{-3} (%)
ER1	0.07	0.04	6241	11
ER2	0.07	0.04	6550	5
ER3	0.04	0.02	3473	5
ER4	0.04	0.02	3169	5
Assessment criteria	1.00	5.53	150	-

In the event of a major leak of gas from the lagoon, it is predicted there are no exceedances of the short-term assessment criteria for CO_2 or CH_4. The highest modelled concentration for both CO_2 and CH_4 is predicted at receptor FR1 with a maximum 15-minute average concentration of 0.37 % and an hourly mean concentration of 0.28 % respectively. With regards to CO_2, concentrations of this magnitude are lower than those required to cause physiological effects of slightly deeper breathing (0.5 % in air). The lower explosive limit of CH_4 is 5.53 %, of which modelled concentrations are significantly below.

For H_2S (with a modelled concentration of 0.5 %), a large puncture of the gas membrane was predicted to cause exceedances of the EAL short-term assessment criterion of 150 µg.m^{-3} at all future and existing modelled receptor locations. The highest exceedance occurs at FR1 with a concentration of 40.96 mg/m^3. With reference to **Table 14-4**, a concentration of this magnitude causes eye irritation. The highest exceedance at an existing receptor is predicted at ER2 with a concentration of 6.5 mg/m^3 which is not indicated to cause any health effects.

Analysis was undertaken to determine the number of hourly meteorological conditions which are predicted to give rise to exceedances of the H_2S assessment criterion. Analysis was undertaken for all years modelled. With reference to **Table 14-12**, in the event of a major leak of gas, which is considered unlikely, an exceedance of 150 µg.m^3 was predicted to occur for 20 % or fewer hours, based on a five-year dataset, at all receptors.

Contour plots showing the spatial dispersion of gases in the event of Scenario 2 are included in Figures **A14-2** to **A14-4**. Concentrations of CO_2 are predicted to exceed 1 % immediately to the north of Lagoon in the location of the now remediated Lagoon 2. It is assumed this parcel of land will not be farmed and therefore it is not considered farm workers within the Proposed Development are at risk of elevated levels of CO_2. However, levels of CO_2 immediately to the east of the lagoon are in exceedance of 1 %, and therefore slightly deeper breathing may be experienced. There are no exceedances are the lower explosive limit for CH_4 outside the lagoon boundary, as shown on **Figure A14-3**. With reference to **Figure A14-4**, the assessment criteria for H_2S is exceeded across the whole site.

With regard to Scenario 3, should the northern or eastern bunds fail either partially or completely, it is considered the modelling of Scenario 2 captures the reasonable 'worst-case' impacts of the emissions of gas on the Proposed Development as it is expected that the greatest effect would be experienced in the vicinity of Lagoon 3 itself when gas is released. In Scenario 3, digestate is predicted to run through the centre of the site through the location of the Farm Hub. This will cause significant odours across a wider area of the site in comparison to Scenario 2; however, in this event, the site will be immediately evacuated until remediation has occurred.

With the exception of human intervention, a major leak of gas from the lagoon could possibly arise as a result of extreme weather conditions, in which case, torrential rain and high winds would disperse emissions of gas efficiently. In addition to this, from the latest inspection of Lagoon 3 which occurred in September 2021, it was concluded the risk of failure of the containment system was 'very low'.

Sensitivity test

Scenario 1 – exit velocity 1 m/s

The results of the sensitivity test for Scenario 1 with an exit velocity of 1 m/s are presented in **Table 14-13**.

Table 14-13: Scenario 1 Sensitivity test with an exit velocity 1 m/s: Maximum predicted concentrations at each modelled receptor

Receptor ID	Maximum 15-minute concentration of CO_2 (%)	Maximum hourly mean concentration of CH_4 (%)	Maximum hourly mean concentration of H_2S - 0.5 % H2S concentration (µg m^{-3})
FR1	0.00143	0.00113	163
FR2	0.00068	0.00048	70
FR3	0.00038	0.00026	37
FR4	0.00044	0.00031	44
FR5	0.00018	0.00012	17
FR6	0.00020	0.00013	19
FR7	0.00021	0.00013	19
FR8	0.00018	0.00011	16
FR9	0.00015	0.00010	14
FR10	0.00025	0.00016	24
ER1	0.00026	0.00017	25
ER2	0.00026	0.00018	26
ER3	0.00015	0.00009	14
ER4	0.00014	0.00009	13
Assessment criteria	1.00	5.53	150

With reference to **Table 14-13**, in the event of a minor leak with an exit velocity of 1 m/s, the maximum 15-minute concentration of CO_2 is predicted to be 0.0014 % occurring at FR1, which still remains significantly below the lower assessment criteria of 1 %. The maximum hourly mean concentration of CH_4 is also predicted at FR1 with a concentration of 0.0011 %. Therefore, even with an exit velocity of 1 m/s which is considered highly unlikely, there is not considered to be a risk of asphyxiation from CO_2 or explosion from CH_4 in the event of a small puncture to the gas membrane.

With an exit velocity of 1 m/s and a 0.5 % concentration of H_2S within the lagoon, there is one exceedance of the allowable hourly mean concentration of 150 µg m^3 which was predicted to occur at FR1 with a maximum concentration of 163 µg.m^3. Exceedance of the criteria is only predicted to occur during three hours of meteorological conditions across the five years modelled which equates to 0.0068 % of conditions.

Contour plots are included in **Figures A14-5** to **A14-7** in **Appendix 14.5**. Transient receptors are not at risk of asphyxiation or explosion from CO_2 and CH_4 respectively as concentrations are well below the respective assessment criteria. Hourly mean concentrations of H_2S exceed the EAL of 150 µg m^3 in the south-west of the Proposed Development and in the farmland to the east of the Proposed Development, where farm workers may be present (as shown on **Figure A14-7**).

Additional H_2S Sensitivity Test

The results of the sensitivity test of alternative concentrations of H_2S within Lagoon 3 are presented in **Table 14-14**. The percentage of hours over which the exceedances of the H_2S EAL were predicted to occur are presented in **Table 14-15**.

Table 14-14: Sensitivity test: Maximum predicted hourly mean concentration of H_2S at each modelled receptor with H_2S concentrations of 0.1 and 3% by volume and varying exit velocities

Receptor ID	Maximum hourly mean concentration of H_2S (µg m^{-3})					
	Scenario 1				Scenario 2	
	Exit velocity - 0.1 m/s		Exit velocity - 1 m/s			
	3 % H_2S concentration	0.1 % H_2S concentration	3 % H_2S concentration	0.1 % H_2S concentration	3 % H_2S concentration	0.1 % H_2S concentration
FR1	85	2.8	977	33	245752	8192
FR2	37	1.2	419	14	105489	3516
FR3	19	0.6	221	7	55798	1860
FR4	23	0.8	265	9	66824	2227
FR5	9	0.3	101	3	25509	850
FR6	10	0.3	112	4	28333	944
FR7	10	0.3	117	4	29598	987
FR8	9	0.3	99	3	25021	834
FR9	7	0.2	83	3	21117	704
FR10	12	0.4	143	5	36101	1203
ER1	13	0.4	148	5	37447	1248
ER2	14	0.5	155	5	39301	1310
ER3	7	0.2	82	3	20836	695
ER4	7	0.2	75	3	19015	634
Assessment criteria	150					

Table 14-15: Sensitivity test: % of hourly meteorological conditions where an exceedance of 150 µg.m^{-3} occurs at a modelled receptor

Receptor ID	Percentage of hours between 2016 and 2020 which results in an exceedance of 150 µg m^{-3} (%)		
	Scenario 1 - exit velocity 1 m/s	Scenario 2	
	3 % by volume H_2S concentration	3 % by volume H_2S concentration	0.1 % by volume H_2S concentration
FR1	1.1	16	9
FR2	0.5	17	5
FR3	0.1	22	3
FR4	0.3	29	4
FR5	0	24	1
FR6	0	25	1
FR7	0	24	1
FR8	0	20	1
FR9	0	17	1
FR10	0	19	2

Receptor ID	Percentage of hours between 2016 and 2020 which results in an exceedance of 150 µg m^{-3} (%)		
	Scenario 1 - exit velocity 1 m/s	Scenario 2	
	3 % by volume H_2S concentration	3 % by volume H_2S concentration	0.1 % by volume H_2S concentration
ER1	0	22	2
ER2	1.3	8	1
ER3	0	13	1
ER4	0	22	1

For Scenario 1, there are no exceedances of the 150 µg.m^3 EAL, with the exception of a 3 % by volume H_2S concentration and an exit velocity of 1 m/s. In this scenario there are exceedances at four future receptor locations (FR1, FR2, FR3 and FR4) which are all located in the north-west of the Proposed Development which are representative of glamping, special event area and glass house/demonstration building, respectively. With reference to **Table 14-15**, the percentage of hours where exceedances of the assessment criterion are predicted is 1.1 %, 0.5 %, 0.1 % and 0.3 % for receptors FR1, FR2, FR3 and FR4 respectively. There is also a marginal exceedance at existing receptor ER2 with a concentration of 155 µg.m^3 which is representative of existing Rumbold's Farm located 0.79 km to the north-west of Lagoon 3.

