Land Quality Management Ltd

For

Welwyn Hatfield Borough Council

REVIEW OF INFORMATION RELATING TO THE PROPOSED INCLUSION OF THE BIRCHALL GARDEN SUBURB WITHIN THE DRAFT LOCAL PLAN

LQM Report Number: **1359-1/1**

Issue Number: **2**

Status: **Final**

Date: **April 2018**

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Date **06 April 2018**

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1	**29 March 2018**	NA
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Limitations

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LQM obtained, reviewed and evaluated information from the Client and other sources as detailed in the report. LQM's conclusions, opinions and recommendations are based solely on this information.

The conclusions and recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with accepted industry practices at this time and location and as such are not a guarantee that the Site is free from hazardous materials or conditions.

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1 INTRODUCTION

1.1 Terms of Reference

(1) Land Quality Management Ltd (LQM) were initially commissioned in December 2017 to provide Welwyn Hatfield Borough Council (WHBC) with technical land contamination support in relation to the proposed inclusion of the Birchall Garden Suburb (BGS) within the draft Local Plan.

(2) This commission included completion of the following report, which WHBC intend to submit as evidence to the Planning Inspectorate in support of the proposed designation of the BGS within the Local Plan.

1.2 Background

(3) LQM understand that:

- Lafarge Tarmac (LT) own land to the north of the B195 Birchall Lane on the south eastern fringe of Welwyn Garden City, which is known as the Birchall Farm Site, and to the south of the B195, which is known as the Cole Green Site. Collectively the two sites form the proposed Birchall Garden Suburb (BGS).

- The Birchall Farm Site will primarily involve residential development. It falls within the boundary of East Herts District Council and so is excluded from consideration in this review.

- The Cole Green Site is the focus of this review and comprises two areas:

    - The "Central Area" principally consists of land formerly operated as the Cole Green mineral workings, which were subsequently used as landfill until the early 1980s, prior to being landscaped. Since then Lafarge Tarmac has implemented an environmental monitoring programme (groundwater, surface water and landfill gas), and passive gas venting. It is intended to allocate this area as 'urban open land' within the Local Plan and that this area will ultimately become a new country park crossed by footways and cycleways. It is not proposed that substantial building will occur in this area. The location of the Central Area is indicated in the figure of "Cole Green Former Mineral Workings Site Characterisation" from Report 2, which is appended to this report.

    - The "Southern Area" (WGC5 in the draft Local Plan) is adjacent to the former mineral workings and is historically reported to be agricultural land. It is intended to allocate this area for "residential-led mixed use development" within the Local Plan and that this area will ultimately be developed for housing with provision for the necessary schools, shops

etc. The location of the Central Area is indicated in the figure of "Cole Green Site Characterisation" from Report 3, which is appended to this report..

- LT are promoting the inclusion of the BGS/Cole green Site within WHBC's new Local Plan. LT and their consultants Royal HaskoningDHV (RHDHV) have provided a variety of information to the WHBC in support of the proposed BGS, principally comprising the materials listed below.

- As part of the consultation and examination of the draft Plan a number of concerns were raised by representors about potential land contamination issues in relation to the BGS. WHBC is seeking external support to review the evidence submitted by LT to ensure that it is robust and that the allocations within the draft Local Plan are appropriate having regard to the evidence.

1.3 Documents supplied for review

(4) LQM have been provided with the following reports and information:

- **Report 1**"Land Quality Preliminary Investigation & Outline Management Study – Land South of Birchall Road, Cole Green", Royal HaskoningDHV, Dated:30/1/13, Ref: 9Y0074 **(Hereafter referred to as Report 1)**;

- **Report 2** "Cole Green Former Mineral Workings: Soil Survey and Generic Quantitative Risk Assessment", Royal HaskoningDHV, Dated:6/10/14, Ref: 9Y0074 **(Hereafter referred to as Report 2)**;

- **Report 3**"Cole Green Site Characterisation and Generic Quantitative Risk Assessment", Royal HaskoningDHV, Dated:6/10/14, Ref: 9Y0074 **(Hereafter referred to as Report 3)**;

- A Note/Memo (**Hereafter referred to as the "Memo"**) prepared by RHDHV on 6th Dec 2017 entitled BGS-WHBC Note;

- An apparently scanned document entitled "Boring Results – Cole Green, Hertford – 15.11.84", which presents basic logs for B/H 118-BH165;

- An apparently scanned document entitled "Cole Green", which appears to be a summary of logs for BH1 to BH117;

- Borehole logs for boreholes BH1-CGTP10 prepared by Structural Soils and apparently constructed between Dec 2013 and May 2014;

- A plan No C3/28a entitled "Currently Approved Contours" prepared by Redland Aggregates, undated;

- A plan No CG/BHTR01 entitled "Boreholes and archaeological trenches" prepared by Tarmac and dated August 2017;

- A series of historic maps (HistSlice10000), which appear to be an extract from a Landmark Envirocheck report for the site; and
- A plan No C3/24c entitled "Phases of infilling" prepared by Redland Aggregates and dated Jul 1984.
- A letter entitled "*Birchall Garden Suburb as proposed in the Draft Local Plan*" dated 25th Oct 2017 and prepared by the Welwyn Garden City Society (WGCS)
- A technical paper by jb Planning Associates for Gascoyne Cecil Estates (GCE) entitled "*Birchall Garden Suburb: Contamination and Site Suitability*" dated Oct 2017, and an associated report by Wardell Armstrong for Gascoyne Holdings Ltd entitled "*Cole Green Landfill Expert report*" dated Oct 2017

1.4 LQMs remit

(5) WHBC have asked LQM to provide clarification on a number of specific questions:

I. The Royal HaskoningDHV evidence, specifically:

a. Is the submitted evidence proportionate to support a Local Plan allocation? What level of evidence is reasonable for the site promoter to provide at this stage of the development process?

b. Is the evidence submitted by Royal HaskoningDHV robust? Is the scope and methodology appropriate and has it been carried out in line with relevant guidance and best practice?

II. The suitability/appropriateness of the proposed development, specifically:

a. On the basis that the evidence is deemed to be robust, does it demonstrate that the proposed end uses of the site are suitable?

b. Is the evidence sufficient to support the site promoter's assertion that land at the south of the site proposed for housing has not been previously filled? Has sufficient testing taken place to determine this and are the results consistent with land that has not previously been filled?

c. With respect to the area we know has been filled, have any contaminants been identified which mean it is unsuitable for the intended use as public open space? Where contaminants have been found are these a major concern? Can they be remediated to make the site safe?

III. Viability/deliverability of the proposed evidence, specifically:

a. The final question is to understand whether the evidence submitted is sufficient enough to demonstrate that the site is deliverable and that it is viable to bring forward. Are the site promoter's suggested remediation strategies likely to be appropriate? Does the evidence point to any abnormal remediation costs that might put the delivery of the site at threat?

(6) These questions are addressed in the Sections 3, 4 and 5 below.

2 OUTLINE OF THE TIERED APPROACH TO THE ASSESSMENT OF LAND CONTAMINATION RISKS RECOMMENDED IN UK GUIDANCE

(7) There is a large amount of guidance relating to the assessment of land contamination risks in the UK that is published either by government departments and agencies or by professional organisations and trade bodies.

