

14. GROUND CONDITIONS

Introduction

- 14.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Ground Conditions and Land Contamination during the construction and operational phases of the Proposed Development. This Chapter also describes the legislative and policy framework; the methods used to assess the effects; the baseline conditions currently existing at the Application Site; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 14.2 This Chapter relates to both the Lightwood Site and Nicholas King Homes Site (NKH) parts of the Site with the relevant site boundary illustrated as **Figure 1-1**.
- 14.3 Background information has been obtained from the following reports, which are included within **Appendix 14.1 – 14.2**.
1. Omnia Consulting Phase I Desk Top Study Report (ref: A11866/1.1 dated August 2022) – Lightwood Strategic;
 2. Omnia Consulting Phase I Desk Top Study Report (ref: A11997/1.1 dated January 2023) – Nicholas King Homes;
- 14.4 This Chapter will set out the baseline ground conditions for the Site, assess the implications of the Proposed Development, and set out the mitigation options (if applicable).
- 14.5 This report has been prepared by suitably qualified and experienced Geo-Environmental Consultants from Omnia, as detailed below.

Table 14.1 – Summary of individuals involved in producing this EIA Chapter and their relevant qualifications

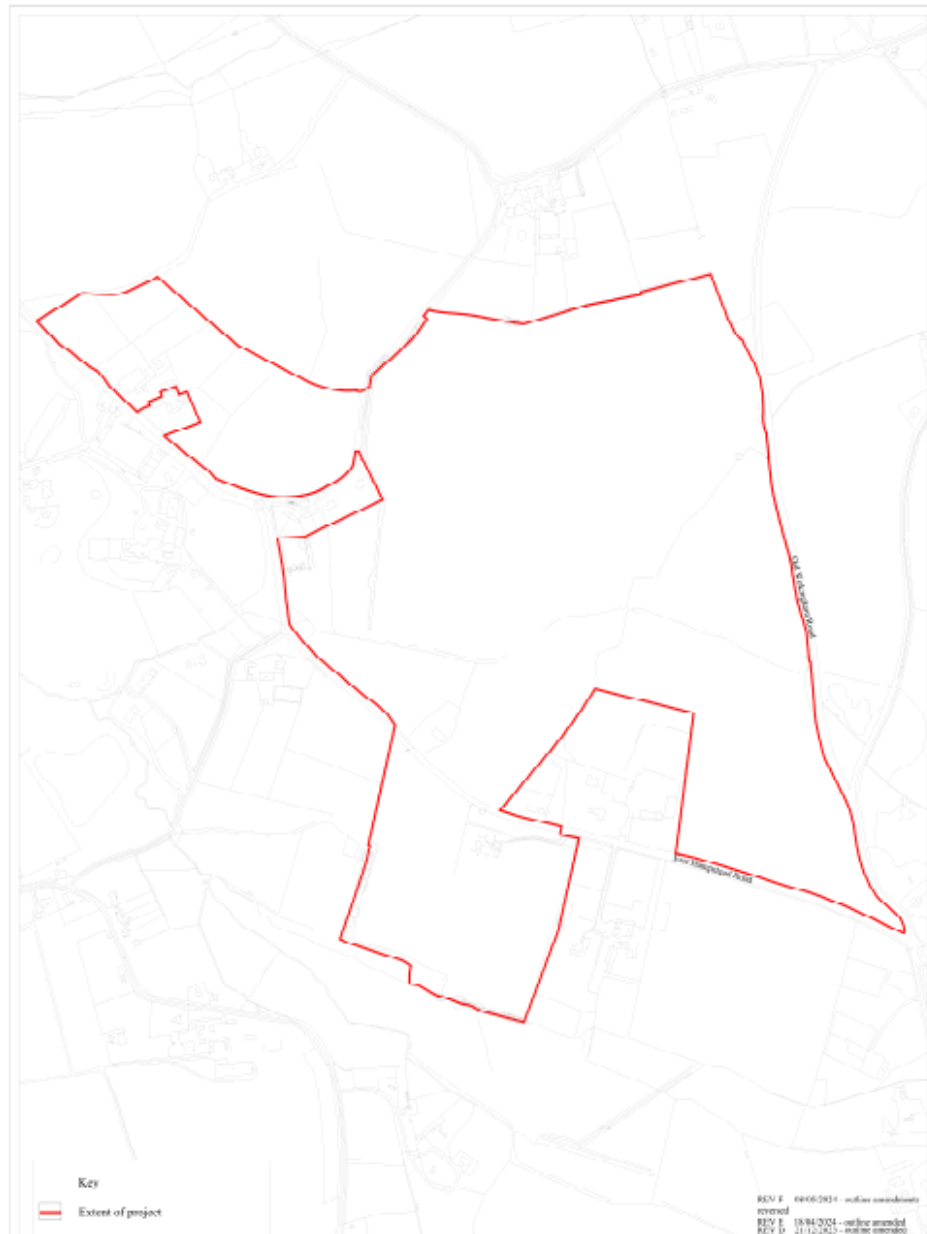
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Study Area

- 14.6 The Lightwood study area comprises Land at South Wokingham, Old Wokingham Road, Wokingham, RG40 3BQ and the Nicholas King Homes (NKH) study area comprises land at Pearce's Farm, Easthampstead Road, Wokingham, RG40 3BN. The study area comprises

an irregularly shaped parcel of land, approximately 66ha. The study areas are shown in **Figure 14.1** below. The Lightwood and NKH Site boundaries are shown within **Figure 1 2**.

Figure 14.1 – Study Area (Site Boundary)



- 14.7 The Proposed Development will come forward via the following three (3no.) separate planning applications:
- A Hybrid Planning Application seeking Outline permission for up to 850 units with all matters reserved (except access to the site) and a full application for SANG land and associated facilities by Lightwood Strategic ("Lightwood Site");
 - An Outline Planning Application for up to 180 units with all matters reserved (except access to the site) by Nicholas King Homes ("NKH Site"); and

- c. A Full Planning Application to provide a vehicular crossing across Byway 30 to allow access for the two parcels of land comprising the South Wokingham SDL Extension, and Active Travel Connections to the Byway to the north from the Lightwood Site.