Therefore, in the event of a minor leak of gas from Lagoon 3 (Scenario 1), even in the absolute 'worst-case' scenario (an exit velocity of 1 m/s and a 3 % by volume concentration of H_2S within the gas), exceedance of 150 µg.m^3 is only predicted to occur for approximately 1 % or less of hourly meteorological conditions at all receptors. The likelihood of a minor leak occurring during these conditions is therefore low.

For Scenario 2, both additional modelled concentrations of H_2S (3 % and 0.1 %) were predicted to cause exceedances of the EAL short-term assessment criterion of 150 µg.m^3 at all future and existing modelled receptor locations.

With a 0.1 % by volume concentration of H_2S within the gas, the highest exceedance occurs at FR1 with a concentration of 8.2 mg/m^3. Under these conditions, exceedance of 150 µg.m^3 is only predicted to occur for 8.8 % of meteorological conditions at FR1. With reference to **Table 14-4**, a concentration of this magnitude does not result in any health implications.

With a 3 % by volume concentration of H_2S within the Lagoon 3, the highest exceedance occurs at FR1 with a concentration of 246 mg/m^3. With reference to **Table 14-4**, a concentration of this magnitude causes loss of olfactory senses. The highest exceedance at an existing receptor is predicted at ER2 with a concentration of 39 mg/m^3 which is the threshold for eye irritation. It should be noted that concentrations of H_2S of this magnitude within the lagoon is highly unlikely and therefore provides a very worst-case.

Contour plots are included in **Figures A14-8** to **A14-13** in **Appendix 14.5**. Consistent with the results reported in **Table 14-4,** transient receptors are not at risk of elevated levels of H_2S in the event of Scenario 1 with an exit velocity of 0.1 m/s and concentrations by volume of 3 % or 0.1 % as well as with an exit velocity of 1 m/s and a concentration by volume of 0.1 %. With an exit velocity of 1 m/s and a concentration by volume of 3 %, transient receptors are predicted to be at risk of concentrations of H_2S in exceedance of 150 µg.m^3 across the whole of the western glamping area as well as in all directions from the lagoon outside of the Proposed Development. In the event of Scenario 2, the whole study area is predicted to experience levels of H_2S above the EAL, as shown on **Figures A14-12** and **A14-13**.

As mentioned above, the risk of failure of the containment system remains '*very low*'.

Workplace exposure limits

The WEL have been assessed to identify the potential risk from gas emitted from Lagoon 3 in the event of failure of the containment system on workers of the Proposed Development.

Figures A14-14 and **A14-15** in **Appendix 14.5** show that**,** in the event of Scenario 1, concentrations of CO_2 are well below the 15-minute WEL of 27,400 mg.m^{-3}, including in the sensitivity test. For H_2S, concentrations are below the 15-minute WEL of 14 mg.m^{-3} within the site boundary even in the absolute worst-case scenario of 3 % by volume concentration within the lagoon, as shown in **Figures A14-16** and **A14-17** in **Appendix 14.5**.

With reference to **Figure A14-18**, concentrations of CO_2 are well below the WEL in the event of a major leak (Scenario 2). Therefore, there is no risk of asphyxiation to workers of the proposed development.

Contour plots showing the WEL for H2S are included in **Figures A14-19** to **A14-21** in **Appendix 14.5**. In the event of Scenario 2 (and 3) with a concentration of 0.5 % by volume, which is considered a reasonably conservative concentration, the WEL for H_2S is exceeded across the west of the site including the western glamping area and the farmland adjacent to the south. With the absolute worst-case concentration of 3 % by volume, the WEL is exceeded across the entire site. However, with the lower range (0.1 % by volume), only the very south-westerly tip of the Proposed Development by the location of the now remediated Lagoon 2 pit and adjacent land is exceeded. In this scenario, due to the extremely limited area of the site exceeding the WEL, it can be determined the potential risk to workers of the site is very low. However, with a concentration of 0.5 or 3 % by volume of H_2S, there is a potential risk to workers.

Summary of Results

A summary of whether the assessment criteria are exceeded under the various modelled scenarios and sensitivity tests is provided in **Table 14-16**. It should be noted that, for those scenarios where exceedances are experienced, the exceedances may not occur at all receptors across the Proposed Development.

Table 14-16: Summary of exceedances of the assessment criteria in each modelled scenario (all receptors)

Pollutant	Concentration by volume within Lagoon 3 (%)	Scenario 1 – Minor Leak		Scenario 2 – Major Leak
		0.1 m/s exit velocity	1 m/s exit velocity	
CO_2	47	No	No	No
CH_4	50	No	No	No
H_2S	0.1	No	No	Yes
	0.5	No	Yes	Yes
	3	No	Yes	Yes

With reference to the table above, there is considered to be no risk to human health from CO_2 or of explosion from CH_4 in any of the assessed scenarios. As such, these impacts are not considered to be significant.

Based on the inspection reports on Lagoon 3, it is considered very unlikely that failure of the containment resulting in loss of gas or digestate will occur. However, should this occur, it is deemed the most likely failure scenario would be a small puncture to the gas membrane (Scenario 1). There is considered to be no risk to human health from H_2S under what is considered the most likely worst-case conditions (0.5 % by volume H_2S concentration and a 0.1 % exit velocity). However, even in the absolute worst-case, modelled in the

sensitivity test (3 % by volume H_2S concentration with an exit velocity of 1 m/s), the probability of a minor leak of gas occurring simultaneously with the low frequency of occurrence of the worst-case meteorological conditions, which results in an exceedance of the assessment criteria, is very low (<1.3 %). Therefore, there is not deemed to be a significant risk to human health in the event of a small puncture to the gas membrane.

In the unlikely event of a major leak of gas from the lagoon occurring in the worst-case event of a major failure of the gas membrane and/or bund (Scenario 2 and 3), there is an exceedance of the EAL for H_2S at all modelled receptors. However, with the most likely worst-case conditions (0.5 % by volume H_2S concentration), the maximum predicted concentration is indicated to cause eye irritation. With a 0.1 % by volume concentration of H_2S, the predicted concentrations do not exceed the threshold for impact on human health. However, with a 3 % by volume concentrations, there is predicted to be a threat of loss of olfactory senses from emissions of H_2S. It should be noted the likelihood of Scenarios 2 or 3 taking place is considered to be 'very low' based on the results of recent inspections (as discussed in **Section 14.2.4.2**). Nevertheless, in the event of a major failure of the gas membrane and/or the lagoon bund, effects on human health in relation to concentrations of H_2S may occur.

It is considered the odour threshold will be exceeded across the site in the unlikely event of Scenario 2 and 3; however, as it does not pose a risk to health it is not considered significant.

The WELs for CO_2 and H_2S are not exceeded in the event of a minor leak (Scenario 1) or from CO_2 in the event of a major leak (Scenario 2 and 3). However, there is a risk to workers from H_2S in the unlikely event of a major leak and/or bund failure.

14.2.5.5 Assumptions, Uncertainties & Limitations

There are inherent uncertainties associated with modelling as it is a mathematical approximation of 'real-world' plume behaviour.

The assessment is based on assumptions regarding content and composition of gases, pollutant concentrations, temperature and flow rates of gas emitted from Lagoon 3 for each modelled scenario. As such, a number of different assessment parameters were modelled to demonstrate the variability in results as a result of these input assumptions. The assessment approach was agreed with CDC as it was not possible to obtain real-world conditions.

