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Phase 1 Preliminary Risk Assessment

at

19 Green Lane
Spalding
Lincolnshire
PE11 2YD

(ref. TJ3117AR1v1.0)

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Appendix F BGS Records.

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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
Al	Aluminium
AONB	Area of Outstanding Natural Beauty
AoPC	Area(s) of Potential Concern
AST	Above Ground Storage Tank
BaA	Benzo(a)anthracene
BaP	Benzo(a)pyrene
BbF	Benzo(b)fluoranthene
BGS	British Geological Survey
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene & Xylene
CAT	Cable Avoidance Tool
CD&E	Construction, Demolition & Excavation
Chy	Chrysene
CLEA	Contaminated Lane Exposure Assessment
CSM	Conceptual Site Model
CWG	California Working Group
C4SL	Category 4 Screening Levels
DEFRA	Dept. for Environment, Food & Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
E	East
EA	Environment Agency
EU	European Union (Council/Commission etc.)
FRA	Flood Risk Assessment
GAC	Generic Assessment Criteria
GQA	General Quality Assessment
GQRA	Generic Quantitative Risk Assessment
Ha	Hectare(s)
IcdP	Indeno(123-cd)pyrene
LLTC	Low Level of Toxicological Concern
LNR	Local Nature Reserve
LoW	List of Wastes
m	Metre(s)
mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
MTBE	Methyl Tert-Butyl Ether
MCERTS	EA Monitoring Certification Scheme
N	North
NGR	National Grid Reference
NNR	National Nature Reserve
NP	National Park
NVZ	Nitrate Vulnerable Zone
PAH	Polyaromatic Hydrocarbon(s)
PAL	Powell Associates Limited
PCB	Polychlorinated Biphenyl(s)
PCoC	Potential Contaminants of Concern
PE	Polyethylene
PFS	Petrol Filling Station
PID	Photo Ionisation Detector
POS	Parks and Open Spaces
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
PVC	Polyvinyl Chloride
QTSE	QTS Environmental Limited
RBMP	River Basin Management Plan
RMS	Risk Management Strategy
RWFD	Revised Waste Framework Directive
RWL	Resting Water Level
S	South
S4UL	Suitable 4 Use Levels
SAC	Special Area of Conservation
SGV	Soil Guideline Value
SNRHW	Stable Non-Reactive Hazardous Waste
SPA	Special Protection Area
SPL	Significant Pollutant Linkage
SPR	Source-Pathway-Receptor
SPZ	Source Protection Zone
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compound(s)
TGEN	Terragen Environmental Consultants Limited
TOC	Total Organic Carbon
TP	Trial Pit
TPH	Total Petroleum Hydrocarbon(s)
UCL_{95}	95% Upper Confidence Limit
UK	United Kingdom
UKAS	UK Accreditation Service
UKEA	UK Environment Agencies
UN	United Nations
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound(s)
W	West
WAC	Waste Assessment Criteria
WFD	Water Framework Directive
WS	Window Sampler

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EXECUTIVE SUMMARY

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of contaminated land hazards, which may be present at the site. As such, potential contaminated land risks have been assessed by considering two key elements:

- The likelihood that sources of contamination are present at the site.
- The consequence or severity of any impacts should contamination be present. The consequence or severity of impact is inferred from the nature of any potential receptors (i.e. something that could be adversely affected by a contaminant, such as human health, an ecological system, property or controlled water etc.) as well as any relevant pathways (i.e. a route or means by which a receptor can be exposed to or affected by a contaminant) relating to the site and the surrounding area.

The site is an irregular shaped plot of land (circa 0.25ha) to the S of Green Lane, close to Spalding town centre. The existing site consists of a detached private bungalow and gardens, with circa twenty-two lock-up garages, partly of corrugated cement sheeting (ACM) construction with timber doors. The site is bound by residential properties with Havelock Street to the NE, South Parade to the S and Thompson Close to the SW. Circa 60m to the NW/W is the recently upgraded Great Northern and Great Western railway line.

Planning permission (ref. H16-0006-16 dated 07/03/2016) was granted by South Holland District Council (the local authority) for a residential development at the site. The planning permission is subject to a number of conditions, one of which (Condition 8) relates to the investigation of potential land contamination. The proposed development includes the demolition of the existing bungalow and garages and the erection of nine residential dwellings (two, 2-bedroom semi-detached houses and seven, 2-bedroom terraced houses) together with an access road, parking spaces (two per dwelling) and areas of soft landscaping (private gardens and communal amenity space).

Records from 1887 to 1903 show the site to be occupied by an orchard woodland, which was subsequently vacant until 1931. Mapping from 1965 to present day shows two blocks of garages on the N part of the site and mapping from 1972 to the present day shows a detached residential dwelling and garden occupying the S part of the site. A railway line/siding is shown along the W boundary of the site on mapping from 1887 to 1965, which has since been disused. A sewage works was shown on mapping between 1931 and 1977 to the SW of the site and a former pond on mapping between 1887 and 1982 to the NW of the site.

There is a potential for contamination to arise from the possible presence of a range of materials and substances associated with former activities onsite and offsite. The range of potential contaminants associated with these activities can be summarised as follows:

- ACM (fabric of the bungalow and garages onsite).
- Fuels and oils (parking of vehicles onsite).
- Former electricity substation (offsite adjacent to SW boundary of the site).
- Infilled land (offsite sewage works to the SW and pond to the NW of the site).
- Former railway line/sidings (offsite adjacent to the W boundary of the site.

We would therefore consider the following as PCoC:

- Hydrocarbons (e.g. petrol, diesel, lubricating oil and vapours etc.).
- Heavy metals.
- Cyanides.
- Sulphates.
- PAH and phenol etc.
- ACM.
- PCB.
- Ground gas (methane and carbon dioxide).

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The published geological survey maps indicate any near surface soil at the site will be underlain by superficial drift (Terrington Beds) and bedrock (Oxford Clay) both of which are designated as unproductive with low to very low permeability.

The site is not located within 2000m of an EA designated SPZ. The closest (Zone 2 outer) is circa 6250m to the NW with the boundary to the inner zone circa 7250m to the NW. There are no groundwater abstractions permits within 2000m of the site.

The only detailed river network entry within 500m of the site boundary relates to the River Welland, circa 465m to the SE, classified as a primary river. Considering the distance to the receptor and the low to very low permeability of the superficial drift and bedrock, it is unlikely that any water bearing strata would be in hydraulic continuity with the water course.

The site is located within a NVZ. The closest designated environmentally sensitive site relates to the Vernatts LNR, circa 1770m to the N. There are residential dwellings (houses and gardens) in close proximity to the site.

