

CHAPTER 16: GROUND CONDITIONS AND LAND CONTAMINATION

Introduction

16.1 This section of the ES presents the results of an assessment of the impacts of the proposed development on matters associated with the potential for land contamination.

16.2 This section is divided into the following broad sub-sections:

- Methodology;
- Planning policy context;
- Baseline information;
- Assessment of potential impacts;
- Mitigation, compensation and enhancement;
- Residual impacts; and
- Conclusion.

16.3 An Agricultural Land Classification Report is included in ES Volume 2.

Methodology

16.4 This section sets out the methodology undertaken in terms of an environmental assessment (including a review of desktop information and intrusive investigations), threshold guidelines used to assess the analytical results from the intrusive investigations, and the methodology used within this Chapter to assess the potential impacts from the proposed development.

Investigation Methodology

16.5 The baseline conditions have been obtained from a desktop review including the identification of the environmental setting, a review of historical maps and regulatory information, and an intrusive site investigation undertaken in November 2013. The desktop review and investigations have been documented in the Delta-Simons

Summary Site Investigation Report (reference 13-0525.03). This has been provided in ES Volume 2.

- 16.6 The intrusive investigations included the drilling of three cable percussive boreholes to a maximum depth of 14.80 metres below ground level (m bgl), and ten dynamic sampler boreholes to a maximum depth of 3.00 m bgl. All the cable percussive boreholes and four dynamic sampler boreholes were installed in order to facilitate ground gas and groundwater monitoring. A total of six soil samples were collected and submitted to a laboratory for a range of chemical analysis. Given the absence of sources of contamination and low sensitivity of receptors, no groundwater monitoring was undertaken. An exploratory hole location plan has been provided as Figure 4 the aforementioned Summary Site Investigation Report in ES Volume 2. Ground gas monitoring was undertaken on one occasion.

Threshold Guidelines

- 16.7 In the absence of a comprehensive and authoritative set of screening values derived using the new CLEA Framework, in order to compare soil analytical results Delta-Simons has referred to:
- The Soil Guidance Values (SGVs) published by the EA;
 - Former SGVs for which no updated SGV has been published;
 - The 2009 Chartered Institute of Environmental Health (CIEH)/Land Quality Management (LQM) Generic Assessment Criteria (GAC);
 - The guidance values produced by the Environmental Industries Commission (EIC), the Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Application in Real Environments (CL:AIRE) in December 2009; and
 - In house Human Health Generic Screening Values (HH-GSVs) derived by Delta-Simons and other non UK values where considered relevant.
- 16.8 Given mixed end use of the application site as commercial, residential and leisure, the analytical results have been assessed against the most sensitive guidance values, i.e. for a residential end-use with gardens.

- 16.9 Using the CIRIA guidance (C665), ground gas monitoring results (both the gas concentrations and the borehole flow rates) are used to define a Characteristic Situation for the application site by calculating the Gas Screening Value (GSV) for methane and carbon dioxide (multiply the maximum recordable positive borehole flow rate (l/hr) by the maximum recordable gas concentrations (%)). Once calculated, the GSV can be further assessed using Table 8.5 and Table 8.6 in the CIRIA guidance document in order to provide typical scopes of protection measures for the proposed development. The calculated GSV has also been used in conjunction with Table 8.7 (NHBC Traffic Light (TL)) in CIRIA C665, in order to provide typical scopes of protection measures for the proposed development.
- 16.10 Further information on soil and groundwater threshold guidelines and ground gas assessments are provided in Sections 6.0 and 4.0 in the Summary Site Investigation Report included in the ES Volume 2.

Ground Conditions Impact Assessment

- 16.11 From the baseline information, Conceptual Site Model's (CSM's) of the development site have been prepared, which in turn identifies the relevant sources, receptors and pathways. This is undertaken in accordance with the legislation given above and CLR11 Model Procedures for the Management of Land Contamination, DEFRA & Environment Agency (EA). The CSM enables the identification of receptors for the EIA which are established for the future use based on the current baseline condition of the development site and the proposed development plan. For reference the CSM's are provided in Section 3.3 of the Summary Site Investigation Report included in ES Volume 2.
- 16.12 The magnitude of an effect has then been considered by the nature of change, its severity, the duration of an effect and the likelihood of an effect occurring, therefore, the risk assessment has been based on a qualitative assessment and professional judgement. The magnitude of an impact has been described as either a 'high', 'medium', 'low' or 'none'. Potential effects in terms of ground conditions tend to be local, therefore, the effects have not been considered in relation to different geographical contexts.

