

CABBAGEFIELD ROW, HAVANT

LAND CONTAMINATION PRELIMINARY RISK ASSESSMENT

Carried out for:

Portsmouth City Council
Civic Offices
Guildhall Square
Portsmouth
Hampshire
PO1 2AR

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1	Final	Poppy Meighen BSc (Hons)	Alexandra Collyer BSc (Hons)	Simon Mason BSc BForSc MI Soil Sci FGS CSci
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1 INTRODUCTION

In March 2020, SOCOTEC UK Limited (SOCOTEC) was commissioned by Portsmouth City Council (PCC) to carry out a Land Contamination Risk Management (LCRM) Phase 1 Tier 1 Preliminary Risk Assessment (PRA) for a site located at Cabbagefield Row, Havant.

It is understood that PCC propose to redevelop the greenfield site named Cabbagefield Row, Havant (approximately 7.4 ha), located north of existing built up area named Leigh Park. The development may include the construction of 150 dwellings with associated gardens, roads, playground and communal allotments.

The development is currently in the scoping phase and the desk study is required to determine whether there may be any significant limitations to the development due to potential contamination. This PRA forms the first phase of the contaminated land assessment.

The offer to undertake the work was detailed in SOCOTEC Quote reference QLO/EN-150182/001/DH Rev00 dated 10 June 2020. The instruction to proceed with the work was confirmed through a receipt of purchase order number 2970914 dated 10 March 2021.

This desk study has been prepared in accordance with British Standards BS5930: 1999+A2: 2010 and BS10175: 2011+A2: 2017 (the updated and revised version of BS 10175: 2011+A1: 2013) and all normative references, including Environment Agency guidance Land Contamination Risk Management (LCRM) (EA, 2020) and AGS Guidelines for Good Practice in Site Investigation.

The desk study presents and discusses the available data obtained for the site and surrounding area's environmental, geological, historical and mining profile, which have been obtained from site specific Groundsure Enviro and Geo Insight Reports. This desk study report identifies the potential environmental issues at the site, and develops an initial conceptual site model (CSM) for geo-environmental considerations. It should be noted that geotechnical considerations are outside the scope of this report.

The principal objectives of the desk study, and the context of the CSM developed within this report, is to provide an assessment of potentially significant risks in order to:

- Give an account of the anticipated ground conditions at the site based upon published historical, geological, hydrogeological and environmental information
- Develop an initial conceptual site model identifying potential sources of contamination, receptors that may be affected by contamination and pathways linking the two (pollutant linkages)
- Undertake a preliminary risk assessment for each identified potential pollutant linkage with respect to the likelihood and severity of the hazard
- Assess the potential requirements for further investigation and risk assessment to ensure that the site is not causing 'significant harm', 'significant pollution of controlled water receptors' (as defined in the Part IIA legislation), or the significant possibility of either of these two events occurring

2 SOURCES OF INFORMATION

The following sources of information have been used in preparation of this report:

- Extracts of available historical Ordnance Survey (OS) maps covering the period from 1859 to 2021, provided by Groundsure, which are presented in Appendix C
- The site and surrounding area's environmental, geological, and mining data in site specific Groundsure Enviro and Geo Insight Reports, presented in Appendix D
- The British Geological Survey (BGS) website
- A site walkover undertaken on 26 March 2021. The walkover photographs are included in Appendix B

3 SITE LOCATION AND DESCRIPTION

3.1 Site Location

The site known as Cabbagefield Row is located directly north of Swanmore Road in Havant. The site is surrounded by grassland and woodland directly north, west and east of the site. The area south of the site consists mainly of residential housing and associated gardens. The approximate National Grid Reference for the site is SU 706 095, and the nearest post code area is PO9 4EX. The site location and layout plans are included within Appendix A.

3.2 Site Description and Reconnaissance Visit

A SOCOTEC Environmental Scientist attended the site on 26 March 2021 to undertake a walkover survey of the site.

The site is greenfield land, comprising approximately 99% open space of grassland, brambles, trees and shrubs and 1% footprint of a telecommunications mast and adjacent electrical box / building and surrounding gravel, located in the centre of the site on the eastern side. The site is rectangular in shape aligned north to south. The site lies on a gentle gradient from north to south, although the northern third of the site has a steep slope down to the north west. A high pressure gas main is located to the west of the site boundary.

The area south east of the site comprises semi-accident woodland known as Cabbagefield Row. The immediate surrounding area directly south of Swanmore Road comprises widely spaced two-storey flat roof terraced residential buildings and associated car parking, garages, internal roads, paths, soft landscaping including general public open space.

Occasional wheelbarrow size loads of fly tipped material were noted in close proximity to Swanmore Road, although no obvious potential asbestos containing material was noted. No significant sources of contamination were noted to be present on site.

No surface water features were noted on site. However, surface water was noted within a small ditch (drainage channel) running parallel approximately 10 m outside the eastern site boundary. 20 m west of the site is a stream named Park Lane Stream which flows from north to south.

A primary school is located approximately 300 m south of the site.

A photographic record of the site walkover is presented in Appendix B.

4 PROPOSED DEVELOPMENT

The site redevelopment is currently at the scoping phase and, however, plans for the redevelopment have been made which will include vegetation clearance, construction of 150 dwellings comprised of 2 to 4 bed houses and 1 to 2 bed apartments with 300 car parking spaces, associated gardens, roads, playground and communal allotments.