There are no landfill sites within 250m of the site. However, there are areas of infilled ground (former pond circa 5m to the NW and former sewage works circa 25m to the SW). which could be considered as sources of ground gas. There are no significant sources of organic contaminants that could generate vapours (e.g. PFS, vehicle maintenance garage etc.) within the immediate vicinity of the site, although parking of vehicles in the garages in the N part of the site could be considered as a source of hydrocarbons and subsequently vapours. The low to very low permeability of the superficial drift and bedrock would inhibit the lateral migration of any gases or vapours from offsite sources.

The risk of potentially significant harm being caused to potentially sensitive receptors by the impact of the potential environmental hazards identified at or surrounding the site in its current state with regards to the proposed end use ranges from **VERY LOW** to **MODERATE** with the overall average being **LOW.** The risk of the site being classified as contaminated land by the local authority under the provisions of the statutory guidance made under Part IIA of the Environmental Protection Act (1990) is **LOW.**

The risk attributed to the potential for contamination to exist at the site is considered to be low. However, due to the presence of potential sources of contamination onsite (ACM in the fabric of the buildings and the parking and storage of vehicles), offsite (former railway line/sidings, electricity substation, infilled land), sensitive receptors (human health, landscape planting and property, buildings and construction materials) and plausible pathways between them, we would recommend that a Phase 2 site investigation be undertaken in accordance with BSI (2013b) along with a Tier 2 GQRA in order to determine the potential presence and extent of any SPL at the site and therefore the requirement for additional investigation and/or remedial measures to be incorporated into the development.

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1.0 INTRODUCTION

TGEN was commissioned by Cley Developments Limited (the client), via a written instruction to proceed (email dated 07/11/2016), to undertake a Phase 1 PRA to address land contamination conditions attached to the planning permission for the proposed development at the site.

2.0 SITE INFORMATION AND SETTING

Site Address	19 Green Lane, Spalding, Lincolnshire PE11 2YD.
NGR	TF 24246 22290.
Site Location and Current Use	The site is an irregular shaped plot of land (circa 0.25ha) to the S of Green Lane, close to Spalding town centre. The existing site consists of a detached private bungalow and gardens, with circa twenty-two lock-up garages, partly of corrugated cement sheeting (ACM) construction with timber doors. The site is bound by residential properties with Havelock Street to the NE, South Parade to the S and Thompson Close to the SW. Circa 60m to the NW/W is the recently upgraded Great Northern and Great Western railway line.
Proposed Development	The proposed development includes the demolition of the existing bungalow and garages and the erection of nine residential dwellings (two, 2-bedroom semi-detached houses and seven, 2-bedroom terraced houses) together with an access road, parking spaces (two per dwelling) and areas of soft landscaping (private gardens and communal amenity space).
Planning Status	Planning permission (ref. H16-0006-16 dated 07/03/2016) was granted by South Holland District Council (the local authority) for a residential development at the site. The planning permission is subject to a number of conditions, one of which (Condition 8) relates to the investigation of potential land contamination.
Remit	Environmental assessors use a SPR conceptual site model when determining the risk posed by a potentially contaminated site or a potentially polluting activity. For potential risk to arise each stage of the SPR linkage must be present, plausible and significant. Our remit included undertaking a Phase 1 PRA at/in the vicinity of the site/activity in order to: • Assess the presence and significance of potential sources of contamination. • Assess the presence and significance of potential sensitive. • Assess the presence and significance of plausible pathways. • Assess the presence and significance of potential sources of pollution associated with the activity. • Assess the potential environmental liabilities and consequences associated with the development. • Construct a preliminary CSM for the development. • Determine the need for additional investigation and assessment (e.g. Phase 2 site investigation and DQRA etc.) and, if deemed necessary, to determine the scope of such works.
Supporting Information	Site location plan (Figure 1). • Proposed development plan (Figure 2). • Planning permission (Appendix A). • TGEN protocol (Appendix B). • GroundSure report and historical maps relating to the site and surrounds (Appendix C). • Local authority search records and planning documents (Appendix D). • Site reconnaissance, site survey(s) and photographic record(s) (Appendix E). • Interviews with key stakeholders. • Geological maps of the local area. • BGS borehole records (Appendix F). • EA records of the local area. • Archaeology Data Service, Natural England and MAGIC search records.

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2.1 Historical Mapping

Date of Mapping	Description of Land Use Activity	
	Onsite	Offsite
1887 to 1889	The site is occupied by an orchard bounded by Green Lane to the N, further tracts of orchard to the S, residential properties fronting onto Havelock Street immediately to the E and a railway line along the W boundary.	The site is located on the W periphery of Spalding in a semi-rural setting. A row of terraced houses with gardens is shown along the NE boundary of the site fronting onto the nearby Havelock Street. There are railway lines of the Great Northern & Great Eastern Joint Railway shown to the W of the site, one branch orientated roughly N to S along the W boundary of the site, another branch circa 40m to the NW and the main line itself circa 80m to the NW. Residential development is shown circa 100m to 250m to the E and NE associated with the town of Spalding. A pond or area of reeds is shown circa 5m to the NW of the site to the N of Green Lane between the two branches of the railway line. An iron works was located circa 250m to the NE.
1903 to 1904	The site is no longer shown to be an orchard. It is shown as open/vacant land.	There has been further residential in the wider surrounds, predominantly to the E and NE within Spalding. Residential development has extended to the S along Havelock Street along the E boundary of the site. Residential houses and gardens are now shown along the S boundary of the site. A footbridge is shown circa 5m to the N of the site from Green Lane across the railway lines. A large area of allotment gardens are shown circa 20m to 250m to the W of the site between branches of the railway lines. Nursery gardens are shown circa 100m to the E and SE of the site. An embankment and another rail line is shown orientated roughly E to W circa 200m to the S of the site.
1931	No significant changes.	There has been continued predominantly residential development of Spalding to the E and NE of the site. The allotment gardens to the W are now labelled as a nursery garden. Part of the former allotments circa 25m to the SW are shown to be occupied by a sewage works with filter beds and a pumping station. One of the nursery gardens to the E has been developed and is now occupied by residential housing. An area of open land circa 100m to the NE is shown to be occupied by a nursery garden.
1965 to 1967	Two rows of what appear to be garages are shown in the N part of the site. Woodland/orchard planting are shown in the S part of the site.	There has been continued development of the wider surrounds. The railway line immediately to the W and 200m to the S are labelled as disused. The nursery garden to the NE is no longer shown and has been occupied by residential development. A garage, depot and tanks are shown on the opposite side of the trail lines circa 125m to the W and NW of the site. The nursery garden circa 100m to the SE are now labelled as a playing field.
1972 to 1977	A single detached residential house is shown in the S part of the site.	There has been continued development of the wider surrounds. The railway line immediately to the W is no longer shown. A builders yard, garage, haulage depot, tanks and a petroleum depot are shown circa 100m to 200m to the W and NW of the site. A coal yard is shown circa 250m to the W of the site.
1982 to 1986	No significant changes.	There has been continued development of the wider surrounds. The nursery garden and sewage works to the W and SW are no longer shown. The pond to the NW is no longer shown and appears to have been filled.
1989 to 1992	No significant changes.	There has been continued development of the wider surrounds. The former sewage works to the SW is no longer shown and has been replaced by residential development. The playing field to the SE has also partially been replaced by residential development.
1992 to 1995	No significant changes.	No significant changes.
2002	No significant changes.	No significant changes.
2010 to 2014	No significant changes.	There has been continued development of the wider surrounds. There has been further residential development of the former nursery garden to the W of the site.