16.13 The significance of effects has been determined by considering the magnitude and the sensitivity of the receptor, which sensitivity is described as either 'high', 'medium' or 'low'. It is noted that there is a lack of EIA definitions that specifically relate to contaminated land in national guidance, therefore, a general assessment for significance has been used, and in line with the EIA guide to good practice and procedures, the terminology used for significance is 'extreme', 'major', 'moderate', 'minor', and 'negligible'.

Planning Policy and other Legislative Context

The Development Plan

Boston Borough Local Plan (1999)

16.14 Saved Policy G4 of the Boston Borough Local Plan states that planning permission will not be granted for developments which will have an adverse effect on the water environment, or the quality of surface of groundwater.

16.15 Saved Policy G8 of the Local Plan states that planning permission will not be granted for developments which will have a significant adverse effect upon the quality of air or soil in terms of living or working conditions, natural flora or fauna or added constraints on future developments in the area, adding that, where appropriate a contamination assessment will be required before planning permission can be granted.

Boston Borough Interim Plan (2006)

16.16 The sentiments of the aforementioned Saved Policies G4 and G8 of the Boston Borough Local Plan are repeated in Criteria 6 and 8 of Policy G1of the Boston Borough Interim Plan, as related to general development considerations.

Other Material Considerations

National Planning Policy Framework

- 16.17 The main legislation with regards to the clean up of historic contamination is set out in Part 2A of the Environmental Protection Act (EPA) 1990 (HMSO, 1990). Section 78A(2), EPA 1990, provides the definition of contaminated land for the purposes of Part 2A, which is: 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused or there is a significant possibility of such harm being caused; or pollution of controlled water is being, or likely to be caused'. Harm is defined as meaning 'harm to the health of living organisms or other interference with the ecological systems of which they form part and in the case of man includes harm to his property'.
- 16.18 The statutory government guidance to Part 2A, Circular 01/2006 (DEFRA, 2006), introduces the concept of the 'pollutant linkage' in Chapter A of Annex 3. A pollutant linkage is formed when there is a linkage between a contaminant source and a receptor by means of a pathway. If any one aspect is missing no linkage is formed. The Circular also mentions that remediation required should result in land being made "suitable for use".
- 16.19 In addition to Part 2A, Sections 161 to 161D of the Water Resources Act 1991 give the Environment Agency powers to take action to prevent or remedy the pollution of controlled waters. The normal enforcement mechanism is a "works notice" served under section 161A, which specifies what actions have to be taken and in what time periods. This is served on any person who has "caused or knowingly permitted" the potential pollutant to be in the place from which it is likely to enter controlled waters, or to have caused or knowingly permitted a pollutant to enter controlled waters.
- 16.20 Chapter 11 of the NPPF discusses 'Conserving and enhancing the natural environment'. The following key issues associated with soil and groundwater contamination are stated within this chapter:

- Paragraph 109 states that 'the planning system should...present both new and existing development from contributing to or being put at unacceptable risk from unacceptable levels of soil...water', and 'the planning system should...remediate and mitigate despoiled, degraded, derelict, contaminated and unstable land, where appropriate';
- Paragraph 120 states that 'to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location'; and
- Paragraph 121 states that 'after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A.
- Regional Policy

16.21 Boston Borough Council's Contaminated Land Inspection Strategy was issued in April 2004. The Inspection Strategy is presented in the context of the Borough Council's Community Strategy and Corporate Plan, which gives the Council's key objectives. These specific objectives are under a primary heading 'a clean and green place:

- To conserve and enhance the built and natural environment;
- To promote high environmental and sustainable lifestyles.