According to the PDP Architecture site context plan, the majority of the housing will be constructed within the centre and southern section of the site leaving the north area of the site as open amenity space which includes small allotments.

5 HISTORICAL SETTING

5.1 Historical Land Usage

The development of the site and surrounding area has been reviewed by reference to the available Ordnance Survey historical maps from 1859 to 2021 and is summarised in Table 1 below.

Table 1 Summary of Site History

DATE	SCALE	GRID INDEX	ON SITE DEVELOPMENT	NEARBY DEVELOPMENT
1859 1868 Partial map 1866-1867	1:2,500 1:2,500 1:10,560	1_1 1_1,1_2	The site is shown to be located upon a boundary where two agricultural fields meet.	The triangular parcel of woodland directly south east of the site is named Cabbagefield Row. The stream now known as Park Lane Stream is located approximately 100 m east of the site. A clay pit and a brick kiln are located approximately 150 m north west of site. A main road named Park Lane aligned north west to south east is located approximately 500 m west of the site. The proximal surrounding area within 500 m radius is largely undeveloped farm land west and south of the site and woodland named Bell's Cops north and Havant Thicket east of the site. Several collective buildings known as Dunsbury Hill Farm are located approximately 500 m west of site in area named Dunsbury Hill. Farm buildings named Middle Park Farm is located approximately 500 m south of the site. Two cottages are located approximately 700 m south east of the site. Brick and Tile works is located approximately 800 m south west of the site.
1897 1908 1908-1909 1895-1896 1895-1898 1907 1910	1:2,500 1:2,500 1:2,500 1:10,560 1:10,560 1:10,560 1:10,560	1_1,1_2 1_1 1_2	No significant changes noted on site.	Lake labelled 'Upper Lake' is located approximately 750 m north east of the site.

DATE	SCALE	GRID INDEX	ON SITE DEVELOPMENT	NEARBY DEVELOPMENT
1910- 1914 1931	1:10,560 1:10,560			
1932 1939 1939-1941 1930-1933 1942	1:2,500 1:2,500 1:2,500 1:10,560 1:10,560	1_1,1_2 1_1 1_2	Footpath replaces fence which divides the site in half.	A small pond is located 150 m north west of the site. Terraced and detached residential housing adjacent to golf course is located more than 1 km north west of the site. This is the first sign of housing development.
1959 -1963 1966	1:10,560 1:10,560		No significant changes noted on site.	Additional terraced housing is added to the area more than 1 km north west of the site. A large residential development is located approximately 750 m south of the site.
1970 1968-1970 1972 1980 1980-1985 1981 1985 1975-1980	1:2,500 1:2,500 1:2,500 1:2,500 1:2,500 1:2,500 1: 2,500 1:10,560	1_1 1_2 1_1 1_2 1_2 1_2 1_1 1_1	No significant changes noted on site.	The area directly south of the site closely resembles to present day maps. Directly south of site is Swanmore Road aligned west to east. South of Swanmore Road is large residential development. A primary school and playing field is located approximately 300 m south east of the site. A motorway named A3 (M) and junction aligned north east to south west located approximately 500 m north west of the site. Two large buildings labelled Works and Factory along with further residential development are located approximately 1 km south west of the site.
1991 1988 -1993 1993 1991-1992	1:2,500 1:1,250 1:1,250 1:10,000	1_2 1_2 1_2	No significant changes noted on site.	Further residential development stretching at least 1 km along the west side of the A3 (M) approximately 750 m west of the site.
2001	1:10,000		No significant changes noted on site.	A primary school main building is located approximately 300 m south east of the site is extended. A prospect school is located approximately 500 m south west of the site. Work building located approximately 1 km south east of the site is replaced by residential housing.
2021	1:10,000		No significant changes noted on site.	New relief road connecting A3 (M) junction directly to residential area located approximately 500 m south west of the site. Three industrial units are located south of the relief road.

5.2 Published Geology

The Groundsure Enviro + Geo Insight report (ref GS-7681010) and British Geological Survey (BGS) Geology of Britain Viewer (2021) indicate that the site comprises two types of solid / bedrock geology. The site is mainly underlain by the solid geology of the Bognor Sand Member, with a section in the north of the site underlain by the London Clay Formation, both of the Palaeogene Epoch. One record of superficial deposits is indicated on the north western corner of the site comprises Head (clay, silt, sand and gravel) of the Quaternary Period. The Groundsure report indicated that the permeability of the Bognor Sand Member is high with intergranular flow type, while the London Clay Formation is very low to moderate, mixed flow type.

The Groundsure report indicates that artificial ground or Made Ground is not present on the site. The Groundsure Geo Insight report indicates that there is Made Ground within 500 m of the site approximately 350 m south of the site. There are two large areas of Made Ground located approximately 1 km south west of the site which could be associated with A1 (M) works.

The Groundsure Geo Insight report indicates one non-coal mining record on site for Chalk, the report describes this occurrence to be likely small scale underground mining including possible presence of mine adits, shafts and tunnels. There may be potential for different ground levels where the work may have occurred. However, the Chalk and any associated small scale mining within the site would have to be relatively deep within the site boundary.

Neither the Groundsure Report nor the British Geological Survey (BGS) Geology of Britain Viewer indicates the presence of faults or coal seams within 1,000 m of the site.

5.3 Geological Hazards

Information on various geological hazards is contained within the Groundsure Geo Insight report where the risks on site (within 50 m) are classified from negligible to low; these are summarised in Table 2 below.