(8) The overarching general principles to be applied in all types of environmental risk assessment in the UK are presented in the recently updated document referred to as "Greenleaves 3" (Defra and Cranfield University, 2011).

(9) With respect specifically to land contamination assessments, the overarching guidance is presented in CLR11 "Model procedures for the management of land contamination" (Environment Agency, 2004). This document was "*developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the UK.*" The guidance within CLR11 emphasises the importance of pollutant linkages[1], site-specific circumstances, uncertainty within the available data, the development of a conceptual site model (CSM) and the application of a tiered risk assessment approach. Where this tiered approach identifies that action is needed to reduce the level of risk, CLR11 also outlines the basis for selecting and implementing the most appropriate remediation or risk management approach.

(10) A British Standard, BS10175, also provides minimum standards for the investigation of potentially contaminated sites (BSI, 2017, p. 2011). This also emphasises a tiered or phased approach to the investigation and assessment of land contamination issues. A large number of other British and/or international standards (ISO) apply to particular aspects within such investigations and assessments, for example BS8576 and BS8485 specify the requirements for characterising and remediating any risks from ground gases (*e.g.* methane and carbon dioxide).

2.1 Preliminary Risk Assessment

(11) CLR11 states that "*The purpose of the preliminary risk assessment is to develop an initial conceptual model of the site and establish whether or not there are potentially unacceptable risks. …*

[1] The concept that for a risk to exist the 3 elements of a linkage must be present; a **source** of contamination, a **receptor** that can be affected by the contamination and a **pathway** that links them. This is the central dogma underlying all assessments regarding risks from land contamination.

During this stage the assessor collects and reviews largely desk-based information to prepare an initial conceptual model to identify possible pollutant linkages."

(12) Other guidance documents use a variety of terms that are synonymous with the preliminary risk assessment, including preliminary investigation and Phase 1, but all are consistent in requiring such an assessment to involve both a desk study of all available documentary evidence and a site reconnaissance (or site visit or walkover survey) of the site under consideration.

(13) Collectively, this information is used to understand the sites past, current and future uses, its environmental setting and the relevant geology, hydrology (surface waters) and hydrogeology (ground waters) and, therefore, to identify all potentially significant contaminant linkages and the uncertainties associated with them. This is then summarised in one or more Conceptual Site Models (CSM).

(14) The CSM is a critical component of the entire assessment and management process and is iteratively updated as more information becomes available and is the basis for determining if further assessment or management works are required and, if so, facilitates their design. Hence, the production and updating of the CSM is fundamental to any land contamination assessment. Furthermore, it is critical that, as far as practicable, all potentially significant linkages are identified in the initial conceptual model as this will dictate all future actions; any omission at this stage may result in some risks being overlooked.

2.2 Site characterisation, Risk estimation and Risk Evaluation

(15) Where the preliminary risk assessment identified potential risks, these should be characterised and assessed (*i.e.* the level of risk should be estimated and its significance then evaluated). This stage of the process (or specific parts of it) are referred to by a variety of different terms in guidance documents including Phase 2, field investigation (ground or site investigation), site characterisation, risk assessment *etc.* This phase of the assessment process may produce a large number of factual and/or interpretive reports over a long period of time before a final CSM containing all potentially unacceptable risks is derived.

(16) At large or complex sites, it is often appropriate (and cost effective) to apply different sampling and analytical strategies to different zones of the site (*i.e.* those with different past or future land used *etc.*) and/or undertake several phases of investigation with each stage informing the design and requirements of the next. Each investigation should be designed to address the uncertainties in the previous CSM.

(17) Field investigations normally involve excavations and the collection of appropriate soil samples that are submitted to relevant testing, usually at a laboratory. Other samples and monitoring

data may also be needed where gases, vapours or groundwater issues may exist. This usually involves installing monitoring wells into boreholes sunk in appropriate locations. Comprehensive records and logging of the soil materials encountered and notes of any relevant visible or olfactory evidence will also be collected during the ground investigation works.

(18) For each zone or phase, the data gathered is then used to estimate the likely risks posed by the various contaminant linkages. The evidence should be assessed as a whole using all available "lines of evidence" to reduce the inherent uncertainties involved. However, as part of this assessment, generic quantitative risk assessment (GQRA) is often used. This involves comparing environmental concentrations with generic or default concentrations set by legislation, guidelines or other authoritative bodies that are intended to ensure adequate protection of human health or the environment. In some circumstances, where these concentrations are exceeded site-specific details of mitigating factors (such as groundwater depths, soil types *etc.*) can be used to in a process called Detailed Quantitative Risk Assessment (DQRA) to demonstrate that some exceedance of the generic/default concentrations will not result in unacceptable risks at this particular site.

(19) It is not necessary, or possible, to remove all risks relating to land contamination issues; the process is intended to identify and address any unacceptable risks. Once each contaminant linkage has been adequately characterised, a robust estimate of the likely current and future risks can be produced. The assessor can then evaluate if the level of risk is likely to be unacceptable and, if so, what risk management may be needed to mitigate such risks; this will be reflected in a final CSM.

2.3 Risk management

(20) Where unacceptable risks are identified in the final CSM, the guidance requires that these are mitigated or managed – a process often referred to as remediation.

(21) The process of identifying suitable risk management options is referred by various terms including Phase 3, options appraisal *etc.* This process will normally result in a remediation strategy report that outlines the final CSM including the potentially unacceptable risks identified at the Site, one or more risk management actions that will be implemented to address these risks and the verification measures and criteria that will be used to demonstrate that these risks have been managed. Once approved by relevant stakeholders, this strategy is implemented[2] and one or more verification reports submitted to demonstrate that each of the potential risks has been adequately mitigated.

[2] Some modification of the strategy is likely, particularly at large or complex sites, as the risk management and construction process may identify additional factors or risks that were not available during the earlier risk assessment and management planning.

3 CLARIFICATION REGARDING THE ROYAL HASKONINGDHV EVIDENCE, SPECIFICALLY:

3.1 Is the submitted evidence proportionate to support a Local Plan allocation?

(22) LQM are contaminated land specialists and not planning consultants. However, LQM is not aware of any significant guidance relating to the 'proportionality' of the evidence needed to support a Local Plan within the NPPF (DCLG, 2012), although:

- The relevant section of the .GOV website states that "*Appropriate and proportionate evidence is essential for producing a sound Local Plan,..*"[3]; and
- Royal Town Planning Institute guidance on Neighbourhood Plans, states that "*The scope and level of detail of the evidence you need should be proportionate to the significance of the issues being addressed in your neighbourhood plan. Evidence requirements are also likely to vary according to the complexity and size of your neighbourhood area*" (RTPI, 2015).

(23) Consequently, below we have assumed that 'proportionality' relates to the amount, complexity and depth (i.e. cost or investment) of the submitted information as well as its relevance; it is not a measure of its technical robustness or accuracy.

(24) Land owners and developers tend to invest in preparatory works, such as land contamination and stability investigations, on an incremental basis taking account of factors such as investment risk and land value. Both these factors are influenced by the current status of a site within the planning system. For example, land will have a higher value and warrant more investment (e.g. ground investigation) once allocated for development within the Local Plan and, again, once outline planning is granted.