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2.2 Local Authority Records

The local authority records can be summarised as follows:

- The site has not been identified as contaminated land under Part IIA of the Environmental Protection Act 1990.
- The local authority do not have any records of pollution incidents at the site or immediate surrounds.
- There are no recorded private water supplies for the site or surrounding area.
- There are no records of groundwater or surface water abstraction at the site or surrounds.
- There are no records of local authority permitted waste or industrial activities for the site or surrounds.
- In terms of potentially contaminative uses, the local authority records indicate that there are several garages on the N part of the site and historically a railway line was present along the W boundary of the site between 1889 and 1992.
- With the exception of the current planning application, there have been no planning applications for development at the site since 1977.

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2.3 Land Use and Surrounding Activities

Authorisations, Incidents & Registers (500m)	Number	Distance	Direction	Comments
Entries in the contaminated land register.	0	n/a	n/a	n/a.
IPC authorisations.	0	n/a	n/a	n/a.
Part A(1) and IPPC permits.	0	n/a	n/a	n/a.
List 2 dangerous substance inventory sites.	3	305m	SW	All three entries relate to pH as the authorized substance, all of which are listed as not active with the closest being Emg Ford.
Part A(2) and Part B permits.	1	125m	NW	The only entry relates to Lovells vehicle finishers on St Johns Road.
COMAH & NIHHS sites.	0	n/a	n/a	n/a.
Category 3 or 4 radioactive substances authorisations.	0	n/a	n/a	n/a.
Licensed discharge consents.	1	355m	SE	The only entry relates to sewage discharges (pumping station) to the River Welland at Welland Road SPS.
EA recorded pollution incidents (national incidents recording system - List 2 records).	0	n/a	n/a	n/a.
EA recorded pollution incidents. (national incidents recording system - List 1 records).	0	n/a	n/a	n/a.
Landfill and Waste Sites	**Number**	**Distance**	**Direction**	**Comments**
Operational landfill sites. (1000m)	0	n/a	n/a	n/a.
Historic landfill sites. (1500m)	2	1380m	N	Both entries relate to the landfill at Woolram Wygate in Spalding.
Waste treatment, transfer or disposal sites. (500m)	0	n/a	n/a	n/a.
EA licensed waste sites. (1500m)	1	1365m	SE	The only entry relates to a metal recycling site (vehicle dismantler) operated by T.J. Elvander.
Ground Working Features	**Number**	**Distance**	**Direction**	**Comments**
Historic surface ground working features. (250m)	8	5m	W	Historic features include a pond (5m W), a sewage works (25m SW), a pit (55m W), a heap (110m SE) a pond (160m SE) and heaps (195m SE and 245m W).
Historic underground working features. (1000m)	0	n/a	n/a	n/a.
Current ground working features. (1000m)	0	n/a	n/a	n/a.
Current Land Uses	**Number**	**Distance**	**Direction**	**Comments**
Entries in the trade directory. (0m)	0	Onsite	n/a	There are no trade directory entries relating to the site itself.
Entries in the trade directory. (250m)	6	15m	W	The closest offsite entry relates to an electricity substation. The other entries relate to vehicle repair and servicing, and new vehicles (120m NW), electricity substation (130m W), vehicle hire and rental (180m W) and disability and motibility equipment (215m N).
Petrol/fuel sites. (500m)	0	n/a	n/a	n/a.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

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2.4 Site Reconnaissance

Site reconnaissance, including interviews with the client/landowner, was undertaken on 16/11/2016 in accordance with DoE (1994a), EA (2004) and BSI (2013b). Observations made are summarised below and should be read in conjunction with the supporting information to this report.

Feature	Details	Description
Land Uses	N	Green Lane and residential houses and gardens with open land and railway line beyond.
	S	Residential houses and gardens fronting onto South Parade and Havelock Street.
	E	Residential houses and gardens fronting onto Havelock Street.
	W	Residential houses and gardens fronting onto Green Lane with railway line beyond.
Access	n/a	Via a tarmac/gravel drive off Green Lane on the N boundary of the site.
Topography	Site	The site was relatively flat at an elevation of circa 6mAOD.
Buildings	Site	There was a prefabricated, single storey bungalow in the S part of the site, which was clad with wooden tiles with an inverted sloping flat roof. Two blocks of single storey, part wood, part corrugated cement sheeting (ACM) clad garages were located in the N part of the site either side of the access drive. It was not possible to access the internal parts of the bungalow or garages at the time of the visit.
Surfacing	Site	The majority of the site was soft surfaced (residential garden). There was a tarmac/gravel driveway across the N part of the site and the footprint of the bungalow and garages were under permanent hardstanding (concrete).
Vegetation	Site	The majority of the vegetation across the site consisted of grass/lawn, with mature deciduous and evergreen trees and shrubs, predominantly around the perimeter of the site and in the adjacent gardens, all of which appeared to be in good health with no signs of stress or impeded growth.
Foundations	Site	Not investigated, although it is assumed that the existing garages and bungalow have conventional shallow strip and pad foundations.
Services	Site	Not investigated, although it is assumed that services (electricity, gas, water and waste) enter or egress the site from the N via Green Lane.
Activities	Site	The site is currently vacant. The central and S part of the site is occupied by a single storey bungalow and surrounding garden and the N part of the site is occupied by two rows of disused single storey garages.
Tanks	Site	None observed at the site.
Interceptors	Site	None observed at the site.
Surface Water	Site	None observed onsite or within the immediate surrounds.
Observations	General	ACM was noted in a number of locations around the site and garden, being used as shuttering for compost heaps and flower beds etc. There was what appeared to be an ACM flue from the bungalow. The site location plan shows an electricity substation on the SW boundary of the site, but this was not observed. Adjacent to the bungalow was an inspection chamber and plastic vent pipe, which would suggest either a sewer connection or septic tank is located onsite.