14.8 The application areas are shown on **Figure 14.2** below.

Figure 14.2 – Nicholas King Homes (NKH) and Lightwood Strategic Application Areas



- 14.9 This assessment relates to the ground conditions within the site boundary (**Figure 14.1**). This is considered appropriate as only the ground conditions within the Site will have the potential to affect the Proposed Development.
- 14.10 As part of the assessment, surrounding land and land uses are considered (within a 250m radius), with the potential impact of these land uses on the ground conditions within the Site being assessed.

Legislative Planning Policy Framework

- 14.11 A summary of key legislation that is relevant to assessing Ground Conditions is provided below, including a summary of national (NPPF) and local planning policies that are of relevance to Ground Conditions.

The Environmental Protection Act 1990

- 14.12 The Environmental Protection Act 1990 sets out the fundamental structure and authority for waste management and control of emissions into the environment for England, Wales and Scotland through eight parts. Part 2A of the Environmental Protection Act 1990 defines contaminated land and sets out how it should be managed by the regulators. Contaminated land is defined as any land which appears to the Local Authority in whose area it is situated

to be in such a condition, by reason of substances on or under the land that (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) pollution of controlled waters is being, or is likely to be, caused. In very broad terms, under the contaminated land regime, land must be remediated to a standard that means it is suitable for its current use.

National Planning Policy Framework

14.13 The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. Sections relevant to contaminated land are referenced below.

14.14 Paragraph 180 requires planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

14.15 Paragraph 183 states that planning policies and decisions should ensure that:

a. a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b. 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

c. adequate site investigation information, prepared by a competent person, is available to inform these assessments.

14.16 Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner, as set out in paragraph 184.

Planning Practice Guidance

14.17 The government has also published Planning Policy Guidance, which describes the role of the planning regime when dealing with land affected by contamination (<https://www.gov.uk/guidance/land-affected-by-contamination>). The PPG explains that Part 2A of the Environmental Protection Act 1990 provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment but that it does not take into account future uses which

could need a specific grant of planning permission. The PPG explains that the implications of contamination for a new development will be considered by the local planning authority to the extent that it is not addressed by other regimes. Put very briefly, it is the role of the planning regime to ensure a site is suitable for its new use.

- 14.18 If there is a reason to believe contamination could be an issue, the PPG requires developers to provide proportionate but sufficient site investigation information (a risk assessment) to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the 'receptors') so that these risks can be assessed and reduced to an acceptable level. The PPG provides that the risk assessment should identify the potential sources, pathways and receptors ('pollutant linkages') and evaluate the risks, to enable the local planning authority to determine whether furthermore detailed investigation is required, or whether any proposed remediation is satisfactory. The PPG also explains that local planning authorities should work with developers to find acceptable ways forward and that, where appropriate, planning conditions can be used to (for example) secure remediation.

The Local Plan

- 14.19 Wokingham Borough Council's main Core Strategy (2010), and a separate Contaminated Land Strategy (2015) states that land classified as contaminated land should have sufficient measures to deal with the contamination. Such measures must address the long-term safety of the development, including the future management of the Site.

Legislative Context

- 14.20 A number of further legislative policies are referenced, as they are key to managing risks to the environment (including human health, controlled waters and sites of geological importance):
1. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
 2. The Groundwater Directive 2006;
 3. Groundwater (England and Wales) Regulations 2009;
 4. The Water Resources Act 1991 (as amended);
 5. The Water Act 2003;
 6. The Environment Act 1995;
 7. Environmental Liability Directive 2004;
 8. Environmental Protection Act (EPA) 1990 (as amended);
 9. Contaminated Land (England) Regulations 2006 (as amended);
 10. Environmental Permitting (England and Wales) Regulation 2016 (as amended);
 11. Wildlife and Countryside Act 1981 (as amended) (in terms of sites designated for their geological interest;

12. Control of Substances Hazardous to Human Health (COSHH), 2002;

13. Control of Asbestos Regulations, 2012

Relevant Guidance

14.21 The following national guidance and accepted industry good practice is relevant to this assessment

1. Land Contamination Risk Management (LCRM) (Environment Agency, 2020, updated 2023);
2. Groundwater Protection Technical Guidance (Environment Agency, 2017a);
3. The Environment Agency's Approach to Groundwater Protection, Version 1.2 (Environment Agency, 2018);
4. Land Contamination Groundwater Compliance Points: Quantitative Risk Assessments (Environment Agency, 2017b);
5. CIRIA R132D: A Guide for Safe Working on Contaminated Sites (CIRIA, 1996);
6. CIRIA C552: Contaminated Land Risk Assessment - A Guide to Good Practice (C552) (CIRA, 2001);
7. CIRIA C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings (CIRIA, 2007);
8. BS6187:2011 Code of Practice for Full and Partial Demolition (BSi, 2011a);
9. BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites: Code of Practice (BSi, 2011b);
10. BS5930:2015+A1:2020 Code of Practice for Site Investigations (BSi, 2015);
11. BS8485:2015+A1:2019: Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings (2019);
12. Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (Environment Agency, 2006).

Assessment Methodology

Baseline Methodology

- 14.22 To determine the baseline conditions for the Site, available information pertaining to the type of geology, soils and groundwater on the site has been reviewed.
- 14.23 Two (2no.) Desk Top Studies have been produced to cover the full site extent, with the information compiled into a Conceptual Site Model (CSM) for both the Lightwood Site and the NKH Site as shown in (**Figure 14.2**).

- 14.24 The baseline information gathered from the Desk Top Studies and available information is summarised within the Baseline Environmental section of this Chapter (with further details provided within **Appendix 14.1** and **Appendix 14.2**).
- 14.25 The above referenced current UK guidance advocates the use of a tiered approach to the assessment of contaminated land whereby initial conceptual models are formulated and, where necessary, further refined through successive phases of ground investigation, risk assessment and, where appropriate, remediation. Only the Phase I Desk Top Studies have been included within this report.
- 14.26 The baseline information gathered is summarised within the Baseline Conditions section of this Chapter (with further information (the full reports) provided within **Appendix 14.1** – **14.2**).
- 14.27 The report references are provided within the 'Sources of Information' section of this Chapter.