(25) It should be noted that an allocation within a Local Plan does not grant planning permission, merely allows compliant planning applications to be brought forward with a greater likelihood of being approved. Land contamination and stability issues would be a material consideration in determining such planning applications and the suitability and technical robustness of the risk assessments used to demonstrate that the proposed development would be 'safe' and 'suitable for use' would be subject to detailed scrutiny at that time and, if granted, subject to specific planning conditions in relation to these issues. Both Report 2 and 3 acknowledge that they are intended to "*inform the iterative master planning process*" and recommend further investigation and assessment works, which we anticipate would be forthcoming if the site were to be allocated as proposed in the draft Local Plan. The current reports are thus clearly not intended to be in-depth and comprehensive risk assessment reports but we

[3] https://www.gov.uk/guidance/local-plans--2 Accessed 21/12/2107

would expect any documentation submitted to support subsequent planning application(s) will be significantly more detailed and robust.

(26) Consequently, the investment represented by information submitted by LT could be considered proportionate for a land holder at this stage in the planning cycle. However, this should not be taken to mean that the submitted evidence is sufficient to allow WHBC to assess viability/deliverability. This is considered separately in Section 5 below.

3.2 What level of evidence is reasonable for the site promoter to provide at this stage of the development process?

(27) The NPPF (DCLG, 2012, Para 120) makes it clear that the responsibility for securing a safe development rests with the developer and/or landowner. However, LQM understands that a land owner is under no obligation to provide any information to a planning authority to facilitate its deliberations regarding a Local Plan. But, if a land owner wished to promote the allocation of their land within a Local Plan, it is likely to be in their interests to disclose some, or all, of the information they hold to the planning authority. Depending on the site and other circumstances, this may include initial, or detailed, land contamination assessments. Such information is likely to be the only available evidence upon which a Planning Authority can consider land contamination and stability issues and their potential impact on viability and deliverability of a proposed development, as a Planning Authority is unlikely to have access to such information from any other source nor afford to commission such surveys itself. However, as stated above, the level of investment by the land owner (hence the comprehensiveness of the land contamination assessments available*)* at any stage is a business decision for that land owner.

(28) The land owner may also hold information that is detrimental to their case. The legal position if they choose to deliberately withhold such information is unclear to LQM, given that they are under no obligation to provide any information in the first instance. So, although further information may be requested from the land owner, there seems little legal obligation for it to be provided. Consequently, it would seem appropriate for the planning authority to regard such voluntary submissions with some degree of caution but the weight given to such evidence appears to be a decision for the relevant planning authority.

(29) The Planning Authority has greater powers to request additional detail and documentation from the landowner/developer in relation to any subsequent planning application. However, it is possible that the original landowner may sell on the site (and associated liability) to realise the potential uplift in value once the site is allocated in the Local Plan. In this case the developer, who will be responsible for delivering a safe development, will not be the original land owner.

(30) In LQMs opinion, although LT appear to hold further information that has not been disclosed to WHBC, the current reports and information listed in Section 1.3 could be considered as a reasonable level of evidence for the land owner to provide to the Planning Authority at this stage of the planning cycle. However, a more transparent and collaborative approach from the landowner would always be preferred.

3.3 Is the scope and methodology appropriate and has it been carried out in line with relevant guidance and best practice?

NB: Legally, reports can only be expected to follow good practice. The concept of "best practice" is subjective and ever-changing. Consequently, our comments below relate only to good practice.

3.3.1 Preliminary Risk Assessment

(31) Current UK good practice (see Section 2) requires that any ground investigation and risk assessment actions are underpinned by a pre-existing preliminary risk assessment. The desktop study[4] and preliminary risk assessment relating to both the Central and Southern Areas is contained in Report 1, which also presents and outline management strategy recommending subsequent investigation, assessment and mitigation of potential land contamination issues at the Site. The aim of the report was to "*identify, as far as reasonably possible, any potential contamination linkages from sources within or around the site which may represent a risk to site users and/or the environment*" and is stated as being "*completed in general accordance with the recommended approach in Contaminated Land Report 11*" (i.e CLR11 -Environment Agency, 2004).

(32) The report does not appear to have consulted the full range of information sources, such as Local Authority/Planning Authority records, aerial photographs or local museum, archive and library information, that might be expected given the size and scale of the proposed development, the presence of a large landfill within parts of the Site and the contentious nature of the proposed development.

(33) Neither is mention made of potential sources associated with ongoing offsite waste activities at Burnside and Captain's Wood. Nor is there any discussion of the development/origins of the various surface water features, including the ponds and drains, and historic management activities in relation to land fill gas and leachate associated with the landfill.

[4] No site reconnaissance is reported. A site reconnaissance is a requirement for a preliminary risk assessment according to the NPPF and BS10175.

(34) Based on their deskstudy and initial CSM, RHDHV identified five principal areas of uncertainty, which they designate as PPL1-5. Namely:

> - the potential for contaminants in the fill materials, capping layer and/or generated leachate to impact on receptors in a recreational (open space) land use context
> - the potential for currently unidentified contaminants to impact on receptors in a residential land use context
> - the potential for ground gas generated in the previously filled area to impact on receptors in a recreational (open space) land use context
> - the potential for ground gas migrating from previously filled area to impact on receptors in a residential land use context
>
> With regard to the whole site and its environs, the following potential contaminant linkages are considered to require further consideration:
>
> - the potential for contaminated leachate and/or dissolved phase contaminants from the fill materials and/or capping layer to impact controlled waters.

(35) The Investigation Strategy presented in Report 1 recommends a "phased approach" to addressing these uncertainties. The initial phase was to include reviewing pre-existing groundwater data, geological/borehole data, ground gas data and landfill records. Although the review of some of this information is presented in Report 2 and particularly Report 3, LQM would generally regard this material as relevant to the original deskstudy and should have been reviewed prior to developing the initial CSM presented in Report 1.

(36) The Investigation Strategy in Report 1 then recommend Site investigation works to characterise identified uncertainties as follows:

- PPL1: Soil sampling, potentially on a grid basis, to characterise the upper meter of the surface soils across the Central Area. Based on the results additional sampling may be required.
- PPL2: Soil sampling, potentially on a grid basis, to identify previously unidentified contamination at the Southern Area. The density of sampling was to be "*based on current guidance and proposed land use (residential).*"
- PPL3: Installation of gas monitoring wells at the Central Area based on a review of existing monitoring data and locations and subsequent onsite monitoring using standard gas analyser instruments.
- PPL4: Installation of gas monitoring wells at the Southern Area and subsequent onsite monitoring using standard gas analyser instruments. A grid based approach was

recommended with the density "*based on current guidance and proposed land use (residential).*"

- PPL5: collection of soil samples from the Central Area (see PPL1) and groundwater samples from groundwater monitoring wells installed on a grid basis and that "*target both groundwater within the superficial deposits and the deeper chalk*".

(37) LQM would generally agree that the preliminary risk assessment presented is broadly in line with CLR11[5]. Although LQM consider the preliminary risk assessment to be relatively superficial and lacking in depth and detail, LQM acknowledge that the approach taken could be considered appropriate given the strategic nature of the report at this stage in the planning process and that PPL1-5 probably represent the most significant potential risks in relation to the site. However, it is unlikely that the preliminary risk assessment presented would be sufficient to support any subsequent planning application as this would need to satisfy the requirements of the NPPF (DCLG, 2012) and BS10175 (BSI, 2017).