2.5 Geology and Aquifer Status

The published geological survey map (1:50,000 scale, BGS, Sheet 144, Spalding, Solid and Drift Edition) for the Spalding area is summarised in sequence from the surface in the table below.

Strata		Aquifer Designation	Area Covered	Estimated Thickness	Age	Typical Description
Near Surface Soil		N/A	Whole Site	Up to circa 1m	Recent	Brown, silty, sandy clay with occasional brick and concrete.
Bedrock	**Terrington Beds Tidal Flat Deposits**	Unproductive	Whole Site	Up to circa 5m	Quaternary	Marine alluvium, salt marsh, tidal creek and river deposits (clay & silt).
	Abbey Sand and Gravel	Secondary	Whole Site	Up to circa 10m	Quaternary	Brackish and marine (sand and gravel).
	Glacial Sand and Gravel	Secondary	Whole Site	Up to circa 5m	Quaternary	Sand and gravel.
	Oxford Clay	Unproductive	Whole Site	Up to circa 55m	Jurassic	Pale grey, clay and mudstone.

The geological map does not record near surface soil. We have based the assessment on observations made during the site reconnaissance. The strata in bold is the designated bedrock aquifer.

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The superficial drift deposits (Terrington Beds/Tidal Flat Deposits) are designated as unproductive with low to very low intergranular permeability. The bedrock (Oxford Clay Formation) is also designated as unproductive with a low to very low fracture permeability. There is no EA information on groundwater vulnerability and soil leaching potential within 500m of the site.

Several BGS records exist for exploratory holes excavated in the vicinity of the site, the closest of which can be summarised as follows:

- Borehole TF22SW61 (ref. A16 Trunk Road Spalding to Sutton TP7) was located circa 160m to the N of the site.

Strata		Description	Thickness
Made Ground		Dark grey and black, stiff to hard, sandy, very silty clay with occasional fragments of brick.	0.6m
		Brown, compact, silty, clayey sand with occasional fragments of brick and vertical root bores.	0.6m
Superficial Drift	Terrington Beds	Brown, clayey, very sandy silt.	0.3m

Groundwater was not encountered.

- Borehole TF22SW36 (ref. St John's Road, Spalding 1) was located circa 195m to the W of the site.

Strata		Description	Thickness
Near Surface Soil		Brown, silty soil.	0.45m
Superficial Drift	Terrington Beds	Brown/grey, soft silty clay.	0.3m

Groundwater was not encountered.

The BGS records corroborate the published geology with any near surface soil likely to be underlain by silty clay (Terrington Beds). Based on our experience of the geological strata in the vicinity of the site we would expect the Terrington Beds to be circa 5m thick, underlain by circa 15m of sand and gravel and subsequently a significant thickness of Oxford Clay.

2.6 Estimated Background Soil Chemistry

Based upon the underlying geological conditions, the soils on and around the site would be classified as rural with concentrations of potential contaminants expected to be as follows: arsenic (<15mg/kg), cadmium (<1.8mg/kg), chromium (60 to 90mg/kg), nickel (15 to 30mg/kg) and lead (<100mg/kg).

2.7 Other Ground Conditions

A moderate risk is allocated to ground stability hazards associated with compressible ground and running sand and a low risk to shrink-swell hazards. A very low to negligible risk rating is allocated to a range of other ground stability hazards at the site. The site is also not within a radon affected area (as defined by the Health Protection Agency) as less than 1% of properties are above the radon action level. In accordance with BRE (2007b), no radon protective measures are considered necessary for new properties or extensions to existing ones. Furthermore, the site is not listed as being within 1000m of an area potentially affected by coal mining.

2.8 Hydrogeology and Groundwater

Feature	Number	Distance	Direction	Comments
EA SPZ Boundary	0	n/a	n/a	There are no EA designated SPZ boundaries within 2000m of the site. The closest (Zone 2 outer) is circa 6250m to the NW with the boundary to the inner zone circa 7250m to the NW.
Groundwater Abstraction Permits	0	n/a	n/a	n/a.
Potable Water Abstraction Permits	0	n/a	n/a	n/a.

Distance and direction to the closest entry. Radius of the search from the boundary of the site was 2000m.

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2.9 Hydrology and Surface Water Features

Feature	Number	Distance	Direction	Comments
Surface Water Features (250m)	2	95m	SE	There are a no surface water features onsite. Within 250m of the site there are two entries, which we assume relate to ponds/streams etc.
Detailed River Network Entries (500m)	1	465m	SE	The only entry within 500m of the site boundary relates to the River Welland, classified as a primary river.
EA GQA Monitoring Points (1500m)	3	610m	SE	There are a number of GQA monitoring points along reaches of the River Welland to the SE and NE of the site, in each case classified as chemical and biological grade B (good) in 2009.
Surface Water Abstraction Permits (2000m)	4	640m	SE	The closest entry is an historical permit for spray irrigation derived from the River Welland. The closest active permit also relates to spray irrigation, circa 1493m to the NW from Vernatts Drain.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.10 Flood Risk

Feature	Number	Distance	Direction	Comments
Zone 2 Floodplain (250m)	1	Onsite	n/a	The site is location in Zone 2 of an EA designated floodplain. The highest risk of flooding from rivers and the sea at the site itself is rated as medium.
Zone 3 Floodplain (250m)	1	Onsite	n/a	The site is location in Zone 3 of an EA designated floodplain. The highest risk of flooding from rivers and the sea at the site itself is rated as medium.
Flood Defences (250m)	0	n/a	n/a	There are no flood defences within 250m or areas benefitting from defences within 250m.
Groundwater Flooding (50m)	0	n/a	n/a	The site is not located in an area considered to be prone to groundwater flooding.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.11 Environmentally Sensitive Land Uses

Designated Environmentally Sensitive Sites	Number	Distance	Direction	Comments
LNR	1	1770m	N	The only entry related to Vernatts LNR.
NVZ	4	Onsite	n/a	Existing NVZ.
Ancient Woodland, AONB, Greenbelt, LNR, NNR, NP, Ramsar, SAC, SPA, SSSI, World Heritage	0	n/a	n/a	n/a.
Ancient Monuments or Archaeological Sites	0	n/a	n/a	n/a.

Distance and direction to the closest entry. Radius of the search from the boundary of the site was 2000m.