Impact Assessment Criteria

- 14.28 This ES Chapter looks to evaluate the direct and indirect (or secondary), short, medium and long-term, permanent and temporary, beneficial and adverse effects, resulting from the implementation of the Proposed Development during both the construction and operational phases.
- 14.29 The assessment will determine the magnitude of change from baseline conditions against the identified sensitivity of the receptors in order to determine the significance of effects.
- 14.30 It will be important to identify the threshold at which point an impact is judged significant in EIA terms, using the table below.

Table 14.2 – Matrix for Determining Significance of Effects

		Sensitivity of Receptor/Receiving Environment to Change/Effect			
		High	Medium	Low	Negligible
Magnitude of change/effect	Major	Major	Major	Moderate	Minor
	Moderate	Major	Moderate	Minor	Negligible
	Minor	Moderate	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

- 14.31 The main receptor types associated with contaminated land and assessment of ground conditions, are human health, controlled waters and local geology. The sensitivity of a receptor is defined as below and have been informed by professional judgement and published screening criteria. The sensitivity of controlled waters is largely determined by its

quality and scale (i.e. local, national and international). The sensitivity for human receptors is determined by proximity to the source of contamination, contaminant concentrations, contaminant age, human physiology and duration of residence/presence in proximity to contamination.

Table 14.3 – Definitions of Sensitivity

Sensitivity of Receptor	Definition: Controlled Waters/Geology	Definition: Human Health
High	High quality resource Rare resource within the local area Limited alternative resource within local area	Construction workers Residential Areas Recreational Areas (soft landscaping)
Medium	Medium quality resource Limited number of resources within the local area Limited alternative resource within local area	Schools Hospitals Care Homes
Low	Low quality resource Frequent resource within the local area Numerous alternative resources within local area	Commercial Areas Industrial Areas
Very Low	Very low importance resource that does not afford protection	N/A

- 14.32 The magnitude of the predicted impact has been determined by considering the temporal scale, the temporary or permanent nature of effects, whether effects are reversible or irreversible, and the geographical scale. The magnitude of both adverse and beneficial effects are set out below.

Table 14.4 – Definitions of Magnitude

Magnitude	Definition: Adverse	Definition: Beneficial
Major	Temporal: Long Term (>5 years from end of construction) Temporary/Permanent: Permanent Reversible/Irreversible: Irreversible Geographical Scale: Regional /National	
	Permanent and irreversible loss of resource, which impacts the regional area. Severe damage to key characteristics, features, or elements of the resource.	Large scale improvement to resource quality, which impacts the regional area. Major improvement to key characteristics, features, or elements of the resource.
Moderate	Temporal: Medium Term (1 – 5 years from end of construction) Temporary/Permanent: Partial Permanent changes Reversible/Irreversible: Partial Irreversible changes Geographical Scale: Local / Regional	
	Partial loss of resource which may impact local/regional area. Some damage to key characteristics, features, or elements of the resource.	Some improvement to resource quality, which impacts the local/regional area. Benefits to key characteristics, features, or elements of the resource.
Minor	Temporal: Short Term (Construction Phase) Temporary/Permanent: Permanent Reversible/Irreversible: Irreversible Geographical Scale: Local	
	Some measurable change in quality of resource which may impact local area. Some damage to key characteristics, features, or elements of the resource.	Some measurable improvement to resource quality, which impacts the local area. Minor benefits to key characteristics, features, or elements of the resource.
Negligible	Temporal: Short Term (Construction Phase) Temporary/Permanent: Temporary Reversible/Irreversible: Reversible Geographical Scale: Local	
	Very limited change in quality of resource that is either temporary or can be reversed	Very limited improvement in quality of resource that is temporary.

Consultation

- 14.33 No consultation has been undertaken with respect to the methodology or source of data used and referenced within the ES Chapter. The assessment methodology has been

undertaken in accordance with industry guidance and best practice. As part of the Desk Top Studies undertaken for the Site, the Wokingham Borough Council Contaminated Land Officer (CLO) was contacted via email in August 2022 (Lightwood Site) and January 2023 (Nicholas King Homes) regarding whether the council were aware of any environmental issues pertaining to the Site. No responses were received to either enquiry.

- 14.34 The following section outlines all of the methods and standard procedures used throughout the investigations.

Sources of Information

- 14.35 To complete the assessment, background information was sought from the following sources:

1. Groundsure Environmental Database Searches:
 - a. Lightwood Site (GS-8946633);
 - b. Nicholas King Homes (GS-9306750);
2. Historical Ordnance Survey Mapping (1871 –2023);
3. Groundwater Vulnerability Map (<http://www.magic.gov.uk/>); and
4. British Geological Survey Map Sheet 269, Windsor, Solid and Drift Edition at a scale of 1:50,000, 1999.

- 14.36 Previous site investigation reports include the documents entitled:

Lightwood Site

1. Omnia Consulting Phase I Desk Top Study Report (ref: A11866/1.1 dated August 2022) – Lightwood Strategic; and

Nicholas King Homes

1. Omnia Consulting Phase I Desk Top Study Report (ref: A11977/1.1 dated January 2023).

Receptors

- 14.37 Two (2no.) main receptor types are associated with contaminated land: human health and controlled waters.
- 14.38 When assessing the potential effects on Ground Conditions from the Proposed Development, it is important to also consider the underlying geology as a potential receptor.
- 14.39 The current ground conditions are largely considered to be in line with the published British Geological Survey map for the site (Windsor, Sheet 269, Solid and Drift Edition at a scale of 1: 50,000, 1999). The approximate location of each strata is detailed within **Figure 14.3** and **Figure 14.4** below.

