# CALDECOTE FARM

NEWPORT PAGNELL · MILTON KEYNES

CHAPTER 7.0

*ENVIRONMENTAL STATEMENT*

# GEOLOGY, SOILS AND GROUNDWATER

JULY 2021

newlands developments

# 7.0 GEOLOGY, SOILS AND GROUNDWATER

# 7.1 INTRODUCTION

7.1.1 This chapter assesses the impact of the Proposed Development in terms of Ground Conditions and Contamination. It considers the potential effects of the proposed construction and operational activities on the Site and local surroundings with respect to the geotechnical and environmental conditions.

7.1.2 This chapter is supported by Appendix 7.1–, Geotechnical and Geo-environmental Ground Investigation by RSK on behalf of Roxhill Developments Ltd, reference: 313114-01 (01), dated October 2015 and Appendix 7.2 – Geotechnical and Geo[1] environmental Ground Investigation Phase 2, by RSK on behalf of Roxhill Developments Ltd, reference: 313114-02 (01), dated July 2018 that are both reports produced by the previous applicant to support previous applications made in respect of the Site.

# 7.2 PLANNING POLICY CONTEXT

## Legislation and Regulation

7.2.1 The relevant legislation, policy and guidance are listed below:

## Legislative Framework

7.2.2 The applicable legislative framework for geology and soils is summarised as follows:

- Part IIA of the Environmental Protection Act, (1990), describes a regulatory role for Local Authorities in dealing with contaminated land;
- Environment Act, (1995), creates a system whereby Local Authorities must identify and if necessary, arrange for the remediation of contaminated sites. The provisions are set out in Section 57, which inserts Part IIA into the Environmental Protection Act, 1990. In addition to these requirements, the operation of the regime is subject to regulation and statutory guidance;
- Contaminated Land (England) (Amendment) Regulations (2012) provide a definition of what constitutes 'contaminated land' and sets out the responsibilities of the Local Authority and the EA in the identification and management of contaminated land. Under the Regulations, contaminated land is defined as:
  *"land which is in the opinion of the Local Authority to be in such a condition by reason of substances in or under the land that:*
  - Significant harm is being caused or there is significant possibility of significant harm being caused; and
  - Significant pollution of controlled waters is being caused or there is a significant possibility of significant pollution of controlled waters being caused".

7.2.3 Harm is defined in relation to harm to the health of living organisms or other interference with the ecological systems of which they form a part, and in the case of man includes harm to property. The potential for harm to occur requires three conditions to be satisfied:

- Presence of substances (potential contamination/pollutants) that may cause harm (source of pollution);
- The presence of a receptor which may be harmed e.g. the water environment or humans, buildings, fauna and flora (the receptor); and
- The existence of a linkage between the source and receptor (the pathway).

7.2.4 Therefore, the presence of measurable concentrations of contaminants within the ground and subsurface environment does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm.

7.2.5 The nature and importance of both pathways and receptors which are relevant to a particular site will vary according to the intended use of the site, its characteristics, and surroundings.

7.2.6 Construction (Design and Management) Regulations (2015) make explicit duties that exist under the Health and Safety at Work Act (1974) and the Management of Health and Safety at Work Regulations (1999). This requires a client to use their influence to ensure that the arrangements made by other duty holders are sufficient to safeguard the health and safety of those working or those affected by specific work.

## National Policy and Guidance

7.2.7 Paragraph 118 c) of the National Planning Policy Framework 2018, states that Planning policies and decisions should "give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land". Paragraphs 178 and 179 set out the National Planning Policy regarding land contamination, and state:

*"Planning policies and decisions should also ensure that:*

- *A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);*
- *After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *Adequate site investigation information, prepared by a competent person, is presented.*

*Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner".*

7.2.8 It is the developer's responsibility to ensure that the site is suitable for use. As a minimum standard the Site should not be capable of being classified as Contaminated Land under Part 2A of the Environment Act 1990 and the developer should provide a Phase 1 desk study and Site walkover to support a planning application. The reports should be prepared by a "competent person" defined as a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation.

