Environmental Statement For
AC Goatham and Sons

MAIN TEXT- CONSOLIDATED ENVIRONMENTAL STATEMENT VERSION - LAND AT PUMP AND BLOOR FARM, LOWER RAINHAM

September 2020

Our Ref: SRS/18-01307

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QUALITY ASSURANCE

This report has been prepared within the quality system operated at Rapleys LLP according to British Standard ISO 9001:2008.

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INFORMATIVE

1. In May 2019, an outline planning application for the development of land at Pump and Bloor Farms, Lower Rainham was submitted to Medway Council (MC) accompanied, amongst other documents, by an Environmental Statement (ES), prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('The Regulations').

2. In March 2020, following extensive consultation with both statutory bodies and the Council, further technical environmental information on a number of topics was formally submitted in accordance with Regulation 25 of the aforementioned Regulations. This 'further information' was submitted by Rapleys LLP as a Supplementary Environmental Statement (SES) which incorporated Supplementary Technical Appendices covering drainage, transport, agricultural land and air quality matters. A Supplementary Non-Technical Summary (SNTS) was also submitted.

3. This 'further information' comprised a number of short responses to questions raised on a number of topics and where this related directly to the information contained within the May 2019 ES submission, it was reported within the March 2020 SES. In addition, some further investigative/survey work was undertaken, also included within that SES. This 'further information' did not result in any changes to the illustrative masterplan or the proposed development itself. The' further information' was summarised as follows –

   (i) Borehole and infiltration testing resulting in revisions and clarifications to drainage/flooding matters;
   (ii) Review of MC strategic highway modelling resulting in clarifications to highway/transportation matters;
   (iii) Clarifications in respect of air quality matters;
   (iv) Clarifications in respect of agricultural matters.

4. In September 2020, to accompany a S78 appeal following the refusal of the outline planning application in April 2020, a further SES (dated September 2020) was prepared and submitted to the Secretary of State. That SES focussed on refinements to, and further consideration of, impacts of the development on heritage assets and the landscape & visual assets, on and within the vicinity of, the Site – these matters were the subject of two of the reasons for refusal of the application. It also noted any changes in policy where appropriate, further information in respect of transport matters and made some revisions relative to cumulative impact assessment.

5. Minor amendments to the illustrative masterplan and the parameter plans reflect the heritage and landscape buffer planting refinements in the north of the Site west of Pump Lane and in the south-western corner of the Site north of the railway. There was no change to the actual development description itself.

6. The Supplementary Technical Appendices relative to these topics and a SNTS were also submitted.

7. All of the supplementary documents are to be read alongside the original May 2019 ES documents.

8. This document, the Consolidated Environmental Statement (CES), represents the combining of both the ES May 2019, the SES March 2020 and the SES September 2020 (subject to amendments and deletions as referenced in the two SES's). It is a composite document put together for ease of reading and reference only. The Scoping Report contained within this (CES) remains unchanged from August 2018. A Consolidated Non-Technical Summary (CENTS) has similarly been put together.

9. The basic structure and format of this document remains unaltered from the ES May 2019, but where changes have been made and incorporated from the text of the two SES's they are shown in blue (SES March 2020) and purple (SES September 2020), the unaltered text remaining printed in grey with titling in green and blue. Where Figures were updated or modified from the ES May 2019 the titles are in blue or purple and carry a suffix 'a'; those Figures new to the ES are also titled in blue or purple.

10. The following examples indicate this:

SES March 2020

This chapter is supported by a Flood Risk Assessment and Drainage Strategy report presented as **Technical Appendix 8.1** and **Technical Appendix 8.1sup**, the latter detailing infiltration borehole testing carried out in late 2019, drainage modelling results for the 1 in 100 year flood plus 40% climate change, a 10% increase in impermeable area allowing for urban creep and further information on Suds and water quality improvement.

SES September 2020

Chapel House - Chapel House is located on the corner of Pump Lane and Lower Rainham Road. It abuts the Site (existing orchards) to the north-west and south-west. It has road frontage with a garden curtilage to the rear. There are no alterations proposed to the character of this part of Pump Lane.

Residential development will replace some of the existing orchards surrounding the listed building altering the wider setting of the listed building. Construction activities will be short term and indirect in nature. The overall impact of construction including the establishment of development is considered to be **Minor adverse**, and the effect Minor Adverse.

1 INTRODUCTION

1.1 AC Goatham and Son (the applicant) is proposing the development of land at Pump and Bloor Farms, Lower Rainham in Kent. The locational context of the Site is shown at **Figure 1.1** together with the boundaries of the application outlined in red.

1.2 An outline planning application has been prepared for the development of the Site comprising:

- Up to 1,250 dwellings, comprising a mix of properties sizes at a medium density;
- Up to 1,000 sq. m of retail or other neighbourhood uses (Use Classes A1, A2, A3, A4 and A5, D1);
- A primary school (Use Class D1);
- A 60 bed extra care facility;
- An 80 bed care home;
- Open space, strategic landscaping and other green infrastructure, and
- Associated vehicular, cycle, pedestrian and drainage infrastructure, including a primary access onto Lower Rainham Road and a secondary access onto Pump Lane.

1.3 The Site Masterplan is presented at **Figure 1.2a.**

1.4 This ES presents the findings of an independent EIA. The EIA is a systematic process which identifies the 'significant' environmental effects of a proposed development and allows environmental concerns to be taken into account in the decision making process before development consent is granted. It also provides an opportunity for such issues to be considered at an early stage and, where possible, for impacts to be designed out of the development.

1.5 This ES has been prepared in accordance with the requirements of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (herein 'the Regulations') and guidance contained in the National Planning Practice Guidance (NPPG).

REQUIREMENT FOR EIA

1.6 The requirement for an EIA is derived from the EC Directive no. 2011/92/EU (*ref. 1.1*). These directives are transposed into UK law through the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the Regulations')(ref. 1.2). The Regulations require that prior to the grant of planning permission the likely significant effects of a project on the environment should be assessed.

1.7 The Regulations set out the types of development which will always be subject to EIA under Schedule 1 and other development which may require EIA under Schedule 2. It is considered that the application proposals fall under Schedule 2 of the Regulations, specifically category 10 (b) Urban Development Projects.

1.8 In accordance with the Regulations the Proposed Development is not Schedule 1 development and the Site is not within a 'sensitive area'. However, the Development does fall within Schedule 2, Class 10 (b) "Urban development projects for the following reasons:

- The Proposed Development includes more than 1 hectare of urban development which is not dwelling house development;
- The Proposed Development includes more than 150 dwellings; and
- The overall area of the Proposed Development exceeds 5 hectares.

SCREENING OPINION

1.9 Rapleys considered that the Proposed Development constituted EIA development under the EIA Regulations and prepared a formal Screening Opinion request (**Technical Appendix 1.1**) to that effect that was sent to MC for consideration.

1.10 The formal decision of MC concluded that the Proposed Development was EIA development under the Regulations.

SCOPING REPORT

1.11 A formal Scoping Opinion was prepared by the team and consultation carried out with MC and relevant statutory bodies in accordance with the Regulations. This occurred in August 2018.

1.12 It should be pointed out that there appeared to be confusion within the MC in respect of the formal decision on the Screening Opinion and the Scoping Opinion. Whilst a letter was received relating to the screening opinion, much of the contents were comments one would expect in the scoping opinion. Very few comments were received from the consultees. A copy of the formal decision is appended to the back of the Scoping Opinion report.

1.13 In addition, some separate discussions have been undertaken with the relevant bodies in respect of the application subject of this ES, the results of which are reflected in the individual chapters.

1.14 The Scoping Report has been updated taking into account amendments resulting from the aforementioned consultation, as well as updates to the baseline survey position, national and local policy changes and alterations to the application strategy and development proposals. These changes are highlighted in red type within the Revised Scoping Report (**Technical Appendix 1.2**).

CONSULTANT TEAM

1.15 The application was submitted on behalf of AC Goatham and Son.

1.16 The ES has been compiled by Rapleys LLP, corporate members of the Institute of Environmental Management and Assessment (IEMA), in conjunction with technical input from a number of professional consultants whose roles are set out below. Three new consultants joined the team in August 2020 and were instructed to appraise heritage, landscape & visual matters and farm business viability.

1.17 A Statement of Competence can be found at **Technical Appendices 1.3** and 1.3sup.

Table 1.1: Consultant Team

Organisation	Role
Rapleys LLP	Project Management; all planning matters; socio economic chapter; EIA co-ordinator.
PBA Stantec	Water Resources (including Flood risk and Drainage), Ground Conditions, Air Quality, and Utilities/Infrastructure.
PRC	All matters relating to the masterplanning of the site.
Tyler Grange	Landscape, Townscape and Visual Amenity.
Lloyd Bore	Landscape, Townscape and Visual Amenity.
Reading Agricultural	Agricultural Land and Soils Assessment.
Anderson Midlands (J Pelham)	Farm Business Viability.
Bloomfields	Farm Business Analysis.

Pegasus Group Ltd	Cultural Heritage.
SWAT/Quest	Archaeology and Cultural Heritage.
The Ecology Partnership	Ecology and Conservation.
DTA	Transportation and Highways

STRUCTURE OF THE ES

1.18 This ES comprises the following documents:

Environmental Statement – Main Text – Volume 1

1.19 This document presents the full ES text and is divided into chapters, supported by figures and tables as appropriate.

1.20 Chapter 2 outlines the methodology for the EIA and details the technical assessments required.

1.21 Chapter 3 sets out the background to the Applications.

1.22 Chapter 4 provides a summary of relevant national and local planning policy.

1.23 Chapter 5 provides a description of the alternatives studied by the applicant, as required by the EIA Regulations.

1.24 Chapter 6 provides a summary description of the Application proposals.

1.25 Chapters 7 to 15 present an assessment of the environmental effects of the proposed development on a topic by topic basis.

1.26 Chapter 16 is now a new separate chapter titled 'Cumulative Effects'.

1.27 Chapter 17 is now an 'Overview' of the environmental effects post-mitigation.

Environmental Statement – Technical Appendices – Volume 2

1.28 A set of technical appendices is presented as a separately bound volume, which support the assessments provided in the chapters above. This is to allow the ES to be a readable document whilst providing the full basis for assessment if required.

Environmental Statement – Non Technical Summary (NTS)

1.29 A non-technical summary has been produced as a free-standing document, which provides a summary of the whole ES in non-technical language, to be easily understood by a lay audience.

1.30 The Application was also supported by a number of other documents including:

- Planning Statement;
- Design and Access Statement;
- Statement of Community Involvement;
- Viability Assessment;
- Noise/Acoustic Assessment Report;
- Sustainability Statement;
- Energy Statement, and
- Utilities Report.

COMMENTS

1.31 This ES is made available by the Council for public viewing during normal office hours. For details of where it can be viewed and the times that it is available, the Council's Development Management Department can be contacted via the following contact details:

- **Telephone:** 01634 331700
- **Email:** Planning.representations@medway.gov.uk
- **Address**: Development Management, Medway Council, Gun Wharf, Dock Road, Chatham, ME4 4TR.

1.32 The ES and planning application documents is also available via the Council's website.

1.33 Comments on the application can be made to the Council.

1.34 It should be noted that the SESs of March and September 2020 were submitted during the Covid-19 pandemic. The SESs and associated documentation were only available electronically via the aforementioned website and email as a result of lockdown restrictions.

1.35 Comments in respect of the appeal documentation, including the SES/SNTS September 2020 can be made to the Secretary of State via the Planning Inspectorate, Temple Quay House, The Square, BRISTOL, BS1 6NP.

AVAILABILITY OF DOCUMENTS

1.36 Additional hard copies of the NTS (free of charge), or electronic copies of all documentation (either via a sharefile link of on a cd) are available from:

- **Email**: info@rapleys.com
- **Address:** 33 Jermyn Street, LONDON, SW1Y 6DN

2 METHODOLOGY

INTRODUCTION

2.1 This chapter describes the methodology used for the ES.

LEGISLATION

2.2 In accordance with Regulation 4(2) of the Regulations (ref 2.1) the environmental topics will identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development to include the following factors:

- Population and human health;
- biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(a) and Directive 2009/147/EC(b);
- land, soil, water, air and climate;
- material assets, cultural heritage and the landscape; and
- the interaction between the factors referred to in sub-paragraphs (a) to (d).

2.3 In addition, the significant effects to be identified, described and assessed will include the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development.

EIA PARAMETERS

2.4 This EIA assesses potential significant environmental effects having regard to the following parameter plans:

- **Figure 2.1a** Land Use Parameter Plan
- **Figure 2.2a** Building Heights Parameter Plan
- **Figure 2.3a** Movement Parameter Plan
- **Figure 2.4a** Blue/green infrastructure Parameter Plan

2.5 Maximum parameters are defined in order to determine the potentially significant effects of the Proposed Development. The parameters are described in Chapter 6 of this ES.

KEY EIA ISSUES

2.6 Accordingly, the ES considers all the environmental topics identified in Schedule 4 of the EIA Regulations.

2.7 The following environmental issues associated with the development have therefore been considered to have the potential to be significant and are to be addressed in detail by the ES:

- Socio-economic impacts, including population;
- Water Resources;
- Transportation;
- Ecology and Conservation;
- Landscape and Visual Amenity;
- Air quality;
- Land use and Agriculture, and
- Archaeology and Cultural Heritage.

2.8 Impacts associated with the following topics are considered to be ‘non-significant’ and are not considered further in this ES:

- Sunlight, daylight and overshadowing;
- Wind, and

- Light pollution.

EIA METHODOLOGY

2.9 The key stages of the EIA process are identified in **Figure 2.5**. Both project and design team meetings attended by key members of the project team were held regularly throughout the scheme evolution process. These meetings ensured that the design team were made aware of potential environmental effects and these were 'designed out' as far as possible. Conversely, this process has also allowed mitigation measures to be 'designed into' the development proposal – this is known as 'inherent or design' mitigation, and is line with the IEMA best practice.

2.10 Each key issue has been given a separate chapter in the ES (chapters 7 to 15). The technical assessments all follow the same format as recommended by relevant good practice guidance (ref. 2.2). Accordingly, each chapter follows the structure below.

2.11 Each chapter starts with an **introduction** outlining the topic area to be assessed.

2.12 The **context** for the assessment is then set out including reference to national, and where appropriate, local guidance relevant to the topic area.

2.13 The methods for undertaking the technical studies are then outlined in the **methodology** section, making reference to best practice and other relevant legislation and guidance.

2.14 Whilst the proposed development is described consistently, the geographical extent of the assessment varies depending upon the aspect being assessed. For example, some environmental effects are confined within the boundaries of the proposed development site; others have a wider assessment area. Accordingly, the geographical scope of the assessments is confirmed in each of the specialist chapters with an indication of the sensitive receptors identified on a topic by topic basis.

2.15 The **baseline conditions** are then described, against which the potential environmental impacts of the proposal are assessed. The conditions are referred to as at the present time, on the basis no significant changes are anticipated between assessment and development works commencing.

2.16 The **potential impacts** are then assessed utilising the methodology as set out below.

2.17 The methodology used to assess the relative magnitude of significance of the effects reviewed in this ES is based on a standardised scale, as set out in **Table 2.1** below. Each of the specialist consultants have based their assessment on this general approach, but the accepted good practice criteria within each topic has led, in some cases, to modifications to this general approach.

2.18 The magnitude of an impact is judged by comparing the extent of the change with particular standards and criteria relevant to each environmental topic. The magnitude is generally estimated as combination of the magnitude of the impact and the sensitivity or value of the affected receptor. The process is described in **Tables 2.1** and **2.2**:

Table 2.1: Magnitude of Impact

Magnitude of Impact	Description - include subject specific examples
High	Very large or large change in environmental conditions (e.g. pollution levels, destruction of habitat). This could result in exceedance of Statutory objectives and/or breaches of legislation.
Medium	Intermediate change in environmental conditions.
Low	Small change in environmental conditions.
Negligible	No discernible change in environmental conditions.

Table 2.2: Sensitivity/Value of Receptor

Sensitivity/value of a Receptor	Description
Very High	Change resulting in a high degree of deterioration or improvement.
High	Change resulting in a material deterioration or improvement.
Medium	Change resulting in a low degree of deterioration or improvement.
Low	Change resulting in a negligible degree of deterioration or improvement.
Neutral	No change.

2.19 **Table 2.3** proves a matrix showing impact significance and magnitude of change.

2.20 The effect is determined by combining the predicted magnitude of impact with the assigned sensitivity of the receptor. The level at which a significant effect arises is provided within the topic method section of each chapter of the ES. Unless stated otherwise, effects of moderate significance or above are considered to be significant in EIA terms.

Table 2.3: Impact Significance Matrix

	Magnitude of Impact			
Sensitivity/ value of a Receptor	**High**	**Medium**	**Low**	**Negligible**
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible

2.21 There is no statutory definition of significant. For the purpose of the EIA **Table 2.4** below provides a general description of significance.

Table 2.4: General Definition of Significance

Significance	Description
Substantial	These effects represent key factors in the decision-making process and will have a major influence on key decision making issues.
Moderate	These effects are likely to be important considerations at a local scale. If adverse these effects have a moderate influence on key decision making issues.
Slight	These effects may be raised as local issues but are unlikely to be of importance in the decision making process. Nevertheless, they are of relevance in the detailed design of the project. When combined with other effects these effects may have a moderate influence on decision making issues.
Negligible	Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. These effects will not have an influence on decision making issues.

2.22 The likely significant effects of the Proposed Development are described as:

- Adverse or beneficial
- Direct or indirect
- Temporary or permanent
- Reversible or irreversible
- Cumulative

2.23 **Mitigation measures** are then considered to avoid, offset or reduce the significant adverse effects of the development. The mitigation strategy follows the following hierarchy:

- Avoid
- Reduce
- Remedy

2.24 Mitigation can be carried out through design (inherent mitigation) or management (additional mitigation), the latter often being considered separately for construction and operation.

2.25 Measures that avoid environmental impacts and effects and which form part of the assessed Proposed Development (as set out in the scheme description or shown on the parameter plans) are known as inherent mitigation that is included in the design of the Proposed Development is taken into account in the assessments.

2.26 Additional Mitigation is defined as a proposed measure that is additional to the assessed Proposed Development in response to environmental impacts identified through the assessment. These aspects may not be capable of representation on the parameter plans as they may involve off-site measures and/or be delivered by a third party via financial contributions.

2.27 Mitigation measures are broadly described in **Table 2.5** below.

Table 2.5: Mitigation Measures

Category	Description
Design (Inherent)	Measure incorporated into design in order to minimise specific effects.
Construction Management (Additional)	Commitment to undertake the construction works in a specific way, for example the use of particular plant, phasing of the works, regular monitoring and management of works.
Operational Management (Additional)	Features specific to the particular technical category including management practices, Environmental Management Systems etc.

2.28 A **summary of the residual impacts** is then included, in order to assess development after mitigation measures have been applied. A summary table is provided at the end of each chapter to present this information.

2.29 Chapter 16 of the ES outlines the assessment of **cumulative effects** of the Proposed Development arising from its construction and operation. Cumulative effects are the result of multiple actions on receptors or resources. There are principally two types of cumulative effect:

(i) Type 1 – Where different environmental impacts are acting on one receptor, as a result of the scheme; and

(ii) Type 2 – Where environmental impacts are acting on one receptor, but are the result of multiple projects in combination (including the scheme being assessed).

2.30 The impacts from a single development or a single environmental impact may not be significant on their own but when combined with other developments or impacts these effects could become significant.

2.31 The methodologies for determining the potential effects of the Proposed Development are detailed in the specialist chapters of the ES. The cumulative impacts assessment focuses on effects that are significant, therefore only receptors experiencing moderate or major adverse effects are to be included in the assessment.

Table 2.6: Cumulative Development Sites

Site Name	Description of Development	Status
Land at Station Road, Rainham MC/14/0285	Development of 90 dwellings	Allowed on appeal
Land North of Moor Street, Rainham MC/14/3784	Development of 190 dwellings	Refused, but identified on the MC housing supply in the SHLAA
Land at Otterham, Quay Lane, Rainham MC/16/2051	Development of 300 Dwellings	Permitted Feb 2017
Berengrave Nursery, Rainham MC/17/3687	Development of 121 dwellings	Permitted Mar 2018

Land south of Lower Rainham Road, Rainham **MC/17/1896**	Development of 202 dwellings	Permitted August 2020, but also within MC housing supply in SHLAA

ASSUMPTIONS AND LIMITATIONS

2.32 The principal assumptions that have been made, and any limitations that have been identified, in undertaking the EIA are set out below. Assumptions specifically relevant to each topic have been set out in the relevant chapter:

(i) The assessments contained within each of the technical chapters are based on the parameter plans, for which planning approval is sought;

(ii) Baseline conditions have been established from a variety of sources, including historical data. Due to the dynamic nature of the environment, conditions may change during the construction and operation of the development;

(iii) For the purposes of the ES, it has been assumed development would start in 2020 and would take nine years to build out, with the overall development completing during 2029;

(iv) Construction activities will take place to a pre-determined schedule and are likely to be conditioned as part of any planning permission, and

(v) A commitment is made to the delivery of a Construction Environmental Management Plan (CEMP), which could form a planning condition to permission.

3 BACKGROUND TO DEVELOPMENT

INTRODUCTION

3.1 This chapter describes the Site and surrounding area, and sets out the background to the Development including any relevant planning history.

THE SITE

3.2 The Site is made up of two farms, Pump farm (circa 23ha) and Bloors farm (circa 25ha) which is largely grade 2 (with some areas being grade 1) agriculture land currently in use as commercial fruit orchards. The farms are separated by Pump Lane, which runs from north to south through The Site.

3.3 The majority of the Site is planted commercial orchard within limited landscaping in the form of hedges surrounding the Site and separating individual parts of the orchard. The Site is part developed and includes a number of farm buildings used for storage and other uses in connection with the commercial orchard which are now at the end of their useful life.

3.4 The Site does not have open public access although dog walkers informally use the Site. There is one public right of way, a bridle way which extends from Pump Lane in the West, crossing Bloors Farm in an easterly direction to Lower Bloor Lane. The proposals allow for betterment in terms of improved access and recreational use of the Site.

3.5 The Site is bounded to the north-west by agricultural fields; to the north and north-east partly by houses and the B2004 Lower Rainham Road and beyond this the Medway River Estuary; to the south by allotments and Lower Bloors Lane beyond which is Bloors Lane Community Woodland and to the west by a railway line and residential development.

SURROUNDING AREA

3.6 The surrounding area is characterised by a mixture of suburban residential development and agricultural land. To the south of the Site on the other side of the rail line is the urban area of Rainham. Further to the north at the far side of Lower Rainham road are the marshes, which are a designated Country Park, within flood zone 3.

3.7 There are two conservation areas bordering the Site, Lower Rainham Conservation Area which is immediately north of Bloors Farm, and Twydall Conservation Area to the West of Pump Farm.

3.8 There are several Listed Buildings in close proximity to the Site. The assets are all Grade II listed and are known as:

(i) Chapel House.
(ii) 497, 499 and 501 Lower Rainham Road (separate listings).
(iii) The Old House.
(iv) Bloors Place.
(v) A range of outbuildings including Cart Lodge and Granary West of Bloors Place.
(vi) Garden walls south and east of Bloors Place.

3.9 The Site straddles Pump Lane which runs north to south between the B2004 Lower Rainham Road and Beechings Way respectively. Pump Lane is a narrow road approximately 4m wide meaning there is limited opportunity for two-way vehicle passage.

3.10 Rainham train station is located approximately 2.5km south east of the Site which is well within walkable and cyclable distance (29 and 8 minutes respectively). The station lies on the principal south east rail route. Train services are available directly to and from the main regional centres at London and Dover. There is a taxi-rank and general drop-off/pick-up area immediately in front of the station entrance.

3.11 There are a number of bus stops located within the vicinity of the Site. The closest is located on Beechings Way approximately 600m south of the centre of the Site. The second of which is located on Lower Rainham Road which runs along the Site frontage and can be accessed approximately 600m north of the Site. Regular services run to and from these stops routing through Lower Rainham and providing links to towns and cities further-a-field.

3.12 Existing walking and cycling facilities within the immediate vicinity of the Site are limited especially along Pump Lane which runs through the centre of the Site.

PLANNING HISTORY

3.13 At the time of the application submission in May 2019, there was no planning history of relevance. Subsequently, on 12th June 2020 MC refused the application for the following reasons:

1. Insufficient information has been provided in relation to mitigation measures, and no agreement has been reached to secure such measures, which are necessary to ensure that there will be no adverse impact on the integrity of the Medway Estuary & Marshes SSSI, SPA and Ramsar site as a result of the additional recreational pressures caused by the proposal. In the absence of imperative reasons of overriding public interest, Regulations 63 and 70 of the Habitats Regulations require permission to be refused. In addition, the lack of information and mechanism to secure the mitigation also results in non-compliance with policies S6 and BNE35 of the Local Plan and NPPF paragraphs 175 &176.

2. The proposed development would have a harmful impact on the local historic landscape, as well as the setting and significance of an number of designated heritage assets, including: listed buildings (York Farmhouse (Grade II); Pump Farmhouse (Grade II); Chapel House (Grade II); 497-501 Lower Rainham Road (Grade II); The Old House (Grade II); Bloors Place (Grade II*); a range of outbuildings including cart lodge and granary west of Bloors Place (Grade II); and, the garden walls to south and east of Bloors Place (Grade II)); and, two Conservation Areas (Lower Twydall; and, Lower Rainham). Applying the great weight which has to be given to the conservation of the designated heritage assets (by virtue of NPPF paragraph 193 and Section 66(1) of the Planning (Listed Buildings and Conservation Areas) Act 1990), the proposal is contrary to Local Plan policies BNE 12 and BNE18. In addition, as the public benefits of the scheme would not outweigh the harm to the designated heritage assets, the proposed development is also contrary to the NPPF paragraph 196.

3. The proposed development would lead to significant long-term adverse landscape and visual effects to the local valued Gillingham Riverside Area of Local Landscape Importance (ALLI), which would not be outweighed by the economic and social benefits of the scheme, in conflict with Local Plan policy BNE34 and NPPF paragraph 170.

4. The applicant has failed to satisfy Highways England that the development will not materially affect the safety, reliability and / or operation of the Strategic Road Network (SRN). This is contrary the tests set out in department for Transport Circular 2/13 paragraphs 9 & 10 and the NPPF at paragraph 109.

5. The cumulative impact from the increased additional traffic cannot be accommodated on the highway in terms of overall network capacity without a severe impact. This is contrary to Local Plan policy T1 and the NPPF at paragraph 109.

6. The cumulative impact from the increased additional traffic from the development is unlikely to be able to create a safe highway environment. This is contrary to Local Plan policy T1 and the NPPF at paragraph 109.

7. No assessment nor technical details have been provided regarding the two new access points along Pump Lane to serve the proposed development, therefore it has not been possible to appropriately assess the adequacy of these access points. This is contrary to Policy T1 of the Medway Local Plan 2003 and paragraph 109 of the NPPF.

8. The proposed development would result in the irreversible loss of 'best and most versatile' (BMV) agricultural land, contrary to Local Plan policy BNE48 and the NPPF at paragraph 170 and footnote 53.

9. In the absence of a completed S106 legal agreement, the proposal fails to secure infrastructure necessary to meet the needs of the development. This is contrary to Local Plan policy S6 and the NPPF at paragraph 54.

3.14 An appeal has been lodged in respect of the application refusal.

4 PLANNING POLICY

4.1 A detailed review of the proposals against the background of the planning policy context is set out in the Planning Statement accompanying the application. However, the summary below demonstrates that the scheme is broadly in accordance with the relevant planning framework.

4.2 This chapter sets out the general guidance in relation to the development of the Site. Specific policy regarding individual issues is referred to in the relevant topic chapters.

NATIONAL PLANNING POLICY FRAMEWORK

4.3 Relevant national planning policy and guidance is set out in National Planning Policy Framework 2019 (NPPF) (ref 4.1) and online NPPG (ref 4.2).

The Presumption in Favour of Sustainable Development

4.4 The NPPF's overriding objective is to secure the sustainable development needed to meet the needs of the country's communities and businesses. Paragraph 8 identifies that there are three dimensions to sustainable development: economic, social and environmental. In terms of an economic role the planning system should contribute to building a strong, responsive and competitive economy by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation. A social role would support strong, vibrant and healthy communities by supplying housing required to meet the needs of present and future generations, and an environmental role that contributes to protecting and enhancing the natural, built and historic environment.

4.5 In the pursuit of sustainable development improvements should be made to people's quality of life, including:

(i) Making it easier for jobs to be created in cities, towns and villages
(ii) Moving from a net loss of biodiversity to achieving net gains for nature
(iii) Replacing poor design with better design
(iv) Improving the conditions in which people, live, work, travel and take leisure
(v) Widening the choice of high quality homes

4.6 The policies which have particular relevance to the proposal for a new settlement are set out below.

Delivering a Wide Choice of High Quality Homes

4.7 NPPF, paragraph 59 states that to boost significantly the supply of housing LPAs should use their evidence base to ensure that their Local Plan meets the full, objectively assessed needs for market and affordable housing in the housing market area. Furthermore, LPAs are required to identify a supply of deliverable (within 5 years) and developable (available within 6-15 years) housing sites.

4.8 NPPF, paragraph 49 notes that housing applications should be considered in the context of the presumption in favour of sustainable development and housing policies should not be considered up to date if the LPA cannot demonstrate a five-year land supply. This is of relevance to the Development as Medway District has a significant shortfall in its five year land supply – the latest position in this regard is acknowledged in appeal reference APP/A2280/W/19/3240339 dated 30 July 2020 where the housing supply was noted at 3.27 years for the period 2019-2024.

4.9 Paragraph 61 explains that the size, type and tenure of housing needed for different groups in the community should be assessed and reflected in planning policies (including, but not

limited to, those who require affordable housing and families with children, which reflect local demand.

4.10 Paragraph 64 outlines that where major development involving the provision of housing is proposed, planning decisions should expect at least 10% of the homes to be available for affordable home ownership, unless this would exceed the level of affordable housing required in the area, or significantly prejudice the ability to meet the identified affordable housing needs of specific groups.

4.11 Paragraph 73 explains LPAs should identify and update annually a supply of specific deliverable sites sufficient to provide a minimum of five years' worth of housing against their housing requirement set out in adopted strategic policies, or against their local housing need where the strategic policies are more than five years old with an appropriate buffer applied.

Building a strong, competitive economy

4.12 Paragraph 80 explains that planning decisions should help create the conditions in which businesses can invest, expand and adapt. Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development.

4.13 Paragraph 82 also sets out that planning decisions should recognise and address the specific locational requirements of different sectors, including making provision for storage and distribution operations at a variety of scales and in suitably accessible locations.

Promoting healthy and safe communities

4.14 Paragraph 91 explains that planning decisions should achieve healthy, inclusive and safe places, which promote social interaction, including opportunities for meetings between people who might not otherwise come into contact with each other; are safe and accessible; and enable and support healthy lifestyles.

4.15 Paragraph 92 sets out that to provide the social, recreational facilities and services the community needs, planning decisions should inter alia, plan positively for the provision and use of shared spaces, community facilities – including meeting places, sports venues and open space) and ensure that established facilities and services are able to develop and modernised and are retained for the benefit of the community.

Promoting sustainable transport

4.16 Paragraph 102 explains that transport issues should be considered from the earliest stages of development proposals so that inter alia, the potential impacts of development on transport networks can be addressed, opportunities for promoting walking, cycling and public transport can be pursued in parallel with mitigating any adverse effects on the environment, and contributing to making high quality places.

4.17 Paragraph 109 states that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or if the residual cumulative impacts on the road network would be severe.

Achieving appropriate densities

4.18 Paragraph 122 explains that planning decisions should support development that make efficient use of land, taking into account:

(i) The identified need for different types of housing and other forms of development, and the availability of land suitable for accommodating it;
(ii) Local market conditions and viability;
(iii) The desirability of maintaining an area's prevailing character and setting; and

(iv) The importance of securing well-designed, attractive and healthy places.

4.19 Paragraph 123 states that it is especially important that planning decisions avoid homes being built at low densities, and ensure that developments make optimal use of the potential of each site.

Achieving well-designed places

4.20 Paragraph 124 that the creation of high quality buildings and places is fundamental to what the planning and development process should achieve.

4.21 Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities

4.22 Paragraph 127 sets out a number of design criteria applicable to new developments covering matters such as function, visual attractiveness, local character (whilst not preventing or discouraging appropriate innovation or change, including increased densities), a sense of place, accessibility and security.

4.23 However, as confirmed within paragraph 131, in determining applications, great weight should be given to outstanding or innovative designs which promote high levels of sustainability, or help raise the standard of design more generally in an area, so long as they fit in with the overall form and layout of their surroundings.

Conserving and enhancing the natural environment

4.24 Paragraph 170 confirms that planning decisions should contribute to and enhance the natural and local environment by inter alia, minimising impacts on and providing net gains for biodiversity and prevent development from contributing to, being put at unacceptable risk from, or being adversely affected by soil, air, water or noise pollution.

Conserving and enhancing the historic environment

4.25 Paragraph 189 explains that in determining applications, LPAs 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.

4.26 Paragraph 193 confirms that when considering the impact of development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. Furthermore, paragraph 197 advises that in weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.

DEVELOPMENT PLAN

4.27 The development plan for Medway Council comprises the saved elements of the Local Plan 2003 (ref 4.3), which were saved in September 2007.

4.28 From a review of the saved proposals map, the following site specifics are noted:

(i) The site is designated within a local landscape importance area, and
(ii) Pump Lane is classified as a Rural Lane.

4.29 Given the age of the adopted Local Plan, it is evidently out of date with reference to the NPPF. As such, its contents should carry limited weight in the consideration of this development proposal – far more weight should be given to national policy and the local authority's position relative to housing need.

4.30 However, for completeness, reference to the relevant policies contained within the Local Plan are listed below and can be viewed in more detail within the accompanying Planning Statement:

(i) Policy S2 - Strategic Principles;
(ii) Policy S4 - Landscape and Urban Design;
(iii) Policy S6 - Planning Obligations;
(iv) Policy BNE1 - General Principles for Built Development;
(v) Policy BNE18 - Setting of Listed Buildings;
(vi) Policy BNE21 - Archaeological Sites;
(vii) Policy BNE24 - Air Quality;
(viii) Policy BNE25 - Development in the Countryside;
(ix) Policy BNE34 - Areas of Local Landscape Importance;
(x) Policy BNE48 - Agricultural Land;
(xi) Policy H3 - Affordable Housing;
(xii) Policy H8 - Residential Institutions;
(xiii) Policy H10 - Housing Mix;
(xiv) Policy R9 - Retail Provision in New Residential Developments;
(xv) Policy L10 - Public Right of Way;
(xvi) Policy T1 - Impact of Development;
(xvii) Policy T2 - Access to the Highway;
(xviii) Policy CF2 - New Community Facilities; and
(xix) Policy CF6 - Primary Schools.

EMERGING POLICY

4.31 The emerging local plan is still in its early stages of preparation and as a result of Covid-19, the timescale has slipped even further. The latest Local Development Scheme (LDS), as reported to Planning Committee on 4th August 2020 identifies that the publication draft (Regulation 19) is planned to be published in spring of 2021, with submission for examination by December 2021 and target adoption of December 2022.

5 ALTERNATIVES

5.1 The EIA Regulations Schedule 4, Part 1 (ref: 5.1) requires that an ES provides:

> *"An outline of the main alternatives studied by the applicant and an indication of the main reasons for the choice, taking into account the environmental effects".*

5.2 This section outlines the need for the development and the main alternatives considered.

NEED FOR THE DEVELOPMENT AND ITS OBJECTIVES

5.3 Lower Rainham is a primary location for development where sustainable growth is to be concentrated. The Council has a duty to provide a sufficient and continuous five year supply of housing to meet its identified needs. There is a pressing need for housing to be delivered in the Medway Council area and the Site represents a major strategic development opportunity on which to provide much needed housing. (Further commentary on this is provided within Chapter 6 of this ES and in the Planning Statement accompanying the application).

5.4 The key objectives of the Application can be summarised as follows:

(i) Creation of an attractive, deliverable, sustainable development in accordance with planning policy; and
(ii) Provision of much needed housing.

ALTERNATIVES

5.5 There are a number of ways of considering Alternatives – the status quo or 'do nothing scenario'; different sites; different uses and different design/layout combinations.

5.6 These are considered briefly in turn below.

Do Nothing Scenario

5.7 Guidance on the preparation of an EIA suggests that the evaluation of a site in the absence of specific proposals should be addressed, which can be described as the "do nothing" alternative. The "do nothing" scenario is a hypothetical alternative, conventionally considered in EIA as a basis for comparing the development proposal under consideration.

5.8 In this situation, this would comprise the land remaining under horticultural use, with very limited public access. However, a top fruit orchard will reach the end of its productive life after around 14 years; thereafter the yield diminishes as the trees effectively become 'exhausted'. The orchard on Pump Farm is at maximum maturity and is no longer a benefit-yielding Site. Furthermore, the farm is surrounded by residential development from whence a number of complaints about farming operations have been made. Access is difficult given its location resulting in farm machinery and HGV's travelling through highly populated, urban areas potentially increasing traffic, pollution and noise – as such, movement and growth is restricted at the farm which prevents modernisation and investment.

Site Alternatives

5.9 The land within the Application is under the control of AC Goatham and Son.

5.10 Other land in other locations around the wider locality of the Peninsula that is controlled by AC Goatham and Son is also already used for fruit farming. Together, the farms make up the AC Goatham and Son business entity.

5.11 There is no reasonable alternative Site for the provision of the orchards currently farmed at Pump Farm.

Use Alternatives

5.12 As identified above, replacement orchards would require significant investment. Resulting improved yields would produce more fruit and a consequential increase in associated traffic movements by workers, machinery, HGV's over the existing situation, which would not be welcomed by local residents.

5.13 Notwithstanding the quality of the land, diversification into arable, dairying, or other pastoral farming is not practicable due to the capital outlay of specialist machinery, reduced labour, new buildings to store grain/milk cattle, location of the land within an urban environment potentially resulting in continued complaints from residents, conflict with dog walkers, etc.

5.14 Consequently, alternative farming uses are not considered to be a viable alternative (new Technical Appendix 13.2(i), Farm Business Financial Viability, August 2020).

Design Alternatives

5.15 Discussions concerning the nature and form of the development of the Site have been on-going for a number of months. During this time various design solutions have been considered. The Design and Access Statement accompanying the Applications details the most recent evolution of the design. The ES summarises a selection of the design alternatives below.

November 2018 Initial Design Concept Masterplan

5.16 The initial design concept in November 2018 as presented to MC as part of the pre-application discussion process (Figure 21 in the Design and Access Statement). The principles here focussed on the creation of a single urban extension with a community hub containing a primary school and provision for Class E uses (formally A1, A2, A3, A4, A5, D1 or D2 uses), a 60 bed care home, open space, play space and other green infrastructure, associated accesses (vehicular, pedestrian, cycle).

The Illustrative Masterplan (February 2019) (Figure 5.1)

5.17 The Illustrative Masterplan design submitted with the application package in May 2019 is shown in **Figure 5.1** and described in chapter 6 of the ES. A number of refinements were made to that Proposed Development in response to further assessment work and comments made during the pre-application and consultation process. The Masterplan includes further landscaping, refinement of the drainage strategy and swale locations, introduction of character areas within the residential development, the introduction of a 60 be extra care facility.

The Illustrative Masterplan (September 2020) (Figure 1.2a)

5.18 A number of refinements have been made to the Proposed Development in response to further assessment work in seeking to address the reasons for refusal (as referenced in paragraph 3.4). The Illustrative Masterplan (Figure 1.2a) includes refinements to landscaping detail and green infrastructure particularly to the west of Pump Lane/south of Lower Rainham Road around the Proposed Development access, in the south-west adjacent to the Lower Twydall Conservation Area and within the school site plot south of Lower Rainham Conservation Area.

6 DEVELOPMENT DESCRIPTION

6.1 The formal description of development for this application is as follows:

> *"Redevelopment of land off Pump Lane to include residential development comprising upto 1,250 residential units, a local centre (with final uses to be determined at a later stage), a village green, a two form entry primary school, a 60 bed extra care facility, an 80 bed care home and associated accesses (vehicular, pedestrian, cycle)."*

6.2 This application relates only to the area shown on **Figure 1.2a.** The parameter plans (land use, building heights, movement, blue/green infrastructure) at **Figures 2.1a-2.4a** have formed the basis of the EIA for the Application. Appropriate conditions attached to any planning permission would ensure that the detailed design is in accordance with these parameter principles.

LAND USE AND QUANTUM

6.3 **Table 6.1** sets out the proposed land uses and Site area/floorspace as described above. This table should be read alongside the parameter plans (**Figures 2.1a-2.4a**)

Table 6.1: Development Quantum Masterplan Application

Land Use	Ha	Amount
Residential	29.78	Up to 1250 dwellings
Village Green	1.12	
Local Centre	0.64	Up to 1,000sqm
Primary School	2.60	
Green/Blue Infrastructure	15.69	
Care Home and Extra Care Facility	1.23	Up to 140 beds
TOTAL	**51.07**	

PARAMETERS

Land Use, Amount and Density (Figure 2.1a)

6.4 The scale of the Masterplan Application Development has had regard to the existing context of the Site, its relationship to the local and wider landscape, topography, views and the nature of the surrounding rural environment. As such, up to 1,250 dwellings are considered deliverable in design terms within identified environmental constraints.

6.5 The dwellings will consist of both market and affordable properties, designed as a range of family housing rather than apartments either side of Pump Lane. Densities will have an average of 15 dwellings per acre pending on the location within the masterplan.

6.6 The local centre comprises a strategic community hub containing a primary school (to the east of Pump Lane) and up to 1000 sq. m of commercial and community space consisting of uses falling in class E (formally A1, A2, A3, A4, A5, D1, D2) (west of Pump Lane), albeit the precise combination of retail and community facilities is to be determined at a later stage. Residential use (class C1) will also form part of the local centre with the aforementioned class E uses at ground level.

6.7 The two form entry primary school is located close to the local centre hub area and is readily accessible on foot or by cycle from the whole of the new development as well as the existing housing area to the south of the Site.

Building Heights (Figure 2.2a)

6.8 The Building Heights Parameter Plan identifies maximum heights. Building heights are measured against AoD. In broad terms the residential development will have a typical 9m ridge height, with the majority of the dwellings across the Site being two storeys. However, albeit undefined at present, there will be some variation in residential height and storeys to a maximum of 12m AoD. Consequently, the maximum building height parameter within the residential areas (including the care/extra care) is 12m.

6.9 Within the village centre, maximum building heights are 10m AoD.

6.10 The maximum building height allowance for the school is 10m AoD.

6.11 The building heights have been informed by early landscape analysis and inputs and have been prepared having regard to the endorsed Masterplan and design approach. Further details are set out in the Design and Access Statement produced by PRC which accompanies the planning application.

Movement (Figure 2.3a)

6.12 The Movement Parameter Plan identifies the main access into the Site from Lower Rainham Road. Secondary points of access are provided either side of Pump Lane to both the north and south of the Russet Farm complex. Neither the main access nor the secondary access points on Pump Lane are reserved as part of the application – they are fixed.

6.13 Indicative points of access for cyclists and pedestrians are proposed via Lower Twydall Road in the far south western corner of the Site, as well as the existing bridleway and main estate road.

6.14 The existing bridleway runs west-east from Pump Lane and is to remain in situ.

6.15 The Transport Assessment together with the Design and Access Statement accompanying the Application sets this out in detail – a summary of the key principles are outlined here.

(i) Primary street/major access road – all-purpose main vehicular road through the Site with a 5.5m carriageway and 2m;
(ii) Minor access road access – leading off from the major access road into the heart of the Development, minimum 4.8m carriageway with some shared surfaces.

Green/Blue Infrastructure (Figure 2.4a)

6.16 Existing vegetation across the Site has been retained as far as possible as shown on the Green and Blue Infrastructure Parameter Plan. Some loss of hedgerow and trees has been necessary to facilitate development.

6.17 The proposed green areas will be set aside as public open space to be secured via the S106 agreement. The detailed design of the attenuation basins and the landscaping of the Site will be determined at the reserved matters stage. Within residential areas further green spaces and play areas are proposed to provide local amenity space.

6.18 The bridleway crossing the eastern part of the Site from west to east will be retained within its existing hedgerows. It will need to be crossed in two places to accommodate the proposed main vehicular road through the Development.

6.19 Existing non-fruit trees and hedgerows will be retained as far as possible and have been used to define the types of green space and development blocks.

DEVELOPMENT PROGRAMME AND CONSTRUCTION

Phasing

6.20 It is difficult to be precise in respect of the phasing of the Development as this is essentially dependent on the timing of securing the planning permission. A detailed phasing strategy is not, therefore, confirmed at this stage. The planning application approval would likely be subject to a condition requiring the submission of a phasing plan prior to commencement.

6.21 Subject to the timing of planning permission, the construction of development is assumed as follows – planning permission received end 2019, submission of first reserved matters end first quarter 2020, start on site end 2020, first house completion autumn 2021, whole site completion April 2030. Accepting that these dates have now been superceded with the passage of time, the principles of the timescales involved for each part of the Development process described remain.

Utilities and Services

6.22 A programme of new infrastructure, upgrades and diversions will be required to facilitate the scale of development proposed. This will include works to electricity, gas, potable water and foul drainage networks. A Utilities Assessment Report detailing existing infrastructure has been submitted as part of the planning application documentation.

Construction

6.23 Construction methods are influenced by a combination of factors including the existing ground conditions and the preferred methods of the building contractor that will be appointed. As such, a programme for the delivery of the development has not yet been established. The identification of potentially significant effects at the construction stage (and the identification of suitable mitigation measures) assumes that a generic construction methodology will be adopted based on standard construction methods and timings derived from similar developments in similar locations. The assumptions made will need to be realistic and appropriate to the development proposed, and many will ultimately be defined in the Construction Environmental Management Plan (CEMP).

6.24 It is assumed that construction of built development will be more or less continuous throughout this time and will include the following activities:

(i) **Enabling works and site preparation:** to include earth moving (cut and fill) and arboricultural works.
(ii) **Provision of infrastructure:** to include the provision of the north-south relief road and access points into the Proposed Development from the relief road.
(iii) **Construction of substructure:** to include localised re-grading, excavation for foundations and installation of ground slabs.
(iv) **Construction of superstructure: comprising the** construction of the main building envelope.
(v) **Fit out of buildings**: to include the installation of insulated timber frames or block work party walls, surfaces finishes, internal division walls, mechanical and electrical installations; and internal fixtures.
(vi) **Landscaping:** soil preparation; tree and vegetation planting, seeding, and construction of footpaths/ cycle routes.

6.25 Enabling works and site preparation will include:

(i) Earth moving – excavation and grading;

(ii) Arboricultural works – including the protection of trees/vegetation to be retained and removal of trees/vegetation to be lost; and
(iii) Some new structural planting may also be implemented as part of the site.

Hours of Work

6.26 It is anticipated that the working hours for works audible at the Site boundary will be as set out below:

(i) 0730 – 1800 Monday to Friday;
(ii) 0800 – 1300 Saturday; and
(iii) No working on Sundays or Bank Holidays.

6.27 These hours will be agreed with the Council prior to the commencement of the works. All work outside of these hours will be subject to prior agreement, and/ or reasonable notice, to the Council, who may impose certain restrictions and will have regard to any planning conditions attached to any grant of permission. Night-time working will be restricted to exceptional circumstances.

Construction Environmental Management Plan (CEMP)

6.28 A CEMP which will clearly set out the methods of managing environmental issues for all involved with the construction works, including supply chain management, will be provided to the Council prior to commencement of the relevant phase of works.

6.29 Throughout the ES measures are set out to mitigate the effects of the Proposed Development during construction. These would be collated in, and implemented by, the CEMP where appropriate.

Waste Management, Recycling and Disposal

6.30 Waste will be generated during all stages of the construction works. Sources of waste within the construction process include:

(i) Packaging – tins, plastics, pallets, expanded foams etc.;
(ii) Dirty water, for example from silt; and
(iii) Timber, off-cuts etc.

6.31 All relevant contractors will be required to investigate opportunities to minimise waste arisings at source and, where such waste generation is unavoidable, to maximise the recycling and re-use potential of construction materials. Wherever feasible, such arisings will be dealt with in a manner that reduces environmental impact and maximises potential re-use of materials.

6.32 A Site Waste Management Plan (SWMP) will be implemented specifically to mitigate the effects of waste arisings during the construction of the Proposed Development. Measures will include:

(i) Making efficient use of materials, including the use of recycled and existing materials on site when and where appropriate; and
(ii) Screening and crushing of surplus material generated during site clearance (where the opportunity exists) prior to relocation in order to reduce the amount of waste generated on the Site.

6.33 For those materials removed from the Application Site, notification by the Construction Liaison Officer for approval (via consultation with the authorities) will take place. Loads will only be deposited at authorised waste treatment and disposal sites. Deposition will be in accordance with the requirements of the Environment Agency (EA); the Environmental Protection Act 1990 (ref 6.1); the Environmental Protection (Duty of Care) Regulations 1992

as amended, (ref 6.2); the Waste Management (England and Wales) Regulations 2006 (ref 6.3); the Landfill (England and Wales) Regulations 2002 and the Landfill (England and Wales) (Amendment) Regulations 2000 (ref 6.4); the Hazardous Waste (England and Wales) Regulations 2005 (ref 6.5); and the List of Wastes (England) Regulations 2005 (ref 6.6).

6.34 To prove the correct depositing of excavated material and to prevent the occurrence of fly-tipping, a waste transfer note system will be used in accordance with the Environmental Protection (Duty of Care) Regulations 1992.

Site Drainage and Effect on Water Resources

6.35 The potential effects on water resources during the construction process are likely to include:

(i) Water demand for construction activities and domestic use by the contractor (however, this is anticipated to be low);
(ii) Generation of domestic foul effluent by contractors;
(iii) Increase in rate of run-off due to creation of impermeable areas for contractor's site facilities, construction of road infrastructure and buildings; and
(iv) Risk of pollution of run-off and groundwater due to construction activities.

6.36 Surface water drainage will be controlled and discharge arrangements will be agreed with the EA or, in the case of discharges to sewer, Southern Water as set out in Chapter 8 (Water Resources).

6.37 The Construction Liaison Officer will ensure that any water which may have come into contact with any contaminated materials during construction will be disposed of in accordance with the Water Resources Act (1991) (ref 6.7) and other legislation, and to the satisfaction of the EA. In addition, any risk will be reduced by adopting good management practices.

6.38 All liquids and solids of a potentially hazardous nature (for example diesel fuel, oils, solvents) will be stored on surfaced areas, with bunding, to the satisfaction of the EA.

7 ECONOMY, POPULATION AND SOCIETY – SOCIO ECONOMICS

INTRODUCTION

7.1 The chapter has been prepared by Rapleys LLP and assesses the potential socio-economic impacts of the Proposed Development on the surrounding locality, both during the construction and operational stages.

7.2 It sets out the policy context of the Development in relation to socio-economic issues and describes the methodology used in assessing the socio-economic impacts.

7.3 The baseline position has been established to confirm the socio-economic profile of the area using published data gathered from a variety of sources. The chapter goes on to describe the potential impact that the Development may have on the local baseline conditions, including consideration of cumulative impacts.

CONTEXT

7.4 A review of planning policy is set out below, where relevant to socio-economic issues.

National Planning Policy Framework

7.5 In accordance with the NPPF (ref 7.1) 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):

(i) **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;

(ii) **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 a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

(iii) **An environmental objective** – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

7.6 The following parts of the NPPF are relevant to this chapter of the ES:

5. Delivering a sufficient supply of homes:

7.7 The Government's objective is to significantly boot the supply of homes ensuring that a sufficient amount and variety of land can come forward where it is needed, that the needs of groups with specific housing requirements are addressed ,and that land with permission is developed without unnecessary delay (para.59).

6. Building a strong, competitive economy:

7.8 Planning decisions should help create the conditions in which businesses can invest, expand and adapt. Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development (para.80).

8. Promoting healthy and safe communities:

7.9 Planning decision decisions should aim to achieve healthy, inclusive and safe places which:

(i) Promote social interaction, including opportunities for meetings between people who might not otherwise come into contact with each other – for example through mixed-use developments, strong neighbourhood centres, street layouts that allow for easy pedestrian and cycle connections within and between neighbourhoods, and active street frontages;

(ii) Are safe and accessible, so that crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion – for example through the use of clear and legible pedestrian routes, and high quality public space, which encourage the active and continual use of public areas; and

(iii) Enable and support healthy lifestyles, especially where this would address identified local health and well-being needs – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling (Para.91)

7.10 To provide the social, recreational and cultural facilities and services the community needs, planning policies and decisions should (amongst other principles):

(i) Plan positively for the provision and use of shared spaces, community facilities (such as local shops, meeting places, sports venues, open space, cultural buildings, public houses and places of worship) and other local services to enhance the sustainability of communities and residential environments;

(ii) Take into account and support the delivery of local strategies to improve health, social and cultural well-being for all sections of the community; and

(iii) Ensure an integrated approach to considering the location of housing, economic uses and community facilities and services (Para 92).

7.11 To ensure that a sufficient choice of school places is available to meet the needs of existing and new communities, planning decisions should give great weight to the need to create, expand or alter schools and work with schools promoters, delivery partners and statutory bodies to identify and resolve key planning issues before applications are submitted (Para. 94).

7.12 In relation to open space and recreation, the NPPF recognises (para.96) that access to a network of high quality open spaces and opportunities for sport and physical activity is important for the health and well-being of communities.

7.13 Decisions should protect and enhance public rights of way and access, including taking opportunities to provide better facilities for users (para. 98).

Relevant 'Saved' Policies of The Medway Local Plan 2003 (ref 7.2)

7.14 Several policies were saved by the Sectary of State in September 2007. Local Plan policies relevant to this chapter of the ES are summarised below:

(i) **Policy S1: Development Strategy:** The development strategy for the plan area is to prioritise re- investment in the urban fabric. This will include the redevelopment and recycling of under-used and derelict land within the urban area, with a focus on the Medway riverside areas and Chatham, Gillingham, Strood, Rochester and Rainham town centres.

Land use and transport will be closely integrated, and priority will be given to a range of new and improved transport facilities, including facilities for walking, cycling and public transport.

Strategic economic development provision will be made both within the urban area and at Kingsnorth and Grain.
In recognition of their particular quality and character, long-term protection will be afforded to:

(a) areas of international, national or other strategic importance for nature conservation and landscape; and

(b) the historic built environment, including the Historic Dockyard, associated sites and fortifications.

Outward peripheral expansion onto fresh land, particularly to the north and east of Gillingham, will be severely restricted. The open heartland of Medway at Capstone and Darland will be given long-term protection from significant development.

(ii) **Policy S2: Strategic Principles:** The implementation of the development strategy set out in policy S1 will focus on:

(a) maintaining and improving environmental quality and design standards;

(b) a sustainable approach to the location and mix of new development, to provide local communities with a range of local facilities, (including transport measures to serve development and sensitivity in the use of energy and natural resources);

(c) the adoption of a sequential approach to the location of major people and traffic attracting forms of development, including retailing, leisure, educational and health facilities.

(iii) **Policy BNE1***: General Principles of Built Development* supports development which is appropriate in relation to the character, appearance and functioning of the built and natural environment by *inter alia*:

(a) being satisfactory in terms of use, scale, mass, proportion, details, materials, layout and siting; and
(b) respecting the scale, appearance and location of buildings, spaces and the visual amenity of the surrounding area".

(iv) **Policy CF2** *New Community Facilities* permits facilities where:

(a) the size and scale of development being appropriate to the site;
(b) the development having no detrimental impact on the countryside, residential amenity, landscape or ecology; and
(c) accessibility to the local population by a variety of means of transport, including public transport, cycling and walking.

METHODLOGY

7.15 The majority of the Site lies in the Rainham North ward. Given that this ward adjoins the Twydall ward, consideration has been given to the existing baseline conditions of Twydall alongside the Rainham North ward.

7.16 To allow for a wider assessment, the existing baseline conditions of the following geographical scales have also been reviewed, where possible:

(i) Medway (Local Authority Area);
(ii) South East (regional); and

(iii) England (national).

7.17 In confirming the methodology, reference has been made to the DoE Good Practice Guide on Environment Assessment (DOE, 1995) (ref. 7.3), works by Chadwick (2002) (ref. 7.4) and Morris and Therival (2001) (ref. 7.5)

Baseline Methodology

7.18 The Proposed Development has been assessed in the context of an analysis of the socio-economic characteristics of the research area, including:

(i) Demographics;
(ii) Economy and Employment;
(iii) Wealth and Deprivation;
(iv) Housing;
(v) Education and Training;
(vi) Health, Community and Leisure; and
(vii) Shopping.

7.19 The baseline assessment of the socio-economic conditions was predominantly a desk-based exercise. The main data sources utilised are outlined below, and a full list of websites visited during the gathering of baseline data can be found in the references:

(i) Nomis Official Labour Market Statistics: 2011 Census Data (ref. 7.6);
(ii) Office for National Statistics website (ref. 7.7);
(iii) Population 2017 July 2018 - Medway Council (ref:7.8)
(iv) HM Land Registry Open Data website (ref. 7.9);
(v) North Kent Strategic Housing and Economic Needs Assessment (November 2015) (7.10);
(vi) The website of Medway Council (ref. 7.11);
(vii) Medway Infrastructure Position Statement (ref. 7.12):
(viii) The Department for Education's 'Get information about schools' (GIAS) website (ref 7.13);
(ix) The MHCLG website (ref. 7.14);
(x) Google search and maps , and
(xi) North Kent SHENA Retail & Commercial Leisure Assessment November 2016 (ref:7.15).

7.20 In terms of limitations, the baseline assessment has relied on published sources, notably the 2011 Census.

Significance Criteria

7.21 The significance of socio-economic impact arising from the Proposed Development has been judged by comparing the extent of change with standards and criteria relevant to socio-economic factors.

7.22 The standard approach of combining the magnitude of the effect with the sensitivity of the receptor, as utilised elsewhere in this ES is not, however, readily applicable to this assessment of significance as the receptor population is singularly sensitive. However, a standard approach, as set out below, can still be adopted based on qualitative judgement:

(i) Substantial impact – very large changes in socio-economic conditions, of greater than local scale;
(ii) Moderate impact – intermediate change in socio-economic conditions, at a local level;

(iii) Minor impact – small change in socio-economic conditions, of low importance;
(iv) Negligible impact – no discernible change in socio-economic conditions, below normal levels of perception; and
(v) Nil impact – no change in socio-economic conditions.

7.23 A qualitative, descriptive assessment of impacts is applicable to socio-economic assessment as it is not universally appropriate or possible to predict the precise quantum of impact, as in other areas of assessment. In terms of the spatial scope of impacts, local impacts are those affecting the Rainham North and Twydall Wards and the surrounding areas, and wider impacts are those affecting the Medway area as a whole.

Assessment Methodology

7.24 The baseline conditions of the following 'receptors' considered to be appropriate to the EIA process have been examined, analysed and an assessment made of the impacts the development will have on each of these. Each receptor has been afforded a 'medium sensitivity' reflecting the local demographics and recognising that changes can lead to significant social economic effects requiring an infrastructure response.

(i) Demographics (population (count and demographic structure)
(ii) Economy and Employment (economic activity and employment composition)
(iii) Wealth and Deprivation (levels of deprivation and material wealth)
(iv) Housing (house prices, tenures and compositions)
(v) Education and Training (level of education and existing capacities)
(vi) Health, Community and Leisure (existing facilities and provision)
(vii) Shopping (existing facilities and local centre health)

BASELINE CONDITIONS

7.25 This section considers the baseline conditions for each receptor prior to the Proposed Development commencing. For the purposes of this assessment, the Site is considered to be part of the Rainham North ward; the baseline condition is outlined within this chapter.