Table 14.5 – Summary of Geology

Geological Unit	Location of Geological Unit	Formation Name	Description	Aquifer Classification
Superficial	Western edge of the northern parcel of land, and southern slither of the southern parcel of land.	Alluvium	Clay, Silt, Sand and Gravel	Secondary A
	Central portion of the northern parcel of land	Head Deposits	Clay, Silt, Sand and Gravel	Secondary Undifferentiated
	Northern and south-eastern extent of the northern parcel of land and the central eastern extent of Pearce Farm	River Terrace Deposits	Sand and Gravel	Secondary A
Bedrock	Southern parcel of land, and southern slither of northern parcel of land	Bagshot Sand Formation	Sand	Secondary A
	Site wide	London Clay Formation	Clay, Silt and Sand	Unproductive Strata

Figure 14.3 – BGS Superficial Deposits Map

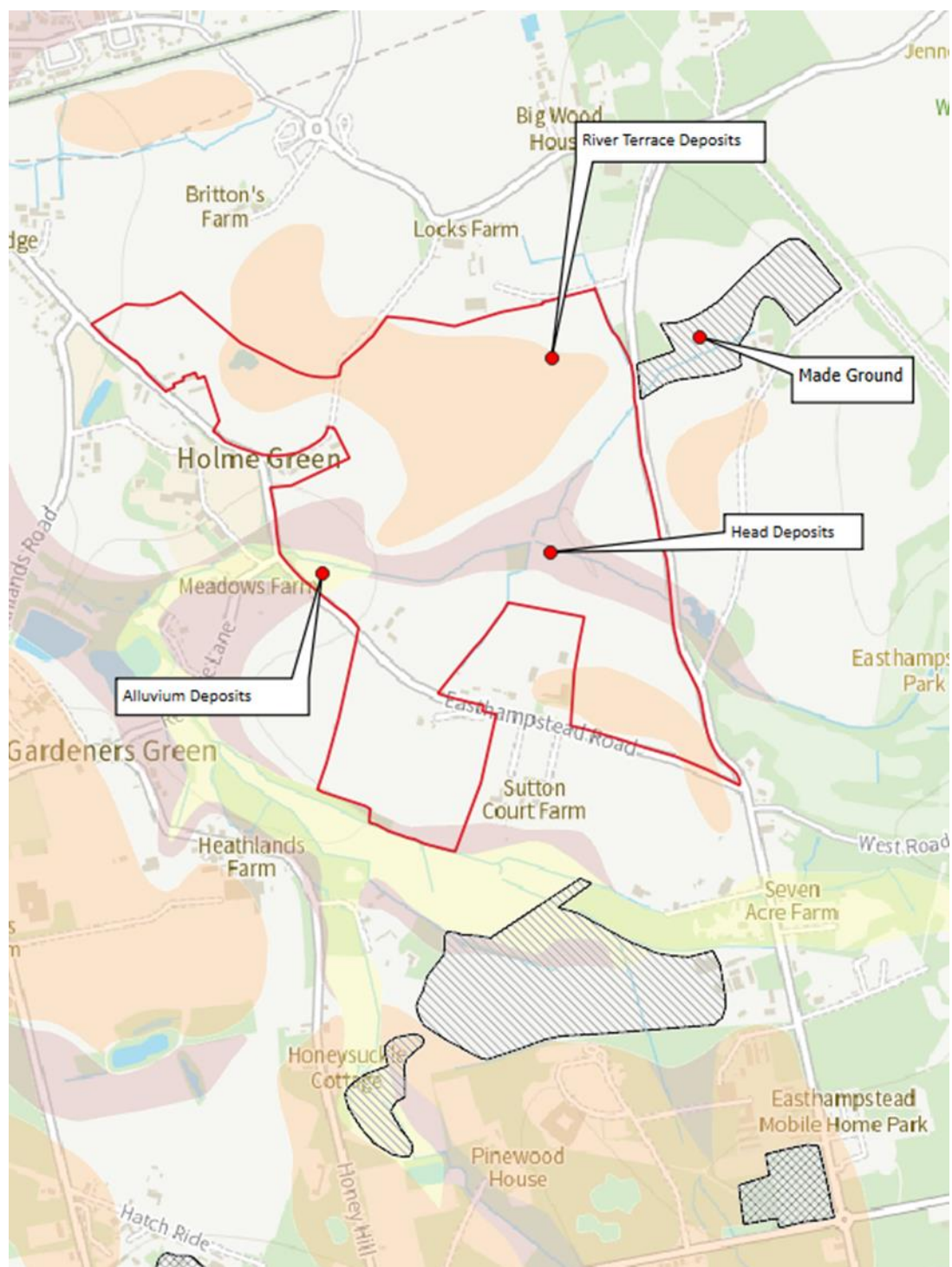
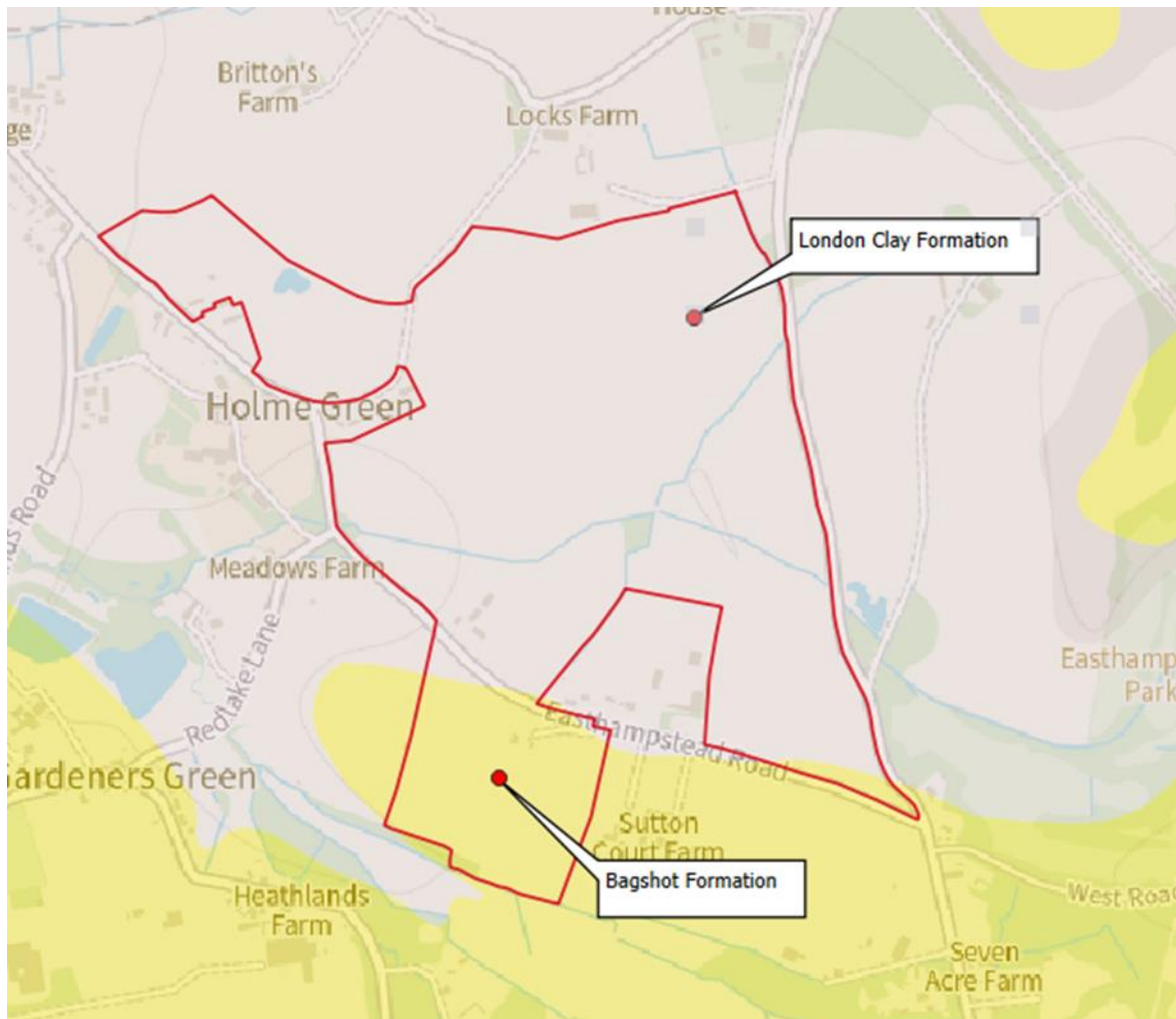


