

9 Ground Conditions

9.1 Introduction

9.1.1 This Chapter presents an assessment of the potential environmental impacts associated with ground conditions at the proposed Keresley Sustainable Urban Extension site, which comprises approximately 49 hectares of agricultural land. Specifically, it considers potential effects related to soil and water contamination, ground gas and effects of ground conditions on buried structures (including water supply pipes and underground concrete).

9.1.2 The purpose of this assessment is to ensure that the development incorporates appropriate mitigation such that it is compliant with the requirements of Part 2A of the Environmental Protection Act (EPA) 1990 and the UK planning regime. In order to achieve this, the development must be undertaken in such a manner that potential impacts on human health (e.g. via soil contamination, ground gas) and the wider environment (e.g. rivers, aquifers etc.) are adequately assessed and mitigated; at both the construction and operational stages of the development.

9.1.3 The environmental impacts assessed relate directly to the chemical quality of soil, groundwater and surface water at the site, and this Chapter constitutes a Tier 1 Contaminated Land Risk Assessment. There are overlaps between the scope of this assessment and various other assessments within this Environmental Statement. The following points should be noted:

- The assessment of effects on ecological receptors within this Chapter is limited to direct effects from either soil or water contamination (e.g. risks to aquatic life by leaching of contamination into a watercourse). Assessments relevant to other potential effects on these receptors e.g. loss of habitat, air pollution etc., are provided in Chapter 5: Ecology.
- The assessment of the effects of the development on water resources provided in this Chapter is limited to those directly related to contamination / chemical quality. Wider effects relating to water resources are discussed in Chapter 10: Drainage and Flood Risk.
- Assessment of the effects of the development on agricultural land in this Chapter is related only to effects directly related to land contamination. Effects associated with the loss of agricultural production are outside the scope of this Chapter and are considered in Chapter 8: Agriculture.
- This Chapter does not consider waste management issues or the potential waste classification of materials at the site. This will be addressed by appropriate Environmental Permitting, exemptions, waste management plans etc., at detailed design stage.

9.1.4 The following information sources have been consulted in the preparation of this Chapter:

- Landmark Envirocheck report dated 26 June 2013, including historical topographical mapping, environmental sensitivity database information and geological / hydrogeological data.
- Health Protection Agency "Indicative Atlas of Radon in England and Wales" (2007) and supplementary report "Radon in Homes in England and Wales" (2010).

9.1.5 This Environmental Statement is intended to support an outline planning application. Therefore, specific details of the development proposals are unconfirmed at present. For the purposes of this Chapter it has been assumed that the development will be low rise residential dwellings, with areas of public open space / amenity based on the parameter plans included in Chapter 2. The assessment methodology adopted generally assumes that the development will comply with the standard conceptual site model (CSM) defined for a residential site with private gardens in Environment Agency publication "Updated Technical Background to the CLEA Model" (2009). Where land use differs from this standard CSM (e.g. any playing fields incorporated within the development), then further assessment may be required at the detailed planning stage. The mitigation measures described within this Chapter allow scope for such detailed assessment, if necessary.

9.2 Assessment Approach

Methodology

9.2.1 The assessment of potential effects has been undertaken by the following process:

- Determination of baseline conditions. This has been achieved by means of a desk study and site walkover inspection. It considers the potential for pre-existing soil, water or ground gas contamination to be present at the site.
- Assessment of the potential effects from any baseline soil, water or ground gas contamination on possible receptors during both the construction and operational phases of the development. This has been achieved by the determination of a conceptual site model (CSM) based on the baseline conditions and details of the proposed development.
- Assessment of the potential effects of the development on the contamination status of soil and water at the site (i.e. potential for the development to introduce new contamination sources, pathways or receptors, during both the construction and operational phases).
- Discussion of mitigation measures to prevent or minimise any identified significant potential adverse effects.
- Assessment of the likely level of residual effects following mitigation.

9.2.2 The assessment has been undertaken by means of a desk study and site walkover inspection. This constitutes a Tier 1 risk assessment as defined in Environment Agency "Model Procedures for the Management of Land Contamination (CLR11)" (2004). Given the nature of the site (i.e. agricultural land, with no significant industrialised history), this is considered to represent an appropriate level of assessment for outline planning purposes. Intrusive site investigation will be undertaken in the future (as part of the detailed design process), which can be used to validate and review the findings of the Tier 1 assessment where necessary and provide additional confirmation / confidence in the appropriateness of any mitigation measures.

9.2.3 This desk study and walkover information is used to inform a qualitative risk assessment, allowing significance criteria to be assigned to each potential effect, in relation to receptor sensitivity and magnitude of effect.

9.2.4 The significance of effects on a given receptor (e.g. future site users, a surface water course, an aquifer etc.) is a product of the sensitivity of that receptor and the potential magnitude of the effect.

9.2.5 Sensitivity criteria for the receptors have been determined with general consideration of CIRIA 552 "Contaminated Land Risk Assessment: A Guide to Good Practice" (2001). However, it should be noted that the evaluation of the sensitivity of surface water and ecological receptors in particular is subject to significant professional judgement, which has been applied in conjunction with the outline classification scheme provided in Table 9.1.

High	Human health, where receptor characteristics promote the likelihood of a significant contaminant linkage (e.g. due to high levels of exposure to soil / dust and / or prolonged exposure). For example, children using residential gardens or public recreation areas, construction workers routinely exposed to soils. Controlled Waters receptors of national and / or strategic importance for the purposes of potable water supplies and / or ecosystems (e.g. Principal Aquifer). High sensitivity ecological receptors, where the sensitivity is directly related to soil, surface water or groundwater conditions e.g. Ramsar site.
Medium	Human health risk, where receptor characteristics provide limited potential for a significant contaminant linkage. For example, workers in commercial premises. Controlled Waters receptors of local importance for the purposes of potable water supplies and / or ecosystems (e.g. Secondary (A) Aquifer). Medium sensitivity ecological receptors (e.g. non statutory local designations, such as Sites of Biological Importance) and other fauna (e.g. livestock).

Low	Human health risk, where receptor characteristics significantly minimise the likelihood of a significant contaminant linkage. For example, users of car parks. Controlled Waters receptors of low importance for the purposes of potable water supplies and / or ecosystems. Buildings or structures prone to long term damage from the chemical ground conditions.
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9.2.6 The potential magnitude of effects on receptors has been assessed by considering the potential contamination and exposure pathways, to determine a classification in accordance with Table 9.2.

