



Ecology Consultancy



Broad Street Mall, Reading

Preliminary Ecological Appraisal

Report for Trium Environmental Consulting LLP

Job Number	7033			
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Summary of key issues

The Ecology Consultancy was commissioned to carry out a Preliminary Ecological Appraisal (PEA), comprising a Phase 1 habitat survey, protected species assessment and ecological evaluation of the Broad Street Mall in Reading. The main findings of the PEA are as follows:

- The site comprised a shopping centre building including internal and external car parks, a basement area and office buildings above. The main habitat present was buildings.
- The site is not subject to any statutory or non-statutory nature conservation designations. There are no statutory designated sites within a 2km radius. The nearest non-statutory designated site is Holy Brook Local Wildlife Site located 0.49km south of the site.
- Semi-natural habitats were absent from the site, and those present are considered to be of low ecological value, being man-made and devoid of vegetation.
- **Bats** – The buildings on site are considered to have negligible potential to support roosting bats and there are no trees on site. No further survey work will be required for roosting bats.
- **Breeding birds** – breeding birds were confirmed as being present on site. Feral pigeon were recorded using the façade and basement areas of the main shopping centre building. It should be noted that feral pigeon may breed all year round, and a check for nesting birds prior to works commencing on site should be undertaken by an experienced ecologist and, if any nests are found, the nests should be protected until such time as the young have left the nest. If any nesting birds are found at any time during clearance works, work should stop immediately and an ecologist consulted.
- Recommendations to enhance the biodiversity value of the site in accordance with national and local planning policies comprise the inclusion of wildlife planting and the provision of bird nesting opportunities.

1 Introduction

BACKGROUND TO COMMISSION

- 1.1 The Ecology Consultancy was commissioned by Trium Environmental Consulting LLP to carry out a Preliminary Ecological Appraisal (PEA) of the existing Broad Street Mall building in Reading. The appraisal was carried out in order to provide ecological information to inform a planning application for a proposed residential development on top of and adjacent to the existing shopping centre. This appraisal considers land within the planning application site boundary (hereon referred to as ‘the site’) as indicated on the plan provided by the client (Corstorphine + Wright Architects, Broad Street Mall, Reading, Pre-application document December 2017).

SCOPE OF THE REPORT

- 1.2 The aim of this appraisal is to provide baseline ecological information about the site. This will be used to identify any potential ecological constraints associated with the proposed development and/or to identify the need for additional survey work to further evaluate any impact that may risk contravention of legislation or policy relating to protected species and nature conservation. Where necessary, avoidance, mitigation/compensation and/or enhancement measures have been recommended to ensure compliance.
- 1.3 This appraisal is based on the following information sources:
- a desk study of the site and land within a 1km surrounding radius;
 - a Phase 1 habitat survey (JNCC, 2010) of the site to identify and map the habitats present;
 - a protected species assessment of the site to identify features with potential to support legally protected species; and
 - an evaluation of the site’s importance for nature conservation.
- 1.4 This appraisal has been prepared with reference to best practice guidance published by the Chartered Institute for Ecology and Environmental Management (CIEEM, 2013) and as detailed in British Standard 42020:2013 *Biodiversity - Code of Practice for Biodiversity and Development* (BSI, 2013).

- 1.5 The survey, assessment and report were conducted and written by Gemma Watkinson MBiolsci ACIEEM, an ecologist with over three years' experience who is competent in carrying out Phase 1 habitat surveys and protected species assessments.

SITE CONTEXT AND STATUS

- 1.6 The proposed development site is 1.76 hectares (ha) in size and is centred on Ordnance Survey National Grid reference SU 71239 73365. The site lies within the centre of Reading and is not subject to any nature conservation designations. It is situated to the south of Broad Street and Oxford Road, and to the west of St Mary's Butts. The site is bordered by Queen's walk and Hosier Street at the south, and by Queen's walk at the west.
- 1.7 The local area is dominated by urban development including Magistrates Court to the south, commercial and retail units to the north and east and residential development to the west. Small semi-natural green spaces are present including an urban park adjacent to the south of the site (Appendix 2, photograph 8) and the churchyard associated with Reading St Minster Church to the south-east.

DEVELOPMENT PROPOSALS

- 1.8 The development proposals for the site, based on current plans provided by the client (Corstorphine + Wright Architects, Broad Street Mall, Reading, Pre-application document December 2017), are for a proposed residential development on top of and adjacent to the existing shopping centre, with continued retail and leisure provision, maintaining frontages along Oxford Street and St Mary's Butts, and improving frontages to Hosier Street and Queen's Walk. A total of 280-420 new residential dwellings are proposed.

RELEVANT LEGISLATION AND PLANNING POLICY

- 1.9 The following key pieces of nature conservation legislation are relevant to this appraisal. A more detailed description of legislation is provided in Appendix 5:
- The Conservation of Habitats and Species Regulations 2017 (commonly referred to as the Habitats Regulations);
 - Wildlife and Countryside Act 1981 (as amended);
 - Natural Environment and Rural Communities Act 2006;
 - Protection of Badgers Act 1992; and

- Wild Mammals (Protection) Act 1996.

1.10 The National Planning Policy Framework (Department of Communities and Local Government, 2012) requires local authorities to avoid and minimise impacts on biodiversity and, where possible, to provide net gains in biodiversity when taking planning decisions.

1.11 Other planning policies at the local level which are of relevance to this development include the Reading Borough Council Local Plan (2015). Further information is provided in Appendix 5.

2 Methodology

DESK STUDY

2.1 The following data sources were reviewed to provide information on the location of statutory designated sites¹, non-statutory designated sites², legally protected species³, Species and Habitats of Principal Importance⁴ and other notable species⁵ and notable habitats⁶ that have been recorded within a 1km radius of the site:

- Thames Valley Environmental Records Centre (TVERC), the local Biological Records Centre, principally for species records and information on non-statutory sites;
- MAGIC (<http://www.magic.gov.uk/>) - the Government's on-line mapping service;
- Ordnance Survey mapping and publicly available aerial photography; and
- Previous bat survey report for the area (FPCR, 2017) which included the proposed development site and adjacent buildings at the south east.

2.2 Records provided by the desk study are provided in Section 3 of this report. Records for relevant protected or noteworthy species have been used to inform the assessment of the potential for protected species at the site and to provide a preliminary view of the site's ecological value but are not presented in the report.

HABITAT SURVEY

2.3 A habitat survey of the site was carried out on the 25 June 2018 in warm, clear, dry conditions. It covered the entire site including boundary features. Habitats were described and mapped following standard Phase 1 habitat survey methodology (JNCC, 2010). Habitats were marked on a paper base map and subsequently digitised using

¹ Statutory designations include Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR).

² Non-statutory sites are designated by local authorities (e.g. Sites of Importance for Nature Conservation or Local Wildlife Sites).

³ **Legally protected species** include those listed in Schedules 1, 5 or 8 of the Wildlife and Countryside Act 1981; Schedule 2 of the Conservation of Habitats and Species Regulations 2017; or in the Protection of Badgers Act 1992 (as amended).

⁴ **Species of Principal Importance** are those listed on Section 41 of the Natural Environment and Rural Communities Act, 2006.

⁵ **Notable species** include Species of Principal Importance under the Natural Environment and Rural Communities Act 2006; Local Biodiversity Action Plan (LBAP) species; Birds of Conservation Concern (Eaton *et al.*, 2015); and/or Red Data Book/nationally notable species (JNCC, undated).

⁶ **Notable habitats** include Habitats of Principal Importance under the Natural Environment and Rural Communities Act, 2006; those included in an LBAP; Ancient Woodland Inventory sites; and Important Hedgerows as defined by the Hedgerow Regulations 1997.

ESRI ArcGIS software. Habitats were also assessed against descriptions of Habitat of Principal Importance as set-out by the JNCC (BRIG, 2008)⁷.

- 2.4 Records for dominant and notable plants are provided, as are incidental records of birds and other fauna noted during the course of the habitat survey.
- 2.5 Common names are used where widely accepted – for amphibians, birds, fish, mammals, reptiles and vascular plants. Scientific names are provided for other groups but at first mention only if there is also an accepted common name.
- 2.6 The site was also surveyed for the presence of invasive plant species as defined by Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). However, detailed mapping of such species is beyond the scope of this commission and the locations on the habitat plan are indicative only.
- 2.7 Target notes are used to provide information on specific features of ecological interest (e.g. a badger sett) or habitat features that were too small to be mapped.

PROTECTED AND INVASIVE SPECIES ASSESSMENT

- 2.8 The suitability of the site for legally protected species was assessed on the basis of relevant desk study records⁸ combined with field observations from the habitat survey. The likely value of habitat for protected species occurrence was ranked on a scale from 'negligible' to 'present' as described in Table 2.1.
- 2.9 The assessment of habitat suitability for protected or notable species was based on professional judgement drawing on experience of carrying out surveys of a large number of urban and rural sites and best practice survey guidance on habitat suitability and identifying field signs. Further information is provided in CIEEM's Sources of Survey Methods⁹.

Table 2.1: Protected species assessment categories

Category	Description
Present	Presence confirmed from the current survey or by recent, confirmed records.

⁷ Data required to confirm that certain habitats (including rivers and ponds) meet criteria for Habitats of Principle Importance is beyond that obtained during a Phase 1 habitat survey. In these cases the potential for such habitats to meet relevant criteria is noted but further surveys to confirm this assessment may be recommended

⁸ Primarily dependent on the age of the records, distance from the site and types of habitats at the site.

⁹ <http://www.cieem.net/sources-of-survey-methods-sosm->

High	Habitat present provides all of the known key requirements for a given species/species group. Local records are provided by desk study. The site is within or close to a national or regional stronghold for a particular species. Good quality surrounding habitat and good connectivity.
Moderate	Habitat present provides all of the known key requirements for a given species/species group. Several desk study records and/or site within national distribution and with suitable surrounding habitat. Factors limiting the likelihood of occurrence may include small habitat area, barriers to movement and disturbance.
Low	Habitat present is of relatively poor quality for a given species/species group. Few or no desk study records. However, presence cannot be discounted on the basis of national distribution, nature of surrounding habitats or habitat fragmentation.
Negligible	Habitat is either absent or of very poor quality for a particular species or species group. There were no desk study records. Surrounding habitat unlikely to support wider populations of a species/species group. The site may also be outside or peripheral to known national range for a species.

2.10 The findings of this assessment establish the need for protected species surveys that are required to achieve compliance with relevant legislation. Surveys are commonly required for widespread species such as bats, great crested newt, reptiles and badger; but may be necessary for other species if suitable habitat is present.

2.11 Surveys may be required where a site is judged to be of low suitability for a particular species/species group. However, in some cases there may be opportunities to comply with legislation, without further survey, through precautionary measures prior to and during construction.

SITE EVALUATION

2.12 The site's ecological value has been evaluated broadly following guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016) which ranks the nature conservation value of a site according to a geographic scale of reference: international, national, regional, county/metropolitan, district/borough, local/parish or of value at the site scale. In evaluating the nature conservation value of the site the following factors were considered: nature conservation designations; species/habitat rarity; naturalness; fragility and connectivity to other habitats;

2.13 An initial assessment of the site's contribution to green infrastructure and ecosystem services, as recommended by *BS 42020:2013 Biodiversity. Code of practice for planning and development*, is also included.

DATA VALIDITY AND LIMITATIONS

2.14 Every effort has been made to provide a comprehensive description of the site, however, the following limitations apply to this assessment.

- The protected species assessment provides a preliminary view of the likelihood of protected species occurring on the site. It should not be taken as providing a full and definitive survey of any protected species group. Additional surveys may be recommended if on the basis of the preliminary assessment or during subsequent surveys it is considered reasonably likely that protected species may be present.
- The ecological evaluation is preliminary and may change subject to the findings of further ecological surveys (should these be required).
- Even where data for a particular species group is provided in the desk study, a lack of records for a defined geographical area does not necessarily mean that there is a lack of ecological interest, the area may simply be under-recorded.
- Where only four figure grid references are provided for protected species by third parties, the precise location of species records can be difficult to determine and they could potentially be present anywhere within the given 1km x 1km square. Equally six figure grid references may be accurate to the nearest 100m only.
- The Phase 1 habitat survey does not constitute a full botanical survey or provide accurate mapping of invasive plant species.
- Ecological survey data is typically valid for two years unless otherwise specified.