Demographics

7.26 **Table 7.1** sets out the increase in population identified between the 2001 and 2011 Census' across the local, district, regional and national scale. This indicates that Rainham North has experienced a proportionally larger increase in population during the ten year period in comparison to the district, regional and national scale areas.

7.27 The 2011 Census records the population of the Medway Area as 263,925 residents. Furthermore, Medway Council (Population 2017 July 2018 - Medway Council) uses a best fit approach to produce an area definition based on wards and super output areas which estimates the current (July 2017) population of to be 277,616 residents. The ONS 2018 mid-year population estimates (published in July 2019) identify the population of Medway as 277,855.

Table 7.1: Population Increase

	Rainham North	Twydall	Medway	South East	England
2001	8,677	13,282	249,488	8,000,645	49,138,831
2011	8,563	13,048	263,925	8,634,750	53,012,456

Increase (No.)	-114	-234	14,437	7,834,105	3,873,635
Increase (%)	-1.3%	-1.7%	5.7%	7.9%	7.8%

7.28 **Table 7.2** identifies the population and age distribution for the Rainham North and Twydall wards relative to the local authority, regional and national scale areas. The Census data does indicate a larger elderly population for instance, the aged 65 and over group are well represented in the Rainham North and Twydall wards, with higher than national average figures of 20.08% and 18.13%, respectively. Younger populations, in particular those aged 0 to 4 are less well represented in Rainham North and Twydall when compared to the regional and national averages.

Table 7.2: Population Age Structure

Age Group	Rainham North		Twydall		Medway		South East		England	
	No	%	No	%	No	%	No	%	No	%
0 to 4	478	5.58%	764	5.85%	17,224	6.52%	534,235	6.18%	3,318,449	6.24%
5 to 19	1,449	16.92%	2,603	19.94%	51,763	19.61%	1,542,617	17.86%	9,393,826	17.7%
20 to 29	927	10.82%	1,471	11.27%	36,622	13.87%	1,062,344	12.3%	7,246,202	13.66%
30 to 44	1,730	20.2%	2,331	17.86%	54,321	20.58%	1,761,278	20.39%	10,944,271	20.6%
45 to 64	2,259	26.38%	3,513	26.92%	66,990	25.38%	2,252,256	26.08%	13,449,179	25.3%
65+	1,720	20.08%	2,366	18.13%	37,005	14.02%	1,482,020	17.16%	8,660,529	16.3%
Total	**8,563**		**13,048**		**263,925**		**8,634,750**		**53,012,456**	

7.29 The ONS have produced 2016-based sub-national population projections for each local authority in the UK. The latest projections were published by the Medway Council in July 2018 and provide a useful update on anticipated population trends following the 2011 Census. The latest projections suggest that the population of Medway will increase by 8.2% (equating to 22,800 people) by mid-2026, ahead of the national average of 5.9%.

7.30 According to the projections, it is expected that proportion of younger people (aged 0 to 15) in Medway will increase marginally from 20.4% in 2016 to 20.7% in 2026. Whereas for the same period, the proportion of working age people (aged 16 to 64) in the Local Authority area is expected to decrease from 64% to 61.9%. The projections also suggest that the district will follow the national trend of an increasingly ageing population with the proportion of those aged 65 and over-estimated to increase from 15.6% in 2016 to 17.5% in 2026.

Economy and Employment

7.31 In general, the baseline data in **Table 7.3** shows that the percentages of those of working age (16-74 years) that are economically active in the Rainham North Ward (50.89%) is broadly comparable to Twydall (49.01%%). However, this remains lower than the Local Authority Area

(52.27%), regional (52.36%) and national figures (51.27%). The percentage of those economically active but currently unemployed in Rainham North (2.68%) is slightly lower than that of Twydall (3.47%), the wider District (3.58%) and the national average (3.21%), however, is slightly above the average for the region (2.5%).

Table 7.3: Economic Activity

	Rainham North		Twydall		Medway		South East		England	
	No.	%	No.	%	No.	%	No.	%	No.	%
Economically active	4,358	50.89%	6,395	9.01%	137,954	52.27%	4,521,184	52.36%	27,183,134	51.27%
Economically inactive	1,835	21.42%	2,876	22.04%	56,204	21.29%	1,753,157	20.30%	11,698,240	22.06%
Unemployed	230	2.68%	454	3.47%	9,469	3.58%	216,231	2.50%	1,702,847	3.21%

7.32 **Table 7.4** confirms that, in Rainham North, 37.09% of the working population work in a managerial/professional role (occupations 1-3), which is higher than Twydall (26.63%) and Medway (34.39%) however, is lower than the average for the region (44.81%) and England (41.2%). Rainham North has a higher percentage of the population working in administrative/secretarial roles at 16.05% compared to Twydall at 12.99%, the Medway (12.80%) and England (11.45%).

7.33 The percentage of the population working in skilled trades in both Rainham North (12.51%) is lower than both the average for Twydall (14.92%) and for Medway (13.07%) however is higher than both the average for the region (11.1%) and England (11.36%). The percentage of people working in process plant and machinery roles is at 6.696% within Rainham North; this is lower than Twydall at 10.1%. Within the Medway, 8.58% of the population works within process plant and machinery, while the average in England is 7.18%.

Table 7.4: Employment by Occupation

Occupation	Rainham North		Twydall		Medway		South East		England	
	No.	%	No.	%	No.	%	No.	%	No.	%
1. Managers, directors and senior officials	430	10.51%	462	7.85%	11,924	9.41%	521,978	12.25%	2,734,900	10.86 %
2. Professional occupations	565	13.81%	533	9.06%	16,404	12.94%	798,224	18.73%	4,400,375	17.48%
3. Associate professional and technical occupations	523	12.78%	556	9.45%	15,265	12.04%	589,352	13.83%	3,219,067	12.79%
4. Administrative and secretarial occupations	657	16.05%	764	12.99 %	16,223	12.80%	488,467	11.46%	2,883,230	11.45%
5. Skilled trades occupations	512	12.51%	877	14.92 %	16,564	13.07%	473,290	11.10%	2,858,680	11.36%

6. Caring, leisure and other service occupations	348	8.50%	612	10.41 %	12,171	9.60%	397,104	9.32%	2,348,650	9.33%
7. Sales and customer service occupations	370	9.04%	653	11.1%	11,670	9.21%	336,150	7.88%	2,117,477	8.41%
8. Process plant and machine operatives	274	6.69%	594	10.1%	10,870	8.58%	242,998	5.703%	1,808,024	7.18%
9. Elementary occupations	412	10.07%	827	14.06 %	15,598	12.31%	413,160	9.69%	2,792,318	11.09%
All categories: Occupation	4,09 1		5,8 78		126,68 9		4,260,7 23		25,162,72 1	

7.34 **Table 7.5** below identifies and displays the distribution of employee jobs by economic sector. Within both Rainham North and Twydall wards, the largest economic sectors by number of employees are: wholesale and retail trade including motor vehicle repair; human health and social work; Manufacturing and construction. This remains consistent with the Local Authority Area, regional and national contexts, with other high value sectors such as information and communication, real estate activities and Electricity, gas, steam and air conditioning supply less represented at the Rainham and Twydall wards, indicating a lower skilled local economy.

Table 7.5: Employment by Industry

Industry	Rainham North		Twydall		Medway		South East		England	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture, forestry and fishing	10	0.24%	15	0.25%	446	0.35%	28,582	0.67%	203,789	1.6%
Mining and quarrying	2	0.04%	2	0.03	83	0.06%	5,832	0.13%	43,302	0.2%
Manufacturing	297	7.25%	517	8.79%	9,603	7.57%	306,391	7.19%	2,226,247	9.1%
Electricity, gas, steam and air conditioning supply	19	0.46	20	0.34%	966	0.76%	24,500	0.57%	140,148	0.6%
Water supply, sewerage, waste management and remediation activities	51	1.24%	67	1.13%	1,523	1.2%	29,749	0.69%	175,214	0.8%
Construction	444	10.85%	707	12.02%	13,857	10.93%	339,761	7.97%	1,931,936	8.0%
Wholesale and retail trade; repair of motor vehicles and motor cycles	728	17.79%	1,179	20.05%	22,022	17.38%	662,860	15.55%	4,007,570	16.2%
Transport and storage	224	5.47%	425	7.23%	7,672	6.05%	222,795	5.22%	1,260,094	4.0%

Accommodation and food service activities	166	4.05%	242	4.11%	5,639	4.45%	214,329	5.03%	1,399,931	6.3%
Information and communication	100	2.44%	100	1.7%	3,398	2.68%	235,081	5.51%	1,024,352	3.3%
Financial and insurance activities	303	7.4%	253	4.3%	6,336	5%	191,566	4.49%	1,103,858	3.7
Real estate activities	56	1.36%	83	1.41%	1,591	1.25%	61,133	1.43%	367,459	1.4
Professional, scientific and technical activities	245	5.98%	184	3.13%	5,988	4.72%	317,787	7.45%	1,687,127	5.9
Administrative and support service activities	165	4.03%	284	4.81%	6,408	5.05%	219,830	5.15%	1,239,422	4.4
Public administration and defence; compulsory social security	316	7.72%	341	5.8%	9,688	7.64%	255,674	6%	1,483,450	7.1
Education	338	8.26%	513	8.72%	11,215	8.85%	432,119	10.14%	2,490,199	9.7
Human health and social work activities	443	10.82%	703	11.95%	14,754	11.64%	495,212	11.62%	3,121,238	12.9
Arts, entertainment, recreation and other services	179	4.37%	239	4.06%	5,355	4.22%	208,963	4.9%	1,257,385	4.8

7.35 The Annual Survey of Hours and Earnings (ASHE) provides the most comprehensive and up to date source of information on the structure and distribution of earnings in the UK. The latest data from 2018 identifies that the average weekly earnings for full-time workers in Medway (£536.6) are lower than that of the regional average (£589.2) and the national average (£575). Similarly, the survey finds that full-time workers in the District work on average 37.5 hours a week, which is in line with both the regional and national average at 37.5 hours a week.

7.36 In **Table 7.6**, the travel to work distances from the 2011 Census are displayed. The largest proportion of residents in Rainham North travel 'less than 10 km' to get to work; this is generally consistent with the wider comparator areas (however lower than the average for England (52%) but still indicates a strong level of local employment).

Table 7.6: Travel to Work

	Rainham North		Twydall		Medway		South East		England	
	No.	%	No.	%	No.	%	No.	%	No.	%
Less than 10km	1,866	45.61%	3,129	53.23%	58,827	46.43%	1,999,263	46.92%	13,162,415	52%
10 km to less than 30 km	677	16.30%	1,006	17.11%	23,488	18.53%	884,170	20.75%	5,287,919	21%
30 km and over	836	20.43%	736	12.52%	21,519	18.53%	494,686	11.61%	2,002,678	8%

Other	712	17.4%	1,007	17.13%	22,855	18.04%	882,604	20.71%	4,709,709	19%

Wealth and Deprivation

7.37 Overall, the levels of deprivation in Medway are found to be relatively low on the Index of Deprivation 2015, ranking 121st out of 326 local authorities (where 1 equals the most deprived). Deprivation data is not available at ward level but the most recent review of the deprivation index carried out by Medway Council (2016) prepared by Medway Council indicates that the Site is not located within an area identified as having the most deprivation within Medway.

7.38 In terms of car ownership, 79.1% of households have at least one car or van in the Rainham North ward, whereas 74 of households do so in Twydall. This compares to 78.12% of households in the District, 81.42% in the wider region and 74% in England.

7.39 **Table 7.7** shows that 76.46% of all households in Rainham and 66.22% of all households in Twydall are owner occupiers (either outright or with a mortgage). This falls above (marginally lower for Twydall) the Medway average at 67.65%, but higher than the national average of 63%. Rainham North appears to have a lower proportion of households under social rented tenure (7.45%) in comparison to the Medway (13.77%), region (13.71%) and country (18%), whereas Twydall (24.03%) has a higher proportion of social rented tenure households to the comparator areas.

Table 7.7: Housing Tenure

	Rainham North		Twydall		Medway		South East		England	
	No.	%	No.	%	No.	%	No.	%	No.	%
Owned	2,872	76.46%	3,538	66.22%	71,853	67.65 %	2,404,517	67.62%	13,975,024	63%
Shared ownership	10	0.266%	20	0.37%	1,114	1.04%	39,280	1.1%	173,760	1%
Social rented	280	7.45%	1,284	24.03%	13,996	13.77 %	487,473	13.71%	3,903,550	18%
Private rented	552	14.69%	414	7.74%	18,153	17.09 %	578,592	16.27%	3,715,924	17%
Living rent free	42	1.11%	86	1.6%	1,093	1.02%	45,601	1.28%	295,110	1%

Housing

7.40 As set out in **Table 7.7**, 14.69% of households in the Rainham North ward are under private rental tenure; this is lower than the regional (16.27%) and national (17%) averages. The Twydall Ward considerably lower with only 7.74% of all households identified as being under private rental tenure.

7.41 With regards to household composition, there are less single person households (30.61%) than married couple households (34.69%) within Rainham North, this is also constant with Twydall ward there are a greater proportion of married couple households (33.39%) than single person households (27.55%). For reference, the level of single person households and married couple households in Medway is 27.71% and 35.09% respectively, and in England, 30.21% and 33.08% respectively.

7.42 The percentage of one-family pensioner householders in both the Rainham North is 26.27%, which is higher than the Medway (18.17%) and England average (20.46%).

7.43 Medway Council have not provided details on the vacancy rates within Medway.

7.44 In terms of the level of detached housing, the overall Local Authority Area has a lower rate than the national average (22.43%) at 13.82%. This is similar to that of the ward Rainham North (13.15%) with the Twydall ward considerably lower at 4.97%. In comparison, at the region level, 28.19% of houses in the South East are detached. The percentage of terraced housing within Rainham North and Twydall is 39.32% and 38.33% respectively, which compares to a Medway average of 40.82%, however these are well above the national average of 25%.

7.45 According to the HM Land Register Open Data website, the average house price in Medway (as of February 2019) was £242,370, which is considerably lower than the regional average of £315,700 and marginally lower than the national average of £242,964. In December 2019 figures for Medway had increased to £250,000. This is still considerably lower than the South-East as a whole at £325,000. Using the ONS' 2017 house price to residence-based earning ratio – or 'affordability ratio' – Medway can be considered to be more affordable than the wider region with an affordability ratio of 7.95, compared to 9.93 for the South East however is comparable to that of the national average of 7.91.

7.46 Based on the November 2015 North Kent Strategic Housing and Economic Needs Assessment the Local Authority Area has an objectively assessed housing need figure of 1,124 homes per year (between 2012-2037).

Education and Training

7.47 **Table 7.8** below indicates that the general level of education obtained within Medway is slightly lower than the comparator areas considered within this section. For instance, the Rainham North and Twydall wards have a lower proportion of people with level 4 qualifications, at 18.81% and 12.87% respectively, in comparison to 19.13%, 29.94% in the surrounding region and 27% at the national scale.

Table 7.8: Level of Qualification

	Rainham North		Twydall		Medway		South East		England	
Highest level of qualification	No.	%	No.	%	No.	%	No.	%	No.	%
No qualifications	1,634	23.27%	3,150	30.2%	48,226	22.9%	1,333,955	19.07%	9,656,810	22.5%
Level 1 qualification	1,120	15.95%	1,922	18.43%	35,473	16.85%	946,056	13.52%	5,714,441	13.3%
Level 2 qualifications	1,302	18.54%	1,792	17.18%	38,653	18.36%	1,110,706	15.88%	6,544,614	15.2%
Level 3 qualifications	869	12.37%	1,157	11.09%	26,818	12.73%	892,915	12.76%	5,309,631	12.4%
Level 4 qualifications	1,321	18.81%	1,343	12.87%	40,275	19.13%	2,093,693	29.94%	11,769,361	27.4%

7.48 From the Department for Education's 'Get information about schools' (GIAS) website, it has been identified that there is one primary school and one secondary school in within 1km of the site. There are a further eleven primary schools within 3 km of the Site. **Table 7.9** represents the current capacities of primary schools in Medway as registered with the Department of Education. This indicates that the current deficit capacity for additional primary school children within 1km of the site is -62, with a deficit capacity of -314 in primary schools within 3km of the Site.

Table 7.9: Primary School Capacity Levels

Name	Type	Distance	Capacity	Roll	Surplus/Deficit
Thames View Primary School	Primary, Academy converter	0.91km	420	482	-62
				Sub-total:	-62
Meredale Independent Primary School	Not applicable, Other independent school	1.65km	140	79	61
Twydall Primary School and Nursery	Primary, Academy sponsor led	1.67km	525	500	52
Riverside Primary School	Primary, Academy converter	1.67km	210	231	-21

St Margaret's Infant School	Primary, Academy converter	1.8km	270	322	-52
St Margaret's Church of England Junior School	Primary, Academy converter	1.8km	360	356	4
Featherby Infant and Nursery School	Primary, Academy converter	2.1km	270	324	-54
Featherby Junior School	Primary, Academy sponsor led	2.1km	360	348	12
Miers Court Primary School	Primary, Academy converter	2.4km	420	420	0
Woodlands Primary School	Primary, Academy converter	2.6km	420	681	-261
Holywell Primary School	Primary, Community school	3km	210	203	7
TOTAL CAPACITY (within 3km)					**-314**

7.49 The level of capacity at the only secondary school in the area is set out below in **Table 7.10**. This indicates a deficit of -13 places at the Rainham Mark Grammar School which is located 1km from the Site and an overall surplus within 3km of 297 spaces.

Table 7.10: Secondary School Capacity Levels

Name	Type	Distance	Capacity	Roll	Surplus/Deficit
Rainham Mark Grammar School	Secondary, Academy converter	1km	1242	1355	-13
TOTAL					**-13**
The Howard School	Secondary, Academy converter	1.85km	1725	1415	310
Rainham School for Girls	Secondary, Academy converter	1.97km	1558	1644	-86
The Robert Napier School	Secondary, Academy sponsor led	3km	1080	994	86
TOTAL CAPACITY (within 3km)					**297**

7.50 A desk-top review of nurseries and pre-schools in Medway (ref. 8.15) finds the following facilities, all of which are within 1.5 km from the Site:

(i) Busy Bees at Gillingham;

(ii) Featherby Infant and Nursery School;
(iii) Twydall Primary School Nursery & Childrens Centre; and
(iv) Scallywags Nursery.

7.51 The Medway Infrastructure Position Statement published in January 2017 (ref. 8.19) recognises that education is likely to be a key infrastructure issue in Medway due to the anticipated delivery of houses over the Local Plan period. It has specifically identified that there is a shortfall in early years, primary and secondary, however, it has also identified that there is no deficiency in further education.

7.52 The position statement goes on to detail that a new Primary School is being developed at Hoo St Werburgh and one has been included as a part of the Rochester Riverside development along with a potential planned expansion of the Medway University campus. The Proposed Development also incorporates the creation of a new primary school.

Health, Community and Leisure

7.53 The 2011 Census data highlights that the proportion of residents in the Rainham North (81.31%) and Twydall (77.91%) wards that consider themselves to be in a 'good' or 'very good' state of health is lower than the average of Medway (81.96%), the regional average (83.63%) and national average (81.38%).

7.54 In terms of local health facilities that are in close proximity to the Site, a desk-top review has identified one GP practice, the details of which are set out below in **Table 7.11**.

Table 7.11: GP Capacity

GP Practice	No. GPs	Practice List	Patients per GP	Currently accepting patients
Waltham Road Medical Centre	1	1,686	1,686	Yes
Pump Lane Surgery	1	2079	2,079	Yes
Orchard Family Practice	2	4,939	2,469	No
Thames Ave Surgery	3	5,474	1,825	Yes
Dr Vridhagiri Nandini	1	2,125	2,125	Yes
Maidstone Road Rainham Surgery	2	4,684	2,342	Yes

7.55 With regards to secondary care, the Will Adams NHS Treatment Centre is located approximately 800m to the west of the site and the Medway Maritime Hospital is located approximately 3.3km to the west - these offer a range of healthcare services for the local towns and wider rural area. A desk-top review of existing health facilities has also identified that there is one dental surgery and four pharmacies, all of which are within 2.5 km distance to the Site.

7.56 The surrounding area has a number of community facilities, the nearest of which to the Site are:

(i) Twydall Community Centre; and
(ii) St. Margaret's Millennium Centre.

7.57 Medway does not have an up-to-date open space strategy, therefore it is not possible to assess the current oversupply/undersupply of open space within Medway. From a desk based study it has been identified that the following parks are located within 3km of the Site:

(i) Riverside Country Park Copperhouse Lane;
(ii) The Strand (park and garden);
(iii) Gillingham Park;
(iv) Luton Rec (park);
(v) Hempstead Park; and
(vi) Hilly Fields Community Park.

7.58 The Proposed Development includes the following blue and green infrastructure – some 14.48ha including a village green (1.125ha). The precise use of these areas will be agreed with the Council at a later stage through a S106 agreement.

Shopping

7.59 The closest food retail facility to the Site is a Tesco express store located approximately 1.2 km to the south on London Road. Beyond this, there is also a Londis, Iceland Foods, Aldi another Tesco, as well as a range of small convenience and comparison retail facilities within the wider area of Gillingham and Chatham.

7.60 In terms of retail, the most recent evidence-based document is the North Kent SHENA Retail & Commercial Leisure Assessment (November 2016). This does not provide details on the total market shares of comparison and convenience good within Medway as a whole, but focuses on the turnover and market growth.

7.61 The Medway Council Retail Needs Study (2009) identifies that Medway's market share of total convenience expenditure is estimated to be 36.4% (£457.19 million of £1,255.13 million). It also identifies that Medway's market share of comparison expenditure is estimated to be 31% (£682.27 million).

IMPACTS

Construction Impacts

7.62 This section considers the effects of the construction phase on the baseline conditions. The main socio economic impacts during construction relate to economy and employment, and specifically, job creation.

Demographics (population (count and demographic structure)

7.63 Given the levels of construction employment in the Local Authority Area and ability of the labour market to meet demand, no population migration will be required for the construction.

7.64 As a result, the overall impact of the Proposed Development on population is considered to be ***nil***.

Economy and Employment (economic activity and employment composition)

7.65 The construction phase will offer benefits to the economy in terms of jobs created directly on the Site, through the local sourcing of materials and spend of workers. Direct and indirect, temporary and permanent jobs are likely to be created during this time. Likely skills required and jobs created include:

(i) Ground workers in carrying out excavations, foundations and drainage;
(ii) Bricklayers and joinery;
(iii) Specialist steel frame construction;
(iv) Specialist car park construction staff;

(v) Mechanical, electrical and plumbing staff;
(vi) Building and finishing trades;
(vii) Landscape-related trades, and
(viii) Construction managers and other professionals.

7.66 The total construction workforce is currently unknown, however, the development of the Site will support additional temporary jobs locally, regionally and nationally.

7.67 There are around 13,857 construction workers in Medway. It is likely that employment requirements for the Proposed Development will displace only a small amount of existing work in the area as the requirement is a relatively small proportion of labour.

7.68 The construction phase is expected to provide some opportunities to reduce local unemployment through partnerships between housebuilders, contractors and local employment agencies. This may support jobs at the town and local level.

7.69 Overall, the impact of the Proposed Development on this receptor is considered to have a temporary effect that is **minor beneficial.**

Wealth and Deprivation (levels of deprivation and material wealth)

7.70 Increased construction employment would not be considered to materially alter the ward or District earning structure, but can sustain and grow the local sector. Therefore, it is considered to have a **negligible** effect on this receptor.

Housing (house prices, tenures and compositions)

7.71 Employment numbers which are to be supported by the construction phase of the Development are unlikely to affect the housing market in the town or District. Construction workers are expected to largely be located within the Local Authority area given the size of labour pool. Therefore, it is considered that the Development will have **nil** effect on the baseline conditions.

Education and Training (level of education and existing capacities)

7.72 The construction phase is expected to provide some opportunities to link construction to local education and training programmes. The scale of employment and size of the Development suggests that the effects on this receptor will be **negligible**.

Health, Community and Leisure (existing facilities and provision)

7.73 Modern average site accident rates are low and overall it is considered that there would be no effect on health status. Overall, the construction phase is considered to have **nil** effect on health facilities.

7.74 The construction phase is unlikely to have any significant effect on local recreational or social facilities. No facilities surrounding the Site or within Medway are anticipated to be affected by the construction process. Therefore, the construction phase is considered to have a **nil** effect.

Shopping (existing facilities and town centre health)

7.75 Constructions workers will bring indirect beneficial impacts as a result of an increase of money within the local economy and an increase in the demand and use of local services, and retail facilities.

7.76 It is likely that construction workers employed on site will utilise local facilities within the town centre causing some additional retail trade. Previous experience suggests that approximately just over half of the workforce (60%), would spend money on subsistence

averaging £6 a day (YouGov data, 2005). It can therefore be assumed that the during the construction period (10 years) the workforce at the Proposed Development will contribute around £1m to the local economy (based on a 220 day working year). The effect of the construction phase is considered to be **minor beneficial** and short to medium term.

Operational Impacts

7.77 The following section considers the potential impacts of the Proposed Development on the baseline conditions, during its operational/completed development period. The following factors are considered to be inherent mitigation that is taken into account within this assessment:

(i) Proposed on-site green space, including play to be secured via S106 Agreement;
(ii) Proposed flexible use Local Centre (up to 1,000sqm) (with final uses to be determined at a later stage);
(iii) Proposed footpaths and cycleways; and
(iv) S106 contributions.

Demographics (population (count and demographic structure)

7.78 Based on the Local Authority average household size ratio of 2.48 persons per dwelling, the Proposed Development can be expected to accommodate a population of about 3,100 new residents. The demographic make-up of the population is difficult to predict; however, it is expected that there will be a broad mix of occupiers across the Proposed Development.

7.79 The completed and occupied Development will result in an increase in population in the Medway by about 1.17%. This increase is not considered to be significant. This increase in population is considered to have **minor beneficial** effect through an increase in children and population of working age helping to balance an ongoing increase in the ageing population and decrease in working age population.

Economy and Employment (economic activity and employment composition)

7.80 The Proposed Development comprises mixed use development to include a Local Centre comprising; a strategic community hub containing a 2 form entry primary school and up to 1000 sq. m of commercial and community space with final uses to be determined at a later stage. A 60-bed care home and 80 bed extra care facility is also proposed.

7.81 Direct jobs will, therefore, be created as a result of the Development.

7.82 Overall, the Proposed Development is considered to have a **minor beneficial** permanent effect on this receptor.

Wealth and Deprivation (levels of deprivation and material wealth)

7.83 It is assumed that earnings of the incoming population will be similar to the existing and therefore that the Proposed Development is considered to have a **nil** effect on this receptor.

Housing (house prices, tenures and compositions)

7.84 The Proposed Development will provide up to 1,250 dwellings in the period 2021/22 to 2029/30, contributing around 100-150 dwellings per annum. Assuming a provision of 25% affordable housing, a total of 312 affordable homes would be delivered by the Proposed Development in the same period. The Proposed Development will deliver new homes in Medway in the short and medium terms, contributing towards the Council's five-year supply of deliverable housing.

7.85 Overall, the Proposed Development would lead to a **moderate beneficial** permanent effect on this receptor.

Education and Training (level of education and existing capacities)

7.86 The number of primary and secondary students that will be generated by the Proposed Development is calculated using the Local Education Authority's pupil yield figures as below:

(i) 0.27 pupils per dwelling for primary schools.
(ii) 0.20 pupils per dwelling for secondary schools.

7.87 It has, therefore, been estimated that up to 1,250 dwellings will generate up to 337.5 primary and 250 secondary students.

7.88 The current capacity within primary schools within 1km of the site is -61 spaces. Therefore, the Proposed Development would lead to a deficit of 398.5 primary school spaces based on the baseline conditions. While the Proposed Development would exceed the existing baseline capacity in primary schools in Medway, the proposal includes a 2 form entry primary school and as such, it is considered that the specific need requirement created by the proposal can be dealt with onsite.

7.89 The current capacity for secondary school places is -13 (within 1km of the site). A surplus of 297 secondary school places. The Proposed Development would create a demand for 250 spaces which would leave an approximate surplus of 50 spaces following occupation of the Proposed Development.

7.90 Overall, taking into account embedded mitigation, the Proposed Development will have a **minor beneficial** permanent effect on this receptor.

Health, Community and Leisure (existing facilities and provision)

7.91 Assuming a population increase of 3,100 persons, this would result in a total of 24,087 patients to be covered by 10 GPs currently based in Medway. This would mean approximately 2,408 patients per GP, which is considerably above the recommended 1,800 capacity limit set out by NHS.

Table 7.12: GP capacity with and without Proposed Development

GP Practice	No. GPs	Practice List	Patients per GP
Current	10	20,987	2,098
With Proposed Development	10	24,087	2,408.7

7.92 There are therefore exacerbated capacity issues in the local health service as a result of the Development. The mix of uses proposed within the local centre may offer the opportunity for further health care facilities to be provided, although this would also depend on funding from other sources. The effect on health services is, therefore, **a minor adverse** effect**.**

7.93 The Proposed Development would result in an increase in demand for community/leisure facilities. The Proposed Development would, therefore, have a **minor adverse** effect on community facilities.

Shopping (existing facilities and town centre health)

7.94 The Proposed Development includes provision of a local centre, the exact make up of this is to be decided at a later stage. The Proposed Development would also benefit those residents that live near to the Site providing greater choice for possible day to day, small scale, convenience needs. Therefore, have a **minor beneficial** effect on this receptor.

7.95 The proposed local centre element is not intended to replace town centre shopping trips and is intended to serve the day to day needs of future residents. On this basis the Proposed Development will have **nil** effect on town centre health.

MITIGATION

7.96 This chapter has determined that no significant adverse effects have been identified when taking into account inherent mitigation. A number of beneficial effects have been identified. Notwithstanding this, it is anticipated that a S106 Agreement will be required to further mitigate impacts arising from the Development on matters such as waste and recycling, community and leisure facilities.

RESIDUAL IMPACTS

7.97 There would be no residual impacts associated with the Proposed Development.

CUMULATIVE IMPACTS

Construction Impacts

7.98 The cumulative sites considered as part of this chapter assessment are those identified in Table 2.6 of the ES.

Demographics (count and demographic structure)

7.99 Given the levels of construction employment in the District and ability of the labour market to meet demand as summarised above, no population migration will be required for the construction of the cumulative impact sites. As a result, the cumulative effects on this receptor are considered to be **nil.**

Economy and Employment (economic activity and employment composition)

7.100 The cumulative sites will create similar construction jobs and offer benefits to the economy in terms of jobs created directly on each site to the Proposed Development. This will include direct and indirect, temporary and permanent jobs.

7.101 Multiplier effects through supply chain and worker spend will increase further by supporting additional temporary jobs locally, regionally and nationally. The cumulative effects of the construction phases of the cumulative impact sites are expected to provide further opportunities to reduce local unemployment through partnerships between housebuilders, contractors and local employment agencies.

7.102 Overall, the cumulative impact on this receptor is considered to have a temporary effect that is **moderate beneficial.**

Wealth and Deprivation (levels of deprivation and material wealth)

7.103 Increased construction employment would not be considered to materially alter the ward or Local Authority earning structure, but can sustain and grow the local sector. Therefore, it is considered to have a **negligible** effect on this receptor.

Housing (house prices, tenures and compositions)

7.104 The cumulative impacts of the construction phases of the developments are unlikely to affect the housing market in the town or Local Authority Area. Construction workers are expected to largely be located within the District given the size of labour pool. Therefore, it is considered that the cumulative developments will have **nil** effect on the baseline conditions.

Education and Training (level of education and existing capacities)

7.105 The construction phases of the cumulative developments are expected to provide some opportunities to link construction to local education and training programmes. The scale of employment and size of developments suggests that the effects on this receptor will be **negligible** overall.

Health, Community and Leisure (existing facilities and provision)

7.106 It remains the case that the construction phase across all cumulative sites will have **nil** effect on health, community or leisure facilities.

Shopping (existing facilities and town centre health)

7.107 Constructions workers associated with each cumulative site will bring indirect beneficial impacts as a result of an increase of money within the local economy and an increase in the demand and use of local services, and retail facilities. It remains the case that the cumulative effect of the construction phases is considered to be **minor beneficial** and short to medium term.

Operational Impacts

7.108 The following section considers the potential cumulative impacts during operation. The following factors are considered to be inherent mitigation across all cumulative sites that are taken into account within this assessment:

(i) Proposed on-site green space to be secured via S106 Agreement;
(ii) Proposed footpaths and cycleways; and
(iii) Potential S106 contributions.

Demographics (population (count and demographic structure)

7.109 The completed and occupied cumulative developments represent an increase in the population in Medway of around 1.92% based on the district average of 2.48 people per dwelling. This increase is not considered to be significant and should be viewed in the context of meeting the needs of the Local Authority as a whole. This increase in population is considered to have a **minor beneficial** long term effect overall.

Economy and Employment (economic activity and employment composition)

7.110 Further direct jobs will be created.

7.111 The amount of employment generating uses across all cumulative sites is limited to the Proposed Development subject of this ES. Overall, it remains the case that the cumulative impacts of the sites will have a **minor beneficial** long term effect on this receptor.

Wealth and Deprivation (levels of deprivation and material wealth)

7.112 It is assumed that earnings of the incoming population will be similar to the existing and therefore that the cumulative effect is **nil.**

Housing (house prices, tenures and compositions)

7.113 The cumulative developments will deliver around 2,153 dwellings (including 25% affordable homes) in Medway in the short and medium terms, contributing towards the Council's five-year supply of deliverable housing in the short and medium terms.

7.114 Overall, the cumulative sites would lead to a **moderate beneficial** effect on this receptor.

Education and Training (level of education and existing capacities)

7.115 The estimated projected increase in demand across cumulative sites will exceed the current capacity within primary schools and secondary schools in Medway. Through a combination of S106 contributions and on-site primary school provision. Without mitigation this will lead to a **minor adverse** impact across the district.

Health, Community and Leisure (existing facilities and provision)

7.116 The cumulative developments will result in an increase in demand for local community facilities resulting in a **minor adverse** impact across the district.

Shopping (existing facilities and town centre health)

7.117 An increase in population as a result of the cumulative sites will increase footfall and spend in the surrounding centres. The effect of the cumulative sites on existing shopping facilities is, therefore, considered to be **minor beneficial** and long term.

Mitigation

7.118 All of the committed cumulative developments make (or will make) a financial contribution via a S106 Agreement towards things like leisure and community facilities, waste and recycling, etc proportionate to the impacts of each development. In the case of the Proposed Development, given its size, on-site provision of primary education is considered as inherent mitigation.

Residual Impacts

7.119 Taking into account the inherent mitigation and that provided through financial contributions as described above in paragraph 7.117, the residual impacts of the cumulative developments is considered to be **negligible**.

SUMMARY

7.120 This chapter has discussed a range of potential socioeconomic impacts of the Proposed Development and related mitigation measures across the construction and operational phases, including consideration of Cumulative Impacts. Overall, no significant adverse effects have been identified in relation to socio-economic receptors. A number of beneficial effects have been identified and these are summarised in **Table 7.13** below.

Table 7.13: Summary Table

Description of Likely Significant Effects	Significance	Effects					Description of Mitigation	Description of Residual Effects	Significance	Residual Effects				
		B/A	P/T	D/I	ST/M /LT	L/R /N				B/A	P/T	D/I	ST/M/ LT	L/R/N
Demolition and Construction Phase														
Demographics: population count and demographic structure	Nil								Nil					
Economy and Employment	Minor Beneficial	B,	T,	D/I,	ST/MT,	L			Minor Beneficial	B,	T,	D/I,	ST/MT,	L
Wealth and Deprivation	Negligible								Negligible					
Housing (house prices, tenure, composition)	Nil								Nil					
Education and Training	Negligible								Negligible					
Health, Community and Leisure	Nil								Nil					
Shopping	Minor Beneficial	B,	T,	D/I,	ST/MT,	L			Minor Beneficial	B,	T,	D/I,	ST, MT,	L
Operational Phase														
Demographics: population count and demographic stricture	Minor beneficial	B,	P,	D,	LT,	L			Minor beneficial	B,	P,	D,	LT,	L
Economy and Employment	Minor beneficial	B,	P,	D,	LT,	L			Minor beneficial	B,	P,	D,	LT,	L
Wealth and Deprivation	Nil								Nil					
Housing (house prices, tenure, composition)	Moderate beneficial	B,	P,	D,	LT,	L			Moderate beneficial	B,	P,	D,	LT,	L

Education and Training	Negligible		Onsite primary provision. Financial contribution for secondary		Negligible	
Health/Community Facilities	Minor adverse	B,P,D,ST,L	Financial contribution		Negligible	
Shopping Facilities	Minor Beneficial	B, P, D, LT, L			Nil	
Town Centre Health	Nil				Nil	
Cumulative Impacts: Construction						
Demographics: population count and demographic stricture	Nil				Nil	
Economy and Employment	Moderate Beneficial	B, T, D/I, ST/MT, L			Moderate Beneficial	B,T,D/I,ST/MT, L
Wealth and Deprivation	Negligible				Negligible	
Housing (house prices, tenure, composition)	Nil				Nil	
Education and Training	Negligible				Negligible	
Health, Community and Leisure	Nil				Nil	
Shopping	Minor Beneficial	B, T, I, ST/MT, L			Minor Beneficial	B,T,I,ST/MT, L
Cumulative Impacts: Operation						
Demographics: population count and demographic stricture	Minor Beneficial	B, P, D, LT, L			Minor Beneficial	B, P, D, LT, L
Economy and Employment	Minor Beneficial	B, P, D, LT, L			Minor Beneficial	B, P, D, LT, L
Wealth and Deprivation	Nil				Nil	

Housing (house prices, tenure, composition)	Moderate Beneficial	B, P, D, LT, L			Moderate Beneficial	B, P, D, LT, L
Education and Training	Minor adverse	B,P,D,ST,L	Financial contribution		Negligible	
Health /Community Facilities	Minor adverse	B,P,D,ST,L	Financial contribution		Negligible	
Shopping/town centre health	Minor Beneficial	B, P, D, LT, L			Minor Beneficial	B, P, D, LT, L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

8 WATER RESOURCES

INTRODUCTION

8.1 This chapter of the ES has been prepared by Peter Brett Associates LLP, now part of Stantec (PBA) and considers the potential significant effects of the Proposed Development on water resources including flood risk.

8.2 The chapter describes the baseline conditions existing at the Site and surroundings, the potential direct and indirect effects on the water resources, the methods used to assess the impacts, the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

8.3 There are no watercourses on the Site, or locally to it, but the Site is located within 300m of the marshes of Rainham Creek, which forms part of the Medway Estuary and Marshes SSSI. The Site is within the Lower Medway catchment.

8.4 The Site lies within fluvial Flood Zone 1 'Low Probability' (less than a 1 in 1000 (0.1%) annual probability of river flooding).

8.5 There are two potential up to medium risk surface water flow routes running through the centre of the western part of the Site in a north easterly direction.

8.6 The geology of the Site is general Thanet Beds (stiff or very stiff, brown sand CLAY) over Seaford Chalk Formation. The groundwater is within the Seaford Chalk Formation, which has been identified as being a Principal Aquifer. The depth to the ground water varies from ~ 26m at the higher end of the site to ~ 8m at the lower. There is no Groundwater Source Protection Zones within 500m of the Site.

8.7 This chapter is supported by a Flood Risk Assessment and Drainage Strategy report presented as **Technical Appendix 8.1** and **Technical Appendix 8.1sup**, the latter detailing infiltration borehole testing carried out in late 2019, drainage modelling results for the 1 in 100 year flood plus 40% climate change, a 10% increase in impermeable area allowing for urban creep and further information on Suds and water quality improvement.

CONTEXT

8.8 This section of the ES discusses the context of the Proposed Development with regard to the relevant international and national legislation, in addition to national and local planning policies.

National Legislation

8.9 In relation to water resources, the relevant legislative framework includes the following:

(i) Flood and Water Management Act 2010 (ref. 8.1);
(ii) Water Act 2003, as amended (ref.8.2);
(iii) Water Industry Act 1991 (as amended by the Water Act 2003) (ref.8.3);
(iv) Land Drainage Act 1991, as amended (ref.8.4);
(v) Water Resources Act 1991 (ref.8.5);
(vi) Environment Act 1995, as amended (ref.8.6);
(vii) Water Framework Directive (ref.8.7).

National Planning Policy

8.10 The aim of water policy in England and Wales is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.

8.11 Planning Practice Guidance (MHCLG, last updated 2018) [PPG] (ref.8.8), issued by the Ministry of Housing, Communities and Local Government, this brings together planning practice guidance for England and it provides advice on how planning can take account of the risks associated with flooding and coastal change in plan-making and the planning application process. This includes demonstrating how flood risk will be managed now and over the lifetime of the development, taking climate change into account.

8.12 The NPPF (ref.8.9), sets out the government's planning policies for England and how these are expected to be applied. It makes reference to climate change, flood risk, water quality and biodiversity.

8.13 The NPPF aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. In exceptional circumstances where new development is necessary in flood risk areas the policy also aims to ensure it is safe, without increasing flood risk elsewhere, and where possible, reducing flood risk overall.

8.14 The NPPF advocates the use of a risk based sequential test, in which new development is directed towards the areas of lowest risk of flooding. The different areas of flooding are defined by the following Flood Zones:

(i) Flood Zone 1: 'Low Probability' of flooding (less than 1 in 1,000 annual probability of river or sea flooding in any year);
(ii) Flood Zone 2: 'Medium Probability' of flooding (between a 1 in 100 and 1 in 1,000 annual probability of river flooding or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding in any year);
(iii) Flood Zone 3a: 'High Probability' (1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any year); and
(iv) Flood Zone 3b: The functional floodplain (where water is stored in times of flood, including water conveyance routes, annual probability of 1 in 20 or greater in any given year).

8.15 In addition, the PPG specifies the type of land use, defined by its flood risk vulnerability that is appropriate in each Flood Zone. For example, more sensitive developments that would be most severely affected in the event of flooding, such as hospitals, should not be permitted in areas at high probability of flooding, although leisure and tourism developments may be allowed in Flood Zone 3a.

8.16 In February 2017, the Environment Agency (EA) released new guidance 'Flood risk assessments: climate change allowances' (ref.8.10). This provides contingency allowances for potential increases in peak river flow, rainfall intensity and sea level.

8.17 The Table 1 of the current climate change guidance provides a peak river flow allowances table, outlining a range of allowances based on percentile (i.e. the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The provided allowances are also subject to the vulnerability classification of the proposed use and the river basin district of the Site.

8.18 The EA issued an updated national study on the projected impacts of climate change in November 2018, by the Met Office (UKCP18) (ref.8.11). The EA is expected to release updated guidance on climate change allowances based on UKCP18 in due course (including new guidance on river flows, sea level rise and rainfall intensity), but the extent to which the recommended allowances will vary from the 2017 allowances (if at all) has not yet been confirmed. Until further practice guidance is released, guidance provided by the EA confirms that the continued use of the 2017 climate change allowances is recommended.

Local Planning Policy

8.19 Medway Council Local Plan (MC, 2003) (ref.8.12) does not contain any specific policies related to surface water flood risk and drainage.

8.20 The MC Strategic Flood Risk Assessment (SFRA) [Mott MacDonald, 2006] (ref.8.13), its Addendum (Scott Wilson, 2011) and the High Level Appraisal of Potential Solutions to Manage Flood Risk in the Urban Medway (Scott Wilson, 2011) makes a number of recommendations related to flood risk and drainage throughout Medway and these are:

(i) 2.2.2. The Local Planning Authority will expect the developer to provide an assessment of flood risk, including runoff implications which are appropriate to the nature and scale of the development and the risks involved. This assessment should be submitted with the planning application.
(ii) 3.2.9. Medway Council promote SuDS as the normal drainage practice, where appropriate, for all new developments.
(iii) 3.2.9. SuDS are favoured over traditional piped networks as they mimic natural flow patterns; reducing the developments flood risk; minimising pollution arising from surface water runoff which could enter a watercourse or groundwater; maintaining a groundwater recharge and/or enhancing the quality of wildlife habitats, amenity and landscapes.

8.21 The MC SFRA Addendum made the following additional recommendations:

(i) 6.10. SuDS should be encouraged and could count towards 'reducing flood risk'.
(ii) 6.8. By installing SuDS without arranging for their adoption or maintenance, there is a risk that they will eventually cease to operate as designed and could therefore present a flood risk to the development and/or neighbouring property.
(iii) There is no guidance given in relation to minimum surface water runoff rates, although there is reference to best practice guidance.

8.22 MC Preliminary Flood Risk Assessment (MC, 2011) (ref.8.14) this a high-level overview of flood risk from local flood sources, including surface water, groundwater, ordinary watercourses and canals. The Environment Agency (EA) has used a national methodology, which has been set out by Department for Environment, Food and Rural Affairs (Defra), to identify indicative Flood Risk Areas across England. Of the ten indicative Flood Risk Areas that have been identified nationally, one is located within Medway Council's administrative area. Here is a summary of the findings from this assessment that relate to this Site:

(i) From an overview of historic flooding in Medway, none has been recorded on the site.
(ii) The EA's Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. It was developed specifically for use in PFRAs and only provides a high-level view of the wider areas which might be at risk from groundwater flooding. It does show that there is a potential for groundwater flooding on the Site. However, in common with the majority of flooding datasets showing areas which may experience groundwater emergence, it covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.
(iii) There is no local information available that provides evidence on future groundwater flood risk across Medway and groundwater rebound is not believed to be an issue in the area.

8.23 Surface Water Management Plan Final Revision (SWMP) (AECOM, 2016) (ref.8.15) investigates the risks of surface water flooding and proposes a surface water management strategy for

MC. Surface water flooding is defined as flooding from sewers, drains, groundwater, runoff from land, small watercourses and ditches, which occurs as a result of heavy rainfall. The aim of this SWMP was to understand and resolve complex, high risk surface water flooding problems in urbanised areas. A high-level assessment of the risk of this type of flooding was undertaken within Medway using previous modelling results included in the Local Flood Risk Management Strategy and the EA's updated Flood Map for Surface Water. This process was to determine the level of probable future risk, prioritise higher risk areas for further investigation and identify 'quick win' flood mitigation actions. This identified four priority areas for further consideration and three settlements to be assessed at the intermediate level. The Lower Rainham area was not identified as a high-risk area by this process.

Other Relevant Policy, Standards and Guidance

8.24 The assessment is underpinned by the following guidance and/or best practice: Defra guidance on Flood risk assessment for planning applications, 2017 (ref.8.16).

(i) Preparation and assessment of Flood Risk Assessments and any relevant standing advice relating to vulnerable development and development within critical drainage areas (if applicable).

(ii) The EA has released an update of their 2011 document Adapting to Climate Change: Advice to Flood & Coastal Risk Management Authorities. The update (EA, 2016) reflects an assessment completed by the EA between 2013 and 2015 using updated climate change data to produce more representative climate change allowances for England. The document provides a range of climate change allowances for peak rainfall intensities between 20% and 40%, rather than 30% as previously recommended through the NPPF. The Drainage Strategy has been designed to provide for a 20% increase from climate change, with consideration given to a 40% increase and the effect it would have.

(iii) The EA published its Approach to Groundwater Protection (EA, 2018 (ref.8.17)), an update to the previous GP3 document, to outline their approach to management and protection of groundwater in England and Wales. It provides guidance for landowners and developers whose activities may impact upon groundwater. Given the sensitive hydrogeology of the site, guidance within this document has informed the Drainage Strategy.

(iv) In March 2015, Defra published Non-statutory technical standards for sustainable drainage systems (Defra, 2015 (ref.8.18)). This document contains technical standards for the design, maintenance and operation of SuDS. Its purpose is to guide decision makers considering new surface water drainage schemes.

(v) The method of disposing surface water from sites is prioritised within the Building Regulations Requirement Part H3. It requires that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority: i) an adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable; ii) a watercourse, or where that is not practicable; iii) a sewer.

(vi) Best practice sustainable urban drainage design advice is given in The SUDS Manual (CIRIA, 2015 (ref.8.19)). SuDS drainage can be in a variety of forms, including infiltration trenches, swales, permeable surfaces, detention basins and green roofs.

(vii) Flood estimation for small catchments (Institute of Hydrology, 1994 (ref.8.20)) provides flood estimation equations for deriving catchment runoff rates and volumes. This has been used to determine the existing rate of surface water runoff for parts of the site.

(viii) Water. People. Places. A guide for master planning sustainable drainage into developments (AECOM, 2013 (ref.8.21)) has been prepared by the South East England Lead Local Flood Authorities (LLFAs). The guidance outlines the process for

integrating SuDS into the master planning of large and small developments. The LLFAs expect this guidance to be used as part of the initial planning and design process for all types of development. It states that consideration of the movement of water and its interaction with space at the earliest stage of design is crucial to the success of SuDS and allows the developer to maximise wider benefits.

(ix) Sewers for Adoption (WRc, 2012 (ref.8.22)) contains guidance for the design and construction of sewers that will be adopted by Sewerage Undertakers in England and Wales in accordance with Section 104 of the Water Industry Act 1991. The proposed drainage strategy has been progressed in consideration of the design requirements with this guide.

METHODOLOGY

Assessment Methodology

8.25 The methodology adopted in this assessment has focussed on the identification and evaluation of key sensitive receptors identified and then focussing specifically on identifying impact 'types' and risks which have the potential to have a beneficial or adverse impact on a sensitive receptor. This methodology and criteria for assessment has been developed with reference to a variety of legislative drivers and guidance/best practice documents as described under the Legislation and Planning Policy Context in the preceding section.

8.26 The assessment of potential impacts and significant effects has been designed to be part of an iterative process where the results of the assessment process are inputted into the design of the Proposed Development and the development of the mitigation measures.

8.27 The methods used in undertaking the technical study are outlined in this section with and the key sources of information can be summarised as follows:

(i) The Flood Risk Assessment (FRA), prepared by PBA;
(ii) The Surface Water Drainage Strategy, which is within the FRA;
(iii) Gov.UK online flood map for planning and online surface water flood map (EA, 2018);
(iv) MC Preliminary Flood Risk Assessment (MC, 2011);
(v) MC Strategic Flood Risk Assessment (SFRA) [Mott MacDonald, 2006];
(vi) Gov.UK online flood risk from reservoir map (EA,2018).

8.28 The study area for the water resources and flood risk assessment extends to 1 km from the Application Site boundary to enable the identification of any resources/receptors that may potentially be affected by the proposed development to be identified and the impacts and effects assessed.

Consultation

8.29 **Table 8.1** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 8.1: Summary of Consultation Undertaken to Date

Consultee	Individual/department	Comments
Medway Council	Daniel Atkinson - Flood Risk Officer, Medway Council	Received from Rapleys - Draft Pre-Application Meeting Minutes dated 1st October 2018- Confirmed.
		Received from Rapleys – Pre-Application written response from Medway Council dated 19th November 2018 – 'technical assessments will be required covering.

	Submitted to Medway Council during August 18	Environmental Impact Assessment – Scoping Report (SRS/18-013070) dated 1st August 2018
Environment Agency	Customers & Engagement Team for Kent, South London & East Sussex	EA provided Flood Data - Product 4 data (EA ref KSL 99588 JM, Sep 18)

Significance Criteria

8.30 The significance of the effects is defined using a combination of the value/sensitivity of the potential receptor and the potential consequence of the effect. **Tables 8.2** to **8.4** illustrate how the value of the receptor and the magnitude of the impact determine the significance level of the impact which can be 'Negligible', 'Slight', 'Moderate', or 'Substantial'.

Table 8.2: Sensitivity / value of receptor

Sensitivity/value of a receptor	Example of Receptors
Very High **Receptor of international value**	Human Health: Residential and uses where children are present Groundwater: Source Protection Zone Flooding: NPPF Flood Risk Vulnerability Classification "Essential Infrastructure" or "Highly Vulnerable" Surface Water: General Quality Assessment (GQA) Grade A High Ecological Status Ecology: Special areas of conservation, Special Protection Area, RAMSAR Buildings: World Heritage Sites
High **Receptor of national value**	Human Health: Employment Groundwater: Principal Aquifer Flooding: NPPF Flood Risk Vulnerability Classification "Essential Infrastructure" or "Highly Vulnerable" Surface Water: GQA Grade B Ecology: Site of Special Scientific Interest, National or Marine Nature Reserve Buildings: Conservation Area
Medium **Receptor of regional value**	Human Health: Transient or Limited Access, construction workers* Groundwater: Secondary A Aquifer Flooding: Floodplain providing a moderate volume of storage NPPF Flood Risk Vulnerability Classification "More Vulnerable" Surface Water: GQA Grade C or D Good or Moderate Ecological Status

	Ecology: County wildlife sites, Area of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character
Low **Receptor of local value**	Human Health: Unoccupied Groundwater: Secondary B Aquifer or Secondary (Undifferentiated) Flooding: Floodplain with limited existing development. NPPF Flood Risk Vulnerability Classification "Less Vulnerable" Surface Water: Poor Ecological Status Ecology: Local habitat resources or no designation Buildings: Replaceable or Local value
*** assuming that construction workers will adopt appropriate health and safety and personal protective equipment procedures and therefore sensitivity with respect to hazards is reduced to Low.**	

8.31 Determination of the magnitude of change to the receptors as a result of the scheme has been undertaken based upon the criteria set out in **Table 8.3**.

Table 8.3: Magnitude of Impact

Magnitude of Impact	Description
High	Very large or large change in environmental conditions (e.g. pollution levels, destruction of habitat). This could result in exceedance of Statutory objectives and/or breaches of legislation.
Medium	Intermediate change in environmental conditions.
Low	Small change in environmental conditions.
Negligible	No discernible change in environmental conditions.

8.32 The significance of a potential effect is derived based upon the sensitivity of the receptor and the magnitude of the change. The matrix for assigning the significance of effects is presented as **Table 8.4**, effects of 'Moderate' significance or above are considered significant in EIA terms. The significance of an effect can be beneficial, neutral or adverse. The significance of an effect should also be qualified based on the likelihood of an impact occurring (using a scale of certain, likely or unlikely) and the confidence in the accuracy of the assessment.

Table 8.4: Impact Significance Matrix

	Magnitude of Impact			
Sensitivity/Value of a Receptor	**High**	**Medium**	**Low**	**Negligible**
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible

8.33 The significance of residual impacts (i.e. the impacts that remain after the incorporation of mitigation measures) has been assessed through consideration of their magnitude, duration and nature (i.e. reversible or irreversible) and also the geographic context (e.g. highly localised or widespread). The significance criteria are set out in **Table 8.5**.

8.34 In the absence of 'industry standard' significance criteria for the consideration of hydrology and flood risk impacts, a qualitative approach, based upon available knowledge, experience and professional judgement, is employed, which is summarised in **Table 8.5**.

Table 8.5: Significant Criteria

Significance Level	Significance Level Criteria	Typical Examples
Major Beneficial	Major improvements at catchment scale	○ Fundamental changes to the regional hydrological regime. ○ Fundamental reduction in volume and/or peak discharge of surface water runoff from the Site. ○ Fundamental changes to flow conveyance and floodplain storage.
Moderate Beneficial	Improvements at local scale	○ Moderate changes to the local hydrological regime. ○ Moderate reduction in volume and/or peak discharge of surface water runoff from the Site. ○ Moderate changes to flow conveyance and floodplain storage.
Minor Beneficial	Limited improvements at local scale	○ Some noticeable changes to the local hydrological regime. ○ Some noticeable reduction in volume and/or peak discharge of surface water runoff from the Site. ○ Some noticeable changes to flow conveyance and floodplain storage.
Not Significant	No appreciable impact	○ No noticeable changes to the local hydrological regime. ○ No noticeable change in volume and/or peak discharge of surface water runoff from the Site. ○ No noticeable changes to flow conveyance and floodplain storage.
Minor Adverse	Limited detrimental effects at a local scale	○ Some noticeable changes to the local hydrological regime. ○ Some noticeable increase in volume and/or peak discharge of surface water runoff from the Site. ○ Some noticeable changes to flow conveyance and floodplain storage.
Moderate Adverse	Detrimental effects at a local scale	○ Moderate changes to the local hydrological regime.

		○ Moderate increase in volume and/or peak discharge of surface water runoff from the Site. ○ Moderate changes to flow conveyance and floodplain storage.
Major Adverse	Important detrimental effects at a catchment scale which may become key factors in the decision-making process	○ Fundamental changes to the regional hydrological regime. ○ Pollution of potable sources of water abstraction. ○ Fundamental increase in volume and/or peak discharge of surface water runoff from the Site. ○ Fundamental changes to flow conveyance and floodplain storage.
Severe	Important detrimental effects at sites of national or regional importance which will likely become key factors in the decision making process	○ Fundamental changes to the regional/national hydrological regime. ○ Fundamental increase in volume and/or peak discharge of surface water runoff from the Site. ○ Fundamental changes to flow conveyance and floodplain storage.

BASELINE CONDITIONS

8.35 The baseline situation is the prevailing environmental conditions against, which the potential environmental impacts of the proposals are assessed. The conditions referred to are those applicable at the present time and, unless noted otherwise, seen as those which will prevail with no significant change predicted during the interim period before development works are commenced.

8.36 The water resource related baseline conditions for the site have been identified through the PBA Ground Condition and Flood Risk Assessments.

Present Use

8.37 The Site is divided principally in two main parcels of land, divided by Pump Lane which traverses from the southwest to the northeast through the subject Site. The first area, termed "Pump Farm", is bounded by Pump Lane to the east and Lower Twydall Lane to the west. The second area, termed "Bloors Farm", is bounded by Lower Bloors Lane to the east and Pump Lane to the west.

8.38 Pump Farm is agricultural land with a number of orchards and its associated storage buildings are located closest to its eastern boundary along Pump Lane. On its eastern boundary with Pump Lane there is Russett Farm, which is a small scale housing development. From the site walkover undertaken by a PBA Engineers it was noted that the Pump Farm buildings were used to store farming equipment and materials, with another building used for fruit processing. A free-standing LPG gas tank was located near the buildings. Two chemical storage sheds and a large water tank were also noted alongside the main storage building. It was also advised by the Client that a fuel tank was located inside the main farm building, but it is fully bunded and is placed on hardstanding. The Client advised that there is an abstraction borehole located at the rear of the main storage building that is used for irrigation purposes.

8.39 Bloors Farm is agricultural land with a number of orchards with three residential buildings. From aerial photography there is a water tank present along the south eastern boundary of the Site. The water tank seems to be sited on a concrete plinth with an associated abstraction borehole believed to be used for irrigation purposes. From the site walkover it was noted that a Contractor's compound was present, which is associated with the recent localised residential development to the north east of the Site.

Fluvial Setting

8.40 The site is within Flood Zone 1, with land in this zone being described as having a less than 1 in 1,000 annual probability of river, or tidal flooding (<0.1%), as shown in **Figure 8.1**.

8.41 There are no watercourses on the Site, with the closest one being the Medway Estuary, which is within 300m. From an overview of historic flooding in Medway, it was reported in the PFRA, there has been no fluvial flooding recorded on the Site. Therefore, it is assessed that there is a low risk of fluvial flooding on the Site.

Surface Water Setting

8.42 The Gov.UK online surface water flood map (EA, 2018) is presented in **Figure 8.2** and shows the potential route of surface water exceedance flow paths local to the Site.

8.43 Several surface water flow paths are located adjacent to the Site, with zones of medium (1 in 30 to 1 in 1,000 annual probability) to high (less than 1 in 30 annual probability) flood risk running in a north-easterly direction, e.g. along Pump Lane. There is a more limited extent flow path, of medium to high flood risk, starting mainly on the bridle way before running in a north-easterly direction along Lower Bloor Lane.