Table 2 Summary of On Site Geological Risks

HAZARD	RISK CATEGORY
Shrink-Swell Clay	Low
Landslides	Very Low
Ground Dissolution of Soluble Rocks	Negligible
Compressible Deposits	Negligible
Collapsible Deposits	Very Low
Running Sands	Low

5.4 Mining, Extraction & Natural Cavities

According to the Geo Insight report, there are no identified natural cavities within 500 m of the site. There is one disused BritPit recorded 192 m north west of the site named Dunsbury Hill Brick Yard. There is also no coal mining areas or underground workings within 1,000 m of the site; the historical maps also do not record the presence of coal mining activities within 1,000 m of the site.

5.5 Artificial and Made Ground

The Groundsure Geo Enviro and Geo Insight report (ref GS-7290100) highlight Made Ground (undivided) features located approximately 351 m south of the site, no further details were provided with regards to Made Ground.

5.6 Surface Ground Workings

The Groundsure Geo Enviro and Geo Insight report indicates that there are 15 surface ground workings located within 250 m of the site. These are summarised in Table 3 below.

Table 3 Summary of Ground Features

FEATURE	DISTANCE FROM SITE	DATE
Brick Kiln	161 m north west	1867
Clay Pit	167 m north west	1867
Pond	170 m east	1942
Pond	175 m west	1867
Unspecified Pit	178 m west	1942
Unspecified Pit	180 m west	1933
Unspecified Ground Workings	180 m west	1942
Unspecified Pit	182 m west	1963
Unspecified Pit	182 m west	1933
Unspecified Pit	182 m west	1963
Unspecified Pit	186 m north west	1933
Unspecified Pit	186 m north west	1942
Old Clay Pit	186 m north west	1907
Old Clay Pit	186 m north west	1895
Unspecified Pit	190 m north west	1963

The features are not considered to represent a concern, given their distance from the site.

5.7 Hydrogeology and Groundwater and Surface Water Abstraction

The hydrogeological characteristics of the site as indicated by the Groundsure Geo Enviro and Geo Insight report are summarised below in Table 4 below.

Table 4 Summary of Hydrogeological Characteristics

CHARACTERISTIC	OBSERVATIONS
Superficial Aquifer Details (within 500 m of the site)	On site, within the superficial geology is classified as a secondary undifferentiated aquifer. Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Bedrock Aquifer Details (within 500 m of the site)	The bedrock geology underlying the south and centre of the site is classified as a Secondary A and within the north of the site is an unproductive aquifer. Secondary A aquifer has 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 to rivers. These are generally aquifers formerly classified as minor aquifers. Unproductive Aquifer comprising rock layers with low permeability that have negligible significance for water supply of river base flow.
Groundwater Abstraction Licences (within 2000 m of the site)	There are no recorded groundwater abstraction licenses within 2,000 m from the site.
Surface Water Abstraction Licences (within 2000 m of the site)	There is one recorded surface water abstraction licence located approximately 1,422 m north of the site. The abstraction point is historical and no longer applies.
Potable Water Abstraction Licences (within 2000 m of the site)	There are no recorded Potable Water abstraction licences within 2,000m of the site.
Nitrate Vulnerable zones (within 2000 m of the site)	The site is located within a Nitrate Vulnerable Zone (NVZ) at risk from agricultural nitrate pollution. The name of the NVZ is Chichester, Langstone and Portsmouth Harbour NVZ and type is eutrophic water (Estuaries and Coastal Waters). Another NTZ is recorded 493 m north of the site named Hampshire Chalk, type is groundwater.
Source Protection Zone (within 500 m of the site)	The site is located within a Source Protection Zone (SPZ) in an inner catchment within a confined aquifer designated 'Type 1c' SPZ. There is also another SPZ designated 'Type 2' within outer catchment recorded 497 m north east of the site. These are associated with the Principal Aquifer within the Chalk underlying the site at depth.
Groundwater Vulnerability and Soil Leaching Potential (within 50 m of the site)	On site, there are three different groundwater vulnerability records associated with the three different aquifers on site. The groundwater vulnerability within secondary superficial aquifer is medium vulnerability within superficial geology and unproductive within bedrock geology. The groundwater vulnerability within unproductive aquifer is unproductive within bedrock geology. The secondary bedrock aquifer is classed as medium vulnerability within bedrock geology. For all three records, soil leaching potential is low.

5.8 Hydrology and Flooding

The Groundsure Geo Enviro and Geo Insight report recorded four surface water features within 250 m from the site. The closest surface water feature is a drainage channel, located approximately 6 m east of the site. Another surface water feature is an inland river named Park Lane Stream flowing from north to south recorded 22 m west to 212 m south of the site.

The flood risk from rivers and sea on site is Low. There is a Medium risk (less than 1 in 30 but greater than or equal to 1 in 100 chance) of flooding from rivers and the sea located 0-50 m west of the site adjacent to Park Lane Stream. There are no identified flood defences located within 250 m of the site. There are no records of historic flooding from rivers, the sea, groundwater and surface water at the site.

The Groundsure Geo Enviro and Geo Insight report recorded highest risk of surface water flooding within 50 m of the site is 1 in 30 year rainfall event recording flooding between 0.3 and 1.0 m. The surface water flood risk area is in line with Park Lane Stream.

According to Groundsure Geo Enviro and Geo Insight report groundwater flooding susceptibility is high in the north west area on site and high in areas within 50 m of the site. Again this area is in line with Park Lane Stream.