The meteorological data required for the exercise was obtained from NWP data. This uses computer models to process monitored weather observations to forecast meteorological conditions at specified locations, therefore containing its own uncertainties.

Due to the lack of information on the lagoon contents, H_2S was assumed to be a marker of odour. In reality, there are likely to be other odorous chemicals present within the lagoon. However, as stated in **Section 14.2.5**, H_2S was considered to be the gas with the highest odour potential within the Lagoon, therefore this approach was considered to be robust.

14.2.5.6 Mitigation and Recommendations

The only mitigation measure to prevent the potential adverse effects that could arise on infrastructure and users of the Proposed Development, should there be emissions of gas to atmosphere, resulting from a failure of the surface liner, or a failure of the lagoon bund, would be to remediate Lagoon 3 and remove the source. However, Lagoon 3 sits outside the red line boundary of the Proposed Development site and is outside of the applicant's ownership. As such, it is not the applicant's responsibility to undertake the remediation works.

Measures can be put in place to limit the likelihood of exposure. These measures would only be temporary as they would only be in place until Lagoon 3 and its contents are removed in line with the enforcement notice. The recommended measures include:

- Continuous monitoring of CO_2, CH_4 and H_2S immediately to the north of Lagoon 3 within the site boundary to provide an early warning system to indicate possible failures of the containment system.
- Preparation of a response plan in the event of detection of pollutants which includes the person(s) responsible for the repair of the membrane and the potential evacuation of the site.

14.2.6 Summary

This Lagoon 3 Risk Assessment was prepared as part of a planning application for the Proposed Development at Crouchlands Farm, Plaistow. The assessment considered the potential risks to air quality, odour and associated public health that could arise from emissions to atmosphere from Lagoon 3, adjacent to the south-west of the Proposed Development.

The assessment concluded there is no significant impact from CO_2 (asphyxiation) or CH_4 (explosion) to future users of the site or existing receptors in the event of loss of gases and digestate from Lagoon 3.

There is potential for significant impact to human health from 3 % by volume concentrations of H_2S in the worst-case event of a major failure of the gas membrane and/or bund. However, the probability of major failure of the containment system coupled with a concentration of H_2S of this proportion is considered very low.

The assessment is based on a number of assumptions regarding content and composition of gases, pollutant concentrations, temperature and flow rates of gas emitted from the lagoon. A number of recommendations were made including deployment of continuous monitors to the north of Lagoon 3 to provide an early warning system of potential failure of the lagoon's liner and monitoring of the lagoon contents.

14.3 Lagoon 3 Risk Assessment - Land Quality

Lagoon 3 is located adjacent to the site and should a breach occur of its containment then the consequences to Land Quality and Hydrogeology receptors would include the following:

- The immediate release of gas created by the digestate which is presently encapsulated by a tarpaulin cover. A discussion regarding the potential impacts associated within the release of gas is provided in **Section 14.2**, and is not considered further within this Section.
- Overland spill of digestate onto the existing ground surface. The spill modelling for this event is provided in **Appendix 14.1**. In summary, digestate released from the failure of the northern or eastern bunds runs in a downward north-easterly direction towards the location of the Farm Hub. Whereas, in the event of failure of the western and southern bunds, digestate runs away from the Proposed Development to the southwest. The 'worst-case' scenarios for impacts on the Proposed Development are therefore failure of the northern or eastern bunds.
- On release of the digestate the Joint Incident Response Plan for Crouchland AD Plant would be put into action (Joint Incident Response Plan, 2019). If contact was made with sensitive receptors (general public / humans / livestock / surface waters) then a protocol should also be in place for this with clear direction on next steps and the action to be taken to assist the impacted receptor.

- The aquifer unit within the vicinity of the modelled spill projection is non-productive strata / a secondary aquifer, and could potentially be impacted by vertical migration of digestate. The multi-agency incident response plan indicates that the Environment Agency recognises that a pollution incident could pose a moderate to low risk due to the unsaturated zone which is likely to be present directly beneath the site. Vertical migration of digestate would need to be left in situ for a long period of time for downward migration to occur. The aquifer unit is described as having little hydrogeological significance although the strata may be locally extracted and it is noted that historically a well existed in the farmyard. The site is not located within an SPZ and there are no abstraction licences permitted by the Environment Agency within the general site area. There are no drift deposits present within the vicinity of the site with the Weald Clay being present near surface which by its nature would limit the downward migration to some extent of any digestate. If a failure of Lagoon 3 did occur, investigation into its contaminant plume would need to be laterally and vertically (although this is likely to be limited). The spill modelling indicates that the digestate would not penetrate far into the Clay deposit and that the general groundwater table which is slow to recharge would be at a depth unlikely to be impacted by contaminants.
- Watercourses are present downgradient of the likely digestate flow towards the east. The watercourses are at risk from a pollution incident. The Environment Agency identifies that the digestate would present a moderate to high risk to surface waters and an action plan to build dams is contained within the aforementioned multi agency response plan.
- Explore the potential, legal and technical feasibility for provision of an earth bund or formation to the north east of the farm yard to divert digestate from nearby watercourses. As pathways gravitate to natural flow routes and then to river network, the optimum place to put some form of bund to avoid pollution to watercourses is downstream.

15 Cumulative Impact Assessment

15.1 Introduction

In addition to the determination of the potential impacts from the Proposed Development in isolation, the EIA Regulations require that an assessment is made of the potential for cumulative impacts, which considers the impacts from the Proposed Development cumulatively with other proposed projects.

A useful ground rule in EIA is that the environmental impacts of any other development that is already built and operational is effectively included within the baseline conditions, so such effects are already taken account of in the EIA process and can be excluded from the CIA; however, projects that are in the planning process need to be considered. Any that are ahead of the development being assessed (i.e. likely to be submitted or receive consent before the development being assessed or are currently being built) must be taken into account during a CIA. Any that are substantially further back in the planning process and are unlikely to be submitted or get consent until after the development being assessed, can be disregarded because the developer of that project should be taking the effects of the current development into account in their own EIA.

The key aspects for consideration when undertaking CIA are:

- The temporal and geographic (spatial) boundaries of the effects of activities;
- Interactions between the activities and the environment;
- The environmental effects of the project (including future projects and activities); and,
- Thresholds of sensitivity of the existing environment.

CIA is limited to those plans and projects for which sufficient information exists to allow consideration of the potential for such an effect to arise. In the absence of such publicly available data, it is not possible to undertake a detailed cumulative assessment, but it is possible to make judgements on the likely potential impacts on the basis of the characteristics of the other projects being considered and whether there is the potential for the impacts of the various projects to interact spatially or temporally.

15.2 Assessment Methodology

This CIA has been undertaken using a three-stage phased approach described below:

- There is no defined methodology in the UK as to how cumulative impacts should be assessed. Therefore, in determining a suitable approach to this element of the assessment the following guidance has been taken into account Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999);
- Cumulative Effects Assessment Practitioners Guide (Canadian Environmental Assessment Agency 1999); and,
- Guidelines for Environmental Impact Assessment Practice in the UK (Institute of Environmental Management and Assessment 2011).

The first stage of the process was to agree with CDC a list of development plans and projects locally which might warrant consideration in a CIA. This “long list” of developments is presented in **Table 15-1.**