Severe	Construction / development activities result in a short term (acute) risk to human health. Examples include soil displaying highly elevated cyanide concentrations. Short term risk of significant gross pollution of a watercourse or aquifer e.g. major spillage of oil from activities associated with the development. Of particular relevance is the potential release of Priority Substances and Priority Hazardous Substances.
Medium	Exposure to contamination (soil and / or Controlled Waters) that, by way of its characteristics and extent, may result in long term (chronic) risk to human health. Long term risk from leaching of contaminants to water resources or ecological receptors.
Mild	Exposure to contamination (soil and / or Controlled Waters) that, by way of its characteristics and extent, may result in pollution of low value water resources or ecological receptors. Soil contamination at concentrations above that which might be considered 'normal background' (e.g. presence of Made Ground, low risk historical industrial / commercial use). Concentrations are such that a potential risk to human health is unlikely. Damage / compromise to underground structures.
Minor	No significant harm to sensitive receptors, including no significant potential for adverse long term human health effects to future site users. Any non-permanent human health risks to construction workers can be fully prevented by means of personal protective equipment. Easily repairable damage to buildings, structures and services. No observable effect on the use or function of water resources.
¹ Criteria are based on guidance provided in CIRIA 552 (2001).	

9.2.7 The overall effect on each potential receptor has been evaluated as a function of receptor sensitivity and the potential magnitude of effects, as illustrated in Table 9.3.

Magnitude of Effect	Receptor Sensitivity		
	High	Medium	Low
Severe	Substantial	Moderate - substantial	Moderate
Medium	Moderate - substantial	Moderate	Slight
Mild	Moderate	Slight	Negligible
Minor	Slight	Negligible	Negligible

9.2.8 Effects assessed as moderate, moderate-substantial or substantial are considered significant for Environmental Impact Assessment purposes (i.e. mitigation required). Effects assessed as slight are not considered significant, although measures to reduce these to negligible should be considered where practically and economically feasible.

9.2.9 Table 9.3 does not include for coincident beneficial effects that can occur as part of a development, such as the removal or alteration of an at-risk receptor. Where relevant, such effects have been identified separately and assigned a classification of 'beneficial'.

Policy Framework

National Policy, Legislative Context and Guidance

- 9.2.10 Part 2A of the Environmental Protection Act (EPA) 1990 provides a regime for the identification and remediation of contaminated land. This is implemented by the Contaminated Land (England) Regulations 2006 (which consolidate the provisions of the Contaminated Land (England) Regulations 2000 and subsequent amendments), as amended by the Contaminated Land (England) (Amendment) Regulations 2012. This regime is designed to provide an effective statutory framework for the remediation of contaminated land and is based on a number of principles including the "suitable for use" approach and the assessment of contamination by a risk based approach.
- 9.2.11 Section 78A of Part 2A of the EPA defines contaminated land as land that is in such a condition that:
- significant harm is being caused or there is a significant possibility of such harm being caused; or
 - pollution of controlled waters is being or is likely to be caused.
- 9.2.12 The assessment of contamination risks is based on the source-pathway-receptor concept (referred to as a significant pollutant linkage). These terms are defined as follows:
- Source: A substance that is in, on, or under the land and that has the potential to cause harm or to cause pollution of Controlled Waters;
 - Pathway: A route or means by which a receptor could be, or is, exposed to or affected by a contaminant; and
 - Receptor: In general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body.
- 9.2.13 The "pollutant linkage" describes the relationship between the source, the pathway and the receptor. Each component of the pollutant linkage has to be identified as being present before land can formally be considered "contaminated".
- 9.2.14 Additional statutory guidance has been issued on the interpretation and application of Part 2A; namely "Environmental Protection Act 1990: Part 2A Contaminated Land Guidance" (DEFRA, 2012), which introduces additional concepts to assist in the assessment of potentially contaminated land, including consideration of "normal" background contaminant levels and a scheme for categorising sites using a 4 tier system when undertaking Part 2A assessments. It also defines relevant ecological receptors requiring consideration as part of Part 2A contaminated land assessments, which are restricted to sites with recognised ecological status (e.g. SSSIs, Ramsar sites, national nature reserves etc.).
- 9.2.15 Environment Agency (EA) publication "Groundwater Protection: Policy and Practice" (2012) (GP3) sets out a framework for the regulation and management of groundwater and summarises policy for the protection of groundwater resources. It also describes the requirements of the Water Framework Directive (2000/60/EC), which provides an overarching system for the protection of all inland and coastal waters.
- 9.2.16 The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 transpose requirements of European legislation with regard to surface water and groundwater quality into English and Welsh law. These regulations provide assessment criteria relevant to Priority Substances (as defined in EC Directive 2008/105/EC).
- 9.2.17 The Water Supply (Water Quality) Regulations 2000 (amended by the Water Supply (Water Quality) Regulations 2010) detail legislative requirements for drinking water quality.

Planning Policy and Guidance

- 9.2.18 The National Planning Policy Framework (2012) (NPPF) sets out the Government's planning policies for England and how these are expected to be applied and provides a framework for local planning. Section 11 "Conserving the Natural Environment" provides policy context for the redevelopment of brownfield and contaminated land. The NPPF incorporates legislative

requirements into the planning regime. It states that “as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. It specifies that the effects of redevelopment on human health and the environment should be considered by appropriate risk assessment and site investigation to “prevent unacceptable risks from pollution”.

- 9.2.19 The key difference between legislative requirements and the planning regime is that planning guidance aims to prevent future potentially significant pollutant linkages, and is thus sensitive to the proposed land use. Therefore, land developed in accordance with the planning regime (i.e. the NPPF) would often be expected to meet more stringent standards than would be required under legislative requirements alone. This Chapter has employed a methodology designed to be consistent with the requirements of the planning regime.
- 9.2.20 The EA has published extensive guidance on the practical aspects of contaminated land risk assessment, to assist practitioners in meeting both legislative and planning requirements. Of particular relevance is “Model Procedures for the Management of Land Contamination (CLR11)” (2004), which provides the technical risk management framework for assessing and dealing with land affected by contamination. The assessment provided in this Chapter has been undertaken in accordance with CLR11 where relevant. The EA also provides guidance regarding practical measures to protect Controlled Waters from contamination during construction projects within “PPG1 – General guide to the prevention of pollution”.