It should be noted that a flood risk assessment is outside the scope of this report and a Flood Risk Assessment will be presented in a separate report.

5.9 Potential Sources of Ground Gas

5.9.1 Radon

According to the Groundsure Report, the property is not located within a Radon Affected Area, as less than 1% of properties are above the Action Level. The report states that no radon protective measures are necessary in the area.

5.9.2 Ground Gas

The Groundsure report and BGS geology viewer indicate that no artificial, Made Ground, are located on site or within the site's immediate surrounding area. One record of Made Ground located 351 m south of the site is deemed too far from site to have an effect.

No current landfill or other waste sites have been identified and no records of coal mining have been reported within the site's surrounding area. One historical landfill (inert waste) was recorded approximately 90 m west of the site in area known as Dunsbury Hill Farm.

5.10 Utilities

The site has had a recent installation (approximately 10 years) of a telecommunications mast including a small electricity substation. An electricity substation is located approximately 57 m south of the site. A pylon is located 212 m west of the site. The surrounding areas in the south are likely to contain underground services associated with the residential buildings nearby. A high pressure gas main is located approximately 50 m west of the site boundary.

5.11 Historical Petrol and Fuel Sites

The Groundsure Enviro Insight does not list any records of historical petrol stations and fuel sites within 500 m of the site boundary.

6 ENVIRONMENTAL SETTING

6.1 Topography

During the site walkover, the site was noted to be sloping down to the north west corner of the site and dropping away to the west of the site down to Park Lane Stream.

6.2 Designated Environmentally Sensitive Sites

In the context of this report sensitive land usage covered by the Groundsure report includes the following:

- Sites of Special Scientific Interest (SSSI)
- Local and National Nature Reserves (LNR and NNR)

- Special Protection Areas (SPA) and Special Areas of Conservation (SAC)
- World Heritage Sites and Ancient Woodlands
- Areas of Outstanding Natural Beauty (AONB)
- National Parks
- Ramsar sites
- Green Belt
- Nitrate Sensitive Areas and Nitrate Vulnerable Zones (NSA, NVZ)

The Enviro Groundsure report for the site indicates that there is one Local and National Nature Reserve collectively known as Hazleton Common located 1,787 m north of the site. There are 29 records of areas classified as Ancient Woodland. Groundsure report records an area of ancient woodland on site named Cabbagefield Row which is actually an area adjacent to site due south east. Named ancient woodlands recorded within 1,000 m of the site are Bells Copse directly north of the site, Forest of Bere located approximately 595 m north, Round Wood, approximately 680 m east and Bushy Lease located approximately 991 m south west of the site. Otherwise there is no other sensitive land uses located within 1,000 m of the site.

According to Pre-Submission Havant Borough Local Plan 2036 (2019) the northern area of the site and land adjacent to the site are designated Sites of Importance for Nature Conservation (SINCs) which is described as *'A local site which is of substantive nature conservation value. The Site of Importance for Nature Conservation system in Hampshire is managed by Hampshire Biodiversity Information Centre on behalf of the Hampshire Biodiversity Partnership. Such sites are often referred to as Local Wildlife Sites, Local Sites or Sites of Nature Conservation Importance'*.

6.3 Current Contaminative Land Uses

The Groundsure Report details other potential contamination sources located close to the site including 'Current Industrial Data'. There are four records of current land uses that may be considered as contaminative within 500 m of the site. A telecommunications mast and adjacent small electricity substation is located on site. An electricity substation is located approximately 507 m south of the site. Industrial activity associated with curtains and blinds is located 180 m south of the site. A pylon is located 212 m west of the site.

7 PRELIMINARY CONCEPTUAL SITE MODEL

7.1 General

In line with existing legislation and the current good practice guidance for the management of contaminated land, assessments are undertaken using a risk based approach. It is necessary to define a Conceptual Site Model (CSM) for the site which identifies the potential sources of contamination, the receptors and the pathways that can connect them. In order for there to be a risk from contamination, one or more relevant pollutant linkages must exist, connecting a contamination source, a receptor (an entity which might be affected by the contamination) and a pathway (or mechanism) by which the receptor can be exposed to the contaminant.

A discussion of potential sources, pathways and receptors and a tabulated summary of the CSM indicating potential pollutant linkages follow below. The criteria used for assessing the relevance of identified potential pollutant linkages are based on the objectives stated above. It is understood that the purpose of this desk study and walkover is a means to determine and record the current site conditions and to identify and assess the extent of any potential contamination sources within the site prior to its redevelopment for residential use by PCC.

7.2 Potential Sources of Contamination

Potential sources of contamination are usually associated with current and former industrial activities, where the processing, storage, use, transportation and disposal of raw materials, products and wastes often leads to the contamination of underlying ground and groundwater. In addition, natural processes can also give rise to contamination such as hazardous gases.

Based on the information presented above, potential sources of contamination from current and historical site uses and from potentially significant off site sources have been assessed. Potential sources of contamination and contaminants at and within the site boundary are summarised in the table below. These are based on the desk study data obtained and published guidance. Many of the potential current and historical off sites sources identified in previous sections have been discounted on the basis of their distance and direction (e.g. down inferred topographic and groundwater flow gradient) from the site.