3.3.2 Site Characterisation and Risk assessment reports

(38) LQM assume that Report 2 and 3 relate to the characterisation works recommended in the Investigation Strategy outlined in Report 1. As stated above, the scope of Reports 2 and 3 is limited to informing an *"iterative master planning process*" and the nature of the work conducted would appear to be in-line with this and arguably represents a proportionate investment by the land owner at this stage in the planning cycle.

(39) There is a considerable body of good practice guidance[6] relevant to the investigation and assessment of land contamination. Other guidance, for example planning guidance, is also relevant. However, reports only state that the ground investigations are in accordance with "*BS5930: 1999* Code of Practice for Site Investigations" and "BS10175 *Investigation of Potentially Contaminated Sites: Code of Practice* (2011)". It should be noted that the latter was updated and superseded in 2013 (and more recently in 2017). No guidance is cited for the methods used to monitor ground gases or controlled waters, or the risk assessment approaches adopted.

(40) Wardell Armstrong have also conducted a review of Reports 2 and 3. Within their review of these reports, Wardell Armstrong make several observations regarding the assumed sampling density being below "*the range anticipated for exploratory investigations*" of 25-50m centres but also acknowledging that "*the density of sampling grids can vary*". Although BS10175 does present these

[5] However, other guidance documents (eg NPPF and BS10175), which are arguably more relevant at later stages of the planning process, specifically require the preliminary risk assessment to include a site reconnaissance visit.

[6] Legally, reports can only be expected to follow good practice. Best practice is subjective and ever-changing.

as "typical densities" for non-targeted sampling, it also explicitly states that "*The spacing between sampling locations should be determined according to the conceptual model, the phase of the investigation, acceptable levels of uncertainty and the requirements of the risk assessment*" and that "*an exploratory investigation usually requires a lower density sample spacing than a main investigation*". As stated previously, LQM would expect higher sample densities *etc.* during any subsequent investigations in support of planning applications.

(41) Any investigation and assessment of land contamination contains intrinsic and unavoidable uncertainties. However, based on the materials submitted and taken at face value, the quantity and quality of testing and monitoring data presented in Reports 2 and 3 would appear to be sufficiently robust to inform a decision regarding the allocation within the Local Plan, but the remaining uncertainties would need to be addressed as part of any future planning application via relevant conditions and additional investigation, monitoring and assessment.

3.4 Is the evidence submitted by Royal HaskoningDHV robust?

3.4.1 Preliminary Risk Assessment

(42) As discussed in Section 3.3.1, the preliminary risk assessment presented in Report 1 is relatively superficial and lacking in depth and detail.

(43) In particular, the initial conceptual model does not specifically identify potential risks from organic vapours migrating from the landfill, or from the soils and groundwater beneath the Southern Area.

(44) With respect to the non-landfilled areas, RHDHV acknowledge within Report 1 that potential risks relating to the migration of gases[7] and contaminated ground water from the adjacent landfilled areas exist but state that although the "*possibility that isolated and localised sources of contamination may be present (e.g. spillages relating to usage of agricultural machinery, fly tipping)*", their "*inclusion at this stage is considered to be overly conservative*". The report recommends that during the subsequent investigation "*A site walkover, potentially supported by some environmental sampling can be used to indicate whether isolated sources … are present*" and that "*If specific sources are identified, they will be included within the list of potential contaminative linkages*".

(45) Notwithstanding the above comments, it is likely that Report 1 correctly identifies the key risks in relation to the delivery of the proposed BGS development and the initial investigations

[7] The report highlights "ground gases" but does not indicate if this included organic vapours as well as the more common interpretation of carbon dioxide and methane.

recommended within Phase 1 are likely to provide sufficient data at this stage of the planning process to inform decisions relating to the deliverability of the proposed development.

3.4.2 Site Characterisation and Risk assessment reports

(46) Due to their limited scope and indicative superficial nature, Reports 2 and 3 reports contain considerable uncertainty. This uncertainty would be expected to be reduced by the further investigation, assessment and remediation activities proposed within the RHDHV reports, and which would be expected to support any subsequent planning applications.

(47) Both the RHDHV reports are poorly referenced (both with respect to data and figures etc, presented in the same or different RHDHV documents, and with respect to 3rd party documents and information) with no source provided for many of the cited assertions and facts. Without a clear understanding of the basis of many of the assertions it is difficult to comment on the robustness of the evidence submitted.

(48) However, the reports do describe the collection and analysis of a number of samples of soil and other media from both the Central and Southern parts of the Site and a comparison of these with relevant controlled waters and human-health assessment criteria. Whilst a greater density of sampling may be needed to adequately characterise the distribution of any contamination, particularly with respect to areas proposed for more sensitive mixed-use development, the levels of contamination evident to date are unlikely to prevent its successful development.

(49) Some of the "evidence" submitted is in the form of raw data or unattributed figures *etc.* with no context, source or interpretation provided. It is not possible for WHBC to effectively interpret such information without a thorough understanding of the context and source of such information and, preferably, provision of such data in fully transparent reports including the relevant interpretation. LQM have excluded such materials from consideration.

(50) Given the uncertainty in the current reports, it is possible that this further investigation and assessment may demonstrate that significantly more, or less, remediation that currently anticipated by RHDHV will be required.

4 CLARIFICATION REGARDING THE SUITABILITY/APPROPRIATENESS OF THE PROPOSED DEVELOPMENT, SPECIFICALLY:

4.1 On the basis that the evidence is deemed to be robust, does it demonstrate that the proposed end uses of the site are suitable?

(51) LQM assume that the proposed end use of the Central area is 'urban open land' and that of the Southern area as "residential".

(52) LQM are of the opinion that at this stage of the planning cycle the appropriate test is whether the available evidence demonstrates that such development **cannot** be "*safe*" and "*suitable for use*" and/or viable/deliverable as required by the NPPF (DCLG, 2012).

(53) As discussed above, the current reports and information could be considered as suitably robust **for the current stage of the planning cycle**. However, both LQM and Wardell Armstrong have highlighted deficiencies and uncertainties in the available RHDHV reports, memo and other information supplied to WHBC, some of which are discussed in Sections 4.2 and 4.3 below.

(54) In LQMs opinion, on the balance of probabilities, the available evidence suggests that safe and suitable development should be achievable. However, the evidence suggests that a number of potentially significant land contamination and stability issues relating to the Southern and Central Areas may exist (are discussed in more detail below) and the question of viability/deliverability is addressed in Section 5.

4.2 Is the evidence sufficient to support the site promoter's assertion that land at the south of the site proposed for housing has not been previously filled? Has sufficient testing taken place to determine this and are the results consistent with land that has not previously been filled?

(55) LT has submitted *prima facie* evidence within Reports 1, 2 and 3, and the Memo in the form of historic records that suggests that mineral extraction/landfilling activities were restricted to the Central Area of the Site and did not extend to the Southern Area[8]. RHDHV also rightly emphasise that the permitting of an area for extraction and/or landfilling does not mean that such activities actually occurred throughout that area.