Local Planning Policy – Coventry Local Development Plan

- 9.2.21 The site lies within the jurisdiction of Coventry City Council. The relevant local policy document is “Coventry Development Plan” (2001), specifically policies “saved” in 2007. These include policy “EM6 Contaminated Land”. This requires that:
- Planning applications should be accompanied by an assessment of the site's contamination status. This should identify any remediation measures necessary to provide adequate protection to future users from any contamination present at the site (including potential migratory contamination, such as ground gas, from surrounding land). The proposed protective or remedial measures should either eliminate risk or minimise it to acceptable levels.
 - In situ remediation / treatment is the default preferred option over off-site removal, for sustainability reasons.
 - Development should ensure the protection of surface water and groundwater, both in the short and long term.
- 9.2.22 As a saved policy, EM6 remains relevant in local planning terms, particularly as it is compatible with the NPPF. It is considered the most informative local planning policy currently available, in the absence of any more recent relevant local planning policies.

Scoping Criteria

- 9.2.23 Consultation has been undertaken by means of obtaining a formal scoping opinion from Coventry City Council. The scoping opinion is included in Appendix 9.1. This requires that the following is addressed, either directly within the EIA or by subsequent planning conditions:
- 1) Site Characterisation: This should comprise an assessment of current site conditions and potential future risks. This Chapter aims to address this requirement for outline planning purposes, to allow any further detailed work (e.g. intrusive investigation) to be addressed by conditions as necessary.
 - 2) Submission and Implementation of a Remediation Scheme: This Chapter aims to identify the general requirements and scope of any remediation (mitigation) measures required, for the purposes of outline planning. If significant remediation work is required, then it is likely that a detailed remediation scheme would be developed following intrusive ground investigation, at a later stage.
 - 3) Reporting of Unexpected Contamination: This requirement relates to any unexpected contamination identified during the development process. As such, it can only be addressed by planning conditions, although this Chapter provides an outline basis for how unexpected contamination can be dealt with should it be encountered.

9.3 Baseline Conditions

9.3.1 The baseline conditions currently present have been taken as reflective of those at the commencement of the development.

Site Description and Context

9.3.2 The site consists of c.42 hectares of agricultural land c.4km north west of Coventry city centre. The site boundaries are formed by:

- Residential land and Bennetts Road South (to the east).
- Hall Brook (to the north).
- Woodland, agricultural fields and Tamworth Road (to the west)
- The grounds of Royal Court Hotel, a golf driving range and Sandpits Lane (to the south).

Walk-over Inspection

9.3.3 A walkover inspection was undertaken by Wardell Armstrong on 28 June 2013. This identified the site to be occupied by fourteen fields, together with several small sub-enclosures in the south. The fields have been numbered as shown on Drawing ST11713-001. The fields in the west of the site (fields 1-7) are generally in arable use, predominantly containing corn (maize). The eastern fields (fields 8-14) appear to be pasture grassland, although no livestock were present during the walkover (aside from horses in field 9). Various trees are present within the site, both at field boundaries and within fields, including several oaks (see arboricultural assessment).

9.3.4 The site has an undulating profile, with significant changes in levels within individual fields. These appear to represent the natural ground profile and no evidence of the deposition of Made Ground was encountered, although this cannot be confirmed without intrusive investigation.

9.3.5 Exposed agricultural topsoil was present in several of the fields. This consists of red-brown clayey gravelly sand (gravel of sub-rounded to rounded quartzite). The site generally appeared to be effectively drained, with little evidence of waterlogging or marshy areas, although this may vary seasonally. However, a soft marshy area was located in the south of field 9. The area concerned is shown as a pond on topographical mapping and it is apparent that this feature has either dried and silted up or been backfilled. No evidence of Made Ground backfill material was observed.

9.3.6 Ponds were identified in field 1 and on the boundary of fields 11 and 12. The pond in field 11 / 12 was largely marshy and overgrown with reeds.

9.3.7 Hall Brook was inspected as it passes field 6. It consists of a small channel with a very small, but consistent and relatively fast, water flow. The flow may be related to weather conditions, as the walkover inspection took place immediately after heavy rainfall. The water did not display visual evidence of contamination and no potential sources of contamination (e.g. fly tipped waste along the stream banks) were encountered.

9.3.8 The area directly adjacent to the south of the site is recorded on published geological mapping to be occupied by Made Ground deposits. Access to this area was limited during the walkover, due to the presence of heavily overgrown vegetation. Parts of the north of this area appear to be raised relative to field 7, potentially indicating Made Ground deposits. No evidence of vegetation stress was observed. The southern part of the area of recorded Made Ground is accessible from the adjacent Royal Court Hotel and contains several modular metal cabins, small quantities of fly tipped waste and a skip containing waste (predominantly furniture).

9.3.9 A fuel filling station and vehicle body repair shop are located approximately 70m south east of the site.

Site History

9.3.10 Historical topographical mapping for the site dating from 1888-2013 has been assessed (Appendix 9.2). This indicates that the site has remained largely unchanged since 1888, being occupied by agricultural land with a generally constant field configuration since that time. The electricity pylons are shown to have been constructed at some time between 1949 and 1954. Several ponds are recorded to be present throughout the site's history, but there is no evidence of these being

backfilled from the mapping (although, as discussed above, the pond in the south of field 9 was observed during the walkover to either have silted or been backfilled).

- 9.3.11 A small unknown rectangular feature is shown in the west of field 6 on all editions of the 1:2500 scale mapping from 1904 until 1992 (the most recent available edition at this scale). No evidence of this feature was encountered during the walkover inspection.
- 9.3.12 Historical land use in the area surrounding the site generally consists of agricultural fields and woodland, with increasing urbanisation (residential development) to the south east from the 1950s onwards. Features of note in the immediate vicinity of the site include:
- A pond adjacent to the north of the site on the 1913 mapping edition, which is shown to have been infilled by 1936.
 - Coventry and Warwickshire Hospital, which previously occupied the area immediately south of the site (currently occupied by Royal Court Hotel). This is recorded to be present on mapping from 1954, 1964 and 1970. Several tanks were associated with the hospital. It is assumed that these were above ground tanks, due to their appearance on topographical mapping. However, their former contents is unknown. The 1954 mapping edition records filter beds in the north of the hospital, directly adjacent to the south of the site. These are not shown on subsequent mapping editions. It is noted that the former location of the filter beds correlates with the overgrown slightly raised area encountered during the walkover and that geological mapping records the presence of Made Ground in this location (discussed further below).
 - A radiography unit adjacent to the west of the site; shown on mapping from the 1950s only.
 - A garage is shown c.70m south east of the site on mapping from 1972 to present (identified as a fuel filling station during the walkover inspection).
- 9.3.13 Whilst generally agricultural, historical land use in the wider area surrounding the site (i.e. up to 1km) does include some industrial processes, including a briquette works (c.500m north east of the site) and various uses associated with mineral extraction. Quarrying took place c.150m south of the site prior to 1888, with an "old stone pit" marked on the first available mapping (1888). This feature remains as a "disused quarry" on 2013 mapping, indicating that it has not been backfilled or restored. Coventry Colliery was present c.1km north of the site from 1919 until c.1999, whereafter its site was redeveloped as warehousing.