Figure 14.4 – Bedrock Deposits Map

Hydrogeology

- 14.40 The underlying aquifer classifications comprise a Secondary A/Secondary Undifferentiated Aquifer for superficial deposits, Unproductive Strata for bedrock of the London Clay Formation, and Secondary A Aquifer classification for bedrock of the Bagshot Formation.
- 14.41 Based on local topography, the location of surface watercourses and surface water bodies it is considered that shallow groundwater, if present, will likely flow towards the Emm Brook in the centre of the Site and is therefore anticipated to flow northwards in the southern part of the Site, and flow southwards in the northern part of the Site).
- 14.42 The Site is not located within a groundwater Source Protection Zone (SPZ), and there are no groundwater abstraction licenses nor potable water abstractions within a 1.0km radius of the subject site. Groundwater vulnerability data indicates that the Site is underlain by a Secondary A Superficial Aquifer with medium vulnerability, largely overlying bedrock classified as Unproductive Strata (London Clay Formation). The Secondary A bedrock aquifer (Bagshot Sand) within the southern field of the Site is classified as having a high vulnerability.

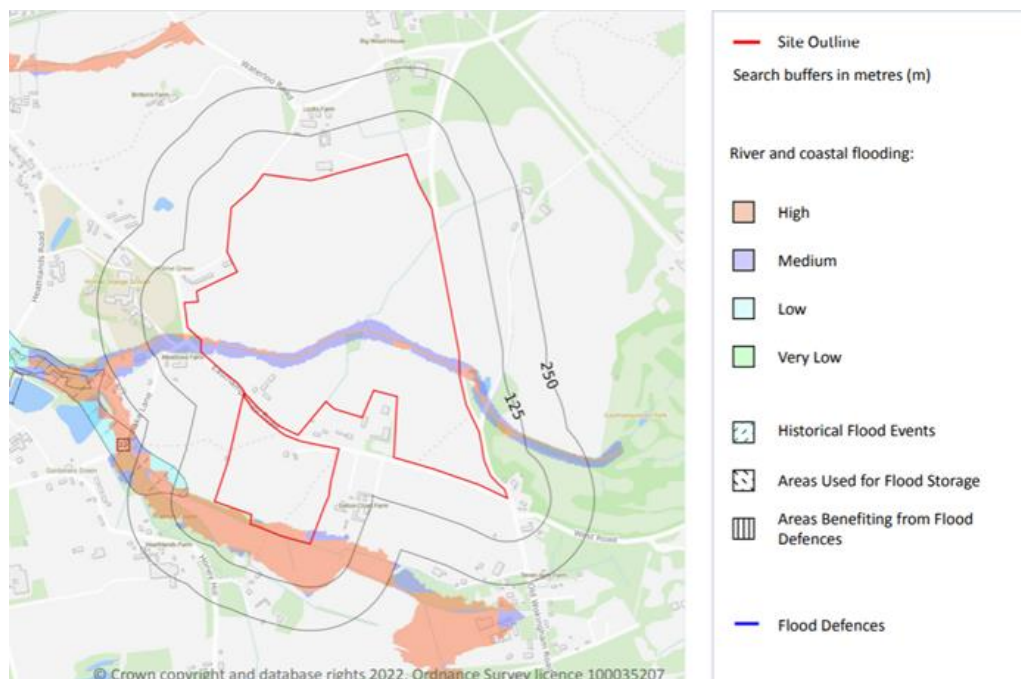
Hydrology

- 14.43 Two (2no.) surface water features were identified within the Site boundary and were both associated with the Emm Brook.

Lightwood Site:

- 14.44 The areas bordering the Emm Brook across the centre of the northern extent of the site and along the southern boundary of the southern parcel of the Lightwood site are categorised as a medium to high risk of river and costal flood and are both within Flood Zones 2 & 3. The remainder of the Site is categorised as being at Negligible risk of River and Costal Flooding as shown within **Figure 14.5** below.