2.15 Despite these limitations, it is considered that this report accurately reflects the habitats present, their biodiversity values and the potential of the site to support protected and notable species.

3 Results

DESIGNATED SITES

Statutory designated nature conservation sites

- 3.1 The proposed development site is not subject to any statutory nature conservation designations. There are no European or national statutory sites within a 1km radius of the site.

Non-statutory designated nature conservation sites

- 3.2 The proposed development site is not subject to any non-statutory nature conservation designations. Three non-statutory sites designated as Local Wildlife Sites (LWS) are present within 1km of the site (see Table 3.1).

Table 3.1: Non-Statutory Designated Sites

Site Name	Distance from site and orientation	Reason for designation
Holy Brook	0.49km south	A stream that carries water from and emptying back into the River Kennet chalk river. Alder and willow line the banks and a variety of wetland species are found along the banks.
River Kennet/ Kennet and Avon Canal	0.78km south	A section of the River Kennet and Avon Canal. The River Kennet is one of the best examples of a chalk river nationally and is a UK BAP habitat. Protected species recorded on site include water vole and freshwater crayfish.
Cow Lane Depot	0.88km north-west	A small isolated triangular site that forms a mosaic of habitats ranging from willow scrub with mature trees to open standing water with swamp to ruderal and tall herb grassland. The site provides a wildlife corridor in an urban landscape.

Habitat inventories and landscape-scale conservation initiatives

Habitats of Principal Importance

- 3.3 Areas of lowland mixed deciduous woodland (1.39ha) and wet woodland (1.37ha) are recorded within 1km of the site, approximately 0.49km south and 0.88km north west of the site respectively. These habitats were not recorded within or adjacent to the survey area.

PHASE 1 HABITAT SURVEY

Overview

- 3.4 The site consists of the existing Broad Street Mall building, including the car park area, basement areas and the two office buildings above (Fountain House and Quadrant House).
- 3.5 Phase 1 habitat types are mapped in Figure 1, areas are given in Table 3.2. A description of dominant and notable species and the composition of each habitat is provided below.

Table 3.2: Phase 1 Habitat Areas

Phase 1 Habitat	Extent	%
Buildings	1.76ha	100

Habitat description

Buildings

- 3.6 The main shopping centre, Broad Street Mall, was constructed of concrete with flat roof areas, much of which was utilised for car parking. Within the car park areas there were some services structures with flat roofs and metal vents (Appendix 2, photograph 1). A stairwell access structure on top of the mall towards the north west of the building had a timber fascia which was positioned away from the wall, resulting in a wide gap.
- 3.7 The concrete walls were in good condition, with no gaps or cracks noted on the external elevations of the building. The northern, southern and western façade of the building was formed of a concrete wall with holes as an artistic feature to the internal car parking area (Appendix 2, photograph 2). There were no gaps within the internal concrete structure of the car parking areas (Appendix 2, photograph 10). Where shop-front cladding was present on the northern and eastern elevations, this was all in good condition, with no gaps noted (Appendix 2, photograph 3).
- 3.8 The basement area (Appendix 2, photograph 4) is well lit and in constant use. Service pipes run through the concrete basement. There were open access points on the southern and western elevations.
- 3.9 Fountain House is a modern multi-storey commercial office block building located above the shopping mall, in the north-western part of the site (Appendix 2, photograph 5). It had a flat roof with a concrete and glass structure. The building was in good condition with no gaps noted.
- 3.10 Quadrant House is located above the shopping mall, at the east of the building (Appendix 2, photograph 7). It is constructed of concrete with a flat roof and metal frame windows on all elevations, with all glazing intact. The building was in good condition with no gaps noted within the structure.
- 3.11 There were rare occurrences of ephemeral plant species recorded growing on the flat roof areas of the mall building. Prickly sow-thistle, groundsel and buddleia seedlings were recorded.

PROTECTED AND INVASIVE SPECIES ASSESSMENT

3.12 The potential for the site to support protected species has been assessed using criteria provided in Table 3.3, based on the results of the desk study and observations made during the site survey of habitats at the site. Other legally protected species are not referred to as it is considered that the site does not contain habitats that would be suitable to support them. The following species/species groups are potentially present at the site:

- bats;
- breeding birds;
- invasive species.

3.13 The table also summarises relevant legislation and policies relating to protected and invasive species. Key pieces of statute are summarised in Section 1 and set-out in greater detail in Appendix 5.

Table 3.3: Protected and Invasive Species Assessment

Habitat/ species	Status 10, 11	Likelihood of occurrence
Bats	HR WCA S5	Negligible: The buildings on site were all constructed of concrete, with flat roofs. They were all in good condition with no gaps or cracks within the structure and no potential roosting features noted. The gap behind the timber fascia on one of the structures on the roof of the mall was considered to be too wide to support crevice dwelling species and no bat droppings were noted on the wall or floor beneath, indicating it had not been previously utilised by roosting bats. The site has limited connectivity to areas of suitable foraging habitat, and the small areas of amenity and species-poor grassland and semi-mature trees within the urban park to the south of the site would provide limited foraging habitats for bats within the local area. There are a total of 37 records from TVERC of four species of bats within 1km of the site including common pipistrelle, soprano pipistrelle, noctule and Daubenton's. Soprano pipistrelle is a Species of Principal Importance. The closest record to the site is located approximately 150m south-east of the site, for a single common pipistrelle emerging from a roost. The previous bat survey report found no bats emerging from or re-entering the building (25th May 2017, 4th July 2017), and bat activity was limited on site to a few passes, comprising common pipistrelle and soprano pipistrelle. Noctule, serotine, <i>Myotis</i> sp., <i>Nyctalus</i> sp., and <i>Plecotus</i> sp were recorded towards the east of the building. The buildings on site are considered to have negligible potential to support roosting bats and are therefore not considered further in this report.
Breeding birds	WCA S5	Present: An active feral pigeon nest was noted within the basement area of the building, on top of a metal shelf (Appendix 2, photograph 11), and a further disused feral pigeon nest noted on top of an illuminated sign within the basement area. It is also considered highly likely that feral pigeon will nest within gaps in the decorative concrete façade on the southern elevation of the building, where an accumulation of droppings was noted (Appendix 2, photograph 9). As breeding birds are confirmed to be present in the site they are considered further in Section 4 of this report.

¹⁰ The following abbreviations have been used to signify the legislation regarding different species: HR = Conservation of Habitats and Species Regulations 2017; WCA S1 = Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); WCA S5 = Schedule 5 of the Wildlife and Countryside Act 1981 (as amended); WCA S9 = Schedule 9 of the Wildlife and Countryside Act 1981 (as amended); PBA = Protection of Badgers Act, 1992.

¹¹ The following abbreviations have been used to signify the policy of conservation assessments applying to notable species: SPI = Species of Principal Importance under the NERC Act 2006; LBAP = Local Biodiversity Action Plan species; BoCC = Birds of Conservation Concern - amber list / red list (Eaton *et al.*, 2015); and/or RD/NN = red data book/nationally notable species (JNCC, undated).

Table 3.3: Protected and Invasive Species Assessment

Habitat/ species	Status 10, 11	Likelihood of occurrence
Invasive species	WCA S9	Negligible: There are desk study records for invasive species within 1km of the site, including some listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), namely Indian balsam and Japanese knotweed. These species were not recorded on site during the habitat survey. As there is a negligible likelihood of presence, invasive species listed on Schedule 9 are not considered further in this report.

NATURE CONSERVATION EVALUATION

- 3.14 The proposed development site is not subject to any nature conservation designations. It is dominated by built environment and contains no Habitats of Principal Importance or Reading BAP habitats. It is situated within an urban area surrounded by retail property and roads and is distant from any sites and habitats of nature conservation importance.
- 3.15 The habitats on site were not considered suitable for any Species of Principal Importance or Reading BAP species, as reported in the desk study or recorded during the survey. It is unlikely that the site would support rare species, or diverse assemblages or large populations of any noteworthy species.

4 Potential Impacts and Recommendations

4.1 This section summarises the potential impacts on habitats and notable species that may be present at this site. The impact assessment is preliminary and further detailed assessment and surveys will be required to assess impacts and design suitable mitigation, where appropriate.

4.2 Due to the nature of the habitats on site and the retention of the existing buildings, the proposals have very few ecological constraints. The following key ecological issues have been identified:

- habitat suitable for breeding birds is present – measures must be taken to avoid killing birds or destroying their nests;
- a range of measures should be undertaken to satisfy the requirement for ecological enhancement included in planning policy.

CONSTRAINTS AND MITIGATION/COMPENSATION

Designated Nature Conservation Sites

4.3 No impacts are envisaged on statutory or non-statutory designated sites due to the distance of the site from any designated site. Therefore, there are no constraints to the proposed development in this regard.

Habitats

4.4 There are no natural habitats present on site, and no constraints were identified in relation to the intrinsic value of the habitats present.

Bats

4.5 The buildings on site will all be retained within the current proposals for the site, with new buildings being constructed on top of the existing shopping mall. No further survey work or mitigation is required for bats on site.

Breeding birds

4.6 All wild birds and their nests are protected under the Wildlife and Countryside Act 1981 (as amended). The site supports at least one common species of breeding bird and has potential to support others.

- 4.7 Where the proposed works require the removal of ledges within the basement or works to the facades of the buildings with potential to support nesting feral pigeons, this must be preceded by a nesting bird check completed by a suitably qualified ecologist within 48 hours of the works, to confirm the absence of nesting feral pigeons. Should they be present, the nest and a suitable buffer of habitat around it must be retained until the young have left the nest. A licenced pest control contractor specialised in the removal of pigeons may be contacted to provide further advice, as they may be able to facilitate the removal of feral pigeons prior to works under a licence.

Other protected species

- 4.8 In the unlikely event that any protected species are found during construction, works must stop immediately and advice sought from a suitably qualified ecologist on how to proceed.

FURTHER SURVEY REQUIREMENTS

- 4.9 Table 4.1 lists further survey requirements as recommended in the constraints section.

Table 4.1: Further survey requirements

Species /Habitat	Survey Requirement	Number of surveys and seasonal considerations
Breeding birds	Breeding bird check	Check for active nests immediately ahead of works commencing on any potential nesting habitats on site.

OPPORTUNITIES FOR ECOLOGICAL ENHANCEMENT

- 4.10 Planning policy at the national and local level and strategic biodiversity partnerships encourage inclusion of ecological enhancements in development projects. Ecological enhancements can also contribute to green infrastructure and ecosystem services such as storm water attenuation and reducing the urban heat island effect. The following measures would be suitable for integration into the site's design, but would require a more detailed design to successfully implement.

Wildlife planting

- 4.11 Wildlife planting should be integral to the soft landscape plans around the base of the new buildings and should include native species and/or species of recognised wildlife

value¹². Planters could be incorporated into the design, to support nectar-rich and berry producing plants which will attract a wider range of insects, birds and mammals. Trees should also be provided, where possible, and can be under-planted to improve structure and cover for wildlife.

- 4.12 Good horticultural practice should be utilised, including the use of peat-free composts, mulches and soil conditioners, native plants with local provenance and avoidance of the use of invasive species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).
- 4.13 Landscaping should include the use of climbing plants growing on a support structure to provide vertical nesting habitat and foraging resources for birds and invertebrates. The support structure should ideally be placed 50-100mm off the façade. Plants should comprise native species or non-native species of recognised wildlife value and either deciduous or evergreen species depending on the specification.