Geological and Environmental Setting

Geology

- 9.3.14 The published geological mapping does not record the presence of Made Ground at the site. An area of Made Ground is recorded directly adjacent to the south of the site, in the location of the former filter beds. Further areas of Made Ground are recorded c.500m north east of the site (location of the former briquette works) and 80m south of the site.
- 9.3.15 The published geological mapping does not record the presence of natural superficial deposits at the site. Natural superficial deposits are recorded to be present discontinuously in the area surrounding the site, primarily comprising glacial till. A small area of alluvium is recorded along the course of Hall Brook.
- 9.3.16 The solid geology at the site is recorded to consist of the Keresley Member of the Salop Formation (Carboniferous age). This is recorded to be primarily sandstone, although contains significant mudstone in some instances. Information about the general local geology is available from the BGS GeoIndex, comprising historical borehole records from the proximity of the former Coventry Colliery (c.1km north east of the site). These indicate the general geological sequence underlying the Keresley Member in the area to be Keele Beds, underlain by the Halesowen Formation and Etruria Formation. These Upper Coal Measures formations generally consists of mudstone and sandstone, and are in turn underlain by productive Middle Coal Measures strata, which in the area of the colliery are present approximately 400m below the base of the Keresley Member.
- 9.3.17 Two faults are recorded to cross the site, both trending in a south east to north west direction. These cross the west and centre of the site respectively and intersect at a point approximately 80m north of the site, (ref EnviroCheck report, Appendix 9.2).

Coal Mining

- 9.3.18 A Coal Authority mining report has been obtained for the site (Appendix 9.3), dated 29 October 2013.
- 9.3.19 Underground mining has been undertaken within past influencing distance of the site at depths of 660m to 840m associated with a single seam of coal, the last date of working being 1996. Some claims for subsidence damage made in 1997 and 1998 were met by the Coal Authority. The Coal Authority has confirmed that any claims for subsidence damage should have stopped and it is considered that the risk of future subsidence associated with historic deep mining can be sensibly discounted.
- 9.3.20 Due to the depth of the productive Middle Coal Measures strata beneath the site, shallow coal and potential opencast coal does not exist beneath the site area.
- 9.3.21 The Coal Authority has confirmed that there are no recorded mine entries within 20m of the site boundary. The closest recorded mine entry is at Coventry Colliery some 950m north-east of the site, which is reported to have been backfilled and capped.

Hydrogeology

- 9.3.22 The Keresley Member is classified by the Environment Agency as a Principal Aquifer. Principal Aquifers are high permeability units that display a significant water storage capability and may support water supply and/or river base flow on a strategic scale. The site lies within a Source Protection Zone III, which indicates that all groundwater recharge at the site is assumed to be discharged at drinking water abstraction boreholes in the area. The relevant abstraction boreholes within the vicinity of the site are:
- Watery Lane Pumping Station. This borehole is located 500m east of the site. It is operated by Severn Trent Water and is licensed for the public supply of potable water.
 - Brownhill Green borehole. This borehole is located 650m south west of the site. It is operated by Severn Trent Water and is licensed for the public supply of potable water.
- 9.3.23 There are no recorded discharge consents at the site or in close proximity (i.e. within 250m).

Hydrology and Environmental Sensitivity

- 9.3.24 The closest surface watercourse to the site is Hall Brook, which forms the northern site boundary. This emanates from a spring in Pikehorne Wood, approximately 325m north west of the site and flows along the northern site boundary in a west to east direction. Hall Brook forms part of the River Sowe / Avon catchment. Environment Agency publication "River Basin Management Plan Severn River Basin District" indicates current chemical quality in Hall Brook to be "good". This is on the basis of measurements of dissolved oxygen, pH, temperature, copper, zinc, lead, nickel, ammonia and phosphate.
- 9.3.25 There are no SSSI, Ramsar sites or nature reserves within 1000m of the site.

Landfills and Waste

- 9.3.26 The Envirocheck report indicates that there are no recorded historical or current landfills, waste transfer stations or waste treatment / disposal facilities within 1000m of the site.

Surrounding Land Use

- 9.3.27 The Envirocheck report provides an indication of potentially significant commercial / industrial activities within the area surrounding the site, by means of records of current and former Pollution Prevention and Control designations and details held within Landmark's Contemporary Trade Directory. A review of this information indicates the main processes of potential contaminative significance to be the fuel filling station and vehicle body repair shop c.70m to the south east of the site. Various other records of commercial / industrial processes are also present at greater distances from the site, including records of historical coal / coke carbonization approximately 700m to the north east (assumed to be related to the briquette works shown on historical mapping in this area).

Radon

- 9.3.28 The site is in a location where less than 1% of homes are recorded to display radon concentrations at or above the action level (200 Bq m⁻³). Due to this, it is not anticipated that radon protection measures will be required within new homes.

9.4 Key Impacts & Likely Significant Effects

- 9.4.1 An assessment of effects is presented for both the construction and operational phases. For ease of assessment with regard to published guidance, the operational phase is assessed first, followed by consideration of any additional or different effects that may be present during the construction phase.