Figure 14.5 – Flooding risk (Lightwood Site)



Nicholas King Homes Site:

- 14.45 The NKH Site is not located within a currently defined Zone 2 or a Zone 3 Floodplain.

Sensitive Receptors

- 14.46 Potential sensitive receptors on-site have been identified as construction workers, future site users, secondary A aquifers below the site, and on-site surface watercourses. It is not considered that future site users will be significantly affected by the development, as they will occupy the site (largely) post development, and therefore are only considered as potential receptors for existing and potential future contamination incidents.

Baseline Conditions

Existing Baseline

- 14.47 The Lightwood boundary includes land south of Easthampstead Road which comprised agricultural fields with storage of machinery equipment (Area 1 Section 2.2.1.1 within **Appendix 14.1**) and land north of Easthampstead Road in the southern centre of the Site comprised Hambridge Farm which comprised barns, a residential dwelling, and associated storage areas surrounded by agricultural fields (Area 2 Section 2.2.1.2 within **Appendix 14.1**).
- 14.48 The Nicholas King Homes boundary includes Pearce's Farm comprising residential dwelling, and a manège which is surrounded by Agricultural fields in the eastern extent of the Site. (Section 2.2.1 **Appendix 14.2**). Further details from both on-site walkovers are provided within **Appendix 14.1** and **14.2**.

Geology

Made Ground

- 14.49 It is considered likely that all current and historical development (as detailed within Section 3.1 of the reports within **Appendix 14.1** and **14.2**) will be underlain by some Made Ground. However, Made Ground will likely be of limited thickness and localised around the farm buildings and infrastructure and is not considered to be present across the entire Site boundary. The nature of the materials can be expected to vary in both composition and thickness beneath the localised developed areas.

Superficial Deposits

Alluvium

- 14.50 Review of BGS mapping indicates that the western edge of the northern parcel of land, and the southern slither of the southern parcel of land within the site boundary (**Figure 14 3**) are underlain by Alluvium which commonly comprises soft to firm consolidated, compressible silty clay, but can also contain layers of silt, sand, peat and basal gravel.

Head Deposits

- 14.51 Review of BGS mapping indicates that the central portion and northern parcel of land within the site boundary (**Figure 14 3**) is underlain by Head deposits which are commonly described as poorly sorted superficial deposits comprising gravel, sand and clay, with local lenses of silt, clay, peat or organic material.

River Terrace Deposits

- 14.52 Review of BGS mapping indicates that the northern and southeastern extent of the northern parcel of land, and the central eastern extent of Pearce's Farm within the site boundary (**Figure 14 3**) are underlain by River Terrace deposits which are commonly described as sand and gravel, locally with lenses of silt, clay or peat.

Bedrock Deposits

Bagshot Sand Formation

- 14.53 Review of BGS mapping indicates that the southern parcel of land and the southern slither of the northern parcel of land within the site boundary (**Figure 14.4**) are underlain by the Bagshot Formation which commonly comprises fine to coarse grained sand, with varying percentages of silt or clay, with sparse seams of gravel. The sands are commonly cross bedded or laminated within the silt/clay.

London Clay Formation

- 14.54 Review of BGS mapping indicates that the entire site is underlain by the London Clay Formation which is mapped outcropping in areas where superficial deposits are present and as subcrop in areas where either superficial deposits or bedrock of the Bagshot Sand Formation are present where the London Clay Formation will be present at depth as shown in **Figure 14-4**. The London Clay Formation generally comprises a stiff grey clay with varying percentages of clay, silt, sand, with occasional thin rounded pebble bands.

Groundwater

- 14.55 Review of historical borehole logs within a 1.0km radius of the site (available via BGS GeoIndex) indicate that shallow groundwater in the area is present at depths of ranging from approximately 1.22m (SU86NW1) – 2.00m bgl (SU86NW9)

Ground Contamination

- 14.56 Potential sources of contamination have been identified by the Conceptual Site Models (CSMs) relating to the development on-site within the localised areas of the farm and associated storage areas. With the addition of potential off site sources relating to historical and current development with 250m of the site (Further details of the potential sources can be found within **Appendix 14.1** and **14.2**).
- 14.57 With limited development of the site and surrounding area it is considered likely that any potential impact from the sources identified within the CSMs will be localised and not site wide. It should be noted that the Desk Study for the Lightwood site identified three (3no.) potential sources of Ground Gas which would need to be assessed across the Lightwood site boundary as set out within **Figure 2.1**. Ground gas was not considered to present a plausible source within the NKH site boundary and therefore further assessment is not required. (Further details can be found in Section 6 of the reports in **Appendix 14.1** and **14.2**).

Controlled Waters Assessment

- 14.58 Following both desk studies the risks posed to groundwater have been assessed.
- 14.59 The site is considered to present a low to moderate risk to controlled waters for the following reasons:

1. Surface watercourses are located centrally on site;
2. Superficial Deposits classified as Secondary A Aquifer;
3. Bedrock of the London Clay Formation is classified as unproductive strata;
4. The site is not located within a groundwater Source Protection Zone;
5. There are no active or historical groundwater or surface water abstraction licences within 250m of the site;
6. Majority of the site is underlain by a Secondary A Aquifer within the River Terrace Deposits and the Secondary Undifferentiated Aquifer within the Head Deposits;
7. Groundwater recorded on publicly available BGS Logs recorded shallow groundwater strikes between 1.22m (SU86NW1) – 2.00m bgl (SU86NW9)

Radon

- 14.60 The Groundsure reports indicate that the site is not located within a Radon Affected Area, with less than 1% of properties being above the action level. At this level BRE publication BR211 indicates that no special radon protective measures are required in the construction of new extensions or dwellings.

Summary of Baseline Conditions

- 14.61 A summary of the identified baseline conditions beneath the site is provided below.