## Guidance

7.2.9 Whilst not specifically referenced within this report, the principles and guidance documented within the following reports has been used:

- British Standards Institution (BSI): BS 10175:2011+A2:2017, (2017), Investigation of Potentially Contaminated Sites, Code of Practice;
- British Standards Institution (BSI): BS 5930:2015+A1:2020, (2020), Code of Practice for Ground Investigations;
- British Standards Institution (BSI): BS 8485:2015+A1:2019, (2019), Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments;
- British Standards Institution (BSI): BS 8576:2013, (2013), Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs);
- British Standards Institution (BSI): BS EN 1997-1:2004, (2004), Eurocode 7: Geotechnical Design – Part 1: General Rules;
- British Standards Institution (BSI): BS EN 1997-2:2007, (2007), Eurocode 7 Geotechnical Design – Part 2: Ground Investigation and Testing;
- Environment Agency Report, Land Contamination Risk Management (2020);
- Construction Industry Research and Information Association (CIRIA) Report C665, (2007), Assessing Risk Posed by Hazardous Ground Gases to Buildings;
- Construction Industry Research and Information Association (CIRIA) Report C741, (2015), Environmental Good Practice on Site 4th Edition;
- Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice Version 2, (2011);
- Environment Agency Science Report SC050021/SR2, (2009), Human Health Toxicological Assessment of Contaminants in Soil;
- Environment Agency Science Report SC050021/SR3, (2009), Updated Technical Background to the CLEA Model, 2009;
- Environment Agency Science Report SC050021/SR4, (2009), CLEA Software (Version 1.06) Handbook; and
- Environment Agency, The Environment Agency's approach to groundwater protection February 2018 Version 1.2.

## Local Planning Policy

7.2.10 Paragraph 12.30 of the Milton Keynes Council Plan (2019) states that:

- The council will encourage proposals for the development and reuse of land that may be contaminated in line with national planning policy and the 1995 Environment Act.
- When considering proposals on land which may be contaminated, the Council will need to assess whether development would be suitable (based on the type of contamination) and whether there are likely to be any unacceptable risks to health or to the environment that may arise from remedial works or proposed use of the site. For permission to be granted, the Council will need to be satisfied that there will be no unacceptable risks..
- The responsibility for decontamination rests with the developer or owner. After remediation, land should not be capable of being classified as contaminated land under Part 2A of the Environmental Protection Act (1990).
- The Council will normally require developers to undertake a full investigation to establish the level of contamination in soils and/or groundwater/surface waters on such sites and undertake the necessary remediation measures, if necessary by imposing conditions on planning permissions. Where required planning applications must be accompanied by a full survey of the level of contamination and proposals for remediation measures. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures, in particular BS 10175:2011+A1:2013: Investigation of potentially contaminated sites and the Environment Agency's 'Model Procedures for the Management of Land Contamination CLR 11' (now superseded by Land Contamination Risk Management, 2020).

# 7.3 ASSESSMENT METHODOLOGY

7.3.1 This section presents the methodology used to assess the potential effects of ground conditions, contamination and soil quality at the site. Where potentially significant receptors exist beyond site boundaries, they have been considered within this assessment.

7.3.2 The assessment will take form of a Conceptual Site Model (CSM) with respect to contamination which will be produced in accordance with current guidance. The CSM will be produced with available data with uncertainty and limitations recognised.

## Magnitude of Impact

7.3.3 The criteria for assessing the magnitude of predicted impact are presented in Table 7.1 below.

**Table 7.1 Criteria for assessing magnitude of impact on receptors**

| Magnitude | Impact |
|---|---|
| High | A fundamental change to location, environment or species |
| Medium | A material but non-fundamental change to location, environment or species |
| Low | A detectable but non-material change to location, environment or species |
| Negligible | No detectable or material change to location, environment or species |
| No Impact | No Impact |

## Sensitivity of receptors

7.3.4 Assessment of potentially significant effects on receptors will consider the sensitivity of the receptors. Significant effects will be identified based on a source-pathway-receptor model. Sensitive receptors are defined as living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminants.

7.3.5 The following receptors have been identified as potentially being impacted by the proposed development.

**Table 7.2 Potential Receptors and Sensitivity**

| Sensitivity | Receptor |
|---|---|
| High | Future site users and construction workers |
| Medium | Water utility pipes, Secondary A Aquifer |
| Low | Tongwell Brook (126m north west), Surface water feature (249m east) |
| Negligible | Site won soils |

## Assessment of Significance

7.3.6 By considering the importance of the receptor with the scale of the effect and significance of the effect can be assessed by using the matrix presented in Table 7.3.

**Table 7.3 Matrix for determining the significance of effect**

| | Sensitivity of Receptor | | | |
|---|---|---|---|---|
| | High | Medium | Low | Negligible |
| High | Major | Major | Moderate | Negligible |
| Medium | Major | Moderate | Minor to Moderate | Negligible |
| Low | Moderate | Minor to Moderate | Minor | Negligible |
| Negligible | Negligible | Negligible | Negligible | Negligible |

## LIMITATIONS TO ASSESSMENT

7.3.7 The intrusive investigations only sample a small proportion of soils and unforeseen ground conditions may be present on site. Due to the un-investigated areas of the site, there may be undisclosed ground conditions which have not been taken into account by reports.