Operational Phase – Conceptual Site Model

Sources

- 9.4.2 The identified baseline conditions (agricultural land) are considered to present a relatively low soil contamination risk. However, contamination associated with agricultural activities cannot be fully discounted, as various agricultural processes have the potential to introduce contamination. These include the application of soil improvement agents (in some historical cases, these included sewage sludge and industrial by-products) and pesticides / herbicides. Agricultural practices can also include burning, with the resulting ash potentially containing elevated contaminant concentrations (e.g. heavy metals, polycyclic aromatic hydrocarbons (PAH)). Additionally, at some agricultural sites, uncontrolled waste disposal may have occurred historically, although there is no evidence from the historical mapping and site walk-over that this was the case at this site (e.g. no significant recorded changes in the ground profile).
- 9.4.3 Field 9 is recorded to contain a pond on published mapping, but during the walkover inspection, this location was found to be occupied by a soft area that is topographically level with the surrounding ground. It is therefore apparent that the pond has either silted up or been backfilled. Any backfill material may represent a potential source of soil contamination and / or ground gas. Additionally, organic silt can also provide a potential ground gas source.
- 9.4.4 An unidentified rectangular feature is shown in the west of field 6 on all editions of the 1:2500 scale mapping from 1904 until 1992 (the most recent available edition at this scale). No evidence of this feature was encountered during the walkover inspection. The possibility that the feature may represent a source of contamination cannot be discounted.
- 9.4.5 The recorded area of Made Ground adjacent to the south of the site (associated with historical filter beds) provides a potential contamination source. The presence of filter beds suggests that previous land use in this location may have involved sewage processing / treatment. Associated Made Ground deposits have the potential to generate contaminants that may migrate onto the site (i.e. ground gas and groundwater contamination). Contaminants commonly associated with sewage deposits include ammonia and toxic metals.
- 9.4.6 Due to the historical agricultural use of the area surrounding the site, there is also the potential for localised areas of uncontrolled historical backfilling. However, there is little evidence for this from the historical mapping and no recorded landfills in the area.
- 9.4.7 All of the potential sources discussed above relate to the identified baseline conditions. These are considered to be the only relevant potential sources of contamination, as activities associated with the operational phase itself (i.e. residential occupation) would not be expected to introduce additional sources. Similarly, any potential long term sources from construction activities would be mitigated at the construction phase and would not persist into the operational phase.

Receptors

- 9.4.8 The relevant critical receptor during the operational phase in relation to human health risk from soil contamination is a female child aged 0-6. This is in accordance with Environment Agency guidance and the standard residential CSM provided in "Updated Technical Background to the CLEA Model" (2009). This represents an increase in receptor sensitivity from baseline (pre-

development) conditions, where agricultural workers and transient site users (walkers) are the only feasible human health receptors.

- 9.4.9 Two sensitive Controlled Waters receptors are present at or adjacent to the site. These are the Principal Aquifer that underlies the site (abstracted for drinking water supply in the area) and the watercourse adjacent to the north of the site (Hall Brook). Aside from aquatic life within Hall Brook (defined as a Controlled Waters receptor), no ecological receptors have been identified (i.e. no sites / designations listed as relevant ecological receptors in Part IIA guidance).
- 9.4.10 The primary receptor in relation to ground gas is considered to be human health, via accumulation of gas in enclosed spaces (e.g. within buildings) leading to explosion or asphyxiation.
- 9.4.11 Other potential receptors at the operational stage include buried concrete and below ground water supply pipes, both of which have the potential to be affected by the surrounding soil chemistry.

Pathways

- 9.4.12 Whilst potential sources and receptors of contamination have been identified in relation to the operational phase, in order for a potential contamination risk to be identified, it is essential that a viable pathway for contamination from the source to reach the receptor exists.
- 9.4.13 The following potential exposure pathways exist in relation to human health risk from soil contamination during the operational phase: direct soil and indoor dust ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils and indoor dust, inhalation of indoor and outdoor dust and vapours.
- 9.4.14 The potential pathways associated with risks to Controlled Waters are:
- Leaching of contamination to the underlying Principal Aquifer (sandstone).
 - Groundwater flow within the Principal Aquifer to Hall Brook and / or nearby drinking water abstractions.
 - Surface run off to Hall Brook.
- 9.4.15 The potential pathways associated with ground gas are lateral migration through high permeability deposits (e.g. sandstone) and vertical migration into buildings.
- 9.4.16 The potential pathways associated with risks to buried concrete and water supply pipes are the generation of contaminated leachate within the unsaturated zone and direct contact with these structures.

Operational Phase Impacts

Human Health

- 9.4.17 The 'receptor sensitivity' criterion for human health impacts has been assessed as 'high', in accordance with Table 9.1. The identified potential sources indicate that the potential for soil contamination concentrations to be present that may present a long term (chronic) human health risk is low, due to the nature of the historical land use and the absence of any recorded deposits of Made Ground or historical activities that would be expected to generate significant quantities of Made Ground. However, as discussed, soil contamination from agricultural activities cannot entirely be discounted, and therefore a 'magnitude of effects criterion' of 'mild' has been assigned. In accordance with Table 9.2, this provides an overall potential impact of **moderate**.

Controlled Waters

- 9.4.18 The receptor sensitivity in relation to groundwater has been assessed as 'high', as the site is within a Source Protection Zone for potable groundwater abstractions from an aquifer of national / strategic importance. Whilst there are direct pathways for any site-derived contamination to reach the aquifer, the potential for a significant source to be present is considered to be low. However, due to the historical agricultural activities it cannot entirely be discounted, hence the 'magnitude of effects' criterion has been assessed as 'mild'. This provides an overall potential impact of **moderate**.

- 9.4.19 The receptor sensitivity in relation to surface water has been assessed as 'medium', as Hall Brook is a minor watercourse that displays good chemical quality, but is of limited potential in supporting aquatic ecosystems (the Environment Agency classifies the current ecological quality as "poor", primarily on the basis of the quantity and dynamic of flow). Similarly to above, the 'magnitude of effects' criterion has been assessed as 'mild'. This provides an overall potential impact of **slight**.

Ground Gas

- 9.4.20 The receptor sensitivity in relation to ground gas has been classified as 'high' and the 'magnitude of effects' criterion as 'severe', as the potential effects of ground gas include acute risks to human health (i.e. explosions in occupied buildings or asphyxiation). This would provide an overall potential impact of substantial. However, although the impact would be substantial if an adverse effect did occur, the probability of such an effect occurring is considered to be low (due to the nature of the potential gas sources identified). Therefore, professional judgement has been used to determine an overall potential impact assessment of **moderate**.

Water Supply Pipes

- 9.4.21 The receptor sensitivity in relation to water supply pipes has been classified as 'high' due to the direct relevance of water quality in supply pipes to human health. The identified potential sources indicate that the potential for soil contamination to be present that may pose a risk significant risk of contaminant leaching into water supply pipes is low. However, as discussed, soil contamination from agricultural activities cannot entirely be discounted, and therefore a 'magnitude of effects' criterion of 'mild' has been assigned. This provides an overall potential impact of **moderate**.

Underground Concrete Structures

- 9.4.22 The receptor sensitivity in relation to underground concrete structures has been classified as "low", in accordance with Table 9.1. As defined in Table 9.2, the 'magnitude of effects' criterion for effects on underground concrete is classified as 'mild'. This provides an overall potential impact of **negligible**. Nevertheless, as a matter of construction quality, structures should be designed to be appropriate for the ground conditions throughout their design life (i.e. a concrete specification appropriate for the ground conditions should be used).