Table 15-1 Long list of projects for consideration of cumulative impacts

Proposed Project	Distance to Proposed Development	Description
20/02134/DOM Redlands Farm Rickmans Lane Plaistow RH14 0LD	0.36 km	Detached outbuilding, gym and office
21/01624/DOM Foxbridge Farm Foxbridge Lane Plaistow RH14 0LB	0.58km	Construction of swimming pool and erection of shed for pool equipment.
21/01080/DOM Foxbridge Farm Foxbridge Lane Plaistow RH14 0LB	0.58km	Internal works, alterations to partition walls and french doors to be replaced. Erection of new entrance porch. Extension to rear terrace area, landscaping improvements and vehicular access to the property with new crossover. External alterations to garage outbuilding and to replace windows like for like.
20/02165/DOM Pear Tree Cottage Rickmans Lane Plaistow Billingshurst West Sussex RH14 0NT	0.76km	Conversion of existing garage roof to home office/ancillary guest accommodation
20/01937/DOM Foxhanger Barn Foxbridge Lane Plaistow RH14 0LB	0.98km	Proposed orangery to north east elevation
20/02154/DOM May Cottage The Street Plaistow Billingshurst West Sussex RH14 0NS	1.14km	Addition of two single storey extensions and main roof modifications at the front and rear.
20/02200/DOM Byfield Plaistow Road Kirdford RH14 0JY	1.16km	Installation of domestic package treatment plant
20/00250/DOM 4 Nell Ball Plaistow RH14 0QB	1.47km	Double storey side extension, block up existing vehicle access and creation of a new vehicle access.
21/01439/DOM The Lodge Whithurst Plaistow Road Kirdford Billingshurst West Sussex RH14 0JW	1.55km	Proposed side and rear extensions to existing 2 storey single family dwelling with detached garage.
21/00396/DOM Oakburn Plaistow Road Ifold Loxwood RH14 0TY	1.58km	Side extension to existing bungalow and conversion into a chalet bungalow style house, works include raising the ridge height of the bungalow and insertion of dormers to the front and rear elevations, erection of front and west side porches.
20/00663/DOM The Burrows Plaistow Road Ifold Loxwood RH14 0TU	1.60km	Demolition of the existing conservatory and erection of replacement single storey extension
20/03380/DOM El Tambo 7 Ifoldhurst Ifold Loxwood RH14 0TX	1.62km	Single storey side extension. Removal of chimney stack. Replacement of existing windows and doors.
20/00724/DOM Waldron Chalk Road Ifold Loxwood RH14 0UA	1.70km	Single storey rear extension and new attached garage to front.
20/02891/DOM Mariposa The Ride Ifold Loxwood Billingshurst West Sussex RH14 0TF	1.81km	Removal of existing timber shed and the construction of a garden office in south-east corner of the plot.

Proposed Project	Distance to Proposed Development	Description
20/02535/DOM Thane The Drive Ifold Loxwood RH14 0TB	1.86km	Single storey extensions to rear and both sides of property. Loft conversion works incorporating raising of existing eaves and ridge. New detached garage.
21/01557/DOM Peacocks Plaistow Road Loxwood RH14 0TS	1.87km	Construction of new 3 bay garage with home office/study above.
21/01871/FUL Foxley, Poundfield Lane, Ifold, Loxwood RH14 0NZ	1.90km	Single dwelling with ground floor annex
20/00734/DOM Howick Farm Scratching Lane Kirdford Petworth West Sussex GU28 9JY	1.90km	External alterations and extension to existing domestic annexe and storage building.
20/02552/DOM Hillside The Drive Ifold Loxwood RH14 0TE	1.93km	New front porches. Single storey rear extension. Insertion of 2 no. front dormers and 2 no. rear dormers to facilitate conversion of part of the loft space to habitable room.
20/02614/DOM Howick Farm Scratching Lane Kirdford Petworth West Sussex GU28 9JY	1.96km	Proposed porch on side elevation.
20/02274/DOM Longmeadow House 3 Oakdene Place Ifold Loxwood RH14 0BA	2.37km	Single storey orangery extension to rear.
20/00846/DOM Siskins 19 The Drive Ifold Loxwood Billingshurst West Sussex RH14 0TE	2.03km	Erection of single storey front and side extensions and detached double garage following demolition of existing single garage, boundary wall and outbuilding. Erection of 1800 high close boarded boundary fence.
21/00516/FUL Woodpeckers Chalk Road Ifold Loxwood Billingshurst West Sussex RH14 0UE	2.11km	Proposed detached chalet bungalow with associated landscaping, bin stores and cycle store.
20/00316/DOM Nanridge The Drive Ifold Loxwood RH14 0TD	2.15km	Single storey side extension and single storey front porch.
21/00959/PLD Staples Hill Cottage Staples Hill Kirdford RH14 0JL	2.22km	Erection of detached car port, work shop and store building ancillary to the house
21/00469/DOM Willow Cottage The Drive Ifold Loxwood RH14 0TE	2.25km	Proposed double garage
21/01807/FUL Belchambers Farm Staples Hill To Plaistow Road Kirdford RH14 0NL	2.26km	Construction of a replacement ancillary storage barn following the demolition of an existing storage barn.
20/01079/DOM Forest Lodge Shillinglee Road Plaistow RH14 0PQ	2.32km	Two storey rear extension and single storey porch.

Proposed Project	Distance to Proposed Development	Description
20/02025/DOM Springhill Nursery The Lane Ifold Loxwood RH14 0UL	2.35km	Erection of single storey rear extension.
20/00603/DOM Evergreen 1A Loxmeadow Close Ifold Loxwood RH14 0RL	2.37km	Single storey extension to the rear of the property.
20/02074/FUL Orchard House Stables Kirdford Billingshurst West Sussex RH14 0NJ	2.38km	Equestrian sand school.
21/01750/FUL Three Oaks Farm The Lane Ifold Loxwood RH14 0UH	2.42km	Demolition and replacement single storey dwelling with associated landscaping and driveway.
21/01355/FUL Land On The East Side Of Plaistow Road Plaistow Road Kirdford West Sussex	2.43km	Erection of 54 no. residential dwellings, associated access roads, car parking, landscaping and public open space all with unrestricted phasing. Application under Section 73 for minor material amendments to planning permission KD/19/00086/FUL to vary Condition 2 (approved plans) to enable various changes to decided plans in respect of layout, elevational treatment and car parking arrangements.
21/00858/FUL Land Adjacent To Waters Edge The Drive Ifold Loxwood West Sussex RH14 0TD	2.44km	Erection of detached chalet bungalow with detached garage and new access with boundary fence. Renewal of application PS/18/00508/FUL.
20/01162/FUL Land South East Of Oakview The Lane Ifold West Sussex	2.46km	Erection of Equestrian stabling barn.
20/01472/DOM Ash Park Shillinglee Road Plaistow RH14 0PQ	2.68km	Construction of two new maintenance and vehicle storage buildings.
21/02352/DOM 7 Townfield Kirdford RH14 0NE	2.81km	Erection of a single storey rear/side extension.
21/02426/FUL Sports Pavilion Plaistow Road Loxwood RH14 0SX	2.85km	Overflow carpark.
21/00918/FUL. Cranbrook Stud Skiff Lane Loxwood Billingshurst West Sussex RH14 0AG	2.93km	Demolition of equestrian barn and lean-to stables. Construction of covered sand school and stables.
20/00389/FUL Lower Barn (Near Chandlers Barn) Skiff Lane Wisborough Green Billingshurst West Sussex RH14 0AA	2.98km	Demolition of Lower Barn and construction of 1 no. dwelling as alternative to Class Q Prior Approval (KD/19/00484/PA3Q).
21/00918/FUL Cranbrook Stud Skiff Lane Loxwood Billingshurst West Sussex RH14 0AG	3.00km	Demolition of equestrian barn and lean-to stables. Construction of covered sand school and stables.
20/00723/FUL Boxall Stud Village Road Kirdford Billingshurst West Sussex RH14 0NN	3.19km	Change of use of 2 no. existing buildings from equestrian use to agricultural use.
20/00072/FUL Walcot Guildford Road Loxwood RH14 0SB	3.28km	Demolition of existing bungalow and construction of 2 no. semi-detached two storey dwellings.