Land contamination has a significant impact on both the environment and the economy to these policy areas are therefore key considerations in developing this inspection strategy.

Existing Situation

Environmental Setting

16.22 During the intrusive investigations, Topsoil was identified across the application site to a maximum depth of 0.30 m bgl, comprising silty sandy clay. Tidal Flat Deposits underlying the Topsoil consisted of brown, mottled grey organic sandy silty, occasionally very gravelly clay. From depths of between 6.3 and 6.8 m bgl, brown, grey sandy silty gravelly clay, with gravel of chalk and flint was identified to the base of the cable percussion boreholes. These soils are considered to be representative of Glacial Till. The bedrock geology of the Ampthill Clay Formation was not

encountered in the boreholes. The hydrogeology of the superficial and bedrock beneath the application site are classified as being Unproductive Strata. The application site and surrounding area are within an area with a large network of field drains and a 'Y' shaped drainage channel is present on-site.

History and Current Site Status & Regulatory Information

16.23 From historical mapping, the application site is indicated to have been agricultural from the earliest map edition to the current map edition. The 1889 map edition identifies the presence of London Road and Tytton Lane East to the west and north of the application site and a railway line, routed north-south, running between western and eastern sections of the application site, present until the 1974 map edition. Current mapping indicates the presence of residential properties to the north and west of the Site, and poultry houses adjacent to the west of the application site. Following a walkover of the application site it was noted that these sheds are no longer used for poultry.

16.24 At the time of writing no relevant regulatory information has been received.

Analytical Results

16.25 All concentrations within soils samples were identified below UK guidance values or laboratory detection limits. In addition, concentrations of TPH were below the laboratory method detection limit and asbestos fibres were not detected in the samples tested.

16.26 There are no significant potential sources of ground gas on or off-site. The gas monitoring revealed low levels of ground gases and low flow. The provisional NHBC Traffic Light Classification is Green.

Impact of Development

During Construction

- Following a source-pathway-receptor risk assessment, the potential impacts that may occur during the construction of the development include the following:
- Groundworkers may be exposed to elevated levels of contaminants, via the inhalation and dermal contact through the handling of contamination, though it is noted that significant areas of contamination have not been identified at the application site;
- Groundwater and the nearby drains may become contaminated through the potential for accidents and incidents during construction; and
- Groundworkers and nearby users of residential properties may become exposed to contaminated soils, through the transportation by wind, though it is noted that significant areas of contamination have not been identified at the application site.

16.27 Table 16.1 below identifies for each receptor during construction and considering the baseline conditions: the sensitivity of the receptor, the nature of the impact, the predicted magnitude and predicted significance:

Table 16.1 Identified Potential Impacts During Construction

Receptor (Sensitivity)	Nature of Impact/Comments	Magnitude	Significance
Groundworkers (high)	Exposure via ground contamination and wind-blown contaminated soils. Any contact will be in the short term and no elevated contaminants were identified during a previous intrusive investigation.	Medium	Minor/ Moderate
Groundwater and the on and off-site surface water (medium)	Impact from potential accidents and incidents.	Medium	Moderate
Nearby residents (high)	Wind-blown contaminated soils. No elevated contaminants were identified during a previous intrusive investigation.	Low	Moderate/ Major

16.28 From the above table, it is considered that the potential impacts during construction and prior to mitigation are considered to be of a **moderate** or **major** significance.

During Operation

16.29 Following a source-pathway-receptor risk assessment, the potential impacts that may occur during the operation of the development include the following:

- Future users may become exposed to contamination via direct contact and inhalation;
- Direct infiltration of contamination through water supply pipes due to the breakdown of plastic by hydrocarbons;
- Root uptake of contamination into plants in landscaped areas/playing fields; and
- Build-up of ground gas and migration into buildings with subsequent asphyxiation of future users.