Construction Phase Impacts

Human Health

- 9.4.23 The critical human health receptor in relation to construction phase impacts is construction workers. In accordance with Table 9.1, the receptor sensitivity has been classified as 'high'. Although the potential exposure duration for construction workers is limited, the nature of their activities (i.e. close contact with soil, dust etc.) promotes the likelihood of a source-pathway-receptor linkage. Therefore, the presence of construction workers represents an increase in receptor sensitivity from baseline (pre-development) conditions, where agricultural workers and transient site users (walkers) are the only feasible human health receptors.
- 9.4.24 Generally, the previous site use indicates that the potential for soil contamination that may present acute health risks is very low. The historical use of the site also provides little potential for soil contamination concentrations to be present that may present a long term (chronic) human health risk. Whilst this cannot be entirely discounted (due to the historical agricultural land) use, the risk would be further reduced by the use of standard Personal Protective Equipment (PPE). Nevertheless, as a precautionary approach, and in accordance with Table 9.2, the 'magnitude and probability of effects' criterion for risks to construction workers has been classified as 'mild'. This provides an overall potential impact of **moderate**.

Controlled Waters

- 9.4.25 The receptor sensitivities for groundwater (Principal Aquifer) and surface water (Hall Brook) are classified as 'high' and 'medium' respectively, as discussed in the Operational Phase assessment above.
- 9.4.26 Ground disturbance during development activities provides an increased potential for the leaching of contamination to surface water and groundwater. Whilst the potential for chemical

contamination at the site appears to be low based on the desk study and walk-over information, physical contaminants (i.e. suspended solids) may present a risk, particularly to surface water. The extent of this risk will depend on the nature of the development activities, with operations involving bulk earthworks or piling the most likely to cause a potential impact. The 'magnitude of effects' criterion has been conservatively assessed as 'medium', to allow for the full range of likely development operations. However, if development is relatively non-disruptive (i.e. shallow foundations and limited regrading) then a classification of 'mild' would be more appropriate. Furthermore, it should be noted that the level of potential effects is likely to decrease within the site with distance from the brook, and that potential effects may be significantly lower at points of the site remote from the brook.

- 9.4.27 The classifications determined above provide an overall potential impact of **moderate-substantial** for groundwater and **moderate** for surface water.

Ground Gas

- 9.4.28 The receptor in relation to ground gas is human health, which is classified as a 'high' sensitivity receptor.
- 9.4.29 It is assumed that any construction compounds will be lightweight modular buildings with solid metal floors. The potential for gas ingress into such buildings is low. However, in the unlikely event of significant gas accumulation, the potential effect (asphyxiation / explosion) is severe, hence the 'magnitude of effects' criterion has been assessed as 'severe'. Together with the high receptor sensitivity, this would provide an overall potential impact of substantial. However, the potential for an adverse effect (asphyxiation / explosion) occurring is considered to be low, given the nature of the potential gas sources identified and the low possibility of significant gas ingress into modular compound buildings. To account for this, professional judgement has been applied to provide an overall potential impact assessment of **slight**.
- 9.4.30 Construction workers also present a potential receptor for ground gas, due to the possibility of gas accumulation within excavations / trenches. However, it is anticipated that this can be addressed by the use of appropriate Confined Spaces working procedures and PPE, so does not affect the overall potential impact assessment provided above.

Potential Impacts Associated With Construction Activities

- 9.4.31 The assessment of potential construction phase impacts provided above is based on pre-existing potential contamination sources at / around the site (i.e. information identified from the baseline conditions assessment). However, the potential for construction activities to introduce new sources of contamination also exists.
- 9.4.32 This can occur due to the storage and / or spillage of fuels and other chemicals used during the construction process. Inappropriate fuel storage / use can present a significant risk to the environment and potential risk classifications associated with these sources are as follows:
- Human health (skin contact, ingestion, inhalation): **Substantial** (high receptor sensitivity and severe magnitude of effects).
 - Controlled Waters (leaching to groundwater etc.): **Substantial** (high receptor sensitivity and severe magnitude of effects).
 - Controlled Waters (Hall Brook): **Moderate-substantial** (medium receptor sensitivity and severe magnitude of effects).
- 9.4.33 Mitigation measures will be required with respect to fuels and other potentially hazardous chemicals to ensure that the construction phase does not introduce new contamination sources that lead to the potential effects on receptors indicated above. This would include the preparation of a Construction Environmental Management Plan.

Cumulative Impacts

- 9.4.34 The only potential cumulative effects are those that relate to mobile contaminants i.e. ground gas and groundwater / surface water contamination. The gas generation risk from the site is considered to be low and therefore the potential for the development to contribute to cumulative effects associated with ground gas is considered negligible.

- 9.4.35 The potential for cumulative effects on water quality in the Principal Aquifer or Hall Brook is considered to be low. This is due to (i) the relatively low potential for significant contamination sources at the site, (ii) the surrounding land use, which is unlikely to provide high contaminant / sediment inputs, (iii) the current recorded water quality in Hall Brook ('good'), (iv) the absence of recorded commercial / agricultural discharges to Hall Brook in the vicinity of the site.

9.5 Mitigation, Enhancement and Residual Effects

Operational Phase Mitigation – Human Health

- 9.5.1 The potential human health effects during the operational phase have been assessed as moderate. Prior to any mitigation, it is recommended that an intrusive site investigation is undertaken. This should include chemical testing of soils for a range of commonly occurring contaminants, including those associated with agricultural activities. The investigation should incorporate testing from across the site, with specific focus on potential point sources of contamination identified from the baseline conditions (e.g. the former pond in Field 9, ground adjacent to the former filter beds etc.).
- 9.5.2 The design of this site investigation should be agreed with the Local Authority in advance. The results should be assessed against relevant published generic assessment criteria (e.g. Soil Guideline Values published by the Environment Agency) and, if necessary by detailed quantitative risk assessment. Should this process identify that soils at the site do not present a potential risk to human health, then the potential for an impact can be effectively discounted (i.e. impact assessment revised to **negligible**) and no mitigation will be required.
- 9.5.3 However, should this process identify a potential human health risk then an appropriate remediation strategy should be determined and agreed with the Local Authority. Based on the currently available information (i.e. potential impact of moderate), then it is considered likely that mitigation measures comprising localised placement below clean cover and / or impermeable surfacing may be a sufficient strategy. However, this should be confirmed following the site investigation.