Proposed Project	Distance to Proposed Development	Description
20/01997/FUL Land East Of Lady Lea House Brewhurst Lane Loxwood West Sussex	3.31km	Demolition of existing B8 unit. Erection of new B8 Storage and distribution unit.
20/00581/FUL Hoveto Dunsfold Road Plaistow Billingshurst West Sussex RH14 0PW	3.34km	Demolition of existing dwelling and proposed replacement dwelling with 3 bay carport.
20/01481/FUL Land South West Of Guildford Road Loxwood West Sussex	3.41km	Demolition of existing dwelling and the erection of 50 dwellings to include 35 private units and 15 affordable units, creation of proposed vehicular access, internal roads and footpaths, car parking, sustainable drainage system, open space with associated landscaping and amenity space (resubmission of planning application reference LX/19/01240/FUL).
SDNP/19/06079/FUL Dales Farm Pipers Lane Northchapel Petworth West Sussex GU28 9LA	3.51km	Change of use of agricultural land to camping site to include 4 no. shepherd's huts for holiday accommodation.
20/00811/FUL Birchlands Glasshouse Lane Kirdford Billingshurst West Sussex RH14 0LW	3.71km	Demolition of an existing building with lawful use as a dwelling, and the erection of a replacement dwelling.
21/00788/FUL Woolspinners, Guildford Road, Loxwood RH14 0SA	3.9km	Proposed 2 no. 3-bed detached dwellings and 2 no. 3-bed semi-detached dwellings, access, landscaping and associated works.
21/01303/DOM North Pound Cottage Shillinglee Road Shillinglee Chiddingfold Godalming Surrey GU8 4SZ	4.75km	Erection of detached annexe building.
WA/2020/1116 Maple Tree Cottage, Plaistow Road, Dunsfold GU8 4PF	5.06km	Erection of two storey outbuilding
21/00889/FUL Home Farm House Shillinglee Road Shillinglee Northchapel GU8 4SY	5.24km	Replacement of existing 1 no. stables, 2 no. storage structures and a storage container with 1 no. American barn.
20/01078/FUL Muttons Cottage Fittleworth Road Wisborough Green RH14 0ER	5.43km	Change use of part of existing agricultural building to 1 no. two-bed residential unit in half of the building with workshop and ancillary office in the other half for an integrated Live Work Unit.
21/02164/FUL Goslings Newpound Wisborough Green RH14 0AT	5.68km	Replacement dwelling, retention of existing dwelling to provide ancillary home office, retention of workshop and removal of 2 no. mobile homes, 2 no. sheds and lean to
SDNP/19/04441/FUL Lower Diddlesfold Farm Diddlesfold Lane Northchapel West Sussex	5.88km	Demolition of existing 2 no. dwellings and garages and erection of a 1 no. dwelling with associated out building and 1 no. agricultural tied dwelling with associated access and landscaping.
20/02773/FUL Copse Cottage Harsfold Lane Wisborough Green RH14 0BD	5.92km	Erection of an ancillary building to provide a home office and storage.
SDNP/20/05811/FUL Westview London Road Northchapel GU28 9HL	5.97km	Proposed 2 storey extension to enable existing 1 no. dwelling house to be split into 2 no. dwellings.

Proposed Project	Distance to Proposed Development	Description
SDNP/19/04244/FUL 4 Cylinders Cottages Fisher Street Northchapel GU28 9EL	6.46km	Two bay extension to existing carport.
WA/2020/0971 The Long House,The Common, Dunsfold GU8 4LE	6.57km	Erection of extensions and alterations following partial demolition of existing dwelling (revision of wa/2019/1901).
WA/2021/01638 Wheelwrights The Common, Dunsfold, Godalming GU8 4LL	6.83km	Erection of outbuilding following demolition of existing outbuilding.
DC/20/1284 Hole Farm Lordings Road Newbridge Billingshurst West Sussex RH14 9JA	7.00km	Conversion of existing ancillary barn to a 2 bedroom dwelling with associated alterations. Replacement of existing garage with a 2 bay garage and home office.
*This is desk-based research, accurate at 14 December 2021. The stage at which the projects listed above are currently at may not be accurate as no site visit has been conducted. A detailed search has been undertaken for an area up to 2km from the site, but a more refined search has been conducted (not including householder applications).		

The second stage of the process was to identify which of these projects (**Table 15-1**) should be carried forward to the next stage of assessment. This selection process followed the relevant guidance documents as listed above and included plans and projects entered into the planning system and those future projects considered reasonably foreseeable where full data sets are available that have been fully analysed and interpreted.

When seeking to establish those projects which merit further consideration in an assessment of cumulative effects, the following questions were asked:

- Do the projects that appear in the long list benefit from planning permission/any other form of consent?
- Has a planning application been submitted, and is there any readily available/accessible environmental information/data sets specific to each project contained in the long list?
- When considering the nature of the projects is there a reasonable prospect that any of the projects on the long list are likely to be constructed in a similar timeframe to the Proposed Development? And,
- Are the projects located within a reasonable spatial extent (in this case 3.5km) such that cumulative environmental effects might be likely?

Projects and plans were removed from the long list based on the answers to the questions above, with those answering “no” removed. The resulting “short list” is presented in **Table 15-2**.

Table 15-2 Screening Assessment undertake to identify the scope of the CIA

Proposed Project	Development Summary	Screening Assessment
21/01355/FUL Land On The East Side Of Plaistow Road, Plaistow Road Kirdford, West Sussex.	Erection of 54 no. residential dwellings, associated access roads, car parking, landscaping and public open space.	Provision of 54 dwellings on site 2.4km from the site could have potential cumulative environmental impacts.
20/01481/FUL Land South West Of Guildford Road, Loxwood, West Sussex.	Demolition of existing dwelling and the erection of 50 dwellings to include 35 private units and 15 affordable units	Provision of 50 dwellings on site 2.4km from the site could have potential cumulative environmental impacts.

Stage three of the process comprises an assessment of the likelihood of potentially significant environmental impacts occurring cumulatively with those identified in this EIA Report, on a topic-by-topic basis.

15.3 Assessment of Cumulative Impacts

Table 15-3 details the likelihood of potentially significant environmental impacts occurring cumulatively with those identified in this EIA Report during construction and operation phase of the Proposed Development.

Table 15-3 Cumulative Impact Assessment

Chapter No.	Topic	Construction	Operation
21/01355/FUL Land On The East Side Of Plaistow Road			
7	Land Quality and Hydrogeology	Due to the distance of the Proposed Development to this project, no cumulative Land Quality and Hydrogeology impacts are considered to be not significant.	
8	Transport and Access	Construction details and programme are unknown, but no significant cumulative impacts are predicted due to the distance between the two application sites.	This application for residential dwellings on land east of Plaistow Road could affect traffic flows on link 6. The Transport Statement submitted to support CDC planning application 19/00086/FUL has been reviewed to establish the predicted increase in vehicle movements on Plaistow Road, which is the only link considered in the Transport Statement (there is no information provided on subsequent assignment of vehicles across the wider road network). Appendix 4 of the Transport Statement confirms a daily trip rate of 4.723, and therefore application of this to 54 dwellings results in 255 additional daily vehicles on Plaistow Road. No HGV trip rate is provided. The increase in total vehicles has been accounted for in Chapter 8, Transport and Access, therefore no further cumulative impacts are anticipated.
9	Air Quality	Due to the distance between the application sites, cumulative impacts during construction are considered to be not significant.	As stated in Section 9.7.1.1, the air quality impact on human health and designated ecological sites is considered to be not significant, which includes the consideration of cumulative impacts with this application.
10	Noise and Vibration	Due to the distance of the Proposed Development to this project, no cumulative Noise and Vibration impacts are considered to be likely.	
11	Nature Conservation and Biodiversity	As this application, as well as the Crouchlands Farm application include sufficient areas of open space, the Proposed Development is not proposing an increase in residential capacity and the distance between the application sites, cumulative impacts on Nature Conservation and Biodiversity are considered to be not significant.	
12	Landscape and Visual Setting	Due to the distance of the Proposed Development to this project, no cumulative Landscape and Visual impacts are considered to be likely.	
13	Cultural Heritage and Archaeology	Due to the distance of the Proposed Development to this project, no cumulative Cultural Heritage and Archaeology impacts are considered to be likely.	
14	Human Health	No cumulative assessment required.	
20/01481/FUL Land South West Of Guildford Road			
7	Land Quality and Hydrogeology	Due to the distance of the Proposed Development to this project, no cumulative Land Quality and Hydrogeology impacts are considered to be likely.	

Chapter No.	Topic	Construction	Operation
8	Transport and Access	Construction details and programme are unknown, but no significant cumulative impacts are predicted as no additional traffic flows considered to be likely on the roads within the study area for the Proposed Development	The Transport Statement submitted to inform the application confirms that no significant impact would be generated on the links in the traffic and transport study area for this EIA.
9	Air Quality	Due to the distance between the application sites, cumulative impacts during construction are considered to be not significant.	As stated in Section 9.7.1.1, the air quality impact on human health and designated ecological sites is considered to be not significant, which includes the consideration of cumulative impacts with this application.
10	Noise and Vibration	Due to the distance of the Proposed Development to this project, no cumulative Noise and Vibration impacts are considered to be likely.	
11	Nature Conservation and Biodiversity	As this application, as well as the Crouchlands Farm application include sufficient areas of open space, the Proposed Development is not proposing an increase in residential capacity and the distance between the application sites, cumulative impacts on Nature Conservation and Biodiversity are considered to be not significant.	
12	Landscape and Visual Setting	Due to the distance of the Proposed Development to this project, no cumulative Landscape and Visual impacts are considered to be likely.	
13	Cultural Heritage and Archaeology	Due to the distance of the Proposed Development to this project, no cumulative Cultural Heritage and Archaeology impacts are considered to be likely.	
14	Human Health	No cumulative assessment required.	