16.30 The following table identifies for each receptor during operation and considering the baseline conditions: the sensitivity of the receptor, the nature of the impact, the predicted magnitude and predicted significance:

Table 16.2 Identified Potential Impacts During Operation

Receptor (Sensitivity)	Nature of Impact/Comments	Magnitude	Significance
Future users (high)	Contact in landscaped areas/residential gardens, though no elevated contaminants were identified during a previous intrusive investigation.	Low / Medium	Low / Moderate
	Asphyxiation from ground gas. However, significantly elevated concentrations have not been identified.	Low	Low / Negligible
Water supply pipes (high)	Via infiltration. Elevated concentrations of hydrocarbons have not been identified within underlying soils.	Low	Moderate
Vegetation (low)	Via root uptake, though no elevated contaminants were identified during a previous intrusive investigation.	Low	Low

16.31 From the above table, the potential impacts during the operation of the development are predominantly considered to be a **low** to **moderate** significance, prior to mitigation.

Mitigation Measures

16.32 A 'hotspot' protocol will be drawn up to ensure that any localised contamination identified during construction activities, which has not yet been identified, is assessed by a specialist in contaminated land.

16.33 Site workers will be made aware of the possibility of encountering localised contamination through toolbox talks and good standards of personal hygiene, including welfare facilities on-site and the use of appropriate levels of personal protective equipment (PPE), will be enforced.

16.34 Site workers will adhere to health, safety and environmental precautions in order to reduce the potential for any accidents and incidents.

16.35 Methods will be used to reduce the amount of dust, e.g. washing down of vehicle's wheels and the covering of any exposed soils.

16.36 Though the need for upgraded pipework is considered unlikely, the local water authority should be liaised with in order to confirm any requirement for upgraded pipework.

16.37 It should be ensured that a suitable covering of clean topsoil is positioned in residential gardens and regions of soft landscaping. It may be possible to reuse current topsoil on-site for this purpose. Due to the size of the application site, further checks on topsoil quality are recommended.

Residual Impacts

16.38 The table below identifies for each receptor, its sensitivity, magnitude and significance of impacts following the implementation of the above mitigation measures:

Table 16.3 Impacts Following the Implementation of the Mitigation Measures

Description of Impact	Receptor Sensitivity	Magnitude	Significance
Exposure to groundworkers from contact and inhalation of contamination.	High	Low / None	Minor / Negligible
Groundwater and the nearby stream through impact from potential accidents and incidents.	Medium	Low	Minor
Exposure to nearby users through wind-blown contamination.	High	Low / None	Minor / Negligible
Exposure to future users through contact in landscaped areas/residential gardens.	High	Low/ None	Minor / Negligible
Infiltration of contamination through water supply pipes.	High	None	Negligible
Root uptake of contamination by vegetation.	Low	None	Negligible

Monitoring Programme

16.39 Further construction phase mitigation measures, detailed in section 16.41 are required at the site which will be detailed in a Remediation Method Statement and verified in a subsequent Validation Report.

Robustness of Analysis

16.40 Number of samples collected to date is sparse for a large area, however, as detailed in Section 16.23, there is an absence of identified historical uses, potential sources of contamination and identified concentrations of contaminants are **low**.

Summary and Conclusions

16.41 A desktop assessment and intrusive ground investigation has been undertaken for the application site. The desktop assessment indicated that the application site has been agricultural fields from the earliest map edition to the current map edition. The ground investigation did not identify concentrations of contamination in soils above UK guidance values or laboratory detection limits. No significant potential sources of ground gas were identified on or off-site. The gas monitoring revealed low levels of ground gases and low flow.

16.42 Potential source-pathway-receptor pollutant linkages have been identified, therefore, prior to the implementation of mitigation measures, **moderate** to **major** potential impacts have been identified. However, following the implementation of the mitigation measures provided below, the potential residual impacts will be **minor** or **negligible** during both the construction of the development and for the operation of the development:

- A 'hotspot' protocol will be undertaken by contractors during construction activities;
- Site workers will use appropriate levels of personal protective equipment (PPE), will adhere to health, safety and environmental precautions and use methods to reduce the amount of dust;
- Liaison will be carried out with local water authority to confirm if water supply pipework requires upgrading. However, the need for upgraded pipework is considered unlikely; and
- A suitable layer of topsoil and subsoil will be provided in areas of landscaping/residential gardens. Following further testing it may be possible to reuse current topsoil on-site for this purpose.