8.44 Two potential up to medium risk flow routes are identified running through the centre of the western part of the Site in a north-easterly direction, crossing neighbouring agricultural land and the B2004 Lower Rainham Road, prior to reaching the Rainham Creek Marshes.

8.45 From an overview of historic flooding in Medway, it was reported in the PFRA, there has been no surface water flooding recorded on the Site. Therefore, it is assessed that there is a low risk of surface water flooding on the Bloors Farm site with low to medium on the Pump Farm site.

Groundwater Flooding

8.46 From an overview of historic flooding in Medway, it was reported in the PFRA, there has been no groundwater flooding recorded on the Site and that there is no evidence for there being a future risk across Medway; and groundwater rebound is not believed to be an issue in the area.

8.47 From a review of the available geotechnical information, the depth to the ground water varies from ~ 26m at the higher southwestern end of the Site to ~ 8m at the lower north-eastern end.

8.48 Therefore, it is assessed that there is a low risk of groundwater flooding on the Site.

Flood Risk from Failure of Infrastructure

Sewers

8.49 The SFRA and PFRA do not identify that there has been any historic sewer flooding.

Reservoirs

8.50 There are no reservoirs close enough to impact the Site in the event of a reservoir breach.

Water Mains

8.51 There have been no reported issues with water main bursts causing flooding.

Geology and Ground Conditions

8.52 The Site is partially underlain by Thanet Beds comprising pale yellow-brown, fine grained sand, to a stiff brown sandy clay. These strata are underlain by the Seaford Chalk Formation

comprising firm white chalk with flint seams. Publicly available borehole and trial pit logs within the general vicinity of the Site have generally confirmed the anticipated geological sequence.

Hydrology and Groundwater Vulnerability

8.53 The superficial Head Deposits are considered to be a Secondary (Undifferentiated) aquifer, the Thanet Sand Formation is considered to be a Secondary A aquifer and the Seaford Chalk Formation is considered to be a Principal aquifer. The Site is not located within a groundwater Source Protection Zone (SPZ).

8.54 There are no registered abstractions on the Site. However, the client has advised that a borehole is located to the rear of the main storage buildings, associated with Pump Farm, and is used for irrigation purposes. Another borehole was located during the site walkover towards the eastern boundary of the Site and appears to be part of the irrigation system for the orchard associated with the Bloors Farm site.

Environmental Setting

8.55 The Medway Estuary is located less than 300m northeast of the Site which is classified as being: Site of Special Scientific Interest (SSSI); Special Protection Area (SPA); Marine Nature Reserve; and Ramsar Site.

Summary of Potential Receptors

8.56 Potential receptors at, and adjacent to the Site are set out in **Table 8.6**:

Table 8.6: Summary of Potential Receptors and Sensitivity

Receptor	Description	Sensitivity
Human Health – On-site current users	Farm workers and general public.	High
Human Health – On-site future users	Future residents, school pupils	Very High
Human Health - Neighbours	Owners of houses in Twydall and Lower Rainham. People visiting the adjacent Bloors Lane Community Woodland and Allotment Gardens	Very High
Human Health – Construction/ maintenance workers	Workers constructing the proposed development	Medium
Groundwater - Shallow	Superficial Head Deposits - Secondary Undifferentiated Aquifer	Low
Groundwater - Deep	Seaford Chalk Formation – Principal Aquifer	High
Property – Buildings	Proposed buildings and services	Low
Property - Animal or Crop	Proposed Community Orchard and off-site Allotments and woodland.	Low
Ecological systems	RAMSAR, Special Protection Area and SSSI within 300m from the site.	Very High

IMPACTS

8.57 This section identifies the likely significant water resource impacts resulting from the Proposed Development and considers impacts during construction and once the Development is completed prior to any mitigation.

Construction Impacts

Fluvial Flood Risk

8.58 Due to the low flood risk posed to the Site, which will not alter from the baseline conditions identified, the construction activities are not considered likely to affect flooding within the area, or be affected by external sources of flooding. As such, the construction activities are considered to result in **No Significant** effects, direct or indirect, on flood risk on a short-term basis and at a local or regional scale.

Surface Water

8.59 The surface water drainage system to be installed as part of the Proposed Development will be designed to intercept the majority of contaminants produced as a result of the construction works, such as silty or accidental oily run-off, and prevent any such contaminants entering the local drainage system or ground water. This will be achieved through setting up a surface drainage system to collect site run-off and passing it through oil interceptors and silt separation processes, before discharging to surface water sewers and/or soakaways.

8.60 During this period, contaminants produced as a result of the construction works, such as silty and accidental oily run-off could be directed into the public surface water sewer impacting its correct operation, or discharge to soakaways affecting ground water quality. Accordingly, taking this worst-case scenario, the effect of construction on hydrology is considered to be of low sensitivity and medium impact and therefore to be direct **Minor Adverse** significant effects on a short-term basis and at a local scale.

8.61 The construction of the Proposed Development will occur on existing agricultural land resulting in new large impermeable areas and potentially increased run-off rates leading to on and off-site flooding. The surface drainage strategy for the Site is based on sustainable drainage system (SuDS) principles with a connection to the existing public surface water sewer network, with infiltration drainage to supplement, if further site investigations during detail design shows this is viable. The proposed approach will make use of the network of interconnected swales and flow-controlled attenuation basins to maintain the current greenfield runoff rate, therefore, maintaining the 'pre-development' discharge rate and quality of surface water run-off. The construction activities will be phased such that the proposed drainage system will be in place before the hard surfaces are installed. As such construction will result in **No Significant** effects, either direct or indirect, on a medium-term basis and at a local scale.

Groundwater

8.62 The Principal Aquifer at the Site (underlying superficial deposits and in addition the Thanet Sand formation in places), is classed as having a High sensitivity. The risk of contaminants (such as the inadvertent disturbance of existing contaminated material within the ground and/or the accidental spillage of hydrocarbons) directly entering the groundwater resource is medium to low, even if soakaways are used. Based on this, the direct effect of the construction on groundwater quality is considered to be of medium sensitivity and low impact and therefore of **No Significant** effect on a medium-term basis and at a regional scale.

Foul Drainage

8.63 Reasonable volumes of foul water are likely to be generated during the construction phase. The foul water produced may need to be removed from temporary welfare facilities initially using tankers before permanent facilities are provided, which it should be possible to connect to the existing local drainage system and then through the new foul water drainage system for the proposed development, once installed. As such, the construction of foul water drainage is considered to result in **No Significant** effects, either direct or indirect, on a short-term basis and at a local scale.

Water Supply

8.64 There two likely water demands during the construction process, which are the supply for the construction workers, via their associated welfare facilities, and any construction processes that need a water supply, e.g. on-site batching of concrete. Through the likely proposed phased nature of delivering the development this should mean that the peak number of on-site workers will be kept to a reasonable level, as well as the actual welfare demand being relatively low. If a water-based on-site construction process is selected with the relatively standard residential properties being considered it is unlikely any processes will need continuous high-volumes of water. Based on this, the direct effect of construction on water supply is considered to be of low sensitivity and up to a medium impact and therefore of **No Significant** effect on a medium-term basis and at a local scale.

Operational Impacts

Fluvial Flood Risk

8.65 Given the low flood risk posed to the Site as it is in Flood Zone 1 and due to the proposed drainage system maintaining the baseline conditions, the operational phase is not considered likely to affect flooding within the area. As such the operational phase will have **No Significant** effects, either direct or indirect, on flood risk on a long-term basis and at a local or regional scale.

Surface Water

8.66 The surface drainage strategy for the Site is based on SuDS principles with a connection to the existing public surface water sewer network, with further infiltration drainage to supplement if possible. This approach will make use of the proposed network of interconnected swales and flow-controlled attenuation. This will provide the necessary flood protection, attenuated discharge from the Site and ensure high water quality, so the discharge is at a pre-development rate and quality. Based on this, the operational phase will have **No Significant** effects, either direct or indirect, on surface water discharge rates and water quality on a long-term basis and at a local scale.

Groundwater

8.67 The surface drainage strategy being based on SuDS principles will result in 'good quality' surface water, so if infiltration is possible, there will be **No Significant** effects during the operational phase, either direct or indirect, on groundwater quality on a long-term basis and at a regional scale.

Foul Drainage

8.68 The foul water drainage system will be designed and installed to ensure adequate capacity to service the Proposed Development, with any off-site sewer reinforcements or improvement in existing infrastructure being undertaken. This would ensure the anticipated volume of foul discharge would be adequately managed. As such, the operation phase will have **No Significant** effects, direct or indirect, on a long-term basis and at a local scale.

Water Supply

8.69 While Southern Water (SW) has identified that there is not adequate network capacity to service the overall final development once installed, i.e. water mains to carry the water to the site, they have not said that their current, or planned, water resources cannot cope. This is assumed that this is because SW resources planning has been developed to service the local residential property growth, which this Proposed Development will be partly providing. Assuming this growth will occur with, or without, this development, regionally it could be argued that this Proposed Development is not effectively linked to this impact. At a more local level it may have a medium impact on supplies, as regionally the houses could be built elsewhere. Based on this, the direct effect of the operational phase on water supply is considered to be of low sensitivity and up to a medium impact and therefore of **No Significant** effect on a on a long-term basis and at a local scale.

MITIGATION

8.70 This section presents the mitigation measures that will be adopted.

Construction

Fluvial Flood Risk

8.71 No specific mitigation measures are considered necessary.

Surface Water

8.72 Whilst the surface water drainage system to be installed as part of the Proposed Development will likely intercept the majority of contaminants produced as a result of the construction works, the initial period of the construction phase will be undertaken when there is no formal drainage system, i.e. during the construction of the drainage system itself. To address these short-term, minor adverse significant effects, management and operational systems will be put in place through a CEMP to minimise the potential effects posed to water quality.

Groundwater

8.73 Even though the Proposed Development poses no significant effects to groundwater quality, for best practice reasons, particularly if infiltration is possible and used, reference will be made to the need for appropriate process and procedure to maintain water quality and therefore, it will be made a requirement for this to be covered in the CEMP. For example, to minimise the risk of pollution from oils on site, the CEMP will request details to be supplied of the measures to be used in relation to their storage, use and disposal. It is likely that it will be suggested in the CEMP that environmentally considerate lubricants, such as synthetic, non-toxic biodegradable hydraulic fluids should be used at sensitive locations.

Foul Drainage

8.74 No specific mitigation measures are considered necessary for foul drainage as there will be no significant effects with good site management practices. However, again for best-practice reasons, the need for this will be made a requirement to be covered in the CEMP. For instance, the CEMP will require the contractor to confirm the level of usage of his welfare facilities and identify an appropriate method of disposing of the generated wastewater.

Water Supply

8.75 No specific mitigation measures are considered necessary for water supply as there will be no significant effects with good site management practices. However, again for best-practice reasons, the need for this will be made a requirement to be covered in the CEMP. For instance, the CEMP will require the contractor to use water saving devices in the welfare

facilities and if water on-site construction processes are being considered, with high peak-demands, on-site storage will be specified to help address this.

Operational

Fluvial Flooding

8.76 No specific mitigation measures are considered necessary, as there will be no significant effects when the Development is completed on flood risk. However, measures will be incorporated through detailed design to mitigate any residual localised flood risk including finished floor levels of proposed buildings to be set a minimum of 150mm above final ground level.

Surface Water

8.77 The design of the surface water drainage system to be installed as part of the Proposed Development based on SuDS principles will ensure a high water-quality discharge via to sewer and / or soakaways to the ground water. Based on this, and provided that an adequate maintenance regime is put in place by the adopting authority / management company, no additional measures are considered necessary.

Groundwater Quality

8.78 Given that there will be no significant effects of the operational phase on groundwater quality no specific additional mitigation measures are considered necessary.

Drainage

8.79 The drainage for the completed Development will be designed with adequate on-site capacity and the completion of any offsite improvements, as well as the drainage network installation being provided in line with the phasing of the Development. No specific mitigation measures are necessary.

Water Supply

8.80 Measures will be incorporated through detailed design to reduce water usage of the completed Development. Such measures will include: installation of water efficient bathroom and kitchen devices, and landscaping and open space areas will be designed to have a low water use.

RESIDUAL IMPACTS

8.81 Residual impacts are those that are predicted to remain after implementation of the mitigation measures.

8.82 As a result, with the mitigation proposed in place, there will be N**o Significant** residual effects during either the construction or operational phases.

CUMULATIVE IMPACTS

8.83 Cumulative impacts are identified as impacts that may arise from a combination of a Proposed Development impacts and those of other planned developments in the area identified in chapter 2. There will be **No Significant** cumulative effects.

SUMMARY

8.84 There are no watercourses on the Site, or locally to it, but the Site is located within 300m of the marshes of Rainham Creek, which forms part of the Medway Estuary and Marshes SSSI. The Site is within the Lower Medway catchment.

8.85 The Site lies within fluvial Flood Zone 1 ‘Low Probability’ (less than a 1 in 1000 annual probability of river flooding) and therefore, it is assessed that there is a low risk of fluvial flooding on the Site.

8.86 There are two potential up to medium risk surface water flow routes running through the centre of the western part of the Site in a north easterly direction. It is assessed that there is a low risk of surface water flooding on the Bloors Farm site with low to medium on the Pump Farm site.

8.87 The geology of the Site is general Thanet Beds over Seaford Chalk Formation, where the groundwater is situated. There are no groundwater protection zones as a result of public drinking water being extracted, where risk of contamination is critical, within 500m of the Site. It is assessed that there is a low risk of groundwater flooding on the Site.

8.88 There is no identified flood risk from failure of infrastructure, e.g. sewers or reservoirs.

8.89 Generally, it has been identified that in terms of the likely significant water resource impacts resulting from the proposed development during the construction phase there are likely to be minor significant effects on the hydrology of the site.

8.90 Mitigation during construction will be the use of a CEMP.

8.91 Once the development is completed, there are anticipated to be No Significant effects.

Table 8.7: Summary Table

Description of Likely Significant Effects	Significance	Effects B/A, P/T, D/I, ST/M/LT, L/R/N					Description of Mitigation	Description of Residual Effects	Significance	Residual Effects B/A, P/T, D/I, ST/M/LT, L/R/N				
Construction Phase														
Fluvial Flood Risk	Negligible (not significant)	A	T	D/I	ST	L/R	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water - initial period water quality	Slight adverse (not significant)	A	T	D	ST	L	CEMP to minimise the potential effects posed to water quality	None	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water - flood risk	Negligible (not significant)	A	T	D/I	MT	L	CEMP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Groundwater – High sensitivity Principal Aquifer	Negligible (not significant)	A	T	D	MT	R	CEMP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Foul drainage	Negligible (not significant)	A	T	D/I	ST	L	CEMP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Supply	Negligible (not significant)	A	T	D	MT	L	CEMP	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operational Phase														
Fluvial Flood Risk	Negligible (not significant)	A	P	D/I	LT	L/R	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Negligible (not significant)	A	P	D/I	LT	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Groundwater	Negligible (not significant)	A	P	D/I	LT	R	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Foul drainage	Negligible (not significant)	A	P	D/I	LT	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Supply	Negligible (not significant)	A	P	D	LT	L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

9 GROUND CONDITIONS/CONTAMINATION

INTRODUCTION

9.1 This chapter of the ES has been produced by Peter Brett Associates LLP, now part of Stantec (PBA) and considers the potential significant effects of the proposed development in relation to ground conditions with consideration given to potential ground stability and contamination related impacts.

9.2 The chapter describes the baseline conditions existing at the Site and surroundings, the potential direct and indirect effects of the ground conditions, the methods used to assess the impacts, the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

9.3 This chapter is supported by a Phase 1 Ground Condition Assessment report comprising a Preliminary Ground Stability Risk Assessment and a Tier 1 Qualitative Contamination Risk Assessment presented as **Technical Appendix 9.1** (ref 9.1)**.**

CONTEXT

9.4 This section of the ES discusses the context of the Proposed Development with regard to the relevant international and national legislation, in addition to national and local planning policies.

International/National Legislation

9.5 The role of the planning system is to control future development and land use. UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act 1990 (ref. *9.2)*. Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. The broad approach, concepts and principles with respect to land contamination management in Part 2A should be applied in the determination of planning applications. Part 2A focuses on the identification and remediation of land which in its current use poses an unacceptable risk to people or the environment.

9.6 The assessment of risk arising from contamination and remediation requirements should be considered on the basis of both the current and proposed use. The underlying approach to identifying and dealing with risk and the broad policy objective of safeguarding human health and the environment are similar for both the planning system and Part 2A.

9.7 The Regulations and Statutory Guidance that accompany the Environmental Protection Act, include the Contaminated Land Statutory Guidance for England 2012 (ref. *9.3)* and the Contaminated Land (England) Regulations 2006, which have been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) (ref. *9.4*). The guidance includes a definition of 'risk', where a risk is said to be a combination of *"(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and (b) the scale and seriousness of such harm or pollution if it did occur*".

9.8 The Environmental Damage (Prevention and Remediation) (ref *9.5)* Regulations came into force on 19th July 2015 and implement the European Environmental Liability Directive. The Regulations provide that, for certain activities, where there is an imminent risk of environmental damage, steps must be taken to prevent such damage. If environmental damage has already occurred; the regulations stipulate that the operator of the activity must prevent further damage. The provisions include enforcement procedures including criminal sanctions for breaches of the Environmental Damage Regulations.

9.9 Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwater, but not perched groundwater. The Environmental Permitting (England and Wales) Regulations 2016 (ref. *9.6*) have replaced those parts of the Water Resources Act 1991 that relate to the regulation of discharges to controlled waters (including groundwater). Under the Environmental Permitting Regulations, groundwater activities relate to inputs of pollutants to groundwater. The Environmental Permitting Regulations also replace the Groundwater Regulations 2009 which replaced the Groundwater Regulations 1998.

9.10 The Environmental Permitting Regulations transposed the Groundwater Directive 1980 (GWD), the Water Framework Directive 2003 (WFD) (ref. *9.7*) and Groundwater Daughter Directive 2006 (GWDD) (ref. *9.8*). The GWD remained in force until its repeal in December 2013.

9.11 The GWD was enacted by the Groundwater (England and Wales) Regulations 2009, which were subsumed by the Environmental Permitting Regulations, which clarify four objectives that specifically relate to groundwater quality in the Water Framework Directive (2000):

(i) Achieve 'Good' groundwater chemical status by 2015, commonly referred to as 'status objective';

(ii) Achieve Drinking Water Protected Area Objectives;

(iii) Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as 'trend objective'; and

(iv) Prevent or limit the inputs of pollutants into groundwater, commonly referred to as 'prevent or limit' objectives.

9.12 The Water Act 2003 (Commencement No.11) Order 2012 (ref. *9.9*) brought into full force the amendments in section 86 of the Water Act 2003 for the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be 'significant' to meet the definition of contaminated land.

National Planning Policy

9.13 Section 15, paragraphs 170, 178, 179 and 180 of the NPPF (ref. *9.10*) describe the policy considerations that local planning authorities should have regard to when preparing policies for development plans and in making decisions on applications in respect of land affected by contamination or land instability. After remediation required through the planning process, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990 (Para 178).

9.14 For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use. The NPPF stipulates that planning policies and decisions on planning applications should ensure that:

> *"the 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)"; and that "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." (Para 178).*

9.15 The NPPF stipulates that planning policies and decisions should "contribute to and enhance the natural and local environment", including by "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." (Para 170).

9.16 It is generally considered that a Phase 1 Ground Conditions Assessment (Desk Study and site reconnaissance) is the minimum requirement to support any planning application for a site that might be affected by contamination or land instability.

9.17 Further information on land stability is given in a Planning Practice Guidance Note on "Land stability" published by DCLG in March 2014 (ref. 9.11). Paragraph 001 of this states that *"The planning system has an important role in considering land stability by:*

(i) Minimising the risk and effects of land stability on property, infrastructure and the public;

(ii) Helping ensure that various types of development should not be placed in unstable locations without various precautions; and

(iii) To bring unstable land, wherever possible, back into productive use".

9.18 Paragraph: 006 (Reference ID: 45-006-20140306) states "*A preliminary assessment of ground instability should be carried out at the earliest possible stage before a detailed planning application is prepared. Developers should ensure that any necessary investigations are undertaken to ascertain that their sites are and will remain stable or can be made so as part of the development of the site. A site needs to be assessed in the context of surrounding areas where subsidence, landslides and land compression could threaten the development within its anticipated life or damage neighbouring land or property. Such information could be provided to the planning authority in the form of a land stability or slope stability risk assessment report. Developers may choose to adopt phased reporting, e.g. desk study results followed by ground investigation results*".

Local Planning Policy

9.19 The current Local Plan for Medway Council was adopted in May 2003 (ref *9.12*). Policy BNE23 addresses the issue of development on potentially contaminated land. Policy BNE23 states that:

> *"Development on land known or likely to be contaminated or affected by adjacent or related contamination must be accompanied by findings of a detailed site examination to identify contaminates and the risks that these might present to human health and the wider environment. Appropriate measures to reduce, or eliminate, risk to building structures, services and occupiers of the site and of adjoining sites must be agreed. Such remedial measures must be satisfactorily implemented before the development is occupied."*

9.20 The Medway Local Plan (2012 to 2035) has undergone a consultation exercise on the Development Strategy stage (June 2018). The draft plan consultation is expected to be the winter 2018/19 therefore changes to the Local Planning Policy may need to be considered at a later date.

9.21 At the time of writing this report no information on the future Contaminated Land policies was available for review.

Other Relevant Policy, Standards and Guidance

9.22 The assessment is underpinned by the following guidance and/or best practice:

(i) DEFRA/EA, Contaminated Land Report 11 (CLR 11) 'Model Procedures for the Management of Land Contamination' (ref. *9.13*);

(ii) BS 5930:2015 "Code of practice for ground investigations" (ref. *9.14*); and,

(iii) BS 10175:2011+A1:2013 "Investigation of contaminated sites – code of practice" (ref. *9.15*).

9.23 This assessment adopts a tiered approach to ground condition assessment as set out in the aforementioned documents. The assessment also considers the requirements detailed in the Environment Agency's (EA) "Guiding principles for land contamination" (ref. *9.16)*. The guiding principles documents are a package of three documents (Guiding Principles for Land Contamination (GPLC) 1 to GPLC3) that replaced the EAs 'requirements for land contamination reports' published in 2005. It should be noted that the GPLC documents were withdrawn at the end of 2015 as part of the measures implemented by the EA as they no longer provide guidance. Whilst regulatory endorsement is no longer in place, these documents still provide useful guidance.

METHODOLOGY

Assessment Methodology

9.24 This assessment, which is based on the findings of a Phase 1 Ground Condition Assessment (**Technical Appendix 9.1),** seeks to establish the current baseline conditions in respect of land contamination and stability, before identifying and assessing the potential impacts that may arise due to the Proposed Development, and the effects upon identified receptors from the impacts.

9.25 The study area is defined as the Site and up to a 1km radius from the Site as, based on professional judgement and accepted industry practice, this is considered to represent the likely zone of influence of any impacts on ground conditions or from contamination. Where impacts have the potential for effects further afield than this, this has been identified.

9.26 Within the context of this report, the word 'impact' and 'effect' are used, in accordance with best practice to differentiate between impacts as a consequence of development, and effects upon identified receptors.

9.27 The assessment of the ground conditions at the Site has been undertaken by following a tiered approach as recommended within the industry guidance (namely the Model Procedures for the Management of Contaminated Land):

(i) Tier 1 – a qualitative assessment of historical and published information, together with a site reconnaissance, undertaken in order to develop a preliminary conceptual site model and inform a preliminary risk assessment;

(ii) Tier 2 – an assessment of ground condition data using published generic assessment criteria to screen the site and establish whether there are actual, or potential, unacceptable risks; and (if required);

(iii) Tier 3 - detailed - a quantitative assessment involving the generation of site specific assessment criteria (SSAC).

9.28 For this assessment, a Tier 1 assessment has been undertaken. The results of the Tier 1 assessment form the basis for the baseline conditions and assessment of impacts within this ES chapter.

9.29 The assessment has involved a study of available desk-based information including information from a site walkover survey, readily available information and a Landmark Envirocheck report encompassing the Site and surrounding area to establish local ground conditions and environmental setting.

9.30 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences a source-pathway-receptor methodology is adopted, with the underlying principle that the identification of pollutant linkages consists of the following three elements:

(i) A source/hazard (a substance or situation that has the potential to cause harm or pollution);

(ii) A pathway (a means by that the hazard moves along / generates exposure); and

(iii) A receptor/target (an entity that is vulnerable to the potential adverse effects of the hazard).

9.31 Without a pollutant linkage, the contamination may be a potential hazard but does not constitute a risk unless all three elements are present. Therefore, in assessing the potential for contamination to cause a significant effect, the extent and nature of the potential source or sources of contamination must be assessed, pathways identified, and sensitive receptors or resources identified and appraised, to determine their value and sensitivity to contamination related impacts.

9.32 The methodology adopted in this chapter is qualitative with a progression from factual information (stated with reasonable certainty) regarding the baseline conditions, to appraisal informed by professional judgement and expression of opinions on the relative significance.

9.33 Baseline conditions for the study area have been identified for the purpose of this ES using a Phase 1 Ground Condition Assessment (GCA) for the site, undertaken by PBA in 2018 which presents information on the geotechnical and geo-environmental setting of the Site. The PBA 2018, GCA report is included in **Technical Appendix 9.1** and describes the types and locations of:

(i) Potential Sources of Contamination (PSCs), based on identification of current and historic land use; and

(ii) Potential Geological Hazards (PGHs), (such as ground stability hazards that may result from artificial and natural cavities, and potential adverse foundation conditions that may be affected by compressibility, shrinkage/swelling of clay stratum, groundwater and drainage).

9.34 The PBA 2018, GCA report also identifies the type and sensitivity of potential receptors (including consideration of human health, buildings, groundwater, surface water and certain ecological systems) and identification of possible migration or transportation pathways.

Consultation

9.35 **Table 9.1** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 9.1: Summary of Consultation Undertaken to Date

Consultee	Individual/department	Comments
Medway Council	Stuart Seed – Environmental Protection Officer	Received from Rapleys - Draft Pre-Application Meeting Minutes dated 1st October 2018- Confirmed a phase one contamination assessment would be sufficient with the application.
		Received from Rapleys – Pre-Application written response from Medway Council dated 19th November 2018 – 'technical assessments will be required covering contamination. These reports will be required with any planning application'
	Submitted to Medway Council during August 18	Environmental Impact Assessment – Scoping Report (SRS/18-013070) dated 1st August 2018
Environment Agency	Lucy Payne Customers and Engagement officer. Kent and South London	Closure Report and Environmental Monitoring Data to 2015 pertaining to the adjacent landfill site at the Lower Twydall Chalk Pit
Environment Agency	Russell Bayliss Customer Services Team. Kent, South London and East Sussex	Environmental Monitoring Data to Dec 2017 pertaining to the adjacent landfill site at the Lower Twydall Chalk Pit

Significance Criteria – Land Contamination

9.36 The significance of the effects is defined using a combination of the value/sensitivity of the potential receptor and the potential consequence of the effect. **Tables 9.2-9.4** illustrate how the value of the receptor and the magnitude of the impact determine the significance level of the impact which can be 'Negligible', 'Slight', 'Moderate', or 'Substantial'.

9.37 The classifications have been generated using descriptions of environmental receptor importance and value given in various guidance documents including Guidance for the Safe Development of Housing on Land Affected by Contamination (ref. *9.17*) and Department of the Environment, Transport and the Regions (DETR) Circular 02/2000, Contaminated Land: Implementation of Part 2A of the Environmental Protection Act 1990 (ref. 9.18). Human health and buildings classifications have been generated by PBA using the attribute description for each class based on professional judgement.

Table 9.2: Criteria Used in Ground Conditions for Classifying Receptor Value or Sensitivity

Sensitivity/value of a receptor	Example of Receptors
Very High **Receptor of international value**	Human Health: Residential and uses where children are present; Groundwater: Source Protection Zone Surface Water: General Quality Assessment (GQA) Grade A High Ecological Status Ecology: Special areas of conservation, Special Protection Area, RAMSAR Buildings: World Heritage Sites
High **Receptor of national value**	Human Health: Employment Groundwater: Principal Aquifer Surface Water: GQA Grade B Ecology: Site of Special Scientific Interest, National or Marine Nature Reserve Buildings: Conservation Area
Medium **Receptor of regional value**	Human Health: Transient or Limited Access, construction workers* Groundwater: Secondary A Aquifer Surface Water: GQA Grade C or D Good or Moderate Ecological Status Ecology: County wildlife sites, Area of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character
Low **Receptor of local value**	Human Health: Unoccupied Groundwater: Secondary B Aquifer or Secondary (Undifferentiated) Surface Water: Poor Ecological Status Ecology: Local habitat resources or no designation Buildings: Replaceable or Local value
*** assuming that construction workers will adopt appropriate health and safety and personal protective equipment procedures and therefore sensitivity with respect to contamination (not potential geological hazards) is reduced to Low.**	

Table 9.3: Magnitude of Impact on Ground Conditions

Magnitude of Impact		Description
High	Adverse	A marked impact that causes a key attribute of the receptor to be lost/degraded
	Beneficial	A marked improvement in relation to a key attribute of the receptor
Medium	Adverse	A noticeable impact that exceeds a standard (for example a generic assessment criteria (GAC)) but that does not cause a key attribute of the receptor to be lost/degraded
	Beneficial	Benefit to, or addition of, key characteristics, features or elements or improvement of attribute quality
Low	Adverse	A discernible impact that is below a standard (for example a generic assessment criteria (GAC)) and does not cause a key attribute of the receptor to be lost/degraded
	Beneficial	A discernible improvement in relation to a key attribute of the receptor.
Negligible		No discernible impact

9.38 The matrix for assigning the significance of effects is presented as **Table 9.4**, effects of 'Moderate' significance or above are considered significant in EIA terms.

Table 9.4: Impact Significance Matrix for Assessing Ground Conditions

	Magnitude of Impact			
Sensitivity/Value of a Receptor	**High**	**Medium**	**Low**	**Negligible**
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible

Significance Criteria – Land Stability

9.39 Evaluation of the ground conditions (from a land stability perspective) at the site is based on the suitability of the geomorphological and geotechnical properties of the ground for the intended end use, and the processes and treatment of the ground that may be required to achieve that end use.

9.40 The significance of the effects of these processes has been assessed by comparing the likely impacts of the interactions between these processes and the existing ground conditions. Factors taken into consideration include;

(i) Magnitude, scale and duration of the impact

(ii) The sensitivity of any receptors identified

(iii) The level of risk that an impact will occur

(iv) Effectiveness of any mitigation measures

9.41 For the purposes of this chapter, the following criteria have been adopted to describe the magnitude of impacts.

Table 9.5: Magnitude of Impact (Land Stability)

Magnitude of Impact		Description
High	Adverse	Complete destruction of the affected receptor/feature
	Beneficial	Complete restoration/remediation of the affected receptor/feature
Medium	Adverse	Fundamental adverse changes to the affected receptor/feature
	Beneficial	Fundamental improvements to the affected receptor/feature
Low	Adverse	Limited adverse changes to the affected receptor/feature
	Beneficial	Limited improvements to the affected receptor/feature
Negligible		No discernible impact

9.42 A receptor/feature is classified in terms of its value or sensitivity; the criteria used in this ground conditions chapter are described in **Table 9.6** below. The human health and built environment classifications have been generated by PBA using professional judgement for each class.

Table 9.6: Sensitivity of Receptors (Land Stability)

Sensitivity/value of a receptor	Built Environment	Human health
Very High **Receptor of international value**	Residential, education, employment development, motorways, mainline Railway, power transmission line, gas/oil pipelines. Motorways	Residential and uses where children are present
High **Receptor of national value**	Commercial, A roads, Dual Carriageway,	Construction Workers
Medium **Receptor of regional value**	B Road, branch line railway, power distribution Lines(local)	Public Open Space
Low **Receptor of local value**	Local Services, C Road	Limited Access

9.43 This approach allows any effects of the development during the Construction and Operational Phases to be identified as Beneficial or Adverse (except where negligible) and, depending on the magnitude of the change in impact, to be assessed as being Negligible, Slight, Moderate or Substantial.

9.44 The matrix for assigning the significance of impacts is presented as **Table 9.7**, impacts of 'Moderate' significance or above are considered significant in EIA terms.

Table 9.7: Impact Significance Matrix (Land Stability)

	Magnitude of Impact			
Sensitivity/Value of a Receptor	**High**	**Medium**	**Low**	**Negligible**
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible

Assumptions/Limitations

9.45 Whilst there are some inherent limitations associated with the preliminary studies, the Site is largely structurally undeveloped in nature and mostly undisturbed competent ground. Therefore, it is considered that the level of uncertainty with the land contamination and stability datasets for the Proposed Development is relatively insignificant in the context of the overall scale, condition and nature of the Site.

9.46 It is recognised however that further ground investigation and assessment will be undertaken at the Site following determination of the planning application, and that the information from such studies will be used to further inform and confirm the impact assessment contained herein. It is expected that such studies will be secured through a suitable planning condition.

9.47 Some of the conclusions in this assessment and the PBA 2018, GCA are based on third party data. No guarantee can be given for the accuracy or completeness of any of the third-party data used.

BASELINE CONDITIONS

9.48 Baseline conditions for the Site have been identified through the PBA 2018, GCA as described in Section 9.33 of this chapter. Given the land use (historical and current) across the Site, and baseline data available, the assessment presented herein is considered appropriate for a preliminary characterisation of the Site sufficient for robust environmental assessment testing.

Site History and Present Use

9.49 A description of the historical land use both on-site and off-site is provided in the PBA 2018, GCA presented in **Technical Appendix 9.1.** Within this report the Site has been divided principally as two main parcels of land, divided by Pump Lane which traverses northeast to southwest through the subject site. The first area, termed “Pump Farm”, is bounded by Pump Lane to the east and Lower Twydall Lane to the west. The second area, termed “Bloors Farm”, is bounded by Lower Bloors Lane to the east and Pump Lane to the west.

9.50 Pump Farm has remained as agricultural land with a number of orchards since the mid 1800’s, Pump Farm is located adjacent to the south eastern boundary of this area along Pump Lane. By 1974 a small-scale residential development has occurred immediately north of the site along the Lower Rainham Road. By the map dated 1985 Pump Farm is labelled as a Depot. By the 1990 aerial photography the Pump Farm storage shed has been constructed in its current location. By the aerial photography dated 2006 Pump Farm has been developed into housing but the Pump Farm storage shed remains. From the site walkover undertaken by a PBA Engineers it was noted that the Pump Farm buildings were used to store farming equipment

and materials, with another building used for fruit processing. A free-standing LPG gas tank was located near the buildings. Two chemical storage sheds and a large water tank were also noted alongside the main storage building. It was also advised by the client that a fuel tank was located inside the main farm building but it is fully bunded and is placed on hardstanding. He also advised that there is an abstraction borehole located at the rear of the main storage building that is used for irrigation purposes.

9.51 Bloors Farm has also remained as agricultural land with a number of orchards since the mid 1800's. By 1896 a small building is located along the north eastern boundary, this is later labelled as a Windpump. This area continues to expand with more buildings being added until they are demolished in 2015 and three residential buildings are erected by 2018. From the aerial photography dated July 2013 it was noted that a water tank is present along the south eastern boundary of the Site. From the site walkover it was noted that a Contractor's compound was present associated with the recent localised residential development to the north east of the Site, as previously mentioned. The compound contained associated construction material waste and an associated temporary access track constructed from general demolition rubble. The demolition rubble was described as potentially containing limited amounts of asbestos containing materials. The water tank previously discussed was noted to be cited on a concrete plinth with an associated abstraction borehole believed to be used for irrigation purposes.

9.52 A number of chalk pits were noted on the historical maps off-site with the closet being adjacent to the north-western boundary of Pump Farm named Lower Twydall Chalk Pit. The pit has been subsequently used as an inert landfill, now completed and restored. The Closure Report, obtained from the Environment Agency, indicates the restoration of the site was completed in March 2013, with the site restored currently to rough open ground, with the intention to be restored to agriculture. To date the site appears to remain as rough open ground.

Geology and Ground Conditions

9.53 A description of the anticipated geological sequence at the site is presented in **Technical Appendix 9.1** and summarised here.

9.54 The Site is partially underlain Thanet Beds comprising pale yellow-brown, fine grained sand. These strata, is in turn underlain by the Cretaceous age Seaford Chalk Formation comprising firm white chalk with flint seams. The Thanet Sand is mapped locally as an outlier and thins to the northern, western and eastern boundaries of the Site, but is shown extending beneath the railway line to the south. Superficial Head Deposits comprising clay, silt and gravel are mapped as being present locally to the north of the Site, principally in areas not overlain by Thanet Sand. In particular Head Deposits are found within the narrow shallow valley feature occupied by Pump Lane. Publicly available borehole and trial pit logs within the general vicinity of the Site have generally confirmed the anticipated geological sequence.

Environmental Setting

9.55 The Envirocheck Report, contained within **Technical Appendix 9.1**, identified two landfill sites within 250m of the site, the location of these are shown on Figure 2 within **Technical Appendix 9.1**:

(i) Licence Number: 210049. Name: 'Lower Twydall Chalk Pit'. Category: Inert landfill. Licence Holder: Kent Land Reclamation Ltd.

(ii) Licence Number: Unknown. Name: 'Pump Lane'. Category: Inert Waste. Licence Holder: Unknown.

9.56 Lower Twydall Chalk Pit landfill is located immediately adjacent to the north-western boundary of Pump Farm. The landfill is currently in a period of "Closure", to which

environmental monitoring data provided by the Environment Agency indicates that ground gas concentrations on the perimeter are relatively low, with methane concentrations recorded being below 0.4% and carbon dioxide generally between about 2% and 3.5%. Similarly, groundwater quality monitoring has shown that the Site poses a low risk of contamination.

9.57 Pump Lane Landfill is located approximately 150m south of the Site. The landfill is believed to have been a historical chalk pit infilled with inert waste prior to the construction of the residential area which now surrounds it. Given the scale of the landfill, its age and likely composition and proximity to existing development, it is not considered as representing a significant risk to the Proposed Development, and is not taken forward as a potential offsite source of contamination.

9.58 The Medway Estuary is located approximately 190m northeast of the Site which is classified as being: a Site of Special Scientific Interest (SSSI); a Special Protection Area (SPA); a Marine Nature Reserve; and, a Ramsar Site.

Hydrology and Groundwater Vulnerability

9.59 The superficial Head Deposits are considered to be a Secondary (Undifferentiated) aquifer, the Thanet Sand Formation is considered to be a Secondary A aquifer and the Seaford Chalk Formation is considered to be a Principal aquifer. The Site is not located within a groundwater Source Protection Zone (SPZ).

9.60 There are no registered abstractions on the site. However, the client has advised that a borehole is located to the rear of the main storage buildings, associated with Pump Farm, and is used for irrigation purposes. Another borehole was located during the site walkover towards the eastern boundary of the Site and appears to be part of the irrigation system for the orchard associated with Bloors Farm Site.

9.61 Groundwater levels recorded on available BGS records and also from available groundwater monitoring from boreholes associated with the Lower Twydall Chalk Pit indicate that groundwater levels are between about 4m and 2m AOD (above ordnance datum). The regional groundwater flow is expected to be directed to the north-northeast towards the Medway Estuary. Monitoring date from the Lower Twydall Chalk Pit confirms this flow direction

Land Contamination

Potential Sources of Contamination

9.62 The majority of the Site comprises undeveloped land and has remained as open fields and agricultural farmland. In these areas, it is considered that the likelihood of sources of significant potential contamination being present is Very Low and very localised Low potential in areas used for the storage of chemicals and fuels, and in areas of localised made ground.

9.63 The surrounding land use is predominantly agricultural and residential use and whilst this generally presents a Very Low risk of widespread contamination it is recognised that agricultural storage areas may represent very localised contamination hazards.

9.64 The historical Lower Twydall Chalk Pit landfill site borders the application Site to the northwest and represents a potential geo-environmental hazard. The available factual data received from the Environment Agency indicates that the landfill was filled with Inert Waste arising from the local construction industry. Gas concentrations at the landfill were monitored between 2010 and 2017 as part of the landfill closure procedure; the monitoring wells located around the perimeter of the landfill recorded very low concentration of ground gases, with methane recorded below 0.3% and carbon dioxide below 3.5%. Furthermore, groundwater quality monitoring undertaken at the Site has not revealed any significant groundwater

contamination occurring. Furthermore, it is noted that this landfill is located down/cross - gradient of the site. Therefore, it is unlikely any contaminants will be mobilised from the landfill and transported onto the Site. This suggests that fugitive emissions from the landfill site onto the Site are likely to be negligible and the landfill does not constitute a significant source of potential contamination. The risk associated with the landfill is considered to be **Low.**

Summary of Potential Receptors

9.65 Potential receptors at and adjacent to the Site have been identified as part of the GCA and are set out in **Table 9.8** below:

Table 9.8: Summary of Potential Receptors and Sensitivity

Receptor	Description	Sensitivity
Human Health – On-site current users	Farm workers and general public.	High
Human Health – On-site future users	Future residents, school pupils	Very High
Human Health - Neighbours	Owners of houses in Twydall and Lower Rainham. People visiting the adjacent Bloors Lane Community Woodland and Allotment Gardens	Very High
Human Health – Construction/ maintenance workers	Workers constructing the proposed development	Medium
Groundwater - Shallow	Superficial Head Deposits - Secondary Undifferentiated Aquifer	Low
Groundwater - Deep	Seaford Chalk Formation – Principal Aquifer	High
Property – Buildings	Proposed buildings and services	Low
Property - Animal or Crop	Proposed Community Orchard and off-site Allotments and woodland.	Low
Ecological systems	RAMSAR, Special Protection Area and SSSI approximately 190m from the site.	Very High

Land Stability

Potential Geological Hazards

9.66 The majority of the Site is undeveloped and therefore undisturbed natural ground. The potential geological hazards that have been identified as part of the GCA are set out in **Table 9.9** below:

Table 9.9: Summary of Geological Hazards

Description	Hazard Classification
Coal Mining Affected Areas	Not in a Coal mining area
Collapsible Ground Stability Hazards	Very Low
Compressible Ground Stability Hazards	Very Low
Dissolution Hazard	High
Landslide Ground Stability	Low
Running Sand	Very Low
Shrinking or Swelling Clay	Low/Very Low

9.67 From this assessment, Dissolution is taken forward as a Potential Geological Hazard. There is a possibility that localised areas of limited thicknesses made ground may be present on the Site this is therefore also taken forwards as a Potential Geological Hazard.

Embedded Mitigation

9.68 Prior to construction a site characterisation ground investigation will be undertaken at the site to identify the need, development and agreement of a remedial strategy such that as part of the construction stage that areas of land contamination or land instability are appropriately considered, and mitigation measures put in place. Such works will be agreed with the regulatory authorities.

9.69 During construction works, potential sources of contamination may be introduced to the Site on a transient basis, including fuel storage for construction plant, bulk cement and more minor storage and use of construction products. Impacts, provided that these materials are properly controlled, are not expected to be significant.

9.70 Mitigation measures will be designed in accordance with BS 6031:2009 (ref. 9.20), BS 8004:2015 (ref. 9.21), CIRIA C649 (ref. 9.22) and CIRIA C648 (ref. 9.23). Embedded mitigation measures would include adherence to good practice guidelines and could potentially involve the following:

(i) Soils which are to be reused onsite would be tested for suitability. This would form part of a site materials and waste management strategy which would be drafted prior to construction and would focus on the re-use, recycling and reduction of waste spoil; Any additional soil materials that are to be imported to the Site would be required to be certified to ensure that contaminative materials are not being introduced to the area. This would be undertaken in accordance with the Waste Duty of Care Code of Practise (ref. 9.24) and the excavation and reuse of materials would be undertaken in accordance with a Materials Management Plan (MMP);

(ii) Any vegetation, topsoil and subsoil would be removed to expose a suitable sub-grade. Any soils, sub-soils or aggregate suitable for reuse would be stockpiled appropriately in accordance with a MMP;

(iii) In order to limit disturbance, site access tracks and defined compound areas would be constructed first to allow controlled movement of vehicles around the Site;

(iv) Stockpiles will be sited a minimum distance from watercourses to avoid pollution run-off;

(v) During construction, silt traps and oil interceptors would be placed in drains on site. No untreated surface or waste waters would be allowed to drain into water bodies during construction, operation or decommissioning. Where necessary appropriate consents from the local water or Sewerage Company and/or the Environment Agency would be obtained. The disposal of this effluent would be the responsibility of the contractor. If necessary, this water would be tanked off-site for disposal at a suitable facility;

(vi) All oil and chemical storage tanks and areas where drums are stored would be surrounded by an impermeable bund sized to contain 110% of capacity. In addition, multiple tanks or drums would be within bunds sized to contain the greater of 110% of the capacity of the largest tank or 25% of the total tank's contents;

(vii) All foundations would be appropriately specified to resist chemical attack from soils or groundwater; and

(viii) Foundations and underground infrastructure would also be designed so as not to present a preferential pathway for contaminant migration, if present at the Site, this may include the provision of a Foundation Works Risk Assessment (FWRA) and the use of EA guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination (*ref. 9.24*).

9.71 Further, specific mitigation measures could include, for example; removal of as yet undetermined contamination hotspots following a site characterisation ground investigation, development and agreement of remedial strategies with regulatory authorities, and dealing with unforeseen ground conditions.

9.72 Appropriate design requirements will be specified within the new buildings to mitigate against any residual risks from land and water quality and the associated geological hazards. For example, the design and depth of foundations, and ground infiltration systems (soakaways) would take account of the potential dissolution risk determined from the results of proposed ground investigation.

9.73 The principal risk to soils and controlled waters following construction will result from the potential migration of pollutants associated with uncontrolled/accidental spillages or discharges from the development activities. Measures will be proposed to mitigate against such risk and will follow good practise, such as the use of trapped gulley's, interceptors etc.

9.74 The risk to site workers during any subsequent maintenance works would relate to the risk of skin contact, inhalation and ingestion of any residual as yet undetermined contaminated material on the Site. In accordance with current health and safety legislation, the contractor will be required to adopt measures to mitigate the risk to site workers and as such would be considered to be low.

IMPACTS

Land Contamination

9.75 The features of the Proposed Development that are relevant to the effects related to land contamination are those that would change the impacts arising from the potential for a significant source of contamination, pathway or receptor to be present. The assessment has been carried out with respect to the most likely effects that may occur in relation to the proposed development. The possible effects are presented in **Table 9.10** with respect to each of the receptors identified.

Table 9.10: Description of Effects (relative to receptors) – Land Contamination

Receptor	Description
Human Health	Skin contact, inhalation or ingestion of contaminated soils, surface water and groundwater. Death or injury by inhalation or explosion of ground gases. Death or injury by inhalation of harmful in-ground vapours.
Groundwater	Movement of contaminants by surface water infiltration, groundwater flows and drainage. Leaching of contaminants from the near-surface soils.
Built Environment	Movement of contaminants by surface water infiltration, groundwater flows and drainage. Leaching of contaminants from the near-surface soils.
Ecological Systems	Deterioration or change in conditions resulting in loss or damage to system.

Construction Impacts

9.76 During the construction stage of the Proposed Development, the number of and length of time that site workers would be on the Site will increase compared with currently. The activities that site workers are likely to be involved in, e.g. excavations etc. may also provide a new potential pathway between the receptor (site worker) and any potential sources of contamination that have been identified.

9.77 **Construction Workers**: The majority of the Site is currently undeveloped and the potential for land contamination to be present in these areas is Very Low, the magnitude of impact is considered to be negligible and as such, without any mitigation, the potential significant impact on construction workers in these areas is considered to be **Negligible**. The exception relates to any areas where the potential for land contamination to be present is Low, the magnitude of impact is considered to be low and as such the potential significant impact on construction workers without mitigation is considered to be **Negligible**. Prior to construction as set out in section 9.68 above, a site characterisation ground investigation will be undertaken at the site to identify the need, development and agreement of a remedial strategy such that as part of the construction stage that areas of land contamination are appropriately considered, and mitigation measures put in place.

9.78 **Groundwater**: The presence of a Principal Aquifer at the Site (underlying superficial deposits and in addition the Thanet Sand formation in places) which is classed as having a High sensitivity, the magnitude of impact is currently considered to be Low which, following ground investigation and implementation of remediation, if required, would reduce to **Negligible**.

9.79 **Ecology**: It is considered that due to the fact there is currently a Very Low to Low potential for contamination to be present on the Site, migration of any potential localised contaminants is limited and the distance of the ecological receptors and, following ground investigation and implementation of remediation, if required, would result in a **negligible** magnitude of impact. Given the Very High sensitivity of the receptor the potential significant impact on the Medway Estuary and Marshes SPA/SSSSI/Ramsar following implementation of any remediation, if necessary, would be **Slight Adverse.**

Operational Impacts

9.80 **On site users**: The majority of the Site is currently undeveloped and the potential for land contamination to be present in these areas is Very Low. It is assumed that as part of the Construction stage that necessary remedial works will have been undertaken, informed by a ground investigation and agreed remedial strategy. The exception relates to areas where the potential for land contamination to currently be present is Low. As such it is considered that whilst there is an increase in receptor sensitivity given the residential use of the site, compared to the current land use, the magnitude of impact will have been reduced to Negligible and as such the potential effect is **Slight**.

9.81 **Groundwater**: The presence of a Principal Aquifer at the Site (underlying superficial deposits and in addition the Thanet Sand formation in places), results in the Site as having a High sensitivity. Whilst there is an increased built development (therefore reduced infiltration potential), it is assumed that remedial action, as determined through ground investigation at the site, will have been undertaken as part of the construction stage works and as such the potential effect is **negligible**.

9.82 **Built Environment**: Whilst there is currently a Very Low to locally Low potential for contamination to be present across the Site, it is assumed that remedial action, as determined through ground investigation at the site, will have been undertaken as part of the construction stage works and as such the potential effect is **negligible**.

9.83 **Ecology**: It is considered that due to the Very Low/Low potential for contamination to be present on the Site, and any remedial action undertaken as part of the construction stage remedial action, as determined through ground investigation at the site, will have been undertaken as part of the construction stage works and as such the potential effect is **negligible**.

Land Stability Impacts

9.84 The potential effects are presented in **Table 9.11** with respect to features/receptors and the potential geological hazards identified.

Table 9.11: Description of Effects – Land Stability

Receptor	Description
Human Health	Injury due to ground movement due to dissolution.
Built Environment	Damage to buildings and infrastructure due to ground movements related to dissolution. (Operational Phase only)

Construction Impacts

9.85 **Human Health**: During the construction stage the number and length of time that site workers would be on the Site will increase compared to the baseline. The potential significant impact on site workers from the identified geological hazards, with a magnitude of impact being medium, is considered to be **Slight Adverse.** Prior to construction as set out in section 9.70 above, a site characterisation ground investigation will be undertaken at the site to identify the need, development and agreement of a remedial strategy such that as part of the construction stage that areas of land contamination are appropriately considered, and mitigation measures put in place. Such works will be agreed with the regulatory authorities.

Operational Impacts

9.86 **Human Health**: The completed Development will comprise built development across the Site and there will be increased numbers of site users who will be within the Site for longer periods compared to the baseline. Whilst there is an increase in receptor sensitivity, remedial action and mitigation in design undertaken as part of the construction stage, as determined through ground investigation at the site, will have been undertaken as part of the construction stage works and as such the potential effect is **negligible**.

9.87 **Built Environment:** The potential significant impact from ground movement following the completion of the Development associated with dissolution is considered to have a potential significance impact of Moderate Adverse, due to the very high receptor sensitivity and the low magnitude of impact.

MITIGATION

9.88 This section presents the mitigation measures that will be adopted and provides a re-assessment of the potential effects identified in the sections above, post mitigation.

Land Contamination

9.89 It is anticipated that an appropriate ground investigation will be undertaken prior to Development, including ground gas monitoring and geoenvironmental testing of soils and groundwater, to confirm the nature of the ground conditions, refine the Conceptual Site Model if necessary, update the risk assessments, and to enable any remediation or specific mitigation measures in respect of land contamination to be agreed with the regulatory authority and implemented. It is a presumption that all construction activity will commence after further ground investigation has been carried out, in accordance with good practice, statutory controls, including appropriate PPE for construction workers, and in order to meet the intended end use of a particular development parcel.

9.90 If any potential contamination is identified following the ground investigation, example mitigation in the design of the proposed development could be the provision of a sufficient clean cover within soft landscaping areas, if required, to prevent prolonged skin contact, inhalation and ingestion of contaminated soils.

Construction

9.91 **Construction Workers:** To mitigate any potential significant impact, resulting from any identified or unidentified contamination as part of the construction stage, appropriate protective clothing and equipment will be worn by site workers; and good standards of hygiene adopted to prevent prolonged skin contact, inhalation and ingestion of soils during construction. In addition, the methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site. Good working practices such as appropriate protective clothing and equipment, inclusion of tool box talks and watching briefs for unexpected contamination should also be adopted.

9.92 To mitigate any potential effect associated with the inhalation of potentially hazardous ground gases, appropriate ventilation will be provided to all confined spaces and appropriate procedures adopted to ensure they are checked for hazardous gases prior to man-entry.

9.93 It is considered that the mitigation measures will reduce the potential significant impact on site workers to **Negligible**.

9.94 **Groundwater:** To mitigate any potential significant impacts prior to commencement of development a ground investigation will be undertaken across the Site, and this will identify any existing contamination and any specific mitigation measures that may be required. In

areas of significant impact, and elsewhere as identified during the Site investigation, appropriate mitigation (if necessary) will be carried out if a potential significant impact is identified. In addition, the design of foundations for buildings and structures will avoid techniques that will create potential pollution pathways, and best practice construction techniques will be used.

9.95 It is considered that following implementation of the mitigation measures the potential significant impact on groundwater will be **Slight Beneficial**.

9.96 **Ecology:** It is considered that following implementation of the mitigation measures mentioned above the potential significant impact on ecological systems will be **Slight Beneficial**.

Operational

9.97 **Site Users:** To mitigate any potential significant impact on human health associated with contact or ingestion of contaminated soils, and/or the inhalation of potentially hazardous ground gases (in areas adjacent to the Landfill), the proposed ground investigation will enable refinement of the site conceptual model and appropriate risk assessment which will then lead to development of appropriate mitigation measures as necessary. In relation to any land gas issues, should they arise, appropriate gas protection measures will be designed after gas monitoring and gas risk assessment has been completed (if required) and implemented during the construction stage. Such measures could include a proprietary gas resistant membrane and/or passively vented under floor sub-space (as appropriate and determined in accordance with BS8485:2015).

9.98 It is considered that following investigation and assessment, and implementation of mitigation measures (if needed) during construction the potential effects on site users will be **Slight Beneficial.**

9.99 **Groundwater:** Following construction and during operation of the Site the surface water system will incorporate appropriate measures to ensure any contaminated water does not reach the groundwater as a result of accidental spillage or leaks during the Site operation.

9.100 It is considered that following implementation of the mitigation measures mentioned above and in previous sections the potential significant impact on groundwater will be **Slight Beneficial**.

9.101 **Ecology:** It is considered that following implementation of the mitigation measures mentioned above the potential significant impact on ecological systems will be **Slight Beneficial**.

Land Stability

9.102 This section presents the additional mitigation measures that will be adopted and provides a re-assessment of the potential effects identified in the sections above, post mitigation.

9.103 It is anticipated that appropriate ground investigation will be undertaken prior to development, to determine the nature of the ground conditions and any potential geological hazards, and enable any specific remediation or mitigation measures in respect of land stability to be determined.

9.104 The development design will include foundation and other infrastructure and drainage construction design elements appropriate for the encountered ground conditions and the land stability risk assessment. Such measures may include as necessary reinforced strip or trench fill or grillage foundations with minimum widths and cantilever spans, and employing appropriate standoff distances for the location of soakaways from foundations or primary infrastructure.

9.105 It is a presumption that all construction activity will commence after full ground investigation is completed, in accordance with good practice.

9.106 It is considered that following the mitigation measures the potential significant impact from Land Stability will be **Slight Beneficial**.

RESIDUAL IMPACTS

9.107 Residual impacts are those that are predicted to remain after implementation of the mitigation measures described above.

9.108 The Proposed Development will result in the investigation and assessment of the Site prior to commencement of the Development, from a land contamination and suitability for proposed end use perspective. The investigation and assessment will identify any areas where there is a hazard and subsequent remediation/mitigation is necessary. Therefore, following the implementation of the mitigation measures described above, residual effects during both the construction and the operation stages of development with reference to potential land contamination will be at worst **Negligible.**

9.109 It is considered that subject to the mitigation measures described above, residual effects during both the construction and the operation stages of development with reference to potential geological hazards it is considered that there will **no significant residual effects.**

CUMULATIVE IMPACTS

9.110 Construction of the Pump and Bloor Site could occur simultaneously with some other developments identified.

9.111 Given the geological and hydrogeological setting of the Site, and its distance from the majority of the other developments, it is considered that there is no significant linkage or association between the developments and the Pump and Bloor Farm site and consequently no cumulative ground condition effects will result.

9.112 The only exception to this is the Site denoted A1, Land South of Lower Rainham Road, which includes land currently forming the Lower Twydall Chalk Pit landfill area. There is currently no planning information regarding this site however it is assumed that this site will be subject to review through the planning regime and would incorporate their own site specific mitigation measures, as required, to address any potential changes in land gas regime and groundwater conditions and management and monitoring, then it is anticipated that there would be **No effects** in relation to cumulative construction impacts to ground conditions.

SUMMARY

9.113 This assessment of ground conditions has been undertaken to identify the likely potential significant effects of the Proposed Development in relation to ground conditions with consideration given to potential ground stability and contamination related impacts. This assessment is informed by undertaking a Phase 1 Ground Condition Assessment Report which comprised a Preliminary Ground Stability Risk Assessment and a Tier 1 Qualitative Contamination Risk Assessment which was used to establish the current baseline conditions and assessment of impacts within this ES Chapter.

9.114 The Site is underlain by the Thanet Sand Formation or Superficial Head Deposits which in turn overlie the Seaford Chalk Formation. Whilst the Site is located in close proximity to Lower Twydall Chalk Pit landfill, the environmental monitoring of that site to date, does not indicate that there are significant risks associated with offsite sources of land gas or contaminated land/groundwater.

9.115 Based on historical and current land use, the potential for contamination to be present at the Site is Very Low with very limited areas being Low. There are therefore no currently identified significant geo-environmental risks at the Site which would preclude development for the proposed end use.

9.116 The receptors considered in the assessment are those receptors identified in statutory guidance. The importance of each receptor is classified in one of five bands with a Very High classification associated with receptors of national or international importance. Human health has been identified as receptors of high to very high importance/sensitivity, ecological systems has been identified as being of very high sensitivity, whilst groundwater has been identified as being of high sensitivity.

9.117 A review of potential geological hazards has identified the risk of land instability or potentially adverse foundation conditions to be present, in general, to be High. This is due to the risk of solution features associated with the dissolution of the Seaford Chalk Formation underlying the Site.

9.118 It is considered that provided further characterisation of the ground is obtained through a Phase 2 intrusive ground investigation and subsequent remediation and/or mitigation measures are adopted (if required), and that appropriate design and construction methods are used for the development, this will, in themselves, provide mitigation against the potential issues and reduce residual impacts to an acceptable level. The residual impacts on the Proposed Development, following mitigation, from contamination is considered to be, at worst, Negligible in relation to harm to construction workers during the construction phase and at worst Negligible during the operational phase in relation to damage to the built environment.