Operational Phase Mitigation – Controlled Waters

- 9.5.4 The site investigation should also include an assessment of any sources of contamination to Controlled Waters (e.g. leachability testing, particularly on any Made Ground deposits identified). The quality of groundwater within the Principal Aquifer is also likely to require assessment by groundwater chemical testing. Borehole locations for this purpose should take account of the identified off-site potential contamination source (Made Ground to the south of the site), the location of the former pond (Field 9) and any areas of Made Ground identified during the site investigation.
- 9.5.5 Should this investigation indicate that the site does not present a significant risk to Controlled Waters, then the potential for an impact can be effectively discounted (i.e. impact assessment revised to **negligible**) and no mitigation will be required.
- 9.5.6 However, should the investigation identify a potential significant risk, then specific mitigation measures will be determined, based on the nature and severity of the contamination. Based on currently available information (which indicates a relatively low risk of significant contamination), it is considered that localised selective re-use (e.g. beneath hardstanding) or excavation and treatment / removal would be the most likely mitigation options in instance. However, this should be appraised in detail following the ground investigation, and the potential for more extensive mitigation (e.g. chemical treatment of any pre-existing groundwater contamination) cannot be discounted.

Operational Phase Mitigation – Ground Gas

- 9.5.7 Due to the identified potential for a moderate impact from ground gas, it is recommended that intrusive site investigation and gas monitoring is undertaken to specify precise mitigation requirements. The number and locations of boreholes should be designed in accordance with the identified potential gas sources (including the potential for gas migration from Made Ground deposits located to the south of the site) and the recommendations of relevant guidance (e.g. CIRIA 665 'Assessing risks posed by hazardous ground gases to buildings' and BS8576:2013 'Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)'). Following an appropriate period of gas monitoring (in accordance with the published guidance), the data will be used to determine specific mitigation measures. Based on the currently available information, the likely scope may range from no gas protection to the installation of passive gas protection into new buildings (gas membranes, passively vented sub-floor voids etc.).
- 9.5.8 An additional mitigation measure that may be implemented if necessary is the localised removal of any material with a high gas generation capacity (e.g. pond sediments) during the redevelopment.

Operational Phase Mitigation – Water Supply Pipes

- 9.5.9 Should the site investigation identify significant soil contamination at the site, then the location of water supply pipes will require consideration. If it is necessary / preferred to place water supply pipes within, or directly below, deposits affected by contamination, then mitigation may be necessary comprising the use of specialist pipes and / or clean services trenches, in order to prevent the ingress of contamination. In this instance the precise pipe specification should be determined via chemical testing in accordance with the recommendations of UKWIR publication 'Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites', and approved by the service provider prior to installation.

Construction Phase Mitigation – Human Health

- 9.5.10 As discussed above, it is likely that potential risks to construction workers can be effectively managed via the use of appropriate standard PPE and therefore will require no mitigation measures beyond basic operational health & safety considerations. These should include contingency / emergency procedures for the potential that unexpected contamination is identified (e.g. asbestos, waste oils etc.), although given the historical use of the site this is considered relatively unlikely.

Construction Phase Mitigation – Controlled Waters

- 9.5.11 Should the site investigation identify the presence of significant leachable contamination, then mitigation will be required to ensure that this does not cause an adverse impact during the construction phase. The disturbance of soils during the construction phase may lead to temporary increases in the leachability of contamination and leachate generation. Should a significant potential risk be identified, then mitigation will be via a Construction Environmental Management Plan. Depending on the nature and extent of any contamination present, and details of the redevelopment scheme (e.g. extent of re-profiling earthworks), elements contained within the EMP may include:
- Segregation of any material identified to present a specific risk on impermeable sheeting, for future selective re-use, on-site treatment or off-site disposal.
 - Topsoil stripping in any areas identified as a potential risk to directly precede any excavations, to minimise the time that ground surfaces are exposed for.
 - Good practice during earthworks / excavations to minimise leaching, including compaction of exposed surfaces.
 - Managed temporary surface drainage (ditches, temporary impoundment ponds) to control surface run-off. This can assist in managing both the chemical quality of construction water and the suspended solids load. Options for re-use or discharge of surface water include dust suppression or release to Hall Brook (under a Discharge Consent). The protection of water quality, including suspended sediment, in Hall Brook is likely to be a relevant concern during the construction phase and monitoring may be required throughout this phase, depending on the nature of the development works.

- The control of any earthworks or material movements under appropriate Environmental Permits, exemptions or CL:AIRE "The Definition of Waste: Development Industry Code of Practice" (2011).

Construction Phase Mitigation – Ground Gas

- 9.5.12 Given the nature of the potential gas sources and common construction details of construction compound buildings (i.e. temporary cabins), it is considered unlikely that additional specific mitigation will be necessary during the construction phase. This should be confirmed prior to the construction phase, based on the outcome of gas monitoring from boreholes during the intrusive investigation.

Construction Phase Mitigation – Use and Storage of Fuels and Chemicals

- 9.5.13 Construction activities present the potential for additional contamination sources, with the potential to affect human health and Controlled Waters via the spillage or inappropriate storage of chemicals (e.g. fuels). These risks are not abnormal for a construction project and can be mitigated by good construction health and safety / management procedures. The specific details of these should be determined by occupational health and safety specialists and will be specified in site health and safety documentation prior to the construction phase (e.g. a Pollution Incident Control Plan). For the purposes of this assessment, an overview of the likely requirements is considered sufficient.
- 9.5.14 The scope of the protective / mitigation measures is likely to include:
- Appropriate training of site personnel in the handling and use of potentially dangerous substances, and associated risks;
 - Preparation of method statements for the handling and use of chemicals / fuels;
 - Use of adequate PPE;
 - Appropriate environmental management at fuel storage locations (e.g. in accordance with *The Control of Pollution (Oil Storage) Regulations 2001* and Environment Agency PPG2 "Above Ground Oil Storage Tanks"); and,
 - Identification of contingency / emergency measures to minimise / negate effects in the event of spillages.
- 9.5.15 Mitigation measures will ensure that the development complies with the requirements of Environment Agency PPG1 "General Guide to the Prevention of Water Pollution". This provides a significant degree of overlap with the construction phase Controlled Waters mitigation measures discussed above.