# 7.4 BASELINE CONDITIONS

## Site Setting

7.4.1 The site comprises a triangular shaped plot of land covering 16 hectares of agricultural land. An area of Made Ground is present at the access to the site, with occasional mounds present across the site.

7.4.2 Surrounding land uses include the M1 with commercial and residential developments to the west, the A244 to the north, agricultural fields to the south and a sand and gravel quarry with agricultural fields beyond to the east.

7.4.3 The site is set within a Nitrate Vulnerable Zone.

## Site History

7.4.4 The site has remained relatively undeveloped up until 2012 except for an addition of a drainage ditch extending into the centre of the site in 1971.

7.4.5 In 2012, signs of quarrying and ground workings were identified within the northern and central region and from 2014, excavations, tracks and settling ponds were mapped in the south, with excavations in the north were mapped as backfilled.

7.4.6 Surrounding land uses included a sewage works, allotment gardens and M1 motorway to the west.

## Regulatory Review

7.4.7 Milton Keynes Council approved planning permission for the development of sand and gravels extraction from site in March 2003. The proposed restoration of excavations details filling using inert fill, landfill waste and in-situ overburden of which 75% should be natural waste and 25% should be builders waste.

## Geology

7.4.8 Published ground conditions indicate the site to be underlain by the Felmersham Member (sands and gravels) covering most of the site, with Head Deposits and Glaciolacustrine Deposits mapped in the south western corner of the site. Bedrock is indicated to comprise the Kellaways Formation (mudstone) across the majority of the site, with a small area of Cornbrash Formation (limestone) indicated in the north western corner and a small strip of the Peterborough Member (mudstone) in the south west corner.

7.4.9 Ground conditions encountered during the intrusive ground investigation comprised a varying thickness of Made Ground (up to 4.9m deep) over the Felmersham Member and/or Glacial Deposits, overlying the Kellaways Formation and/or Peterborough Member encountered at depth.

7.4.10 Topsoil was recorded within all but two intrusive locations.

## Hydrogeology and Hydrology

7.4.11 The Environment Agency (EA) classifies the Kellaway Formation and the Felmersham Member as Secondary A Aquifers.

7.4.12 The Peterborough Member is classified as an unproductive stratum whilst the Glaciolacustrine Deposits and Head Deposits are classified as a Secondary Undifferentiated Aquifer.

7.4.13 The nearest identified surface water feature to the site is Tongwell Brook located approximately 126m to the north of the site noted to be flowing from south west to north west. An unnamed additional surface water feature is located 249m to the east of the site.

7.4.14 Groundwater was encountered within six locations within the Made Ground and in one location within the Felmersham Member at depths between 0.90m and 2.90m bgl during the ground investigation. Groundwater was encountered in the majority of boreholes during the post investigation monitoring period, recorded predominantly within the Made Ground. Groundwater flow was indicated to be in a northerly direction towards Tongwell Brook.

## Ground Gasses

7.4.15 Four rounds of ground gas monitoring were conducted over the two investigations. Low levels of carbon dioxide were recorded (<4.6%) and flow rates were recorded at a maximum of 3.1l/hr. Methane was not recorded above the limits of detection.

7.4.16 Based on a maximum gas screening value (GSV) of 0.1426l/hr given for the site, the site has been characterised as CS1.

## Contamination Assessment

7.4.17 No visual or olfactory evidence of contamination was recorded during the intrusive ground investigation.

7.4.18 No significant pollutant linkages were identified in the context of soil contamination in the context of a commercial development. Trace Asbestos was recorded in only one location, therefore the risk to human health was considered negligible, and specific mitigation measures were not considered to be required.

7.4.19 Leachate and groundwater analysis did not identify the presence of significant concentrations of contaminants and it was considered that the risk to controlled waters is considered low to negligible.

## Geotechnical Assessment

7.4.20 Given the depth of Made Ground across the site, a piled foundation was considered to be the preferable founding option.

7.4.21 In accordance with BRE Special Digest recommendations 'Concrete in Aggressive Ground' (2005), the conditions of the soils at the site would be classified as Design Sulphate Class DC-5 and ACEC Class AC-5 when considering the most appropriate type of concrete to be used to resist chemical attack.