9.119 The residual impacts on the Proposed Development, following mitigation, from land stability is considered to be, at worst, Negligible during the construction phase in relation to harm to construction workers and, at worst, Slight Beneficial during the operational phase in relation to harm to site workers and damage to the built environment.

9.120 It is concluded that the potential residual impacts, associated with contamination and land stability do not pose an unacceptable constraint to the Proposed Development.

Table 9.12: Summary Table

Description of Likely Significant Effects	Significance	Effects				Description of Mitigation	Description of Residual Effects	Significance	Residual Effects				
		B/A	P/T	D/I	ST/M/LT	L/R/N				B/A	P/T	D/I	ST/M/LT	L/R/N
Demolition and Construction Phase														
Harm to construction workers - Contamination	Negligible	T,D,ST,L					Described in section 9.68-9.74	None	Negligible	T,D,ST,L				
Contamination of groundwater	Negligible	A,T,D,ST,N					Described in section 9.68-9.74	None	Negligible	B,T,D,ST,N				
Harm to ecological systems - contamination	Slight adverse	A,T,I,ST,N					Described in section 9.68-9.74	None	Slight adverse	B, T, I St, N				
Harm to construction workers – land stability	Slight adverse	A, T, D, ST, L					Discussed in section 9.104-9.198	None	Negligible	T, D ST, L				
Operational Phase														
Harm to site users - contamination	Slight adverse	A, P, D, LT, R					Described in section 9.99	None	Negligible	B. P, D, LT, L				
Contamination of groundwater	Negligible	A, P, D, LT, N					Described in section 9.101	None	Negligible	B, P D LT, N				
Harm to ecological systems - contamination	Slight adverse	A, P, I, LT, N					Described in section 9.103	None	Negligible	B, P, I, LT, N				
Damage to built environment - contamination	Negligible	P, D, LT, L						None	Negligible	P, D, LT, L				
Harm to site users – land stability	Moderate adverse	A, P, D, LT, R					Discussed in section 9.104-9.108	None	Slight adverse	B, P. D. LT, R				

Damage to built environment and ground – land stability	Moderate adverse	A, P, D, LT, L	Discussed in section 9.104-9.108	None	Slight adverse	B, P, D, LT,L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

10 TRANSPORTATION

INTRODUCTION

10.1 This chapter of the ES assesses the impact of the Proposed Development on transport and highway effects. This chapter has been prepared by David Tucker Associates.

10.2 This assessment considers the potential transport and highway impacts of the proposals including the impact of construction traffic and development generated traffic on the capacity and safety of the surrounding road network, and the implications for public transport and pedestrian and cycling movements.

10.3 Full details of the above are provided within the Transport Assessment (TA) provided as **Technical Appendices 10.1**, **10.1sup** (relating to Technical Notes 1,2,3 providing information on highway safety, walking/cycling/horse riding assessment, educational trip generation and analysis of sensitivity test data) and **10.1 sup (September 2020)** (providing further information on accident data and analysis, on the access arrangements to the site, minor amends to traffic assignment on the wider network and further information on the public transport strategy). A Framework Travel Plan was also prepared to support the application and is included as **Technical Appendix 10.2a.**

10.4 Where necessary, details of the mitigation measures required to prevent, reduce, or offset identified traffic impacts associated with the Proposed Development are stated in this chapter. The resulting residual impacts are also reported, which assumes that mitigation will be applied.

CONTEXT

10.5 This section of the ES discusses the context of the Proposed Development with regard to national and local planning policies.

Planning Policy

National Planning Policy Framework

10.6 The Government's overall planning policies for England are described in the revised NPPF (ref.10.1). The NPPF states that "…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".

10.7 It further states as Paragraph 111 that "All development that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed".

Kent County Council Local Transport Plan (KCC LTP4)

10.8 The LTP4 (ref 10.2) has been adopted and the document strategies and policies cover the period from 2016-2031. The LTP4 aims to ensure that Kent County grows in a consistent and sustainable manner.

10.9 The LTP4 has 4 key outcomes which it aims to achieve through a set of policies;

> *Outcome 1) Economic growth and minimised congestion: Deliver resilient transport infrastructure and schemes that reduce congestion and improve journey time reliability to enable economic growth and appropriate development, meeting demand from a growing population.*

Outcome 2) Affordable and accessible door-to-door journeys: Promote affordable, accessible and connected transport to enable access for all to jobs, education, health and other services.

Outcome 3) Safer Travel: Provide a safer road, footway and cycleway network to reduce the likelihood of casualties, and encourage other transport providers to improve safety on their networks.

Outcome 4) Enhanced Environment: Deliver schemes to reduce the environmental footprint of transport and enhance the historic and natural environment.

Outcome 5) Better Health and Wellbeing: Provide and promote active travel choices for all members of the community to encourage good health and wellbeing, and implement measures to improve local air quality.

The Kent Design Guide

10.10 The adopted Kent Design Guide (KDG) (ref 10.3) seeks to promote *a "Common approach to the main principles which underlie Local Planning Authorities criteria for assessing planning applications. It also seeks to ensure that the best of Kent's places remain to enrich the environment for future generations".*

10.11 Planning Authorities in Kent will adopt this guide as a supplementary Planning Document so that it can be a material consideration in determining planning applications.

10.12 The KDG includes various sections which all outline expected standards and policies which new developments should adhere to. These include;

(i) "Developments should be permeable and linked to the surrounding network, allowing safe, direct routes for pedestrians and cyclists. Direct routes through developments should be provided for walkers and cyclists'.
(ii) 'Homezone' developments are required to adhere to the following guidelines:
(iii) Traffic speeds restricted to around 10mph
(iv) High quality hard paving
(v) Strong enclosure of the public access space
(vi) Minimal front gardens
(vii) Careful planting of trees within the public area
(viii) Integration within the overall network of streets, making them part of a through route system.
(ix) Speed reducing features should be an intrinsic part of any layout and should be a combination of urban form and carriageway alignment.
(x) To enable drivers to both, see and be seen at junctions, around cures and at entrances to premises, it is necessary to provide clear unobstructed visibility related to the anticipated vehicle speeds.
(xi) The need for turning facilities should generally be avoided by designing layouts with through routes.
(xii) Consideration should be given in new development to the size and type of vehicles that need access and – for emergency service vehicles – the provision of 'standing' space.
(xiii) Access for fire appliances must be considered at the initial design stage.
(xiv) The materials used in the public realm are important in the creation of quality places.
(xv) The Better Homes: Localism, Aspiration and Choice Document".

METHODOLOGY

10.13 This section provides details of the data and information supplied for the purposes of undertaking the traffic assessment. It also describes the adopted methodology for assessing and appraising the potential traffic impacts associated with the construction and operation phases of the Proposed Development.

Study Area

10.14 The following junctions have been considered within the Transport Assessment:

(i) Lower Rainham Road/ Yokosuka Way/Gads Hill;
(ii) Beechings Way/ Yokosuka Way/ Cornwallis Avenue/ Ito Way;
(iii) A2/ Ito Way;
(iv) Hoath Way/ London Road/ Twydall Lane;
(v) Pump Lane/ A2 London Road;
(vi) Bloors Lane/ A2 London Road;
(vii) Beechings Way/ Pump Lane priority; and
(viii) Beechings Way/ Pump Lane mini roundabout.

10.15 Further wider assessment in terms of M2 and further afield is considered in terms of air quality impacts.

Traffic Flow Assessment

10.16 Traffic flows before and after the Proposed Development are quantified in terms of the AM peak hour (0800-0900) and the PM peak hour (1700-1800), and daily traffic movements. The Development will pass through a number of stages in its lifetime during which the volume and type of traffic will lead to different environmental impacts. The scenarios considered within this traffic and transport chapter include for the purposes of appraisal:

(i) Base Year (2018): This is representative of existing traffic levels;
(ii) Base Year (2029): This is the future year, 10 years after application submission without the Proposed Development.
(iii) Base Year (2029) + Development: This is the future year with the Proposed Development.

Assessment Approach

10.17 The Institute of Environmental Management and Assessment (IEMA), formerly the Institute of Environmental Assessment (IEA) has prepared "Guidelines for the Environmental Assessment of Road Traffic "(IEA 1993)" (ref 10.4) which sets out the recommended list of environmental impacts which could be considered as potentially significant whenever a new development is likely to give rise to changes in traffic flows. These are:

(i) severance;
(ii) driver delay;
(iii) pedestrian delay and amenity;
(iv) accidents and safety;
(v) hazardous loads; and
(vi) fear and intimidation.

Severance

10.18 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic route. Whilst the IEMA Guidelines refer to the effect of traffic on severance of 30%, 60% and 90% producing "slight", "moderate" and "substantial" changes in severance respectively, it is suggested that caution be applied to relying on this quantum

of change. The consideration of severance in this assessment has had due regard to specific local conditions, in particular, the location of pedestrian routes to local facilities and whether crossing facilities are provided or not.

Driver Delay

10.19 Traffic delays to 'non-development' traffic can occur:

(i) at the Site entrances where there will be additional turning movements;
(ii) on the highways passing the Site where there may be additional flow; and
(iii) at key junctions on the nearby highway network.

10.20 Effect on driver delay is based on the quantum of change in traffic levels against interpretation of the local highway link capacity expressed in terms of predicted flows.

Pedestrian Delay

10.21 The Proposed Development will bring about increases in the number of vehicle movements during the construction and operational phases. In general terms, increases in traffic levels are likely to lead to greater increases in delay to pedestrians seeking to cross-roads. The IEMA Guidelines recommend that, rather than rely on thresholds of pedestrian delay, the assessor should use judgement to determine whether pedestrian delay is a significant impact. This is the approach which has been adopted for the purposes of this assessment.

Pedestrian Amenity

10.22 This is broadly defined 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 IEMA Guidelines cite a doubling of traffic flow (or its lorry component) as representing a threshold for effect evaluation. This measure is considered within the assessment that follows.

Fear and Intimidation

10.23 This again relates to pedestrians, and shares characteristics with pedestrian amenity. There are no commonly agreed thresholds for estimating danger, but research work is cited setting out "degree of hazard" levels relating to 18 hour average traffic flow, 18 hour HGV flow and average vehicle speed. These levels are considered within the assessment that follows in terms of effect.

Accidents and Safety

10.24 The Personal Injury Accident (PIA) record for the local and strategic highway network has been obtained for the most recently available 5 year period. The effect of additional traffic from the Proposed Development is considered in terms of the magnitude of traffic increase and existing accident record data.

Hazardous Loads

10.25 The IEMA Guidelines acknowledge that most developments will not result in increases in the number of movements of hazardous/dangerous loads.

Assessment of Significance

10.26 The significance of an effect is determined by the interaction of the following two factors:

(i) the magnitude, scale or severity of the effect or change, and
(ii) the value, importance or sensitivity of the environmental resource being affected.

10.27 The IEMA Guidelines make it clear that:

"For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed up by data or quantified information wherever possible" (paragraph 4.5)".

10.28 Having regard to this guidance, the approach to determining the significance of identified impacts that has been followed in this assessment is explained in the following paragraphs. The approach has had regard to the guidance given in 'Design Manual for Roads and Bridges Vol II Section 2 Part 5 HA205/08 – Determining Significance of Environment Effects' (ref 10.5) in terms of defining the measure of magnitude and significance of impacts.

10.29 The following series of tables describe in turn how the following terms are defined for the purposes of this assessment:

(i) Value or Sensitivity of the receptor (**Table 10.1**)
(ii) Magnitude of the impact (**Table 10.2**)
(iii) Quantified significance of effect (**Table 10.3**)

Table 10.1: Environmental Value (or Sensitivity) and Typical Descriptors

Value (sensitivity)	Typical Descriptors
Very High	Facility of international or national significance.
High	Close proximity to schools, colleges, accident black-spots.
Medium	Close proximity to congested junctions, hospitals, community centres, conservation areas.
Low (or Lower)	Close proximity to public open space, nature conservation areas, and residential areas with adequate pavements.
Negligible	Receptors of low sensitivity.

Table 10.2: Magnitude of Impact

Magnitude of Impact	Description
High	Very large or large change in environmental conditions (e.g. pollution levels, destruction of habitat). This could result in exceedance of Statutory objectives and/or breaches of legislation.
Medium	Intermediate change in environmental conditions.
Low	Small change in environmental conditions.
Negligible	No discernible change in environmental conditions.

Table 10.3: Impact Significance Matrix

		Sensitivity of Receptor			
		High	**Medium**	**Low**	**Negligible**
Magnitude of Effect (degree of change)	Large	Major	Major	Moderate	Minor
	Moderate	Major	Moderate	Minor	Negligible
	Small	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

BASELINE CONDITIONS

Site Description

10.30 The Site is located in Lower Rainham which is situated approximately 400m south of the Medway River Estuary.

10.31 The Site straddles Pump Lane which runs north to south between the B2004 Lower Rainham Road and Beechings Way respectively. Pump Lane is a narrow road approximately 4m wide meaning there is limited opportunity for two-way vehicle passage. Pump Lane is subject to a 30mph speed limit with additional vehicle height and width restrictions of 13'6'' and 6'6'' respectively.

10.32 At the northern boundary of the Site Pump Lane meets the B2004 Lower Rainham Road where Pump Lane forms a wide bellmouth at a simple priority T-junction. To the west where the B2004 carriageway runs through Lower Twydall the single carriageway has an approximate width of 7.0m and is subject to a 40mph speed limit. Further east as the B2004 enters Lower Rainham the width of the single carriageway becomes more variable as it passes through residential frontage. The speed limit here is reduced to 30mph, inclusive of the junction where Pump Lane meets the B2004. The route is managed by a series of traffic light controls which incorporate shuttle working and speed cushions.

10.33 To the west the B2004 provides access to minor local roads including Lower Twydall Lane, Eastcourt Lane and Lower Featherby Road and eventually runs to a 4-arm roundabout where Yokosuka Way can be accessed to the south and the A289 Gads Hill to the north west. To the east the B2004 provides access to minor local roads including Pump Lane, Lower Bloors Lane, Motney Hill, Berengrave Lane and Station Road. Station Road and Ottenham Quay Lane can be followed south for approximately 1.5km where they join the A2 trunk road.

10.34 Pump Lane continues south and passes under the rail line where the carriageway narrows and shuttle working for two-way car passage is exercised. Approximately 150m south of this passage, Pump Lane joins Beechings Way via a simple priority T-junction. Beechings Way is an important local distributor road providing access to a number of residential streets within the local vicinity and connecting the eastern border of Gillingham with the A2 corridor.

10.35 Further east Lower Bloors Lane runs parallel with Pump Lane, this carriageway is similarly narrow as Pump Lane and at approximately 400m south Lower Bloors Lane narrows further, transitioning from a vehicle worthy carriageway into a pedestrian only access. Where Lower Bloors Lane meets the rail line there is a footbridge crossing which provides pedestrian access onto the wider road network south of the Site and into the centre of Lower Rainham.

Baseline and Future Traffic Flows (AADT)

10.36 Baseline 24-hour traffic flows for 2019 have been derived using the ATCs. Tempro local growth factors for the area (Medway 018, Urban, Minor and Principal routes) have been used to factor the 2017 flows to 2019 flows and provide a future year of 2029. The Annual Average Daily Traffic (AADT) flows are set out in **Table 10.4**.

Table 10.4: Base and Future Traffic Flows

Road Link	2019 Base	% HGVs	2029 Base	% HGVs
A289 Pier Road	35,540	2.5%	39,899	2.5%
A289 Yokosuka Way	28,658	2.4%	32,173	2.4%
Cornwallis Avenue	10,756	1.9%	12,121	1.9%
A289 Ito Way	23,268	2.9%	26,121	2.9%
A2 Sovereign Blvd (W of Ito Way)	25,698	1.9%	28,850	1.9%
A2 Sovereign Blvd (E of Ito Way)	36,204	2.5%	40,645	2.5%
Beechings Way (W of Pump Lane)	13,618	2.6%	15,346	2.6%
Beechings Way (E of Pump Lane)	10,181	2.1%	11,473	2.1%
A2 London Road (West of Pump Lane)	12,210	4.0%	13,707	4.0%
A2 High Street	12,210	4.0%	13,707	4.0%
A278 Hoath Way	37,033	3.5%	41,576	3.5%
Lower Rainham Road (E of access)	9,107	0.6%	10,263	0.6%
Lower Rainham Road (W of access)	9,107	0.6%	10,263	0.6%

IMPACTS

Construction Impacts

10.37 During the construction of the Proposed Development, it would be necessary for various plant, equipment and material to be transported to the Site. It is proposed that the majority of construction traffic will enter or leave the Site via Lower Rainham Road and then to Yokosuka Way, A2 and Hoath Way towards the M2.

10.38 The construction operation will be the subject of a CEMP. In addition to vehicle routing, this would also set out items such as periods of operation and construction workers parking within the Site.

10.39 The types of vehicles and number of vehicles that will deliver construction material to the Site will vary depending on phasing and the materials collected or delivered. Typically, the

final rate of project completion reflects many competing factors, such as access to the development, completing the sales of buildings and availability of labour and materials, as well as maintaining a quality environment during the early phases of a project during these construction phases.

10.40 It is therefore estimated that the number of HGV and LGV movements associated with the construction of the site based on 5 day delivery and collection schedule over 48 working weeks per year, there is likely to be in the order of 40 HGV movements and 40 LGV movements per day. These numbers will be refined at the reserved matters stage and following the appointment of the relevant parties.

Severance

10.41 Given the low levels of daily flows generated by construction traffic, no significant severance effect will result.

10.42 Adopting the methodology set out in **Tables 10.1-10.3**, it is considered to be a low sensitivity receptor (**Table 10.1**). The magnitude of the effect is minor (**Table 10.2**) and overall, this is considered to be a **negligible effect** (**Table 10.3**).

Driver Delay

10.43 Given the low levels of traffic flows generated by construction traffic there will be no significant effect on driver delay. Background traffic peak hour movements are unlikely to coincide with any peak (however limited in view of overall numbers) in construction traffic.

10.44 Adopting the methodology set out in **Tables 10.1-10.3**, the roads within the vicinity of the site are considered to be a low sensitivity receptor (**Table 10.1**). The magnitude of the effect is minor (**Table 10.2**) and overall, this is considered to be a **negligible effect** (**Table 10.3**).

Pedestrian Delay and Amenity

10.45 Given the range of local factors and conditions which can influence pedestrian delay, the guidance suggests it is not considered wise to set down any thresholds, but instead it is recommended that assessors use their judgement to determine whether pedestrian delay is significant.

10.46 Construction traffic will be constrained to defined routes, which focus on access to and from Lower Rainham Road, Yokosuka Way, A2, Hoath Way and the M2. Any impacts on pedestrian delay and amenity are likely to occur on the Lower Rainham Road where there is a footway present and a number of residential properties. It is however considered that these are minor given the construction traffic is temporary and will only occur over the duration of the construction period.

10.47 Adopting the methodology set out in **Tables 10.1-10.3**, the pedestrian routes within the vicinity of the Site are considered to be a low sensitivity receptor (**Table 10.1**). The magnitude of the effect is minor (**Table 10.2**) and overall, this is considered to be a **minor effect** (**Table 10.3**).

Fear and Intimation

10.48 There are no commonly agreed thresholds for estimating danger, but research work is cited setting out “degree of hazard” levels relating to 18 hour average traffic flows, 18 hour HGV flows and average vehicle speed.

10.49 The thresholds are based upon the conclusions of the 1981 study by Crompton and Gilbert entitled ‘Pedestrian Delays, Annoyance and Risk’.

Table 10.5: Magnitude Criteria Fear and Intimidation Thresholds

Degree of Hazard	Ave. traffic flow over 18hr day	Total 18hr HGV Flow	Ave. speed over 18hr day miles/hr
Extreme	1800 +	3000+	20+
Great	1200-1800	2000-3000	15-20
Moderate	600-1200	1000-2000	10-15

10.50 Given the low levels of daily flows generated by the construction traffic, it is considered to be a low sensitivity receptor (**Table 10.1**). The magnitude of the effect is minor (**Table 10.2**) and overall, this is considered to be a **negligible effect** (**Table 10.3**).

Accident and Safety

10.51 The expected changes in traffic are too small in comparison to base flows to have any statistically meaningful effects upon the observed local accident rate record. The resulting significance of effect is **negligible**.

Hazardous Loads

10.52 Due to the nature of the construction activities it is not anticipated that the construction process will require carriage of materials listed on The Carriage of Dangerous Goods in the UK. The resulting significance of effect is **negligible**.

Operational Impacts

10.53 The completed Development would be likely to give rise to a range of transport related impacts. These would be likely to include longer term benefits to the amenity of local pedestrians, cyclists and public transport users once the Development is completed through the provisions of new and improved routes and facilities. It is expected that these would be of beneficial impact of moderate significance, offering localised improvements to local routes and reduction in journey times and distances.

10.54 In addition, whilst not specifically relevant to the assessment of environmental impacts, the Transport Assessment sets out the wider beneficial impacts the Development would have in terms of meeting local and national policy objectives of achieving sustainable development growth in the area.

10.55 The percentage increase on each of the links as a result of the Development traffic in 2021 and 2031 is shown in **Table 10.6**. It is considered there are no EIA impacts on any route.

Table 10.6: Percentage Increase for Total Volume

Road Link	2029
	Increase in Total Flow
A289 Pier Road	5.1%
A289 Yokosuka Way	1.6%
Cornwallis Avenue	4.2%
A289 Ito Way	2.0%
A2 Sovereign Blvd (W of Ito Way)	3.6%
A2 Sovereign Blvd (E of Ito Way)	1.3%
Beechings Way (W of Pump Lane)	23.7%
Beechings Way (E of Pump Lane)	6.7%
A2 London Road (West of Pump Lane)	20.9%
A2 High Street	3.0%
A278 Hoath Way	3.7%
Lower Rainham Road (E of access)	0.9%
Lower Rainham Road (W of access)	24.5%

Severance

10.56 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic route. Whilst the IEMA Guidelines refer to the effect of traffic on severance of 30%, 60% and 90% producing "slight", "moderate" and "substantial" changes in severance respectively, it is suggested that caution be applied to relying on this quantum of change.

10.57 Taking total traffic volumes, in accordance with the IEMA Guidelines, the level of traffic related to the development proposals is less than 30% on all links, as shown in **Table 10.5**. The magnitude of overall traffic increase can, therefore, in accordance with **Table 10.2** be defined as **negligible**. Combined with the fact that the road links can, in accordance with **Table 10.1**, be defined as receptors of low sensitivity means that the overall effect is **negligible** (**Table 10.3**).

Driver Delay

10.58 The IEMA Guidelines note that driver delay is only likely to be significant when the traffic on the highway network is at or close to the capacity of the system. Each of the roads considered within the assessment operate well within capacity threshold levels for future years. It can, therefore, be concluded that there will be negligible impact in respect of driver delay.

10.59 During the typical network peak periods (08:00-09:00 and 17:00-18:00) traffic generation from the proposals has been tested for capacity on the local and strategic road network. This is set out in detail in the supporting Transport Assessment. Minor localised improvements are proposed various locations on the local network. There will be no material impact on junction operation as a result of the Development proposals.

10.60 Adopting the methodology set out in **Tables 10.1-10.3**, the overall network is a low sensitive receptor (**Table 10.1**). The magnitude of the impact is negligible (**Table 10.2**) and overall, this is considered to be a **minor effect** (**Table 10.3**). As already indicated, in common with standard assessment practice, minor effects are not considered to be significant in environmental assessment terms.

Pedestrian Delay and Amenity

10.61 The Proposed Development will bring about increases in the number of vehicle movements and pedestrian movements. In general, increases in traffic levels are likely to lead to greater increases in delay to pedestrians seeking to cross.

10.62 Any impacts on pedestrian delay and amenity are likely to occur on the Lower Rainham Road, Pump Lane and Beechings Wat where footways are present.

10.63 Adopting the methodology set out in **Tables 10.1-10.3**, the overall network is a low sensitive receptor (**Table 10.1**). The magnitude of the impact is negligible (**Table 10.2**) and overall, this is considered to be a **minor effect** (**Table 10.3**). As already indicated, in common with standard assessment practice, minor effects are not considered to be significant in environmental assessment terms.

Fear and Intimation

10.64 In accordance with the criteria contained in **Table 10.5**, the Proposed Development traffic would fall below the threshold for average hourly flows and 18 hour flows.

10.65 Adopting the methodology set out in **Tables 10.1 – 10.3**, the low sensitivity (**Table 10.1**) and negligible magnitude of impact (**Table 10.2**) results in a **negligible effect** of hazardous or abnormal loads as a result of the Proposed Development (**Table 10.3**).

Accident and Safety

10.66 A full review of personal injury accidents within the vicinity of the Site has been undertaken. There were a total of 20 recorded personal injury collisions within the surveyed area, of these one was recorded as fatal in severity, another six were serious and the remaining collisions were recorded as slight.

10.67 The fatal collision involved a car and motorcyclist. The six serious collisions involved cars, motorcyclists and a pedal cycle.

10.68 Adopting the methodology set out in **Tables 10.1-10.3**, the low sensitivity of the receptor (**Table 10.1**) and low magnitude of impact (**Table 10.2**) results in a **minor effect** (**Table 10.3**) of the proposals on highway safety.

Hazardous Loads

10.69 It is unlikely there will be hazardous or abnormal loads associated with the Proposed Development. Adopting the methodology set out in **Tables 10.1 - 10.3**, the low sensitivity (**Table 10.1**) and negligible magnitude of impact (**Table 10.2**) results in a **negligible effect** of hazardous or abnormal loads as a result of the Proposed Development (**Table 10.3**).

MITIGATION

Construction Phase

10.70 The construction phase of the Development would be unlikely to result in significant traffic impacts. However, as with all major construction projects, a CEMP should be developed. The aim of this will be to ensure the contractors meet the requirements of all relevant environmental legislation, agreements, authorisations and commitments.

10.71 As part of the CEMP the routing of construction traffic should be agreed with the relevant authorities and should form part of the construction methodology adopted by the contractor. The contractors should be encouraged to require employees to share vehicles or use public transport to reduce the impact of employee's cars.

10.72 Given the additional traffic generated from the construction works is considered to be within the capacity of the local road network, and with the adoption of the CEMP the residual impact is considered to be insignificant.

Operational Phase

10.73 The Transport Assessment sets out a detailed transport strategy as to how the site can be best and most appropriately served from a transport perspective.

10.74 Localised highway improvement works have been identified at junctions to deal with the NPPF test impact, however none trigger the specific EIA threshold impact.

10.75 A Framework Travel Plan has been prepared for the Proposed Development. This is aimed at reducing vehicular trips associated with the Site and includes a set of measures to encourage travel by sustainable modes.

RESIDUAL IMPACTS

Construction Phase

10.76 With the implementation of the mitigation measures described above and good site practice, the residual effects of traffic generated by construction activities is considered to be **negligible**.

Operational Phase

10.77 The scale of effects as set out above for each of the transport related elements will remain unchanged with the mitigation in place. The residual effects of the Proposed Development on transport are considered to be **negligible**.

CUMULATIVE IMPACTS

Construction Phase

10.78 There are no developments nearby the Proposed Development that will cause cumulative construction impacts. As such no cumulative construction impacts are anticipated.

Operational Phase

10.79 The major housing development sites in the immediate area have been reviewed. This includes sites which are identified in the Council's supply which may not come forward, and is therefore a worst case scenario. These are as follows:

(i) Site 1 – Land at Station Road, Rainham, Kent ME8 7QZ – 90 Units. (Allowed)
(ii) Site 3 – Land North of Moor Street, Rainham – 190 Units. (Refused, but identified in the Council's supply in SLAA)
(iii) Site 4 – Land At Otterham Quay Lane Rainham Kent – 300 Units. (Approved)
(iv) Site 6 – Berengrave Nursery, Berengrave Lane, Rainham, Gillingham ME8 7NL – 121 Units. (Approved)
(v) Site C - Land South Of Lower Rainham Road Rainham Gillingham Medway ME8 7UD – 202 Units. (Permitted August 2020, and identified in the Council's supply within SLAA)

10.80 This amounts to around 900 dwellings in total. To understand the likely growth, the base traffic forecasts have been uplifted using local TEMPRO growth factors. TEMPRO is a tool for interrogating the National Road Traffic Forecasts taking into account demographic changes and pricing trends.

10.81 On this basis, it is assumed that local background traffic growth factors derived from the latest TEMPRO will take account of increases in traffic flows for these land parcels. Comparison of the planning assumptions within TEMPRO for the Local Plan period up to 2029 includes around 11,380 dwellings in Medway as a whole. This is significantly higher than that for the individual sites above and hence no further uplift is required.

10.82 The operational phase cumulative impacts associated with the Proposed Development are predicted to be **negligible**.

SUMMARY

10.83 Potential environmental impacts resulting from the traffic that are likely to be generated by the Proposed Development have been identified. The major direct potential impacts are increases in traffic congestion and delay.

10.84 The impact assessment was based on an analysis of the traffic likely to be generated by the Proposed Development. When considered in the context of the existing traffic flows on the surrounding road network, the number of construction vehicles would not be expected to have a significant impact on the operation or safety of the surrounding road network.

10.85 In terms of adverse impacts, the main issue would be increased overall flows on the local road network. In general terms, the traffic can be adequately accommodated on the network, although some localised improvements have been identified to mitigate specific impacts.

10.86 In conclusion, the Proposed Development meets the key transport tests set out by the Local Highway Authorities in that would allow for efficient maintenance and management of transport infrastructure, it will improve accessibility and provide healthier travel choices. In addition, it would provide for safer roads and communities and would reduce congestion which might otherwise occur through less sustainable development growth.

Table 10.7: Summary Table

Description of Likely Significant Effects	Significance	Effects B/A, R/T, D/I, ST/M/LT, L/R/N					Description of Mitigation	Description of Residual Effects	Significance	Residual Effects B/A, P/T, D/I, ST/M/LT, L/R/N				
Construction Phase														
Severance	Negligible	A	T	D	ST	L	Described in section 10.70/71	None	Negligible	A	T	D	ST	L
Driver Delay	Negligible	A	T	D	ST	L	Described in section 10.70/71	None	Negligible	A	T	D	ST	L
Pedestrian Delay and Amenity	Negligible	A	T	D	ST	L	Described in section 10.70/71	None	Negligible	A	T	D	ST	L
Fear and Intimidation	Negligible	A	T	D	ST	L	Described in section 10.70/71	None	Negligible	A	T	D	ST	L
Accident and Safety	Negligible	A	T	D	ST	L	Described in section 10.70/71	None	Negligible	A	T	D	ST	L
Operational Phase														
Severance	Negligible	A	P	D	LT	L	Described in section 10.73/74	None	Negligible	A	P	D	LT	L
Driver Delay	Negligible	A	P	D	LT	L	Described in section 10.73/74	None	Negligible	A	P	D	LT	L
Pedestrian Delay and Amenity	Negligible	A	P	D	LT	L	Described in section 10.73/74	None	Negligible	A	P	D	LT	L
Fear and Intimidation	Negligible	A	P	D	LT	L	Described in section 10.73/74	None	Negligible	A	P	D	LT	L
Accident and Safety	Negligible	A	P	D	LT	L	Described in section 10.73/74	None	Negligible	A	P	D	LT	L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

11 LANDSCAPE AND VISUAL

INTRODUCTION

11.1 This chapter provides a summary of the findings of a Landscape and Visual Impact Assessment (LVIA) prepared by Tyler Grange Group Limited that forms **Technical Appendix 11.1a** to this Environmental Statement.

11.2 An overview of the Site context, key policy constraints and the landscape and visual baseline is included, as well as those landscape and visual receptors which have formed the basis of the assessment, having been identified as those with the potential to experience significant landscape or visual effects associated with the Proposed Development.

11.3 Key landscape and visual design principles and mitigation measures that have been incorporated into the proposals and have been taken into account within the assessment are set out. Full details of these can be found in the Design and Access Statement and the LVIA (**Technical Appendix 11.1a**).

11.4 A summary of the landscape and visual effects for each receptor during the construction phase, upon completion and residual effects after 15 years once mitigation planting has matured is provided. The text provides a summary of the reasonings behind the assessment. A summary of the significance of effects is set-out on Table 11.2 at the rear of this chapter.

Proposed Development

11.5 The Proposed Development incorporates a range of mitigation measures to minimise the landscape and visual effects and respond to the local context. These are set out in the Design and Access Statement and have been illustrated on the Landscape Framework plan contained in the LVIA. The landscape principles and mitigation measures include the following:

(i) Retaining hedgebanks and hedgerows along Pump Lane and Lower Bloors Lane to respect their character;
(ii) Planting of community orchards within areas of green space alongside Pump Lane and around the buildings at Pump Farm and Russett Farm;
(iii) Provision of a village green to provide setting to Pump Lane and the farm buildings / properties and reflect the agricultural heritage and character;
(iv) Areas of open space incorporating native hedgerows, trees and woodland planting to provide separation and buffers to the conservation areas at Lower Rainham and Lower Twydall;
(v) Strengthening of existing hedgerows to site boundaries and provision of landscape buffers to incorporate tree belts and green corridors with recreation routes, foot cycleways and SUDs;
(vi) Creation of improved connections through areas of green infrastructure and open space within the Site;
(vii) Limiting the height of development to respect the existing built form; and
(viii) Strategic landscape planting throughout the Development and tree planting to streets to break up the built form and provide a soft green backdrop when the Site is viewed from the estuary to the north.

LOCAL PLANNING POLICY

Area of Local Landscape Importance

11.6 The Site is situated within the Gillingham Riverside Area of Local Landscape Importance (ALLI), a non-statutory designation in the Local Plan that represents the lowest tier of designations at a local level (Policy BNE34 within the Medway Local Plan, adopted 2003). The ALLI includes land that extends to the east and west of the site, as well as land to the

north of Lower Rainham Road, including the shoreline. The ALLI includes the Riverside Country Park, Parts of the Medway Estuary SSI, SPA and RAMSAR Site, as well as the Motney Hill Local Nature Reserve. The Saxon Shoreline Way long-distance path runs alongside the shoreline within the ALLI.

11.7 In addition to their landscape importance, the ALLIs are identified as functioning as buffers between neighbourhoods and communities, green corridors or links for the community to reach the wider countryside, urban fringe land to be protected from urban sprawl and a habitat and wildlife corridors. More specific functions are identified for each of the ALLIs, with the following identified for the Gillingham Riverside ALLI:

(i) Green buffer separating Twydall and Rainham from areas of international importance for nature conservation and recreation along the Medway estuary;
(ii) Enhances the setting of the Medway Towns Ring Road and allows attractive views from the river and railway;
(iii) Provides residents with an extensive area with access to attractive, rural landscape;
(iv) Provides an attractive setting to the Lower Rainham and Lower Twydall conservation areas;
(v) Contains a number of orchards, mature hedgerows and farm groups complementing and contributing to the Riverside Country Park; and
(vi) Forms a green backdrop when viewed from the Medway Estuary.

11.8 The site-specific landscape character assessment to inform the LVIA (Technical Appendix 11.1a) has considered the function and features of the ALLI when assessing the value of each of the Local Landscape Character Areas identified. Along with a review of the Box 5.1 Value Factors identified within the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) *(ref 11.1)* this has allowed for the assessment to identify which of the features of each LLCA are related to those factors attributed to the designation of the ALLI area. This, in turn has enabled the LVIA to allow an informed assessment of how the Site contributes to the local character, features and valued aspects of the landscape.

BASELINE CONDITIONS

Site Context

11.9 The Site comprises an area of land comprising approximately 51.2 hectares of agricultural land that is managed for commercial fruit growing and is laid to orchard. The Site is situated on land to the immediate northeast of the built area of Twydall, which bounds the Site alongside the London to Margate railway line. To the southeast, development at Rainham extends to the north of the railway. The wider conurbation of Gillingham is situated to the west, adjoining Twydall.

11.10 To the northeast, the Site is bounded by Lower Rainham Road, including the settlement of Lower Rainham. To the southeast, the Site is bound by Lower Bloors Lane which connects with Lower Rainham Road and extends to the railway, where a footbridge provides pedestrian access into Twydall to the south. The western site boundary is irregular in shape, following field boundaries formed by hedgerows and tree belts to areas managed as orchard and arable fields to the northwest, east of Lower Twydall.

11.11 The Site is bisected by Pump Lane, which runs north-south from Lower Rainham Road and crosses under the railway south of the Site. To the centre of, and outside the Site development along Pump Lane include Pump Farm and a modern development of houses at Russett Farm.

11.12 A bridleway runs diagonally from Lower Bloors Lane on the eastern boundary, connecting with Pump Lane opposite Pump Farm.

11.13 Fields within the Site are divided by coniferous shelterbelts, including those along the bridleway, as well as bounding the allotments and railway line east of Pump Lane. Tall hedgerows run alongside Pump Lane and Lower Bloors Lane, with breaks in the vegetation at gateways, development frontages and accesses.

11.14 The land slopes gently upward from the low-lying marshes north of Lower Rainham Road and shoreline beyond towards the edge of Twydall to the south. The urban area of Twydall, Rainham and Gillingham extend sup the slopes towards the wooden skyline of the North Downs beyond.

11.15 Land along the shoreline lies within the Riverside Country Park, with car parks, café and play areas on land north of Mariners Farm, north of the Site. Horrid Hill and Motney Hill project the shoreline into the Medway Estuary, with the Saxon Shore Way long distance path running along the shoreline. Bloors Lane community woodland lies to the east of the Site, accessed off Bloors Lane. Woodland and shelterbelts along the shoreline and inland provide containment and are distinctive features in the local landscape.

11.16 The Landscape Character and site Features are considered in detail in Section 4 of the LVIA (**Technical Appendix 11.1a**). This has included a review of published landscape character assessments, as well as a site- specific landscape character assessment undertaken by Tyler Grange which identifies Local Landscape Character Areas and features within the Site that maybe affected by the Proposed Development.

Landscape Character

11.17 The Site is situated within the "Lower Rainham Farmlands" LCA as identified by the Medway Landscape Character Assessment. The LCA extends between the railway to the south and Lower Rainham Road to the north and includes land up to the ring road to the northwest and edge of Rainham to the southeast. The key characteristics of the LCA include the mixed farmland including orchards, shelterbelts, and hedgebanks, as well as the enclosure by Lower Rainham Road and the railway line. The Medway Landscape Character Assessment recognises that the area has poor accessibility and links to urban areas and is divided by development at Rainham. Guidelines for the area include improving links between Twydall and the open countryside and with the Riverside Marshes to the north which is recognised for its value as a green buffer, wildlife corridor and as a wildlife corridor and link to the wider countryside.

11.18 The site-specific landscape character assessment has defined the **Lower Rainham and Lower Twydall Fruit Belt LLCA** which covers the area of and between the ring road on the edge of Gillingham to the west and Rainham to the east. The Site is situated within this LLCA, which is characterised by the gently sloping land with large rectilinear field managed as commercial orchards and arable fields. Paddocks and remnant orchards are present near the ring road to the northwest. Bloors Lane Community Woodland and tree belts provide enclosure to the southeast of the area.

11.19 The site-specific character assessment also identifies those features within and adjacent to the Site which may be affected by the Proposed Development. These include: Lower Bloors Lane, Pump Lane, Bridleway GB6a, Pump Farm & Russett Farm, Commercial Orchards; Lower Rainham & Lower Twydall; Lower Rainham Road; and the role of the Site as part of a green backdrop when viewed from the Medway.

11.20 The land north and east of Rainham has been identified as falling within the **Medway Marshes Farmland LLCA** which is separated from the Site by Rainham Road to the north and development that extends northwards along Berengrave Lane to Motney Hill Road. The Medway Marshes Farmland LLCA provides separation between the shoreline and land south of Rainham Road.

11.21 The site-specific assessment has defined the strip of land north of the marshes farmland as the **Medway Shoreline and Riverside Country Park LLCA.** This includes the Saxon Shore Way and Riverside Country Park, including woodland and tree belts that form a distinctive vegetated backdrop to the estuary. Views across the estuary are identified as a perceptual attribute of this LLCA.

Landscape Sensitivity

Lower Rainham and Lower Twydall Fruit Belt LLCA

11.22 The assessment has identified the Lower Rainham and Lower Twydall Fruit Belt LLCA as having an overall **Medium Landscape Sensitivity** to residential development. The LLCA has been assessed as making a Low / Medium Contribution to the features and function of the Gillingham Riverside ALLI. This recognises that, whilst the area makes a limited contribution overall, the land within the LLCA has a role in providing a setting to the conservation areas at Lower Rainham and Lower Twydall, as well as part of a wider buffer between Twydall and Rainham and green backdrop in views from the estuary.

11.23 There are opportunities to provide improved access across the LLCA to connect the urban areas with the shoreline and country park, as well as respect the character of lanes and historic land use for traditional orchards and native trees and hedgerows to field boundaries.

Medway Marshes Farmland LLCA

11.24 The Medway Marshes Farmland LLCA has been assessed as having a **Medium Landscape Sensitivity**. The LLCA is valued for its recreation and ecological qualities associated with the Riverside Country Park and nature reserves. Woodland and hedgerows to field boundaries provide structure and enclosure, linking with the vegetation along the shoreline to the north. The LLCA has been assessed as making a Medium Contribution to the features and function of the Gillingham Riverside ALLI.

11.25 Development on land within the Site to the south of the LLCA beyond Lower Rainham Road would not directly impact upon the recreation or ecological value of the land, nor the character of the agricultural land and associated trees and hedgerows linking with the woodland and vegetation along the shoreline.

Medway Shoreline and Riverside Country Park LLCA

11.26 The Medway Shoreline and Riverside Country Park LLCA has been assessed as having a **High Landscape Sensitivity**. The LLCA is valued for its recreation, ecological and perceptual qualities associated with views across the estuary, as well as the distinctive character of the shoreline well vegetated backdrop. The LLCA makes a High Contribution to the features and function of the Gillingham Riverside ALLI.

11.27 However, given the physical and visual containment by a strong band of vegetation along the inland edge of the shoreline, development outside the LLCA would not directly impact upon the recreation value of the land and views across the estuary, nor the distinctive character of the shoreline and associated vegetated edge.

Visual Context

11.28 A summary of the composition of views obtained from within the Study Area is set out below. A full description of the composition of views is included alongside the representative Photoviewpoints within the LVIA (**Technical Appendix 11.1a**).

Views from the North

11.29 From the Hoo Peninsula on the northern shore of the Medway estuary there are expansive panoramic views across the mudflats and marshes towards the southern shoreline.

11.30 The shoreline and marshes to the north of Lower Rainham are well vegetated, with woodland at the Riverside Country Park and around Mariners Farm combining with trees and hedgerows to field boundaries to provide a soft green edge and backdrop to the views across the Medway. Beyond the marshes, houses at Lower Rainham are visible amongst the vegetation. The northern edge of Twydall is defined by linear housing that adjoins the railway line to the south of the Site. These properties form a developed backdrop that then extends up the slopes towards Gillingham beyond.

11.31 There are also expansive views across the wider estuary and backdrop to the shorelines of the Hoo Peninsula to the north and Lower Rainham to the south from Horrid Hill and Motney Hill. The composition of the views from these locations is similar to that from the more distant views to the north, with the vegetated shoreline and buildings along Lower Rainham Road beyond.

11.32 The land to the southwest of the Site adjacent to the railway line is situated in front of the properties on the northern edge of Twydall which form a linear edge and developed backdrop. The lower lying fields to the southwest and south of the Site are set beyond intervening vegetation and built form. Tall hedgerows bounding the Site along Lower Bloors Lane, the community woodland and hedges alongside the railway and bridleway provide enclosure and a well treed backdrop to the east.

11.33 Views from the shoreline along the Saxon Shore Way north of Lower Rainham Road are orientated across the expansive views of the Estuary to the north and northwest. Views inland are screened by the vegetation and woodland that runs alongside the shoreline associated with the Riverside Country Park and boundaries within the marshes.

11.34 Views along Lower Rainham Road include the linear settlement of Lower Rainham and tall hedgerows bounding the Site, with glimpsed views across arable fields towards the estuary to the north.

Views from the East

11.35 From the east, the Site is set beyond tall hedgerows and hedgebanks along Lower Bloors Lane. Views are focussed along the narrow, enclosed lane, with occasional glimpsed over hedgerows or through gateways.

Views from the South

11.36 Within the built area of Twydall, views are orientated along the residential streets and local rods. These follow a grid pattern, with Beechings Way running southeast – northwest channelling views.

11.37 From streets on the higher slopes that are orientated to look north-eastwards, there are framed views out across the estuary. In the foreground, linear development along Beechings Way forms a backdrop blocking views across the site.

11.38 There are some views north from properties and streets that overlook the Site adjacent to the railway line. In the summer, when trees and hedgerows are in leaf views across the Site are heavily filtered. In the wintertime, there may be some views across the Site towards the wider views north of the estuary.

Views from the West

11.39 In views obtained from gateways on Lower Twydall Lane, the rolling topography and hedgerows to field boundaries limit distant views to the east. The main focus of views is along the narrow lane that is bounded by tall hedgerows with little outward visibility.

11.40 There are views along the railway line for the footbridge on Lower Twydall Lane, with oblique views across the Site to the wooded backdrop beyond. Wider views are limited by trees surrounding properties at Lower Twydall.

Views from within the Site Area

11.41 Views from the bridleway that runs between Pump Lane and Lower Bloors Lane through the Site are enclosed by tall coniferous hedgerows and channelled along the route of the path. Outward views are limited to those through gateways or short sections of post and rail fencing.

11.42 Views along Pump Lane are channelled by the tall roadside hedgerows with glimpses through gateways into the Site. Properties at Pump Farm, Russetts Farm and cottages along the lane introduce development and focal points.

Visual Receptors

11.43 Having identified the extent of visibility, composition of views and representative viewpoints, those groups of people (visual receptor) who may have the potential to have their views and visual amenity affected by the Proposed Development have been identified. These are set out on the table below, along with their respective sensitivities to visual change associated with the Proposed Development.

Table 11.1 Visual Receptors

Visual Receptor	Representative Photoviewpoint	Visual Sensitivity		
		Value	Susceptibility	Overall Sensitivity
Users of the Saxon Shore				
Northern shore of the Medway	Photoviewpoint 1	High	Low	**Medium**
South of Motney Hill	Photoviewpoint 4	High	Medium	**Medium / High**
North of Lower Rainham	Photoviewpoint 5	High	Low	**Medium**
Users of the Riverside Country Park				
Users of the Riverside Country Park - Horrid Hill	Photoviewpoint 2	High	Medium	**Medium / High**
Users of Lower Rainham Road	Photoviewpoints 6, 7 and 8	Low	Medium	**Medium**
Users of Lower Bloors Lane	Photoviewpoints 9 - 11	Medium	Medium	**Medium**
Users of Lower Twydall Lane	Photoviewpoints 12 and 13	Medium	Medium	**Medium**
Users of Bridleway GB6a	Photoviewpoints 14a, 14b and 15	Medium	Medium / High	**Medium**

Users of Pump Lane	Photoviewpoints 16, 17 and 18	Medium	Medium	**Medium**
Users of Trains Passing the Site		Medium	Low	**Low/Medium**
Residents of Properties adjacent to and overlooking the site				
Lower Twydall South of the Railway	Photoviewpoint 19	High	Medium	**Medium**
Pump Lane		High	High	**High**
Lower Bloors Lane		High	High	**High**
				Medium
Lower Rainham		High	High	**High**
Lower Twydall		High	Medium	**Medium**

LANDSCAPE EFFECTS

Landscape Effects Within the Study Area

11.44 Within the wider Study Area, the Proposed Development would not be inconsistent with the pattern and extent of development. The Site is situated within a peri urban context with the urban form of Twydall and Rainham impacting upon the character of the landscape across the Study Area.

11.45 The settlement pattern in the area includes development that lies in proximity to the shoreline, including the edge of Gillingham to the northwest. In proximity to the Site, land at Rainham to the east extends north beyond the railway line up to Lower Rainham Road, south of Motney Hill. Houses and commercial / light industrial units extend north of Lower Rainham Road on Motney Hill Road, on land adjacent to a nature reserve and in proximity to the Saxon Shore Way.

11.46 As recognised within the Medway Landscape Character Assessment, the Medway Fruit Belt Landscape Character Area has poor east-west connectivity and access to the recreation facilities and landscape of the Riverside Country Park and Saxon Shore Way. The Site in particular has poor access and does not provide connections from the wider urban area to existing amenities, including nature reserves, community woodland and the wider Public Right of Way network.

11.47 The Proposed Development offers the opportunity to greatly improve public access across the area, as well as the provision of attractive areas of green space including community orchards, recreation walks, equipped play areas, a village green and informal green spaces.

Lower Rainham and Lower Twydall Fruit Belt LLCA

11.48 The Proposed Development has been assessed as resulting in **Moderate Adverse** landscape effects at the Local Landscape Character Area scale for the Lower Rainham and Lower Twydall Fruit Belt LLCA. This reflects the extent of the Site within this LLCA and degree of change associated with the removal of the commercial orchards and construction of the Proposed Development.

Site-Wide

11.49 The assessment has also identified that the effects at a site-wide level will also be **Moderate Adverse**. The containment of the Site by existing development and woodland, shelterbelts / tree belts and tall hedgerows limit the influence that the Proposed Development will have upon the wider landscape. The strategic landscape buffers and associated planting proposed on the Site boundaries (embedded mitigation) will further contain and enclose the Site, limiting any effects on landscape receptors and character areas beyond.

11.50 The assessment has also identified the likely effects on a number of landscape receptors within and bounding the Site, taking into account embedded mitigation. These have identified **Moderate Adverse** effects for the Orchards, setting to Lower Rainham and character of Pump Lane, feeding into the overall site-wide assessment.

Indirect Effects: Medway Shoreline and Riverside Country Park LLCA

11.51 In addition to the effects on the Site area and associated features, the assessment has also considered indirect effects on other landscapes within the Study Area, including the Medway Marshes Farmland LLCA and Medway Shoreline and Riverside Country Park LLCA that have been identified by the site-specific landscape character assessment as part of the LVIA.

11.52 Although these LLCAs are separated from the Site by Lower Rainham Road, settlement and the belt of woodland and tree planting along the shoreline, land on the upper slopes to the southwest of the Site is visible from vantage points on the shoreline from Horrid Hill (Riverside Country Park) and Motney Hill (Saxon Shore Way). As recognised within the Local Plan, the green backdrop to views from the estuary is a feature of the Gillingham Riverside ALLI, within which the Site is situated. In this respect the backdrop to the estuary is one of the perceptual aspects and part of the scenic quality of the Medway Shoreline and Riverside Country Park LLCA.

11.53 As recognised by the site-specific landscape character assessment, the vegetation along the shoreline within this LLCA makes a high contribution to the green backdrop to the estuary. The Proposed Development will not impact on this.

11.54 The tree planting associated with the Proposed Development will, upon maturation provide a green canopy that will soften and break up development both on the Site and within the built area of Twydall on the rising land to the south. There will therefore be a **residual Localised, Indirect Minor Adverse Effect** on the Medway Shoreline and Riverside Country Park associated with the Proposed Development.

VISUAL EFFECTS

11.55 A summary of the key findings of the assessment are set out below for each of the groups of people (visual receptors) identified within the baseline assessment as having the potential to have their views and visual amenity affected by the Proposed Development. The effects during the construction phase are therefore generally greater than those experienced upon completion and the residual effects once the landscape mitigation has matured.

Users of the Saxon Shore Way and Riverside Country Park

11.56 As identified through the analysis of policy and the baseline studies, access to the countryside and the associated recreational and amenity benefits are valued aspects of the landscape, with the views along the shoreline and across the estuary forming part of the experience enjoying by people using the Saxon Shore Way and Riverside Country Park. The contribution that the visual experience and views make to the value of the landscape has been incorporated into the assessment of landscape effects and has also informed the sensitivity of these people to visual changes associated with the Proposed Development. This has

included consideration of the contribution that the Site makes as part of the green backdrop in views from the estuary, including those obtained from Horrid Hill (within the Riverside Country Park) and the Saxon Shore Way. Users of these recreation resources have been assessed as being of a Medium / High sensitivity to visual change associated with the Proposed Development.

11.57 Users of the Saxon Shore Way to the north of the Medway Estuary have the potential to experience **Minor Adverse Visual Effects** upon completion of the Proposed Development, reducing to **Neutral** after 15 years when the planting to site boundaries and within the Site mature. This reflects the distance of the viewers and limited nature of change in relation to the expansive views across the wider estuary.

Construction Phase

11.58 During the construction phase, **Temporary Moderate Adverse Visual Effects** have been identified for visitors to Horrid Hill and views obtained from the Saxon Shore Way to the south of Motney Hill. This is due to the introduction of uncharacteristic elements and movement that will draw attention and disrupt views towards the Site. The wider views across the estuary would remain unaffected.

On Completion and Residual Effects

11.59 In views from the Saxon Shore Way south of Motney Hill and Horrid Hill within the Riverside Country Park, the Proposed Development will be more visible due to the closer proximity. In views from these locations, the Proposed Development will be visible, set beyond vegetation on the shoreline and properties in Lower Rainham. The houses will be viewed against the built edge of Twydall and Rainham that extends up the slopes beyond the Site the south.

11.60 Upon completion, there will be **Minor / Moderate Adverse Visual Effects** resulting from the introduction of development into these views.

11.61 Upon maturation of the landscape buffer planting and trees throughout the Proposed Development, this will reduce to **residual Permanent, Localised Minor Adverse Visual Effects.**

11.62 As recognised within the assessment for the above receptors, the expansive views across the estuary from these vantage points and along the recreational routes will not be affected by the Proposed Development. In those views back towards the shore from the north and promontories of Horrid Hill and Motney Hill, the Proposed Development will retain a green backdrop, set beyond the woodland and shelterbelts along the shoreline and tying-in with the woodland and trees that bound the Site and within adjacent areas. The Proposed Development will also soften the existing linear developed edge south of the railway line through the provision of extensive new planting to boundaries and within the Site.

Users of Lower Rainham Road

On Completion and Residual Effects

11.63 For users of Lower Rainham Road passing the Site, there will be **localised minor adverse visual effects** arising from the implementation of the new site entrance to the northwest of Pump Lane both at completion and residual effects (after 15 years) when the landscape mitigation has matured.

11.64 The Site entrance will introduce a new gateway on the approach to Lower Rainham where there is a developed context with associated road signage, bollards and traffic lights. The Proposed Development will be set back beyond the retained tall hedgerows to the road and landscape buffer beyond incorporating tree planting. This will serve to screen views of the Proposed Development. At the Site frontage beyond the entrance of Lower Rainham Road,

development is set beyond landscape buffers and areas of open space incorporating ponds, trees and hedgerow presenting an attractive entrance to the Site.

Users of Lower Bloors Lane

Construction Phase

11.65 During the construction phase, **Temporary Moderate Adverse Visual Effects** have been identified for users of Lower Bloors Lane where the works will be in close proximity to the lane and visible beyond lower sections of hedgerow and gateways.

On Completion and Residual Effects

11.66 Upon completion these will reduce to **Localised Minor / Moderate Adverse Visual Effects** where views of houses may still be obtained in close proximity along the lane.

11.67 The residual effects will be **Permanent, Localised and Minor Adverse** once the mitigation planting has matured.

Users of Lower Twydall Lane

11.68 In the limited views of the Site available Lower Twydall Lane, the Site is set beyond intervening trees and hedgerows to field boundaries. In these views, the Proposed Development will result in **Minor Adverse Visual Effects** at completion, reducing to **Permanent Negligible Visual Effects** upon completion when the mitigation planting has matured.

Construction Phase

11.69 In views from the footbridge over the railway on Lower Twydall Lane, there will be Temporary Moderate Adverse Visual Effects associated with the construction works in these localised and limited views.

On Completion and Residual Effects

11.70 Upon completion, housing to the southwest of the Site will replace oblique views across the Site beyond filtering vegetation along the railway line. The Proposed Development will be seen in context with houses at Lower Twydall to the south of the railway line and result in **Localised Minor /Moderate Adverse Visual Effects.**

11.71 These will reduce to **Permanent, Minor Adverse** with the maturation of the tree belts alongside the railway which will filter and soften views of the houses within the Site.

Users of Pump Lane

Construction Phase

11.72 During the construction phase, the works to create new accesses roads and development of the village centre, care home, school and housing will give rise to **Temporary, Major Adverse Visual Effects** for users of Pump Lane. This is a result of the proximity to the works and extent of construction works taking place along the lane, including the new access roads opening up views into the Site as well as and disruption caused by temporary closures and traffic management.

On Completion and Residual Effects

11.73 Upon completion of the Proposed Development, assuming the mitigation planting has not established there would be **Localised, Moderate Adverse Visual Effects.**

11.74 Once the landscape planting and community orchard areas, village green and buffers to the village centre, care home and school have established, the residual effects for users of Pump Lane will be **Permanent, Localised and Minor / Moderate Adverse.**

11.75 Development will be set back from the lane beyond areas managed as community orchards, the village green and opens spaces, in keeping with the existing glimpsed views of orchards obtained to the south of Russett Farm. The hedgerows along the lane and supplementary planting will screen views of development, with views along new accesses off the lane set beyond verges with street trees.

Users of Bridleway GB6a

Construction Phase

11.76 During the construction phase, there will be disruption to users of the bridleway with temporary closures to allow for the implementation of the internal roads and development.

On Completion and Residual Effects

11.77 Upon completion, there will be **Localised, Minor Beneficial Visual Effects** for users of the bridleway, which will be incorporated into a green corridor. The bridleway will pass alongside areas of open space including play areas / pocket parks and pass through the village green.

11.78 As the landscape establishes and planting matures, these will increase to **Permanent, Localised Minor / Moderate Beneficial Visual Effects.** This reflects the change from an enclosed path with glimpsed views of commercial orchards to a route that is integrated into areas of open space with recreation and amenity spaces at the heart of the new community.

Users of Trains Passing the Site

On Completion and Residual Effects

11.79 For users of trains passing the Site, the Proposed Development will result in the loss of filtered glimpsed views across the Site west of Pump Lane. Upon completion, this will result in **Localised, Minor / Moderate Adverse Visual Effects**.

11.80 With the maturation of buffer planting incorporating tree belts along the railway this will reduce to **Permanent, Localised and Minor Adverse Visual Effects**. The assessment reflects the fleeting, glimpsed nature and extent of the views from the trains and the existing vegetation that filters outward views across the Site from along much of the southwestern site boundary.

Residents of Properties Adjacent to and Overlooking the Site

11.81 The Visual Assessment has also given consideration to the likely effects upon the views and visual amenity of residents of properties adjacent to and overlooking the Site. No properties have been accessed as part of the baseline studies. The assessment is based upon observation made from fieldwork in the public realm and from analysis of maps and aerial imagery.

Residents of properties in Twydall south of the railway

Construction Phase

11.82 For residents of properties with views across the Site, the construction works will give rise to **Temporary, Localised and Moderate / High Adverse Visual Effects.**

On Completion and Residual Effects

11.83 Upon completion, prior to maturation of landscape buffer planting alongside the railway, the loss of views across the Site will give rise to L**ocalised, Moderate Adverse Visual Effects.**

11.84 Once the trees have matured, this will reduce to **Permanent Minor / Moderate Adverse.**

11.85 The assessment recognises the context within which the views of the Site are experienced, beyond a busy railway line and planting to gardens and alongside the railway line filtering views across the Site.

Residents of Properties on Pump Lane

Construction Phase

11.86 During the construction phase, residents of these properties will likely experience **Temporary, Localised Major Adverse Visual Effects** on their views and visual amenity. This reflects the extent of construction works to the lane and on adjacent land surrounding the properties. This includes that associated with the implementation of infrastructure, opens space and development.

On Completion and Residual Effects

11.87 Upon completion there will be **Localised, Moderate / Major Adverse Visual Effects** before the landscaping to the open spaces and village green established, and trees within the community orchards, landscape buffers and opens paces mature.