16 Summary of Potential Impacts and Mitigation Measures

16.1 Introduction

Table 16-1 and **Table 16-2** provide an overall summary of the findings of the ES for the receptors where further assessment work has been undertaken, including:

- Land quality and hydrogeology;
- Transport and access;
- Air quality;
- Noise and vibration;
- Nature conservation and biodiversity;
- Landscape and visual setting; and,
- Cultural heritage and archaeology.

Table 16-1 and **Table 16-2** list the potential environmental impacts that are predicted to arise during the construction and operational phases of the Proposed Development, respectively. The significance of each of the potential impacts is stated, along with any mitigation measures that are recommended to avoid or reduce adverse impacts. The residual impact (i.e. the significance of the potential impact remaining following mitigation) is also stated.

Table 16-1 Summary of the significance of potential environmental impacts, mitigation and residual impacts during the construction phase of the Proposed Development

Potential Impact	Significance	Mitigation	Residual Impact
Land Quality and Hydrogeology			
Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Human health: moderate adverse Construction workers from ground gas: major adverse	Targeted ground investigation, development and adherence to a CoCP, use of appropriate PPE	Human health: negligible Construction workers from ground gas: minor adverse
Direct impacts on groundwater quality and groundwater resources	Minor adverse	(see Section 7.6.1.4 for further details)	Negligible
Impacts on surface water quality and the ecological habitats they support from contamination	Minor adverse	Same as above, plus specific measures for storage of fuels, oils, lubricants, waste water and other chemicals	Negligible
Sterilisation of Future Mineral Resources	Minor adverse	Same as above, plus collecting perched water within Made Ground or groundwater from dewatering activities, storage and treatment (as required)	Minor adverse
Built environment	Minor adverse	None proposed	Negligible adverse
Property	Minor adverse	Pre-construction site characterisation works, and remediation works if required	Minor adverse
Transport and Access			

Potential Impact	Significance	Mitigation	Residual Impact
Impacts less than operational phase			
Air Quality			
Dust and Particulate Matter Emissions	N/A*	Mitigation measures as recommended by the IAQM (2016), see Section 9.6.1.2.	Not significant
Noise and Vibration			
No assessment of construction noise carried out		Best practice mitigation recommended	N/A
Nature Conservation and Biodiversity			
Designated Site (Dust Impacts on LWS)	Negligible to moderate adverse	Dust control	Negligible
Loss of hedgerow habitat and potential damage/ degradation to woodland	Moderate adverse	Compensatory habitat creation, adoption of buffer zones and additional habitat creation	Hedgerow: moderate beneficial Woodland: negligible
Badgers	Moderate adverse	Covering of excavations at night	Negligible
Bats	Minor adverse	Compensatory habitat creation, additional habitat creation and installation of bat boxes	Minor beneficial
Breeding bird	Moderate adverse	Vegetation clearance undertaken outside of nesting season, installation of bird boxes	Negligible to minor beneficial
Common dormouse	Negligible	None proposed	Negligible
Great Crested Newt	Moderate adverse	EPS Licence, implementation of GCN mitigation strategy and habitat creation	Moderate beneficial
Invertebrate	Negligible	Habitat creation	Moderate beneficial
Reptiles	Negligible	None proposed	Negligible
Other Notable Species	Hedgehog habitat: negligible Killing/injury of hedgehogs: moderate adverse	Covering of excavations at night	Negligible
Invasive/Non-Native Species	Moderate adverse	Eradication programme	Moderate beneficial
Landscape and Visual Setting			
Landscape effects	Major Adverse at three receptors Moderate Adverse at two receptors Minor Adverse at one receptor	Implementation of a CEMP.	Impacts are temporary in nature and limited to construction.
Visual effects	Major adverse at three viewpoints	Implementation of a CEMP.	Impacts are temporary in nature and limited to construction.

Potential Impact	Significance	Mitigation	Residual Impact
Lighting – Sky Glow	Minor to Moderate Adverse	Good lighting design	Minor to Moderate Adverse
Lighting – Light Intrusion	Minor to Moderate Adverse	Good lighting design	Minor Adverse
Lighting – Luminaire Intensity	Minor to Moderate Adverse	Good lighting design	Minor Adverse
Cultural Heritage and Archaeology			
Conservation Area	N/A	Production and implementation of a Construction Management Plan (CMP), Construction Transport Plan, Construction Noise Management Plan and site investigation prior to commencement of construction work	Not significantly adverse
Listed Buildings			
Archaeology			
***Assessment methodology does not assign significance before mitigation**			

Table 16-2 Summary of the significance of potential environmental impacts, mitigation and residual impacts during the operational phase of the Proposed Development

Potential Impact	Significance	Mitigation	Residual Impact
Land Quality and Hydrogeology			
Exposure of workforce, landowners, land users and neighbouring land users to contaminated soils and groundwater and associated health impacts	Direct contact: moderate adverse Ground gas migration: major adverse	If required, remedial works and provision of any ground excavation information to maintenance workers to allow for the production and implementation of task specific risk assessments and method statements	Minor adverse
Impact on controlled waters (groundwater and surface waters)	Minor adverse	Safe methods of working, storage of liquids (fuels, oil lubricants and other chemicals) in an impermeable bund, availability of spill kits at all times, and development of ERP	Minor adverse
Sterilisation of future mineral resources	Minor adverse	None proposed	Minor adverse
Built environment	Moderate adverse	Ground investigation and gas protection measures in buildings, if required. Clean or lined service corridors for utilities. Use of materials suitable for ground conditions identified	Minor adverse
Property	Minor adverse	If required, remedial works and provision of any ground excavation information to workers to allow for the production and implementation of task specific risk assessments and method statements	Minor adverse
Transport and Access			
Severance	Links 2 and 6: Negligible	None proposed	Links 2 and 6: Negligible
Amenity			

Potential Impact	Significance	Mitigation	Residual Impact
Highway Safety Driver Delay	Links 1, 3-5 and 7: Minor		Links 1, 3-5 and 7: Minor
Air Quality			
Road Traffic Emissions	Human receptors: negligible Ecological receptors: negligible	No additional mitigation measures required (embedded mitigation as part of the Proposed Development will also minimise emission)	Negligible
Odour Emissions	Negligible	None proposed	Negligible
Noise and Vibration			
Onsite Vehicle Movements – 'Typical' Operational Scenario – Existing NSR's	Major adverse at NSR5, negligible to minor adverse at all other receptors	Operational noise mitigation provided in **Section 10.7.4** Access road adjacent to NSR5 to be resurfaced	Not significant (with additional context provided in Section 10.7.2)
Onsite Vehicle Movements – 'Typical' Operational Scenario – Proposed NSR's	Negligible	Operational noise mitigation provided in **Section 10.7.4**	Not significant
Onsite Vehicle Movements – 'Typical' Operational Scenario – Cumulative Noise Assessment	Minor adverse	Operational noise mitigation provided in **Section 10.7.4**	Not significant
Onsite Vehicle Movements – 'Worst-case' Operational Scenario – Existing NSR's	Major adverse at NSR4 and NSR5, negligible to minor adverse at all other receptors	Operational noise mitigation provided in **Section 10.7.4** Access road adjacent to NSR5 to be resurfaced	Not significant (with additional context provided in Section 10.7.3)
Onsite Vehicle Movements – 'Worst-case' Operational Scenario – Proposed NSR's	Negligible	Operational noise mitigation provided in **Section 10.7.4**	Not significant
Onsite Vehicle Movements – 'Worst-case' Operational Scenario – Cumulative Noise Assessment	Major adverse at NSR5, and minor adverse at all other receptors	Operational noise mitigation provided in **Section 10.7.4**	Not significant
Nature Conservation and Biodiversity			
Designated Sites	Light-spillage on important assemblages of roosting/ foraging/ commuting bats: moderate to major adverse Increased human activity on LWS: moderate adverse	Adoption of a sensitive lighting strategy Woodland management and adoption of a visitor management plan	Negligible
Habitats	Moderate adverse	Woodland management and adoption of a visitor management plan. Buffer zone planting	Negligible