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2.12 Sources, Pathways and Receptors

Records from 1887 to 1903 show the site to be occupied by an orchard woodland, which was subsequently vacant until 1931. Mapping from 1965 to present day shows two blocks of garages on the N part of the site and mapping from 1972 to the present day shows a detached residential dwelling and garden occupying the S part of the site.

A railway line/siding is shown along the W boundary of the site on mapping from 1887 to 1965, which has since been disused. A sewage works was shown on mapping between 1931 and 1977 to the SW of the site and a former pond on mapping between 1887 and 1982 to the NW of the site.

There is a potential for contamination to arise from the possible presence of a range of materials and substances associated with former activities onsite and offsite. The range of potential contaminants associated with these activities can be summarised as follows:

- ACM (fabric of the bungalow and garages onsite).
- Fuels and oils (parking of vehicles onsite).
- Former electricity substation (offsite adjacent to SW boundary of the site).
- Infilled land (offsite sewage works to the SW and pond to the NW of the site).
- Former railway line/sidings (offsite adjacent to the W boundary of the site.

We have reviewed the list of potential contaminants given in the relevant DoE Profiles, where relevant, in conjunction with the potential sources of contamination listed above and would therefore also consider the following as PCoC:

- Hydrocarbons (e.g. petrol, diesel, lubricating oil and vapours etc.).
- Heavy metals.
- Cyanides.
- Sulphates.
- PAH and phenol etc.
- ACM.
- PCB.
- Ground gas (methane and carbon dioxide).

We would consider the following potentially sensitive receptors to be present at or adjacent to the site as a result of the proposed development:

- Human Health (HH) including end users of the site, the developers and offsite neighbours etc.
- Landscape planting and property (LPP).
- Environment (ENV) including ecology, amenity, archaeology and scheduled monuments etc.
- Groundwater (GW).
- Surface water (SW).
- Buildings and construction materials (BCM).

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3.0 PRELIMINARY CONCEPTUAL SITE MODEL

The following section summarises the information gathered during the Phase 1 PRA, culminating in the compilation of a detailed preliminary CSM. The purpose of this section of the report is to identify and assess the plausibility of sources of contamination, the presence of receptors sensitive to such contamination and pathways between the two.

- It is proposed to demolish the unused bungalow and garages and erect nine residential dwellings (two, 2-bedroom semi-detached houses and seven, 2-bedroom terraced houses) together with an access road, parking spaces (two per dwelling) and areas of soft landscaping (private gardens and communal amenity space.
- End users of the site (residents) are considered to comprise adults and children.
- There are areas of soft landscaping including private gardens and communal amenity space included within the proposed residential development, where plants, trees, shrubs etc. may be grown and animals (domesticated pets or livestock) may be kept.
- The site is located within a NVZ. The closest designated environmentally sensitive site relates to the Vernatts LNR circa 1770m to the N. There are residential dwellings (houses and gardens) in close proximity to the site. With the exception of short term impacts in the immediate vicinity of the site during the development itself (e.g. noise and dust), which we assume will be controlled through the implementation of good practice, it is not considered that a long term SPL would be active as a result of the development.
- The superficial drift deposits (Terrington Beds/Tidal Flat Deposits) are designated as unproductive with low to very low intergranular permeability. The underlying bedrock (Oxford Clay Formation) is also designated as unproductive with a low to very low fracture permeability. There is no EA information on groundwater vulnerability and soil leaching potential within 500m of the site.
- The site is not located within 2000m of an EA designated SPZ. The closest (Zone 2 outer) is circa 6250m to the NW with the boundary to the inner zone circa 7250m to the NW. There are no groundwater abstractions permits within 2000m of the site.
- The only detailed river network entry within 500m of the site boundary relates to the River Welland, circa 465m to the SE, classified as a primary river. Considering the distance to the receptor and the low to very low permeability of the superficial drift and bedrock, it is unlikely that any water bearing strata would be in hydraulic continuity with the water course.
- Based on the latest UK guidance from BRE, CIRIA and NHBC etc., some types of contaminants (e.g. heavy metals, organic compounds, cyanides and sulphates etc.) associated with made ground, former commercial/industrial activities and some natural strata could potentially have a detrimental effect on construction materials, such as below ground concrete structures, pipework/services and membranes through direct contact. In addition to this, volatile compounds and ground gases may potentially migrate through permeable below ground strata and accumulate in void spaces (e.g. rooms and cavity spaces etc.), where they can be considered to pose a risk to the buildings through potential flammability/explosivity. There are no landfill sites within 250m of the site. However, there are areas of infilled ground (former pond circa 5m to the NW and former sewage works circa 25m to the SW). which could be considered as sources of ground gas. There are no significant sources of organic contaminants that could generate vapours (e.g. PFS, vehicle maintenance garage etc.) within the immediate vicinity of the site, although parking of vehicles in the garages in the N part of the site could be considered as a source of hydrocarbons and subsequently vapours. The low to very low permeability of the superficial drift and bedrock would inhibit the lateral migration of any gases or vapours from offsite sources. As such, a ground gas and vapour SPL would be considered as present, although if low permeability silty clay soils are confirmed as being present at the site, then this would inhibit/preclude lateral migration.

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Nr	Onsite Sources	Pathways	SPL	Receptors	Consequence	Probability	Risk Matrix Classification	Comments
1	Potential for inorganic and low volatility organic contaminants to be present within the subsurface soils.	Dermal contact, soil and soil dust ingestion, and inhalation of soil dust.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	The presence of inorganic contaminants in the near surface soils associated with the former/historic uses of the site (e.g. garages), which is largely unsurfaced is considered likely.
2		Consumption of home grown produce.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	
3		Root uptake of soluble contaminants in surface soils.	LPP	Landscape planting.	MILD	LIKELY	LOW/MODERATE [9]	Phytotoxic contaminants are likely to be present in the near surface soil, although the consequence is considered to be minor based upon the vegetation growth observed directly adjacent to the site, which appeared to be in good health with no signs of stress or inhibited growth.
4		Intake of soil contaminants by animals.	LPP	Domesticated pets or livestock.	MILD	LOW	LOW [5]	The risk classification reflects the likely presence of inorganic contaminants in the near surface soils associated with the former/historic uses of the site, which is largely unsurfaced.
5		Ingress into standard PE water supply pipework and subsequent water ingestion.	HH	End users.	MEDIUM	UNLIKELY	LOW [4]	The probability of ingress of inorganic contaminants and/or low volatility organic contaminants into standard PE pipes is considered unlikely.
6		Building materials in direct contact with aggressive ground.	BCM	Site buildings.	MEDIUM	UNLIKELY	LOW [4]	Aggressive ground is not anticipated in the Terrington Beds.
7		Dissolution into pore water/shallow groundwater and subsequent migration.	GW	Groundwater.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the classification of the superficial drift and bedrock as unproductive, the likely probability of inorganic contaminants in the near surface soil and the distance to a SPZ and/or groundwater abstraction.
8		Dissolution into pore water/shallow groundwater and subsequent migration.	SW	Streams, ditches and ponds.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the distance to a surface water receptor and the low potential for horizontal migration within the impermeable superficial drift and bedrock strata.
9		Dissolution into pore water/shallow groundwater and subsequent lateral migration.	ENV	LNR.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the relative small size of the site in relation to the distance to the identified receptor(s).