Table 14.6 – Summary of baseline conditions

Baseline Conditions	Summary
Ground Conditions	Ground conditions are expected to be in line with the BGS mapping, and comprise natural strata described as Topsoil, overlying Superficial deposits of River Terrace Deposits, Head Deposits or Alluvium; further underlain by bedrock deposits of London Clay or Bagshot Sand Formation.
Groundwater	Review of boreholes within a 1km radius of the site indicates that shallow groundwater is present at depths of 1.22 – 2.00m bgl.
Soil Contamination	Both CSM models identified potential sources of contamination, however given the limited development of the site and surrounding areas it is thought that if contamination was identified on-site that it would be localised and not prevalent across the entire site.
Controlled Waters Contamination	It is considered the risk to Controlled waters is low to moderate across the site

Baseline Conditions	Summary
Ground Gas	The Lightwood site identified three (3no.) potential sources of Ground Gas which would need to be assessed across the Lightwood site boundary as set out within Figure 2.1. Ground gas was not considered to present a plausible source within the NKH site boundary and therefore further assessment is not required.

Future Baseline Conditions

- 14.62 Based on the proposed residential end use and assuming that construction activities follow current best practice the underlying baseline ground conditions attributed to the underlying geology are not considered likely to change significantly, with the exception of shallow ground conditions which will be modified by construction activities. Therefore ground conditions beneath the site will remain largely the same as if the Proposed Development were not to proceed.

Assessment of Effects

- 14.63 The impacts of the development must be considered, utilising **Table 14 9**, for both the construction phase of works and during the operational phase of development. The definitions of the sensitivity and magnitude has been set out in the Assessment Methodology section of this Chapter. The effects from both the construction phase and operational phase are both discussed below within **Table 14-10** and **Table 14-11**.

Table 14.7 – Significance Thresholds

		Sensitivity of Receptor/Receiving Environment to Change/Effect			
		High	Medium	Low	Negligible
Magnitude of change/effect	Major	Major	Major	Moderate	Minor
	Moderate	Major	Moderate	Minor	Negligible
	Minor	Moderate	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

During Construction Phase

- 14.64 Due to the nature of construction works, disturbance to the ground conditions can be expected and therefore have the potential to result in impacts to human health, the environment and the built environment. Likely works to impact the existing ground conditions

include investigation works, earthworks and foundation works. Impacts associated with these include:

1. Effects of Construction on Soil and Geology
2. Effects of Construction on Groundwater Quality
3. Effects of Construction on Surface Water Quality
4. Effects on Construction Workers from Potential Contamination within the underlying soils/groundwater
5. Creating new or preferential pathways to receptors through disturbance of the ground or installation of service corridors for underground utilities

14.65 These impacts and associated risks are discussed further within **Table 14 10**.

14.66 These impacts will be managed through mitigation measures discussed further in the 'Proposed Mitigation' section of this Chapter.

Operational Phase

14.67 From the results of the previously completed Desk Top Studies (included within **Appendix 14.1-14.2**), the CSM models have identified potential sources of contamination, however given the limited development of the site and the surrounding areas it is considered that if contamination is present on-site that it would be localised and not prevalent across the entire site.

14.68 A revised CSM has been developed to highlight the potential effects of the development during the operational phase to the Lightwood Site.

14.69 These impacts are assessed within **Table 14 11** prior to mitigation measures and determine the probability of exposure.

Table 14.8 – Effects of Development - Construction Phase

Effect	Discussion of Effect	Sensitivity of Receptor	Magnitude of change	Significance
Effects of Construction on Soil and Geology	There are no designated sensitive geological receptors that would be affected by the development. The soil resource would be sterilised/become inaccessible for extraction at a later date. Shallow soils on site could be impacted by the construction works (eg affected by Spills and leaks of chemicals and fuels), it is considered the impact would be localised, however would require clean up.	Medium	Minor	Minor
Effects of Construction on Groundwater Quality	Depending on the time of year foundation excavations are undertaken, there is the potential for shallow groundwater to be encountered within excavations. Soils will be exposed to rainfall with the potential for new or unknown contamination to mobilise into groundwater. Groundwater is considered to be attributed to the Secondary A Aquifer below the site for the purposes of this assessment	Medium	Minor	Minor
Effects of Construction on surface Water Quality	Given the presence of Emm Brook on-site, this is considered the most sensitive surface water feature as part of the development. Emm Brook is noted to have chemical and ecological ratings of 'fail' and 'moderate' respectively. It is considered that the Water Framework Directive will require the quality is improved, such that it is important no further impact occurs. Removal of topsoil as part of the development, and given the clay content of underlying soils, it is considered an amount of silt runoff may occur. Construction works have the potential to increase contaminated surface water runoff to the nearby surface water features.	Medium	Moderate	Moderate

Effect	Discussion of Effect	Sensitivity of Receptor	Magnitude of change	Significance
Effects on Construction Workers from Potential Contamination within the underlying soils/groundwater	There is potential for contaminated soils and groundwater to be present within underlying soils/water in previously developed areas of the site, that requires further investigation ahead of construction works. If contamination is identified, construction workers may come into contact with the impacted soils/groundwater.	Medium	Minor	Minor
Creating new or preferential pathways to receptors	There is potential for contaminated soils and groundwater to be present within underlying soils/water in previously developed parts of the site, that requires further investigation ahead of construction works. If contamination is identified, ground disturbance or the installation utilities could create preferential pathways. Receptors would be considered as future site users of the site and surrounding soils and water resources.	Medium	Moderate	Moderate

Table 14.9 – Effects of Operational Phase

Effect	Discussion of Effect	Sensitivity of Receptor	Magnitude of change	Significance
Potential for Contaminated soils to be present within soft landscaping areas of the development Proposed Gardens and Public Open Space	There is potential for contaminated soils and groundwater to be present within underlying soils/water of the site, that requires further investigation ahead of construction works. The impact of the development is that the end user of the site is changing, from agricultural use to a residential end use, and therefore the receptor is considered as the future users of the site	High	Moderate	Major
Potential for Contaminated soils to be present beneath areas of proposed buildings. Inhalation of Vapours		High	Moderate	Major
Potential for contaminated groundwater to be present beneath the site. Controlled Waters		High	Moderate	Major

Proposed Mitigation

Construction Phase Mitigation Measures

14.70 The impacts discussed in **Table 14 10** can be mitigated by ensuring that appropriate safety measures and working practices are followed in accordance with:

1. CIRIA 1996 'A guide for safe working on contaminated sites, Report 132' and;
2. The Health and Safety Executive 'Protection of Workers and the General Public During the Redevelopment of Contaminated Land', as well as;
3. Working to good working practice, and;
4. A full assessment should be undertaken, in line with current asbestos legislation (Control of Asbestos Regulations, 2012) ahead of the commencement of works on site to mitigate against the risk of exposure to asbestos during construction works.