4.2.1 Preliminary Risk Assessment

(56) The landfill records described in Report 1 do not appear to be comprehensive and very little detail has been presented regarding the nature and extent of the historic landfilling. The deskstudy is

[8] However, the source for much of the information appended to the memo is unclear and the full extent of the research material consulted by RHDHV remains to be confirmed.

apparently based solely on a Landmark Envirocheck Report (including historic mapping and Geological mapping generated by the British Geological Survey) and "*site-specific borehole records, landfill records and site plans*" provided by LT. The report does not appear to have consulted other sources of information.

(57) For example, little effort appears to have been made within Report 1 to identify the type and extent of the wastes landfilled during the various phase of landfilling and no attempt has been made to provide details of the uses/history of the Southern Area (*e.g.* tenant agreements and allowable uses *etc*.).

(58) Furthermore, LQM note that WGSC and GCE appear to have identified several archive documents and other anecdotal information suggesting that infilling may have been more extensive and to have extended onto some or all of the Southern Area. This additional evidence does not appear to have been considered by RHDHV during the preparation of the preliminary risk assessment (Report 1). Although LQM note that RHDHV have responded to these claims within the Memo, a more robust response should have been possible given the data available to them.

4.2.2 Site Characterisation and Risk assessment reports

(59) The sufficiency of the sampling is dependent on the stage of the investigation/development. As discussed above the current RHDHV reports are preliminary only and so will contain a substantial amount of residual uncertainty. Although the reports may not represent the density of sampling that would be required to support a planning application, such as that described in BS10175, they are likely to represent a substantial investment.

(60) Report 3 describes a soil survey and risk assessment for the Southern area conducted by RHDHV in 2013/14 that involved "*10 trial pits and 23 boreholes located across the site including along the boundary with the landfill*". Samples were "*generally taken from the top meter of the soil profile*" Groundwater samples were "*recovered from all monitoring wells where groundwater was present (16 wells) on three occasions*".

(61) The trial pit and borehole logs in Report 3 do not report any obvious indications of landfilled wastes, although brick, concrete, ceramic tile and glass were reported down to 1.5m in a minority of location, which suggest that localised disposal of rubble has occurred. Furthermore, the RHDHV memo provides anecdotal evidence of a further 4 investigations/reports (totalling ~218 unknown locations) that also apparently "*confirm natural deposits*", which would suggest that the widespread presence of anthropogenic wastes is unlikely.

(62) The analysis of samples described in Report 3 suggests that although present, any contamination does not appear to be substantial. The source of such contamination is not evident; it

could represent anthropogenic wastes (or potentially contamination migration from the adjacent landfill), but could equally relate to historic agricultural activities, such as burning, track construction/pond infilling *etc.*

(63) The significance of contaminant concentrations was generally assessed using human health generic assessment criteria (GACs) for the "residential with home grown produce" land use and at 1% soil organic matter. The concentrations of some contaminants at some locations exceeded these GACs. With respect to the surface 1mbgl up to 46 samples were tested for some analytes:

- Arsenic, lead and vanadium- 10 exceedances up to 2.5xGAC
- Benzo[a]pyrene and other PAH-like compounds – 11 exceedances up to 6xGAC
- Chloromethane – 1 exceedance 4.5xGAC
- PCBs were detected on 2 samples - no assessment criteria was derived
- loose asbestos fibres were identified in two samples (one amosite and one chrysotile) - no assessment criteria was derived.

(64) However, RHDHV used a statistical approach (the US95) to suggest that generally the levels of most of these contaminants across the Site were not of concern. There are numerous assumptions and potential shortcomings associated with this statistical approach but in general it does suggest that wide-spread contamination is unlikely while the presence of contaminant hotspots, which may still require remediation, cannot be ruled out. Within Report 3, RHDHV conclude that the only contaminants of potential concern are polyaromatic hydrocarbons (PAHs), particularly benzo[a]pyrene, and asbestos. Subsequently, within the Memo, RHDHV state that a subsequent 'reassessment' in line with more up-to-date assessment criteria shows that benzo[a]pyrene "*does not represent a potential unacceptable risk to human health*" and suggest that any asbestos-impacted soils could be reused at depth (>1mbgl) beneath a geotextile membrane within "screening bunds". Whilst there is insufficient information to comment on this assessment and the suggested use for asbestos-containing soils, based on the current information, LQM agree (whether infilled or not) the levels of contamination across the Southern Area are not sufficient to render the Site undeliverable.

(65) In addition to risks to human health from shallow soil contamination, Report 3 and the Memo also consider risks from ground gas to development of the Southern Area and risks to, and from, ground water. However, potential risks from organic vapours (migrating from the landfill, or from the soils and groundwater beneath the Southern Area) do not appear to have been considered in any detail.

(66) With respect to ground gas, Report 3 presents an initial, but worst case, assessment that classifies the Southern Area as Characteristic Situation 2 (CS2). Consequently, gas protection measures may need to be installed in all proposed buildings in the Southern Area. There is still considerable uncertainty in this assessment and in the underlying gas Conceptual Site Model (gCSM) but the Memo contains a commitment to incorporate adequate mitigation works during development.

(67) As with other aspects of the land contamination issues, the current gas risk assessment and recommended mitigation measures should be considered as preliminary and subject to change. LQM would anticipate that, if a suitable understanding of the gCSM can be ascertained through subsequent data gathering, appropriate and effective gas mitigation measures could be designed to ensure adequate protection. It is possible that a refined gas risk assessment may allow the Characteristic Situation to be downgraded to CS1 (ie no protection measures required), particularly if landfill within the Central Area is demonstrated to be the principal gas source and adequate measures are implemented to prevent any gas migration. A detailed gas risk assessment would be expected to accompany any subsequent planning application(s) and support the recommended gas mitigation measures for all parts of the Site. Any such risk assessment **must** consider the potential impacts of the proposed development of both the Central and Southern Areas on the local gas regime.

(68) As described below, information in Report 2 (relating to the former landfill in the Central Area) does not include any data or assessment of the risks to controlled waters (including the principal aquifer) posed by leachate from the former landfill. This would appear to be a serious omission as the former landfill potentially represents a substantial current and ongoing risk to local water resources. However, some information is presented in Report 3 relating to controlled waters issues associated with the redevelopment of the Southern Area. Report 3 reports that "*groundwater strikes/seepages were recorded in the majority of the boreholes*" (23 boreholes/monitoring wells were installed), these were "*predominantly in the Made Ground, and sand and gravel horizons*". Several rounds of monitoring indicated groundwater between 0.39 – 5.81 mbgl but variation in each well was up to 1.27m. Report 3 suggests a "*tentative local groundwater flow to the south and west*".

(69) Based on Report 3, the Southern Area generally consists of topsoil (to ~0.1 mbgl), Made Ground (0-2.1mbgl), Lowestoft Formation deposits of alternating sand and clay (0-10.5mbgl). Towards the western and southern boundaries gravels of the Kesgrave Catchment Subgroup are present (0.8-5.3mbgl). These gravels are designated as a Secondary A Aquifer. The superficial drift deposits are underlain by chalk (5.2-10mbgl), which is designated as a Principal Aquifer. The majority of both the Central and Southern Areas are within a Source Protection Zones (SPZs); the Central Area within a SPZ3 and the Southern Area an SPZ2/SPZ1. There are also other recorded licensed abstractions locally.