Biodiverse green roof

- 4.14 The aspiration should be to install biodiverse / biosolar roofs on the new buildings (subject to loading capacity) as they deliver multiple green infrastructure benefits, including being of high wildlife value.
- 4.15 A biodiverse green roof would provide additional benefits such as protecting and prolonging the life of the roof membrane, reducing building energy use by insulating the building in winter and keeping it cooler in summer, providing a SuDS function by reducing storm water run-off from the roof, reducing the urban heat island effect and local air/noise pollution. Combining a biodiverse roof with PV panels (biosolar roof) would also provide further benefits, such as the cooling effect the vegetation has on the PV cells, increasing their productivity in hot weather, as well as resulting in a more efficient use of roof space.
- 4.16 Professional advice should be sought (e.g. The Green Infrastructure Consultancy - <https://greeninfrastructureconsultancy.com/>) and the green roof should follow UK standards published by the Green Roof Organisation (GRO, 2014) and include additional habitat features such as deadwood, varying substrate depths and areas of

¹² For example The Royal Horticultural Society (RHS) Perfect for Pollinators Scheme <https://www.rhs.org.uk/science/conservation-biodiversity/wildlife/encourage-wildlife-to-your-garden/plants-for-pollinators> and the joint RHS/Wildlife Trust's Gardening With Wildlife In Mind Database <http://www.joyofplants.com/wildlife/home.php>

bare rocky substrate. This will provide good habitat for a range of invertebrates and birds, and would contribute to the Urban 1 habitat plan of the Reading Biodiversity Action Plan (Reading Borough Council, 2006).

Flowering lawn

- 4.17 In any proposed amenity lawn areas it is recommended that a flowering lawn such as WFT-Species-Rich-265 is used (Wildflower Turf Ltd, 2018). Flowering lawns contain low growing, hardy native wildflower species and provide a higher biodiversity value than traditional amenity grassland but also provides the resistance to footfall and regular management that is required for amenity lawns.

Provision of bird nesting opportunities

- 4.18 The provision of bird boxes would be appropriate at this site. Many different designs are available including boxes to support species such as swift, which is a priority species in the Reading Biodiversity Action Plan. Woodcrete bird boxes (Schwegler, 2014) are recommended as they are long lasting compared to wooden boxes, insulate occupants from extremes of temperature and condensation and are available in a broad range of designs.

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Appendix 1: Habitat Map

Figure 1: Habitat Survey Map



Appendix 2: Photographs

Photograph 1

Northern elevation of Broad Street Mall. Fountain House above on north-western part.



Photograph 2

Western elevation of Broad Street Mall with Fountain House above.



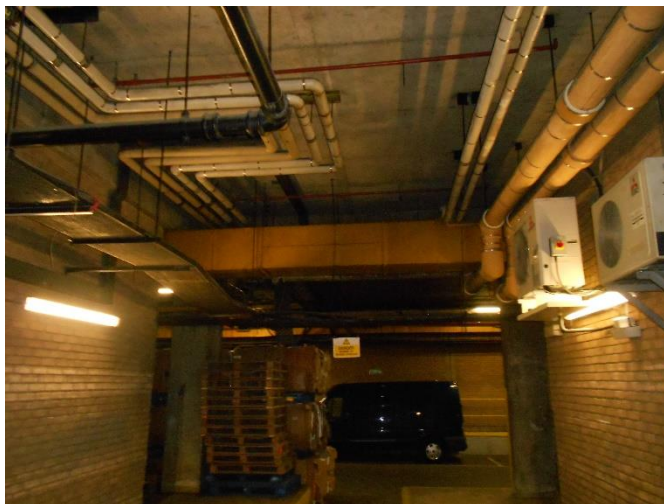
Photograph 3

Eastern elevation of Broad Street Mall.



Photograph 4

Representative view of
basement area of Broad
Street Mall.



Photograph 5

A view showing car park areas
and Fountain House above
Broad Street Mall.



Photograph 6

Further view of car parking
areas on top of Broad Street
Mall.



Photograph 7

View of western elevation of
Quadrant House on top of
Broad Street Mall.



Photograph 8

View of small urban park at
south of Broad Street Mall.

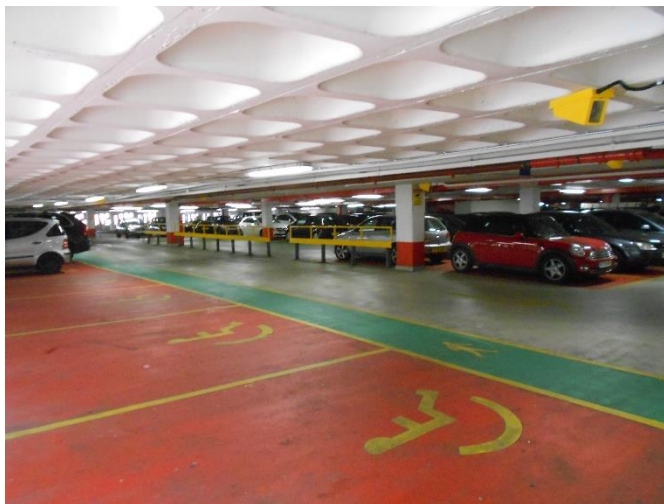


Photograph 9

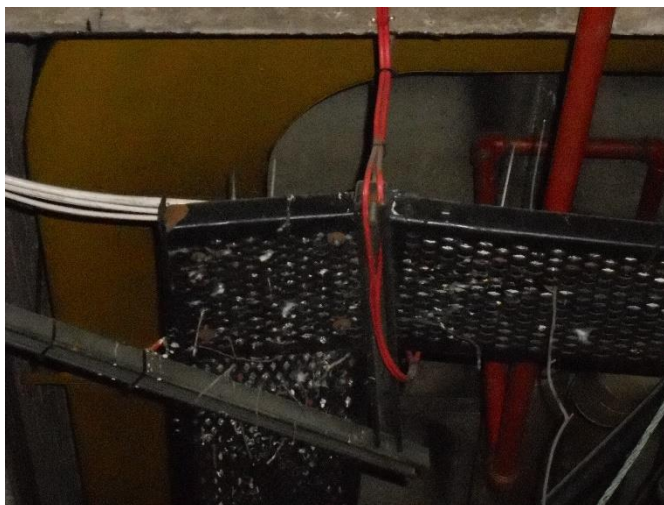
Potential feral pigeon nesting
area within concrete façade,
where not netted over.



Photograph 10
View of interior car parking
areas



Photograph 11
Feral pigeon nesting site
above metal shelf in basement
area.



Appendix 3: Plant Species List

Plant Species List for Broad Street Mall, Reading compiled from Phase 1 habitat survey carried out on the 25 June 2018.

Scientific nomenclature and common names for vascular plants follow Stace (2010) and Blockeel & Long (1998) for bryophyte species. Please note that this plant species list was generated as part of a Phase 1 habitat survey, does not constitute a full botanical survey and should be read in conjunction with the associated results section of this PEA.

Abundance was estimated using the DAFOR scale and additional notes taken as follows:

D = dominant, A = abundant, F = frequent, O = occasional, R = rare, L = locally
c=clumped, e=edge only, g=garden origin, p=planted, y = young, s=seedling or sucker,
t=tree, h=hedgerow, w=water

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE	QUALIFIER
<i>Buddleja davidii</i>	Buddleia	R	
<i>Senecio vulgaris</i>	Groundsel	R	
<i>Sonchus asper</i>	Prickly sow-thistle	R	

Appendix 4: Target Notes

Target Notes List for Broad Street Mall, Reading from the Phase 1 habitat survey and protected and notable species assessment carried out on the 25 June 2018.

Target note (TN)	Description
1	Accumulation of pigeon droppings on exterior concrete façade. Potential nesting site.
2	Disused feral pigeon nest above illuminated light in basement area.
3	Active feral pigeon nest above metal shelf structure in basement area.

Appendix 5: Legislation and Planning Policy

Important notice: This section contains details of legislation and planning policy applicable in Britain only (i.e. not including the Isle of Man, Northern Ireland, the Republic of Ireland or the Channel Islands) and is provided for general guidance only. While every effort has been made to ensure accuracy, this section should not be relied upon as a definitive statement of the law.

A NATIONAL LEGISLATION AFFORDED TO SPECIES

The objective of the EC Habitats Directive¹³ is to conserve the various species of plant and animal which are considered rare across Europe. The Directive is transposed into UK law by The Conservation of Habitats and Species Regulations 2017 (formerly The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended).

The Wildlife and Countryside Act 1981 (as amended) is a key piece of national legislation which implements the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and implements the species protection obligations of Council Directive 2009/147/EC (formerly 79/409/EEC) on the Conservation of Wild Birds (EC Birds Directive) in Great Britain.

Since the passing of the Wildlife & Countryside Act 1981, various amendments have been made, details of which can be found on www.opsi.gov.uk. Key amendments have been made through the Countryside and Rights of Way (CRoW) Act (2000).

Other legislative Acts affording protection to wildlife and their habitats include:

- Deer Act 1991;
- Countryside and Rights of Way (CRoW) Act 2000;
- Natural Environment & Rural Communities (NERC) Act 2006;
- Protection of Badgers Act 1992;
- Wild Mammals (Protection) Act 1996.

Species and species groups that are protected or otherwise regulated under the aforementioned domestic and European legislation, and that are most likely to be affected by development activities, include herpetofauna (amphibians and reptiles), badger, bats, birds,

¹³ Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora

dormouse, invasive plant species, otter, plants, red squirrel, water vole and white clawed crayfish.

Explanatory notes relating to species protected under The Conservation of Habitats and Species Regulations 2017 (which includes smooth snake, sand lizard, great crested newt and natterjack toad), all bat species, otter, dormouse and some plant species) are given below. **These should be read in conjunction with the relevant species sections that follow.**

- In the Directive, the term ‘deliberate’ is interpreted as being somewhat wider than intentional and may be thought of as including an element of recklessness.
- The Conservation of Habitats and Species Regulations 2017 does not define the act of ‘migration’ and therefore, as a precaution, it is recommended that short distance movement of animals for e.g. foraging, breeding or dispersal purposes are also considered.
- In order to obtain a European Protected Species Mitigation (EPSM) licence, the application must demonstrate that it meets all of the following three ‘tests’: i) the action(s) are necessary for the purpose of preserving public health or safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequence of primary importance for the environment; ii) that there is no satisfactory alternative and iii) that the action authorised will not be detrimental to the maintenance of the species concerned at a favourable conservation status in their natural range.

Bats

All species of bat are fully protected under The Conservation of Habitats and Species Regulations 2017 through their inclusion on Schedule 2. Regulation 41 prohibits:

- Deliberate killing, injuring or capturing of Schedule 2 species (e.g. all bats)
- Deliberate disturbance of bat species as:
 - a) to impair their ability:
 - (i) to survive, breed, or reproduce, or to rear or nurture young;
 - (ii) to hibernate or migrate³
 - b) to affect significantly the local distribution or abundance of the species
- Damage or destruction of a breeding site or resting place
- Keeping, transporting, selling, exchanging or offering for sale whether live or dead or of any part thereof.

Bats are also currently protected under the Wildlife and Countryside Act 1981 (as amended) through their inclusion on Schedule 5. Under this Act, they are additionally protected from:

- Intentional or reckless disturbance (at any level)
- Intentional or reckless obstruction of access to any place of shelter or protection
- Selling, offering or exposing for sale, possession or transporting for purpose of sale.

How is the legislation pertaining to bats liable to affect development works?

A European Protected Species Mitigation (EPSM) Licence issued by the relevant countryside agency (e.g. Natural England) will be required for works liable to affect a bat roost or for operations likely to result in a level of disturbance which might impair their ability to undertake those activities mentioned above (e.g. survive, breed, rear young and hibernate). The licence is to allow derogation from the relevant legislation but also to enable appropriate mitigation measures to be put in place and their efficacy to be monitored.

Though there is no case law to date, the legislation may also be interpreted such that, in certain circumstances, important foraging areas and/or commuting routes can be regarded as being afforded de facto protection, for example, where it can be proven that the continued usage of such areas is crucial to maintaining the integrity and long-term viability of a bat roost¹⁴.