Operational Phase Mitigation Measures

14.71 The operational phase effects can be mitigated by undertaking further ground investigation (Phase 2 site investigation) across the site, as recommended within the Desk Top Study Reports (**Appendix 14.1** and **14.2**). The findings will be required to be set out within a standalone report, with conclusions made as to whether remedial measures will be required. If remedial measures are deemed to be required, they will need to be set out within a standalone Remediation Method Statement (RMS).

14.72 This should be secured through a standard planning condition.

Residual Effects

14.73 This section assess the impact of the Proposed Development together with the fully implemented mitigation measures. A description and assessment of the magnitude and significance of impacts that will remain after the proposed mitigation measures are implemented is included within **Table 14-12** below.

14.74 The impacts affecting the site will remain as Minor - Major given that further investigation has been recommended across the site to determine if contamination is present and therefore if remedial measures are required on-site. It should be noted that if remedial measures were required, and are adopted in line with guidance, the site would be reduced to negligible. However, the risk cannot be completely removed from any site.

14.75 As with the development of any site, residual impacts may still be present but the associated risks will be reduced to negligible by undertaking a Phase 2 site investigation, and following the good working practices outlined above.

Table 14.10 – Summary of Residual Effects

Potential Effect	Nature of Effect (Permanent / Temporary)	Significance (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)	Mitigation / Enhancement Measures & Monitoring (and how these will be secured)	Residual Effects (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)
Construction				
Effects of Construction on Soil and Geology	Permanent	Minor Adverse	Works on site should follow CIRIA 1996 'A guide for safe working on contaminated sites, Report 132' and; The Health and Safety Executive 'Protection of Workers and the General Public During the Redevelopment of Contaminated Land'.	Negligible
Effects of Construction on Groundwater Quality	Permanent	Minor Adverse	A full assessment should be undertaken, in line with current asbestos legislation (Control of Asbestos Regulations, 2012) ahead of the commencement of works on site to mitigate against the risk of exposure to asbestos during construction works.	Negligible
Effects of Construction on surface Water Quality	Permanent	Moderate Adverse	Working to good working practice. Construction works should be undertaken in accordance with a Construction Environmental Management Plan (CEMP), which should be secured with a suitable planning condition.	Negligible

Potential Effect	Nature of Effect (Permanent / Temporary)	Significance (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)	Mitigation / Enhancement Measures & Monitoring (and how these will be secured)	Residual Effects (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)
Effects on Construction Workers from Potential Contamination within the underlying soils/groundwater	Temporary	Moderate Adverse	A full site investigation and Phase 2 interpretive report should be undertaken across the Site to determine the baseline conditions across the Site. If contamination is present a remediation method statement will be produced to ensure construction works are undertaken suitably, to mitigate any risk of potential preferential pathways.	Negligible
Creating new or preferential pathways to receptors	Permanent	Major Adverse	The requirement for a Phase 2 site investigation, and Remediation Method Statement/Verification should be secured through a suitable planning condition. Construction workers would be made aware of any contamination on site through on-site safety briefings, and PPE provided.	Negligible
Completed Development				
Potential for Contaminated soils to be present within soft landscaping areas of the development. Proposed Gardens and	Permanent	Major Adverse	A full site investigation and Phase 2 interpretive report should be undertaken across the Site to determine the baseline conditions across the Site. If contamination is present a remediation method statement will be produced to ensure remedial measures	Minor Adverse

Potential Effect	Nature of Effect (Permanent / Temporary)	Significance (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)	Mitigation / Enhancement Measures & Monitoring (and how these will be secured)	Residual Effects (Major / Moderate / Minor) (Beneficial / Adverse / Negligible)
Public Open Space			are implemented to ensure the protection of receptors.	
Potential for Contaminated soils to be present beneath areas of proposed buildings. Inhalation of Vapours	Permanent	Major Adverse	Following completion of a Remediation Method Statement, and installation of required measures, a verification inspection and report will be completed to confirm the correct installation of required measures.	Minor Adverse
Potential for contaminated groundwater to be present beneath the site. Controlled Waters	Permanent	Major Adverse	The requirement for a Phase 2 site investigation, and Remediation Method Statement/Verification should be secured through a suitable planning condition.	Minor Adverse

Cumulative Effects Assessment

- 14.76 Cumulative effects are only associated to the Lightwood Site and NKH Site as indicated within **Figure 14.2** due to the ground conditions within the boundary being the only ground conditions affected by the Proposed Development. It is not considered the Site will have a cumulative effect on ground conditions outside of the site boundary. Therefore, following review of the above, Omnia do not anticipate Cumulative Effects may be present within the site boundary if all mitigation measures set out above are implemented.
- 14.77 However, an assessment of the site will be required upon the completion of a Phase 2 Intrusive Ground Investigation for contamination.

Limitations and Assumptions

- 14.78 Impacts have been assessed from the Desk Top Studies (report ref: A11866/1.0) and (report ref: A11997/1.0).

- 14.79 However, it should be noted that further ground investigation and assessment is required across the Site.

Summary of Effects

- 14.80 A summary of residual effects is provided within **Table 14.12** and **Table 14.13** above, and has not been repeated here.

Conclusion

- 14.81 Although impacts and effects of the development have been identified for the construction and operational phases, these impacts can be mitigated to reduce the effects, such that it is not considered the development would have a major adverse effect to the ground conditions, when considered as above.