(70) According to Report 3, there are a number of surface water bodies and streams onsite but "*Groundwater levels … indicate that the local shallow groundwater flow is to eh southwest, therefore the Hatfield Hyde Brook and River Lea are considered receptors*" for the Southern Area. However, an unnamed steam that feeds into the River Mimram "*may be at risk from potential contaminants of concern (PCOC) emanating from the landfill*" in the Central Area.

(71) Within Report 3, the significance of contaminant concentrations within ground and surface water data and soil leachate data relating to the Southern Area were generally assessed by comparison with either drinking water standards (DWS) or environmental quality standards (EQS).

(72) Soil leachate data (max 17 samples) identified potential risks to underlying groundwater relating to:

- Mercury, chromium and copper - 4 samples up to 2x EQS. RHDHV state that the exceedances "*were marginal and the mean concentrations did not exceed GAC*". It was also suggested that any contamination was not anthropogenic in nature.

- Hydrocarbons (aliphatic EC12-16, EC16-21, EC21-35 and Aromatic EC12-16, EC16-21, EC21-35) - 2 samples up to 68xDWS. RHDHV state that "*The mean concentration also exceeded the GAC, however the exceedances were marginal*". It was also noted that the use of DWS is conservative.

- PAHs and PAH-like compounds (including naphthalene) - ~ 15 samples up to 160xEQS. RHDHV noted that "*Although the mean concentration exceeded the GAC the exceedances were marginal with the exception of naphthalene (which was only detected in CGBH21) and the sum of benzo[ghi]perylene and indeno[123cd]pyrene*".

(73) Based on the limited leachability testing reported to date, LQM would generally agree with RHDHV that the soils in the Southern Area "*do not appear to have a significant impact on groundwater*".

(74) Report 3 also describes the installation of 16 ground water monitoring wells; 15 of these represented perched water within the Lowestoft Formation, only 1 was representative of the Secondary A Aquifer (CGBH03). Although the presentation of data in Appendix 5 of Report 3 is far from clear, it seems that the groundwater data (2 rounds of monitoring resulting in a total of 32 samples) suggested:

- Metals (including arsenic, boron, cadmium, chromium, copper lead and nickel) exceeded EQS in up to 25 samples. RHDHV notes that groundwater contamination did not seem to correlate

with leachable contamination in soils[9]. It was also noted that, with the exception of chromium, where an exceedance was reported in Round 1 sampling, in many cases it was not identified in the second round. Chromium exceeded the EQS for chromium VI in many boreholes (Including CGBH03 Secondary A Aquifer) consistently but concentrations were "*significantly lower during the second monitoring round*".

- Cresols and xylenols exceeded EQS in 2 samples

- Hydrocarbons (generally aliphatic EC12-16, EC16-21, EC21-35 and Aromatic EC12-16, EC16-21, EC21-35) – 10 samples up to 32xDWS. . RHDHV again notes that groundwater contamination did not seem to correlate with leachable contamination in soils. It was also noted that concentrations of hydrocarbons in some locations were lower in the second round and "*only CGBH22 exhibited hydrocarbon exceedances for aromatics EC21-35 in both monitoring rounds*". With respect to CGBH03 (Secondary A Aquifer), "*aromatic hydrocarbon compounds C21-35 were only detected during the first monitoring round*".

- PAHs and PAH-like compounds (including naphthalene) – 16 samples up to 8270xEQS. RHDHV again notes that groundwater contamination did not seem to correlate with leachable contamination in soils and that concentrations were generally lower in the second round (except for CGBH18) but that the "*majority of the exceedances were recorded in the northwestern part of the site*"[10]. With respect to CGBH03 (Secondary A Aquifer), "*a number of PAH compounds were recorded …however, the exceedances were generally not replicated in the second round*".

(75) Within the Memo, RHDHV also note that any residents/site users are unlikely to come into contact with the groundwater and that no volatile contamination were identified. Given the variable nature of groundwater contamination, LQM would not consider the results of only 2 monitoring rounds as sufficiently robust to draw reliable conclusions in the context of a full planning application but, based on the data currently available (including the lack of any volatile contaminants), the current data does not suggest that the ground water is likely to pose any substantial risks to potential residents *etc.* within the Southern Area. However, the data does indicate some level of groundwater contamination that will require further monitoring and assessment to determine if remediation measures are needed to protect the wider water environment. Such work should be referred to the Environment Agency prior to any subsequent planning approval being granted.

[9] This would seem to indicate a possible upstream source, such as the former landfill

[10] LQM assume that this relates to the area closest to the former landfill

(76) Within Report 3, RHDHV conclude that "*Although the PCOC have been identified in the perched groundwater this is unlikely to represent a receptor, but is important as a potential pathway allowing migration of PCOC to other sensitive receptors such as designated aquifers/abstractions*" but suggest that low permeability horizons within the Lowestoft Formation "*would significantly retard any vertical migration*". However, it is also acknowledged that "metals and PAH compounds at concentrations exceeding the GAC" have been identified in Secondary A Aquifer. Ground water samples were not recovered from the Principal Aquifer (chalk) but RHDHV suggest that the chalk encountered was described as "*slightly sandy, slightly gravelly silt which is likely to exhibit a lower permeability than the gravels associated with the Secondary A Aquifer and retard, to some degree, PCOC*". RHDHV also note that monitoring at the nearby potable water abstraction has not apparently suggested any issues with the quality of the groundwater from the Principal Aquifer.

(77) Surface water samples were obtained from an on-site brook (which apparently rises somewhere in the vicinity of the former landfill/mineral workings and discharges to the Hatfield Hyde Brook) and from a U-shaped surface water drain (which apparently solely intercepts water from the former landfill/mineral workings and discharges into the highway drainage network). Two rounds of samples were collected from two locations in the surface drain (CGSW01 and CGSW02) and from two locations in the brook; CGSW03 (downstream) and CGSW04 (upstream). Water from the CGSW01 were observed to have a "vibrant orange colour" and also had high levels of ammoniacal nitrogen, which is associated with landfill leachate. Of the seven surface water samples analysed[11] :

- Metals –levels of chromium, and nickel exceeded EQS in all samples from both rounds collected from the drain, other exceedances included arsenic, barium, boron, cadmium and nickel. Chromium exceeded the EQS for chromium VI in all samples from the brook, other exceedances included boron, cadmium, selenium and nickel. The data indicates that the water flowing from the Central Area is impacted by certain metals, the concentrations tend to decline as they flow across the Southern Area. RHDHV note that some of the PCOC identified in perched groundwater are not present in the surface waters.

- Hydrocarbons (aliphatics EC8-10, EC10-12 and aromatics EC10-12) – 1 samples collected during Round 1 from CGSW01 contained up to 1.7xDWS.

- PAHs and PAH-like compounds (including naphthalene) – Concentrations of the sum of benzo[b]fluoranthene and benzo[k]fluoranthene and the sum of benzo[ghi]perylene and

[11] Round 1 sample from CGSW04 was apparently not tested

indeno[123cd]pyrene were recorded at up to 100xEQS in CGSW01, CGSW02 and CGSW03 during Round 1.