Table 5 Potential Sources of Contamination

SITE USE / ACTIVITY AND AREA	SOURCES	CONTAMINANTS
Current use of the site for telecommunications and services.	Telecommunications mast, electrical substation and Made Ground associated with the hardstanding and underground buried services.	A range of organic and inorganic contaminants and ground gases, including heavy metals and metalloids, cyanide, fuels, fuel oils, hydrocarbons, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs)
Historical and current features (within 250 m of the site)	From 1859 a clay pit and Brick Kiln brick was located approximately 150 m north west of the site. Possible Made Ground associated with brick works and clay pit.	A range of organic and inorganic contaminants and ground gases, including heavy metals and metalloids, cyanide, fuels, fuel oils, hydrocarbons, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs)

7.3 Potential Migration Pathways

To develop further an understanding of the potential risks posed by the contaminants to human receptors, the pathways through which contaminants may impact receptors need to be identified. The potential migration pathways and / or exposure routes considered to be present at the site are:

- Direct soil, soil dust and / or water ingestion
- Inhalation of soil dust, soil vapour and / or water vapour
- Dermal contact with contaminated soil, soil dust and/or water
- Lateral and vertical migration of gases and / or vapours through permeable strata
- Leaching of contaminants from soils into soil pore water and shallow groundwater
- Downward migration of soil pore water and shallow groundwater (including via preferential pathways created by foundations)
- Lateral groundwater flow towards nearby controlled water receptors
- Preferential pathways including existing services and proposed ground improvements and / or foundations
- Permeation of organic contaminants through water supply pipes and into the water supply for the site

7.4 Potential Receptors

Potential receptors have been identified and categorised as follows:

7.4.1 Human Health

- Current and future site users
- Neighbouring site occupants
- Construction workers during any proposed development at the site

7.4.2 Controlled Waters

- Drainage channel located approximately 6 m east of the site. River named Park Lane Stream recorded 22 m west to 212 m south of the site.

7.4.3 Environmental Receptors

The site has one adjacent environmental receptor; Ancient Woodland of Cabbagefield Row

7.4.4 Property, Buildings, Structures and Services

The works on site is to include vegetation removal and construction of 150 dwellings with 300 car parking spaces, associated gardens, roads, playground and communal allotments.

Any water supply pipes or utilities that will service the buildings are considered to be potential receptors.

7.5 Summary

The relevant pollutant linkages based on the potential sources, pathways and receptors outlined above are tabulated below.

Table 6 Preliminary Conceptual Site Model

SOURCE	PATHWAY	RECEPTOR
Sources and contaminants as identified in Table 5 above.	- Ingestion of soils / soil dust and / or groundwater - Dermal contact with soil, soil/dust and / or groundwater - Inhalation of soil dust and / or soil / groundwater vapours	- Construction workers - Current and future users of the site - Neighbouring site occupants
	- Leaching and downward migration via permeable soils - Lateral groundwater migration - Migration via man made pathways (services, service trench backfill) - Surface run off	- Perched groundwater in shallow superficial deposits - Any existing or future water supply pipe or utilities
	- Ingress of ground gases and vapour into buildings, accumulation and asphyxiation or explosion - Migration via man made pathways (services, service trench backfill)	- Proposed new buildings - Future site users - Neighbouring residential buildings

There are currently a series of uncertainties and assumptions in the CSM presented above as this is based on Desk Study information only:

- Ground conditions have been conceptualised based on BGS geological maps and other primarily desk-based information
- The thickness and extent of any Made Ground at the site is currently unknown
- The presence and extent of any suspected contamination is unknown in the absence of ground investigation data
- The presence and depth of any groundwater bodies at the site is currently unknown
- The ground gas regime at the site has not been characterised

8 PRELIMINARY RISK ASSESSMENT

8.1 Assessment of Environmental Risks Methodology

The identification of potential pollutant linkages is a key aspect of the evaluation of potentially contaminated land. An approach based on CIRIA report C552 has been adopted. For each of the pollutant linkages, an estimate is made of the potential 'Severity of Risk' and the 'Probability of Risk Occurring'. These are then used for an overall qualitative evaluation of the level of risk, as defined below in tables taken from CIRIA report C552.

Table 7 presents the classification of the severity of the risk.

Table 7 Severity of Risk

RISK FACTOR	TYPICAL EXAMPLES
Severe	Acute risks to human health; Major pollution of controlled water receptors
Medium	Chronic (long-term) risk to human health; Pollution of controlled water receptors
Minor	Damage to non-sensitive species or ecosystems, buildings or services

The probability of risk occurring is classified according to the criteria provided in Table 8 below:

Table 8 Probability of Risk Occurring

PROBABILITY RATING	DESCRIPTION
High Likelihood	Pollutant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
Low Likelihood	Pollutant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

An overall qualitative evaluation of the level of risk is gained from a comparison of the severity and probability as represented in Table 9 below:

Table 9 Risk Rating Evaluation

		SEVERITY		
		SEVERE	MEDIUM	MINOR
PROBABILITY	HIGH LIKELIHOOD	Very High Risk	High Risk	Moderate / Low Risk
	LIKELY	High Risk	Moderate Risk	Low Risk
	LOW LIKELIHOOD	Moderate Risk	Moderate / Low Risk	Very Low Risk
	UNLIKELY	Moderate / Low Risk	Low Risk	Very Low Risk

8.2 Preliminary Risk Assessment

The following table details the potential risks associated with the various potential pollutant linkages identified through the assessment of the data collated in this report. The risk category should be reviewed if further information is made available or the environmental setting of the site changes, for example through a proposed change in the development layout or end use.