11.88 Upon maturation of the trees and establishment of landscape to areas of green infrastructure and open spaces, the residual effects will reduce to **Permanent, Localised and Moderate Adverse**. This recognises the setting of the properties at the heart of a landscape framework to the centre of the Site and development incorporating buffers, green spaces, the village green and community orchards.

Residents of Properties on Lower Bloors Lane

On Completion and Residual Effects

11.89 For residents of those properties fronting onto and overlooking Lower Bloors Lane, there may be **Localised, Minor / Moderate Adverse Visual Effects** upon views and their visual amenity upon completion of the Proposed Development and before the maturation of mitigation planting.

11.90 Once gapping up and enhancement works to the hedgerows and trees / landscape buffer within the Site has matured, these will reduce to **Permanent, Localised and Minor Adverse Visual Effects**.

Residents of Properties of Lower Rainham

Construction Phase

11.91 From properties overlooking the Site, the construction works associated with the school and houses north of the bridleway will be visible, set back beyond the playing fields. This may give rise to **Temporary, Localised and Moderate Adverse Visual Effects** for these residents.

On Completion and Residual Effects

11.92 Upon completion, the setting-back of the Proposed Development beyond a landscape buffer and the playing fields will result in **Localised, Minor / Moderate Adverse Visual Effects**.

11.93 These will reduce to **Permanent, Localised and Minor Adverse Visual Effects** with the maturation of the planting to the landscape buffers along the Site boundaries and adjacent to the playing fields and housing south of the school.

Residents of Properties at Lower Twydall

11.94 There are limited views towards the Site from properties at lower Twydall. For those with outward views to the east, intervening vegetation to field boundaries filters views into the western site area.

On Completion and Residual Effects

11.95 Upon completion, any development visible from these properties will be set beyond intervening trees and hedgerows, resulting in **Localised, Minor Adverse Visual Effects.**

11.96 These will reduce to **Permanent Negligible Visual Effects** upon maturation of the landscape buffer planting to the western site boundary which will screen views of the Propose Development.

SUMMARY

11.97 The effects of the Proposed Development at the construction stage, at completion (with embedded mitigation planting), ie, year 1 and the residual effects after 15 years of growth are summarised in Table 11.2 below.

Table 11.2: Summary of Landscape and Visual Effects

Description of Likely Significant Effects	Significance	Summary	
		B/ A, P/T, D/I ST/M/LT,L/R/N	
Demolition and Construction Phase			
Landscape Receptors			
Lower Rainham Farmlands LCA	Minor Adverse	A,T,I,LT,R	Works will introduce uncharacteristic elements into the local landscape, with the development changing the land use and character of the site area.
Lower Rainham and Lower Twydall Fruit Belt LLCA	Moderate / Major Adverse	A,T,I,LT,L	Works will introduce uncharacteristic elements into the local landscape, with the development changing the land use and character of the site area.
Medway Shoreline and Riverside Country Park LLCA	Minor Adverse	A,T,I,LT,L	Works will introduce uncharacteristic elements into the local landscape, with the development changing the land use and character of the site area.
Medway Marshes Farmland LLCA	Minor Adverse	A,T,I,LT,L	Works will introduce uncharacteristic elements into the local landscape, with the development changing the land use and character of the site area.
Site Area and Site Features	Major adverse (localised)	A,T,D,LT,L	Works will introduce uncharacteristic elements into the local landscape, with the development changing the land use and character of the site area.
Visual Receptors			
Users of Northern shore of the Medway	Minor adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of South of Motney Hill	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of North of Lower Rainham	Minor Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.

Users of Horrid Hill	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Lower Rainham Road	Minor / Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Lower Bloors Lane	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Lower Twydall Lane	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Bridleway GB6a	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Pump Lane	Major Adverse (localised)	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Users of Trains Passing the Site	Minor / Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Residents of properties in Twydall south of the Railway	Moderate / Major Adverse (localised)	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Residents of properties on Pump Lane	Major Adverse (Localised)	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Residents of properties on Lower Bloors Lane	Minor / Moderate Adverse	A,Y,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Residents of properties of Lower Rainham adjacent to and overlooking the site	Moderate Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.
Residents of properties at Lower Twydall	Minor Adverse	A,T,D,M,L	Construction activities introduce uncharacteristic elements, movement of vehicles and plant and disruption into views.

Description of Likely Significant Effects	Significance	Effects Year 1	Description of Mitigation	Significance	Residual Effects (Year 15) (At maturation of proposed mitigation planting)
		B/ A, P/T,D/I,ST/M/LT,L/N/R			B/A,P/T,D/I,ST/M/L,L/R/N
Operational Phase					
Landscape Receptors					
Lower Rainham Farmlands LCA	Minor Adverse	A,T,D,LT,R	Embedded landscape mitigation measures.	Minor Adverse	A,P,I,LT,L
Lower Rainham and Lower Twydall Fruit Belt LLCA	Moderate Adverse	A,T,D,LT,L	Range of embedded landscape mitigation measures, including landscape buffers, tree planting and implementation of new areas of community orchards and village green.	Moderate Adverse	A,P,D,LT,L
Medway Shoreline and Riverside Country Park LLCA	Minor Adverse	A,T,I,LT,L	Embedded landscape mitigation measures.	Minor Adverse	A,P,I,LT,L
Medway Marshes Farmland LLCA	Minor Adverse	A,T,I,LT,L	Embedded landscape mitigation measures.	Minor Adverse	A,P,I,LT,L
Site Area and Site Features	Major Adverse (Localised)	A,T,D,LT,L	Range of embedded landscape mitigation measures, including landscape buffers, tree planting and implementation of new areas of community orchards and village green.	Moderate Adverse	A,P,D,LT,L
Visual Receptors					
Users of Northern shore of the Medway (Photoviewpoint 1)	Minor Adverse	A,P,D,M,L	Landscape buffer planting and trees throughout the development	Neutral	P,D,LT,L
Users of South of Motney Hill (Photoviewpoint 4)	Minor / Moderate Adverse	A,P,D,M,L	Landscape buffer planting and trees throughout the development	Minor Adverse	A,P,D,LT,L

Users of North of Lower Rainham (Photoviewpoint 5)	Minor Adverse	A,P,D,M,L	Landscape buffer planting and trees throughout the development	Neutral	P,D,LT,L
Users of Horrid Hill (Photoviewpoint 2)	Moderate Adverse	A,P,D,M,L	Landscape buffer planting and trees throughout the development	Minor Adverse	A,P,D,LT,L
Users of Lower Rainham Road (Photoviewpoint 6,7 and 8)	Minor Adverse	A,P,D,M,L	Development will be set back beyond the retained tall hedgerows to the road and landscape buffer beyond incorporating tree planting.	Minor Adverse	A,P,D,LT,L
Users of Lower Bloors Lane (Photoviewpoints 9, 10 and 11)	Minor / Moderate Adverse	A,P,D,M,L	Landscape buffer incorporating planting to gap-up and enhance the existing hedgerows alongside the lane, as well as new tree and hedgerow planting within the site.	Minor Adverse	A,P,D,LT,L
Users of Lower Twydall Lane (Photoviewpoints 12 and 13)	Minor Adverse	A,P,D,M,L	Landscape buffer and screening vegetation.	Minor Adverse	A,P,D,LT,L
Users of Bridleway GB6a (Photoviewpoints 14a, 14b and 15)	Minor Beneficial	B,P,D,M,L	The bridleway will pass alongside areas of open space including play areas / pocket parks and pass through the village green.	Minor / Moderate Beneficial	B,P,D,LT,L
Users of Pump Lane (Photoviewpoints 16, 17 and 18)	Moderate Adverse	A,P,D,M,L	Development will be set back from the lane beyond areas managed as community orchards, the village green and opens spaces, in keeping with the existing glimpsed views of orchards obtained to the south of Russett Farm. The hedgerows along the lane and supplementary planting will screen views of development, with views along new accesses off the lane set beyond verges with street trees.	Minor / Moderate Adverse	A,P,D,LT,L

Users of Trains Passing the Site	Minor / Moderate Adverse	A,P,D,M,L	Buffer planting incorporating tree belts along the railway.	Minor Adverse	A,P,D,LT,L
Residents of properties in Twydall south of the Railway	Moderate Adverse	A,P,D,M,L	Buffer planting incorporating tree belts along the railway.	Minor / Moderate Adverse	A,P,D,LT,L
Residents of properties on Pump Lane	Moderate / Major Adverse (localised)	A,P,D,M,L	Development will be set back from Pump Lane, with hedgerows retained and areas of community orchards will replace the commercial orchards, viewed through the access and beyond the hedgerow.	Moderate Adverse	A,P,D,L
Residents of properties on Lower Bloors Lane	Minor / Moderate Adverse	A,P,D,M,L	Gapping up of hedgerows and planting to landscape buffers along the lane.	Minor Adverse	A,P,D,L
Residents of properties of Lower Rainham adjacent to and overlooking the site	Minor / Moderate Adverse	A,P,D,M,L	Mitigation planting to the site boundaries.	Minor Adverse	A,P,D,L
Residents of properties at Lower Twydall	Minor Adverse	A,P,D,M,L	Mitigation planting to the site boundaries.	Negligible	P,D,L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

12 AIR QUALITY

INTRODUCTION

12.1 Air pollution adjacent to the site and in proximity to roads is dominated by emissions from vehicles. **Figure 12.1** shows the location of the diffusion tube monitoring and Local Nature Conservation Sites in the vicinity of the Application Site. The main pollutants of concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and particulates assessed as the fraction of airborne particles of mean aerodynamic diameter less than 10 micrometres (PM_{10}) and 2.5 micrometres ($PM_{2.5}$). These pollutants are most likely to approach their respective air quality standard, set for the protection of human health and vegetation, in proximity to busy and congested roads.

12.2 The Proposed Development has the potential to impact local traffic movements and thus emissions of the aforementioned pollutants, which could affect air quality at existing and proposed sensitive receptor locations. As such, these pollutants form the focus of the air quality assessment.

12.3 This chapter is supported by **Technical Appendices 12.1, 12.1sup** (which is a Note responding to a number of questions raised by the Environmental Health Officer during the determination of the application), **12.2 to 12.7**. The chapter summarises the findings of the air quality assessment undertaken for the Proposed Development, which include:

(i) establishing the current and future baseline air quality conditions at and in proximity to the Application Site, including the identification of existing sensitive receptors to changes in air quality;

(ii) assessing potential construction-phase air quality impacts at identified sensitive receptors, specifically relating to fugitive dust and exhaust emissions associated with construction activities;

(iii) assessing potential operation-phase local air quality impacts at identified sensitive receptors, particularly associated with sections of the local road network where changes in vehicle emissions are likely to be caused by the introduction of the Proposed Development;

(iv) undertaking an emissions mitigation calculation in accordance with the Medway Air Quality Planning Guidance in conjunction with determining appropriate mitigation to reduce emissions from the operational development; and

(v) assessing the suitability of the Application Site for the proposed land uses, which includes potentially sensitive receptors (e.g. residential properties and primary school) with respect to predicted future local air quality levels.

12.4 Where necessary, details of the mitigation measures required to prevent, reduce, or offset identified air quality impacts associated with the Proposed Development are stated in this chapter. The resulting residual impacts are also reported, which assumes that mitigation will be applied.

12.5 Specific assessment in relation to international / European designated sites of nature conservation interest is presented within the document entitled “Information for Habitats Regulations Assessment” (IHRA), produced by Ecology Solutions. As air quality matters are pertinent to the IHRA, reference is made to this document within this chapter, where relevant.

POLICY CONTEXT

12.6 This section of the ES discusses the context of the Proposed Development with regard to the relevant European Union (EU) and UK air quality legislation, in addition to national and local planning policies.

European & National Air Quality Legislation

European Ambient Air Quality Directive 2008

12.7 The 2008 Ambient Air Quality Directive (2008/50/EC)(ref. 12.1) is the primary driver for managing and improving air quality for each member state of the EU. The Directive sets legally binding limit values for concentrations in ambient (outdoor) air of pollutants that can impact public health, including NO_2 and particulates (PM_{10}, $PM_{2.5}$).

12.8 EU limit values are set for individual pollutants and comprise a concentration value, an averaging time over which it is to be measured, the number of allowed exceedances per year (if any), and a date by which it must be achieved. Some pollutants (e.g. PM_{10}) have more than one limit value covering different averaging times.

Air Quality Standards Regulations 2010

12.9 The EU Directive was transposed into English law via the Air Quality Standards Regulations 2010, as amended (ref. 12.2).

12.10 The responsibility for meeting the prescribed air quality limit values is devolved to the national administrations. In England, the Secretary of State for Environment, Food, and Rural Affairs has responsibility for adhering to the limit values, whilst the Department for Environment, Food and Rural Affairs (Defra) co-ordinate the assessment of compliance with limit values and development of Air Quality Plans for the UK.

12.11 Under the 2017 Air Quality Plan (ref. 12.3), certain local authorities are required under the Environment Act to undertake feasibility studies to identify options to deliver compliance with EU limit values. Medway Council was not included in the list of authorities required to do this.

Local Air Quality Management

12.12 Under the Environment Act 1995 (ref.12.4), the UK Government and the devolved administrations are required to prepare and publish a national Air Quality Strategy. The most recent version of the Strategy was published in 2007 (ref.13.5) and establishes the UK's air quality standards and objectives, in addition to providing guidance, where needed, on air quality action planning at national, regional and local scales.

12.13 Air quality standards are concentrations recorded over a given averaging period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutants on health and the environment. An objective is the target date of which exceedances of a standard must not exceed a prescribed number.

12.14 Local authorities in England are required to review air quality within their jurisdiction, under Part IV of the Environment Act 1995, and designate air quality management areas (AQMAs) where air quality standards are not being met and/or where air quality improvement is needed. Local authorities are then required to work towards achieving the national Air Quality Strategy objectives and standards as prescribed in the Air Quality Standards Regulations 2010.

12.15 An air quality action plan must be established by the local authority outlining the measures to improve air quality within the designated AQMA. The purpose of these action plans is to contribute to the achievement of air quality limit values at the local level.

Relevant UK Air Quality Objectives

12.16 The national air quality objectives and EU limit values that the UK must comply with, specifically for traffic-related pollutants NO_2, PM_{10}, and $PM_{2.5}$, are presented in **Table 12.1**.

12.17 The respective UK objective and EU limit value concentration standards and averaging periods are numerically identical for each pollutant, based on air quality standards set for the protection of human health and vegetation.

Table 12.1: National Air Quality Objectives and European Directive Limit Values for the Protection of Human Health

Pollutant	UK Objective / EU Limit Value (µg/m^3)	Averaging Period	Date to be achieved by and maintained thereafter:	
			UK Objective	EU Directive
Protection of Human Health				
Nitrogen Dioxide (NO_2)	200*	1 hour mean	31.12.2005	01.01.2010
	40	annual mean	31.12.2005	01.01.2010
Particulate Matter (PM_{10})	40	annual mean	31.12.2004	01.01.2005
	50**	24 hour mean	31.12.2004	01.01.2005
Particulate Matter ($PM_{2.5}$)	25	annual mean	2020	2010
Protection of Vegetation				
Oxides of Nitrogen (NO_x)	30	Annual Mean	30.12.2000	19.07.2001
	75	Maximum 24-hour mean	30.12.2000	19.07.2001

* Not to be exceeded more than 18 times per year; ** Not to be exceeded more than 35 times per year

Critical Levels and Loads for Designated Ecological Sites

12.18 Critical loads (CLOs) and levels are used for assessing the risk of air pollution impacts on ecosystems. Critical loads are defined as *'a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'* (Ref 12.6).

12.19 Empirical CLOs for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution. They are based on empirical evidence such as observations from experiments and gradient studies. CLOs are assigned to habitat classes defined within the European Nature Information System (EUNIS) (Ref 12.7) which enables consistency of habitat terminology and understanding. CLOs are given as ranges and reflect the variation in ecosystem response across Europe.

12.20 CLOs for use in impacts assessments, which were revised in June 2010, are provided on the Air Pollution Information System (APIS) (Ref 12.8). The impact of the development on nutrient nitrogen and acid (from nitrogen) deposition has been assessed at relevant identified sensitive ecological receptors against the CLO's set out on the APIS website. Further information is also provided in the Supplementary Advice to the Conservation Objectives of European designated sites, published by Natural England.

12.21 The Application Site and local road network is located in close proximity to an international/European Designated Site - Medway Estuary and Marshes Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and RAMSAR site. The CLOs of relevance to this Designated Site, identified in conjunction with Ecology Solutions, are set out in **Table 12.2.**

12.22 In addition, in light of pre-application correspondence with Natural England (NE), consideration has been afforded to potential impacts which would arise on European designated sites located further away from the Development Site which may be associated with an increase in road traffic on the strategic transport network. As outlined in detail in the IHRA, whilst the potential for effects arising on a number of site has been scoped out using traffic data, further consideration has been afforded to potential for effects arising to a further two European designated Sites, being the Swale SPA and RAMSAR site, which spans the A249 north of Iwade and the North Downs Woodlands Special Area of Conservation (SAC), the nearest component of which is located adjacent to the A249 south of Detling and the A229 south of Kit's Coty, respectively. The CLOs relevant to these sites are also provided in **Table 12.2.**

Table 12.2: Critical Loads for European Designated Sites

Pollutant Species	Critical Load	Background Deposition	Habitat CL Designation
Medway Estuary and Marshes SSSI/SPA/RAMSAR site			
Nitrogen Deposition	20-30 kgN/ha/yr	13.21 kgN/ha/yr	Saltmarsh Habitat[1]
Acid (nitrogen) Deposition	There are no critical loads related to Acid deposition for saltmarsh habitats, so an assessment of acid deposition has not been included		
Swale SPA/RAMSAR site			
Nitrogen Deposition	15-30 kgN/ha/yr	14.2 kgN/ha/yr	Rich Fens (reed beds within 200 m)[1]
Acid (nitrogen) Deposition	There are no critical loads related to Acid deposition for saltmarsh and reedbed habitats, so an assessment of acid deposition has not been included		
North Downs Woodland SAC			
Nitrogen Deposition	5-15 kgN/ha/yr	25.87 kgN/ha/yr	Coniferous Woodland[1]
Acid (nitrogen) Deposition	0.142 keq/ha/yr	1.85 keq/ha/yr	Coniferous Woodland
[1]**lowest critical load has been selected for the assessment**			

Environmental Protection Act 1990 – Control of Dust and Particulates (Construction Works)

12.23 The Environmental Protection Act (ref.12.9) contains a definition of what constitutes a 'statutory nuisance' with regard to dust and places a duty on Local Authorities to detect any such nuisances within their area. Dust arising from construction works could lead to statutory nuisance if it '*interferes materially with the wellbeing of the residents, i.e. affects their wellbeing, even though it may not be prejudicial to health*'.

12.24 Section 80 of the Act states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

12.25 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

Climate Emergency

12.26 On 8 October 2018, the UN Intergovernmental Panel on Climate Change (IPCC) released a report on the state of climate science, warning that if the planet warmed by 1.5 °C there would be devastating consequences such as extreme weather conditions. Medway Council, along with Kent County Council declared a climate emergency in April 2019. Council requested that the Cabinet establish a clear action plan for Medway to become carbon neutral within an appropriate timescale. Notwithstanding this, the Council does not have a statutory duty to reduce emissions in line with the Climate Change Act 2008 or to develop an action plan.

12.27 On 9 July 2019, a report was presented to the Cabinet setting out the Council's aspirations and approach to the delivery of an action plan. In particular, the Cabinet agreed to the establishment of the Climate Change Member Advisory Group. A five-year rolling action plan is being developed.

12.28 On 20 March 2020, an update report was presented to Cabinet which identified that

(i) a draft Kent and Medway Energy and Low Emissions Strategy (KMELES) setting out how the Council would achieve carbon neutrality by 2050 was consulted on over the summer of 2019, with the final document expected to be adopted as policy in the spring of 2020 – this did not happen due to Covid-19 and there is no further update on this at this time,

(ii) the Climate Change Action Plan would be finalised by August 2020 subject to the completion of a carbon assessment and any other work arising as a result, and that the Action Plan would be presented to Cabinet in November 2020 – no further update is available at the time of writing this SES.

12.29 A number of measures that the Advisory Group have identified and are being pursued as part of the Action Plan (in addition to the KMELES) include EV charging infrastructure, electric buses in Medway, promoting car sharing/walking/cycling, developing an energy policy, developing a biodiversity/tree planting strategy, plastics use reduction, etc. It remains to be seen as these proposals are developed further, how they are translated into planning policy.

Planning Policy

National Planning Policy Framework

12.30 The Government's overall planning policies for England are described in the NPPF (ref.12.10). The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to *'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'*.

12.31 Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 170) requires that *'planning policies and decisions should contribute to and enhance the natural local environment by …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'.

12.32 In dealing specifically with air quality the NPPF (paragraph 181) states 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. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan'.*

12.33 Paragraph 183 states that '*the focus of planning policies and decisions should be on 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*'.

Medway Council, Local Plan 2003

12.34 MC is currently developing a new Local Plan. However, until such time as the new Local Plan is published policies set out in the 2003 Local Plan (ref.12.11), continue to be used to guide development across the district.

12.35 Under Policy BNE2 the Plan requires all development to '*secure the amenities of its future occupants and protect those amenities enjoyed by nearby and adjacent properties'* thus requiring development to have regard to airborne emissions which can impact amenity such as fumes, smoke, soot, ash, grit and dust.

12.36 The Plan also sets out Policy BNE24 which states that *'development likely to result in airborne emissions should provide a full and detailed assessment of the likely impact of these emissions. Development will not be permitted when it is considered that unacceptable effects will be imposed on the health, amenity or natural environment of the surrounding areas taking into account the cumulative effects of other proposed or existing sources of air pollution in the vicinity'.*

METHODOLOGY

12.37 This section provides details of the data and information supplied for the purposes of undertaking the air quality assessment. It also describes the adopted methodology for assessing and appraising the potential air quality impacts associated with the construction and operation phases of the Proposed Development.

12.38 The scope of the air quality assessment and associated methodology was agreed through consultation with MC Environmental Protection Officer.

Key Guidance

12.39 A summary of the guidance documents referred to in the completion of this assessment is provided below.

Medway Council Air Quality Planning Guidance

12.40 MC has produced specific Air Quality Planning Guidance (ref.12.12). The guidance has been developed in conjunction with the Kent and Medway Air Quality Partnership to improve air

quality across Kent and Medway and with an aim to provide a consistent approach to undertaking air quality assessments as part of the planning regime.

12.41 The methodology used for undertaking the assessment is based on the guidance set out within the document. In conjunction with an assessment of operational and construction impacts the guidance requires all major developments to undertake an emissions mitigation assessment to '*calculate the emissions resulting from a development and produce an exposure cost value to be spent on mitigation measures*'. This assessment has therefore included an emissions mitigation calculation and refers to the standard and additional mitigation measures listed in the guidance, which are addressed in the mitigation section of this chapter.

Local Air Quality Management Review and Assessment Technical Guidance 2016

12.42 Defra has published technical guidance for use by local authorities in their review and assessment work (ref. 12.13). This guidance, referred to in this document as LAQM.TG16, has been used where appropriate in the assessment presented herein.

Land-use Planning & Development Control: Planning for Air Quality 2017

12.43 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance (ref.12.14) that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

Guidance on the Assessment of Dust from Demolition and Construction 2016

12.44 This document (ref.12.15) published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

National Planning Practice Guidance – Air Quality 2014

12.45 This guidance (from paragraph: 001 Reference ID: 32-001-20140306) (ref.12.16) provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

BASELINE CONDITIONS

12.46 The 2018 Air Quality Annual Status Report (ASR) (ref. 12.17) published by MC was reviewed to establish baseline air quality conditions in the vicinity of the Application Site. The ASR provides the annual mean NO_2 monitored levels at the respective monitoring sites for the previous five years (2013 – 2017). This monitoring data was used to enable model verification and adjustment as part of the atmospheric dispersion modelling study.

12.47 Background NO_x, NO_2, PM_{10} and $PM_{2.5}$ pollutant concentrations corresponding to the 1 km^2 grid squares covering the Application Site and road network considered within the assessment were obtained from Defra's published national pollutant mapping data (Ref 12.18) for use in the air quality assessment.

12.48 Background NO_x concentrations for the international/European designated sites outlined above have been obtained from the APIS website (Ref 12.8), along with background nitrogen and acid deposition rates, and are provided in **Table 12.2**.

Construction Phase Assessment

Fugitive Dust Emissions

12.49 Construction phase activities associated with the Proposed Development may result in the generation of fugitive dust emissions (i.e. dust emissions generated by site-specific activities that disperse beyond the construction site boundaries).

12.50 If transported beyond the site boundary, dust can have an adverse impact on local air quality. The IAQM has published a guidance document for the assessment of demolition and construction phase impact (Ref 12.15). The guidance considers the potential for dust nuisance and impact to human health and ecosystems to occur due to activities carried out during the following stages of construction:

(i) Demolition;
(vi) Earthworks;
(vii) Construction; and
(viii) Trackout.

12.51 A qualitative assessment of air quality impacts due to the release of fugitive dust and particulates (PM_{10}) during the construction phase was undertaken in accordance with the methodology detailed in the IAQM guidance.

12.52 The assessment takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels, thus enabling a level of risk to be assigned. Risks are described in terms of there being a low, medium or high risk of dust impacts.

12.53 Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined.

12.54 A summary of the IAQM assessment methodology is provided in **Technical Appendix 12.1**.

Construction Vehicles and Plant Emissions

12.55 Exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself.

12.56 As information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

(i) The number and type of construction traffic and plant likely to be generated by this phase of the Proposed Development;
(ii) The number and proximity of sensitive receptors to the Application Site and along the likely routes to be used by construction vehicles; and
(iii) The likely duration of the construction phase and the nature of the construction activities undertaken.

Operation Phase Assessment

12.57 The assessment of operation phase air quality impacts has focussed on vehicle emissions of NO_x, NO_2, PM_{10}, and $PM_{2.5}$, given that the Proposed Development will generate additional traffic movements on the local road network and will introduce sensitive receptors adjacent

and/or near to existing roads. Therefore, a detailed atmospheric dispersion modelling exercise was undertaken to predict the level of change in local air quality.

Atmospheric Dispersion Modelling

Model Selection and Assessment Scenarios

12.58 Cambridge Environmental Research Consultants (CERC) ADMS-Roads v4.1.1 dispersion model was used to assess the potential changes in local concentrations of the aforementioned air pollutants associated with additional vehicle emissions generated by the operation the Proposed Development. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to compute emissions dispersion. It can predict long-term and short-term pollutant concentrations, as well as calculations of percentile concentrations for comparison with the respective UK air quality objectives.

12.59 The following scenarios were assessed within ADMS-Roads:

(i) 2017 – Atmospheric Dispersion Model Verification (*see below for further information*);
(ii) 2017 – Baseline year;
(iii) 2022 – Future Assessment Year 'Without Development' (i.e. future baseline only, including committed developments); and
(iv) 2022 – Future 'With Development' (i.e. future baseline + Proposed Development).

12.60 2017 is the most recent year for which monitoring data and meteorological data were available to enable verification of the model performance. A baseline year of 2017 was modelled to provide predictions of existing pollutant concentrations at the identified sensitive receptors. 2029 is the anticipated completion year of the Proposed Development, however, to ensure a worst-case assessment the 2029 traffic data has been used for the 2022 assessment year.

Traffic Data and Emissions Inventories

12.61 Traffic data were provided by the project transport planning consultants for each of the above scenarios, encompassing the local road network in the immediate vicinity and leading into Rainham, Chatham and Gillingham, including the Rainham and Central Medway AQMA.The EPUK Land-use Planning Guidance sets out the following criteria for determining when there is a risk of significant impacts on local air quality and thus when a detailed air quality assessment is required:

(i) A change in Light Duty Vehicles (LDVs) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
(ii) A change in Heavy Duty Vehicles (HDVs) flow of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere

12.62 Those road links where the above criteria are met have been included within the modelling assessment.

12.63 Traffic data were provided as Annual Average Daily Traffic (AADT) flows and the percentage of Heavy Duty Vehicles (HDVs) applicable to each modelled link. Average traffic speeds were assumed for each road link and reduced on the approach to and progress through the junctions, with reference to guidance provided in LAQM.TG16 and using professional judgement. A summary of the traffic data applicable to all modelled roads included in the assessment is provided in **Technical Appendix 12.2.**

12.64 The traffic data for all future year scenarios include flows for other committed developments in the locality of the Application Site.

12.65 Traffic data was used to develop emissions inventories for each pollutant (NO_x, PM_{10}, $PM_{2.5}$) and scenario using Defra's latest emissions factors toolkit (EFT v8.0.1) (ref. 12.19). The EFT allows for the calculation of emission factors arising from road traffic for all years between 2015 and 2030. For the predictions of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time.

12.66 In order to take account of uncertainties relating to future year vehicle emissions, an assessment has been carried out utilising 2021 emission factors and background concentrations combined with traffic data from 2029 to predict impacts within the 2022 assessment year. This is considered a conservative assumption of emissions in the future. **Technical Appendix 12.3** provides a justification for the selection of future year vehicle emission factors.

12.67 Each emissions inventory for the respective scenario was input to the ADMS-Roads model to enable prediction of pollutant concentrations at identified sensitive receptor locations (see 'Selection of Sensitive Receptors' below). The modelling exercise utilised the following key inputs:

(i) Pollutant emission rates for each road link within the modelled area (g/km/s);
(ii) Geometry of each modelled road link;
(iii) Hourly sequential meteorological data obtained from Gravesend Airport for 2017; and,
(iv) Coordinates of each sensitive receptor at which the model calculated pollutant concentrations.

12.68 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data obtained from the Met Office observing station at Gravesend for 2017 were considered representative for the modelled area.

Model Outputs and Results Processing

Human Receptors

12.69 For each modelled scenario, the ADMS-Roads model predicted the local road contributions of NO_x, PM_{10}, and $PM_{2.5}$ to the respective annual mean total concentration at each sensitive receptor. The relevant Defra background pollutant value was added to the roads contribution to derive the total annual mean concentration reported in the assessment.

12.70 Annual mean road-NO_x was converted to total annual mean NO_2 concentrations using Defra's NO_x to NO_2 Calculator v6.1 (ref.12.20). This calculator converts the road-NO_x at the specified receptors to road-NO_2 and enables the background NO_2 contribution to be accounted for to derive the annual mean NO_2 total.

12.71 LAQM.TG16 advises that exceedances of the 1-hour mean NO_2 objective are unlikely to occur where annual mean concentrations are below 60µg/m^3, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO_2 concentrations are 60µg/m^3 or above.

12.72 The number of days with PM_{10} concentrations greater than 50µg/m^3 was estimated using the relationship with the annual mean concentration described in LAQM.TG16.

12.73 The predicted annual mean NO_2, PM_{10}, and $PM_{2.5}$ concentrations at each modelled receptor were compared against the relevant UK air quality objectives (see **Table 12.1**) and evaluated within the context of the assessment significance criteria (see 'Significance Criteria').

Ecological Receptors

12.74 The ADMS-Roads model has also been used to predict local road concentrations of NO_x at identified ecological receptors (as discussed in detailed below).

12.75 The predicted annual mean NO_x concentrations have been added to background NO_x concentrations taken from the APIS website and resulting concentrations compared against the relevant objective limit set for vegetation (**Table 12.1**). the model has also predicted the maximum 24-hour NO_x concentrations with the 24-hour background concentrations calculated from the annual mean using guidance provided by DEFRA (2 x annual mean, multiplied by 0.59)

12.76 Guidance produced by the Environment Agency on assessing emissions to air in relation to the Habitats Directive (AQEAG06) (Ref 12.22) sets out empirical methods for calculating nitrogen deposition (N-deposition) rates based on calculated NOx concentrations and deposition velocity using the following formula:

(i) Dry deposition flux (µg/m^2/yr) = ground level concentration (µg/m^3) x deposition velocity (m/s)

12.77 The AQTAG06 guidance only provides deposition velocities for grassland (0.0015 m/s) and forest habitats (0.003 m/s). The deposition rate for grassland has been used for the Medway Estuary and Marshes SSSI/SPA/RAMSAR site and the Swale SPA/RAMSAR site while the forest deposition rate has been applied for receptors within the North Downs Woodland site.

12.78 The resulting dry deposition rate can be converted to N-deposition in kg/ha/yr by multiplying by a factor of 95.9.

12.79 The acid (nitrogen) deposition has been calculated from the predicted dry deposition rate by applying a factor of 6.82, as set out within the AQEAG06 guidance.

12.80 The maximum predicted deposition rates have been added to background deposition rates and compared with site specific critical loads obtained from APIS (**Table 12.2**).

Model Verification

12.81 The predicted annual mean NO_2 results from the base year (2017) model scenario were compared with the equivalent 2017 MC monitored results to identify where differences occur. The majority of modelled concentrations should be within +/-25% of the equivalent monitored value, but ideally within +/10%.

12.82 Differences between modelled and measured pollutant concentration can be caused by a number of factors, including:

(ii) Estimates of background concentrations;
(iii) Meteorological data uncertainties;
(iv) Uncertainties in source activity data such as traffic flow data and vehicle emissions factors;
(v) Model input parameters such as roughness length, minimum Monin-Obukhov length, overall model limitations; and
(vi) Uncertainties associated with monitoring data, including locations.

12.83 Model verification is a process that facilitates these uncertainties to be investigated and, through appropriate adjustment of the modelled road-NO_x contribution, minimised to improve the consistency of modelling results versus available monitored data.

12.84 Model adjustment factors for road-NO_x derived through this process were applied to all subsequent model scenario outputs to provide the final predicted concentrations.

12.85 Details of the model verification and adjustment calculations are presented in **Technical Appendix 12.4.** The adjustment factor derived through this process was applied to the model road-NO_x outputs for all scenarios prior to conversion to annual mean NO_2 concentrations

12.86 Monitoring carried out at the Chatham AURN site has also been used to verify predicted PM_{10} and $PM_{2.5}$ concentrations in accordance with the guidance set out in LAQM.TG16. The calculated adjustment factors have been applied to predicted PM_{10} and $PM_{2.5}$ concentrations. Details of the model verification are also set out in **Technical Appendix 12.4**.

Selection of Sensitive Receptors

12.87 Sensitive receptors are locations where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development (as defined in LAQM.TG16). These will include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to air pollutants emitted from the exhausts of construction and operational traffic associated with the Proposed Development.

Construction Phase

12.88 The IAQM assessment is undertaken where there are:

(i) human receptors within 350m of the site boundary or within 50m of the route(s) used by construction vehicles on the public highway;
(ii) human receptors up to 500m from the site entrance(s);
(iii) ecological receptors within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway; and
(iv) ecological receptors up to 500m from the site entrance(s).

12.89 It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

Operational Phase

Human Receptors

12.90 A number of receptor locations representative of relevant public exposure were identified at which pollution concentrations were predicted. Receptors have been identified adjacent to the roads that are likely to experience the greatest change in traffic flows or composition, and therefore NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) concentrations, as a result of the Proposed Development.

12.91 In terms of locations that are sensitive to pollutants emitted from vehicles on the local road network, these will include places where members of the public are likely to be regularly present over the averaging periods prescribed in the relevant air quality objectives (see **Table 12.1**). For instance, on a footpath where exposure will be transient, comparison with a short-term standard (i.e. 1-hour mean) may be relevant. At a school or a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (i.e. 24-hour mean or annual mean) may be more appropriate.

12.92 The locations of the assessment receptors are shown on **Figures 12.2 to 12.4** and listed in **Table 12.3** below.

Table 12.3: Identified Human Sensitive Receptor Locations included in local air quality assessment

Receptor	Description/Address	Grid Reference (X,Y)		Height (m)
R1	430 Lower Rainham Road	581037	167913	1.5
R2	405 Lower Rainham Road	580957	168010	1.5
R3	316 Lower Rainham Road	580588	168218	1.5
R4	92 Lower Rainham Road	579661	168677	1.5
R5	Herleva Way	579448	168668	1.5
R6	1 Danes Hill	579158	168882	1.5
R7	45 Gads Hill	578866	168968	1.5
R8	82 Odo Rise	579480	168431	1.5
R9	Hillyard Close	579318	167868	1.5
R10	106 Corn Wallis Avenue	579041	167793	1.5
R11	55 Corn Wallis Avenue	578890	167870	1.5
R12	95 Beechings Way	579861	167549	1.5
R13	201 Beechings Way	580358	167189	1.5
R14	2 Truro Close	580732	167050	1.5
R15	Thames View Infant School	581020	166764	1.5
R16	43 Bloors Lane	580864	166428	1.5
R17	Broadway	579056	167201	1.5
R18	Dane Court School	579016	166670	1.5
R19	Rotary Gardens	578648	166702	1.5
R20	38 Watling Street	578034	166870	1.5
R21	159 Rainham Road	577766	166926	1.5
R22	70 Rainham Road	577594	166953	1.5

R23	105 Chatham Hill	577233	167064	1.5
R24	64 Chatham Hill	576771	167328	1.5
R25	Otway Terrace	576345	167441	1.5
R26	New Road Primary School	576271	167432	1.5
R27	5 Twydall Lane	579702	166504	1.5
R28	50 London Road	579932	166423	1.5
R29	Scallywags Nursery	580701	166226	1.5
R30	69 London Road	580885	166181	1.5
R31	24 High Street	581436	166031	1.5
R32	54 High Street	581557	165959	1.5
R33	Care Home 117 High Street	581842	165884	1.5
R34	135 High Street	581894	165854	1.5
R35	6 Hoath Lane	579699	164925	1.5
R36	3 Wigmore Glade	579611	163833	1.5
R37	Haughton Avenue	579722	163379	1.5
R38	Rosebury House, Bedhurst	579336	162318	1.5

Ecological Receptors

12.93 In terms of ecological receptors, the impact of vehicle emissions at designated sites (SSSIs, SPAs, SACs, Ramsar) within 200 m of an affected road should be considered within the air quality assessment, as stipulated by Highways England guidance (ref. 12.21). Affected roads are those that experience any of the following:

(i) Road alignment change of more than 5m;
(ii) Daily traffic flow change of more than 1000 per day;
(iii) HDV change or more than 200 per day;
(iv) Change in traffic speeds of 10 km/hr or more;
(v) Change in peak hour speed of more than 20 km/hr.

12.94 The Medway Estuary and Marshes SSSI/SPA/RAMSAR site is located to the north of the Application Site, as shown in **Figure 12.1**. Traffic flows are predicted to change along road links 1 and 13 (Figure 12.2.1, **Technical Appendix 12.2**) by more than 1000 vehicles per day as a result of the operational development. Parts of the Medway Estuary and Marshes Designated Site lies within 200 m of both road links. A number of receptors have been selected

representing the Designated Site at locations within 200 m of the road links. The locations of these receptors are shown in **Figure 12.2** and details are provided in **Table 12.4**.

12.95 Concentrations have also been predicted at 10m intervals, up to 100m from receptors E3 and E4 leading away from Links 1 and 13 to the north, to assess the distance at which significant impacts may occur.

Table 12.4: Identified Ecological Sensitive Receptor Locations Included in Local Air Quality Assessment

Receptor	Description/Address	Grid Reference (X,Y)		Height (m)
E1	Medway Estuary and Marshes SSSI/SPA/RAMSAR site (north of Lower Rainham Road)	581304	167923	0
E2	Medway Estuary and Marshes SSSI/SPA/RAMSAR site (north of Lower Rainham Road)	581059	168184	0
E3	Medway Estuary and Marshes SSSI/SPA/RAMSAR site (north of Gads Hill, including a transect of receptors at 10 m intervals up to 100 m north of the site boundary)	579415	168875	0
E4	Medway Estuary and Marshes SSSI/SPA/RAMSAR site (north of Gads Hill, including a transect of receptors at 10 m intervals up to 100 m north of the site boundary)	579042	169047	0
E5	Medway Estuary and Marshes SSSI/SPA/RAMSAR site (north of Gads Hill,)	578813	169189	0

12.96 In light of the predicted change in road traffic movements on the strategic transport network, receptors have also been selected along transects at 10 m intervals spanning the A249 up to 100 m either site to predict impacts within the Swale SPA/RAMSAR site. A further two transects have also been selected up to 100 m from the A249 and A229 at 10 m intervals to predict impacts within the North Downs Woodlands SAC. The locations of these receptors are shown in **Figures 12.5 to 12.7**.

Significance Criteria

Construction Phase

12.97 The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

12.98 For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Application Site on local concentrations of

NO_2 and particulate matter, the significance of residual effects has been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance, which are described below.

Operational Phase

Human Receptors

12.99 The results of the local air quality impact assessment have been evaluated with reference to the guidelines presented in **Table 12.5**. These are based on EPUK guidance, which provides the basis to assess the potential significance of the Proposed Scheme on local air quality.

12.100 The IAQM guidance describes the magnitude of incremental change (Do-Minimum versus Do-Something) in the pollutant concentration at each individual sensitive receptor as a proportion of a relevant air quality assessment level (AQAL). In this assessment, the AQALs are the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives.

12.101 The incremental change at each receptor is examined in the context of the total predicted annual mean concentration and its relationship with the AQAL. This allows an impact descriptor to be assigned to each receptor, with overall significance of the effects of any impacts assigned by professional judgement.

Table 12.5: Impact Descriptors for Individual Receptor

Annual mean concentration at receptors in assessment year	% Change in Concentration (DM - DS) Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes:

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as 'adverse', and where it decreases as 'beneficial'.

12.102 In reporting the overall significance on local air quality, a number of potential contributing and/or limiting factors should be accounted for, including:

(i) The existing and future air quality in the absence of the development;
(ii) The extent of current and future population exposure to the impacts, and
(iii) The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

12.103 The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does

not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.

Ecological Receptors

12.104 The Environment Agency has set criteria for assessing the significance of air quality impacts within AQTAG06, stating that if the process contribution (PC) is less than 1% of the relevant long-term benchmark (CLE or CLO) and less than 10% of the short-term (i.e. 24-hour NO_x CLE), then emissions are not likely to have a significant effect either alone or in combination. This criterion has been used to identify where impacts predicted as a result of traffic related emissions can be classed as being insignificant.

12.105 Where a predicted impact cannot immediately be classed as insignificant further consideration of the effect needs to be carried out to establish the likely significance of the impact and to assist in establishing appropriate mitigation measures. Where impacts are predicted that cannot immediately be classed as not significant, these have been discussed further with Ecology Solutions. Further detailed consideration in light of the test of the Habitats Regulations is presented in the IHRA.

Limitations and Assumptions: Atmospheric Dispersion Modelling

12.106 There are naturally (if, limited) uncertainties associated with both measured and modelled concentrations. The model (ADMS-Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not take into account.

12.107 The application of model verification for the 2017 model scenario allowed a number of potential uncertainties to be investigated (see 'Model Verification' above) and, through appropriate adjustment of the model outputs, minimised to improve the consistency of modelling results versus available monitored data. Model verification was completed with reference to guidance set out in LAQM.TG16.

12.108 To evaluate model performance and assess these uncertainties, the verified model results were subjected to statistical analyses to establish confidence in the results being presented. The statistical parameters assessed comprised:

(i) Root Mean Square Error (RMSE);
(ii) Correlation Coefficient, and
(iii) Fractional Bias.

12.109 See **Technical Appendix 12.4** for further details and outcomes of the model performance analysis.

12.110 In future year scenarios, another uncertainty relates to the projection of vehicle emissions and, in particular the rate at which emissions per vehicle will improve over time. This assessment has utilised the most recent version of Defra's Emissions Factors Toolkit to provide the most up to date estimate of current and future vehicle emissions projections.

12.111 Due to the uncertainty surrounding the accuracy of future year background concentrations, a precautionary approach has been taken whereby, for the future scenario in 2022 has used background concentrations from 2021 in accordance with the approach set out in **Technical Appendix 12.3**. This approach is considered to provide a conservative assessment.

Emissions Mitigation Assessment

12.112 In accordance with the Medway Air Quality Planning Guidance (Ref 12.12) an emissions mitigation assessment has been carried out. This uses the emissions mitigation calculation to calculate the emissions resulting from the operational development and produces an exposure cost value which should be spent on mitigation measures.

12.113 EFT v8.0.1 has been used to calculate the amount of transport related pollutant emissions from the operational development based on the total daily trips. The output has then been multiplied by the Interdepartmental Group on Costs and Benefits (IGCB) damage costs (Ref 12.23) for the key pollutants, nitrogen oxides (NO_x) and particulates (PM_{10}) and adjusted to account for inflation. Finally, the calculated annual cost has been multiplied by 5 and adjusted to account for changing use value (following the Defra guidance) to provide a 5-year exposure cost value which is the amount (value) of mitigation that is expected to be spent on measures to mitigate the emissions.

BASELINE CONDITIONS

Review and Assessment of Air Quality

12.114 MC has declared four AQMAs within their administrative area as a consequence of their local air quality review and assessment work.

12.115 The Central Medway AQMA is approximately 2.4 km to the south west of the Application Site and covers the main road network within Chatham and Rochester. The Gillingham AQMA lies approximately 2.9 km to the north west of the Application Site and incorporates part of Pier Road. The Rainham AQMA is located along the High Street and lies approximately 1.3 km to the south east of the Application Site.

12.116 The Application Site does not fall within any of the four AQMA, the final AQMA being located at Chattenden over 3 km to the north west. Air quality in the immediate vicinity of the Site has not been found to exceed the relevant air quality objectives as part of the review and assessment process.

Local Emission Sources

12.117 The Application Site is located in an area where air quality is mainly influenced by emissions from road transport using Lower Rainham Road.

12.118 There are no industrial pollution sources in the immediate vicinity of the Application Site that will influence local air quality. There is a train line running adjacent to the southern boundary, however, this line is not a *relevant railway track* as set out within LAQM.TG16 and background NO_2 concentrations at the Site are less than 25 µg/m^3 (**Table 12.6)**, therefore based on the screening process set out within LAQM.TG16, emissions from the railway line will not result in an exceedance of the objective limits at the Site and therefore have not been considered any further within the assessment.

Background Air Quality Data

12.119 The background pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ for 2017 and 2021 from the grid squares representing the Application Site are summarised in **Table 12.6**. Additional concentrations from all the grid squares representing the total assessment area (as presented in Figure 12.2.1, **Technical Appendix 12.2**) are provided in **Technical Appendix 12.5**. All of the annual mean background concentrations are well below the relevant objectives.

12.120 As detailed previously background NO_x concentrations for the Medway Estuary and Marshes SSSI/SPA/RAMSAR site, the Swale SPA/RAMSAR site and the North Woodlands Downs SAC have been obtained from the APIS website. The data indicates an annual mean background

concentration across the Designated Site of 24.4 µg/m^3, which is below the annual mean objective of 30 µg/m^3.

12.121 NO_x background concentrations of 12.3 µg/m^3 and 17.4 µg/m^3, have been obtained from the APIS website for the Swale SPA/Ramsar site and North Downs Woodlands SAC, respectively.

Table 12.6: Background Concentrations (µg/m^3)

Grid Square (OS Grid Reference)	NO_2 (µg/m^3)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)	
	2017	2021	2017	2021	2017	2021
580500, 167500	14.2	12.6	13.9	13.5	9.6	9.2
581500, 167500	13.2	11.8	13.3	12.9	9.3	8.9

Local Authority Air Quality Monitoring Data

Automatic Monitoring Data

12.122 MC operates two continuous automatic monitoring stations. One of these is located in Lower Stoke, approximately 10 km north of the Application Site in a rural background location. This site is not considered relevant to this assessment and therefore has not been used for the baseline analysis. The other site is located within the Central Medway AQMA approximately 3km to the south west of the Application Site. The air pollutants monitored comprise NO_2, PM_{10} and $PM_{2.5}$.

12.123 The annual mean concentrations recorded at this monitoring site for the latest four years of data capture, as published by MC, are presented in **Table 12.7**.

Table 12.7: MC Automatic Monitoring Data

Site Name	Site Type	Distance from Application Site (km)	Pollutant	Annual Mean Concentration (µg/m^3)			
Chatham AURN	Roadside	3 to the south west	NO_2 (annual mean)	24.8	23.5	25.7	25.4
			NO_2 (1-hour mean >200 µg/m^3)	0	0	0	0
			PM_{10} (annual mean)	21.4	18.5	19.1	21.6
			PM_{10} (24-hour means >50 µg/m^3)	15	4	3	7
			$PM_{2.5}$	14	11.8	11.5	14.1

Note: Exceedances of air quality objective are highlighted in **Bold**.

12.124 Annual mean NO_2 concentrations have met the annual mean and 1-hour objective limits at this site since 2014 showing that the objective is being met at locations within the Central Medway AQMA.

12.125 Annual mean concentrations of PM_{10} and $PM_{2.5}$ are also meeting the relevant objective limits at this location. The site has recorded between 3 and 15 exceedances (**Table 12.7**) of the 24-hour mean PM_{10} objective limit of 50 µg/m^3, however as the objective allows for up to 35 exceedances in any given year, the objective has been met since 2014.

12.126 The data shows no significant trend in concentrations during this period with no obvious increase or decrease in concentrations over the four-year period.

Diffusion Tube (No_2) Monitoring Data

12.127 MC also undertakes diffusion tube monitoring of NO_2 at various locations within the borough. Annual mean concentrations of NO_2 recorded at sites within the assessment area are provided in **Table 12.8**, as published by MC, for the latest four years of data.

Table 12.8: MC Diffusion Tube Monitoring Data

Site Name	Site Type	Distance from Application Site (km)	AQMA Location	Annual Mean Concentrations (µg/m^3)			
DT01	Roadside	1.1 to the south east	Rainham	44.7	43.4	42.2	45.4
DT04	Roadside	4 to the south west	Central Medway	38.2	36.8	38.6	37.9
DT09	Roadside	3 to the south west	Central Medway	26.2	27.7	25.6	25.5
DT11	roadside	4 to the south west	Central Medway	35.2	36.3	35.6	35.7
DT15	Roadside	1.5 to the south east	Rainham	34.4	34.4	35.3	36.0
DT16	Roadside	1.6 to the south east	Rainham	26.9	25.8	28.6	28.6
DT17	Roadside	3 to the south west	Central Medway	43.7	45.0	43.5	45.3
DT18	Roadside	4 to the south west	Central Medway	45.4	45.4	46.3	48.0
DT25	Roadside	3 to the north west	Gillingham	-	37.6	36.5	42.9
DT26	Roadside	3 to the north west	Gillingham	-	25.8	33.6	28.1
DT27	Roadside	3 to the north west	Gillingham	-	37.6	33.5	39.1

12.128 The objective for annual mean NO_2 was exceeded at four monitoring locations during 2017 and has been consistently exceeded at three of the sites since 2014. One of these sites falls within the Rainham AQMA while two are within the Central Medway AQMA. At all other monitors the objective has been met since 2014.

12.129 There are no monitoring sites at or in the immediate vicinity of the Application Site which falls outside the AQMA. Pollutant concentrations at the Application Site are expected to be considerably lower than recorded at the monitoring sties set out in **Table 12.8** due to is location south of Lower Rainham Road, which experiences traffic flows considerably lower than those within the AQMA.

Summary

12.130 MC operates an extensive monitoring programme which includes a number of locations in Medway, all of which are within the identified AQMA.

12.131 The monitoring shows that within the AQMA air quality is often above the objective with exceedances of the annual mean NO_2 objective recorded at a number of locations. However, the Application Site is located in a relatively undeveloped area, at a relatively significant distance of 2.5 km from the boundary of the AQMA. Existing pollutant concentrations at the Application Site are likely to be closer to those predicted in the Defra Background maps (**Table 12.6**).

12.132 Model verification relies on the use of local monitoring data to enable a comparison with model outputs to be undertaken and appropriate model adjustment derived (see **Technical Appendix 12.4**). In the absence of local monitoring specific to the Application Site, MC automatic and diffusion tube data were utilised to verify the model.

IMPACTS

Construction Impacts

12.133 Construction activities that have the potential to generate and/or re-suspend dust and PM_{10} include:

(i) Site clearance and preparation;
(ii) Preparation of temporary access/egress to the Application Site and haulage routes;
(iii) Earthworks;
(iv) Materials handling, storage, stockpiling, spillage and disposal;
(v) Movement of vehicles and construction traffic within the Application Site (including excavators and dumper trucks);
(vi) Use of crushing and screening equipment/plant;
(vii) Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
(viii) Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
(ix) Internal and external finishing and refurbishment; and
(x) Site landscaping after completion.

12.134 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

Assessment of Potential Dust Emission Magnitude

12.135 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and trackout. The findings of the assessment are presented below.

Demolition

12.136 There are two storage barns that will require demolition as part of the development process, along with the removal of a number of caravans, all located in an area to the west of Pump Lane. The total volume of the buildings to be demolished is less than 7,000 m^3 and the two buildings are less than 10 m in height. Furthermore, the main construction materials are timber and metal cladding. The potential dust emissions magnitude for demolition activities is considered to be **small**.

Earthworks

12.137 The total area of the Application Site is more than 50,000 m^2 and the total material that will be moved is estimated to be more than 100,000 tonnes. There will also be more than 10 heavy earth moving vehicles active on the site at any one time, and storage bunds are expected to

be more than 8 m in height. The potential dust emission magnitude is considered to be **large** for earthwork activities.

Construction

12.138 The total volume of buildings to be constructed on the Application Site is not yet known. However, it is anticipated that it will be greater than 100,000 m^3 with construction materials being used having a moderate to large potential for releasing dust (i.e. concrete and brick work). Therefore, the potential dust emission magnitude is considered to be **large** for construction activities.

Trackout

12.139 Information on the number of HDVs associated with this phase of the Proposed Development is not available and therefore professional judgement has been used. It has been assumed that given the size of the development area there are likely to be more than 50 HDV outward movements in any one day, travelling over 100 m of dusty surface material. Given the above, it is considered that the potential dust emission magnitude for trackout is **large**.

12.140 A summary of the potential dust emission magnitude determined for each construction activity considered is presented in **Table 12.9**.

Table 12.9: Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction Activities	Large
Trackout	Large

Assessment of Sensitivity of the Study Area

12.141 A wind rose generated using the 2017 meteorological data for Luton (see **Technical Appendix 12.6)**, shows that the prevailing wind direction is from the southwest. Therefore, receptors located to northeast of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

12.142 Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. The closest sensitive receptors to the Application Site are the residential areas located to the north of the Application Site (0 - 200m), including dwellings off Pump Lane and along Lower Rainham Road, plus residential to the south (20 – 350 m), on the opposite side of the railway line.

12.143 Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 12.10**.

Table 12.10: Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	High	High	Medium
Human Health	Low	Low	Low	Low

Risk of Impacts

12.144 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. A summary of the risk of dust impacts associated with the construction of the Proposed Development is provided in **Table 12.11**.

Table 12.11: Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	High	Large	Medium
Human Health	Negligible	Low	Low	Low

12.145 The risk category identified for each construction activity has been used to determine the level of mitigation required. Overall, the development is expected to have a **High** risk for dust impacts.

Construction Vehicles & Plant

12.146 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. It is anticipated that construction traffic will access the site via Lower Rainham Road and Pump Lane. Due to the expected phasing of the Development, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.

12.147 Final details of the exact plant and equipment likely to be used on site will be determined by the appointed contractor and is considered likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the site are likely to be variable over the construction period.

12.148 Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used, the local air quality impacts are considered to be **negligible** according to the assessment significance criteria and based on professional judgement.

Operational Impacts

12.149 The detailed results of the atmospheric dispersion modelling exercise are presented in **Technical Appendix 12.7** and a summary is provided below.

Human Receptors

Existing Sensitive Receptors

Annual Mean NO_2 Concentrations

12.150 The results of the assessment demonstrate that, in the 2017 baseline scenario, predicted concentrations do not exceed the annual mean objective for NO_2 (40 µg/m^3) at any modelled receptor. The highest predicted concentration is 38.6 µg/m^3 at R21, which is located at the junction of the A2 and Canterbury Street within the Central Medway AQMA.

12.151 In 2022, the predicted annual mean NO_2 concentrations at all sensitive receptors are well below the annual mean objective, both 'with' and 'without' the Proposed Development. The highest predicted concentrations again are at R21.

12.152 Traffic generated by the operational development is predicted to increase annual mean NO_2 concentrations at all the selected receptor locations (**Technical Appendix 12.7, Table 12.7.3**). The highest increase in annual mean concentrations attributed to the Proposed Development is 1.9 µg/m^3, predicted at receptors R12 and R13. Both receptors are located on Beechings Way to the west of Pump Lane, which experiences the highest increase in trips as a result of the operational development.

12.153 Based on the significance criteria set out in **Table 12.5**, the change of 1.9 µg/m^3, which equates to 5% of the AQAL, is of **negligible** significance due to concentrations under the with development scenario being less than 75% of the objective.

12.154 Overall, the impact of the increased vehicle emissions associated with the operation of the Proposed Development, on annual mean NO_2 concentrations, is considered to be **negligible** at all receptor locations, including within the Central Medway and Rainham AQMA.

Hourly Mean NO_2 Concentrations

12.155 All annual mean NO_2 concentrations predicted in each modelled scenario were below 60 µg/m^3. Therefore, hourly mean NO_2 concentrations are unlikely to cause a breach of the hourly mean objective. The impact of the Proposed Development on hourly mean NO_2 concentrations at existing sensitive receptors is considered to be **negligible**.

Annual Mean PM_{10} Concentrations

12.156 The results of the assessment demonstrate that, in the 2017 baseline scenario, predicted concentrations do not exceed the annual mean objective for PM_{10} (40 µg/m^3) at any modelled receptor. The highest predicted concentration is 26.4 µg/m^3 at receptor R21 (A2 junction).

12.157 Predicted annual mean concentrations of PM_{10} are well below the objective at all sensitive receptors in both the 'without' and 'with' Proposed Development scenarios for the assessment year (2022).

12.158 The predicted changes in annual mean PM_{10} concentrations are all 3% or less of the respective annual mean objective and, based on the EPUK/IAQM guidance, the impact of increased vehicle emissions, associated with the Proposed Development, on annual mean PM_{10} concentrations, is considered to be **negligible**.

Daily Mean PM_{10} Concentrations

12.159 The objective for daily mean PM_{10} concentrations is 50 µg/m^3 to be exceeded no more than 35 times a year. The results of the dispersion modelling indicate that, based on the predicted annual mean (calculated using the guidance set out in LAQM.TG16), the highest number of exceedance days was predicted at receptor R21 with 16 exceedances per annum in 2017.

12.160 The increased vehicle emissions associated with the Proposed Development result in an increase in exceedence days of no more than 1, with the highest being at R21 with 19 exceedances in the 2022 with development scenario. Therefore, the impact on daily mean PM_{10} concentrations is considered to be **negligible**.

Annual Mean $PM_{2.5}$ Concentrations

12.161 The predicted annual mean concentrations of $PM_{2.5}$ are all well below the respective objective (25µg/m^3) in each of the modelled scenarios. The highest predicted concentration is 16.5 µg/m^3, which is predicted at receptor R21.

12.162 All changes in $PM_{2.5}$ as a result of increased traffic associated with the Proposed Development are <3% of the objective and therefore, based on the EPUK/IAQM guidance, the Proposed Development is considered to have a **negligible** impact on $PM_{2.5}$ concentrations.

Exposure of Future Residents

12.163 Receptors R1 to R3 are all located adjacent to Lower Rainham Road, and therefore most representative of the Application Site along the northern boundary. Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ are all below the relevant objectives at each of these receptor locations therefore concentrations along the northern boundary of the Site are also expected to be comfortably meeting the relevant objective limits.

12.164 Concentrations of all three pollutants are known to decline with increasing distance from source. Traffic emissions along Lower Rainham Road are the main source of emissions influencing air quality at the Application Site. Concentrations across the rest of the Site will therefore be lower than predicted at receptors R1 to R3 and therefore meeting the relevant objective limits.