(78) Although no detailed (graphical) assessment of trends and correlations in the ground and surface water data has not been presented, which would facilitate the identification of the likely source of such contamination. RHDHV note that some of the PCOC identified in perched groundwater were not present in surface water samples and concluded that although "*some continuity between the perched groundwater and the stream it would appear that … the perched groundwater are not having a significant impact on the on-site surface waters*". Within Report2, RHDHV suggest that the source of the groundwater contamination is likely to be off-site, but in the Memo clarify that ground and surface water contamination "*is likely to be associated with leaching from Cole Green landfill*". They also conclude that "f*urther assessment of the risk associated with the PCOC identified in the Secondary A Aquifer may require detailed quantitative risk assessment and liaison with the EA*". The Memo also contains assurances that "*mitigation works will be undertaken to improve baseline groundwater and surface water conditions*".

(79) LQM would generally agree that it seem likely that the source of some, or all, of the observed ongoing contamination entering ground and surface waters is the former landfill located in the Central Area, and that further work is need to determine the nature and level of pollution risk that this may pose to controlled waters. There is considerable uncertainty in the current understanding of the groundwater regime at the site and the level of risk posed by the former landfill, and it is not possible to comment on whether the groundwater mitigation measures outlined in the Memo would be appropriate or adequate. However, it is generally accepted that, if needed, groundwater remediation is more difficult and expensive than the treatment of soil contamination.

(80) Consequently, based on the current information, there is no reason to suspect that soil contamination and ground gas issues cannot be addressed during development and should not render the redevelopment of the Southern Area non-viable or undeliverable. There does appear to be ongoing groundwater contamination issues, which are probably related to leachate from the landfill wastes in the Central Area, but there is currently no evidence that these would pose a risk to future residents. It is possible that remediation will be needed to address the groundwater contamination issues associated with the landfill. Such remediation could represent a substantial cost, but is likely to be needed irrespective of the allocation of the Central and Southern Areas within the Local Plan. This is a matter for the Environment Agency to determine.

(81) In our experience, it is likely that subsequent investigation and large-scale earthworks will reveal a greater, rather than lesser, need for remediation or risk management actions regarding

contamination and land stability issues than those envisaged at the current initial stages. This is likely to impact, but not necessarily preclude, project viability/deliverability (see Section 5).

4.3 With respect to the area we know has been filled, have any contaminants been identified which mean it is unsuitable for the intended use as public open space? Where contaminants have been found are these a major concern? Can they be remediated to make the site safe?

(82) The public open space land use is generally considered to be less sensitive than, for example, residential uses because the expected exposure frequency and durations are lower. Beyond the proposed "urban open space" allocation, LQM are not aware of the nature of the country park proposed for the Central Area. This term covers a wide variety of possible scenarios, which could pose greater or lesser risks to human health.

(83) Only limited soil sampling data has currently been provided for the Central Area, which is known to have been subject to infilling. This is mainly presented in Report 2, which described a 2014 survey of shallow soils survey involving 49 hand auger locations and sampling within the surface 1 mbgl. The field work identified anthropogenic materials in numerous locations including clinker, plastic, glass, brick, ash, cloth rags, and pottery, which are indicative of landfill waste. However, the survey did not characterise the deeper materials nor prove the depth or extent of such wastes.

(84) The significance of contaminant concentrations was generally assessed using human health generic assessment criteria (GACs) for the "residential **without** home grown produce" land use, but the soil organic matter adopted is unclear. Up to 48 shallow soil samples were tested for some analytes and showed that the concentrations of some contaminants at some locations exceeded these GACs[12]:

- Lead – 6 exceedances at up to 4xGAC
- Petroleum Hydrocarbons (aromatics EC21-35 fraction) – a single marginal exceedance (1.1xGAC)
- benzo[a]pyrene and other PAH-like compounds – 5 exceedances at up to 7.5xGAC
- Asbestos (predominantly loose fibres of chrysotile and amosite) was present in 4 samples - no assessment criteria was derived

[12] The apparent exceedances of hexachloroethane and chloromethane appear to be an artefact of laboratory dilution effects on the method Limit of Detect.

- PCBs were detected above LoD (12.4 µg/kg) in 5 of 15 samples - no assessment criteria was derived

- loose asbestos fibres were identified in 4 of 47 samples (two amosite and two chrysotile). One sample also contained a fragment of ACM (chrysotile) - no assessment criteria was derived.

(85) However, RHDHV used a statistical approach (mean) to suggest that the general levels of lead, aromatics EC21-35 across the Site were not of concern. There are some assumptions and potential shortcomings associated with this statistical approach but in general it does suggest that wide-spread contamination is unlikely but the presence of 'hotspots', which may still require remediation, cannot be ruled out. Within Report1, RHDHV suggest that the only contaminants of potential concern are polyaromatic hydrocarbons (PAHs), particularly benzo[a]pyrene and other PAH-like compounds (such as dibenzofuran), asbestos and PCBs but conclude that none of these contaminants are "*likely to represent a major constraint to redevelopment of the site*".

(86) In addition to this investigation, the Memo outlines 2 additional subsequent investigations; one "*on the northern extent of the landfill adjacent to Hollwell sic]Hyde lane … associated with the potential construction of a building*" (4 boreholes and 10 trial pits in 2015), the other in 2017 involved "*three further samples by hand auger at each of the locations where asbestos and PCB had been identified*" but full details (e.g. reports including logs and certificates of analysis) have not been provided. The Memo reports that "*In total (across all phases of investigation) ninety-two samples were tested for asbestos and fifty-six samples were tested for PCBs*".

(87) With respect to asbestos, RHDHV indicate that the wide-spread presence of visible fragments of asbestos-containing materials (ACMs) was not encountered and that asbestos was only detected during laboratory analysis. Asbestos (type unknown) was reported to have been identified in 10 of the 92 samples, generally at concentrations below 0.001%. RHDHV conclude that they "*consider that the asbestos is unlikely to represent a significant risk to site users*". LQM have not been provided with any further evidence regarding the additional testing or the nature of the risk assessment undertaken to support this conclusion.

(88) The assessment of risks relating to asbestos-containing soils is an emerging specialist area and one that LQM are at the forefront of (Nathanail et al., 2014). In our experience, the current data represents conditions similar to those associated with many areas of urban made ground, including parks and playing fields. However, WHBC should note that asbestos is, rightly, a highly contentious contaminant and its presence is likely to result in considerable local concern and potentially opposition. Prior to this area being granted planning permission:

- A more transparent presentation of the existing data and, if necessary, additional data should be provided;

- A robust risk assessment in line with current good practice should be presented;

- If risk management or remediation is needed, suitable measures should be included in the relevant Remediation Strategy for the site

(89) However, overall, we would tend to agree with RHDHV that these issues are unlikely to be unsurmountable. Due to the contentious nature of asbestos, we would recommend that WHBC (incl. both planning and environmental health function) develop a coherent policy relating to how asbestos-containing soils are/should be assessed and managed within the borough before any planning application needs to be determined.