Potential Impact	Significance	Mitigation	Residual Impact
Badgers	Negligible	None proposed	Negligible
Bats	Moderate to major adverse	Adoption of a sensitive lighting strategy	Negligible
Breeding bird	Negligible	None proposed	Negligible
Common dormouse	Negligible	None proposed	Negligible
Great Crested Newt	Significant at site level	Appropriate signage, pathways, litter bins and fencing of new ponds. Habitat management	Minor beneficial
Invertebrate	Significant at site level	Sensitive lighting scheme. Appropriate signage and pathway provision. Habitat management	Minor beneficial
Reptiles	Negligible	None proposed	Negligible
Other Notable Species	Negligible	None proposed	Negligible
Invasive/Non-Native Species	Moderate adverse	Native planting scheme. Monitoring by an ecologist	Negligible
Water neutrality	Major adverse	Water usage reduction measures and rainwater harvesting	Negligible
Landscape and Visual Setting			
Landscape effects	Major Adverse at one receptor at Completion Year (1 Year) Moderate Adverse at one receptor at Completion Year (1 Year)	Landscape mitigation presented in Section 12.6.1.1	Insignificant after 15 Years
Visual effects	Major Adverse at one receptor at Completion Year (1 Year) Moderate Adverse at three receptor at Completion Year (1 Year)	Visual mitigation presented in Section 12.6.1.1	Insignificant after 15 Years
Lighting – Sky Glow	Minor to Moderate adverse	Good lighting design	Minor to Moderate adverse
Lighting – Light Intrusion	Minor to Moderate adverse	Good lighting design	Minor to Moderate adverse
Lighting – Luminaire Intensity	Minor to Moderate adverse	Good lighting design	Minor to Moderate adverse
Cultural Heritage and Archaeology			
Conservation Area	N/A	Sensitivity of proposed buildings to local vernacular, controlled opening hours, controlled release of odours, sensitive lighting scheme and Events Traffic Management Plan	Not significantly adverse

Potential Impact	Significance	Mitigation	Residual Impact
Human Health			
Risks to air quality, odour and associated public health from loss of gases and digestate from Lagoon 3	No significant impact from CO_2 or CH_4 to future users of the site or existing receptors. There is potential for impact to human health from 3% volume concentrations of H_2S in the worst-case event of a major failure of the gas membrane or bund. However, the probability of major failure of the containment system coupled with a concentration of H_2S of this proportion is considered very low.		

17 References

Amion Consulting. (2022). Amion Consulting, Artemis Land and Agriculture, Crouchlands Farm, Economic Impact and Social Value Assessment Report, February 2022.

Atkins. (2008). Crouchland AD Lagoon: Report on a Visit to Crouchland AD Lagoon. September 2018.

Bayle. S., Cadiere. A., Cariou. S., Despres. J., Fages. M., Roig. B., Sellier. A., Fanlo. J. and Chaignaud. M (2018) Odour measurements at Different Methanisation Sites. Chemical Engineering Transactions, 68, pp.79-84.

Biggs. J., Ewald. N., Valentini. A., Gaboriaud. C., Griffiths. R.A., Foster. J., Wilkinson. J., Arnett. A., Williams. P. and Dunn. F. (2014). Analytical and Methodological Development for Improved Surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.

Bright, B., Morris, P., Mitchell-Jones, A.J. and Mitchell-Jones, T. (1997) The Dormouse Conservation Handbook. May 1997. English Nature.

British Geological Survey (n.d.) Geoindex online viewer. [Online] Available at: https://www.bgs.ac.uk/geoindex/.

British Research Establishment. (2005). Special Digest 1: Concrete in Aggressive Ground. June 2005.

BSI Standards Publication. (1991). British Standard 7445-2: 1991, Description and Measurement of Environmental Noise – Part 2: Guide to the Acquisition of Data Pertinent to Land Use. June 1991.

BSI Standards Publication. (2014). British Standard 5228: 2009 +A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise, Part 2 Vibration. February 2014.

BSI Standards Publication. (2014). British Standard 8233: 2014, Guidance on Sound Insulation and Noise Reduction for Buildings. February 2014.

BSI Standards Publication. (2019). British Standard 4142: 2014 +A1:2019, Methods for Rating and Assessing Industrial and Commercial Sound. June 2019.

Canadian Environmental Assessment Agency (1999). Cumulative Effects Assessment Practitioners Guide. February 1999.

Chichester District Council. (2013). Plaistow Conservation Area Character Appraisal and Management Proposal. May 2013.

Chichester District Council. (2015). Adopted Chichester Local Plan: Key Policies 2014-2029. June 2015.

Chichester District Council. (2020). Air Quality Annual Status Report. June 2020.

Chartered Institute of Ecology and Environmental Management. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management. September 2018.

Collins, J.(ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines. 2016. The Bat Conservation Trust.

Contaminated Land: Applications in Real Environments. (2011). The Definition of Waste: Development Industry Code of Practice. March 2011.

Department for Education & Education Funding Agency. (2015). Acoustic design of schools: performance standards (Building bulletin 93). December 2014.

Department for Environment, Food and Rural Affairs. (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007.

Department for Environment, Food and Rural Affairs. (2010). Noise Policy Statement for England. March 2010.

Department for Environment, Food and Rural Affairs. (2012). Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance. April 2012.

Department for Environment Food and Rural Affairs. (2018). Local Air Quality Management Technical Guidance TG(16). 2018.

Department for Environment, Food and Rural Affairs. (2019). Clean Air Strategy 2019. January 2019.

Department for Environment, Food and Rural Affairs. (2020). Background Mapping Data for Local Authorities. 2020.

Department for Environment, Food and Rural Affairs. (2021). Anaerobic Digestion. [Online] Available at: https://www.gov.uk/government/statistics/area-of-crops-grown-for-bioenergy-in-england-and-the-uk-2008-2020/section-3-anaerobic-digestion.

Department for Levelling Up, Housing and Communities. (2021). National Planning Policy Framework. July 2021.

Department for Transport. (2006). Explanatory Memorandum to the UK Non Road Mobile Machinery (Emissions of Gaseous & Particulate Pollutants) (Amendment) Regulations. 2006.

Department of Communities and Local Government. (2006). Minerals Policy Statement 1: Planning and Minerals. November 2006.

Department of the Environment. (1997). The UK National Air Quality Strategy. February 1997.

Department of the Environment, Transport & the Regions. (2000). UK Air Quality Strategy. January 2000.

Department of the Environment, Transport & the Regions. (2003). UK Air Quality Strategy-Addendum. February 2003.

Department of the Environment. (1974). The Control of Pollution Act. July 1974.

Department of Transport (Welsh Office). (1988). Calculation of Road Traffic Noise. June 1988.

English Nature. (2001). Great Crested Newt Mitigation Guidelines. August 2001.

Environment Agency. (2007). Pollution Prevention Guidelines PPG5: Works and Maintenance in or near Water. October 2007.

Environment Agency. (2008). Integration of Air Quality Modelling and Monitoring Methods: Review and Applications. May 2008.

Environment Agency. (2010). Guiding Principles for Land Contamination GPLC1. March 2010.

Environment Agency. (2010). FAQs, Technical Information, Detailed Advice and References GPLC2. March 2010.

Environment Agency. (2010). Reporting Checklist GPLC3. March 2010.

Environment Agency. (2012). Pollution Prevention Guidelines PPG6: Working at Construction and Demolition Sites. April 2012.

Environment Agency. (2013). Pollution Prevention Guidelines PPG1: Understanding your Environmental Responsibilities - Good Environmental Practice. July 2013.

Environment Agency. (2017). Pollution Prevention Guidelines PPG8: Safe Storage and Disposal of Used Oils. July 2017.

Environment Agency. (2019). Joint Incident Response Plan for Crouchland AD Plant Lagoon Three, Sussex. October 2019.

Environment Agency. (2021). Land Contamination Risk Management. April 2021.

Environment Agency. (2021). Pollution Prevention Guidelines PPG21: Pollution Incident Response Planning. June 2021.

Environmental Protection Agency. (2015). Anaerobic Digestion and its Applications. October 2015.

European Commission. (1999). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. May 1999.