Birds

With certain exceptions, all birds, their nests and eggs are protected under Sections 1-8 of the Wildlife and Countryside Act 1981 (as amended). Among other things, this makes it an offence to:

- Intentionally kill, injure or take any wild bird;
- Intentionally take, damage or destroy the nest of any wild bird while it is in use or being built;
- Intentionally take or destroy an egg of any wild bird;
- Sell, offer or expose for sale, have in his possession or transport for the purpose of sale any wild bird (dead or alive) or bird egg or part thereof.

Certain species of bird, for example the barn owl, black redstart, hobby, bittern and kingfisher receive additional special protection under Schedule 1 of the Act and Annex 1 of the European

¹⁴ Garland & Markham (2008) Is important bat foraging and commuting habitat legally protected? Mammal News, No. 150. The Mammal Society, Southampton.

Community Directive on the Conservation of Wild Birds (2009/147/EC). This affords them protection against:

- Intentional or reckless disturbance while it is building a nest or is in, on or near a nest containing eggs or young;
- Intentional or reckless disturbance of dependent young of such a bird.

How is the legislation pertaining to birds liable to affect development works?

To avoid contravention of the Wildlife and Countryside Act 1981 (as amended), works should be planned to avoid the possibility of killing or injuring any wild bird, or damaging or destroying their nests. The most effective way to reduce the likelihood of nest destruction in particular is to undertake work outside the main bird breeding season which typically runs from March to August¹⁵. Where this is not feasible, it will be necessary to have any areas of suitable habitat thoroughly checked for nests prior to vegetation clearance.

Those species of bird listed on Schedule 1 are additionally protected against disturbance during the breeding season. Thus, it will be necessary to ensure that no potentially disturbing works are undertaken in the vicinity of the nest. The most effective way to avoid disturbance is to postpone works until the young have fledged. If this is not feasible, it may be possible to maintain an appropriate buffer zone or standoff around the nest.

Invasive Plant Species

Certain species of plant, including Japanese knotweed *Fallopia japonica*, giant hogweed *Heracleum mantegazzianum* and Himalayan balsam *Impatiens glandulifera* are listed on Part II of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) in respect to Section 14(2). Such species are generally non-natives whose establishment or spread in the wild may be detrimental to native wildlife. Inclusion on Part II of Schedule 9 therefore makes it an offence to plant or otherwise cause these species to grow in the wild.

How is the legislation pertaining to invasive plants liable to affect development works?

Although it is not an offence to have these plants on your land per se, it is an offence to cause these species to grow in the wild. Therefore, if they are present on site and development activities (for example movement of spoil, disposal of cut waste or vehicular movements) have the potential to cause the further spread of these species to new areas, it will be necessary

¹⁵ It should be noted that this is the main breeding period. Breeding activity may occur outwith this period (depending on the particular species and geographical location of the site) and thus due care and attention should be given when undertaking potentially disturbing works at any time of year.

to ensure appropriate measures are in place to prevent this happening prior to the commencement of works.

Wild Mammals (Protection) Act 1996

All wild mammals are protected against intentional acts of cruelty under the above legislation. This makes it an offence to:

- Mutilate, kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate any wild mammal with intent to inflict unnecessary suffering.

To avoid possible contravention, due care and attention should be taken when carrying out works (for example operations near burrows or nests) with the potential to affect any wild mammal in this way, regardless of whether they are legally protected through other conservation legislation or not.

B NATIONAL AND EUROPEAN LEGISLATION AFFORDED TO HABITATS

Statutory Designations: National

Nationally important areas of special scientific interest, by reason of their flora, fauna, or geological or physiographical features, are notified by the countryside agencies as statutory **Sites of Special Scientific Interest** (SSSIs) under the National Sites and Access to the Countryside Act 1949 and latterly the Wildlife & Countryside Act 1981 (as amended). As well as underpinning other national designations (such as **National Nature Reserves** which are declared by the countryside agencies under the same legislation), the system also provides statutory protection for terrestrial and coastal sites which are important within a European context (Natura 2000 network) and globally (such as Wetlands of International Importance). See subsequent sections for details of these designations. Improved provisions for the protection and management of SSSIs have been introduced by the Countryside and Rights of Way Act 2000 (in England and Wales).

The Wildlife & Countryside Act 1981 (as amended) also provides for the making of **Limestone Pavement Orders**, which prohibit the disturbance and removal of limestone from such designated areas, and the designation of **Marine Nature Reserves**, for which byelaws must be made to protect them.

Statutory Designations: International

Special Protection Areas (SPAs), together with **Special Areas of Conservation** (SACs) form the **Natura 2000** network. The Government is obliged to identify and classify SPAs under the

EC Birds Directive (Council Directive 2009/147/EC (formerly 79/409/EEC)) on the Conservation of Wild Birds). SPAs are areas of the most important habitat for rare (listed on Annex I of the Directive) and migratory birds within the European Union. Protection afforded SPAs in terrestrial areas and territorial marine waters out to 12 nautical miles (nm) is given by The Conservation of Habitats & Species Regulations 2010 (as amended). The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) provide a mechanism for the designation and protection of SPAs in UK offshore waters (from 12-200 nm).

The Government is obliged to identify and designate SACs under the EC Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora). These are areas which have been identified as best representing the range and variety of habitats and (non-bird) species listed on Annexes I and II to the Directive within the European Union. SACs in terrestrial areas and territorial marine waters out to 12 nm are protected under The Conservation of Habitats & Species Regulations 2010 (as amended). The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) provide a mechanism for the designation and protection of SACs in UK offshore waters (from 12-200 nm).

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. The Convention covers all aspects of wetland conservation and wise use, in particular recognizing wetlands as ecosystems that are globally important for biodiversity conservation. Wetlands can include areas of marsh, fen, peatland or water and may be natural or artificial, permanent or temporary. Wetlands may also incorporate riparian and coastal zones adjacent to the wetlands. Ramsar sites are underpinned through prior notification as Sites of Special Scientific Interest (SSSIs) and as such receive statutory protection under the Wildlife & Countryside Act 1981 (as amended) with further protection provided by the Countryside and Rights of Way (CROW) Act 2000. Policy statements have been issued by the Government in England and Wales highlighting the special status of Ramsar sites. This effectively extends the level of protection to that afforded to sites which have been designated under the EC Birds and Habitats Directives as part of the Natura 2000 network (e.g. SACs & SPAs).

Statutory Designations: Local

Under the National Sites and Access to the Countryside Act 1949 **Local Nature Reserves** (LNRs) may be declared by local authorities after consultation with the relevant countryside agency. LNRs are declared for sites holding special wildlife or geological interest at a local

level and are managed for nature conservation, and provide opportunities for research and education and enjoyment of nature.

Non-Statutory Designations

Areas considered to be of local conservation interest may be designated by local authorities as a **Wildlife Site**, under a variety of names such as **County Wildlife Sites** (CWS), **Listed Wildlife Sites** (LWS), **Local Nature Conservation Sites** (LNCS), **Sites of Biological Importance** (SBIs), **Sites of Importance for Nature Conservation** (SINCs), or **Sites of Nature Conservation Importance** (SNCIs). The criteria for designation may vary between counties.

Together with the statutory designations, these are defined in local and structure plans under the Town and Country Planning system and are a material consideration when planning applications are being determined. The level of protection afforded to these sites through local planning policies and development frameworks may vary between counties.

Regionally Important Geological and Geomorphological Sites (RIGS) are the most important places for geology and geomorphology outside land holding statutory designations such as SSSIs. Locally-developed criteria are used to select these sites, according to their value for education, scientific study, historical significance or aesthetic qualities. As with local Wildlife Sites, RIGS are a material consideration when planning applications are being determined.

C NATIONAL PLANNING POLICY

The National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) replaced Planning Policy Statement (PPS9) in April 2012 as the key national planning policy concerning nature conservation. The NPPF emphasises the need for suitable development. The Framework specifies the need for protection of designated sites and priority habitats and priority species. An emphasis is also made for the need for ecological networks via preservation, restoration and re-creation. The protection and recovery of priority species – that is those listed as UK Biodiversity Action Plan priority species – is also listed as a requirement of planning policy. In determining a planning application, planning authorities should aim to conserve and enhance biodiversity by ensuring that: designated sites are protected from adverse harm; there is appropriate mitigation or compensation where significant harm cannot be avoided; opportunities to incorporate biodiversity in and around developments are encouraged; planning permission is refused for development resulting in the loss or deterioration of irreplaceable habitats including aged or veteran trees and also ancient woodland.

The Natural Environment and Rural Communities Act 2006 and The Biodiversity Duty

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'biodiversity duty'.

Section 41 of the Act (Section 42 in Wales) requires the Secretary of State to publish a list of habitats and species which are of 'principal importance for the conservation of biodiversity.' They are referred to in this report as Species of Principal Importance and Habitats of Principal Importance. This list is intended to assist decision makers such as public bodies in implementing their duty under Section 40 of the Act. Under the Act these habitats and species are regarded as a material consideration in determining planning applications. A developer must show that their protection has been adequately addressed within a development proposal.

D LOCAL PLANNING POLICY

The Reading Borough Council Local Plan (2015) deals with matters of strategic importance for Reading. Key chapters include Chapter 9 – Open Space and Recreation, and Chapter 11 – Built and Natural Environment.

Policy CS28: Loss of Open Space

Development proposals that will result in the loss of open space or jeopardise its use or enjoyment by the public will not be permitted. In exceptional circumstances, development may be permitted where it is clearly demonstrated that replacement open space, to a similar standard, can be provided at an accessible location close by, or that improvements to recreational facilities on remaining open space can be provided to a level sufficient to outweigh the loss of the open space. The quality of existing open space should not be eroded by insensitive development on adjoining land.

Policy CS29: Provision of Open Space

All new development should make provision for the open space needs of the development through appropriate on or off-site provision, or through contributions towards the provision or improvement of leisure or recreational facilities, including open space. New provision will be sought on residential sites of 50 or more units, or for developments where the availability and quality of existing provision has been identified as deficient in the provision for open space. The provision and improvement of Children's Play Areas and Neighbourhood Recreation Areas should be made, as appropriate, in order to ensure a satisfactory level of

provision within the urban area. On sites of less than 50 dwellings or in areas not identified as deficient in the provision of open space, new open space provision/ improvements/ enhancements will be sought through appropriate contributions.

Policy CS36: Biodiversity and Geology

Development should retain, protect and incorporate features of biodiversity or geological interest (including protected species and their habitats) found within the application site into their schemes.

On sites with recognised biodiversity or geological value, development will not be permitted where there would be a direct or indirect adverse impact on the site, unless it can be clearly demonstrated that: -

i. The need for development clearly outweighs the need to protect the value of the site; and

ii. Appropriate compensation, impact minimisation, mitigation and compensation are provided.

b) Local Nature Reserves and Wildlife Heritage Sites will be safeguarded and where possible, enhanced. Permission will not be granted for any development that would adversely affect a designated nature reserve or Wildlife Heritage Site.

c) Any development that would sever or threaten the integrity of an established wildlife link, as indicated on an adopted proposals map, will not be permitted. Where applicable, developments should be designed to protect, consolidate, extend and enhance the network of wildlife links and corridors in and adjoining the Borough, working with neighbouring authorities where appropriate.

F REGIONAL AND LOCAL BAPS

Many local authorities in the UK have also produced a local Biodiversity Action Plan (LBAP) at the County or District level. The Reading Biodiversity Action Plan is based on the UK list of Species and Habitats of Principal Importance and contains 38 priority species action plans and 8 priority habitat action plans. The site could support the priority local biodiversity action plan species of swift.