(90) With respect to PCBs, apart from the data in Report1, no details are provided regarding the results of the additional sampling but in the Memo RHDHV rely on unidentified Environment Agency and Dutch guidance to conclude that "*PCB concentrations recorded at the site would not represent a significant risk to site users*". LQM have not been provided with any further evidence regarding the additional testing or the nature of the risk assessment undertaken to support this conclusion. PCBs are not unexpected contaminants associated with historical landfills but there presence is also (rightly) likely to be the subject of some public concern and objection. As for asbestos, a more transparent and robust presentation and assessment of the existing data should be presented prior to this area being granted planning permission and, if necessary, additional data collected. It is possible, even likely, that a robust risk assessment will demonstrate if remediation is required and, if so, what measures would be appropriate.

(91) There is currently no data on the depth, extent and composition of the landfilled wastes found at depth, nor on the types and concentrations of contaminants present within such wastes. However, it is unlikely that, after appropriate development, people at a country park would come into direct contact with such materials. Any potential risk from the deeper waste materials are likely to relate to the differential settlement, the generation of landfill gases, the volatilisation of organic contaminants (which could potentially pose inhalation risks) and the migration of contaminated leachate into groundwater. It would be expected that any planning application would have due regard to such issues and that, if necessary, adequate mitigation would be incorporated in the design.

Both LQM and Wardell Armstrong, have highlighted the lack of robust risk assessments relating to ground gases and controlled waters (including groundwater) risks associated with the former landfill in

the Central Area. However, we note that both Report 2 and the Memo include commitments to assess and manage any risks posed by landfill gas.

(92) The situation with respect to risk to the water environment is less clear, but the Memo does outline proposed mitigation measures involving "interceptor drains". It is not possible to determine if such measures would be sufficient to adequately protect all controlled waters receptors, and the proposed development of the Southern Area, but the current evidence does not suggest that adequate risk management measures could not be implemented. Robust controlled waters risk assessments would need to be submitted in support of any future planning application. We understand that WHBC has consulted the Environment Agency at every stage of the plan making process. However, the EA did not have the resource to review the full reports but considered that there was no reason to oppose development of the Site at the Local Plan stage and that any matters could be addressed at the planning application stage.

(93) It should be noted that if serious impacts to groundwater (particularly to the underlying chalk principle aquifer) are revealed during subsequent sampling, assessment and modelling the resulting costs could be substantial and could conceivably compromise viability. However, if this were the case, it is likely that the landowner would be legally obligated to undertake appropriate remediation even if the development did not go ahead.

(94) Wardell Armstrong and WGCS have also highlighted potential issues with respect to groundwater and landfill gas that may be caused or exacerbated by the development of the country park (e.g. the weight of capping and piling *etc.*). These are valid concerns and such risks would need to be fully investigated, assessed and, if necessary, addressed during any such development and may not be insignificant. However, it is also possible that the landfill may already represent an ongoing source of groundwater and gas risks even before any redevelopment. Indeed, reports 1 and 2 provide partial evidence to support ongoing off-site migration of leachate and landfill gas. Consequently, the redevelopment of would provide for the investigation, assessment and, if necessary, mitigation of such risks, which would not otherwise be funded. Should the land not be redeveloped, these issues will be considered by the Council, if it has not already done so, as part of its duty to "*cause its area to be inspected from time to time*" under Part 2A of the Environmental Protection Act.

(95) In conclusion, the principal contaminates of concern with respect to human health identified to date in the shallow soils are asbestos and PCBs. These are a concern but probably not a major concern, and can probably be adequately dealt with in more detailed work in relation to any subsequent planning application and, if necessary, adequately remediated. Although measures may need to be implemented during the redevelopment to mitigate both onsite and offsite ground gas risks, this should not be onerous given the low sensitivity of the landuse and availability of relatively low

cost options to manage off-site migration. The risks posed by the landfill wastes to controlled waters have been poorly characterised to date and remain a significant uncertainty. However, based on the current information, there is no reason to suspect that land contamination issues cannot be addressed during development and should not render the redevelopment of the Central Area as a country park non-viable or undeliverable. However, in our experience, the costs of the required assessments and remediation in relation to contamination and land stability issues are likely to increase, rather than decrease. This is likely to impact, but not necessarily preclude, project viability/deliverability (see Section 5).

5 CLARIFICATION REGARDING VIABILITY/DELIVERABILITY OF THE PROPOSED EVIDENCE, SPECIFICALLY:

5.1 **The final question is to understand whether the evidence submitted is sufficient enough to demonstrate that the site is deliverable and that it is viable to bring forward. Are the site promoter's suggested remediation strategies likely to be appropriate? Does the evidence point to any abnormal remediation costs that might put the delivery of the site at threat?**

(96) It should be noted that LQM are not surveyors or valuers and therefore we can only comment on deliverability and viability from a technical perspective in relation to land contamination management.

(97) In the first instance, no amount of investigation or assessment would be capable of demonstrating that the site is deliverable/viable as this negates the inherent uncertainty associated with land contamination issues. However, as discussed above given the current stage in the planning cycle the evidence supplied to LQM could be considered appropriately robust with respect to informing decisions concerning allocation within the Local Plan and do not demonstrate that the site could not be viably delivered.

(98) LQM have not been provided with a remediation strategy document and the RHDHV reports and memo only outline approaches that may be applicable; LQM do not regard these as firm proposals and in any case the current investigation and assessments are insufficient to allow a robust remediation strategy to be derived. However, the current information does seem to suggest that an effective remediation strategy could be devised in due course.

(99) LQM understand that LT are currently suggesting that the remediation costs would be in the order of £2.5 million, but that no detail has been provided on how this figure has been derived or what contingencies it contains. Based on the limited nature of the investigation and consequent lack of resolution regarding the land contamination and stability issues (including potential leachate and ground gases/vapours emissions from the waste mass) affecting the Site, it is not possible to judge if this is a reliable figure. Our experience is that such estimates usually increase rather than decrease as more information becomes available, therefore the possibility that remediation costs may ultimately threaten the viability of the proposed development cannot be ruled out. However, this is true of all brownfield (and some greenfield) sites and it can also be argued that the increased land value associated with allocation within the Local Plan would facilitate the investigation and assessment of a potentially significant source of human health, ground water and ground gas risks, which would otherwise remain 'under the radar' or which could potentially require consideration by WHBC under the Part 2A regime.

6 OVERALL CONCLUSION

(100) Notwithstanding the critiques of the information supplied by LT by LQM, Wardell Armstrong and WGCS, which highlight various deficiencies, uncertainties and potential inaccuracies in this information, the central question is whether there is any land contamination or stability reason that WHBC should **not** allocate the site for housing and urban open space within the Local Plan. As discussed above, although only preliminary works have been conducted to-date and significant uncertainty remains, the available information could be considered appropriate for the current stage of the planning cycle. The various limitations of the current work identified (e.g. by LQM, Wardell Armstrong and WGCS) would need to be addressed in any future investigation and assessments in support of any planning applications. The current evidence does not appear to suggest any substantial justification for the land not to be allocated within the Local Plan, notwithstanding the possibility that any development may ultimately be unviable/undeliverable.

(101) However, WHBC will need to consider that due to the historic landfilling in the area and the likely scrutiny and opposition to any subsequent planning applications, the review and management of land contamination issues during the development are likely to require considerable time and expertise, which will need to be provided throughout the development period. WHBC may wish to consider how it will provide and fund this expertise, if its decisions are to be reasonable.

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