Table 10 Preliminary Risk Assessment

SOURCE	PATHWAY	RECEPTOR	SEVERITY	PROBABILITY	RISK RATING	COMMENTS
Sources and Contaminants as identified in Table 5	- Soil / dust / groundwater ingestion - Dermal contact - Inhalation of soil dust / vapours - Permeation of water supply pipes	- Construction workers - Future site users - Neighbouring site users	Medium	Unlikely	Low Risk	Due to age of the electricity substation on site and the fact the infrastructure lies on top of hardstanding, it is considered that contaminants are unlikely to be present beneath the site. However, there might be a possibility of a backup generator which could be powered by hydrocarbons. The buried services for mobile mast are unlikely to present a risk to receptors but it is a possibility of presence of contamination in backfill. Although the risk is likely to be low, a ground investigation is recommended to confirm low levels of contamination are present on site. The small scale fly tipping should be removed by the Local Authority.
	- Generation and migration of ground gases - Asphyxiation or explosion upon ignition	Buildings	Medium	Unlikely	Low Risk	Although the risk is likely to be low, a ground investigation is recommended to confirm low levels of ground gas is present on site.
	Leaching and downward migration of contaminants	Drainage channel located approximately	Medium	Unlikely	Low Risk	The bedrock geology underlying the future housing development within south and centre of the site is classified as a Secondary A which may be capable of supporting water supplies at a local scale, and in

	in into the groundwater • Lateral Groundwater Migration • Migration via man made pathways (services, service trench backfill) • Surface water run off	6 m east of the site. River (Park Lane Stream) recorded 22 m west to 212 m south of the site • Ancient Woodland				some cases forming an important source of base flow to rivers. As there are two nearby surface water receptors, measures may be taken to avoid any leaching of contaminants into nearby water courses during the construction phase. Although the risk is likely to be low, a ground investigation is recommended to confirm low levels of contamination are present on site.
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9 CONCLUSION

Following completion of the desk study and the development of the initial Conceptual Site Model and Preliminary Risk Assessment, the risks posed by land contamination are anticipated to be low for potential human health and controlled waters receptors. Potential sources of contamination considered to be present on site include the electrical substation associated with the telecommunications mast located within the central eastern area of site. Although PCBs are not considered a potential source due to age of the electrical infrastructure, however hydrocarbon contamination is considered possible due to a possibility of a petrol / diesel backup generator.

The majority of the site where housing development will take place is underlain by Bognor Sand Member (Secondary A aquifer). A secondary A aquifer may be capable of supporting water supplies at a local scale, and in some cases forming an important source of base flow to rivers. As there are two nearby surface water receptors.

However, there are currently a series of uncertainties and assumptions in the CSM as this is based on Desk Study information only and a ground investigation is recommended to confirm levels of contaminants within the soil and groundwater underlying the site is low.

10 RECOMMENDATIONS

The actual presence of contamination in, on, or under the ground can only be confirmed by an intrusive site investigation. Based on the findings of the above it is recommended that further intrusive investigation work is undertaken in order to assess the condition of soil and groundwater beneath the site and to allow ground gas monitoring to be undertaken. It is envisaged that this would comprise the excavation of a series of shallow trial pits targeting potential sources of contamination around mobile mast and associated infrastructure in order to facilitate the collection of soil samples for analysis. A series of boreholes should also be installed as ground gas monitoring wells to allow the recording of ground gasses to characterise the ground gas regime on site and facilitate the collection of shallow groundwater samples, should this be encountered.

The data obtained from these works will be used to refine the CSM and gather geoenvironmental information in order to assess any potential risks with respect to future site users, construction workers and controlled water receptors pertinent to the site.

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BGS Geology of Britain Viewer. www.bgs.ac.uk. British Geological Survey.

BS 5930:2015 : Code of practice for ground investigations. British Standards Institution.