12.165 The Application Site is considered to be suitable for the proposed land uses with respect to local air quality.

Ecological Receptors

Annual Mean NO_x Concentrations

Medway Estuaries and Marshes SPA/RAMSAR

12.166 Baseline NO_x concentrations assessed at a number of locations within the Medway Marshes SPA/SSSI/RAMSAR exceed the annual mean critical level for NO_x under the 2017 baseline scenario (receptors E3, E4 and E5).

12.167 The modelling assessment predicts annual mean NO_x concentrations below the critical level of 30 µg/m^3 at receptors E1 and E2 under all three assessment scenarios (**Technical Appendix 12.7,** Table 12.7.4). The critical level is exceeded at receptors E3 and E4, which represent the closest areas of the SSSI/SPA to Gads Hill. The critical level is exceeded for over 100 m from the nearest point to Gads Hill at receptor 3 and up to 60m at E4. Beyond this, concentrations fall below the objective under all scenarios. The objective is also predicted to be just above the objective at receptor E5. It is noted that this is the case prior to the assessment of the Proposed Development (i.e. arising as a result of the Local Plan (LP) development). However, the predicted concentrations show a decline in concentrations

between the 2017 and 2022 baseline scenarios at all locations. This is due to a decline in vehicle emissions in future years as a result of improvements in vehicle technology.

12.168 Traffic generated by the operational development results in an increase in NO_x concentrations within the Medway Estuary and Marshes SPA/SSSI/Ramsar. As outlined in Table 12.7.6 of **Technical Appendix 12.7**, the change in NOx concentrations arising as a result of the proposed development has been identified for each of these points. At receptors E1, E2 and E5 the change in concentrations has been modelled to be 1% or less of the identified critical level. On this basis, the change in NO_x levels arising as a result of the proposed development can properly be classed as not significant and can therefore be scoped out from further assessment. Further consideration in this regard is provided in the IHRA.

12.169 At receptors E3 and E4 the change in concentrations have been modelled to be more than 1% of the critical level and therefore cannot be classed as 'not significant'. Further consideration has therefore been undertaken in relation to the European designated site, as outlined in the IHRA.

Swale SPA/RAMSAR site

12.170 Annual mean NO_x concentrations predicted at the Swale Estuary SPA/RAMSAR are set out in Tables 12.7.7 to 12.7.9 of **Technical Appendix 12.7.** The modelling is predicting an exceedance of the critical level up to 20 m from the A249 at receptors L1, with concentrations falling below the critical level by 30 m either side of the road. However, the critical level is met at all L2 receptors. This is due to the road elevation above ground level.

12.171 Traffic generated by the operational development is predicted to result in no change in the critical level at any receptors within the Swale Estuary SPA/Ramsar. The impact of the development can therefore be deemed as not significant within this European designated site and no further consideration of the impacts on this habitat site is considered necessary.

North Downs Woodlands SAC

12.172 The modelling assessment is predicting an exceedance of the critical level up to 60 m from the A249 at receptor transect L3 (Table 12.7.10, **Technical Appendix 12.7**). Beyond 60m concentrations fall below the critical level.

12.173 Adjacent to the A229 annual mean NO_x concentrations are predicted to meet the critical level.

12.174 Traffic generated by the operational development would not result in a change in annual mean NO_x concentrations at either of the two modelled locations within the North Downs Woodlands SAC (Table 12.7.12, **Technical Appendix 12.7**). The impact of the development can therefore be deemed as not significant and no further consideration of the impacts on this habitat site is considered necessary.

24-hour NO_x Concentrations

Medway Estuary and Marshes SSSI/SPA/RAMSAR site

12.175 The modelling assessment is predicting 24-hour NO_x concentrations below the objective limit of 75 µg/m^3 at all receptor locations under the base scenarios. (**Technical Appendix 12.7,** Table 12.7.4). However, the objective is exceeded at receptors E3 under the with development scenario (**Technical Appendix 12.7,** Table 12.7.5).

12.176 Predicted increases in the 24-hour NO_x concentrations as a result of the operational development equate to between 0.3% - 2.7% of the CLE. This is below the 10% criteria, as discussed in paragraph 13.95 and therefore impacts are not considered to be significant. No further assessment is considered necessary.

Swale SPA/RAMSAR site

12.177 The 24-hour NO_x critical level is also being exceeded either side of the A249 for up to 40 m at receptor transect L1 (Table 12.7.7, **Technical Appendix 12.7**). At all other locations within the Swale SPA/RAMSAR site the critical level is being met.

12.178 The impact of traffic on 24-hour NO_x concentrations is predicted to be not significant given that the change would be less than 10% of the critical level and no further consideration of the impacts on this habitat site is considered necessary.

North Downs SAC

12.179 The 24-hour critical level is being exceeded up to 20 m from the A249 within the North Downs Woodlands SAC. However, the critical level is being met adjacent to the A229 within this European designated site (Table 12.7.10, **Technical Appendix 12.7**).

12.180 There would be no change in the critical level as a result of the operational development therefore the impact on 24-hour NO_x concentrations would not be significant (Table 12.7.12, **Technical Appendix 12.7)** and no further consideration of the impacts on this habitat site is considered necessary.

Nitrogen Deposition

Medway Estuary and Marshes SSSI/SPA/RAMSAR site

12.181 The calculated N-deposition rates are below the CLO of 20-30 kgN/ha/yr at all the selected receptors under all three assessment scenarios (**Technical Appendix 12.7,** Table 12.7.4).

12.182 The change in N-deposition as a result of emissions from the operational development is predicted to be less than 1% of the CL at all receptor locations, therefore the impact is classed as not significant and no further consideration of potential effects arising on these international/European designated sites is considered necessary. Further information in relation to the assessment of nitrogen deposition (in relation to all such sites) is presented in the IHRA.

Swale SPA/RAMSAR site

12.183 The calculated N-deposition rates are exceeding the lower level of the CLO of 15-30 kgN/ha/yr at the majority of receptors along L1 and L2 transects within the Swale SPA/RAMSAR site (Table 12.7.7 and 12.7.8, **Technical Appendix 12.7**). However, there will be no change in deposition rates as a result of the operational development therefore the impact are classed as not significant and no further consideration of potential effects arising on these international/European designated sites is considered necessary.

North Downs Woodlands SAC

12.184 The calculated N-deposition rates are exceeding the CLO of 5-15 kgN/ha/yr at all receptors along the L3 and L4 transects (Table 12.7.10, **Technical Appendix 12.7**). However, there will be no change in deposition rates as a result of traffic generated by the operational development (Table 12.7.12, **Technical Appendix 12.7**) therefore the impact would be not significant and no further consideration of potential effects arising on the European designated site is considered necessary.

Acid (Nitrogen) Deposition

North Downs Woodlands SAC

12.185 The calculated acid (nitrogen) deposition rates are exceeding the CLO of 0.142 keq/ha/yr at all receptors along the L3 and L4 transects (Table 12.7.10, **Technical Appendix 12.7**). However, there will be no change in deposition rates as a result of traffic generated by the operational development (Table 12.7.12, **Technical Appendix 12.7**) therefore the impact would be not significant on acid deposition and no further consideration of potential effects arising on this European designated site is considered necessary.

MITIGATION

Construction Phase

12.186 In the absence of mitigation, activities associated with the construction phase of the Proposed Development are considered to represent a high risk with respect to potential dust impacts at nearby sensitive receptors. As such, a number of best practice mitigation measures should be implemented during construction of the two phases. They are measures that accord with IAQM guidance and which are commensurate to the scale and nature of the Proposed Development.

12.187 The mitigation measures focus on controlling fugitive releases of construction phase dust and should be implemented by the contractor through a Construction Environmental Management Plan (CEMP) or similar. The recommended measures include, but may not be limited to, measures stated below.

General Dust Management

(i) A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

Site Management

(i) All dust and air quality complaints should be recorded, and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.

(ii) The complaints log should be made available to the local authority on request.

(iii) Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.

(iv) Regular liaison meetings with other high-risk construction sites within 500 m of the Application boundary (i.e. Bengrave Nursery Development) should be undertaken to ensure plans are co-ordinated and dust and particulate emissions minimised.

Monitoring

(i) Daily on-site and off-site inspections should be carried out, particularly where receptors are nearby. The results of the inspections should be recorded, and the log made available to the LA when asked. The inspection should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning provided where necessary.

(ii) Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked.
(iii) The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

(i) Plan the Site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
(ii) Where practicable, erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on site.
(iii) Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the Site is active for an extensive period.
(iv) Avoid site runoff of water or mud.
(v) Keep site fencing, barriers and scaffolding clean using wet methods.
(vi) Remove materials that have a potential to produce dust from the Site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
(vii) Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

(i) Ensure all vehicle operators switch off engines when stationary - no idling vehicles.
(ii) Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
(iii) A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials;
(iv) Impose and signpost a maximum speed limit of 15 mph on surface and 10 mph on unsurfaced haul roads and work areas;
(v) A Travel Plan that supports and encourages sustainable travel by construction workers should be implemented.

Operations

(i) 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.
(ii) Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
(iii) Use enclosed chutes and conveyors and covered skips.
(iv) Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
(v) Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

(i) Avoid bonfires and burning of waste materials.

Measures Specific to Demolition

(i) Ensure effective water suppression is used during demolition operations such as hand-held sprays which are more effective than hoses;

(ii) Avoid explosive blasting and use manual or mechanical alternatives;
(iii) Bag and remove any biological debris or damp this down before demolition takes place.

Measures Specific to Earthworks

(i) Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
(ii) Where practicable, windbreak netting/screening should be positioned around materil stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Application Site and the surroundings.
(iii) Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
(iv) During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.
(v) Long-term earthworks and stockpiles should be re-vegetated as soon as practicable to stabilise surfaces. Where this is not possible hessian, mulches or trackifiers should be use.

Measures Specific to Construction

(i) All construction plant and equipment should be maintained in good working order and not left running when not in use.
(ii) Scabbling should be avoided if possible.
(iii) Any sand and aggregates should be stored in bunded areas and kept damp to prevent emissions and dispersion.
(iv) All bulk cement and fine powders should be delivered in enclosed tankers and stored in silos or sealed bags, depending on volume.

Measures Specific to Trackout

(i) Water-assisted dust sweepers should be used to remove tracked material from access and local roads.
(ii) Dry sweeping should be avoided, ensuring damping equipment is made available.
(iii) All vehicles entering and leaving the site should be covered if carrying materials.
(iv) Regular inspections of on-site haul roads should be carried out to check for integrity and repairs carried out as soon as practicable.
(v) All inspections should be recorded and logged.
(vi) Where practicable, hard surfaced haul roads should be installed and swept being kept damped down at all times.
(vii) A wheel washing facility should be installed, including rumble grids, at an appropriate location close to the site exit point with an adequate area of surfaced road between the wheel wash and exit point.
(viii) Where possible, access points should be located at least 10 m from existing receptors.

12.188 Detailed mitigation measures to control construction traffic should be discussed between the Proposed Development contractor and MC to establish the most suitable access and haul routes for the site traffic.

12.189 The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements should be

programmed to avoid peak hours on the local road network to reduce any potential for contributing to traffic congestion.

Operational Phase

Mitigation Emissions Calculation

12.190 The Proposed Development is predicted to generate 7,104 movements per day with 0.5% heavy duty vehicles, in 2022. The annual emissions have been calculated using the EFT V8.0 using the data set out in **Table 12.12**. The annual emissions are estimated to be 6777 kg/yr of NO_x and 808 kg/yr for PM_{10}.

Table 12.12: Emissions Calculation Input to EFT V8.0

Road Type	Year	Traffic Flow	% HDV	Speed (kph)	No. of Hours	Link Length (km)
Urban (not London)	2022	7,104	0.5	50	25	10

12.191 The Interdepartmental Group on Costs and Benefits (IGBC) damage costs used are the IGCB Air Quality Damage Costs per tonne, 2015 prices Central Estimate (Ref 12.23). As the impacts of PM are being quantified and valued alongside NO_x, it is appropriate to reduce the direct health impact of NO_2 and therefore Table 2 values for NO_x damage costs were used.

12.192 In accordance with the Defra guidance on the calculation of damage costs, the 2015 damage costs were inflated to 2021 (representing 2022) prices by 2.5% per annum (**Table 12.13**). For the 5-year appraisal period (2021 to 2025), the costs were then increased by 2% per annum in accordance with the guidance (**Table 12.14** and **Table 12.15**), and the total values discounted by 3.5% per annum to get the net present value of the damage costs (**Table 12.16**). These steps are shown in the following tables.

Table 12.13: Inflation of 2015 Damage Costs to 2021

Pollutant	2015 Damage Costs (£ per Tonne)	2021 Damage Costs (£ per Tonne)
NO_x	21,044	24,405
PM_{10}	58,125	67,407

Table 12.14: Uplift of Damage Costs 2% per Annum

Year	NO_x (£ per Tonne)	PM_{10} (£ per Tonne)
2021	24,405	67,407
2022	24,893	68,755

2023	25,391	70,130
2024	25,898	71,533
2025	26,416	72,964

Table 12.15: Calculated Damage Costs Per Annum

Year	NO_x (£)	PM_{10} (£)
2021	169,091	55,675
2022	172,4731	56,788
2023	175,922	57,924
2024	179,441	59,083
2025	183,030	60,264

Table 12.16: NPV of Damage Costs (Discounted 3.5% per annum)

Year	NO_x (£)	PM_{10} (£)
2021	169,091	55,675
2022	166,640	54,868
2023	164,225	54,073
2024	161,845	53,289
2025	159,500	52,517

12.193 The estimated damage costs are £821,302 for NO_x and £270,422 for PM_{10} and therefore the total damage cost is £1,091,724 over the first five-year period.

Mitigation Measures

12.194 The change in pollutant concentrations attributable to traffic emissions associated with the operation phase of the Proposed Development (i.e. impacts on local air quality) are negligible in terms of impacts on human receptors. Further assessment with regards to the significance of effects on international / European designated sites is presented in the IHRA. As identified in that assessment, specific avoidance or mitigation measures in respect of air quality impacts

on the international / European designated sites are not required, in order to reach a conclusion of no adverse effect on integrity.

12.195 The emissions mitigation calculation calculated a damage cost of £1,091,724, which is expected to be spent on implementing mitigation measures to reduce emissions. The MC Air Quality Planning Guidance advises the following standard mitigation methods for all major developments:

(i) All gas fired boilers to meet a minimum of <40mgNO_x/kWh
(ii) 1 electric charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking).

12.196 In addition to the above measures the guidance recommends the following scheme mitigation measures for consideration:

(i) Travel plan (where required) including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies;
(ii) A welcome pack available to all new residents online and as a booklet, containing information and incentives to encourage the use of sustainable transport modes from new occupiers;
(iii) Eco-driver training and provision of eco-driver aid to all residents;
(iv) EV recharging infrastructure within the development (wall mounted or free standing in-garage or off-street points);
(v) Car club provision within development or support given to local car club/eV car clubs;
(vi) Designated parking spaces for low emission vehicles;
(vii) Improved cycle paths to link cycle network;
(viii) Adequate provision of secure cycle storage;
(ix) Using green infrastructure, in particular trees, to absorb dust and other pollutants;
(x) Contribution to low emission vehicle refuelling infrastructure;
(xi) Low emission bus service provision and waste collection services;
(xii) Bike/e-bike hire schemes;
(xiii) Contribution to renewable fuel and energy generation projects;
(xiv) Incentives for the uptake of low emission technologies and fuels.

12.197 The above list is not exhaustive and MC is willing to consider other options which aim to reduce overall emissions from the Site. The developer will determine a package of mitigation measures equivalent to the calculated damage cost which will be agreed with MC.

12.198 It is not possible to quantify the reduction in emissions as a result of the mitigation plan however, it is anticipated that the measures would significantly reduce overall emissions which would reduce the potential for impacts.

RESIDUAL IMPACTS

Construction Phase

12.199 With the implementation of the mitigation measures described in section 13.165 and good site practice, the residual effects of dust and PM_{10} generated by construction activities is considered to be **negligible**.

12.200 The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **negligible**.

Operational Phase

Human Receptors

12.201 The residual effects of the Proposed Development on air quality are considered to be **negligible** for all pollutants considered within the assessment, based on the assessment results and criteria provided by the IAQM/EPUK guidance, with the application of professional judgement.

Ecological Receptors

12.202 The assessment has found that the impact of the development can be classed as not significant in relation to nitrogen deposition, acid (nitrogen) deposition and the 24-hour critical level for NO_x. However, impacts associated with annual mean NO_x critical level have been considered further within the IHRA.

CUMULATIVE IMPACTS

Construction Phase

12.203 There are a number of permitted and allocated development sites in the vicinity of the Application Site which have been considered in terms of cumulative effects. If under construction during the same period as the Proposed Development, there is the risk of cumulative effects from dust and traffic emissions on local sensitive receptors. However, significant effects are only likely to occur as a result of dust emissions at receptors within 350 m of construction activities, therefore any construction sites over 700 m from the Application Site are unlikely to result in significant cumulative effects at receptors within 350 m of the Proposed Development.

12.204 A review of recent planning applications identifies a permitted development at Bengrave Nursery, located approximately 200m to the south east of the Application Site. There is therefore a risk of cumulative effects at receptors located between the two sites. However, the Bengrave Nursery development would be subject to stringent mitigation measures similar to those proposed for this application, which are expected to result in negligible effects beyond the site boundaries. On this basis it is expected that any cumulative impacts are unlikely to be significant. Furthermore, given the location of the Bengrave Nursery Site construction traffic is expected to use different haul routes, the cumulative impact of emissions from construction traffic is unlikely to be significant on local air quality.

12.205 All other identified permitted or allocated developments are located over 900 m from the Application Site, therefore there any cumulative effects would be **negligible**.

Operational Phase

12.206 Traffic flows from committed developments in the vicinity of the Application Site were accounted for within the traffic data utilised in this air quality assessment. Considering the atmospheric dispersion model results, the operational phase cumulative impacts associated with the Proposed Development are predicted to be **negligible** in relation to human receptors and ecological receptors.

SUMMARY

12.207 A qualitative assessment of the potential impacts on local air quality from construction activities has been completed for this phase of the Proposed Development using the IAQM methodology. This identified that there is a High Risk of dust soiling impacts and a Low Risk of increases to particulate matter concentrations due to construction activities.

12.208 However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of

dust and PM_{10} generated by construction activities on air quality are therefore considered to be negligible. The residual effects of emissions to air from construction vehicles and plant on local air quality are considered to be **negligible** and would not constitute a significant environmental effect.

12.209 A quantitative assessment of the potential impacts during the operational phase of the Proposed Development was undertaken using ADMS-Roads to predict the changes in NO_2, PM_{10}, and $PM_{2.5}$ concentrations that would occur due to traffic generated by the Proposed Development. The assessment has accounted for the additional vehicle movements on the assessed road network generated by other committed development within proximity to the Proposed Development.

12.210 The assessment demonstrated that the Proposed Development would result in a **negligible** increase in pollutant concentrations and would not cause any exceedances of the statutory UK air quality objectives. The results also show that future residents of the Proposed Development would not be subject to pollutant concentrations that would exceed the statutory objectives, thus the Application Site is considered suitable for the proposed land uses.

12.211 Assessment of impacts on the identified European designated sites are less than 1% of the relevant 24-hour critical level for NO_x and critical load for nitrogen deposition and acid (nitrogen) deposition. Therefore, the impact of the development can be classed as not significant in relation to these pollutants. However, impacts exceed 1% of the annual mean NO_x critical level. On this basis, the change in NO_x levels arising as a result of the proposed development cannot be classed as not significant. Impacts in relation to the critical level for annual mean NO_x within the Medway Estuary and Marshes SSSI/SPA/RAMSAR site have been considered further within the IHRA document.

12.212 In accordance with the Medway Air Quality Planning Guidance an emissions mitigation calculation was carried out which calculated a damage cost of £1,091,724. A package of mitigation measures equivalent to this cost will be determined in agreement with MC to reduce emissions from the operational development.

12.213 Based on the assessment significance criteria, the residual effects of the Proposed Development on local air quality are considered to be **negligible** in terms of human receptors and would not constitute a significant environmental effect.

12.214 As outlined in the IHRA, having undertaken further detailed assessment it is concluded that the development proposals are not likely to lead to an adverse effect on the integrity of any international / European designated sites as a result of air quality impacts; as such, there would be **no** residual effects.

12.215 The Proposed Development is considered to comply with relevant national and local air quality policies.

Table 12.17: Summary Table

Description of Likely Significant Effects	Significance	Effects B/A, R/T, D/I, ST/M/LT, L/R/N					Description of Mitigation/ Enhancement Measures	Description of Residual Effects	Significance	Residual Effects B/A, P/T, D/I, ST/M/LT, L/R/N				
Construction Phase														
Impact from dust soiling	Substantial (high according to IAQM guidance)	A	T	D	ST	L	Described in section 12.166	None	Negligible	A	T	D	ST	L
Impact on human health	Slight (low according to IAQM guidance)	A	T	D	ST	L	Described in section 12.166	None	Negligible	A	T	D	ST	L
Operational Phase														
Impact on existing sensitive receptors	Negligible	A	P	D	LT	L	Described in section 12.176	None	Negligible	A	P	D	LT	L
Impact on proposed residential receptors	Negligible	A	P	D	LT	L	Described in section 12.176	None	Negligible	A	P	D	LT	L
Impact on Ecological Receptors	Unknown	A	P	D	LT	L	Described in section 12.176 and in the IHRA (albeit not specifically required in respect of international/European designated sites)	None	Negligible	A	P	D	LT	L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

13 LAND USE AND AGRICULTURE

INTRODUCTION

13.1 This chapter of the ES assess the impact of the Proposed Development on the environment in respect of agricultural soils and land use, and also considers the impact on the existing horticultural business.

13.2 The agricultural soils and land classification part of the chapter has been prepared by Reading Agricultural Consultants who have many years' experience and expertise in the preparation of Environmental Impact Assessments (EIAs) as well as contributing Agricultural Land Classification (ALC) surveys to EIAs for housing, minerals, infrastructure and other large-scale developments.

13.3 The Proposed Development will impact agricultural land and soils at Pump Farm, Lower Rainham.

13.4 This chapter presents the findings of the ALC survey undertaken for the Proposed Development. The detail is found in **Technical Appendix 13.1** and includes:

(i) a statement of the actual amount and quality of agricultural land on the Site;
(ii) the sensitivity of agricultural land according to its grade within the ALC;
(iii) the sensitivity of the soil resource; and
(iv) the impact on the soil and land resource.

13.5 Where necessary, details of the mitigation measures required to prevent, reduce or offset identified impacts associated with the Proposed Development are stated in this chapter. The resulting residual impacts are also reported, which assumes that mitigation will be applied.

13.6 Matters in connection with the farm business are presented in full within **Technical Appendix 13.2(i), August 2020** produced by Anderson Midlands (J Pelham), Technical Appendix 13.2(ii) produced by Lambert and Foster, and **Technical Appendix 13.2(iii)sup**, which included a Note responding to queries raised by Officers during the determination of the application.

POLICY CONTEXT

13.7 This section of the ES discusses the context of the Proposed Development with regard to the relevant European Union (EU) and UK legislation, in addition to national and local planning policies.

European & National Legislation

13.8 There is no adopted legislation at the EU or national level relating to soil protection. The EU Thematic Strategy for Soil Protection (ref. 13.1) outlines the condition of soils in Europe and aims to ensure their protection and sustainable use. The overarching aims are to prevent further soil degradation, preserve soil functions and restore degraded soils to a standard appropriate to their intended use.

13.9 The strategy includes a proposal for an EU Soil Framework Directive which promotes the sustainable use of soil and its protection as a natural and non-renewable resource. However, the proposed Directive was withdrawn in 2014 as it could not be agreed by a qualified majority. In taking its decision, the European Commission stated that it remains committed to the objective of the protection of soil and will examine options on how best to achieve this.

13.10 No direct replacement proposals have yet come forward from the Commission, although Directive 2014/52/EU emphasises that public and private projects should consider and limit their impact on land, particularly in respect of land-take, and on soil, particularly in respect

of organic matter, erosion, compaction and sealing (i.e. covering undisturbed natural soils with urban development and infrastructure construction).

Planning Policy

National Planning Policy Framework

13.11 The Government's overall planning policies for England are described in the Revised National Planning Policy Framework (NPPF) (ref.13.2).

13.12 Paragraph 170 of the NPPF identifies the protection and enhancement of soils as a priority in the conservation and enhancement of the natural and local environment.

13.13 Paragraph 170 goes on to advise that planning policies and decisions should take into account the economic and other benefits of best and most versatile (BMV) agricultural land which is land classified as Grades 1, 2 and 3a in the ALC system of England and Wales.

13.14 Paragraph 171 of the NPPF advises in footnote 53 that, where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred by those of a higher quality.

13.15 There is no policy within the NPPF on the effects of development on any agricultural interests other than land quality, although guidance in Natural England's Technical Information Note (TIN) 049 (ref.13.3) indicates that, although ALC is a basis for assessing how development proposals affect agricultural land within the planning system, it is not the sole consideration, with planning authorities guided to protect and enhance soils more widely.

Medway Local Plan 2003 and Future Medway Local Plan (2012 – 2035)

13.16 There are no policies within the Medway Local Plan 2003 (ref.13.4) or the emerging development strategy (ref. 13.5) that deal with development involving agricultural land or soils.

METHODOLOGY

13.17 This section describes the adopted methodology for classifying the quality of agricultural land and soils present at the Site.

13.18 The effects on the agricultural resource are concerned with the permanent loss of agricultural land and soils to the Development and the temporary and permanent effects of the Development on the land and soil resources within the Site.

13.19 The Site was subject to a detailed ALC survey in accordance with the established ALC guidelines (ref.13.6) in November 2018. The report of survey is contained at **Technical Appendix 13.1.** In total, 69 soil profiles were examined using an Edelman (Dutch) auger at an observation density of more than one per hectare. One observation pit was also excavated examine soil structure.

13.20 At each observation point, the following characteristics were assessed and recorded for each soil horizon up to a maximum of 120cm or any impenetrable layer: soil texture; significant stoniness; colour (including local gley and mottle colours); consistency; structural condition; free carbonate and depth.

13.21 Soil Wetness Class (WC) was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick.

13.22 Soil droughtiness is investigated by the calculation of moisture balance equations. Crop-adjusted Available Profile (AP) water is estimated from texture, stoniness and depth, and

then compared to a calculated Moisture Deficit (MD) for the standard crops, wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP in insufficient to balance the MD and droughtiness occurs. When a profile is found with significant stoniness, sufficient to prevent penetration of a hand auger, then it is assumed for the purposes of calculating draughtiness, that similar levels of stoniness continues to the full 1.2m depth considered.

Significance Criteria

13.23 The ALC survey provides a statement of the actual amount and quality of agricultural land on the Site. Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use, and Grade 5 is very poor quality land, with severe limitations due to adverse soil, relief, climate or a combination of these. Grade 3 land is divided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). The best and most versatile agricultural land comprises Grades 1, 2 and 3a.

13.24 The impact on the soil resource is assessed according to the degree to which disturbed soil resources are re-used in a manner that enables the resource to fulfil one or more of the primary soil functions of:

(i) the production of food and biomass, and the provision of raw materials;
(ii) the storage, filtration and cycling of water, carbon and nitrogen in the biosphere;
(iii) the support of ecological habitats and biodiversity;
(iv) support of the landscape;
(v) the protection of cultural heritage; and
(vi) the provision of a platform for human activities, such as construction and recreation.

13.25 The sensitivity of agricultural land is assessed according to its grade within the ALC, as set out in **Table 13.1**. The sensitivity of the soil resource reflects its textural characteristics and its susceptibility to the effects of handling during construction and the re-instatement of land.

Table 13.1: Sensitivity of Agricultural Land and Soil Resources

Sensitivity	Agricultural Land	Soil Resources
High	Grades 1 and 2	Soils with high clay and silt fractions (clays, silty clays, sandy clays, heavy silty clay loams and heavy clay loams)
Medium	Subgrades 3a and 3b	Silty loams, medium silty clay loams, medium clay loams and sandy clay loams
Low	Grades 4 and 5	Soils with high sand fractions (sands, loamy sands, sandy loams and sandy silt loams)

13.26 The thresholds for determining the magnitude of change have been derived taking into account the statutory consultation procedures with Natural England for development involving the loss of agricultural land. These require specific consultation with Natural England for non-agricultural development proposals that are not consistent with an adopted local plan and involve the loss of 20ha or more of BMV land (Ref. 13.3). **Table 13.2** sets out the magnitude of change for agricultural land resources.

13.27 The magnitude of change on soil resources takes into account the continued ability of a soil to fulfil its primary functions, as set out in **Table 13.2**. These definitions have been derived from good practice guidance on handling soils, particularly the Defra Construction Code of Practice for the Sustainable Use of Soils (Ref. 13.7).

Table 13.2: Magnitude of Impact on Agricultural Land and Soil Resources

Magnitude of Impact	Agricultural Land	Soil Resource
High	Development would directly lead to the loss of over 50ha of agricultural land	The soil displaced from development is unable to fulfil one or more of the primary soils functions
Medium	Development would directly lead to the loss of between 20 and 50ha of agricultural land	The soil displaced from development mostly fulfils the primary soil functions off-site or has a reduced capacity to fulfil the primary functions on site
Low	Development would directly lead to the loss of between 5 and 20ha of agricultural land	The soil displaced from development mostly fulfils the primary soil functions on-site
Negligible	Development would directly lead to the loss of less than 5ha of agricultural land	The soil retains its existing functions on-site

13.28 The significance of the effect is then assessed based on the sensitivity of the resource and the magnitude of impact, as shown below in **Table 13.3**. Those effects that are moderate or substantial are considered to be significant.

Table 13.3: Impact Significance Matrix

	Magnitude of Impact			
Sensitivity/value of a Receptor	High	Medium	Low	Negligible
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible

Limitations and Assumptions

13.29 No assumptions were made, or limitations experienced in respect of the collection of baseline soils and agricultural land quality information. Full access was granted to all land sufficient to undertake the surveys to the recommended methodology.

The Farming Business

13.30 Reports have been prepared by Anderson Midlands (August 2020) and Lambert and Foster, advisers to the Applicant in respect of the farm business aspect of the property. The reports consider the existing business and how the changing demands of the horticulture industry are likely to affect the operation of the business at Pump Farm in the future. These are included as **Technical Appendices 13.2(i) August 2020, 13.2(ii)** and **13.2(ii)sup.**

BASELINE CONDITIONS

Agricultural Land and Soils

13.31 The Site extends to approximately 52ha of agricultural land, predominantly comprising apple orchards with a small area of grass to the east. The Site lies to the north west of Rainham and is bounded in the north by the Lower Rainham Road. It is bounded in the east by the Lower Bloors Lane, to the south by a railway line and to the west by agricultural land and residential properties off Lower Twydall Lane. The Site slopes downward, from west to east, falling from around 30m Above Ordnance Datum (AOD) to 10m AOD.

13.32 Local agro-climatic factors have been calculated using the Meteorological Office's data set for the centre of the Site at a representative altitude of 20m AOD and are shown in **Table 13.4**. The data shows the Site to be warm and moderately dry with large crop moisture deficits. Field Capacity Days (FCD) are shorter than is typical for lowland England, providing adequate opportunities for agricultural work.

Table 13.4: Local Agro-Climatic Conditions

Parameter	Value
Average Annual Rainfall	619mm
Accumulated Temperatures >0°C	1,478 day°
Field Capacity Days	124 days
Average Moisture Deficit, wheat	121mm
Average Moisture Deficit, potatoes	118mm

13.33 The British Geological Survey map (ref.13.8) of the Site shows the underlying geology in the west and east to be of the Thanet Formation, mostly comprising fine-grained sand that can be clayey. There is a narrow band of the Seaford Chalk Formation running roughly north east to south west comprising firm white chalk. This chalk is overlain with superficial deposits of glacial Head and may include gravel, sand and clay.

13.34 The Soil Survey of England and Wales soil association mapping (1:250,000 scale) (ref.13.9) shows the Hamble 1 association across the Site. These soils are characterised by deep, often stoneless, fine silty soils. Series within this association may be affected by groundwater, with impeded drainage at depth, or be shallow over chalk. However, profiles are typically well drained, of Wetness Class (WC) I.

13.35 Agricultural land quality is at the Site is affected mostly by soil droughtiness, with some profiles also limited by Soil Wetness, and varies across the Site from Grade 1 to Subgrade 3a.

13.36 In the northern and southern parts of the Site there are some excellent quality Grade 1 soils. Soils from these profiles generally comprise fine, sandy silt loam topsoils with some medium silty clay loam topsoils also present. These soils have low stone, light silty profiles with adequate available water and no limitations.

13.37 Most (79%) of the soils found across the Site are of Grade 2 quality. These silty clay loam and medium clay loam soils are most affected by droughtiness as a result of large moisture deficits, slight stoniness and medium or heavy textured subsoils.

13.38 Profiles of WC I with heavy topsoil textures and profiles of WC II with medium topsoil textures are also slightly limited to Grade 2.

13.39 There are some small pockets of Subgrade 3a land within the Site. These are found to the south west bordering the railway and to the east of the Site, off Pump Lane. In these pockets of land, the upper subsoil is moderately stony or chalky, with a resultant droughtiness limitation to Subgrade 3a. Some rare instances of profiles of WC III are also limited to Subgrade 3a.

13.40 The areas of the various ALC grades are given in **Table 13.5** and are mapped on **Figure 13.1**.

Table 13.5: Agricultural Land Classification of the Site

Grade	Description	Area (ha)	% of agricultural land
1	Excellent quality	8.6	17
2	Very good quality	40.6	79
3a	Good quality	2.3	4
Total Agricultural		51.5	100
	Non-agricultural	0.5	-

The Farming Business

13.41 AC Goatham and Son farms over 2,400 acres of land all for top fruit (apples and pears). Pump Farm is a part of this operation comprising approximately 135 acres (54.8 hectares) of predominately apple orchard with a small area of grass in the east. Of the 135 acres, 12 acres is rented. There is no security of tenure on the rented land, with this only being rented on an annual basis.

13.42 Pump Farm has a modest range of old farm buildings and mobile units on site, most of which are in a poor condition. These buildings do not meet the modern demands on the business to improve the living quarters for attracting seasonal workers and in addition to ensuring the standards of storage facilities, equipment stores and accommodation meet the need of the supermarket auditors (commissioned by the client buying the fruit, so not just the standards and requirements set out by the business itself). These facilities are inadequate to service the holding.

13.43 The orchards at Pump Farm are established commercially planted root stock. 50% of Pump Farm is 4 / 5-year-old Braeburn rootstock. However, this Braeburn stock requires replacement due to it no longer being a favoured variety by the supermarkets as there is an oversupply of this being grown.

13.44 Over the last 3 years Pump Farm has produced an average of 6,702 bins across the orchards, which at 330 kg per bin equates to 48 tonnes per hectare. The farm is no longer generating a commercial yield when compared to modern requirements at around 75 tonnes per hectare and as such, is not deemed suitable to be retained.

13.45 When the Braeburn crop is taken out, the 2018 figures alone would show that the rest of the orchards of other varieties (Conference / Gala / Discovery) only produced a yield of 49.39 tonnes per hectare. This is below the requirements of the business which requires 60 tonnes per hectare.

13.46 A requirement for specialist machinery brings about the need to transport this equipment from the larger supporting hub farms. The type of machinery used at Pump Farm is standard mechanised machinery for planting, pruning, spraying, picking, hedge trimming and orchard mowing. This is predominantly tractor-driven machinery, other than at harvest, when self-propelled motorised elevated picking platforms are utilised. None of the machinery is stored at the farm, given the limited storage capacity and security issues. All the machinery is sent over from Howt Green Farm, near Bobbing, some 7 miles away.

13.47 In order to survive, the fruit growing industry has undergone consolidation in terms of distribution of produce. It is not possible or practical to provide infrastructure required to make each fruit farm in the overall business 'self-sufficient' in storage term needs, accommodation, machinery. Hub farms are the norm which means that cold storage, accommodation for labour and storage of machinery is shared and based at a single site serving a number of farms within the business. Flanders Farm, Hoo and Howt Farm, Bobbing are two sites that form this function for the overall business.

13.48 In short, the key issues facing the farm business at Pump Farm are commercial (profitability in a competitive market and balancing whether the need to completely replace the tree stock in the next couple of years makes financial sense), as well as practical (ease of transporting the fruit and machinery through an increasingly urban environment, increasing residents' complaints about farming operations, etc.).

IMPACTS

Construction Phase

Effect on Agricultural Land

13.49 Construction effects will primarily relate to the loss of agricultural land within the Site. The Development will involve the loss of 51.5ha of BMV agricultural land mostly in Grades 1 and 2, with a small area of Subgrade 3a, either for built development, or for the provision of open space and green infrastructure.

13.50 Grades 1 and 2 land is of high sensitivity and Subgrade 3a land is a resource of medium sensitivity (**Table 13.1**). The combined magnitude of impact is high (**Table 13.2**). Therefore, from **Table 13.3** the Development will result in a direct, permanent, **substantial adverse** impact on BMV agricultural land.

Effect on Soil Resources

13.51 As soil is a finite resource that fulfils many important functions and services for society in addition to the production of food and fibre, it is important that soil resources are protected and used sustainably. During the construction phase, damage to, and loss of, topsoil could occur if other dissimilar materials such as subsoil or other materials were stockpiled directly on it without a separating layer or possibly by poor work causing mixing of topsoil, subsoil and other materials during stockpile placement or removal.

13.52 There is also a risk to long-term damage to soil structure, and the loss of potentially valuable soil, if there is uncontrolled trafficking of land and soil by heavy machinery, especially wheeled machinery.

13.53 Biodegradation of topsoil would occur if it is compacted in storage, stockpiled when wet, if stockpiled in the medium- to long-term, or covered by soil stores for significant periods.

13.54 Permanent, direct, adverse impacts may arise, therefore, from disposing of soil or re-using it for inappropriate purposes that do not meet the many beneficial functions of soil; by mixing incompatible soil resources; and by poor management of the soil resource. This would represent an **adverse** effect.

13.55 The soils on the Site are predominantly silty clay loams which are of medium sensitivity to movements and handling and which, prior to mitigation, would be subject to a high magnitude of change in **Table 13.2**. The effect of the Development on the soil resource prior to mitigation is therefore assessed as being **moderate adverse**.

Effects on Farm Business

13.56 With the whole of the site given over to development, the farm business at Pump Farm would inevitably cease in its entirety. It would not be practical, as set out in **Technical Appendices 13.2(i) and 13.2(ii),** to retain even a small part of the business on the site. The Development would result in the loss of some 51ha of commercial fruit orchards. This will result in a **substantial adverse** effect on the business at Pump Farm which is significant.

13.57 Whilst seasonal jobs would directly be lost from Pump Farm, with the hub farm method of operations within the overall business, these seasonal workers would be transferred to other farms within the business. Overall, the effect on seasonal jobs is considered to be **slight to negligible**.

Operational Phase

13.58 The permanent removal of land from agriculture would occur during the construction phase of the Development, it is not considered that any further effects would occur during operation of the Development.

13.59 Similarly, the permanent loss of the farm business from Pump Farm would occur during or prior to the construction phase of the Development. There would be no further effects during the operation of the Development.

MITIGATION

Construction Phase

Effect on Agricultural Land

13.60 There are no universally applicable measures available to mitigate the direct loss of agricultural land. The use of BMV land for development needs to be considered in the context of the need for development, the high quality of agricultural land in the District and the ongoing potential for the land to realise its inherent agricultural land quality.

Effect on Soil Resources

13.61 The primary measures available to mitigate the impacts on soil resources would be set out in a Soil Resource Management Plan (SMRP), to be prepared at the detailed design stage. The plan would confirm the different soil types (based on the soil survey work already undertaken); the most appropriate re-use for the different types of soils; and the proposed methods for handling, storing and replacing soils on-site.

13.62 The aim of a soil management plan will be to re-use as much of the surplus soil resources on-site in the detailed design of open spaces and green infrastructure. Any surplus soils will be disposed of in a sustainable manner (i.e. as close to the Site as possible and to an after-use appropriate to the soils quality) in accordance with Defra's Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (ref.13.7).

13.63 The quality of soils retained on-site and exported off-site (if required) will be maintained by following good practice guidance on soil handling and storage, particularly to avoid compaction and biodegradation of soils that are to be retained on site in storage. In this respect, topsoil must be stockpiled separately to subsoil.

13.64 With the adoption of appropriate mitigation for the handling and restoration of soils, as part of a Construction Environmental Management Plan (CEMP), most soils will be able to continue their various ecosystem functions on or off the Site, principally as a medium for producing food and biomass; for storing and cycling water and carbon; and for supporting habitats, biodiversity and landscape planting.

Effect on Farm Business

13.65 There are no real measures available to mitigate the direct loss of the farm business at Pump Farm. The effects of permanent loss of agricultural land on the farm business are considered to be fully mitigated through the process of adaption and consolidation of the farms that make up the overall farm business operated by the Applicant. Consequently, the magnitude of impact is considered to be reduced to **negligible.**

RESIDUAL IMPACTS

Construction Phase

13.66 The Development will result in the loss of 51.5ha of best and most versatile agricultural land. This remains a direct, permanent substantial adverse effect, which is significant.

13.67 Following best practice guidance on soil handling, storage and re-use of the soils in an appropriate manner will enable the soil to re-establish some of the existing functions. The magnitude of change to the soil resource would therefore be moderate to slight, and the effect would be slight, and is not expected to give rise to a significant effect.

13.68 The Development will result in the loss of 51.5ha of land at Pump Farm from the overall farm business covering some 2,600ha. This remains a direct, permanent, substantial adverse effect. In the context of Pump Farm alone, this is significant, but in the context of the overall farm business the effect is not significant.

Operational Phase

13.69 There will not be any residual effects on agricultural land and soils from the Development once complete.

13.70 There will not be any residual effects on the Pump Farm business from the Development once complete.

CUMULATIVE IMPACTS

13.71 Cumulative effects (i.e. effect of more than one development upon a single environmental factor) is not considered relevant to the assessment of potential agricultural effects, as these are by nature site specific. Furthermore, effects associated with soils and agriculture are not considered relevant to assessing likely combined effect of environmental factors upon single receptors (e.g. combined effect of noise, dust and visual effects on one receptor). There are thus no cumulative effects anticipated on land use, soil resources or land classification due to the Proposed Development.

SUMMARY

13.72 **Table 13.10** contains a summary of the likely significant effects of the Development.

13.73 The preceding chapter addresses the impact of the Development on agricultural land and soil resources across 51.5ha of agricultural land at Rainham. This has been informed by a detailed site survey in accordance with the MAFF ALC guidelines and criteria.

13.74 The land is in agricultural production, under apple orchards with some smaller areas of grass.

13.75 The Site is classified as excellent to good quality land, of best and most versatile quality. The most extensive soil type found across the Site is of Grade 2 quality, comprising approximately 40.6ha of land. The next most prevalent soil type is excellent quality Grade 1 land which comprises 8.6ha of the Site. The least prevalent soil type is good quality, Subgrade 3a land which comprises 2.3ha of the site. The remaining area is made up of non-agricultural land comprises farm buildings, roads and tracks.

13.76 There are no universally applicable measures to mitigation the direct loss of agricultural land. The use of BMV land for development needs to be considered in the context of the need for the development, the high quality of agricultural land in the District and the continued ability of the Site to realise its inherent agricultural production in continuing to grow high value fruit crops.

13.77 The Development will have a direct, permanent, substantial adverse effect on BMV agricultural land which would be significant.

13.78 The primary measures to mitigate the impacts on soil resources relate to identifying the most appropriate re-use for the soil types found on the Site, and following good practice guidance on handling, storing and replacing soils on site. The predominantly silty clay loam soils on the Site are a receptor of medium sensitivity. With mitigation, the residual effect of the proposed Development on the soil resource is assessed as slight adverse, which is not significant.

13.79 The effects of permanent loss of agricultural land on farm business are considered to be fully mitigated through the consolidation of the business plan by the Applicant. The effect of the Proposed Development on the overall farm business would be not significant.

Table 13.6: Summary Table

Description of Likely Significant Effects	Significance	Effects B/A, R/T, D/I, ST/M/LT, L/R/N					Description of Mitigation/ Enhancement Measures	Description of Residual Effects	Significance	Residual Effects B/A, P/T, D/I, ST/M/LT, L/R/N				
Construction Phase														
Loss of BMV agricultural land	Significant	A	P	D	LT	L	None available	Significant	Significant	A	P	D	LT	L
Effects on Farm Business	Significant	A	P	D	ST	L	Consolidation of farm business	Moderate	Moderate adverse	A	P	D	LT	L
Effect on soil resources	Moderate	A	P	D	LT	L	Implementation of a soil resource plan	Slight	Slight adverse	A	P	D	LT	L
Operational Phase														
No effects														

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

14 ARCHAEOLOGY AND CULTURAL HERITAGE

INTRODUCTION

14.1 The chapter focuses on the assessment of the likely significant environmental effects of the Proposed Development on Non Designated Heritage Assets/Archaeology of the environment. It considers the likely significant effects of the proposed works on any buried archaeological remains within the Site and the wider study area. The chapter has been prepared by SWAT Archaeology and Pegasus Group.

14.2 **Technical Appendix 14.1** accompanies the chapter and comprises the Archaeological Desk-Based Assessment produced by SWAT Archaeology, which provides a comprehensive survey of all relevant data sources, including a full cartographic regression exercise. This Appendix should be referred to for any further details regarding the below ground archaeology at the site and the immediate vicinity.

14.3 **Technical Appendix 14.2** comprises of the Pleistocene and Palaeolithic Desk-Based Assessment produced by QUEST, which provides a more detailed assessment of the potential for Palaeolithic Archaeology.

14.4 Consideration has also been given to the impact of the development on Designated Heritage Assets and their setting, the detail of which is found in **Technical Appendix 14.3a** Heritage Setting Assessment, prepared by Pegasus Group.

CONTEXT

Legislative Framework

14.5 National legislation and guidance relating to the protection of, and proposed development on or near, important archaeological sites or historical buildings within planning regulations is defined under the provisions of the Town and Country Planning Act 1990. In addition, local authorities are responsible for the protection of the historic environment within the planning system and ensure than a Heritage Asset is protected to enable it to be passed on to future generations.

14.6 Statutory protection is also provided to certain classes of designated heritage assets under the following legislation:

(i) Ancient Monuments and Archaeological Areas Act 1979 (ref 14.1);
(ii) Planning (Listed Buildings and Conservation Areas) Act 1990 (ref 14.2);
(iii) Enterprise and Regulatory Reform Act 2013 (ref 14.3);
(iv) Hedgerow Regulations (statutory Instrument No. 1160) 1997 (ref 14.4);
(v) Treasures Act 1996 (ref 14.5); and
(vi) Burial Act 1857 (ref 14.6).

14.7 Section 7 of the Planning (Listed Buildings and Conservation Areas) Act provides that listed building consent is required for:

> *'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....'*

14.8 Section 16(2) of the Act states that:

> *'In considering whether to grant listed building consent for any works the local planning authority.....shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses'.*

14.9 For applications for planning permission affecting the setting of listed buildings, Section 66 of the Act requires that:

> *'in considering whether to grant planning permission for development that affects a listed building or its setting or whether to grant listed building consent, the local authority shall have special regard to the desirability of preserving a listed building or its setting or any features of special architectural or historic interest which it possesses'.*

14.10 The assessment of potential setting effect has followed the guidance set out in '*The Setting of Heritage Assets', published by English Heritage in 2011* (ref 16.7). Paragraph 2.2 (EH 2011) observes that:

> *"... setting embraces all of the surroundings ... from which the heritage asset can be experienced or that can be experienced from or within the asset. Setting does not have a fixed boundary and cannot be definitively and permanently described as a spatially bounded area or as lying within a set distance of a heritage asset".*

14.11 As far as 'key principles' are concerned, EH (2011) states that:

> *"... setting is the surroundings in which an asset is experienced. All heritage assets have a setting, irrespective of the form in which they survive and whether they are designated or not. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral."*

14.12 EH (2011) then adds that:

> *"... the extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset will play an important part, the way in which we experience an asset in its setting is also influenced by other environmental factors such as noise, dust and vibration; by spatial associations; and by our understanding of the historic relationship between places".*

14.13 In practical terms, EH (2011) sets out an approach to setting and development management based on a five-step procedure; i.e.

1. Identify which heritage assets and their settings are affected;

2. Assess whether, how, and to what degree, these settings make a contribution to the significance of the heritage asset(s);

3. Assess the effects of the proposed development, whether beneficial or harmful, on that significance;

4. Explore ways of maximising enhancement and avoiding or minimising harm; and

5. Make and document the decision and monitor outcomes.

National Planning Policy Framework

14.14 The NPPF (ref 14.7) sets out the Government's core principles in relation to planning and the historic environment and is covered in section 16, paragraphs 185-202. These principles are designed to underpin the planning and decision-making process to ensure that Local Planning Authorities (LPA), developers and owners of heritage assets adopt a consistent approach to the conservation of the Historic Environment.

14.15 The Historic Environment, as defined in the NPPF, Annex 2, comprises:

'all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.'

14.16 NPPF Annex 2 defines a Heritage Asset as:

'a building monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing)'.

14.17 Paragraph 189 of the NPPF states 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.'

14.18 Paragraph 190 of the NPPF states that:

'The LPA should take this assessment into account when considering the impact of a proposal on a heritage asset, to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal.'

14.19 The NPPF further provides definitions of terms which relate to the historic environment in order to clarify the policy guidance given. For the purposes of this report, the following are important to note:

(i) **Significance.** The value of a heritage asset to this and future generations because of its heritage interest. This interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

(ii) **Setting**. The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.

14.20 The NPPF is supported by the Planning Policy Guidance (ref 14.8), which includes Conservation Principles, Policy and Guidance (2008) as well as Good Practice Advice in Planning Notes 1 to 3, all issued by Historic England.

Local Policies

14.21 Medway Council has a Local Plan adopted in 2003 (ref 14.9). The plan has a number of saved policies relevant to archaeology:

(i) Policy BNE20: Scheduled Ancient Monuments
(ii) Policy BNE21: Archaeological Sites

14.22 These policies are covered in greater detail below:

Policy BNE20: Scheduled Ancient Monuments

14.23 Development affecting scheduled ancient monuments or other nationally important sites will not be permitted if it would: (i) damaged or destroy such sites; or (ii) be detrimental to their setting.

Policy BNE21: Archaeological Sites

14.24 Development affecting potentially important archaeological sites will not be permitted unless:

(i) The developer, after consultation with the Archaeological Officer, has arranged for an archaeological field evaluation to be carried out by an approved archaeological body before any decision on the planning application is made; and

(ii) It would not lead to the damage or destruction of important archaeological remains. There will be a preference for the preservation of important archaeological remains in situ.

(iii) Where development would be damaging to archaeological remains, sufficient time and resources are made available for an appropriate archaeological investigation undertaken by an approved archaeological body. Such investigations should be in advance of development and in accordance with a specification and programme of work approved by the Council. Resources should also be made available for the publication of the results of the investigation.

Heritage Asset Review (November 2017) (ref 14.10)

14.25 Medway Borough Council has produced a review focussing on its Heritage assets. There is a short section on Rainham which quotes the following:

> *'Positioned on the fringe of the urban area, Rainham is subject to a great deal of development pressure due to the current demand for housing in the area. Pressure to develop agricultural land is intense and should be resisted in all but the most appropriate instances to ensure that the agricultural character that defines Rainham's heritage is preserved.'*

Assumptions/Limitations

14.26 The assessments set out in this report have been undertaken on the basis of professional experience. However, the assessment of impacts on heritage assets (archaeological or cultural) is often subjective, especially in relation to setting issues, as thee is no accepted definition of what the setting of an individual heritage asset might comprise.

METHODOLOGY

14.27 The consideration and forecasting of potential development effects is based upon an assessment of data relating to designated and non-designated heritage assets, undertaken by professionals with extensive desk and field-based experience in the identification, assessment, and mitigation of development-related effects on the historic environment. The Significance of the Effect is dependent on the important of the heritage asset or its setting and the magnitude of the effect.

14.28 The NPPF refers to the consideration of the 'significance' of heritage assets. In the context of an EIA however, the term significance is used to denote the magnitude of likely environmental effects. Therefore, to avoid confusion, when referring to the NPPF, the term importance or sensitivity (rather than significance) is used within this assessment.

14.29 The determination of the importance of these assets is based on statutory designation and/or professional judgement. The Conservation Principles, Policy and Guidance (Historic England, 2008) includes four values:

(i) Evidential value: The potential of the physical remains to yield evidence of past human activity. This might consider: date, rarity, state of preservation, diversity/complexity, and contribution to published priorities, supporting documentation, collective value, and comparative potential;

(iii) Historic value: The ways in which past people, events and aspects of life can be connected through heritage assets to the present, such as a connection often being illustrative or associative;

(iv) Aesthetic value: This derives from the ways in which people draw sensory and intellectual stimulation from the heritage asset, considering what other people have said or written; and

(v) Communal value: This derives from the meanings of a heritage asset for the people who know about it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical, particularly associative, and aesthetic values, along with educations, social or economic values.

Table 14.1 – Definition of Receptor Sensitivity

Sensitivity/value of a Receptor	Sensitivity/value of a Receptor
Very High	Internationally important archaeological sites or monuments. International important areas, structures and other buildings designated as World Heritage Sites.
High	Ancient Monuments scheduled under the Ancient Monuments and Archaeological Areas Act 1979, or archaeological sites and remains of comparable quality, assessed with reference to the Secretary of State's non-statutory criteria. Scheduled Monuments with standing remains; Grade I and II* Listed Buildings; Conservation Areas containing very important buildings;
Medium	Archaeological sites and remains which, while not of national importance, score well against most of the Secretary of State's criteria. Grade II Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historic associations; Conservation Areas containing buildings that contributes significantly to its historic character; and Historic Townscape or built up areas with important historic integrity in their buildings.
Low (or lower)	Archaeological sites that score less well against the Secretary of State's criteria. 'Locally listed buildings' and undesignated built heritage of local significance.
Negligible	Areas in which investigative techniques have produced no or only minimal evidence for archaeological remains, or where previous large-scale disturbance or removal of deposits can be demonstrated

Table 14.2 – Determining Magnitude of Impact

Magnitude of Impact		Description
Major	Adverse	Demolition of a built heritage asset or complete alteration to its setting Complete removal of an archaeological site.
	Beneficial	Arrest of physical damage or decay to a built heritage asset or structure. Alteration to a built heritage asset resulting in significant beneficial impact. Arrest of physical damage or decay to an archaeological site resulting in significant beneficial impact.
Moderate	Adverse	Harmful alteration (but not demolition) of a built heritage asset or that its setting is significantly modified. Removal of a major part of an archaeological site and loss of research potential.
	Beneficial	Alterations to a built heritage asset resulting in moderate beneficial impacts. Land use change resulting in improved conditions for the protection of archaeological remains plus interpretation measures (heritage trails, etc.).
Minor	Adverse	Alterations to a built heritage asset resulting in minor harm or noticeably different from original setting. Removal of an archaeological site where a minor part of its total area is removed but the site retains a significant future research potential.
	Beneficial	Alterations to a built heritage asset resulting in minor beneficial impacts Land use change resulting in improved conditions for the protection of archaeological remains
Negligible	Adverse	Negligible impact from changes in use, amenity, or access. Negligible direct impact to the built heritage asset or is setting Negligible impact from changes in use, amenity, or access to an archaeological asset.
	Beneficial	Very minor benefit.
No Change		No change would be perceptible, either positive or negative.

Determining Significance of Effect

14.30 The assessment of significance of any effect in EIA terms is founded on a professional judgement of the heritage important of a given asset or group of assets, as informed by policy guidance, when taken against the magnitude of effect.

Table 14.3 – Determining Significance of Effect

		Magnitude of Impact				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Receptor Sensitivity	**Very High**	Neutral	Minor Adverse	Moderate Adverse	Major Adverse	Extreme Major Adverse
	High	Neutral	Minor Adverse	Moderate Adverse	Major Adverse	Major Adverse
	Medium	Neutral	Minor Adverse	Minor Adverse	Moderate Adverse	Major Adverse
	Low	Neutral	Minor Adverse	Minor Adverse	Minor Adverse	Moderate Adverse
	Negligible	Neutral	Neutral	Neutral	Neutral	Neutral

14.31 The assessment matrix in **Table 14.3** is not intended to be 'prescriptive', but rather it allows for the employment of professional judgement to determine the most appropriate level of effect for each heritage asset. Only those effects defined as Major or Moderate are considered to be significant in terms of the EIA Regulations. All other effects are deemed to be 'not significant'.

Consultations

14.32 In accordance with the NPPF early consultation has taken place with Kent County Senior Archaeological Officer, Ben Found.

BASELINE CONDITIONS

Non-Designated Heritage Assets/Archaeology

14.33 The baseline assessments combine both an examination of all available information (from sources such as the local Historic Environment Record, historical maps, historical borehole data held by the British Geological Survey, and relevant geological, Quaternary and archaeological literature), site visits and professional judgement to establish the known or potential baseline conditions on the development site.

14.34 The archaeological desk-based assessment incorporated a search of Kent HER. The methodology followed relevant guidance and complied with the Code of Conduct and other relevant regulations issued by the Chartered Institute for Archaeologists (CIfA). An intensive walkover of the site visit was undertaken on the 8th August 2018, where the topography and evidence for archaeological remains on the site was assessed.

14.35 The following section presents a summary of the historical and archaeological background of the general area. This is presented by historical period, and has been compiled in order to place the study area into a wider archaeological context.

Table 14.4: Ages of Historic Development

Prehistoric	Palaeolithic	c. 500,000 BC – c.10,000 BC
	Mesolithic	c.10,000 BC – c. 4,300 BC
	Neolithic	c. 4.300 BC – c. 2,300 BC
	Bronze Age	c. 2,300 BC – c. 600 BC
	Iron Age	c. 600 BC – c. AD 43
Romano-British		c. AD 43 – c. AD 410
Anglo-Saxon		AD 410 – AD 1066
Medieval		AD 1066 – AD 1485
Post-medieval		AD 1485 – AD 1900
Modern		AD 1901 – present day

14.36 The Archaeological Desk-Based Assessment has generally shown that the area to be developed is within an area of high archaeological potential for the prehistoric and Post Medieval periods with moderate and low/moderate chance for the Roman and Anglo-Saxon period respectively. All other periods are low. An archaeological walkover was conducted, and no artefacts or archaeological features were noted. Historical mapping shows that the vast majority of the area was and is agricultural from at least the Post Medieval period, if not earlier. Sections 14.37 to 14.59 are taken from the Archaeological Desk-Based Assessment. Detailed Analysis regarding the Palaeolithic taken from the Pleistocene and Palaeolithic Desk-Based Assessment is covered in sections 14.60.

Prehistoric Period

14.37 The non-designated assets relate from the earliest period of human activity the Palaeolithic onwards and relates to the attractiveness and use of the estuary area that also continued into the Mesolithic and Neolithic periods. The Bronze Age is also represented. There appears to be a gap in activity in the area until the Roman period whereby the foreshore for maritime transport links was important as well as the Romans leaving burial and pottery evidence, especially to the area east of the Site. Medieval occupation began in the area around the Lower Road and Twydall Lane and the hamlet grew in the Post Medieval period as seen by the Designated Assets of the surviving houses with the creation of scattered farms.