European Committee for Standardisation. (2009). EN590:2004 Automotive fuels - Diesel - Requirements and Test Methods. April 2009.

European Parliament. (1996). Council Directive 96/62/EC of 27 September 1996 on Ambient Air Quality Assessment and Management. September 1996.

European Parliament. (2008). 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. May 2008.

FSIS Environmental Safety and Health Group. (n.d.). Carbon Dioxide Health Hazard Information Sheet. [Online] Available at: https://www.fsis.usda.gov/sites/default/files/media_file/2020-08/Carbon-Dioxide.pdf.

Hankinson Duckett Associates. 2011. Chichester District Landscape Capacity Study Extension. August 2011.

Health and Safety Executive. (1974). Health and Safety at Work Act. July 1974.

Health and Safety Executive (2002). Control of Substances Hazardous to Health. 2002.

Health and Safety Executive. (2011). Assessment of the Major Hazards Potential of Carbon Dioxide (CO_2). June 2011.

Health and Safety Executive. (2015). Construction Design and Management (CDM) Regulations. April 2015.

Her Majesty's Stationary Office. (2000). Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations. March 2000.

Her Majesty's Stationary Office. (2002). Statutory Instrument 2002 No. 3043, The Air Quality (England) (Amendment) Regulations. December 2002.

Her Majesty's Stationary Office. (2010). Statutory Instrument 2010 No. 1001, Air Quality Standards (England) Regulations. March 2010.

Highways England. (2019). LA 105 Air quality. November 2019.

Highways England. (2020). Design Manual for Roads and Bridges: LA 111 Noise and Vibration Revision 2. May 2020.

HM Government. (1981). Wildlife and Countryside Act. October 1981.

HM Government. (1990). Planning (Listed Buildings and Conservations Areas) Act. May 1990.

HM Government. (1991). Water Resources Act. July 1991.

HM Government. (1995). Environment Act. July 1995.

HM Government. (2004). The Planning and Compulsory Purchase Act. May 2004.

HM Government. (2005). Office Of The Deputy Prime Minister Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System. August 2005.

HM Government. (2015). The Environmental Damage (Prevention and Remediation) (England) Regulations. March 2015.

HM Government. (2016). The Environmental Permitting (England and Wales) Regulations. December 2016.

HM Government. (2016). The Groundwater (Water Framework Directive) (England) Direction. May 2016.

HM Government. (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/527). April 2017.

HM Government. (2017). The Water Environment (Water Framework Directive) (England and Wales) Regulations. March 2017.

HM Government. (2017). The Conservation of Habitats and Species Regulations 2017 (SI 2017/1012). October 2017.

Institute of Acoustics, Association of Noise Consultants and Chartered Institute of Environmental Health. (2017). Professional Practice Guidance on Planning & Noise: New Residential Development. May 2017.

Institute of Air Quality Management. (2016). Guidance on the Assessment of Dust from Demolition and Construction. June 2016.

Institute of Air Quality Management. (2018). Guidance on the Assessment of Odour for Planning. July 2018.

Institute of Air Quality Management and Environmental Protection UK. (2017). Land-use Planning and Development Control: Planning for Air Quality. January 2017.

Institute of Air Quality Management and Environmental Protection UK. (2020). A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites. May 2020.

Institute of Environmental Assessment (1993). Guidelines for the Environmental Assessment of Road Traffic. 1993.

Institute of Environmental Management and Assessment. (2011). Guidelines for Environmental Impact Assessment Practice in the UK. 2011.

Institute of Environmental Management & Assessment. (2017). Guidelines for Environmental Impact Assessment. 2017.

Institute of Environmental Management and Appraisal. (2014). Guidelines for Environmental Noise Impact Assessment. 2014.

Institute of Lighting Professionals. (2013). Guidance on Undertaking Environmental Lighting Impact Assessments. 2013.

Institute of Lighting Professionals. (2018). Guidance Note 08/18 Bats and artificial lighting in the UK. Bat Conservation Trust, Institute of Lighting Professionals. 2018.

International Standards Organisation. (1996). ISO 9613-2, Acoustics – Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation. December 1996.

Joint Nature Conservation Committee. (2010). Handbook for Phase 1 habitat survey: A technique for environmental audit. Joint Nature Conservation Committee, Peterborough. 2010.

Joint Nature Conservation Committee. (2021). Guidance on Decision-making Thresholds for Air Pollution. Joint Nature Conservation Committee, Peterborough. December 2021.

Kirdford Parish Council. (2014). Kirdford Parish Neighbourhood Development Plan. July 2014.

Landscape Institute and Institute of Environmental Management and Appraisal. (2013). Guidelines for Landscape and Visual Impact Assessment. Routledge, Taylor & Francis Group, Oxfordshire. April 2013.

Yan. L., Ye. J., Zhang. P., Xu. D., Wu. Y., Liu. J., Zhang. H., Fang. W., Wang. B., and Zeng. G. (2018). Hydrogen Sulfide Formation Control and Microbial Competition in Batch Anaerobic Digestion of Slaughterhouse Wastewater Sludge: Effect of Initial Sludge pH. Bioresour Technol. 2018 Jul;259:67-74. doi: 10.1016/j.biortech.2018.03.011. Epub 2018 Mar 6. PMID: 29536876.

Lucas V and Bethan, S. (2004) Numerical Weather Prediction – An Alternative to Meteorological Observations for Dispersion Modelling. 2004.

Mammal Society. (2020). Red List for Britain's Mammals. [Online] Available at: https://www.mammal.org.uk/science-research/red-list/

Ministry for Communities and Local Government. (2017). Guidance: Environmental Impact Assessment. July 2017.

Ministry of Housing, Communities & Local Government. (2019). National Planning Practice Guidance for Noise. July 2019.

Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework. February 2019.

Ministry of Housing, Communities and Local Government. (2019). Planning Practice Guidance: Air Quality. November 2019.

National Institute for Occupational Safety and Health. (2013). Immediately Dangerous to Life or Health (IDLH) Values. November 2013.

Natural England. (2013). National Character Area Profile: 121 Low Weald. September 2013.

Natural England. (2018). Natural England's Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations. June 2018.

Public Health England. (2015). Methane Incident Management. Public Health England Centre for Radiation, Chemical and Environmental Hazards. October 2015.

Public Health England. (2009). Hydrogen Sulphide General Information. Public Health England Centre for Radiation, Chemical and Environmental Hazards. 2009.

Public Health England. (2019). Methane General Information. Public Health England Centre for Radiation, Chemical and Environmental Hazards. January 2019.

Plaistow and Ifold Parish Council. (2019). Plaistow and Ifold Parish Neighbourhood Plan 2014-2029. September 2019.

Royal HaskoningDHV. (2021). Crouchlands Farm EIA Screening Report. February 2021.

Sheils Flynn. (2022). Landscape and Visual Impact Assessment

Simon Jones Associates Ltd. (2019). Arboricultural Constraints Report for Pre-Application Advice at Crouchlands Farm, Plaistow. July 2019.

South Downs National Park Authority. (2018). Dark Skies Technical Advisory Note. April 2018.

South Downs National Park Authority. (2021) Camping and Glamping Technical Advice Note. July 2021.

Sussex Air Partnership (2020). Air Quality and Emissions Mitigation Guidance for Sussex. January 2020.

UK Water Industry Research. (2011). Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. January 2011.

Ward Associates (Consulting Engineers) Ltd. (2022). Water Neutrality Assessment for Proposed Development at Crouchlands Farm, West Sussex, RH14 0LE. January 2022.

Warwick, H. (2016) Britain's Hedgehogs: Research and the Conservation Effort in the Face of Serious Decline. British Wildlife Vol. 28, pp78-86. December 2016.

West Sussex County Council. (2005). A Strategy for the West Sussex Landscape. October 2005.

West Sussex County Council. (2011). West Sussex Transport Plan 2011-2026. February 2011.

West Sussex County Council and South Downs National Park Authority. (2014). West Sussex Waste Local Plan. April 2014.

West Sussex County Council and South Downs National Park Authority. (2021). West Sussex Joint Minerals Local Plan. March 2021.

World Health Organisation. (1999). Guidelines for Community Noise. 1999.

World Health Organisation. (2000). Air Quality Guidelines for Europe, 2nd Edition. 2000

World Health Organisation. (2018). Environmental Noise Guidelines for the European Region. 2018.