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APPENDIX E – Geoenvironmental Desk Study



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PHASE 1 ENVIRONMENTAL DESKTOP STUDY

BROAD STREET MALL, READING

FOR

MOORGARTH ESTATES

JULY 2018

REPORT REF: 2206-DS01

REV A



CIVIL/STRUCTURAL ENGINEERS | DEVELOPMENT CONSULTANTS | PROJECT MANAGERS

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PREPARED BY	CHECKED BY	DATE	REVISION
Ben Jagger MEng (Hons) Project Engineer	Basil Basray BEng (Hons), CEng, MStructE Managing Director	July 2018	C

1.0 INTRODUCTION

BJB Consulting has been commissioned by Moorgarth Estates to prepare a Phase 1 Environmental Desktop Study to accompany the planning application for the development of this subject site. The comments given in this report and the opinions expressed are subject to BJB Consulting Service Constraints provided in Appendix A.

The site is located within Reading town centre, approximately 450 metres (m) southwest of Reading railway station, in a mixed-use commercial, retail and residential area. Oxford Road is located adjacent to the north of the site, beyond which numerous retail, residential and commercial buildings are located. St. Mary's Butts is located adjacent to the east of the site, beyond which a church and further retail, residential and commercial buildings are located. A public house is located adjacent to the southeast of the site. A theatre and a small park are located adjacent to the south of the site. A walkway and a hotel are located adjacent to the west of the site. The overall site is approximately 1.8 hectares and the National Grid Reference for the approximate centre of the site is 471220, 173360. A site location plan is contained in Appendix B.

The Proposed Development includes the construction of four new blocks on top of the existing structure on-site and the extension and refurbishment of one existing blocks.

The Proposed Development will comprise a total of circa 30,000 m² gross internal floorspace (GIA) and up to 530 residential units (of a range of unit sizes and tenures).

The current design of the Proposed Development is looking to provide:

- Block 1: 22 storey (on top of the existing mall and therefore 25 storeys in total) development providing up to 180 residential units with amenity space and parking;
- Block 2: 18 storey (on top of the existing mall and therefore 21 storeys in total) development providing up to 150 residential units, with amenity space and parking;
- Block 3: 15 storey (on top of the existing mall and therefore 18 storeys in total) development providing up to 115 residential units, with retail unit;
- Block 4: Refurbishment and extension of existing office floors, with two additional floors proposed above. There will therefore be three levels of residential, within a 5 storey block, providing up to 35 residential units; and
- Block 5: Provision of up to 50 residential units above the existing retail parade, along with enhancements to the existing shop fronts.

In order to comply with the Environment Act 2018, a Phase 1 Desk Study has been commissioned by Moorgarth Estates. The desk study will assess the environmental impact of historical, current and future factors on the development. This report will present the data obtained and provide a conceptual ground model and preliminary risk assessment as well as discussing the scope of any intrusive investigation that may be required. This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese Knotweed).

1.1 Scope of this Report

The principal components of this report are generally as described in Section 6.2 of BS10175:2011 and guidance given in CLR 11 Model Procedures for the Management of Contaminated Land (Environment Agency(EA), 2004). CLR 11 sets out a process based on a tiered risk assessment with increasing level of detail required to progress through the tiers.

The scope of work undertaken for this report has comprised:

- A review of readily available geological, hydrogeological and aquifer vulnerability maps; and historical Ordnance Survey map extracts.
- Acquisition and review of environmental information for the Site and its immediate surrounds, through a modular Groundsure report.
- A qualitative Tier 1 risk assessment utilising a preliminary Conceptual Site Model (CSM) to identify 'source-pathway-receptor' linkages to assess the potential risk and hazards, if any, associated with potential existing contamination in the ground.

The primary aim of this report is to meet the requirements of the National Planning Policy Framework (NPPF, 2012) Clauses 120, 121 and 122. Under the definition 'Site Investigation Information' given in the NPPF glossary page 56, the Phase 1 Desk Study and contamination risk assessment is also the minimum requirement under the NPPF to support any planning application on a site that might be potentially affected by contamination.

This report presents the findings of the study together with a qualitative assessment of any hazards and constraints posed by the existing ground conditions within the existing building footprint to the proposed development during construction and end use.

1.2 Methodology and Sources of Information

The methodology for assessment of potentially contaminated land is included in Appendix C.

The underlying principle is the evaluation of pollutant linkages in order to assess whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of three elements:

- A source of contamination or hazard that has the potential to cause harm or pollution;
- A pathway for the hazard to move along/generate exposure; and
- A receptor which is affected by the hazard.

For each potential linkage identified, the risk is estimated through consideration of the magnitude of the potential consequences and the likelihood or probability of an event occurring.

This report is divided into chapters identifying potential sources (hazard identification), potential pathway and receptor identification and risk estimation and assessment.

The following primary sources of information were used in the preparation of this report:

- Groundsure Historical and current Ordnance Survey mapping – Contained in Appendix D;
- A Groundsure Review – Contained in Appendix E;
- British Geological Survey (BGS) mapping – Extract from the BGS Digital geological map of Great Britain, see borehole records in Appendix F;
- Internet searches on the local history of the area.
- Current and recent-past satellite imagery accessed through the web-hosted Google Earth and Bing maps portals;
- An environmental data enquiry for information on potentially contaminative current and historical land uses on and in the immediate vicinity of the site has been obtained from local agencies via the Groundsure Review.

2.0 LAND USE

2.1 Current Land Use

The subject site supports a shopping mall ('Broad Street Mall') arranged over basement level, ground floor and one upper floor. Furthermore, office accommodation ('Quadrant House') is located within the eastern area of the site and further office accommodation ('Fountain House') is located within the north-western corner of the site. A multi-storey car park is located within the south-western area of the site and numerous further car parking spaces are located on the roof of the shopping mall. The basement level extends underneath the development and includes numerous plant rooms, the main waste storage area and numerous storage rooms associated with the retail units on-site.

The Groundsure Review highlights that there are three industrial sites on site, these being:

- An electrical equipment repair and servicing,
- A disability and mobility equipment store and;
- A business centre.

2.2 Historical Land Use

This section summarises the identified historical land uses on and immediately adjacent to the sites. The historical map extracts are included in Appendix D.

Historical Land Use

Map Dates	Comments
1879	Steam Saw Mill is located on site surrounded by residential dwellings. The surrounding area is residential with schools and churches etc.
1880	A brewery and court are now denoted on site.
1900	A smithy and fire station are now noted on site as opposed to the brewery and court.
1912	No obvious change on site.
1913	No obvious change on site.
1914	No obvious change on site.
1931	No smithy noted.
1933	No obvious change on site.
1938	No obvious change on site.
1957	No mill, fire station, or brewery noted. Car park on site adjacent to a garage. Site still primary residential with a public house on the corner of Oxford Road and Mary's Butts.
1959	No obvious change on site.
1961	No obvious change on site.
1962	Residences removed and car park now larger and occupies vacated area. A garage is noted on site.
1971	The majority of the site has been cleared except a building on the eastern boundary and a number of buildings in the south-east corner.
1976	Only the buildings in the south-east corner remain.
1977	The Butts Centre has been constructed in the vacated space.
1979	No obvious change on site.
1980	A multi-storey car park is now noted as part of the centre.

1982	No obvious change on site.
1988	'The Butts Centre' is now denoted as 'The Broad Street Mall'.
1991	No obvious change on site.
1993	No obvious change on site.
1994	No obvious change on site.
2002	No obvious change on site.
2010	No obvious change on site.
2014	No obvious change on site.
Notes	<u>Historical Tanks</u> The closest recorded historical tank was recorded 51m south-east of the site. <u>Energy Features</u> The closest recorded historical energy feature was within 19m of the site in 1980. <u>Petrol and Fuel Sites</u> The closest recorded fuel station was recorded 391m north-east of the site. <u>Garages</u> A garage was recorded on site in 1962. <u>Potentially Infilled Land</u> The nearest record of potentially infilled land is 261m south-east of the site.

3.0 GEOLOGY AND ENVIRONMENTAL SETTING

Information on the geological and environmental setting of the sites are used in the Hazard Assessment Section of the contaminated land risk assessment to identify potential pathways and receptors.

3.1 Published Geology and Geological Hazards

The British Geological Survey's (BGS) Digital map of Great Britain has been reviewed for the area, and the following geologies have been identified for the site:

Made Ground

There is no available data for the made ground. However, it is known that the existing foundations bear onto natural strata at basement level and therefore any made ground which may have existed prior to construction of the mall will have been removed. The ground surrounding the site is retained by the basement structure which would have been backfilled against the retaining wall utilizing suitable excavated material.

Superficial/drift Geology

Taplow gravel member (sand and gravel) has been identified as the superficial geology on site. Boreholes 1, 7, 9 and 10 reflect this geology with a layer of sand and gravel to a maximum depth of circa 5.8m below ground level (bgl).

Bedrock Geology

Seaford chalk formation and Newhaven chalk formation (undifferentiated chalk) has been identified as the bedrock geology on site. All of the attached boreholes reflect this geology with layers of clayey chalk as shallow as surface level and as deep as 5.8m bgl.

3.2 Geological Hazards

The GroundSure Review identifies the level of risk associated with the following geological hazards which have been determined from BGS GeoSure Data:

Potential for collapsible ground instability	- Very Low
Potential for compressible ground instability	- Negligible
Potential for landslide ground instability	- Very Low
Potential for running sand ground instability	- Very Low
Potential for shrinking or swelling clay ground instability	- Negligible
Potential for soluble rocks instability	- High

According to the BGS GeoSure Data, very significant soluble rocks are present, with a high possibility of localised subsidence occurring naturally or in adverse conditions such as high surface or subsurface water flow. Due to the presence of soluble rock a specialist land stability assessment is recommended.

According to the Groundsure Review, the property is not within a Radon Affected Area, as less than 1% of properties are above the action level. Therefore, no radon protection measures are necessary

in the construction of new dwellings or extensions, as described in publication BR211 by the Building Research Establishment.

BJB Consulting generally agrees with the above assessments and it is considered that a low risk applies to the site with respect to natural geological hazards. Except in regards to instability due to soluble rocks, in which case additional assessment is recommended.

3.3 Mining

There is no data found for coal mining within 75m of the site

In addition, the Groundsure report states that localised small scale underground chalk mining may have occurred on-site. However, the potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered.

There are no recorded areas of brine mining within 75m of the site.

3.4 Hydrogeology, Hydrology

The on-site superficial geology is classified as a Secondary A aquifer and the on-site bedrock geology is classified as a Principal aquifer. Table 1 below describes the aquifer in question:

Table 1: Identification of aquifers within the bedrock deposit

Deposit	Aquifer Designation	Description
Bedrock	Principal	"Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers"
Superficial	Secondary A	"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow rivers. These are generally aquifers formerly classified as minor aquifers"

The closest recorded abstraction licence is for both ground and potable water and is located 81m north of the site.

The site is not within a Source Protection Zone (SPZ).

Leaching potential refers to the risk that soluble contaminants will be transmitted through the soil to the groundwater reservoir. Leaching potential depends on soil permeability, water table conditions and hydraulic loading. Soils with high leaching potentials are more sensitive than soils with low leaching potentials.

The site's groundwater vulnerability and soil leaching potential is recorded as 'Minor Aquifer/High Leaching Potential' with a soil vulnerability category of 'H1' – Soils that readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.

The closest River Network is identified as Holly Brook; the Brook is classified as an inland river not influenced by normal tidal action.

The closest surface water feature is located 196m south of the site.

The GroundSure review indicates that the site is located within an area classified as Flood Zone 1 (low).

For reference, Flood Zone 1, 2 and 3 are defined as:

Flood Zone 1 Low probability. This zone comprises of land assessed as having less than 1 in 100 (0.1%) annual probability of flooding from rivers or seas.

A Flood Risk Assessment has been carried out which is contained in BJB Consulting's FRA report reference 2206-FRA01, dated July 2018. This takes into account the Environment Agency's flood maps and should be referred to for further information.

3.5 Waste Management and Gas Monitoring

The nearest record of a potentially infilled feature is 261m south-east of the site.

The Groundsure report confirms that the closest Licensed Discharge Consent is 248m east of the site, however it appears to have been revoked in 1991.

There are no records of Control of Major Accident Hazards (COMAH) & Notification of Installations Handling Hazardous Substances (NIHHS) sites within 500m of the site.