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Nr	Onsite Sources	Pathways	SPL	Receptors	Consequence	Probability	Risk Matrix Classification	Comments
10	Potential for volatile organic contaminants to be present within the subsurface soils.	Dermal contact, soil and soil dust ingestion, and inhalation of soil dust.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	The presence of organic contaminants in the near surface soils associated with the former/historic uses of the site (e.g. garages), which is largely unsurfaced is considered likely.
11		Consumption of home grown produce.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	
12		Inhalation of vapours (indoors and outdoors).	HH	End users.	MEDIUM	LOW	LOW/MODERATE [8]	The probability of organic contaminants being present in the near surface soils associated with the former/historic uses of the site (e.g. parking of vehicles in garages in the N part of the site) is considered likely.
13		Root uptake of soluble contaminants in surface soils.	LPP	Landscape planting.	MILD	UNLIKELY	VERY LOW [2]	VOC are not directly toxic to plants unless free product is present, which can disrupt water uptake.
14		Intake of soil contaminants by animals.	LPP	Domesticated pets or livestock.	MILD	LOW	LOW [5]	The risk classification reflects the likely presence of inorganic contaminants in the near surface soils associated with the former/historic uses of the site, which is largely unsurfaced.
15		Ingress into standard PE water supply pipework and subsequent water ingestion.	HH	End users.	MEDIUM	LOW	LOW/MODERATE [8]	The probability of ingress of organic contaminants into standard PE pipes is considered low.
16		Building materials in direct contact with aggressive ground.	BCM	Site buildings.	MEDIUM	UNLIKELY	LOW [4]	Aggressive ground is not anticipated in the Terrington Beds.
17		Dissolution into pore water/shallow groundwater and subsequent migration.	GW	Groundwater.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the classification of the superficial drift and bedrock as unproductive, the likely probability of organic contaminants in the near surface soil and the distance to a SPZ and/or groundwater abstraction.
18		Dissolution into pore water/shallow groundwater and subsequent migration.	SW	Streams, ditches and ponds.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the distance to a surface water receptor and the low potential for horizontal migration within the impermeable superficial drift and bedrock strata.
19		Dissolution into pore water/shallow groundwater and subsequent lateral migration.	ENV	LNR.	MINOR	LOW	VERY LOW [3]	The risk classification reflects the relative small size of the site in relation to the distance to the identified receptor(s).

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Nr	Onsite Sources	Pathways	SPL	Receptors	Consequence	Probability	Risk Matrix Classification	Comments
20	Potential for dissolved phase contaminants to be present within shallow groundwater.	Lateral and vertical groundwater movement via natural or artificial flow paths.	GW	Groundwater.	MILD	LIKELY	LOW/MODERATE [9]	The risk classification reflects the classification of the superficial drift and bedrock as unproductive, the likely probability of contaminants in the near surface soil and the distance to a SPZ and/or groundwater abstraction.
21		Lateral and vertical groundwater movement via natural or artificial flow paths.	ENV	LNR.	MILD	LIKELY	LOW/MODERATE [9]	The risk classification reflects the relative small size of the site in relation to the distance to the identified receptor(s).
22	Potential for elevated methane to be present within the subsurface soils due to the presence of infilled ground.	Lateral and vertical migration into onsite buildings with a potential to cause an explosion.	HH	Onsite property and occupants.	MEDIUM	UNLIKELY	LOW [4]	The risk classification reflects the absence of any significant sources of ground gas (e.g. landfill sites or infilled land) onsite.
23		Lateral migration towards offsite buildings with a potential to cause an explosion.	HH	Onsite property and occupants.	MEDIUM	UNLIKELY	LOW [4]	
24	Potential for elevated carbon dioxide to be present within the subsurface soils due to the presence of infilled ground.	Lateral and vertical migration into onsite buildings with a potential to cause asphyxiation.	HH	Occupants of onsite buildings.	MEDIUM	UNLIKELY	LOW [4]	
25		Lateral migration towards offsite buildings with a potential to cause asphyxiation.	HH	Occupants of offsite buildings.	MEDIUM	UNLIKELY	LOW [4]	
26	Potential for radon within the subsurface	Lateral migration towards onsite buildings with a potential to cause long term health effects.	HH	Occupants of onsite buildings.	MILD	UNLIKELY	VERY LOW [2]	The site lies in an area where <1 % of homes are at or above the UK radon action level (200 Bq/m^3).

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Nr	Offsite Sources	Pathways	SPL	Receptors	Consequence	Probability	Risk Matrix Classification	Comments
27	Potential for dissolved phase inorganics contaminants to be present within shallow groundwater associated with offsite commercial/industrial activities.	Lateral and vertical groundwater movement via natural or artificial flow paths.	GW	Groundwater.	MILD	LOW	LOW [4]	Potentially contaminative activities have been identified adjacent to the site (former railway line/sidings and electricity substation). The underlying superficial drift and bedrock are classified as unproductive with low to very low permeability. As such, the consequence is considered mild and the probability for dissolved phase inorganic contamination to migrate onto the site via the superficial drift or bedrock is considered low.
28	Potential for volatile organic contaminants to be present within the subsurface soils associated offsite commercial/industrial activities.	Migration of vapours to the surface followed by inhalation (indoors and outdoors).	HH	End users.	MILD	UNLIKELY	VERY LOW [3]	There are no potentially contaminative uses (historic or contemporary) within 250m of the site boundary considered to represent a potential offsite source of volatile organic contamination. The underlying superficial drift and bedrock are classified as unproductive with low to very low permeability. As such, the consequence is considered mild and the probability for dissolved phase inorganic contamination to migrate onto the site via the superficial drift or bedrock is considered unlikely.
29	Potential for elevated methane to be present within the sub-surface soils.	Lateral and vertical migration into onsite buildings with a potential to cause an explosion.	HH	Onsite property occupants.	MEDIUM	LOW	LOW/MODERATE [8]	The former sewage works to the SW and infilled pond to the NW would be considered as potential sources of ground gas within 250m of the site. However, the probability is considered to be low due to the anticipated low to very low permeability of the superficial drift and bedrock.
30	Potential for elevated carbon dioxide to be present within the subsurface soils.	Lateral and vertical migration into onsite buildings with a potential to cause asphyxiation.	HH	Occupants of onsite buildings.	MEDIUM	LOW	LOW/MODERATE [8]	