# 7.5 POTENTIAL IMPACTS

## Construction Phase

7.5.1 During the construction phase, stripping of Topsoil from the site has the potential to lead to permanent, direct, minor adverse effect through damage to soil structure and potential loss of Topsoil. There is also the potential for a permanent, direct, minor, adverse effect through compaction of shallow soils by construction traffic.

7.5.2 There is potential for the use of machinery and plant associated with construction activities to have a short to medium term, direct, permanent or temporary risk to soils and groundwater from contaminants through accidental fuel/oil spills and leaks, lubricants or inappropriate storage of chemicals or fuels.

7.5.3 No significant pollutant linkages were identified in the context of soil contamination from the development site.

7.5.4 Unanticipated contamination in soils may be present in areas of the site not previously investigated, which may represent a potential risk to human health or controlled waters.

7.5.5 The use of machinery and plant associated with earthworks and construction activities (including the establishment of a construction compound) could give rise to risk to soils, groundwater, and surface water features from contaminants through accidental fuel/oil spills and leaks, storage of chemicals or fuels.

7.5.6 The sensitivity of construction workers and controlled waters receptors is high and medium respectively and the impact magnitude, prior to mitigation, is low. There is likely to be a direct, adverse temporary effect of minor to moderate significance to human health and controlled waters receptors prior to the implementation of mitigation measures.

## Operational Phase

7.5.7 It is assumed that as part of the construction phase, any unanticipated contamination encountered as part of the site works will have been mitigated and remediated in line with the proposed development.

7.5.8 The sensitivity of future users and controlled waters receptors is high and medium respectively and the impact magnitude, prior to mitigation, is low. There is likely to be a direct or indirect, temporary minor to moderate negative effect on future users prior to the implementation of mitigation measures.

# 7.6 MITIGATION MEASURES

## Construction Phase

7.6.1 Site contractors are required to produce a Construction Environmental Management Plan (CEMP) prior to the commencement of works on-site which, amongst other things, will provide details of environmental control measures necessary to mitigate the predicted impacts discussed above.

7.6.2 During the construction phase, spillages (such as oil, fuel, cement, chemicals etc.) and soil erosion or the generation of suspended solids during construction activities (including excavations and plant/wheel washing) will be controlled through the implementation of a CEMP. This would include prevention measures such as: bunded storage; designated wheel washing areas; settling basins; screening stockpiles of materials; dampening exposed soils as appropriate; and set out requirements for ongoing monitoring and liaison.

7.6.3 If previously unanticipated contamination is identified, advice from a specialist should be sought immediately. Suspected contamination within materials should be kept separately for analysis.

7.6.4 During the construction phase, it is anticipated that lubricants, chemicals and fuels will be stored in an appropriate manner, with secondary containment and contingency or emergency procedures in place should spillages or leakage occur.

7.6.5 Potential impacts to construction workers will largely be mitigated by the use of Personal Protective Equipment (PPE) such as dust masks and gloves and through the use of good hygiene practices to minimise ingestion of particulates.

## Operational Phase

7.6.6 The proposed development is expected to comprise industrial units covering the majority of the site and incorporate hardstanding at the surface which will break direct contact pathways between unlikely contamination and future site users.

# 7.7 RESIDUAL IMPACT ASSESSMENT

### Construction Phase

7.7.1 There is likely to be a direct, temporary, short term insignificant effect on receptors following the implementation of mitigation measures.

### Operational Phase

7.7.2 There is likely to be a direct, permanent, beneficial effect to controlled waters as the proposed development will reduce rainfall infiltration and inhibit potential unforeseen leachate from leaching into groundwater and migrating towards the identified receptors.

## CLIMATE CHANGE

7.7.3 No significant effects in relation to climate change are anticipated.

# 7.8 CUMULATIVE IMPACT ASSESSMENT

7.8.1 It is considered that there will be minimal cumulative effects on ground conditions and contamination resulting from the Proposed Development and the cumulative schemes considered as part of the assessment, as each development will incorporate appropriate mitigation measures.

# 7.9 CONCLUSIONS

7.9.1 This chapter assesses the potential effects of the proposed development on ground conditions. It describes the baseline conditions that exist at the sites of proposed developments, the potential direct and indirect effects of the proposed development and the mitigation measures to prevent and reduce the potential effects.

7.9.2 This chapter is supported by a two third party Phase 2 Geotechnical and Geo-environmental Ground Investigation Report.

7.9.3 Based on the information available as detailed herein and following the implementation of applicable impact avoidance and mitigation measures, all potential geological and soils related effects associated with the construction and operation of the Proposed Development are assessed as being not significant.