The Groundsure Review confirms that the Environment Agency landfill data records the closest historic landfill site as being 951m north-west of the site, with the waste type described as 'inert'.

There are no records of any landfill sites with a Pollution Prevention and Control (PPC) permit or waste management license currently in force within 1000m of the site.

The closest Environment Agency licensed waste site is recorded 749m west of the site and is described as a metal recycling site.

3.6 Pollution Incidents to Controlled Waters

The Groundsure Review identifies any environmental permits, pollution incidents and registers within 500m of the site. Figure 1 below highlights this:

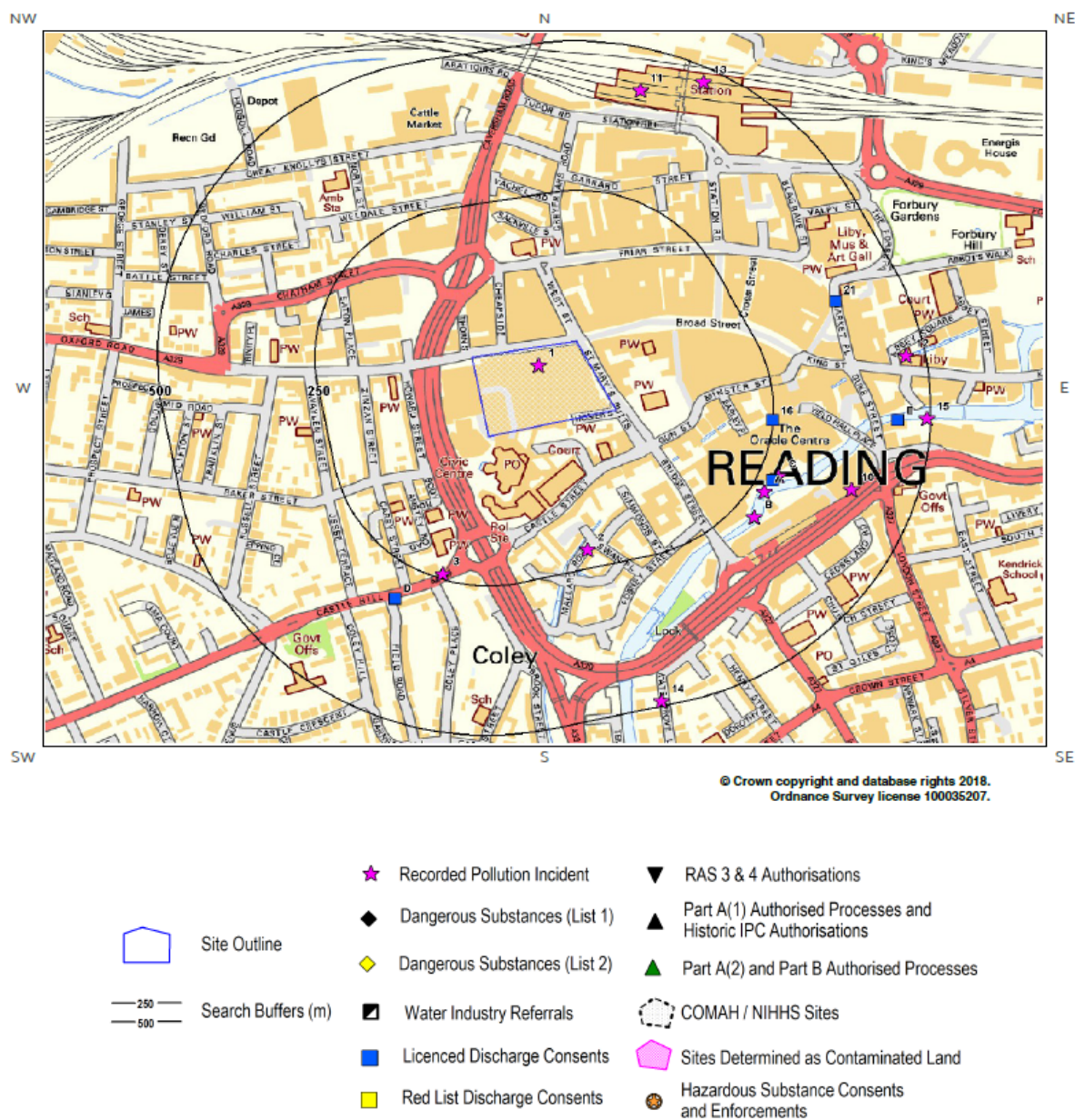


Figure 1: Environmental Permits, Pollution Incidents and Registers

The closest pollution incident occurred on site in 2002, with the pollutant described as contaminated water from 'Firefighting Run-Off'. The incident had no impact of water, land or air quality. This incident is shown on Figure 1 above by the designation '1'.

3.7 Sensitive Land Use

The Groundsure Review highlights that there are no areas of Sensitive Land within 2000m of the site.

The closest Nitrate Vulnerable Zone (NVZ) is 50m north-west of the site. An NVZ is a designated area of land that drains into nitrate polluted waters, or waters which could become polluted by nitrates. As the development plan is outside of this zone and does not include any proposed agricultural uses, the development is not affected.

3.8 Industrial Land Use and Potential Sources of Contamination

The historical maps indicate that there were potential sources of contamination on site and within the surrounding area. There are a number of sites which are recorded in the Groundsure Review as having a potentially contaminative past land use, which are summarised below.

Potentially Contaminative Sources

Details	Classification	Location relative to site
4No. Garages	Industrial	On site 1958-1962
Fuel Station	Industrial	391m north-east of the site
Historical Tank	Industrial	51m south of the site
Energy Feature	Industrial	19m 1980
Infilled Land	Industrial	261m south-east of the site

4.0 PRELIMINARY RISK ASSESSMENT (TIER 1)

4.1 Introduction

The methodology developed and adopted for the assessment of ground conditions is presented in Appendix C. In accordance with guidance in CLR 11 (EA Model Procedures for the Management of land Contamination), a staged approach to risk assessment has been adopted and this report presents a Tier 1 assessment or first stage.

The underlying principle of ground condition assessment is the identification of pollutant linkages in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. For a pollutant linkage to be identified a connection between all three elements (source/ hazard - pathway - receptor) is required.

4.2 Conceptual Site Model and Preliminary Risk Assessment

The Conceptual Site Model (CSM) identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). A Tier 1 Qualitative Risk Assessment includes the development of a preliminary conceptual site model (CSM). The CSM describes the types and locations of potential contamination sources, the identification of potential receptors and the identification of potential transport/migration pathways.

4.2.1 Potential Sources of Contamination

The potential sources of contamination that have been identified as part of this desk based assessment are shown in the table below.

Potential Contaminants	Historic Sources of Potential Contamination On-Site	The current site use is not considered to act as a significant source of contamination however, consideration should be given to removing all disused plant equipment on-site (including all disused diesel tanks). Furthermore, all known oil interceptors should be cleaned out on a regular basis to ensure that the interceptor is effective and minimise the risk of oils passing through the drainage system.
		The site has been subject to a history of potentially contaminative activities in particular steam saw mills, a timber yard, a brewery ('Lion Brewery'), a furniture depository, a smithy, three garages, an electricity sub-station, and a rifle range. These historical land uses represent potential sources of contamination.
	Historic Sources of Potential Contamination Off-Site	Surrounding sites (within 250 metres) have had a significant industrial history and include a tramway, a weighbridge, a grave yard, a carriage manufactory, a bus depot, a whitening works, a coach manufactory, and numerous coal yards, garages, breweries, bakeries, depots and malt houses. However, these potentially contaminative surrounding land uses have largely been redeveloped into the current commercial, residential and retail land uses through various phases of redevelopment.

4.2.2 Identification of Potential Receptors

In order to determine whether the identified hazards pose a risk it is necessary to identify the presence of potential receptors and pathways by which they can be exposed to the hazard.

Details of the potential receptors identified as part of the assessment and determination whether or not the receptor is probable for this site are presented in the table below.

Item	Commentary	Potential Receptor (Yes/No)
Human Health - Current	Commercial	Yes
Human Health - Future	Residential	Yes
Neighbouring Human Health	Residential properties, commercial/industrial buildings	Yes
Construction Workers	Earthworks and general construction activities	Yes
Groundwater	Primary/Secondary aquifer	Yes
Surface Water	Drains on site	Yes
Buildings	Utilities	Yes
Property	Existing buildings	Yes

4.2.3 Potential Pathways and Pollutant Leakages

The table below outlines the general conceptual site model and preliminary risk assessment.

General conceptual site model and preliminary risk assessment

Potential source	Potential nature of hazard	Contaminants Associated with the potential source	Pathway	Receptor	Risk/likelihood of harm
Previous site usage	Industrial Activity Infilled Land Made Ground Agricultural	None	Ingestion of soil	Site operative End user Neighbours	Very Low Very Low Very Low
			Ingestion of dust	Site operative End user Neighbours	Very Low Very Low Very Low
			Dermal contact	Site operative End user Neighbours	Very Low Very Low Very Low
			Inhalation of dust	Site operative End user Neighbours	Very Low Very Low Very Low
			Inhalation of vapours	Site operative End user Neighbours	Very Low Very Low Very Low
			Consumption of vegetables and fruit	End user	Very Low
			Contaminated soil and/or groundwater	Groundwater	Very Low
			Vertical and lateral movement of mobile contamination	Castle Wood	Very Low
				Structures & services	Very Low
Ground gas	Made Ground	None	Asphyxiation, fire and explosion	Site operative End user	Very Low Very Low
Solid geology	Radon	None	Inhalation of polonium alpha particle emitter	Site operative End user	Very Low Very Low

Notes on table above:

- There has been development and historical potential contaminative uses on site, however the risk to site operatives from made ground and/or contaminants associated with this is very low as any on-site made ground which may have existed prior to construction of the mall will have been removed.

- b) The risk of radon gas to both site operatives and end users is deemed very low as the development is not within a radon affected area. Therefore, the risk of radon gas to the end user is also very low.
- c) The risk to neighbours during construction is deemed to be very low, as the proposed form of construction of the ground works will be confined within the basement areas of the existing mall.

4.3 Geotechnical Assessment

4.3.1 Introduction

It is a requirement of the National Planning Policy Framework (NPPF) Clause 121 for a site potentially at risk from ground instability to be assessed, therefore, consideration is given below to the risk of potential causes of subsidence arising from existing ground conditions across the site, as identified by the report. Comments are also provided on development requirements to mitigate ground conditions.

As this geotechnical appraisal has been based on publicly available information obtained as part of a desk based data collection and the initial intrusive ground investigation, the comments made herein should therefore be considered as preliminary.

4.3.2 Existing Ground Conditions

As discussed in the earlier sections of this report the site has undergone a wholesale re-development which currently forms the shopping centre and encompasses the entire site area

Underlying chalk strata, Seaford chalk formation and Newhaven chalk formation, has been identified for the site area. The ground conditions will require verification in the form of a detailed intrusive site investigation, however it is noted from the data reviewed that the risk is low to negligible for geological hazards relating to: collapsible ground, compressible ground, landslides, running sand, and shrinking or swelling clay.

Prior to the commencement of the development it is recommended that geotechnical ground investigation is commissioned to assess the risk of instability due to soluble rock.

4.3.3 Coal Mining

The Groundsure Review confirms that, historically, no coal mining activity has taken place on site, therefore there is no risk of artificial cavities.

The report does, however, highlight that localised small-scale chalk mining works may have taken place on-site, although the British Geological Survey (BGS) report states that these are at a level where they need not be considered and therefore no further investigation is required.

5.0 CONCLUSIONS AND RECCOMENDATIONS

5.1 Contamination

The site has been assessed and concluded to have a very low risk to both site operative and end users due to contamination in relation to historic use.

The site requires further evaluation by carrying out a geotechnical ground investigation in order to assess the risk of instability due to soluble rock. Any ground strengthening works which may be required will be developed once the findings of the intrusive ground investigation are made available.