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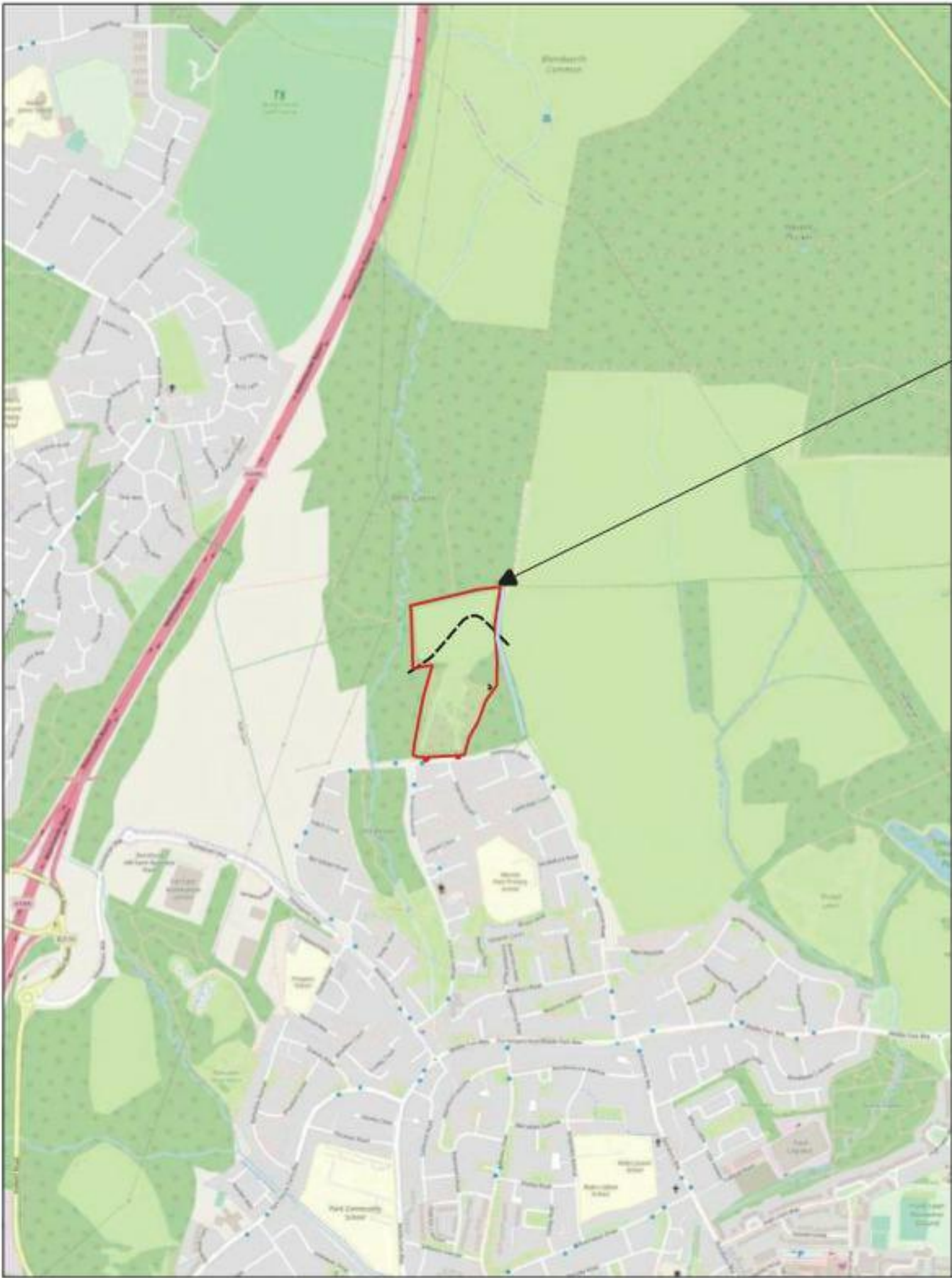
EA : 2020 : Environment Agency Guidance, Land Contamination Risk Management (LCRM). Environment Agency, Bristol. Published 8 October 2020 at www.gov.uk/government/publications/land-contamination-risk-management-lcrm.

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Groundsure : 2021: Historical Ordnance Survey Maps Report Ref. GS-7681009, 23 March 2021

APPENDIX A

FIGURES



The Site

0 250 500 750 1,000 m

Scale: 1:25,000
Source:
QuickMapServices © OpenStreetMap contributors,
CC-BY-SA, Contains Ordnance Survey data © Crown
copyright and database right 2010-12.
Note : Site boundary not to scale

Project Cabbagefield Row, Havant
Project No. STH1016
Client PDP Architecture

Figure
1



Legend

- Site Boundary
- Telecommunications Infrastructure

Note:
Site boundary and features not to scale

Source:
QuickMapServices.© OpenStreetMap contributors, CC-BY-SA.
Contains Ordnance Survey data © Crown copyright and
database right 2010-12.

Title:

Site Features

Project:

Cabbagefield Row, Havant

SOCOTEC



Project Number:

STH1016

Figure

2

APPENDIX B
SITE RECONNAISSANCE NOTES AND PHOTOS

REFERENCES	
Project no.	STH1016
Site Address	Opposite 125 Swanmore Road, Havant PO9 4EY
Date of Visit	26 March 2021
Prepared by	Simon Mason
SITE – GENERAL	
Plan of site	annotate site plan or provide sketch
Site size (area : % building, % hardstanding, % open space / other	99% open space comprising, grassland, brambles, and shrubs 1% gravel and footprint of Vodafone phone tower and adjacent electrical box / building
Current use (occupants and operations)	Open space accessible by the public on foot and used for dog walking along paths and within grassland areas
SITE BUILDINGS	
Age of building(s)	Phone tower and adjacent electrical boxes / buildings, approximately 10 years old
Building appearance: no. of storeys, basement, roofing type, chimneys / stacks?, car park, service areas	N/A
Tanks: location (internal / external : above or below ground), age / condition, size / capacity, type, bunding (condition), refuelling point, evidence of stains / spills	N/A
Heating : electric/gas/oil	Electric mains must connect to phone tower and adjacent electrical boxes / buildings
Chemical storage : drums, other, chemical stores	N/A
Gas control , measures (e. g. vents, cowls, monitoring / alarms)	High pressure gas main located to the west of the site boundary, need to call 0800 111 999 prior to breaking ground
Other evidence of industrial activity	Phone tower / mast
Asbestos / deleterious materials – any asbestos surveys? removal programmes?	N/A
Electrical equipment / Transformers – check for PCBs? Backup power supplies (generators)	Electrical box adjacent to phone tower, but relatively recent and no PCBs likely to be associated with it
SITE – EXTERNAL	
Site surfacing: type (asphalt/concrete etc.), staining, weathering, subsidence, repairs. Landscaped areas.	Open space comprising grassland, brambles, shrubs and trees
Drainage: interceptors, disposal of storm water/ waste water, mains water supply?	N/A
Site topography – flat / sloping?, level compared to surroundings, evidence of filling or raising, earthworks?	Sloping down to the north west corner of the site and dropping away to the west of the site down to the River
Vehicle maintenance : wash down areas, workshops, refuelling points	Site used by quad bikes, but otherwise no evidence of spills
Waste: skips/ compounds, any hazardous waste? Burning ground or incinerators	Fly tipped rubbish in small (wheelbarrow sized) piles at close proximity to houses in the south of the site