14.38 Evidence from the Prehistoric period has been found within the Site and the wider area. The Kent HER has two records from the Palaeolithic period within the assessment area. The chalk pit adjacent to the Site on the western side had many Palaeolithic finds. South of Bloors Place Palaeolithic hand axes on the eastern side of the Site and other flint debitage has also been found. In the wider area nearby Otterham Quay has Palaeolithic finds and the wider area around the Medway is well known for early finds from this period as seen on the Hoo Peninsular. In the immediate area around the Site, little has been securely dated in primary locations. The Kent HER has two records from the Mesolithic period within the assessment area being blades and flakes found in the area near Pump Farm, where the exact location is unknown but likely to be within the Site. To the south east at Berengrave Nursery, a large

number of flints were found including possible Mesolithic blades. Mesolithic artefacts are less common in the wider area. The Kent HER has two records from the Neolithic period within the assessment area. A Neolithic hand axe was found at Bloor's Place and the Lower Twydall chalk pit also originally contained late Neolithic flints. In addition, there are the flints found at Berengrave Nursery that included the Neolithic period. The finds from the Twydall Chalk pit are discussed in greater detail in the Pleistocene and Palaeolithic section.

14.39 For the Bronze Age period, two finds of axes have been found south of the railway and the Site, 350m apart, with none in the wider area and the Kent HER had no records relating to the Iron Age.

14.40 In the Palaeolithic period, the Medway was initially the dominant river rather than the Thames. As a consequence, many of the sand and gravel areas of the Medway contain Palaeolithic finds especially in the areas around the Hoo Peninsular and Rochester. The Twydall chalk pit has evidenced many Palaeolithic finds and Palaeolithic implements have also been found at nearby Otterham Quay. Of the Mesolithic period there is little evidence. The Neolithic has limited evidence as well but a gully and posthole have been found at Grange Farm, Gillingham and a Neolithic/Bronze Age flint working floor was found west of Motney Hill, north east of the SITE in 1952. In the wider Medway area Medway has megalithic monuments, in particular Neolithic long barrows of great importance. Grange Farm to the north west of the SITE has also provided evidence of Bronze Age activity.

14.41 Located just south of the A2 in Rainham, evidence of Iron Age occupation and activity has been found with enclosure and a roundhouse. In the wider area the known important Iron Age areas are hill forts located at Bigbery (near Canterbury), Oldbury and Quarry Wood.

Romano-British Period

14.42 The Kent HER has two records from the Roman period within the assessment area. The exact location unknown but Roman pottery possible relating to a cremation burial was found near the Lower Twydall chalk pit. North west of the Site in the area of Sharp's Green further Roman pottery was discovered, again the exact location is unknown. Roman activity in the wider area includes Roman settlement activity has been found in the area of Rainham Creek and Otterham Quay, to the north east of the Site and a Roman-British pottery kiln circa 500m east of the Site at Berengrave Nature Reserve although the precise location is unknown. A Roman cremation burial ground is located just to the east of Rainham Docks East, and near the head of Otterham Quay is another probably Roman cemetery.

14.43 In addition, the A2 is on the path of Watling Street, the Roman Road from London to Canterbury and on to Dover. Upchurch the next village on the north Kent coast to the east of Otterham is well known for its Roman occupation and cemetery as well as many Roman pottery works.

Anglo-Saxon

14.44 The Kent HER has two records from the Anglo-Saxon period within the assessment area. Anglo-Saxon period pottery was found in the area of Sharp's Green, north west of the Site. In addition, a 5th century coin was discovered in the north western area of the eastern half of the Site, exact location unknown. These suggest that there is Anglo-Saxon activity in the area.

14.45 In a charter dated 811 AD, Rainham is described as a royal town when the charter records a grant of land to Wulfred, Archbishop of Canterbury. An Anglo-Saxon cemetery has been found at nearby Otterham Creek.

Medieval Period

14.46 For the Medieval period there are 11 records. There are two main Medieval areas, the ribbon development along the Lower Rainham Road and the cluster of buildings on the northern end of Lower Twydall Lane. Chapel house (Grade II) is mid to late 15th century in date and is located on the western side of the northern end of Pump Lane is adjacent to the SITE. More Grade II houses are on the southern side of the Lower Rainham Road also from the late 15th century being No. 497, 499 and 501, originally an open hall house, it is now three houses. On the northern side of the Lower Rainham Road is The Old House (Grade II) from the 15th century. Medieval domestic occupation was also found below the Post Medieval house at The Black House on the Lower Rainham Road Adjourning the north east area of the SITE is Bloors Place, a Grade II* listed building with 15th century origins. On Lower Twydall Lane is the grade II Little London Farmhouse, thought to be late 15th century or early 16th century. The Manor Barn (Grade II) is dated to the 16th century origins. Nearby Twydall Barn is 15th century and York Farmhouse is 16th century. Within the area of the SITE but exact location unknown but in the eastern half, a Medieval copper alloy seal matrix was founded and reported under the PAS scheme.

14.47 There is no separate entry for Rainham in the Domesday Book. Nearby Upchurch and Newington come under the Manors in Milton, near Sittingbourne with Gillingham under the manor of Chatham.

14.48 Rainham Street was essentially a linear development along Watling Street focused around the junction with station Road. Rainham East was situated at the southern end of a spur of land Called Motney Hill and the docks and the area of Rainham East is known to have Medieval origins. Lower Rainham (also known as West Rainham) is the area around Bloors Place and the Lower Rainham Road was essentially a ribbon development as was at one time the main road from Chatham to Queenborough.

14.49 The church in Rainham is located on the south side of Watling Street and is dated to the 13th century with the local Kentish Ragstone and flint used in its construction. As with many other churches, it underwent restoration in the Victorian period.

14.50 Bloors Place takes its name from the family of le Bloere or le Blore. Originally built in the 15th century as a Wealden hall house with a stone range added to the rear in the early 16th century. Based of writings in 1798 by Hasted a historian he comments that Christopher Bloor, who had bought the Manor of Sileham from Sir Antony St Leger, 'rebuilt his seat in this parish …..in which his ancestors had resided for several generations'. The house has been altered and extended many times and some of it demolished in the late 18th century to reduce its size. The house subsequently belonged to the Earl of Thanet.

14.51 Berengrave Park to the east of the SITE had been part of the Manor of Queencourt. Queen Elenor, the widow of Henry II gave it to St. Catherine's Hospital in 1273. The Park was mainly used for cattle and sheep grazing.

Post Medieval Period

14.52 The Kent HER has 11 records from the Post Medieval period within the assessment area. Pump Farmhouse is from this period (Grade II) being late 18th century. The grade II garden walls and outbuildings of Bloors Place are from this period. Black House, north west of the Site (Grade II) dated to the early-mid 17th century. The Manor House (Grade II) in Lower Twydall Lane is late 17th century. The railway was opened in 1853. Post Medieval pottery has been found near Twydall and is thought to be an area south of the railway. North of the Site on the foreshore are two wharfs from this period. On the Lower Rainham Road are recorded the location of the Methodist Church that was to the west of Bloors Place and The St. John's Mission Church that closed in the 1950s. Map regression confirms that the majority of the

Site was either arable fields or orchards in this period. However, within the SITE there was a house on the northern side of the bridleway that has been demolished along with a number of other structures in the western half that have also been demolished. These included buildings in the northern part of the western half where the nursery used to be and a number of smaller buildings in the area west of Pump Farm within the orchards.

14.53 The north Kent coast and proximity to London meant a number of chalk quarries and clay extraction occurred in the area with the manufacturing of bricks, cement and lime. Adjoining the SITE is Twydall chalk quarry and the cement works to the north of this quarry on the coast at Sharps Green north west from the SITE. The Cement Works started in 1902 and were closed by 1913. The works incorporated a barge quay north of Sharps Green in an area called Horrid Hill as well as having 7 chamber kilns. The chalk pit at Twydall was connected to the cement works by tramway. Bloors Wharf is located north of Bloors Place. It was originally called Blowers Quay based on a survey commissioned by Queen Elizabeth I in 1566.

14.54 In 1912 at Motney Hill cement works started connected to a chalk pit located to the south now known as Berengrave Local Nature Reserve. The cement works also had its own docks called Rainham Docks East. The cement works closed at Motney Hill in the 1930s with the chalk pit also closing in 1931.

14.55 In the early 20th century much of the area north of Watling Street being the dip slope of the North Downs was dug for brickearth for the local brick making industry. In the tithe records, the field designated No. 2 is called 'Pump Farm Brickearth'. The nearest brickworks were located around Otterham Quay. One, known as Leeneys, was right on Otterham Quay itself. This brickfield closed in 1931-1932. Another located in an area known as Four Gun field closed in 1954. Opposite this field was Clover Lay brickfield which closed in 1953. The largest brickworks were in Big Field which closed in the 1980s. Brickearth deposits are normally 2-4m thick that overlay chalk. It is this brickearth that provides the rich soil needed for agriculture

14.56 There are 10 farmstead records confirming the rural and agricultural nature of the area. Some farmsteads still have the farmhouse remaining, which are listed with the exception of Queens Court. This includes Pump Farm, Twydall Farm, York Farm, Little London Farm and Bloors Farm. A number have been completely demolished such as an outfarm south east of Bloors Farm, another on Pump Lane south of the railway, an outfarm east of Sharp's Green. There is a surviving farmstead north east of Twydall to the north west of the Site.

14.57 The railway was constructed in 1858 from Chatham to Faversham, which fuelled the growth of industry but also urbanisation, particularly the area north of the High Street. Following electrification of the railway and increasing urbanisation, to the south of Watling Street, saw Rainham as a commuter town for London in the 20th century. As a result of this growth, the various separate areas of Rainham, such as east, west and Lower have now all been incorporated into the main town.

14.58 In 1997, Bloors Wharf became part of the Riverside Country Park. The park is situated on the coastal region between Gillingham and Rainham and consists of circa 100 hectares. It was originally established in 1970 and officially opened in 1987 following designation as the area as a country park under the Countryside Act 1968. The land was formally farmland that was then used as waste disposal by the Council, which stopped in the 1950s with the land being left.

14.59 The Archaeological desk-based assessment has considered the archaeological potential of the site. Archaeological investigations in the vicinity, map research, the historical environment record results and recent archaeological investigations have shown that the Site may contain archaeological sites and these can be summarised as:

(i) Prehistoric: high
(ii) Iron Age: low
(iii) Roman: moderate
(iv) Anglo-Saxon: low/moderate
(v) Medieval: low
(vi) Post-Medieval: high
(vii) Modern: low

Pleistocene and Palaeolithic Archaeology

14.60 To understand the potential for Palaeolithic archaeological remains, focus is given to the geology of the area. The Site is on the lower dip-slope of the North Downs. Its south-west boundary coincides closely with the 30m contour. From this level the ground falls north-eastward as a gently concave slope with no obvious irregularities to a level of ca. 7.0m OD near the north-east edge of the Site. The lower dipslope of the North Downs within the Site and nearby is dissected by shallow dry valleys approximately parallel with one another and aligned from SW to NE. Near the middle of the Site, Pump Lane occupies one of these dry valleys, and an even shallower depression, marked by slight re-entrants in the contours, is present near the NE end of the Site. Immediately downslope from this part of the Site, this depression was formerly occupied by Twydall Chalk Pit.

14.61 The Site is underlain mainly by the Thanet Formation with smaller areas mapped as Head, all resting on bedrock Chalk. There are no BGS archive boreholes or other good quality records of sub-surface conditions within or close to the Site. There is little mapped evidence of river terrace development, or of any fluvial deposition above the level of the Holocene floodplain. This is in contrast with the situation on the north side of the Medway in the Hoo peninsula. It is not possible therefore to develop deposit models to illustrate the stratigraphy beneath the Site.

14.62 The Twydall Chalk Pit served a cement works at Horrid Hill in the intertidal zone on the south side of the estuarine Medway and was linked to it by a tramway. Where the tramway crossed the estuarine mudflats, it was elevated on an artificial causeway which was constructed using the superficial deposits that overlay the Chalk in the Twydall Chalk Pit. The material forming the causeway has been the source of large numbers of Palaeolithic artefacts. It was recorded in 1968 that 85 handaxes and 179 retouched and flake implements had been found. The initial discovery of these artefacts was found in 1908 and reported as several hundreds of flint implements of various forms and types. Other investigators have continued to collect material from this site, but there are no detailed records of these investigations and it is difficult to piece together exactly what was collected where and by whom. A field survey in 1971 by the Upchurch Archaeological Research Group recovered 700 mainly Palaeolithic artefacts.

14.63 Although the Twydall Chalk Pit is not within the Site, there is clearly the likelihood that deposits present in the pit extend into the Site. In 1990, Whittaker described the superficial deposit sequence overlying the chalk in Twydall Chalk Pit that incorporated the Palaeolithic assemblage. Whittaker regarded the deposits as being associated with the 3rd Terrace of the Medway describes them as being up to 2.0m thick overlying a chalk surface penetrated in places by ‘angular or ill-defined depressions’ which he regarded as solution features; or cut into by ‘shallow well-defined features’ which he regarded as ‘stream channels formed within a braided stream environment’. The solution features he described as occupied by ‘weathered chalk and massive blocks of dark “soil” within a matrix of light brown loam’. The ‘stream channels’ he described as occupied by ‘layers of laminated sands’.

14.64 The examination of mapped outcrops and scattered borehole records in the area between Upnor and Upchurch in the height range of the Site shows that the superficial deposits overlying the Chalk are variable. A major component in these deposits is sandy silt often

described in the record as 'brickearth', together with sandy and stony clays forming Head, and much less commonly beds of gravel. There is no evidence within the Site or elsewhere on the south side of the estuarine Medway for the well-developed sequence of river terraces recognized on the north side of the river in the Hoo peninsula. There are spreads of River Gravel in Gillingham, to the west of the Lower Rainham site and at a slightly higher level, which have been a significant source of Palaeolithic material, but the age of these gravels and their place in the Medway terrace sequence has not been established on the basis of detailed investigation.

14.65 There are no Palaeolithic find spots that are definitely within the Site. There is however ample evidence for Palaeolithic occupation on the lower dipslope of the Chalk in the height range of the Site, mainly as records of isolated artefacts but with a few records of more prolific sites. There is no record that artefacts were ever recovered from the chalk pit itself. There appears to be Palaeolithic material representing both a handaxe (Acheulian) industry and a flake-based (?Clactonian) industry.

14.66 Consequently, there is therefore no way of knowing whether they were preserved in Head or River Terrace Deposits, or possibly in Head reworking River Terrace Deposits. Furthermore, if terrace deposits are present within the Site, there is no agreement as to the stratigraphic position that they may occupy, in particular how they may relate to the various Members of the Hoo Gravel Formation in the Hoo peninsula.

14.67 As a consequence, since there is good evidence of Palaeolithic occupation in the immediate vicinity of the Site and a real possibility that deposits incorporating Palaeolithic material are present within the Site. **Table 14.6** along with **Figure 14.3** provides an assessment as to the Palaeolithic potential in various areas across the site. It will be appropriate to undertake a programme of intrusive interventions to gain a clearer understanding of the superficial geology within the site during the evaluation phase in respect of the potential for Palaeolithic archaeological remains.

Archaeological Significance

14.68 Prehistoric activity, particularly in the Palaeolithic period is rare and as a result understanding the occupation and activity and exploitation of the estuary is a key research topic of national significance. As in understanding the Roman occupation and exploitation along the foreshore in this area is considered of regional significance. Understanding of the Medieval and Post-Medieval development of the area can be considered to be of local rarity.

14.69 The survival of the potential archaeological remains within the Site for all periods is currently unknown. Mapping shows that the vast majority of the area was and is agricultural and therefore archaeological remains may survive. However, repeated grubbing out of fruit trees over time would have disturbed the upper layers as well as the digging of shallow trenches in modern times for water pipes for irrigation of the trees. In addition, map regression shows some Post Medieval structures, some residential and some of unknown purpose, which have since been demolished that would have had foundations and could have potentially disturbed any archaeological remains in those areas. It is possible that some of the foundations of these earlier buildings may also survive below ground.

14.70 Based on the information gained in the Archaeological, Pleistocene and Palaeolithic Desk-Based Assessments, it can be concluded that the Site is of high archaeological interest. The south east research framework (SERF), mentions the need to understand Palaeolithic chronology especially in the areas of Palaeolithic deposits of which the Thames Estuary is significant. The Palaeolithic desk-based assessment concluded that a clearer understanding of the superficial geology was required since there were no well-developed sequence of river terraces recognized on the south side in the area of the Site in comparison to the north side of the river in the Hoo peninsula. Previous finds have been unstratified and not subject to

modern archaeological methods in the area, which adds to the significance of the Site. Understanding the exploitation of the coastal area for all the prehistoric periods is key. SERF also expresses a requirement to understand more about the rural settlement in Roman times for non-villa sites. The Conservation Area focuses on the hamlets historical Medieval / Post-Medieval origins and local significance along the Lower Rainham Road as well as in Twydall Lane, although no appraisal for either Conservation Area has yet been written. However, the Council's SHLAA has reviewed and considered the area not suitable due to the historic landscape, archaeological and agricultural significance.

14.71 Initial consultation with KCC suggests that further archaeological investigation is required specifically for the assessing the condition and survivability of any Palaeolithic remains as well as for later periods of archaeology.

Designated Heritage Assets

Scheduled Ancient Monuments

14.72 There are no Scheduled Monuments either on or in the near vicinity of the Site.

Conservation Areas

14.73 There are two conservation areas within the assessment area, but not within the Site. The Council has not yet issued any appraisals relating to either area. One conservation area located along the ribbon development of the Lower Rainham Road and the other at Lower Twydall Lane. The Lower Rainham Conservation area extends to the area in the west around Chapel House and includes the Site area to the north of Chapel House and the Lower Rainham Road. It also effectively borders the Site at the rear of the houses of 500-506 Lower Rainham Road. The Lower Twydall Conservation area encompasses both sides of the Lower Twydall Road including York Farm, The Barn, Little London Farm and the Manor Court. The Site borders parts of the conservation area in the region of the rear of York Farm and The Barn.

Listed Buildings

14.74 There are a number of listed buildings within the Study Area, generally concentrated within the Lower Rainham Conservation Area to the north-east and Lower Twydall Conservation Area to the west / north-west of the Site.

14.75 Those within the Lower Rainham Conservation Area are as follows:

(i) Chapel House.
(ii) 497, 499 and 501 Lower Rainham Road (separate listings).
(iii) The Old House.
(iv) Bloors Place.

14.76 A range of outbuildings and garden walls including Cart Lodge and Granary West are associated with Bloors Place. There are also two Listed Buildings to the north of the Site on Lower Rainham Road; Bay Tree Villa and The Black House.

14.77 The closest Listed building to the Site within the Lower Twydall Conservation Area is York Farmhouse. Beyond this to the north are Little London Farmhouse, Manor House (and attached garden wall) and Manor Barn (and attached north and west walls). Pump Farmhouse is outside the Site, but within its central apex.

IMPACTS

Construction Impacts

14.78 The effects from the construction phase will be direct or physical within the boundary of the Site where housing and /or groundworks for infrastructure are proposed.

Non-Designated Heritage Assets/Archaeology

14.79 The nature and extent of any surviving below ground archaeology is inherently uncertain as it is not practical at this stage of the process to undertake intrusive evaluation across the Site due to the nature of the existing horticultural operation. Realistically, such evaluation would have to be the subject of a condition on any grant of planning permission. What is clear though is that the Proposed Development has the potential to impact any unknown archaeological deposits that exist. The resultant effect magnitude of impact to significance is therefore uncertain as is the significance of effect.

14.80 Should there be potential for Palaeolithic remains at the Site following additional investigation, however, which are considered of national importance, the resultant impact of significance would be considered **major adverse**.

Designated Heritage Assets

14.81 None of the designated heritage assets will experience physical or direct impact from the construction phase of the Proposed Development. However, there may be some indirect impacts to a number of the assets through changes to their setting.

14.82 **Chapel House -** Chapel House is located on the corner of Pump Lane and Lower Rainham Road. It abuts the Site (existing orchards) to the north-west and south-west. It has road frontage with a garden curtilage to the rear.

14.83 There are no alterations proposed to the character of this part of Pump Lane.

14.84 Residential development will replace some of the existing orchards surrounding the listed building altering the wider setting of the listed building. Construction activities will be short term and indirect in nature. The overall impact of construction including the establishment of development is considered to be **minor adverse**, and the effect Minor Adverse.

14.85 **Pump Farmhouse -** located on the western side of Pump Lane at approximately the halfway point of Pump Lane. Pump Farmhouse is situated towards the rear of a relatively large land parcel which includes surrounding mature vegetation and a garage at the rear. The Farmhouse is set back from Pump Lane itself and is almost surrounded by a recent residential development at Russett Farm.

14.86 Glimpsed views of the existing orchards are available from Pump Farmhouse, particularly to the north-east as these are separated from the curtilage by the existing farm track. Construction activities will be short term and indirect. The overall impact is considered to be **minor adverse** and the effect **minor adverse.**

14.87 **Bloors Place** - located on the southern side of Lower Rainham Road to the north-west of the Site. The complex of listed structures has its own substantial and well defined curtilage and is contained within considerable mature vegetation; it is not visible from the public highway nor is it readily visible from the adjacent existing Site.

14.88 Construction activities will be short term and indirect. The overall effect of construction including the establishment of development on Bloors Place itself is considered to be **negligible adverse,** and the effect **minor adverse**. No harm is anticipated to the outbuildings.

14.89 **Lower Rainham Conservation Area** - The Conservation Area runs along Lower Rainham Road, and contains at either end Chapel House to the northwest and Bloors Place to the southeast. It was designated in March 1989. The Site lies immediately along the full length of its southern boundary.

14.90 Notwithstanding the lack of formal Conservation Area appraisal, the designated area is very specifically defined and contained to the curtilage of the buildings identified within it. There

appears little historic association with the adjacent Site and orchards, which themselves are now farmed in a very 'modern' and commercially orientated way.

14.91 Construction of the residential development will be short term and indirect. The overall impact of construction including the establishment of development is considered to minor adverse and the effect is considered to be **moderate adverse**.

14.92 **Lower Twydall Conservation Area** - The Conservation Area runs along Lower Twydall Lane, and contains five Grade II listed buildings, including York Farmhouse. The Conservation Area was designated August 2014. It lies to the west of the Site, adjoin it at its extreme south-eastern extent. Here the Conservation area is characterised by farmhouses set in large parcels of land, shielded from the Site by mature vegetation.

14.93 Despite the lack of formal conservation area appraisal, its boundaries, again a tightly drawn to the curtilage of the buildings within it. Only one farmstead has a direct boundary with the Site.

14.94 Construction activities will be short term and indirect. The overall impact of construction including the establishment of development is considered to be **negligible** and the effect **minor adverse.**

Operational Impacts

Non-Designated Heritage Assets/Archaeology

14.95 There would be no effect on archaeological assets during the occupation phase because impacts and effects would be mitigated at the construction stage.

Designated Heritage Assets

14.96 Without further mitigation over and above the embedded mitigation, the level of impact is considered to be as identified during construction.

MITIGATION

Construction Phase

Non-Designated Heritage Assets

14.97 The presence, location and significance of buried archaeological remains for all periods cannot be confirmed based on the available information. Whilst the site has a high archaeological potential, KCC Archaeology may suggest additional archaeological mitigation works to be secured by an appropriate condition as part of the planning process. If additional archaeological works are to be carried out as a condition to planning approval, the scale, scope and nature of archaeological works will need to be agreed through consultation with the statutory authorities.

14.98 Intrusive evaluation and any subsequent further excavation will identify and record any buried remains and determine whether there is a need for preservation in situ – in which case, alterations to the masterplan would need to be made as part of any further planning permission.

Designated Heritage Assets

14.99 The intention is to retain existing boundary planting and vegetation wherever possible, and particularly that adjacent to the designated heritage assets – this is embedded mitigation. Consequently, this will reduce, in each case, the impact/effect on the setting of the assets.

Operational Phase

Non-Designated Heritage Assets

14.100 No mitigation measures are proposed.

Designated Heritage Assets

14.101 In each case, existing vegetation along the boundaries of the Site with the asset is to retained, i.e., embedded mitigation. In addition, further landscaping and planting is proposed of varying depths along all Site boundaries. As this matures over time, the level of impact on the setting of the assets is anticipated to reduce accordingly.

14.102 Specifically around Chapel House, a wide belt of new orchard type planting is to be created as part of a proposed community orchard. In respect of Pump Farmhouse, the existing vehicle farm track immediately to the east will be down-graded to a simple pedestrian/cycleway, improving the setting of the asset as a result in the reduction of vehicular traffic.

RESIDUAL IMPACTS

Non-Designated Heritage Assets

14.103 There will be no residual effects on archaeological assets following the completion of the development; all effects will have been mitigated at the design and construction stage.

Designated Heritage Assets

14.104 Once the Development is completed, the level of impact to the setting of the assets is considered to reduce slightly, with the maturing of the additional planting, but remain in the overall levels as assessed above.

CUMULATIVE IMPACTS

14.105 There are considered to be no cumulative impacts on either non designated or designated heritage assets.

SUMMARY

14.106 The area of Lower Rainham is area of important archaeological interest relating to the prehistoric period having been occupied for millennia. Palaeolithic finds have been found all along the north Kent coast and the area of the site is no exception with Palaeolithic and Neolithic finds located around the eastern and western half. Unfortunately for many finds the exact location is not known as they were discovered in antiquity and aside from an evaluation of the Twydall chalk pit, there has been little opportunity for archaeological exploration in the area of the Site.

14.107 Anglo-Saxon evidence has been found below a house on the Lower Rainham Road, attesting to the fact that that the area continued to utilised into the Medieval period and the listed buildings from the Medieval and Post Medieval period along the Lower Rainham Road and Lower Twydall Lane confirms this and as a result the Site is bordered by two Conservations Areas, one to the north and one to the west.

14.108 An assessment has been undertaken of the likely significance of effect of the Proposed Development on the Archaeological environment, both within and outside the Proposed

Development area. The presence, location and significance of buried archaeological remains cannot be confirmed based on the current available information – this is due to the very damaging disruption that intrusive investigation would cause to the existing horticultural operations. Whilst the Site is considered to be of high archaeological potential, KCC Archaeology may suggest additional archaeological mitigation as part of the planning process. If additional archaeological works are to be carried out as a condition to planning approval, the scale, scope and nature of archaeological works will need to be agreed through consultation with the statutory authorities.

14.109 The impact of the Proposed Development on the heritage significance of listed buildings and conservation areas within close proximity has been considered. minor adverse impacts were identified to Pump Farmhouse, Chapel House and the Lower Rainham Conservation Area, and Negligible Adverse Impacts were identified to Bloors Place and Lower Twydall Conservation Area. The significance of the effect of these impacts would be Minor for Bloors Place, Chapel House, Pump Farmhouse and Lower Twydall Conservation Area and Moderate for Lower Rainham Conservation Area.

Table 14.5: Summary Table

Description of Likely Significant Effects	Significance	Effect	Mitigation	Description of Residual Effects	Significance	Residual Effects
		B/A,P/T,D/I,ST/MT/LT,L/R/N				B/A,P/T,D/I,ST/MT/LT,L/R/N
Demolition & Construction						
Buried Archaeology	Major adverse	A,P,D,LT,N	Secured by Condition	None	Moderate adverse	A,P,D,LT,N
Setting of designated assets – listed building	Minor adverse	A,T,I,ST,L	CEMP, Use of hoardings as necessary. Retention of existing planting.	As assessed	Minor adverse	A,T,I,ST,L
Setting of designated assets – conservation areas	Moderate adverse (L R) Minor adverse (Lower Twydall)	A,T,I,ST,L	CEMP, Use of hoardings as necessary. Retention of existing planting.	As assessed	Moderate adverse (Lower Rainham) Minor adverse (Lower Twydall)	A,T,I,ST,L
Operation						
Buried Archaeology	Same as construction effects					
Setting of designated assets – listed buildings	Minor adverse	A,P,I,LT,L	Supplemental planting will mature over time, screening the development	As assessed	Minor adverse	A,P,I,LT,L
Setting of designated assets – conservation areas	Moderate adverse (LR) Minor adverse (Lower Twydall)	A,P,I,LT,L	Supplemental planting will mature overtime, screening development	As assessed	Moderate adverse (Lower Rainham) Minor adverse (Lower Twydall)	A,P,I,LT,L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

15 ECOLOGY AND CONSERVATION

INTRODUCTION

15.1 This chapter has been prepared by The Ecology Partnership and presents the results of surveys in and around the Site, which aims specifically to assess the significance of the impacts created by the proposed development on protected species and habitats, and cumulative impacts alongside other developments. The following impacts from the Proposed Development are considered on the following:

(i) On site habitats;
(ii) Protected species known to be present on site;
(iii) Local cumulative impacts;
(iv) Wider cumulative impacts on locally designated sites and nationally and internationally designated sites.

CONTEXT

Legislation

15.2 Wildlife legislation and national and local planning policies may have an effect on the Proposed Development. The following paragraphs identify relevant planning policies legislation and discuss these in the context of the Site.

Wildlife Legislation

15.3 The applicable legislative framework for ecology and nature conservation is summarised as follows:

(i) The Conservation of Habitats and Species Regulations, 2017 (as amended) (commonly referred to as the 'Habitats Regulations') (ref 15.1);
(ii) Wildlife and Countryside Act, 1981 (as amended) (ref 15.2);
(iii) The Natural Environment and Rural Communities Act, 2006 (ref 15.3);
(iv) The Countryside and Rights of Way Act, 2000 (ref 15.4);
(v) Town and Country Planning (Environmental Impact Assessment) Regulations, 2011 (ref 15.5);
(vi) The Hedgerows Regulations, 1997 (ref 15.6);
(vii) The Protection of Badgers Act, 1992 (ref 15.7);
(viii) The Wild Mammals (Protection) Act, 1996(ref 15.8).

National Planning Policy

15.4 National policy guidance is provided by National Planning Policy Framework (NPPF) 2018 (ref 15.9), which sets out the Government's planning policies for England and how they should be applied. The section on **habitats and biodiversity** notes in section 174 (b) that 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";*
>
> *and that in determining planning applications, local planning authorities should follow certain principles, including that (section 175 (d));*
>
> *"opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity".*

Local Planning Policy

Medway Local Plan (2003)

15.5 The Medway Local Plan was adopted in 2003 (ref 15.10) and contains the following policies relating to nature conservation:

(i) BNE35: International and National Nature Conservation Sites
(ii) BNE36: Strategic and Local Nature Conservation Sites
(iii) BNE37: Wildlife Habitats
(iv) BNE38: Wildlife Corridors and stepping stones
(v) BNE39: Protected Species

15.6 The Site was surveyed to assess its ecological value and to ensure compliance with national and local plan policies. The PEA report was produced with reference to then current guidelines for preliminary ecological appraisal (CIEEM 2017. Ref 15.11) and in accordance with BS 42020:2013 Biodiversity – Code of Practice for Planning and Development (ref 15.12). This impact assessment has been produced in accordance with CIEEM's EcIA Guidelines 2018 (ref 15.13).

METHODLOGY

15.7 The pre-development ecological baseline was established through review of existing survey data obtained from the following documents, which are found as **Technical Appendices 15.1 - 15.6** to the ES:

(i) Preliminary Ecological Appraisal, EPR, (2017) – **Technical Appendix 15.1**
(ii) Bat activity survey, Ecology Partnership (2018) – **Technical Appendix 15.2**
(iii) Badger Survey, Ecology Partnership (2018d) – **Technical Appendix 15.3**
(iv) Breeding Bird Survey, Ecology Partnership (2018a) – **Technical Appendix 15.4**
(v) Reptile survey, Ecology Partnership (2018c) – **Technical Appendix 15.5**
(vi) GCN eDNA Letter of Report, Ecology Partnership (2018b) – **Technical Appendix 15.6**

15.8 A desktop study search was completed using an internet-based mapping service, *MAGIC*, for statutory designated sites, and two internet-based aerial mapping services (*Bing Maps* and *Google Maps*) were used to understand the habitats present in and around the survey area and habitat linkages and features (ponds, woodlands etc.) within the wider landscape.

15.9 The Site was surveyed by EPR (Ecological Planning and Research Ltd) on the 21st June 2017 (**Technical Appendix 15.1**). From the EPR report methodology: Habitats were mapped based on the Joint Nature Conservancy Committee's (JNCC) Phase 1 Habitat Survey methodology (ref 15.14) with additional notes taken on the potential presence of protected or notable species.

15.10 The purpose of this assessment was to identify whether more comprehensive species surveys for protected species or habitats (Phase 2) were to be recommended. Phase 2 surveys were then undertaken by The Ecology Partnership in 2018.

15.11 Species specific surveys were undertaken with respect to bats, badgers, reptiles, GCNs, and bird surveys. A summary of the work is set out in the table below. Detailed survey methodologies are provided in the baseline ecological reports found in **Technical Appendices 15.1-15.6**.

Table 15.1: Protected Species and Vegetation Surveys

Faunal Group	Survey Methodology	Date of Surveys	Guidance
Bats – activity surveys	Seasonal dusk surveys from May to September 2018 across the site using transect methods and stops for recording activity as per Bat Conservation Trust guidelines (ref 15.6). Anabat Express static recording devices were left on-site in three locations for at least five consecutive nights per season, in May, July and September.	**2018** Dusk activity transects were undertaken on: 4th June 23rd July 4th September Anabat Express were deployed on site and recorded data from: 17th-21st May 23rd – 29th July 4th - 10th September	Bat Surveys – Good Practice Guidelines 3rd edition (ref 15.6).
Reptiles	The refugia were placed within suitable habitat across the site, along the site boundaries and treelines. Mats were set up prior to the commencement of the reptile survey. A total of seven survey visits were made to the site to check the refugia for the presence of reptiles during each survey. Visits were only carried out if the weather conditions were suitable for locating reptiles. On each visit to the site, a minimum of one circuit to check all refugia was carried out. Natural refugia were also surveyed during these visits. Any natural refugia, such as log piles and brash piles, were lifted and hand searched for evidence of reptiles.	24th May to the 21st June 2018	The timing and number of surveys completed were based on guidelines produced by Froglife (1999) and Gent and Gibson (1998) (ref 15.11 and 15.12)
Badgers	During the survey, all habitats potentially suitable for badgers were systematically examined for evidence of badger activity. Particular attention was paid to areas where the vegetation and/or the topography offered suitable sett sites. Where potential badger setts were identified, trail cameras were left in situ to record activity and determine sett type/species present.	Surveys between the 17th May and 10th September	The evaluation of badger activity was based on methodology developed for the National Survey of Badgers (ref 15.8).

Great Crested Newt Surveys	Habitat Suitability Index assessment of accessible off-site ponds. eDNA surveys conducted on two ponds off site. All water samples were taken by Jade Brennan BSc (Hons) MSc Grad CIEEM (GCN Licence Ref – 2017 – 31295 – CLS - CLS), with Emma Bagguley BSc (Hons) MSc MCIEEM (GCN Licence Ref – 2016-23003-CLS-CLS). All water samples were analysed by Surescreen in accordance with the protocol set out in Appendix 5 of Biggs *et al*. (2014).	HSI surveys were undertaken alongside the water samples. Water Samples for eDNA analysis were collected on the 28th June 2018.	Oldham at al. (2000) ref 15.19) Biggs et al (2014) (ref 15.5)
Breeding Bird Surveys	A single visit was undertaken once a month during the breeding season from April to June 2018. On each visit the site was walked along each boundary and, where possible through the centre of the site. Each bird seen or heard was identified to species, registered to the parcel of land in which it was recorded and given a BTO Atlas breeding evidence code.	**2018** 26th April 17th May 11th June	Balmer et al. (2013)

Ecological Assessment Methodology

15.12 This assessment has been carried out with reference the CIEEM *Guidelines for Ecological Impact Assessment* (EcIA). This document provides best practice guidance in identifying whether an EcIA is required and where it is required, guidance on determining the value of ecological features and resources including those that have been designated for nature conservation, and the impact magnitude, including description of baseline conditions and cumulative impact assessment.

15.13 The baseline condition of the Site is taken to be the situation as found by The Ecology Partnership during site surveys carried out throughout 2018. Surveys conducted in the wider landscape have been reviewed to help assess the cumulative impact scenarios.

15.14 Future baseline is considered to be the year of completion of the project (anticipated 2030, albeit currently unknown). The assessment considers the 'worst case' development permitted within the parameters being applied for.

15.15 The methodology below defines how the criteria for how the assessment is to be made. This includes identifying the importance of ecological features (the 'receptor') within the Site and around the Site, the significance of the impact in which the assessment addresses the importance of the receptor and the extent, magnitude, duration of the impact on that receptor.

The level importance of a receptor

15.16 The evaluation of ecological features and resources should be based on sound professional judgement whilst also drawing on the latest available industry guidance and research. The

approach taken in this report is based on that described in 'Guidelines for Ecological Impact Assessment in the UK and Ireland' published by the Chartered Institute of Ecology and Environmental Management whereby important ecological features are identified, and these are considered within a defined geographical context using the following frame of reference:

15.17 A receptor is defined as a feature affected by an impact. This receptor may be of negligible nature conservation value, or it may have a value at local, county, national or international level.

(i) International; Features of **International** importance are those protected by international treaties, legislation, agreements and designations. Examples include Ramsar sites, Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Certain species are also protected under international law, such as those listed in the Habitats Directive (1992).
(ii) National / Regional; Features of importance at the **National** level include those with statutory protection, such as National Nature Reserves (NNRs), Sites of Special Scientific Interest (SSSIs) and species with legal protection, such as BAPs/ Red Data Book species.
(iii) County / District; Features that are important at **County or District** level may be protected by local development framework policies. Sites can also have local statutory designations as Local Nature Reserves (LNRs) or local non-statutory designations such as the Sites of Nature Conservation Importance (SNCI)
(iv) Local; Features that are important at a **local** level may be of particular value in the context of the site itself.
(v) Site (not of elevated importance at a local level).

15.18 Features considered to be of importance at the site level only have been scoped out of this assessment (with the exception of protected species which are considered in terms of mitigation and any legislative requirements, for example a bat roost of low conservation significance is likely to be site level only importance, however, a Natural England licence will still be required for works impacting such a roost type). Legally protected species can be important solely because of the need to meet legislation, or because they are also a feature of a County Wildlife Site or target of a local Biodiversity Action Plan. In these cases, the same species could warrant different levels of importance, possibly with different implications for what is reasonable mitigation or compensation, beyond legislative compliance.

Assessment of Impacts and Significance

15.19 The CIEEM publication also sets out a methodology for the assessment of potential effects arising from development.

15.20 The impacts which are set out below are those which arise after taking account of the design mitigation. The impacts on ecology are assessed by (a) determining the level of importance/sensitivity of the receptor, for example national, county, or local; (b) determining the type, magnitude and timescale of the impact; and then (c) using this information on the receptor and impact to determine the significance of the impact: described as major, moderate, or minor significant, or not significant. For example, a moderate or small impact on an internationally important feature is likely to be significant, while a similar impact on a feature of local value is less likely to be significant.

15.21 Based on this context, the nature of the effect is characterised and considered under the following parameters:

(i) Positive or negative – will the activity lead to an adverse, beneficial or neutral effect;
(ii) Extent – the size or amount of an impact, the area of habitat or number of individuals affected;

(iii) Duration – the time for which the impact is expected to last prior to recovery or replacement, i.e. short-term or long-term;

(iv) Reversibility – an effect may be irreversible in that recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it, i.e. permanent or temporary;

(v) Timing and frequency – some changes may only cause an impact if they coincide with critical life-stages or seasons, whilst frequent events may cause a greater effect than a single event.

15.22 Based on the nature of the effect, an assessment is then made whether the effect on a habitat or species is likely to be ecologically 'significant'. CIEEM guidance defines a 'significant effect' as *"an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general", going onto state that "significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)."*

15.23 Specific assessment with regards to potential effects arising on international / European designated sites as a result of the proposed development has been undertaken, in the report entitled "Information for Habitats Regulations Assessment" (IHRA), produced by Ecology Solutions, which accompanies the Application. This assessment has been undertaken in light of the relevant tests under the Habitats Regulations, in order to provide the Competent Authority with all information that they may reasonably require to discharge their duties. This Chapter should therefore be read in conjunction with the IHRA in terms of effects relating to international / European designated sites.

Table 15.2: Matrix for determining impact significance

		Levels of importance of the receptor				
		International	**National**	**County / District**	**Local**	**Site / negligible**
Effect Significance	**Large**	Major	Major	Moderate	Minor	Negligible
	Medium	Major	Moderate	Minor	Minor	Negligible
	Small	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Minor	Minor	Negligible	Negligible	Negligible

Limitations of the assessment

15.24 It should be noted that whilst every effort has been made to provide a comprehensive description of the Site, no single investigation could ensure the complete characterisation and prediction of the natural environment. The site was visited over the period of several site visits, as such seasonal variations cannot be fully observed and potentially only a selection of all species that potentially occur within the site have been recorded. Therefore, the survey provides a general assessment of potential nature conservation value of the Site and does not include a definitive plant species list. However, the survey area was visited on a number of occasions over the optimal period, ensuring that detailed habitat information could be gathered. It is therefore considered that the survey work has allowed a robust assessment of habitats and botanical interest across the Site.

15.25 The specific protected species surveys were undertaken at the appropriate time of year and during suitable weather conditions to an appropriate level of survey effort. Any specific limitations are noted in the relevant sections above or discussed in the results section.

BASELINE CONDITIONS

Desktop Study

15.26 An ecological data search was obtained from Kent and Medway Biological Records Centre (TVERC) in November 2018 by The Ecology Partnership. Records of protected species were identified within a 2km radius of the site (See **Table 15.3**).

15.27 Several additional water bird species are listed within the biological records due to the location close to the coast and SPA, but have not been included in **Table 15.3** as they are considered very unlikely indeed to utilise the Site, given the habitats present and the requirements of the relevant species.

Table 15.3: Notable and Protected Species within 2km in the last ten years

Species	Status	Closest record distance	Most recent record
Common pipistrelle (*Pipistrellus pipistrellus*)	UK BAP species, Annex IV of the Habitats Directive, Priority Species listed under Section 41 of the Natural Environment and Rural Communities Act 2006, Wildlife and Countryside Act 1981 Schedule 5 Section 9; Schedule 2 of Conservation of Habitats and Species Regulations 2017 (European Protected Species animal)	c.2km	2017
Soprano pipistrelle (Pipistrellus pygmaeus)		c.2km	2017
Brown long-eared bat (Plecotus auritus)		c.2km	2015
Noctule (Nyctalus noctula)		c.2km	2017
Nathusius pipistrelle (Pipistrellus nathusii)		700m	2012
Daubenton's bat (Myotis daubentonii)		c.2km	2011
Serotine (Eptesicus serotinus)		c.2km	2015
Leisler's bat (Nyctalus leisleri)		c.2km	2008
Natterer's bat (Myotis nattereri)		c.2km	2009
Slow Worm (Anguis fragilis)	Natural Environment and Rural Communities Act 2006 - Species of Principal Importance in England; Sussex BAP species; Sussex Protected Species Register;	250m north	2012
Common lizard (Zootoca vivipara)		250m north	2012
Adder (Vipera berus)		250m north	2012

Grass snake (Natrix helvetica)	UK BAP priority species; Wildlife and Countryside Act 1981 Schedule 5 Section 9	250m north	2012
Red kite (Milvus milvus)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended) IUCN Amber List	c.1km	2016
Goshawk (Accipiter gentilis)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended)	c.1km	2012
Merlin (Falco columbarius)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended); Birds Directive Annex 1	c.1km	2015
Hobby (Falco subbuteo)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended)	c.1km	2015
Turtle Dove (Streptopelia turtur)	BoCC Red List	c.1km	2016
Skylark (Alauda arvensis)	NERC Act (2006) Section 41; Birds Directive Annex 2.2	c.1km	2016
Redwing (Turdus iliacus)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended); BoCC Red List	c.1km	2016
Barn owl (Tyto alba)	Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended) IUCN Amber List	c.2km	2016
European Water Vole (Arvicola amphibious)	Wildlife and Countryside Act (1981 as amended) Schedule 5; NERC Act (2006) Section 41	1.4km northeast	2012
Great Crested Newt	Wildlife and Countryside Act (1981 as amended) Schedule 5; Bern Convention Appendix	1.2km southwest	2011

2; European Protected Species; Habitats Directive Annex 2 & 4; NERC Act (2006) Section 41

15.28 The Site lies within 250m of an internationally designated site, with a further nine statutory designations within 5km, these are detailed below within **Table 15.4.**

Table 15.4: Statutory Sites within 5km of the Site

Name of site and designation	Description (Taken from site citation where applicable)	Approximate Distance from Site (At nearest point)	Scale of Importance
Medway Estuary and Marshes SPA, SSSI and Ramsar	The estuary has a complex arrangement of tidal channels, which drain around large islands of saltmarsh and peninsulas of grazing marsh. The mud-flats are rich in invertebrates and also support beds of *Enteromorpha* and some Eelgrass *Zostera spp*. Small shell beaches occur, particularly in the outer part of the estuary. The complex and diverse mixes of coastal habitats support important numbers of waterbirds throughout the year.	234m north	International
Queendown Warren SAC, SSSI and LNR	This site contains heath and scrub (10%), dry grassland (70%) and deciduous broad-leaved woodland (20%).	4.2km southeast	International
Purple Hill SSSI	The site includes areas of chalk grassland, scrub and woodland. The grassland is of the upright brome *Bromus erectus*, sheep's fescue *Festuca ovina* type and is extremely herb rich, with one nationally rare plant species occurring.	4.3km south	National
Tower Hill to Cockham Wood SSSI	The site contains woodland representative of that on Tertiary deposits in Kent and supports a rich insect fauna. In addition, Upnor Quarry exposes a complete Tertiary stratigraphic sequence. Much of Cockham Wood consists of neglected coppice, principally ash *Fraxinus excelsior*, with oak *Quercus robur* standards. The shrub layer, is especially varied towards the central part of the wood.	4.5km northwest	National

15.29 The Site lies within a local wildlife site and a number of others are situated within a 2km radius, these are detailed within **Table 15.5** below.

Table 15.5: Non-statutory wildlife sites within 2km

Site name and designation	Description	Approximate distance and direction from site	Scale of importance
Ambley Wood LNR	Ancient woodland	1.9km southwest	County
Darland Banks LNR	Chalk grassland, scrub and woodland.	2.1km southwest	County
Berengrave Chalk Pit LNR	Forms part of the Riverside Country Park. There is a small lake in a disused chalk pit, and other habitats are scrub, woodland and reedbeds.	500m east	County

15.30 There are Habitats of Principle Importance (Section 41 NERC Act 2006) surrounding the Site. These are shown in **Figure 15.1**.

15.31 The Site consists largely of managed commercial orchard habitat, surrounded by treelines and hedgerows with treelines throughout the Site. There are a number of buildings on the Site that have been excluded from the survey area.

15.32 The detail below has been taken directly from the 'Preliminary Ecological Appraisal and Briefing Note' by EPR in June 2017 (**Technical Appendix 15.1**).

Orchards and Grassland

15.33 The main habitats on the Site are orchards with narrow grass strips between rows of apple trees and wider grass verges, which vary in width between approximately 5-10 m around the margins of the Site. These grassed areas are intensively managed, regularly mown with herbicide treatment applied along the edges; plant species present are those that are more tolerant of such management, including Annual Meadow-grass *Poa annua*, Perennial Rye-grass *Lolium perenne*, Cock's-foot *Dactylis glomerata*, Greater Plantain *Plantago major* and White Clover *Trifolium repens*. In a few places along the margins of the Site were planted lavender and thyme to provide a foraging resource for bees within the on-site hives.

15.34 A small area of orchard in the north-east of the Site is less intensively managed with unmown grass strips and brash piles at the ends of the rows presumably for invertebrates. Nearby is an area of less intensively managed grassland where crates are stored, but still of no significant botanical interest. Species included Yorkshire-fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera* and Creeping Buttercup *Ranunculus repens*.

Hedgerow and Trees

15.35 The boundary of the Site is formed primarily from tall (c. 2-4 m high) species-poor hedgerows, locally dominated by English Elm *Ulmus procera* and Poplar cf. *Populus balsamifera* with locally frequent Ash *Fraxinus excelsior* and elder *Sambucus nigra*. Tree lines c. 6-14 m high also form part of the boundary in places as well as within the Site to act as wind breaks/shelter belts; plant species include Grey Alder *Alnus incana* and Leyland Cypress *x Cupressocyparis leylandii*.

15.36 Hedgerows and trees also line both sides of a public footpath that runs across the eastern half of the Site in a more-or-less NW-SE orientation from Pump Lane to Lower Bloors Lane. This footpath becomes more sunken to the east with c. 1m high banks.

Foraging and Commuting Bats

15.37 Bat activity surveys were undertaken seasonally across the Site in 2018, with visits in June, July and September. Transect routes were plotted along areas of suitable bat foraging and commuting habitat and walked by surveyors equipped with full spectrum bat detectors.

15.38 Bat surveys were undertaken on the 4th June, 23rd July and the 4th September 2018. The dusk surveys commenced at sunset and observations were maintained until 2 hours after sunset. Bats usually emerge about twenty minutes after sunset depending on the species, light level, weather conditions and time of year. Peak activity will normally last for about two hours after sunset, during times of peak insect activity.

15.39 The bat surveys indicated a low level of activity across the Site, with the majority situated along the western railway line, central southern public footpath and habitat around the edges of the allotments and woodland to the south.

15.40 Static detectors left on-site for five nights in May, July and September reinforced the findings of the walked transects. The positions of the Anabats were chosen to give a good representation of activity on the edges of the Site and within the centre. These give a good indicator of the overall level of use on site by bat species.

15.41 Activity was dominated (66%) by common pipistrelles on all three Anabat locations with over 600 calls recorded in May. Soprano pipistrelles were also fairly dominant with 100-200 calls recorded each season (over the five recording days). Also present on site are noctules, serotines and Nathusius pipistrelles. These bats were recorded in low numbers across all three locations, making up a total of only 5% of all bat calls recorded on site. These species appear to use the Site to commute across on an infrequent basis. Diversity of bat species using the Site is considered to be low, reflecting the position of the Site adjacent to residential developments and the main landuse of the Site being agricultural (with the likely use of insecticides reduces food sources). Supporting this theory, the central poplar treeline Anabat recorded the least level of activity. This is likely due to the poor foraging opportunities the orchard habitat affords, whilst the native treelines and hedgerows along the western railway line create a 'natural' green corridor providing food for invertebrates and in turn bats.

15.42 Using assessment criteria set out by Wray et al. (2010) (Ref 15.15), the Site qualifies as a receptor of site importance only, owing to the low quality of on-site habitat, lack of food sources and low numbers of bats present.

Badgers

15.43 Various mammal holes were identified in 2017 and 2018 across the Site and these were monitored at various intervals in 2018 through use of motion-triggered cameras.

15.44 All holes across the Site have been periodically checked throughout May – September 2018 during other species specific surveys. Conclusions for each area identified in **Figure 15.2** are detailed below:

(i) Area 1: Rabbit warren with fox activity around.
(ii) Area 2: Used by rabbits. Overgrown.
(iii) Area 3: No holes identified in 2018. Overgrown. Not in use.
(iv) Area 4: Well vegetated, overgrown over the season. Rabbit use only and not in use by September.
(v) Area 5: No holes identified. Overgrown. Not in use.

(vi) Area 6: Overgrown but spoil identified in September 2018.
(vii) Area 7: No animals recorded using the holes in July however rabbits use found in September 2018 with a brief view of a badger in the area. Badger faeces nearby suggests they are present in this area of the site (but the sett may be off-site).
(viii) Area 8: New in September 2018: Rabbit warren with fox activity around.

15.45 Badger evidence was found in September around area 7. Several areas of droppings were identified and footage caught one glimpse of badger legs over a week's filming.

15.46 In September there are large amounts of fallen fruit throughout the Site and much of these appear to be eaten by mammals. This food source will attract badgers to the Site to forage but does not necessarily mean they reside on the Site.

15.47 No holes identified on the Site have been confirmed to be in use by badgers. All holes identified by EPR in 2017 and by The Ecology Partnership in 2018 are considered to be in use by rabbits, foxes or no longer in use by any species.

15.48 The habitat on-site provides good foraging opportunities for badgers with areas of open grassland, woodland and fruiting tree species. Limited evidence of badger activity was recorded and observed in a single location on the Site while undertaking other survey work. The Site is therefore considered a receptor of site level importance for foraging badgers only.

Reptiles

15.49 The grassland edges of the Site were considered to hold some potential for supporting reptiles, along hedgerows and scrub. A terrestrial survey of the Site for reptiles (presence or absence) was carried out between the dates of 24th May and the 21st June 2018. Prior to the commencement of the survey, bitumen felt tiles were left in areas of suitable habitat on 17th May 2018. Surveys were only undertaken in suitable weather conditions.

15.50 A peak count of nine slow worms (good population) was found on the Site, largely within the western fields along the railway line, and two common lizards (low population) were found on the Site. It is considered likely that more reptiles are present on the Site as there is a high disturbance level from dog walkers and workers.

15.51 The Site is not a key reptile site is considered to be of site level importance only.

Great Crested Newts

15.52 There are no ponds on the Site, however OS maps revealed two ponds located within 250m, with an additional three ponds within 500m of the Site. The closest waterbody is within the curtilage of a private residential property and the additional three were located within the Riverside Country Park to the north of the Site. **Figure 15.3** shows the identified waterbodies.

15.53 Ponds 1 and 2 were accessible within the fields towards to the eastern end of the Country Park and permission was granted to survey these on the 28th June 2018. These two ponds were virtually identical in shape, size and vegetation and are 347m north of the edge of the Site. Pond 3 was inaccessible and located on private land so could not be surveyed. The pond was noted to be surrounded by mown grassland and hardstanding. This pond is 70m from the Site boundary. Pond 4 within the grounds arounds around the visitors centre at the Country Park 370m from the Site boundary, with the Lower Rainham Road as a barrier between the development and the pond. Pond 5 is 250m from the Site boundary but could be seen due to 7ft wooden fencing along the footpath. This pond was therefore not able to be surveyed.

15.54 Ponds 1 and 2 were given an HSI score of 'average'. Pond 4 was assessed as 'Below average'. Ponds 3 and 5 were inaccessible to survey.

15.55 Ponds 1 and 2 were surveyed for presence of GCN using eDNA survey methodology. Water samples were taken from water bodies on-site on the 28th June 2018 and analysed by SureScreen Scientifics. All samples returned a negative result for GCN eDNA presence, indicating their likely absence from the water bodies. Pond 4 is considered highly unlikely to contain any GCN due to the isolation from other suitable habitat and ponds, the presence of waterfowl and below average HSI score.

15.56 Pond 3 is the closest to the Site boundary, 70m, and on the southern side of the Lower Rainham Road. This pond is considered to be isolated from other such waterbodies however. The closest waterbody on the same side of the main road is located within Berengrave Local Nature Reserve over 500m east, for which there are no records of GCN presence, only common amphibians. Ponds 1 and 2 are 277m north of pond 4 and were negative for GCN presence. It is therefore considered unlikely that a population of GCN could persist within this waterbody.

15.57 The terrestrial habitat within the redline boundary is dominated by short managed grassland between the rows of apple trees within the orchard. This habitat is not considered to be suitable for GCN due to the lack of structure and cover. The Site is bordered by mature treelines and hedgerows however which could provide dispersal opportunities for amphibians and small mammals around the edge of the Site. These boundaries are understood to be retained within the scheme, therefore there is to be no loss of suitable terrestrial habitat. GCN are therefore not considered further within this impact assessment.

Breeding Birds

15.58 Breeding bird surveys were undertaken between April and June 2018, the surveys identified 26 bird species using the Site, of which 17 were either breeding on-site or included the Site as part of their territory.

15.59 It is noted that none of the species recorded during the survey are qualifying features (species / assemblage) associated with either Medway Estuary and Marshes SPA, Ramsar site or SSSI. This result is expected as most of the qualifying waterbird species do not use orchard habitat and hedges. On this basis, it is considered that there is no functional link between the Site and adjacent sites of statutory interest for their breeding birds. Further assessment in this regard is presented in the IHRA.

15.60 Any impact of the Development through habitat loss is therefore on the populations of the four common, but declining farmland birds that are classified as Section 41 species or of Red List status; house sparrow, dunnock, linnet and starling.

15.61 The Site is considered a receptor of site importance.

Table 15.6: Summary table of faunal groups present on -site and levels of importance

Faunal Group/Species	Description	Level of importance
Bats – foraging and commuting	Bat activity surveys undertaken in 2018 identified low levels of foraging and commuting activity, primarily situated along the railway, public footpath and along the edges of the woodland and allotments in the south-eastern half. These features provide green links across the Site for bats in the local area. The short grassland and orchard were considered of lesser value due to the high levels of management.	Local

	The bats recorded were largely dominated by common species, with common and soprano pipistrelle both well represented. Other species included noctule, Nathusius pipistrelle in very of pass numbers.	
Badgers	Monitoring of various holes in 2018 identified that the majority were in use by rabbits or foxes. A single hole was shown to be of interest to a badger on a single occasion in September only. The Site is considered to be of use to badgers as a foraging habitat only, with the fallen orchard apples providing an attractive late summer food source.	Site
Reptiles	Reptile surveys in 2018 identified a good population of slow worms and low populations of common lizard. This does not meet criteria for a Key Reptile Site. Low numbers were identified within overgrown vegetation along hedgerows and the western railway line.	Site
Birds	Boundary features only were found to be use by a relatively low number of bird species. A low number of BoCC Red List species were found to be using the Site, with no evidence of use of the Site by qualifying species associated with the international / European designated site recorded during the survey.	Site

Future Baseline

15.62 Future baseline conditions are conditions which would be likely to arise if present conditions continue and none of the proposed alternatives are implemented. Future baseline conditions of the Site will be described as the maintenance of the Site as grazed pasture and horse paddocks to the south and east, with a continued absence of management on large areas of the Site.

15.63 The future baselines are considered to be as follows:

(i) Commercial orchard – Regular maintenance and use of orchard through pruning and use of insecticide, no change likely.
(ii) Semi-improved grassland – Regular mowing likely and grazing by rabbits, no change likely.
(iii) Buildings, bare earth and hardstanding – Outside of the development boundary. No significant change likely. Agricultural barns to be in continued use for storage. Hardstanding in continued use as access track and car park area.
(iv) Hedgerows – Boundary features and internal hedges unlikely to be change much overtime. Growth is capped through management.
(v) Treelines within the site – Used as windbreaks therefore likely to be maintained in good condition. No change likely.
(vi) Treelines along the public footpath – Defunct areas within the hedgerows likely to enlarge through use.

15.64 In summary, future baseline conditions of the Site will largely be the same as what is currently present, as the Site is in use as a commercial orchard and the majority of habitats will be highly managed.

IMPACTS

Construction Activities with the Potential for Significant Effects

15.65 Construction within the red line boundary of the Site is considered to involve the following activities:

(i) Removal of semi-improved grassland, orchard habitat and scattered internal short treelines and internal hedgerows.
(ii) Removal of some trees on-site;
(iii) Construction of new buildings, hardstanding and infrastructure;
(iv) Tree and shrub planting and landscaping within the scheme;
(v) SUDS creation; and
(vi) Disturbance - construction lighting and plant / vehicle noise, vibration, movement and general activity.

15.66 Habitats and species which are considered in terms of potential impacts:

(i) Habitats present on the Site, including mature trees, hedgerows, semi improved grassland and the orchard habitat;
(ii) Protected species present on the Site;
(iii) Off-site habitats which are designated and protected either locally or nationally designated.

Construction Effects on Designated Sites / Off Site Habitats

15.67 Detailed consideration with regards to potential effects arising during the construction phase on Medway Estuary and Marshes SPA/SSSI/Ramsar site (in addition to other international / European designated sites) has been undertaken, with full details provided within the IHRA. The following paragraphs summarise the key findings of the assessment insofar as they relate to the construction phase, prior to the adoption of mitigation measures.