5.2 Geotechnical

The underlying geology has been identified as Seaford chalk formation and Newhaven chalk formation and no made ground is present on-site due to the construction of the existing mall and the removal of any made ground to incorporate the basement level. The ground surrounding the site is retained by the basement structure and has been backfilled with made ground. However, there will be no risk due to made ground as the proposed development is located entirely within the existing site boundary.

There is no evidence of any historical or proposed coal mining works and therefore a Coal Mining Risk Assessment is not required.

Shallow historical chalk mining has taken place on site; however, this is of a small scale and no further investigation is required.

5.3 General

Following this preliminary risk assessment, further investigation is recommended relating to any instability due to soluble rock.

6.0 REFERENCES

EA, 2004 The Model Procedures for the Management of Land Contamination CRL 11 published by the Environment Agency (EA)

EA, 2010 Guiding Principles for Land Contamination GPLC 1 to 3. Environment Agency (EA).

NPPF, 2012 Department for Communities and Local Government (2012). National Planning Policy Framework

BRE, 2007. Radon: Guidance on protective measures for new buildings, 2007. Report BR211, Building Research Establishment (BRE), Garston, Hertfordshire.

CIRIA, 2002 C574 Engineering in Chalk. CIRIA , London.

British Standards Institution, BS5930: *Code of practice for site investigations*, B.S.I., London.

British Standards Institution, Amendment No 1 to BS5930: *Code of practice for site investigations*, B.S.I., London

British Standards Institution, BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.

Department for Environment, Food and Rural Affairs and the Environment Agency, DEFRA R&D Publications, Environment Agency, Bristol.

CIRIA Report C665, Assessing risks posed by ground gasses in buildings.

The Environment Agency: Groundwater source protection.

APPENDIX A

BJB Consulting Service Constraints

SERVICE CONSTRAINTS

This report (together the “Services”) were compiled and carried out by BJB Consulting (BJB) for Moorgarth Estates (the “client”) in accordance with their instruction. The Services were performed by BJB with the reasonable skill and care ordinarily exercised by a reasonable Civil Engineer at the time the Services were performed. Further, and in particular, the Services were performed by BJB taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between BJB and the client.

Other than that expressly contained in paragraph 1 above, BJB provides no other representation or warranty whether express or implied in relation to the Services.

Unless otherwise agreed the Services were performed by BJB exclusively for the purposes of the client. BJB is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing BJB does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such parties relies thereon that party does so wholly at its own and sole risk and BJB disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

It is BJB’s understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without BJB’s review and advice shall be at the client’s sole and own risk. Should BJB be requested to review the report after the date hereof, BJB shall be entitled to additional payment at the then existing rates or such other terms as agreed by BJB and the client.

The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. This information and conclusions contained in this report should not be relied upon in the future without the written advice of BJB. In the absence of such written advice of BJB, reliance on the report in the future shall be at the client’s own and sole risk. Should BJB be requested to review the report in the future, BJB shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between BJB and the client.

The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and BJB. BJB has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and BJB. BJB is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, BJB did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

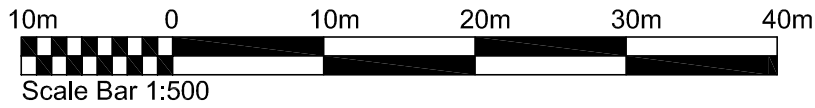
The services are based upon BJB’s observations of existing past historical maps of the Site gained from a Groundsure report of the site together with BJB’s interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the Site.

The Services clearly are limited by the accuracy of the information, including documentation. Further BJB was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. BJB is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to BJB and including the doing of any independent investigation of the information provided to BJB save as otherwise provided in the terms of the contract between the client and BJB.

Any site drawings provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding the site.

APPENDIX B

Existing Site Plan



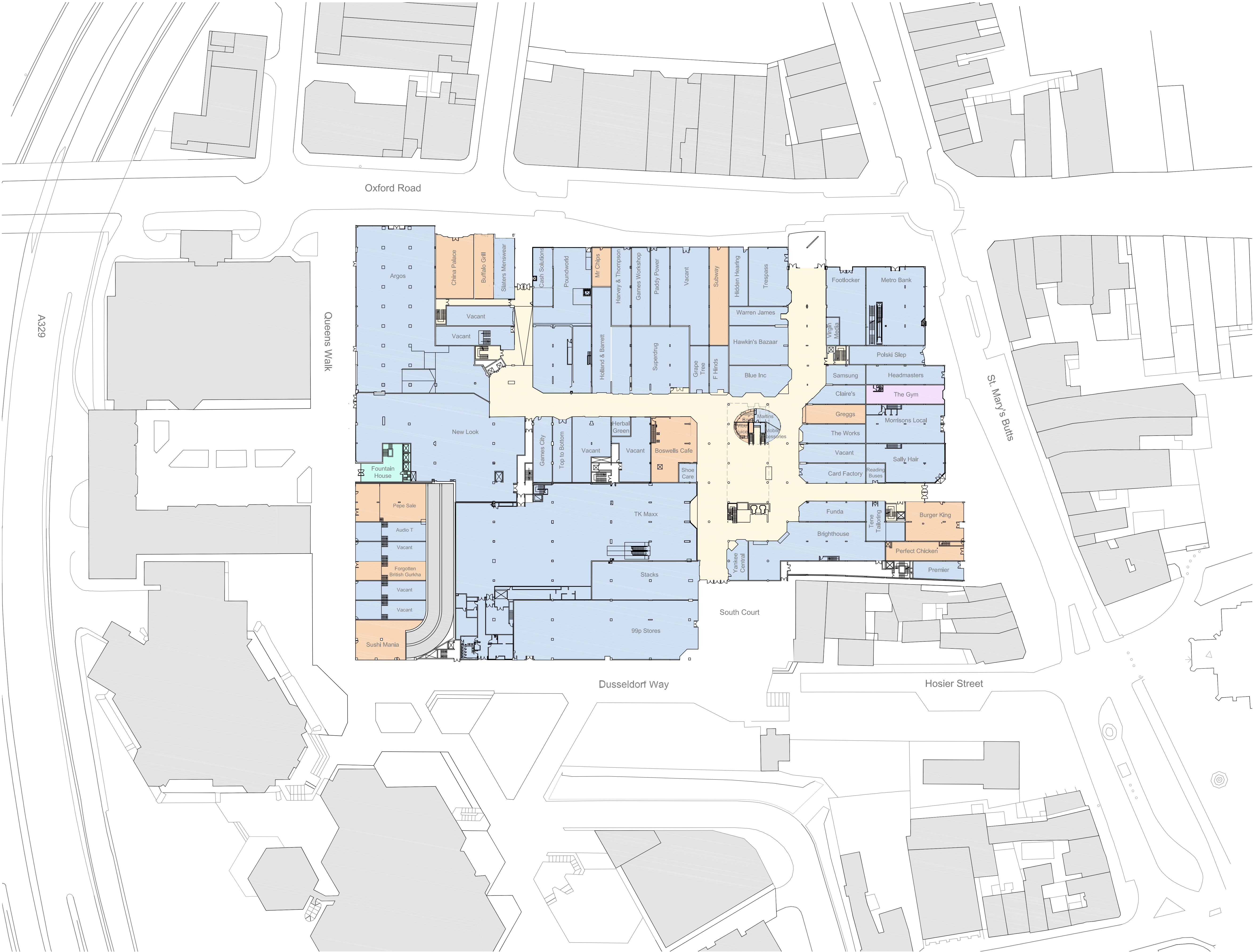
The copyright of this drawing is vested with Corstorphine + Wright Ltd and must not be copied or reproduced without the consent of the company.

Figured dimensions only to be taken from this drawing. DO NOT SCALE. All contractors must visit the site and be responsible for checking all setting out dimensions and notifying the architect of any discrepancies prior to any manufacture or construction work.

NOTES:



- A1 Retail
- A3 Retail
- Leisure
- Office
- Mall Circulation
- Car Park



03.	05.08.15	Tenant names updated	PT
02.	05.08.15	Tenant names updated	PT
01.	04.08.15	Tenant names updated	PT

REV	DATE	NOTES	CHK
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Client

MOORGARTH PROPERTY

Project

BROAD STREET MALL
READING

Drawing Title

EXISTING
GROUND FLOOR PLAN

Drawn	Checked	Paper Size	Scale	Date
CMc	PT	A1	1:500	JULY 2015
Project No.	Drawing No.	Revision		
15116	0202	03		

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APPENDIX C

Environment Agency Flood Map for Planning Report

1 INTRODUCTION

This document defines the approach adopted by BJB Consulting in relation to the assessment of potentially contaminated land in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are Contaminated Land Statutory Guidance (Defra 2012) the Model Procedures for the Management of Contamination (CLR 11) (EA 2004) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) and the National Planning Policy Framework (DCLG 2012).

2 DEALING WITH LAND CONTAMINATION

UK legislation aims to help address the problem of historic contamination of land and the risks it can pose to people's health, controlled water and the environment by determining if a contaminant linkage exists. This requires the three elements of receptor; pathway and source (hazard) to be present.

There are several ways in which land contamination can be addressed. For example, voluntarily where action is taken independently by landowners, when land is developed (or redeveloped) under the planning system, during the building control process using building regulations, or, forced remediation under the Part 2A regime. Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

2.1 Part 2A

The Environment Act 1995 introduced Part 2A into the Environmental Protection Act 1990. Part 2A, its accompanying regulations and original Statutory Guidance came into force in England in April 2000. The legislation was extended in August 2006 to include radiological hazards.

Revised Statutory Guidance was issued April 2012. (Defra 2012) to clarify how the regime should operate. The guidance states that enforcing authorities should seek to use Part 2A only where no appropriate alternative solution exists.

Part 2A defines contaminated land as *"land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility that such harm could be caused, or pollution of controlled waters is being, or likely to be, caused"*.

Harm is defined as *"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"*.

For the purposes of Part 2A, land is contaminated if it poses a significant possibility of significant harm (SPOSH).

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human

health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that *“under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land”*. Further the guidance makes it clear that *“regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible”*.

The overarching objectives of the Government’s policy on contaminated land and the Part 2A regime are:

“(a) To identify and remove unacceptable risks to human health and the environment.

(a) To seek to ensure that contaminated land is made suitable for its current use.

(b) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development”.

In accordance with the guidance, the enforcing authority may need to decide whether and how to act in situations where decisions are not straightforward, and where there is uncertainty. *“In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people”*. The authority is required to *“take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case”*. The aim is *“that the regime produces net benefits, taking account of local circumstances”*.

The guidance recognises that *“normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise”*.

Normal levels are quoted as:

“a) natural presence of contaminants’ such as from underlying geology ‘that have not been shown to pose an unacceptable risk to health and the environment

b) ...low level diffuse pollution, and common human activity...”

Similarly the guidance states that significant pollution of controlled waters is required for land to be considered contaminated and the *“fact that substances are merely entering water”* or *“where discharge from land is not discernible at a location immediately downstream”* does not constitute contaminated land.

The guidance considers four categorisations to establish if land is contaminated by either presenting an unacceptable risk to human health or significant pollution of controlled waters (Categories 1 and 2) or where not (Categories 3 and 4).

Category 1: *“unacceptably high probability, supported by robust scientific evidence, that significant harm or significant pollution would occur”*. These situations can arise where similar land or exposures are known or strongly suspected to have caused harm.

Category 4: *“no risk or that the level of risk is low”*. These situations can arise where no contaminant linkage is established or normal/background levels of contaminants are present, or

where the exposure from soil is only a small proportion of what the receptors may be exposed to.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is a sufficiently strong case that the risks are of sufficient concern to cause significant harm/pollution or have the significant possibility of significant harm/pollution the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published SGV and GAC's represent "*cautious estimates of level of contaminants in soils*" which should be considered "*no risk to health or, at most, a minimal risk*". These values do not represent the boundary between categories 3 and 4 and "*should be considered to be comfortably within Category 4*".

2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

Section 11, Paragraph 109 of the National Planning Policy Framework (NPPF) (DCLG 2012) states the planning system should contribute to and enhance the natural and local environment by "*preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water pollution*" and "*remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate*". Paragraphs 120 and 121 describe the policy considerations the Government expects LPA to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications.