Sub-stations: age, condition, transformers, operator, servicing?	Electrical boxes / buildings associated with the phone mast appear to be in good order and approximately 10 years old
Trees – effects on buildings, condition, species and height	Mature deciduous trees and occasional evergreen located along north, east and west boundaries
Sloping ground – any indication of instability (cracks in ground, bulges, leaning trees, walls or poles), rotational slip scars.	Site is generally located on a crest / ridge with the phone tower at the highest point and the site slopes down and away from the remainder of the site in the north west of the site
Ecological features of note – Burrows, bats, nest sites, designated preservation areas	Ancient woodland to the south east of the site and grassland habitat on site
Other features of note within site	Quite overgrown in areas, which may require clearance prior to trial pitting
SURROUNDING LAND USES	
General site context – industrial, commercial, urban, agricultural etc.	Open space, agricultural and residential to the south
Land use – north (give distances)	Wooded open space to the north of the footpath adjacent to the northern site boundary
Land use – south (give distances)	Housing Estate and open space associated with residential properties to the south of the road along southern site boundary
Land use – east (give distances)	Ancient woodland immediately to the south east and farmland to the east of the footpath along the eastern site boundary. Drainage ditch located along the eastern site boundary in northern half of the site
Land use – west (give distances)	Wooded open space leading down to the River
Nearby (<500m) sources of pollution – landfills, filling stations, industrial activity.	N/A
Nearby river/ surface water features – culverted, banks floodplain. If visible, conditions of watercourse	River flowing to the south located to 20 m to the west of the site boundary and ditch with water located 10 m to the east of the site boundary.
Adjacent geotechnical features of note – cutting, quarries, embankments, slopes (particularly if failed), major excavations, deep basements, sources of vibrations (railway or heavy machinery)	N/A
Other features of note adjacent to site	Reservoir proposed for development in the farmland to the east of the site



Plate 1: Looking north towards the site from Swanmore Road.



Plate 2: Looking east along Swanmore Road, with the residential housing to the right / south.

Notes:
Walkover on 26 March 2021

Project Cabbagefield Row, Havant
Project STH1016
Client Portsmouth City Council

Sheet 1 of 14



Plate 3: Looking south towards the residential housing from Swanmore Road.



Plate 4: Vegetation on southern boundary of site.



Plate 5: Pedestrian access to the site with a sign which says it is an offence to drive motor propelled vehicles on site.



Plate 6: Looking north from southern boundary of the site.



Plate 7: Small wheelbarrow loads of fly tipped rubbish in close proximity to Swanmore Road.



Plate 8: Further fly tipped rubbish on a path.



Plate 9: Looking west into the ancient woodland of Cabbagefield Row



Plate 10: Showing prohibited motorcycle sign, information sign and stream on the right located approximately 110 m from south east corner of site.

Notes: Walkover on 26 March 2021	<table><tr><td>Project</td><td>Cabbagefield Row, Havant</td></tr><tr><td>Project</td><td>STH1016</td></tr><tr><td>Client</td><td>Portsmouth City Council</td></tr></table>	Project	Cabbagefield Row, Havant	Project	STH1016	Client	Portsmouth City Council	Sheet 5 of 14
Project	Cabbagefield Row, Havant							
Project	STH1016							
Client	Portsmouth City Council							



Plate 11: Showing sign including information about Portsmouth Water plan to build a new reservoir east of the site.



Plate 12: Agricultural fields to the east of the site proposed for reservoir development.



Plate 13: Looking at Drainage channel (left) which is 6 m from the north eastern boundary of the site.



Plate 14: Vodafone telecommunications mast and associated electrical substation.

Notes: Walkover on 26 March 2021	Project Cabbagefield Row, Havant Project STH1016 Client Portsmouth City Council	Sheet 7 of 14
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Plate 15: Close up of electric substation and associated infrastructure.



Plate 16: Building units associated with telecommunications mast.



Plate 17: Looking at open field east of the site proposed for reservoir development.



Plate 18: Ditch / drainage channel approximately 10 east of the site boundary.



Plate 19: Looking at signage about potential reservoir (right) and planning proposal from Havant Council for building of reservoir, located east of the site.



Plate 20: Looking south over the site from the northern site boundary.



Plate 21: Looking at Park Lane Stream west of the site.



Plate 22: Looking at electric pylon located west of the site.



Plate 23: Looking at open field located west of the site.



Plate 24: looking at post saying 'Gas high pressure pipeline before excavation Call Free 0800 111 999'. This is located approximately 50 m to the west of the site boundary.

Notes:
Walkover on 26 March 2021

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Plate 25: Looking east across the site towards the phone mast.



Plate 26: Vehicle entrance located along the southern site boundary.



Plate 27: Looking at site entrance from Swanmore Road.



Plate 28: Looking at culvert for Park Lane Stream located south of the site.

Notes: Walkover on 26 March 2021	Project	Cabbagefield Row, Havant	Sheet 14 of 14
	Project	STH1016	
	Client	Portsmouth City Council	