Potential Risks from Unexpected Contamination

- 9.5.16 The possibility for unexpected contamination to be identified during the construction phase exists, although this will be minimised by appropriate pre-construction site investigation. The requirement to adequately identify and address any unexpected contamination during the development has been highlighted in Coventry City Council's Screening Opinion. As unexpected contamination only becomes apparent once construction work has commenced, it is anticipated that this matter will be dealt with as a post-commencement condition. However, the general principles for dealing with unexpected contamination will be as follows:
- Identification of any suspicious materials by site management.
 - Isolation of affected area and assessment by a suitably qualified environmental professional, including the laboratory analysis of soil and / or water samples.
 - Determination of the potential level of risk and identification of an appropriate mitigation strategy, to be approved by the relevant regulatory authorities (e.g. Local Authority). Mitigation measures should be developed in accordance with the 'waste hierarchy', with treatment and retention of material on-site favoured over off-site disposal. The Construction Environmental Management Plan would be reviewed and updated at this stage, to account for the material encountered.
 - Validation of any mitigation work, to confirm that the unexpected contamination has been adequately mitigated. Validation data should be reported to the Local Authority.

Residual Effects

- 9.5.17 No significant residual effects have been identified. However, a slight level of residual risk exists in relation to the use / storage of fuels during the construction phase. This is because the risk of accidental spillage of fuels / chemicals cannot be completely removed. However, the mitigation measures will reduce the potential for this as far as reasonably practical, in accordance with current guidance and best practice. Therefore, the residual effect, which is assessed as **slight**, is considered acceptable.

9.6 Summary

Introduction

- 9.6.1 A ground conditions environmental impact assessment has been undertaken, specifically in relation to potential impacts on human health from soil contamination, risks from ground gas, and potential effects on Controlled Waters receptors. The assessment has been undertaken in accordance with relevant planning and technical guidance (e.g. Environment Agency "Model Procedures for the Management of Land Contamination (CLR11)" (2004)).
- 9.6.2 The assessment constitutes a Tier 1 Contaminated Land Risk Assessment. This includes the determination of a CSM (determination of potential sources, pathways and receptors) and a risk assessment based on the sensitivity of receptors and the potential magnitude of effects. Potential impacts have been assigned significance criteria based on the risk assessment.

Baseline Conditions

- 9.6.3 The site consists of approximately 49 hectares of agricultural land. It has been used for this purpose since at least 1888. The potential for on-site contamination sources is low. However, contamination associated with agricultural use and related activities (e.g. infilled ponds) cannot be entirely discounted.
- 9.6.4 The primary potential source of contamination identified on surrounding land is a recorded area of Made Ground directly adjacent to the south, possibly associated with historical filter beds in this location.
- 9.6.5 Made Ground is not recorded to underlie any part of the site. The agricultural soils are recorded to be directly underlain by sandstone (Keresley Member of the Salop Formation) which is classified as a Principal Aquifer. The site is within a Source Protection Zone 3, with two potable groundwater abstractions located within 650m. A stream (Hall Brook) is located adjacent to the north of the site.

Likely Significant Effects and Mitigation Measures

9.6.6 The potential significant effects identified and recommended mitigation measures are summarised in Table 9.4. It should be noted that many of the classifications of potential effects are precautionary, as there is a relatively low probability that significant contamination sources exist at the site. However, as this cannot be discounted without intrusive investigation, this precautionary approach is considered appropriate. The classifications should be reviewed following intrusive investigation. If this indicates the absence of significant contamination sources then the mitigation measures can be reduced / removed accordingly.

Table 9.4: Summary of Impact Assessment and Mitigation Measures

Operational Phase					
Receptor	Assessment of Effects Without Mitigation	Mitigation Required?	Mitigation Measures	Residual Effects	Notes
Human health (residential users)	Moderate	Contingent on findings of site investigation.	To be confirmed following site investigation. Appropriate mitigation options may include localised placement of clean cover and / or re-use of soil below impermeable surfacing.	Negligible	Mitigation only required if intrusive ground investigation identifies a significant potential source of contamination.
Controlled Waters	Moderate (Principal Aquifer) Slight (Hall Brook)	Contingent on findings of site investigation.	To be confirmed following site investigation. Appropriate mitigation options may include localised selective re-use (e.g. beneath hardstanding) or excavation and treatment / removal.	Negligible	Mitigation only required if intrusive ground investigation identifies a significant potential source of contamination, or significant pre-existing groundwater contamination.
Ground Gas	Moderate	Contingent on findings of site investigation.	To be confirmed following site investigation and gas monitoring. Mitigation requirements may range from no gas protection to the installation of passive gas protection into new buildings (gas membranes, passively vented sub-floor voids etc.).	Negligible	
Water supply pipes	Moderate	Contingent on findings of site investigation and proposed depths and locations of supply pipes.	To be confirmed following site investigation and detailed development proposals. Mitigation requirements may comprise the use of specialist pipes and / or clean services trenches.	Negligible	Mitigation only required if significant source of leachable contamination identified and proposed depths of supply pipes are within / in close proximity to this material.
Underground concrete	Negligible	No	N/A	Negligible	Appropriate sulphate resistant concrete classification to be used.
Construction Phase					
Receptor	Assessment of Effects Without Mitigation	Mitigation Required?	Mitigation Measures	Residual Effects	Notes
Human health (construction workers)	Moderate	Contingent on findings of site investigation.	To be confirmed following site investigation. It is likely that no specialist mitigation beyond standard operational health & safety will be required. These should include contingency / emergency procedures for the potential that unexpected contamination is identified (e.g. asbestos, waste oils etc.), although given the historical use of the site this is considered relatively unlikely.	Negligible	
Controlled Waters	Moderate-substantial (Principal Aquifer) Moderate (Hall Brook)	Contingent on findings of site investigation.	To be confirmed following site investigation and details of any regrading earthworks. Mitigation measures may include segregation of higher risk materials, earthworks processes to minimise leaching, and surface water management measures.	Negligible	
Ground Gas	Slight	No – contingent on findings of site investigation.	To be confirmed based on the outcome of gas monitoring from boreholes during the intrusive investigation and once details of construction phase buildings are known.	Negligible	Appropriate Confined Spaces working procedures should be considered when working in trenches and excavations.
<p>Note: Construction activities provide the potential for additional contamination sources with significant potential effects to human health and Controlled Waters that are not listed in the above table. Depending upon the receptor in question (i.e. human health, Controlled Waters etc.) these effects have been assessed as having either a moderate-substantial effect or a substantial effect without mitigation. Following mitigation measures (to include various construction phase occupational health and safety measures) the effects will be decreased to "slight". This level of residual effect has been assessed as acceptable.</p>					