For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use.

In most other respects, however, the underlying approach to identifying and dealing with risk, and the overall policy objective of safeguarding human health and the environment, are similar to that outlined in Part 2A.

However, the level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to determine land as contaminated under Part 2A.

The current SGV and GAC are not considered target values for the planning regime. In paragraph 121 the developer is required to ensure that land, after development, is not capable of being determined as contaminated land under Part 2A of the EPA 1990.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks. In order to grant a planning permission the Local Planning Authority (LPA) has to be satisfied that there is sufficient information about the condition of the land, its impacts and the availability of viable remedial options. NPPF Paragraph 21 states that "*planning policies and decisions should also ensure that adequate site investigation information, prepared by a competent person, is presented*". Site investigation information is further defined in the NPPF Glossary page 56 and that also states that investigations should be carried out in accordance with

established procedures, including BS10175 (BSI 2011) that in turn links procedure to the requirements of CLR11.

2.3 Building Control

The building control department of the local authority (along with the private sector approved inspectors) are responsible for the operation and enforcement of the Building Regulations 2010 (DCLG 2010) to protect the health, safety and welfare of people in and around buildings and Building Control Regulations Approved Document C. Specifically requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

3 APPROACH

CLR 11 recommends a phased or tiered approach to risk assessment with the three tiers being:-

- Tier 1 - preliminary – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 - generic - a quantitative assessment using published criteria to screen site specific ground condition data forming part of a Phase 2 report
- Tier 3 - detailed – a quantitative assessment involving the generation of site specific assessment criteria

Each tier of risk assessment comprises the following four stages:-

1. Hazard Identification – identifying potential contaminant sources on and off site;
2. Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model (CSM));
3. Risk Estimation – estimating the magnitude and probability of the possible consequences (what degree of harm might result to a defined receptor and how likely); and
4. Risk Evaluation – evaluating whether the risk needs to be, and can be, managed.

A BJB Consulting Phase 1 report normally comprises a desk study, walkover and Tier 1 risk assessment (the project specific offer defines the actual scope of work). This is the minimum requirement as defined by the NPPF, pp56. At Tier 1 the approach to risk estimation involves identifying the magnitude of the potential consequence (taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

The approach is that if a pollution linkage is identified then it represents a potential risk which requires further consideration and either (1) remediation / direct risk management or (2) further tiers of assessment.

A preliminary Phase 2 report comprises an intrusive investigation to collect site specific information, a Tier 2 quantitative generic risk assessment and a refinement of the CSM using the site specific data. Depending on the findings further investigation and/or progression to Tier 3 risk assessment and the generation of site specific assessment criteria may be required.

The BJB Consulting methodology provides an estimate of the level of risk, it does not identify a risk level at which the risk is considered “significant” and/or “unacceptable” as this is dependent on the view of the individual / stakeholder. For example; to a risk adverse stakeholder even a risk level of “very low” may be considered unacceptable and as such this stakeholder may require risk management options to be implemented.

4 IDENTIFICATION OF POLLUTANT LINKAGES AND CONCEPTUAL SITE MODEL (CSM)

For all Tiers the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:-

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

The *Conceptual Site Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CSM is refined as the assessment progresses through the Tiers.

4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical (e.g. explosive gases).

At Tier 1 the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Potential Contaminants of Concern (PCOC) are identified. The PCOC direct the scope of the collection of site specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site specific data is screened using published assessment criteria. In general, published criteria have been developed using highly conservative assumptions and therefore if the screening criterion is not exceeded then the PCOC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the PCOC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate in a site-specific context requires confirmation on a project by project basis and would form part of a Tier 3 assessment.

When reviewing or assessing site specific data BJB Consulting utilise published guidance on comparing contamination data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured process for employing statistical techniques for data assessment purposes. The benefit of the statistical tool is uncertainty is quantified and decisions are made knowing the strength of the evidence. Correct decision probability is a function of sample size, difference in the mean and the critical concentration, variation in measured values and the significance level.

4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological systems;¹
- Controlled waters² – including surface water and groundwater;
- Property, Animal or Crop (existing or proposed) - including buildings, service lines and pipes, crops, livestock, pets, woodland; and
- Archaeological sites and ancient monuments.

¹ International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) “in the local area” will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with guidance (JNCC 1993), is commissioned and the data provided to BJB Consulting. It should be noted that without such a survey the Tier 1 risk assessment may conclude that the identification of potential ecological receptors is inconclusive (see Specification).

² The definition of “pollution of controlled water” was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor importance/value given in various guidance documents including R&D 66 (NHBC 2008) and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications are generated using the attribute description for each class.

The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three tiered process:-

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any

harm to the ecological receptors

- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual site model as follows.

- 1 Establish Regulatory Context
- 2 Collate and Assess Documentary Information
- 3 Summarise Documentary Information
- 4 Identify Potential Contaminants of Concern
- 5 Identify Likely Fate Transport of Contaminants
- 6 Identify Potential Receptors of Concern
- 7 Identify Potential Pathways of Concern
- 8 Create a Conceptual Site Model
- 9 Identify Assessment and Measurement Endpoints
- 10 Identify Gaps and Uncertainties

The information in a standard BJB Consulting Phase 1 report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken). Step 9 is outside the scope of our standard Phase 1 report.

The Tier 1 prepared by BJB Consulting as part of a Phase 1 report will assess the viability of the mode of transport given the site specific circumstances not specific pathways. As with receptor identification it should be noted that without a habitat survey the Tier 1 risk assessment may conclude that the risk to potential ecological receptors is inconclusive.

4.4 Note regarding Water Framework Directive

The Water Framework Directive (WFD) (2000) aims to protect and enhance the quality of surface freshwater, groundwaters and dependent eco systems, estuaries and coastal waters. The WFD was transposed into UK law in 2003 (Statutory Instruments 2003). Member states must aim to reach good chemical and ecological status as defined in the Directive by 2015.

To address the WFD, a River Basin Management Plan (RBMP) has been developed for the 11 River Basin Districts in England and Wales. These were released by Defra in 2009 (Defra 2009).

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Compare to the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

5 RISK ESTIMATION

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).

At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5).

Subsequent Tiers refine the CSM through retention or elimination of potential hazards and pollutant linkages.

6 RISK EVALUATION

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from C552 (Table 6.6). Subsequent Tiers identify potential risk management options through remediation and/or mitigation measures.

7 REFERENCES

- BSI 2007 BS 8485 Code of Practice for characterisation and remediation from ground gas in affected developments.
- BSI 2011 BS 10175 (2011) Code of practice - Investigation of potentially contaminated sites
- CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.
- CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655
- CL:AIRE/EIH 2008 Guidance on Company Soil Contamination Data with a Critical Concentration
- DCLG 2010 Building Regulations 2010 Approved Document C Site preparation and resistance to contaminants and moisture.
- DCLG March 2012. National Planning Policy Framework.
- DETR 2000 Methodology for Multi Modal Studies. Volume 2 Section 4. The Environmental Objective.
- Defra Circular 01/2006
- Defra Circular 04/2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance.
- Defra '2009 Water for Life and Livelihoods. River Basin Management Plan. (11 Districts: Anglia, Dee, Humber, Northumbria, Northwest, Severn, Solway and Tweed, Southeast, Thames, Western Wales) December 2009
- EA 2004: The Model Procedures for the Management of Land Contamination CRL 11 published by the Environment Agency (EA).
- EA 2008 Ecological Risk Assessment Science Report Series SC070009 published by the Environment Agency (EA).
- European Community 2000 Water Framework Directive (2000/60/EC)
- JNCC 1993 Handbook for Phase 1 Habitat Survey – A Technical for Environmental Audit prepared by the Joint Nature Conservancy Council (JNCC)
- NHBC/EA/CIEH 2008: R&D Publication 66 Guidance for the safe development of housing on land affected by contamination.
- Statutory Instrument 2003 No. 3242 Water Resources, England and Wales. The Water Environment (Water Framework Directive) Regulations 2003.

Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: agriculture, residential, allotment, recent retail or office use Contamination: None or low level residual concentrations. Gas generation potential: Inert Made Ground
Low 2	Land Use: recent small scale industrial, railway tracks, small scale fuel storage (heating). Contamination: Locally or slightly elevated concentrations. Gas generation potential: Shallow thickness of Alluvium
Moderate 3	Land Use: railway yards, collieries, scrap yards, light industry, engineering works. Contamination: Locally elevated concentrations. Gas generation potential: Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: gas works, chemical works, heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential: Shallow mine workings Pre 1960's landfill
Very High 5	Land Use: hazardous waste landfills. Contamination: Likely widespread elevated concentrations. Gas generation potential: Domestic landfill post 1960

"Greenfield" is land which has not been developed including not used for crop production or animal husbandry and no contamination source therefore no pollutant linkages.

Table 2: Criteria for Classifying Receptor Sensitivity/Value

Classification/Score	Definition
Very Low 1	Receptor of limited importance Groundwater: Unproductive Surface water: None and/or >250m hydraulically down gradient Ecology: No local designation Buildings: Replaceable Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement Groundwater: Secondary B Surface water: Tertiary <100m hydraulically down gradient Ecology: local habitat resources Buildings: Local value Human health: Minimum score of 4
Moderate 3	Receptor of local or county importance with potential for replacement Groundwater: Secondary A Surface water: Tertiary <50m or Secondary <100m hydraulically down gradient Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character Human health: Commercial
High 4	Receptor of county or regional importance with limited potential for replacement Groundwater: Principal Surface water: Secondary <50m or Primary <100m hydraulically down gradient Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area Human health: Minimum score where human health identified as potential receptor
Very High 5	Receptor of national or international importance Groundwater: Source Protection Zone Surface water: Primary <50m hydraulically down gradient Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage site Human health: Residential, open spaces and uses where children are present

Table 3: Exposure Pathway and Modes of Transport

Receptor	Pathway	Mode of transport
Human health	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
		Irradiation
Groundwater	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
Surface Water	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of wind blown dust
Buildings	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
Ecological systems	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
Animal and crop	Direct	Wind blown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

Table 4: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 5: Classification of Consequence (score = magnitude of hazard Table 1 and sensitivity of receptor Table 2)

Classification / Score	Examples
Severe 20-25	Human health effect - exposure likely to result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium 10-16	Human health effect - exposure could result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
Mild 6-9	Human health effect - exposure may result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor 1-5	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discoloration of concrete.

Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)

	Consequence			
Probability	Severe	Medium	Mild	Minor
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/low	Low
Low likelihood	Moderate	Moderate/low	Low	Very low
Unlikely	Moderate/low	Low	Very low	Very low

Table 7: Description of Risks and Likely Action Required

Risk Classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

APPENDIX D

Historical Mapping

Site Details:

54 BROAD STREET MALL,
BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: County Series

Map date: 1879

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1879
Revised 1879
Edition N/A
Copyright N/A
Levelled N/A



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Production date: 02 July 2018

Map legend available at:
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Site Details:

54 BROAD STREET MALL,
BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: County Series Town Plan

Map date: 1879-1880

Scale: 1:500

Printed at: 1:1,000



Surveyed 1880
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1879
Revised N/A
Edition N/A
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Site Details:

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BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: County Series

Map date: 1912

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1912
Revised 1912
Edition N/A
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Site Details:

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BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: County Series

Map date: 1931

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1931
Revised 1931
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54 BROAD STREET MALL,
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RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: National Grid

Map date: 1957-1959

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
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Revised 1957
Edition N/A
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Revised 1958
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Site Details:

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BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: National Grid

Map date: 1961

Scale: 1:2,500

Printed at: 1:2,500



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Site Details:

54 BROAD STREET MALL,
BROAD STREET, READING,
RG1 7QE

Client Ref: 2206
Report Ref: GS-5187837
Grid Ref: 471238, 173353

Map Name: National Grid

Map date: 1962

Scale: 1:1,250

Printed at: 1:2,000



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