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4.0 CONCLUSIONS AND RECOMMENDATIONS

The risk of potentially significant harm being caused to potentially sensitive receptors by the impact of the potential environmental hazards identified at or surrounding the site in its current state with regards to the proposed end use ranges from **VERY LOW** to **MODERATE** with the overall average being **LOW.** The risk of the site being classified as contaminated land by the local authority under the provisions of the statutory guidance made under Part IIA of the Environmental Protection Act (1990) is **LOW.**

The risk attributed to the potential for contamination to exist at the site is considered to be low. However, due to the presence of potential sources of contamination onsite (ACM in the fabric of the buildings and the parking and storage of vehicles), offsite (former railway line/sidings, electricity substation, infilled land), sensitive receptors (human health, landscape planting and property, buildings and construction materials) and plausible pathways between them, we would recommend that a Phase 2 site investigation be undertaken in accordance with BSI (2013b) along with a Tier 2 GQRA in order to determine the potential presence and extent of any SPL at the site and therefore the requirement for additional investigation and/or remedial measures to be incorporated into the development. The Phase 2 site investigation and Tier 2 GQRA will be required to:

- Assess the presence, extent and significance of potential contaminants in the subsurface strata associated with former activities at and adjacent to the site.
- Assess the significance of potential impacts on sensitive receptors at or adjacent to the site.
- Assess the requirement for remedial measures to be implemented at the site as part of the development.
- Assess the potential environmental liabilities and consequences associated with the development of the site.
- Identify requirements for further works, including the design of any additional investigation, a DQRA and remedial measures, if deemed necessary.

4.1 Scope Of Works

The Phase 2 site investigation should be undertaken in two stages. The Phase 2a site investigation should include an assessment of the geological strata at the site, the nature of the near surface soils and presence and significance of contaminants associated with previous activities at and adjacent to the site. If the Phase 2a site investigation reveals the presence of organic contaminants in the near surface soil (i.e. potential source(s) of ground gas or hydrocarbon vapour) or permeable deposits (i.e. a plausible pathway from offsite sources), then it may be necessary to implement a Phase 2b site investigation including a programme of ground gas monitoring. Alternatively, if this were the case, then in lieu of a programme of gas monitoring, the client may choose to include conservative gas protection measures within the development.

4.1.1 Site Investigation

The vast majority of the SPL will only be active in areas where in-situ soil will be exposed, such as areas of private garden and soft landscaping. For the Phase 2a site investigation we would recommend selecting up to circa twelve exploratory hole locations (i.e. a 15m grid) for general site coverage, which would be concentrated in areas of proposed garden and soft landscaping and the N part of the site. Given our understanding of the site and the proposed development we would assume that each exploratory hole, for assessment of potential contamination, will need to extend through any superficial surface soil and into the underlying natural ground (Terrington Beds) and that in most cases this will necessitate a proportion of the exploratory holes extending to depths of up to circa 3mbgl across the site. Should either significantly variable or consistently uniform soil conditions be encountered onsite then it may be necessary to increase or to decrease the number of exploratory hole locations.

Targeted exploratory locations would be sited in the SW part of the site in the vicinity of the former offsite railway line/sidings and electricity substation, and the area of car parking and storage in the N part of the site.

Additional targeted investigation may also be required along the route of water supply pipes (once finalised) in accordance with UKWIR (2010)/Water UK (2014) to allow an assessment to be made into the suitability of water supply pipe construction or pipe materials at the site.

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During excavation of the exploratory holes a geo-environmental engineer should attend the site to assess the physical nature of the subsurface profile, which should be described through a combination of visual and olfactory observations and detections. Soil descriptions should be in accordance with BSI (2010).

The assessment of soils for volatile organic compounds by visual and olfactory means should be supplemented with the use of a PhoCheck Plus 2000 PID in accordance with the procedures discussed in the TGEN protocol. Representative soil samples should be collected from each of the exploratory holes and transferred to a UKAS accredited laboratory also in accordance with the procedures detailed in the protocol.

Due to the sensitivity of the proposed use, a significant proportion of the samples should be submitted for acute exposure contaminants (i.e. ACM). A number of the samples should also be submitted for a broad screen of chronic exposure contaminants (e.g. heavy and transition metals etc.), including those the identified PCoC as detailed in the table below:

Metals/Semi Metals		Hydrocarbons	Other
• Antimony • Arsenic • Barium • Beryllium • Boron • Cadmium • Chromium (Cr^{III}) • Chromium (Cr^{VI})	• Copper • Lead • Mercury • Molybdenum • Nickel • Selenium • Vanadium • Zinc	• Speciated PAH • Speciated TPH • Phenol (Monohydric) • VOC (PID Headspace)	• Cyanide (Total & Free) • Sulphate (Total & Water Soluble) • Sulphide • pH • Total Organic Carbon • ACM • PCB

Should evidence of contamination be identified or suspected on the basis of the results of in-situ testing, then it may be necessary to increase the scope of testing.

4.1.2 Environmental Monitoring

Should shallow groundwater, leachable contaminants, evidence of VOC or a layer of granular/permeable superficial drift be found extending below the site, then it may be necessary to install a number of the exploratory holes with monitoring standpipes equipped with ground gas and/or groundwater monitoring apparatus.

Should this be the case, then a proposed scope of works for a Phase 2b site investigation would be included within the Phase 2a site investigation report. If necessary, a programme of gas monitoring should be undertaken over a range of climatic conditions including heavy rainfall and rapidly decreasing atmospheric pressure to determine the need for and/or scope of ground gas protection measures to be included within the development. In-lieu of a programme of gas monitoring it may be possible to install conservative gas protection measures. The scope of any gas protection measures should be agreed and/or approved by building control prior to development works commencing at the site.

4.1.3 Tier 2 GQRA

The outcome of the Phase 2 site investigation(s) should be detailed within an interpretative report including observations of the site and soils, a GQRA based on an assessment of the results of laboratory testing and recommendations for remediation and/or further investigation (e.g. DQRA), should these be necessary. The recommendations and conclusions within the report should also include an assessment of the need for a risk management strategy and remediation scheme to be produced detailing works required to break any SPL identified as a potential risk to sensitive receptors.