15.68 For the reasons outlined in the IHRA, the Site does not offer potential opportunities for qualifying bird species associated with the Medway Estuary and Marshes SPA/SSSI/Ramsar site. On this basis, it does not represent land which could be classed as important 'supporting habitat' for Medway Estuary and Marshes SPA/SSSI/ Ramsar site (or indeed other international / European designated sites in the vicinity).

15.69 Furthermore, the Development will not have any impacts on the Medway Estuary and Marshes SPA/SSSI/ Ramsar site as a result of damage to habitats, lighting or noise during the construction phase, given the significant separation of the Site from the nearest part of the international / European designated site and the existing baseline. It is considered that this conclusion may be reached without any specific or avoidance measures required specifically for the SPA/SSSI/Ramsar site.

15.70 There are no watercourses which flow through or which lie adjacent to the Site which are linked to Medway Estuary and Marshes SPA/SSSI/Ramsar site. As such, there is no potential pathway for an adverse effect to arise to the designated site during the construction phase through hydrological impacts, such as surface run-off, contaminated water or siltation.

15.71 Specific and detailed assessment in relation to air quality effects arising from road traffic to both Medway Estuary and Marshes SPA/SSSI/Ramsar site and other international / European designated sites in the wider area has also been undertaken in the IHRA (including construction and operational phases). In conclusion, the Proposed Development will not result

in adverse effects on the integrity of any such sites, either considered alone or in combination with other plans or projects, as a result of air quality effects.

15.72 Berengrave Nursery is located 500m to the east of the Site. There are no direct linkages between the habitats within the red line boundary and the off-site habitats. Indirect impacts resulting from construction including, lighting, traffic pollution, dust and noise will all be considered as part of the CEMP following best standard and mitigation practises.

Construction Effects on Site Habitats and Ecological Features

15.73 The construction process will involve the clearance of habitats, including the orchard, semi-improved grassland and individual trees in order to facilitate the construction of new access roads and buildings with associated residential gardens, communal greenspace and infrastructure.

Commercial Orchard

15.74 The orchard habitat dominates the Site and covers approximately 40ha. The whole of this habitat is to be lost to the development and will be cut down during the construction phase. All of this habitat is to be lost during construction but overall the quality of the habitat is considered to be of low ecological value and highly managed and therefore will have a permanent **indiscernible impact** to the biodiversity at a local level.

Semi-improved grassland

15.75 The semi-improved grassland at the edges of the Site along hedgerows and between orchard rows across the Site. During construction the majority of this habitat will be lost, with exception to the boundary edges. This is considered to be a large loss of this habitat but at type at site level only. The quality of habitat was low, however without suitable mitigation and replanting across the Site, the loss of grassland will have a **minor negative impact** during the construction.

Hedgerows and scattered trees

15.76 The majority of the boundary hedgerows are to be retained and protected during the construction phase. Some internal hedgerows and trees are to be lost during the construction phase; the quantity of habitat to be lost is considered to be small in relation to the quantity of hedgerows and trees on the Site as a whole. These are considered to be of site level importance only due to their isolation from boundary hedgerows and therefore the impact would be of **indiscernible significance.**

15.77 The impacts are of indiscernible significance either owing to the nature of habitats to be lost in the case of the semi-improved grassland and orchard or due to the small scale of proposed habitat loss in the case of the scattered trees within the Site.

Foraging and commuting bats

15.78 The proposals will result in the retention of the majority of the foraging habitat i.e. the boundary hedgerows, treelines and the trees along the public footpath. The bats have been shown to make limited use of the central orchard habitat, which is to be lost to the proposals. The loss of this habitat type is therefore considered to be a minor loss of foraging habitat and of **minor negative significance**. No significant impacts from habitat fragmentation are considered likely as a result of habitat loss as the boundary features are to be retained. The greatest level of bat activity was recorded along the western hedgerows and along the footpath and allotment edge to the south. No habitat loss is to occur along these boundaries of the Site. There is potential for indirect impacts from noise and lighting pollution during the construction phase, this would result in an impact of **minor significance** at site level, the impact would be temporary and negative.

Reptiles

15.79 The primary impact of the construction phase upon reptiles will result from the loss of habitat adjacent to breeding, foraging and hibernation habitat in addition to direct mortalities from construction activities. The habitat in use by reptile is the boundary hedgerows and adjacent grassland, which is to be largely retained. The two impacts combined may significantly reduce the population of reptiles present on-site. Unmitigated, these impacts without suitable mitigation in place will result in an impact of **minor negative significance** at site level.

Badgers

15.80 The clearance of habitat and subsequent construction of buildings and infrastructure close to mammal holes potentially in use by badgers may results in disturbance from noise and vibration through construction activities. No main sett is present on the Site and none of the mammal holes were confirmed to be in use by badgers as such no impacts are predicted on badger setts. Update surveys are always recommended.

15.81 The Site is used as foraging habitat. The loss of foraging habitat is likely to result in an impact of **minor significance** at site level.

Birds

15.82 Common bird species were largely confined to the Site boundary hedgerows and treelines which are to be largely retained under the proposals. Removal of scattered tree habitat during construction phase has the potential to result in direct mortality of nesting birds. There is also likely to be minor disturbance from noise, vibrations and human presence during the construction phase. These impacts are short term, temporary and negative and considered to be of **minor significance** at site level.

Table 15.7: Summary Table of Construction Phase Impacts

Receptor	Impact/effects	Predicted effects with no mitigation in place				
		Receptor Level[1]	Effect magnitude[2]	Permanence[3]	Positive/ negative [4]	Effect Significance
Medway Estuary and Marshes SPA/SSSI/Ramsar site	Direct damage to habitats supporting internationally important breeding populations of over wintering waders and waterfowl species and disturbance to qualifying bird species – through noise, lighting, hydrological impacts and air quality impacts	I	N	T	N	**Negligible**
Other statutory designated sites (including SSSI)	Other designated sites over 4km from the redline boundary and considered to be sufficient distance that construction impacts are negligible	N	-	-	-	**Negligible**
Nearby Local Wildlife Sites / LNR (Berengrave Chalk Pit)	Increased disturbance to habitats and species – noise, dust, pollution measures	C	M	T	N	**Minor**
Commercial Orchard	Loss of entire orchard (approx. 40ha)	L	M	P	N	**Negligible**
Semi-improved grassland	Loss of semi-improved grassland across the majority of the site	S	M	P	N	**Minor**
Hedgerows and scattered trees	Loss of internal hedgerows and scattered trees	S	S	T	N	**Negligible**
Sustainable Drainage Systems	Creation of new SUDs and ponds on site	S	M	P	P	**Negligible**
Foraging and commuting bats	Loss of foraging habitat and commuting routes – some minor loss of internal trees and hedgerows. Loss of orchard and grassland.	L	S	P	N	**Minor**
	Disturbance of bats – noise and light pollution in suitable habitat for foraging and commuting bats may negatively impact upon bats using these features	L	S	T	N	**Minor**

Reptiles	Loss of suboptimal habitat and disturbance during construction. Direct mortality through clearance works may result in direct killing or injuring of individual reptiles.	S	S	T	N	**Minor**
Badger	Disturbance – construction works cause disturbance from noise, light and vibrations	S	S	T	N	**Negligible (no confirmed setts)**
	Loss of foraging habitat	S	S	P	N	**Minor**
Breeding birds	Loss of nests – Clearance of hedgerows and individual trees may result in loss of nesting habitat	S	S	P	N	**Minor**
	Disturbance – increased human presence, noise, light and dust from construction works may cause minor disturbance to nesting birds,	S	S	T	N	**Minor**

1. S = site, L = local, C = county, N – national & I – international 2. N = negligible, S = small, M = medium, L = large 3.T = temporary, P = permanent 4. P = positive, N = negative

Operational Impacts

15.83 The operational stage will involve the use of the new roads, buildings, residential gardens and communal greenspace and associated infrastructure. There will also be a new school on the Site and residential care home. It is understood that a management company will be employed to manage all open space areas. Each of the areas will have a bespoke management plan. The management plan for the habitats on the Site would be conditioned as part of the permission.

Activities and Proposal with the Potential for Significant Effects

15.84 Operational impacts include the following:

(i) Increased recreational pressure to internationally, nationally and locally designated sites;
(ii) Increase in local pet population and the associated pressure on the on-site species in terms of disturbance and predation.
(iii) Increase in the local human population and potential for direct impacts through damage and degradation to off-site habitats.
(iv) Increase in disturbance from lighting and noise
(v) Potential for air quality impacts to international / European designated sites arising as a result of an increase in road traffic along the strategic road network.

15.85 Operational activities will include the management of existing and newly created habitats and open spaces within the development. It is considered that the management of gardens will not be significant in terms of ecology and biodiversity.

International / European Designated Sites

15.86 The Proposed Development will result in a net increase in population in the local area, in close proximity to a number of international / European designated sites including in particular Medway Estuary and Marshes SPA/SSSI/Ramsar site. As such, in the absence of avoidance or mitigation measures, there is potential for an increase in recreational pressure to arise at these sites, which could result in adverse effects including disturbance of qualifying bird species (e.g. through disturbance from dog walkers) and damage or degradation to the habitats supporting qualifying species. Detailed consideration in this regard is provided within the IHRA.

15.87 The Proposed Development will also result in an increase in road traffic movements, both in the immediate locality of the Site and also to the wider strategic transport network. Specific assessment with regards to potential effects has been undertaken, based on detailed traffic modelling and dispersion modelling work undertaken by DTA and PBA respectively. The findings of the assessment are outlined in the IHRA; however, in conclusion, the Proposed Development will not result in adverse effects on the integrity of any international / European designated sites, either considered alone or in combination with other plans or projects, as a result of air quality effects

15.88 The Proposed Development will lead to an increased water run off and sewage demand. Given that the design of the Development incorporates appropriate measures including the delivery of a SuDS system (proposed irrespective of the international / European designated site), the risk of potential adverse effects (via hydrological pathways) occurring as a result are considered to be de minimis in nature. In terms of foul water drainage the Proposed Development will connect to the existing public sewer network, considered to be treated at Motney Hill Waste Water Treatment Works (WWTW) which is understood to have capacity. On this basis, it may be concluded that the Development would not be likely to have a significant effect on the European / international designated sites via hydrological impacts, either considered alone or in combination with other plans or projects.

Other Sites of Special Scientific Interest and Local Nature Reserves

15.89 Berengrave Chalk Pit LNR is located 500m to the east of the Site. Berengrave Chalk Pit LNR has developed since the cessation of the cement works in the 1930s. Woodland on the site is a few decades old. The site supports public footpaths around the site and around the pond, located in the centre of the pit. It is considered likely that this site would be impacted by local increase in recreational pressure. This is likely to result in increased disturbance to wildlife, trampling of vegetation and littering and as such the impact is considered to be minor.

15.90 All other LNR and SSSIs are over 2km from the Site. These sites will likely experience and increase in recreational pressure as a result of the Development, where public access is possible. This is likely to result in increased disturbance to wildlife, trampling of vegetation and littering. The level of impact is considered to be minor.

Other Local Wildlife Sites

15.91 The Site lies within 2km of a number of Local Wildlife Sites, some of which feature public access. The increase in the local population from the Proposed Development is likely to result in increased disturbance to these sites through trampling of vegetation, disturbance of wildlife and littering. The level of impact is considered to be minor.

Off-site woodland

15.92 The Bloors Lane Community Woodland lies adjacent to the Site in the southeast corner. The Proposed Development will result in an indirect minor impact upon this habitat through increased recreational pressure as a result of the increased local population and open public access. There is also potential for **minor** impacts from lighting in proximity to the woodland habitat.

Habitats and fauna on-site

15.93 The retained or re-landscaped open habitats on-site may suffer some minor negative impacts from recreational pressure. Some general recreational pressures to habitats can include the following:

(i) Increased use of the public footpath and trampling of the edge vegetation, leading to degradation of the hedgerows and treelines along this feature;
(ii) Increased cat predation of wildlife as a result of local population increases;
(iii) Nutrient enrichment from dog waste can result in changes in plant communities, favouring plants associated with higher nutrient levels such as stinging nettles;
(iv) Increased fly tipping and littering, can also increase spread of non-native species from garden waste disposal.

Foraging and commuting bats

15.94 Bats can be adversely impacted by artificial lighting of suitable habitat, this can result in disruption of commuting routes as well as loss of foraging habitat. The proposals include construction in proximity to boundary treelines and hedgerows, which are used by foraging bats. Artificial lighting within these areas therefore has potential to have a moderate impact upon commuting and foraging bats on-site.

Reptiles

15.95 Reptiles may suffer from increased cat predation as a result of increased local cat population from the Proposed Development. These impacts are not considered significant beyond site level, however. The impact at site level is considered to be moderate.

Badgers

15.96 The increase in traffic may result in in increased badger mortalities from road traffic accidents. There will also be the loss of foraging habitat and fragmentation of the foraging habitat. The badgers are not considered to use the Site for breeding or year-round foraging so the impacts are not considered significant.

Breeding birds

15.97 Breeding birds may suffer from increased cat predation as a result of increased local cat population from the Proposed Development. Other operational impacts include disturbance from noise and human presence. The significance of these impacts will vary across the species, farmland specialists may be more vulnerable to these impacts whereas urban adaptor species may be largely unaffected or even stand to benefit in some ways. The site-level impacts will largely be negative although not at a level considered significant above site level.

Table 15.8: Summary Table of Operational Phase Impacts

Receptor	Impact/effects	Predicted effects with no mitigation in place				Effect Significance
		Receptor Level[1]	Effect magnitude[2]	Permanence[3]	Positive/ negative[4]	
International / European Designated Sites	Increased recreational pressure – increased disturbance to habitats supporting internationally important breeding populations of over wintering waders and waterfowl species. Increase in local population likely to cause trampling, disturbance/predation of wildlife by cats and dogs, enrichment of habitats from dog fouling, increased likelihood of littering. Impacts resulting from changes in air quality and hydrology (resulting from an operational development). See accompanying IHRA report (Ecology Solutions 2019)	I	L	P	N	**Major**
Other statutory designated sites (LNR and SSSI) (Berengrave Chalk Pit LNR)	Increase in local population likely to cause trampling, disturbance/predation of wildlife by dogs, enrichment of habitats from dog fouling, increased likelihood of littering.	N	S	P	N	**Minor**
Nearby Local Wildlife Sites	Increase in local population likely to cause trampling, disturbance/predation of wildlife by dogs, enrichment of habitats from dog fouling, increased likelihood of littering.	C	S	P	N	**Minor**
Orchard	Change in management from commercial to community orchard will change integrity of the retained/replanted habitat. Recreational pressure.	L	S	P	N	**Minor**
Semi-improved grassland	Increased recreational pressure – Increase in local population likely to cause trampling, disturbance/predation of wildlife by cats and dogs, enrichment of habitats from dog fouling, increased likelihood of littering.	S	S	P	N	**Negligible**
Hedgerows and scattered trees	Degradation of boundary habitats that form back gardens through lack of appropriate management.	S	S	P	N	**Negligible**

SUDs and Ponds	Creation during the construction phase. Degradation during the operational phase through littering and poor management.	S	S	P	N	**Negligible**
Foraging and commuting bats	Disturbance of bats – Light pollution from operational street lighting and other sources from operational phase may impact upon foraging and commuting habitat for bats.	S	S	P	N	**Minor**
Reptiles	Degradation of habitat and receptor areas through lack of appropriate management. Increase site use through increase of recreational pressure.	S	S	P	N	**Minor**
	Cat predation – increase in local cat population likely to occur as a result of development. May result in increased mortality of reptiles	S	S	P	N	**Minor**
Badger	Mortalities from road traffic accidents due to increased traffic during operational phase within proximity to badger habitat.	S/L	L	P	N	**Minor**
	Loss of foraging habitat	S/L	M	P	N	**Minor**
Breeding birds	Loss of nests – Clearance of internal hedgerows and individual trees may result in loss of nesting habitat through inappropriate management	S	S	P	N	**Negligible**
	Cat predation – increase in local cat population may result in increased mortality of birds.	L	S	P	N	**Minor**

MITIGATION

General Construction Mitigation

15.98 In order to minimise effects of construction, standard mitigation measures will be put in place during the construction phase. These measures could be included within a CEMP at the detailed stage, and will include:

(i) Erection of tree protection fencing around retained trees and boundary features in accordance with BS5837:2012;
(ii) Hedge and tree clearance to be undertaken outside nesting bird season, or checked by a suitably qualified person prior to removal;
(iii) Damping down of dust sources and covering of loose materials to reduce dust deposition within adjacent habitats;
(iv) Sensitive lighting scheme in the vicinity of retained habitats and along the edges of the Site to be kept to a minimum, with use of directional lighting or screening as required to reduce light spill;
(v) Monitoring of mammal holes to continue, if necessary, badger sett closure to be performed under NE License;
(vi) Use of best practice guidance for construction work in areas where badgers are active;
(vii) Supervised clearance of habitats suitable for reptiles;
(viii) New wildlife planting including; new woodland planting, new buffer planting and green corridor planting and enhancements;
(ix) Creation of 'dark corridors' and 'green corridors' within the Site with native planting;
(x) Storage of chemicals and hazardous materials in line with best practice guidelines;
(xi) Use of interceptors, bunds and spill kits following best construction methods to void impacts to hydrology;
(xii) General housekeeping rules, including litter removal, maintenance of fence lines etc.

Species-specific Construction Mitigation

Foraging and commuting bats

15.99 The construction phase will result in the loss of areas of poor habitat for bats, at the construction phase this is likely to result in a low residual impact, this will be later mitigated for within the operational phase of the Development where on-going management of the retained habitats and newly created habitats/replacement planting will result in a long-term benefit to bats. This includes the creation of habitats of value to bats such as SUDS and new hedgerows as well as management of retained treelines.

15.100 Disturbance to bats through the construction phase will be limited through working only during daylight hours, this will reduce the impact of light and noise pollution from construction machinery on foraging and commuting bats.

15.101 Mitigation for bats is included within the design of the Site. This includes retaining and protecting features for bats to use as for commuting and foraging and, where possible, the enhancement of these habitats. The treelines will be subject to management to increase its suitability for foraging and commuting bats, the creation of a SUDS pond will also be of value to foraging bats, encouraging a range of invertebrate prey species. Additional planting including planting that will benefit bats will be included within the open space to the north. Linear corridors, green links, use of swales will all provide suitable ecological networks for bats within the Site. A community orchard area, created for wildlife interest, will also be considered an enhancement for bat species on the Site. Enhancements within the Site will include planting of native species and the use of bat boxes on retained trees and within buildings.

15.102 A sensitive lighting scheme will also be employed for this scheme post development for the operational stage. This will be installed at the construction stage. This will shield features of importance for bats such as retained bat potential trees and commuting and foraging features such as woodland edges and tree lines as well as any newly created habitats.

Reptiles

15.103 Reptiles have been found along the western edge of the Site, along the railway line and along the internal hedgerows along the roadside of Pump Lane. The hedgerows are to be retained within the scheme, however the clearance of grassland habitats has potential to result in direct killing or injuring of reptiles.

15.104 Dependent on the extent of habitats lost and retained, reptiles can be translocated from areas subject to disturbance or maintained in situ. Habitat maintained, created and provided as part of the mitigation scheme is considered to be suitable and sufficient in size to ensure the long term survival of the species of reptile on the Site.

15.105 The hedgerows and edges of the Site are to be enhanced with native planting schemes and the grassland should be allowed to grow up along the bases of the hedgerows. Hedgerows and retained habitat should be fenced off to protect these areas of habitat.

15.106 The western edge of the site along the railway line is to be enhanced a green connective corridor along the edge of the Site. The grassland within the orchard is largely considered to be suboptimal due grazing by rabbits. The creation of new open space, internal hedgerows within the scheme and garden habitats, will see a net gain in optimal reptile habitat.

Badgers

15.107 Badgers are a mobile species that can establish new setts or expand existing ones in a short period of time. At the time of writing, no setts were confirmed in use by badgers on the Site, and the Site is only considered to be used as a foraging ground.

15.108 An update badger survey is therefore to be undertaken prior to works commencing to determine whether additional badger activity has occurred in the intervening period. Should any additional mammal holes be identified during this survey then a monitoring period may be required to determine the status and nature of the hole. In the event the hole is a badger sett, this monitoring can be used in support of a Natural England closure license. Should any additional setts be identified within close proximity to the development footprint then the surrounding area around the sett/s will be fenced off, encouraging badgers to avoid the construction site and instead forage within retained treelines and off-site gardens and woodland.

15.109 The following best practice guidance for working in proximity to badger setts should be adopted.

(i) Any trenches or excavations on the Site should be either covered over at night or a plank of wood placed in so as to allow any mammals to escape if the badgers were to accidentally fall in.

(ii) Any open pipes or conduits laid should be blocked off each night to prevent badgers from entering them.

(iii) Construction work should only take place between dawn and dusk with no late evening work. This will reduce possible disturbance to badgers as they emerge to forage and also reduce the risk of traffic casualties from late working site traffic.

(iv) All site workers will be informed of the known badger sett. Site workers must be informed that, by law, they must not:

- Interfere with setts;

- Dump equipment or litter in badger holes;
- Have fires next to badger holes;
- Damage or destroy the setts.

Birds

15.110 The UK breeding season for most bird species takes place between March and September. Any works affecting the suitable bird habitat on the Site are to be carried out outside of this period. If this is not possible, areas of suitable vegetation and ground will be checked for active nests no more than 48 hours prior to clearance. Should active nests be discovered, any works in the vicinity of the nest must cease until the birds have fledged the nest.

15.111 Treelines and hedgerows which are to be maintained within the Development will protected by fence lines to ensure that these features are adequately protected. Dust screens will be erected along the treelines of the public footpath to protect birds that may be nesting within. Furthermore, heras fencing will be in place around the development footprint to prevent site operatives from encroaching into adjacent retained habitats resulting in disturbance.

15.112 Bird boxes are to be hung on suitable retained trees to increase the number of breeding opportunities throughout the Site. Bird boxes can also be integral into the buildings within the Site. New habitat planting across the Site will also provide new opportunities for bird species. Birds were largely restricted to the edges of the Site currently, with the new development extensive garden habitats will be created providing new opportunities for a range of more common garden bird species.

Operational Mitigation

15.113 It is considered that there are potential disturbance effects to qualifying bird species arising from an increase in informal recreation at Medway Estuary and Marshes SPA/SSSI/Ramsar site (and other coastal sites).

15.114 To address these effects, a package of avoidance and mitigation measures are proposed. This comprises three key elements: firstly, provision of an appropriate financial contribution towards management and monitoring at the SPA/SSSI/Ramsar sites, in accordance with the North Kent Coast SAMM; secondly, the provision of enhancements to on-site public open space to maximise opportunities for informal recreation including dog walking; and thirdly engagement with Medway Council to provide further contributions towards off-site recreational opportunities in the local area. Discussions in this regard are still ongoing with English Nature. This is discussed in detail in the accompanying IHRA (Ecology Solutions 2019).

15.115 In terms of air quality and hydrology, impacts are discussed in the accompanying IHRA. Impacts regarding the European and internationally designated sites are considered to be negligible.

15.116 Other local and off site habitats, such as Berengrave Chalk Pit and Bloor Community Woodland, are likely to experience some disturbance from an increase in recreational pressure. It is likely that a financial contribution to support the long term conservation objectives of these features would be sought through any S106 Agreement.

15.117 The Proposed Development includes a village green and areas of enhanced habitat and creation of SUDs. A long-term management plan for open spaces and on-site habitats will be developed which will prescribe the management requirements for each habitat area for a period of 5 - 10 years. After the initial 5 years a review of the management plan will be implemented and adjustments made where necessary.

15.118 The design of the Development has incorporated significant mitigation measures to reduce any potential impacts on protected species and habitats.

15.119 Maintaining dark corridors along existing Site boundaries will reduce the impact the new Development has on foraging and commuting routes for bats. The enhancement of these corridors will also increase the invertebrate diversity and prey sources present in these areas.

15.120 Existing hedgerows on the Site will be retained and enhanced with layered planting, filling in gaps and creating varied structure. The bases of these hedgerows will contain shrubs and taller grassland tussocks, creating habitat for small mammals and reptiles. Additional tree planting will occur throughout the Site, in gardens, along streets and within the community open spaces and school grounds. Tree and hedgerow planting will provide nesting habitat for birds and foraging habitat for bats.

15.121 Creation of ponds and SUDs on the Site will provide habitat for a range of wildlife species including amphibians, reptiles, small mammals, birds and bats. Native aquatic species will be allowed to establish with strict management of invasive species. The ponds will be fenced off to limit public interaction and litter should be removed regularly.

15.122 The creation of enhanced habitats, with native species planting, the establishment of wildlife boxes, the creation and maintenance of connectivity around the Site, will provide optimal conditions for a range of species present on the Site and in the local area. Thus, the new planting will enhance the local carrying capacity for these species.

RESIDUAL IMPACTS

15.123 Residual impacts are finally considered taking the development, construction and operational impacts, alongside mitigation measures. The outcome of the layout of the Site and the mitigation measures employed throughout the construction and operational stages of the Development aim to remove, where possible, any residual impacts.

15.124 The mitigation measures in place should effectively negate the most significant predicted negative impacts on the Site.

Table 15.9: Residual Effects Operation

Receptor Receptor Importance	Significance before mitigation	Mitigation	Residual Impacts
Medway Estuary and Marshes SPA/SSSI/Ramsar site	Major negative	SAMMS provision, on site mitigation and off site provision. See accompanying IHRA report.	Negligible
Other statutory designated sites (LNR and SSSI)	Minor negative	Provision of off-site financial contributions Creation of on-Site open space. Educational leaflets to new home owners detailing impacts of recreational pressure on designated sites.	Indiscernible
Nearby Local Wildlife Sites	Minor negative	Provision of off-site financial contributions Creation of on-Site open space. Educational leaflets to new home owners detailing impacts	Indiscernible

		of recreational pressure on designated sites.	
Orchard	Minor negative	Management plan for the retained/replanted orchard. Less use of pesticides to encourage more invertebrate and bird life. Restrict usage and entrance through fencing. Higher quality habitat than the commercial orchard.	Minor positive
Semi-improved grassland	Negligible	Enhancement of retained grassland habitat to diversify sward. More sensitive management scheme, with annual cut late summer following flowering species.	Minor positive
Hedgerows and scattered trees	Negligible	Fencing off of area to prevent public access. Management plan for hedgerows. Enhancement planting, infilling, additional tree planting across the Site.	Minor positive
SUDs and Ponds	Negligible	Appropriate management of plant species. Fenced off with litter removal.	Minor positive
Foraging and commuting bats	Minor negative	Implementation of sensitive lighting scheme as detailed within bat activity survey. Creation of dark corridors along suitable habitat features such as woodland edge.	Indiscernible
Reptiles	Minor negative	On-going management during operational phase of receptor areas to create structurally diverse grassland habitat. Management of habitat features for reptiles such as log and brash piles and hibernacula and to ensure plenty of cover available for reptiles to reduce predation risk.	Indiscernible
Badger	Minor negative	Replacement orchard planting for foraging to occur on a small scale.	Indiscernible

		Creation of green corridors and open space within development site	
Breeding birds	Minor negative	Installation of nest boxes across the Site to increase nesting opportunities. Additional tree and hedgerow planting. Installation of cat resistant nest boxes such as Schwegler 2GR Nest Box. Boundary habitat to be enhanced for birds.	Minor positive

CUMULATIVE IMPACTS

15.125 A number of planning applications have been made within the local area and should be considered in combination with the application at Pump Farm (which is the largest proposed development in the area).

15.126 The most significant cumulative impact is predicted to be the indirect recreation pressure increase on the Medway Estuary and Marshes SPA/SSSI/Ramsar site. SAMMS is used to negate this pressure and help conserve the designated site and its wildlife. Local large-scale developments can be found below:

(i) MC/18/1796 – outline planning application for 202 residential dwellings, open space, landscaping, 455 car parking spaces. Ecology Solutions provided an Ecological Assessment in 2014 and an update in 2018. This found populations of common reptiles and skylarks on site.
(ii) MC/18/2827 – screening opinion for a residential/mixed use scheme of up to 975 dwellings, open space and infrastructure. Entran conducted and EIA scoping report and an EIA is considered necessary.
(iii) MC/17/1820 – 90 dwellings, several conditions and reserved matters under consideration.
(iv) MC/16/2051 – 300 new dwellings, open amenity space, infrastructure works. Several conditions currently being discharged.
(v) MC/11/2756 – 950 residential units, student accommodation, hotels, leisure and events facilities, petrol station and retail use.
(vi) MC/14/3631 - demolition of existing buildings and structures and redevelopment for a mixed development of up to 253 apartments and houses and up to 339 sq.m of Class A1 floorspace
(vii) MC/17/3687 – 121 dwellings, permission granted. Mitigation for the impact on the SPA secured through Section 106 agreement and SAMMS.
(viii) MC/18/1307 – 27 3-bedroom dwellings with access works and landscaping.
(ix) MC/18/3160 – 64 dwellings – SAMMS proposed

15.127 The consented developments are all required, as a result of the planning process, to minimise effects on ecology through mitigation measures. The granting of planning permission for these sites must have been a result of assessing potential impacts on the surrounding habitats, including designated sites, as required by law and policy. This includes assessing the impacts alone and in combination with other projects and plans within the local landscape.

15.128 The majority of individual housing developments listed above have already been granted planning permission and it is therefore anticipated that impacts on ecology and local designated sites have been considered and deemed not significant.

SUMMARY

15.129 The Site lies within the 5km buffer zone of the Medway Estuary and Marshes SPA/SSSI/Ramsar site. The Site lies within 2km of a number of other statutory LNRs and SSSIs and LWs.

15.130 The separate IHRA considers all of the potential significant effects that could arise from the Proposed Development in respect to European and internationally designated sites. Through avoidance and mitigation measures, Ecology Solutions conclude that the Development would not result in any adverse effects on the integrity on any European/international designated sites (in view of their conservation objectives), when the Development is considered alone or in combination with other plans or projects.

15.131 Similar recreational impacts are also predicted on off-site habitats, such the local wildlife sites and nature reserves, including Berengrave Chalk Pit. Off-site financial contributions to their management are considered a suitable method of compensation. This would usually be agreed through a s106.

15.132 On-site open space is proposed, along with footpaths around the Site for use by the public to help reduce the impact on other designated sites. It is expected that long term management plans will be sufficient in ensuring the maintenance of the suitability and functionality of these open spaces.

15.133 The Site is currently dominated by commercial orchard, semi-improved grassland and hedgerows with scattered trees. The habitats were considered to be of low-ecological value and species-poor whilst under the high-level management of the commercial operation. The loss of these habitats is therefore not considered to be significant in terms of ecology.

15.134 The Proposed Development will result in loss of the entire commercial orchard on the Site, along with large areas of the semi-improved grassland and some internal hedgerows and scattered trees. The loss of the habitats on-site is not considered to result in impacts above site level and is considered to be of negligible significance.

15.135 The Proposed Development will see a small area of community orchard replanted, along with areas of grassland, SUDs, ponds and internal hedgerows and street trees created within it. This will see significant improvements in the biodiversity value of the Site, through a varied planting structure, increased species diversity and different management scheme. The Proposed Development must include green corridors around and through the Site (linked to street tree planting, swales and ponds) and ensure 'dark' corridors are developed as part of the scheme. Overall there is considered to be a positive residual impact as a result of the Development.

15.136 The Site has been subjected to numerous protected species surveys including bats, badgers, reptiles, breeding birds and great crested newts.

15.137 The Site contains a reptile population of site level importance, with the suitable habitat on the Site being predominantly at the edges, along the bases of the hedgerows adjacent to the railway line. Impacts of minor significance are identified to the reptile population on the Site, which are to be mitigated through translocation and habitat removal in stages, and retention of suitable habitat along the edges. No significant residual impacts are considered likely to reptiles as a result.

15.138 The Site is in use by badgers as foraging habitat. The mammal holes on the Site are not currently considered to host a sett, however monitoring will be on-going. The loss of the

foraging habitat is considered to be indiscernible as the badgers only use it at certain times of year.

15.139 A number of bird species are situated within the Site boundary, including some birds of conservation concern. Birds are only found within the Site boundary hedgerows and scattered trees due to the commercial nature of the orchards. These habitats are largely to be retained supplemented by additional planting. Timing of works, post development planting and habitat management and provision of new nest boxes will result in a positive impact.

15.140 Low numbers of bats have been found to use the Site boundaries and treeline along the footpath. The proposals have potential to result in negative impacts to foraging and commuting bats on-site, mainly as a result of loss of small areas of habitat and through indirect light pollution. These impacts will be mitigated by new habitat creation and the implementation of a sensitive lighting scheme. No residual impacts are predicted to foraging and commuting bats as a result.

15.141 Some minor operational impacts are likely as a result of the increased local population and provision of public access to the retained habitats on-site. It is considered these would largely be off-set by the implementation of habitat management on the Site and provision of educational leaflets to new home owners.

Table 15.10: Summary Table

Description of Likely Significant Effects	Significance	Effects					Description of Mitigation	Description of Residual Effects	Significance	Residual Effects				
		B/A	P/T	D/I	ST/M/ LT	L/R/N				B/A	P/T	D/I	ST/M/LT	L/R/N
Demolition and Construction Phase														
Medway Estuary and Marshes SPA/SSSI/Ramsar	Negligible	A	T	I	M	N	See separate CEMP and section 15.115-117	See separate CEMP	Negligible	A	T	I	M	N
Other statutory sites	Minor adverse	A	T	I	ST	R	See separate CEMP and section 15.115-117	See separate CEMP	Negligible	A	T	I	M	R
Nearby LWS and LNR	Minor adverse	A	T	I	ST	L	See separate CEMP and section 15.115-117	See separate CEMP	Negligible	A	T	I	M	L
Commercial Orchard (as an ecological habitat there is no value)	Negligible	A	P	D	LT	L	Replanting smaller area of orchard of better-quality habitat.	Permanent net loss of this habitat	Negligible	A	P	D	LT	L
Semi-improved grassland	Minor adverse	A	P	D	ST	L	Replacement of grassland areas sown with species-rich seed mix	Permanent net loss of this habitat	Minor adverse	A	P	D	LT	L
Hedgerows and scattered trees	Negligible	A	T	D	ST	L	Replacement and additional tree planting across the site	Enhancement planting and infilling with additional tree planting across the site	Negligible	A	T	D	LT	L

Sustainable Drainage Systems	Nil	B	P	D	LT	L	New SUDs and ponds to be created and managed within the site.	Permanent new features under management plan.	Negligible	B	P	D	LT	L
Foraging and commuting bats	Minor adverse	A	P	D	LT	L	See 15.101-104	None	Negligible	A	T	D	ST	L
Reptiles	Minor adverse	A	T	D	ST	L	See 15.115-118	None	Negligible	A	T	D	ST	L
Badgers	Minor adverse	A	T	D	ST	L	See Technical Appendix 15.3	None	Negligible	A	T	D	ST	L
Breeding Birds	Minor adverse	A	T	D	ST	L	See Technical Appendix 15.4	None	Negligible	A	T	D	ST	L
Operational Phase														
Medway Estuary and Marshes SPA/SSSI/Ramsar	Major adverse - Significant	A	P	I	LT	N	SAMMS, on site recreation and off site provision See 15.116	Recreational Pressure	Negligible	A	P	I	LT	N
Other statutory sites	Minor adverse	A	P	I	LT	R	See 15.116	Recreational Pressure	Indiscernible	A	P	I	LT	R
Nearby LWS and LNR	Minor adverse	A	P	I	LT	L	See 15.118	Recreational Pressure	Indiscernible	A	P	I	LT	L
Orchard (non commercial)	Minor adverse	A	P	D	LT	L	Replanting smaller area of orchard of better-quality habitat.	Creation of new non commercial orchard of higher ecological value	Minor beneficial	B	P	D	LT	L
Semi-improved grassland	Negligible	A	P	D	LT	L	Replacement of grassland areas sown with species-rich seed mix	Net loss of this habitat	Minor beneficial	B	P	D	LT	L

Hedgerows and scattered trees	Negligible	A	P	D	LT	L	See 15.122 Replacement and additional tree planting across the site.	Enhancement tree and hedgerow planting	Minor beneficial	B	P	D	LT	L
Sustainable Drainage Systems and Ponds	Negligible	A	P	D	LT	L	See 15.119 New SUDs and ponds to be created and managed within the site.	Permanent new features under management plan.	Minor beneficial	B	P	D	LT	L
Foraging and commuting bats	Minor adverse	A	P	D	LT	L	See 15.119 -122 See Technical Appendix 15.2	None Better quality foraging habitat. Dark corridors.	Indiscernible	B	P	D	LT	L
Reptiles	Minor adverse	A	P	I	LT	L	See Technical Appendix 15.5	None Better grassland habitats in receptor area.	Indiscernible	B	P	D	LT	L
Badgers	Minor adverse	A	P	D	LT	L	See Technical Appendix 15.3	Net loss of foraging habitat.	Indiscernible	A	P	D	LT	L
Breeding Birds	Minor adverse	A	P	I	LT	L	See Technical Appendix 15.4	Increase in nesting habitat.	Minor beneficial	B	P	D	LT	L

(Beneficial or Adverse) (B/A), (Permanent or Temporary) (P/T), (Direct or Indirect) (D/I), (Short Term, Medium, Long Term) (ST, M, LT), (Local, Regional, National) (L, R, N)

16 CUMULATIVE EFFECTS

16.1 This chapter assesses the cumulative effects of the scheme arising from the construction and operation of the Proposed Development. Cumulative effects result from the combined impacts of multiple developments as well as multiple in-scheme impacts, for example, combined landscape and ecology impacts on the same sensitive receptor. The impacts from a single development or a single environmental impact may not be significant on their own but when combined with other developments or impacts these effects could become significant.

16.2 There are several definitions of cumulative effects depending on the context in which the term is applied. However, generally, cumulative effects can be defined as 'impacts that result from the incremental changes caused by other past, present and reasonably foreseeable future actions together with the project' (Hyder 1999, Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions) (ref 16.1).

16.3 The guidelines also define impact interactions as "The reactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area."

16.4 Cumulative Effects Assessment (CEA) is a systematic procedure for identifying and evaluating the significance of effects from multiple activities and developments. The purpose of CEA at project level is to consider the incremental contribution of any impacts arising from the activities associated with the development of the proposed scheme which is the focus of the ES, together with impacts from any other significant activities that may be taking place in the vicinity.

STUDY AREA AND BASELINE CONDITIONS

16.5 The study area, and thus receptors, for the assessment of cumulative effects has been informed by the study areas of the specialist environmental assessments – primarily the transport assessment as this had the largest study area, and hence the largest zone of influence of the scheme.

16.6 Baseline conditions are described in the relevant specialist environmental chapters of this ES. Paragraph 2.32 and **Table 2.6** of this ES identify the committed developments which were considered as part of the cumulative effects assessment. Table 2.6 is included in this chapter as **Table 16.1** below for ease of reference. These have been identified by the Consultant Team. No further advice or site suggestions have been forth coming from MC in this regard.

Table 16.1: Cumulative Development Sites

Site Name	Description of Development	Status
Land at Station Road, Rainham	Development of 90 dwellings	Permitted
Land North of Moor Street, Rainham	Development of 190 dwellings	Refused, but identified on the MC housing supply in the SHLAA
Land at Otterham, Quay Lane, Rainham	Development of 300 Dwellings	Permitted
Berengrave Nursery, Rainham	Development of 121 dwellings	Permitted
Land south of Lower Rainham Road, Rainham	Development of 202 dwellings	Undetermined, but also within MC housing supply in SHLAA

METHODOLOGY

16.7 The EIA Regulations require an environmental assessment to identify the potential for, and where present, assess the cumulative effects of a project. Cumulative effects can also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the scheme. 'Reasonably foreseeable' is interpreted to include other projects that are 'committed'. These should include (but not necessarily be limited to) development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken, but the projects have not been constructed.

16.8 Cumulative effects are the result of multiple actions on receptors or resources. There are principally two types of cumulative effect:

(i) Type 1 – Where different environmental topic impacts are acting on one receptor, as a result of the scheme; and

(ii) Type 2 – Where environmental impacts are acting on one receptor, but are the result of multiple projects in combination (including the scheme being assessed).

16.9 The methodologies for determining the potential effects of the proposed scheme are detailed in the specialist chapters of this report. The cumulative impacts assessment has focused on effects that were significant, therefore only receptors experiencing moderate or major effects were included in the assessment.

16.10 When considering type 2 cumulative effects, the receptors experiencing effects of moderate or major significance were assessed to understand how they would be affected by other proposed development projects. A two stage approach initially considered whether the receptors affected by the proposed scheme would be affected by other development projects. Following this, the second stage identified the significance of the cumulative impacts.

16.11 The significance of cumulative effects has been determined using the criteria shown in **Table 16.2** below, which is taken from DMRB Volume 11, Section 2, Part 5 (ref 16.2).

Table 16.2 Determining Significance of Cumulative Effect

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issues.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

DESIGN AND MITIGATION

16.12 Mitigation measures are proposed in the individual specialist environmental chapters of this report and no further mitigation measures have been proposed for the cumulative impacts.

MAGNITUDE AND IDENTIFICATION OF IMPACTS

Type 1 Cumulative Impacts

16.13 The specialist topic chapters (chapters 7-15) have identified major/moderate significant impacts of the Proposed Development. These are summarised in **Table 16.3** below.

Table 16.3: Major/Moderate Impacts of The Proposed Development

TOPIC CHAPTER	RECEPTOR	CONSTRUCTION		OPERATION	
		PRIOR TO MITIGATION	RESIDUAL	PRIOR TO MITIGATION (embedded in Landscape/Visual Context)	RESIDUAL (15 years growth in landscape context)
Society, Population, Economy	Provision of housing/housing supply			Moderate Beneficial	Moderate Beneficial
Archaeology & Cultural Heritage	Buried Archaeology	Major Adverse	Moderate adverse		
	Lower Rainham Conservation Area	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
Landscape Receptors	Lower Rainham and Lower Twydall Fruit Belt LLCA	Moderate/Major Adverse	-	Moderate Adverse	Moderate Adverse
	Site Area and Site Features	Major Adverse (localised)	-	Major Adverse (localised)	Moderate Adverse
Visual Receptors	Users of South of Motney Hill	Moderate Adverse	-		
	Users of Horrid Hill Users of Lower Bloors Lane	Moderate Adverse Moderate Adverse	-	Moderate Adverse	
	Users of Lower Twydall Lane	Moderate Adverse			
	Users of Bridleway GB6a	Moderate Adverse			Moderate Beneficial
	Users of Pump Lane	Major Adverse (localised)		Moderate Adverse	

	Residents of properties in Twydall south of the Railway	Moderate/Major Adverse (localised)		Moderate Adverse	
	Residents of properties on Pump Lane	Major Adverse (localised)		Moderate/Major Adverse (localised)	Moderate Adverse
	Residents of properties of Lower Rainham adjacent to and overlooking the site	Moderate Adverse			
Ecology & Conservation	RAMSAR – from recreational pressure			Major Adverse	Negligible
Agricultural Land	BMV land	Major Adverse	Major Adverse		
	Horticultural Business	Major Adverse	Moderate Adverse		

16.14 Potential inter-related effects arise between

(i) Agricultural land, landscape and heritage during construction – in the context of the loss of the existing horticultural landuse which in turn affects the existing very localised landscape character of the Site and the setting of Lower Rainham Conservation Area. These cumulative effects are assessed as being of **minor adverse** significance.

(ii) Landscape and heritage operational and residual - in the context of the very localised landscape character of the Site and the setting of Lower Rainham Conservation Area. These cumulative effects are again assessed as being of **minor adverse** significance.

Type 2 Cumulative Impacts

16.15 **Table 16.1** identifies the committed developments already incorporated into the ES cumulative assessment considerations. Table 16.3 identifies the major/moderate significant impacts of the development on identified receptors. The potential for the other planned or committed developments within the study area to affect those sensitive receptors has been considered.

16.16 There are not considered to be any significant cumulative construction or residual effects. This is principally because the timing of the construction of all of the sites is unlikely to coincide given that they all have planning permission or have been built out, with exception of the Proposed Development. In any event, it would be common practice for all development sites to operate under a Construction Environmental Management Plan.

16.17 Cumulative operational effects are considered to occur as follows -

(i) Recreational pressure on the RAMSAR sites,

(ii) Squeezing of or loss of biodiversity resource,

(iii) Pressure on health/community/educational facilities, and

(iv) Additional provision of housing /maintaining a supply of housing.

16.18 The following cumulative operational residual effects are considered to occur –

(i) Provision of housing/housing supply across the District would increase as a result of the development of the identified sites – this is a cumulative effect of **moderate positive** significance.

16.19 In respect of the above conclusion, it is assumed that any mitigation proposed by the developers of these committed sites is fully executed and is successful – for example, in respect of recreational impacts on the RAMSAR site and the biodiversity resource in general, there would be overarching commitments to maintaining and enhancing biodiversity, as well as financial compensation through SAMMS or onsite recreational improvements that would be applicable to each site.

SUMMARY

16.20 This CEA has examined the impacts of the scheme in combination and /or with other identified developments. Sensitive receptors and impacts identified through the EIA process for the Proposed Development have been considered and the nature and significance of any potential cumulative impacts likely to arise on these receptors have been examined and found to be of limited occurrence in respect of both Type 1 (both minor adverse significance) and Type 2 (moderate positive significance).

17 OVERVIEW

17.1 An overview of construction and operational effects is set out in **Table 17.1** below.

Table 17.1: Summary of Effects

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
CONSTRUCTION					
Agricultural Land	Loss of agricultural land	Major Adverse (significant)	N/A	Significant	Major adverse (significant)
	Effect on Soil Resource	Moderate adverse	Site Waste Management Plan; a Soil Management Plan or similar	Slight	Slight adverse
	Impact on Agricultural Business	Major/ Moderate adverse (significant)	Consolidation of business plan		Moderate adverse
Economy, Population and Society	Demographics: population count and demographic stricture	Nil	N/A	N/A	Nil
	Economy and Employment	Minor Beneficial	N/A	N/A	Minor Beneficial
	Wealth and Deprivation	Negligible	N/A	N/A	Negligible
	Housing (house prices, tenure, composition)	Nil	N/A	N/A	Nil
	Education and Training	Negligible	N/A	N/A	Negligible
	Health, Community and Leisure	Nil	N/A	N/A	Nil
	Shopping	Minor Beneficial	N/A	N/A	Minor Beneficial
Water Resources	Fluvial Flood Risk	Negligible (not significant)		N/A	N/A
	Water Quality – surface water	Slight adverse (not significant)	CEMP (embedded)	N/A	N/A

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Ground Water	Negligible (not significant)	CEMP (embedded)	N/A	N/A
	Foul Drainage	Negligible (not significant)	CEMP (embedded)	N/A	N/A
	Water Supply	Negligible (not significant)	CEMP and NMP (embedded)	N/A	N/A
Ground Conditions and Contamination	Human Health (Construction Workers)	Negligible	Standard operational health & safety. Embedded mitigation assumed site remediated if necessary prior to construction	N/A	Negligible
	Controlled Waters/ground water	Negligible	As above.	N/A	Negligible
	Ecological systems	Negligible. Slight adverse - RAMSAR	As above	N/A	Negligible
	Ground Stability Landslide	Slight adverse	As above	N/A	Negligible
Transport	Community Severance	Negligible	Construction Traffic Management Plan/CEMP	N/A	Negligible
	Driver and Pedestrian Delay	Negligible	Construction Traffic Management Plan/CEMP	N/A	Negligible
	Accidents and Safety	Negligible	Construction Traffic Management Plan/CEMP	N/A	Negligible
	Fear and Intimidation	Negligible	Construction Traffic Management Plan/CEMP	N/A	Negligible
Ecology and Conservation	Medway Estuary and Marshes SPA/SSSI/Ramsar -Contaminated run-off -Dust -Air quality -Water abstraction	Negligible	CEMP and refer to paras 15.115-117 of ES		Negligible

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Non-statutory sites – LNR, LWS -Dust -Contaminated run-off -Noise	Minor adverse	CEMP and refer to para 15.115-117 of ES		Negligible
	Commercial orchard -Loss of habitat, but it is of little ecological value	Negligible	Replanting smaller area of orchard of quality better habitat	Permanent net loss of this habitat	Negligible
	Hedgerows/scattered trees -Loss of habitat -Damage to retained habitat -Dust	Negligible	Majority of hedgerows retained, for losses existing gaps or least sensitive location chosen, retained habitats protected, new hedge planting and sensitive management implemented. CEMP will prevent dust impacts.		Negligible
	Semi-improved grassland -Loss of habitat -Damage to retained habitat	Minor adverse	Replacement grassland with species rich mix	Permanent loss of this habitat	Minor adverse
	Foraging and commuting bats	Minor adverse	Refer to ES paras 15.101-104		Negligible
	Reptiles	Minor adverse	Refer to ES paras 15.115-118		Negligible
	Breeding Birds	Minor adverse	Refer to ES Technical Appendix 15.4		Negligible
	Badgers	Minor adverse	Refer to ES Technical Appendix 15.3		Negligible
Landscape	Lower Rainham/Lower Twydall Fruit Belt LCA	Moderate/ Major Adverse			
	(Lower Rainham farmland LCA)	Minor adverse			
	Medway Shoreline & Marshes, Riverside Country Park LLCA	Minor adverse			
	Site Features	Major adverse (localised)			

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Users of Northern Shore	Minor adverse			
	Users south Motney Hill	Moderate adverse			
	Users north of Lower Rainham	Minor adverse			
	Users of Lower Rainham Road	Moderate/ Minor adverse			
	Users Horrid Hill	Moderate adverse			
	Users Lower Bloor Lane	Moderate adverse			
	Users Lower Twydall Lane	Moderate adverse			
	Users of Bridleway	Moderate Adverse			
	Users of Pump Lane	Major Adverse (localised)			
	Users of trains passing Site	Minor/ Moderate adverse			
	Residents of Twydall south of railway	Moderate/ Major adverse (localised)			
	Residents on Pump Lane	Major adverse (localised)			
	Residents on Lower Bloor Lane	Minor/ Moderate adverse			
	Residents Lower Rainham	Moderate adverse			
	Residents Lower Twydall	Minor adverse			

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
Air Quality	From dust soiling	Major (substantial) (high according to IAQM guidance)	Refer to chapter 12 para 12.166 of ES		Negligible
	Human Health	Slight (low according to IAQM guidance)			Negligible
Archaeology and Heritage	Physical impact to the potential buried Site archaeology	Major adverse (significant)	Preservation by record (strip, map and sample)	The loss of the asset would be offset by knowledge gained	Moderate adverse
	Setting on designated assets – listed buildings	Minor adverse	CEMP, embedded mitigation (retention of existing planting)	As assessed	Minor adverse
	Setting of designated assets – conservation areas	Moderate adverse (Lower Rainham)	As above	As above	Moderate adverse (Lower Rainham)
		Minor adverse (Lower Twydall)			Minor adverse (Lower Twydall)
OPERATION					
Society, Population and Society	Demographics: population count and demographic stricture	Minor beneficial	N/A	N/A	Minor beneficial
	Economy and Employment	Minor Beneficial	N/A	N/A	Minor Beneficial
	Wealth and Deprivation	Nil	N/A	N/A	Nil
	Housing (house prices, tenure, composition)	Moderate Beneficial	N/A	N/A	Moderate Beneficial
	Education and Training	Negligible	Onsite primary, secondary financial contribution	N/A	Negligible

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Health/Community Facilities	Minor adverse	Financial contribution	N/A	Negligible
	Shopping Facilities/town centre health	Minor Beneficial	N/A	N/A	Minor Beneficial
Water Resources	Fluvial Flood Risk	Negligible (not significant)	N/A	N/A	N/A
	Surface water	Negligible (not significant)	CEMP	N/A	N/A
	Waste water drainage /Foul drainage	Negligible (not significant)	N/A	N/A	N/A
	Water Supply	Negligible (not significant)	N/A	N/A	N/A
	Groundwater	Negligible (not significant)	N/A	N/A	N/A
Ground Conditions	Human Health – site users	Slight adverse	Embedded through decontamination if necessary prior to construction.	N/A	Negligible
	Ground water - contamination	Negligible	As above	N/A	Negligible
	Ecological systems	Slight adverse	As above	N/A	Negligible
	Damage to built environment - contamination	Negligible	As Above	N/A	Negligible
	Site Users – land stability	Moderate adverse	As above	N/A	Slight adverse
Transportation	Community Severance	Negligible	Framework Travel Plan as standard	N/A	Negligible
	Driver and Pedestrian Delay	Negligible	Framework Travel Plan as standard	N/A	Negligible
	Accidents and Safety	Negligible	Framework Travel Plan as standard	N/A	Negligible

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Fear and Intimidation	Negligible	Framework Travel Plan as standard	N/A	Negligible
Ecology & Conservation	Statutory Sites – Medway Estuary and Marshes SPA/SSSI/Ramsar -recreational pressures	Major adverse (significant)	SAMMS, on-site recreation and off site provision		Negligible
	Other statutory sites - -recreational pressure	Minor adverse	Refer to paras 15.116 of ES		Indiscernible
	Orchard (non commercial, i.e. new planting as part of scheme of higher ecological value)	Minor adverse	Replanting to create betterment of habitat		Minor beneficial
	Hedgerows, scattered trees	Negligible	Refer to ES paras 15.122	Replacement and additional planting	Minor beneficial
	Semi-improved grassland	Negligible	Areas replanted and managed to enhance habitat, with more detail provided in a LEMP.		Minor beneficial
	Newly created Ponds and Suds	Negligible	Creation of new habitat as part of Development. More detail provided in a LEMP.	Overall habitat enhancement post-development.	Minor beneficial
	Foraging and commuting bats	Minor adverse	Refer to ES para 15.119-122. Management implemented to enhance habitat, with more detail provided in a LEMP.	Overall habitat enhancement post-development.	Indiscernible
	Reptiles	Minor adverse	Refer to ES Technical Appendix 15.5. Sensitive management implemented to enhance habitat, with more detail provided in a LEMP.	Overall habitat enhancement post-development.	Indiscernible
	Badgers – net loss of foraging habitat	Minor adverse	Refer to ES Technical Appendix 15.3.		Indiscernible

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Breeding Birds – increase in nesting habitat	Minor adverse	Refer to ES Technical Appendix 15.4		Minor beneficial
Landscape	Lower Rainham/Lower Twydall Fruit Belt LCA	Moderate adverse	Range of embedded landscape mitigation measures, including landscape buffers, tree planting and implementation of new areas of community orchards and village green.		Moderate adverse
	(Lower Rainham farmland LCA)	Minor adverse	Embedded landscape mitigation measures.		Minor adverse
	Medway Shoreline & Marshes, Riverside Country Park LLCA	Minor adverse	As above		Minor adverse
	Site Features	Major adverse (localised)	As above		Moderate adverse
	Users of Northern Shore	Minor adverse	Landscape buffer planting and trees throughout the development		Neutral
	Users south Motney Hill	Moderate /Minor adverse	As above		Minor adverse
	Users north of Lower Rainham	Minor adverse	As above		Neutral
	Users of Lower Rainham Road	Minor adverse	As above		Minor adverse
	Users Horrid Hill	Moderate adverse	As above		Minor adverse

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	Users Lower Bloor Lane	Minor/ Moderate adverse	As above		Minor adverse
	Users Lower Twydall Lane	Minor adverse	As above		Minor adverse
	Users of Bridleway	Minor beneficial	As above		Minor/ Moderate Beneficial
	Users of Pump Lane	Moderate adverse	As above		Minor/moderate adverse
	Users of trains passing Site	Minor/ Moderate adverse	As above		Minor adverse
	Residents of Twydall south of railway	Moderate adverse	As above		Minor/ Moderate adverse
	Residents on Pump Lane	Moderate/ Major adverse (localised)	As above		Moderate adverse
	Residents on Lower Bloor Lane	Minor/ Moderate adverse	As above		Minor adverse
	Residents Lower Rainham	Minor/ Moderate adverse	As above		Minor adverse
	Residents Lower Twydall	Minor adverse	As above		Negligible
Air Quality	Existing sensitive receptors	Negligible	Refer to chapter 12 para 12.176 in ES	N/A	Negligible
	On Proposed residential receptors	Negligible	As above	N/A	Negligible

TOPIC	IMPACT	SIGNIFICANCE	MITIGATION	RESIDUAL IMPACT	SIGNIFICANCE
	On Ecological receptors	Unknown	Refer to para 12.176 of ES and the separate IHRA (albeit not specifically required in respect of international/European designated sites)		Negligible
Archaeology and Heritage	Indirect impact on setting of Listed buildings and conservation areas	Minor for the listed buildings.	Considerable strengthening and additional boundary planting and on site planting.	Indirect impact on setting listed buildings and conservation areas reducing over time as planting matures	Minor for listed buildings.
		Moderate adverse Lower Rainham CA			Moderate adverse Lower Rainham CA
		Minor adverse Lower Twydall CA.			Minor adverse Lower Twydall CA

CUMULATIVE EFFECTS

17.2 Chapter 16 has assessed the potential cumulative effects arising from the Proposed Development, including recommendations for mitigation where applicable.

17.3 The CEA has determined that no additional mitigation measures are necessary to address cumulative effects.

17.4 There are no predicted interactions between potential significant environmental effects that have not already been taken account of within the topic chapters in this ES.

CONCLUSIONS

17.5 The ES explains and describes in full the environmental effects likely to be associated with the Proposed Development and places the determining authority in possession of all the necessary environmental information required by both statute and policy.

17.6 This ES therefore enables a decision to be made on the accompanying planning application with adequate provision to be made for environmental mitigations, where appropriate.

ABBREVIATIONS

AAR	Average Annual Rainfall
AADT	Annual Average Daily Traffic
AAHT	Annual Average Hourly Traffic
ARCADY	Assessment of Roundabout Capacity And Delay
AoD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ALC	Agricultural Land Classification
AQMA	Air Quality Management Area
ATC	Automatic Traffic Counters
BAP	Biodiversity Action Plan
CEMP	Construction and Environmental Management Plan
CTMP	Construction Traffic Management Plan
CIEEM	Chartered Institute for Ecology and Environmental Management
CWS	County Wildlife Site
DEFRA	Department of Environment, Food and Rural Affairs
DAS	Design and Access Statement
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EC	European Commission
EIA	Environmental impact Assessment
EPSL	Natural England European Protected Species Licence
ES	Environmental Statement
FRA	Flood Risk Assessment
GCN	Great Crested Newts
GIS	Geographical Information Systems
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HIS	Habitat Suitability Index
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
LEMP	Landscape and Ecological Management Plan
LAQM	Local Air Quality Management

LCA	Landscape Character Area
LVIA	Landscape and Visual Impact Assessment
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
MHCLG	Ministry of Housing, Communities & Local Government
NE	Natural England
NPPF	National Planning Policy Framework 2019
NPPG	National Planning Policy Guidance
NTS	Non-Technical Summary
ONS	Office for National Statistics
OSWI	Other sites of wildlife interest
PEA	Preliminary Ecological Appraisal
PIA	Personal Injury Accident
PICADY	Priority Intersection Capacity and Delay
PRoW	Public Right of Way
SAC	Special Area of Conservation
SAMMS	Strategic Access Management and Monitoring Strategy
SNCI	Sites Of Nature Conservation Interest
SPA	Special Protection Area
SPD	Supplementary Planning Document
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
SWMP	Site Waste Management Plan
TA	Transport Assessment
FTP	Framework Travel Plan
TCPA	Town and Country Planning Act
UWS	Unconfirmed wildlife sites
WFD	Water Framework Directive
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility
m	metres
km	kilometres

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