4.2 Other Considerations

We assume that any geotechnical assessment will be undertaken by others, together with any other assessments to address the conditions attached to the development (e.g. FRA).

We would recommend that this report be submitted to the local authority in respect of the matters reserved by condition 8 of the planning permission.

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5.0 LIMITATIONS AND USE OF THIS REPORT

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions set out in this report.

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of TGEN to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, TGEN has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) TGEN acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. TGEN will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, TGEN shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. TGEN does not provide specialist legal advice and the advice of lawyers may be required.
g) In the summary and recommendations sections of this report, TGEN has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by TGEN and therefore any advice, opinions or recommendations set out in the executive summary, summary and recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
i) There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.
j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by TGEN for inaccuracies within the data supplied by other parties.
k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
l) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
m) This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a reinterpretation of the report in whole or part after its original submission.
n) The copyright in the written materials shall remain the property of the TGEN but with a royalty-free perpetual license to the client deemed to be granted on payment in full to TGEN by the client of the outstanding amounts.
o) These terms apply in addition to the TGEN standard terms of engagement (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing (In the event of a conflict between these terms and the said standard terms of engagement the said standard terms of engagement shall prevail). In the absence of such a written contract the standard terms of engagement will apply.
p) TGEN maintains adequate insurance cover for public liability and professional indemnity. However, we are unable to accept liability for asbestos related matters. Our work must not be taken as sufficient to identify the presence or absence of asbestos in or on the ground. In placing a contract with us the client accepts the restriction on asbestos. If we find or strongly suspect asbestos is or may be present in or on the ground we will inform the client and advise specialist investigation. The client agrees that they shall not bring any claim personally against any director / employee or consultant to us in respect of loss or damage suffered by the client arising out of this contract.

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Figure 1 Site Location Plan(s).

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19, GREEN LANE, SPALDING, LINCOLNSHIRE, PE11 2YD

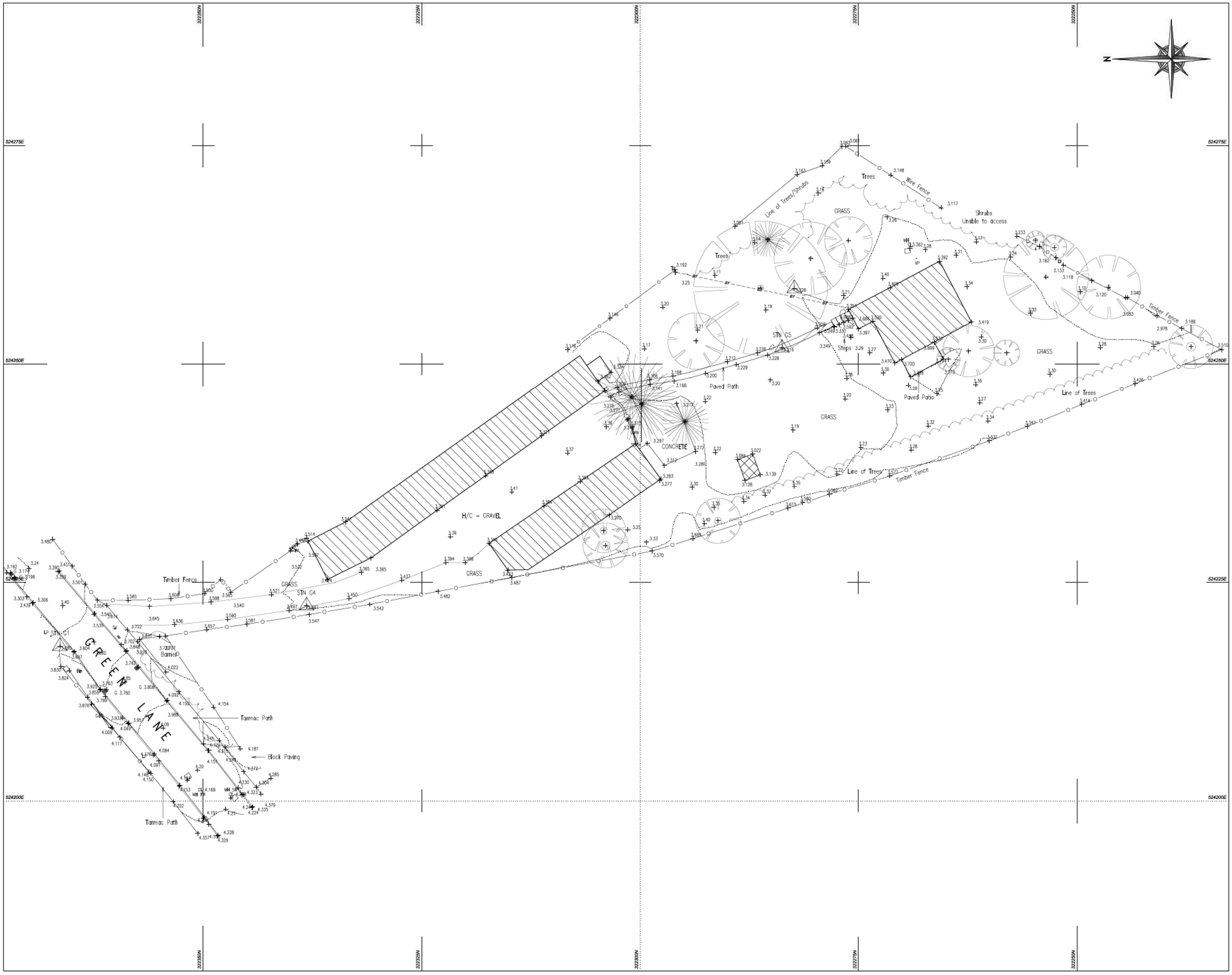


WATER AND DRAINAGE ASSET LEGEND

POTABLE WATER		COMBINED SEWER	
SURFACE SEWER		FOUL SEWER	
SURFACE SEWER S104		FOUL SEWER S104	
SURFACE MANHOLE	•	NON SURFACE MANHOLE	•
RISING MAIN	———	SURFACE WATER RISING MAIN	———
PRIVATE SURFACE SEWER	———	SECTION 24 AGREEMENT SEWER	
HYDRANT	•		

N

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SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
STN1	524217.898	322366.383	3.695	P-K NAIL
STN2	524270.454	322401.894	3.156	P-K NAIL
STN3	524230.378	322276.076	3.194	DISC & NAIL
STN4	524222.351	322338.173	3.487	P-K NAIL
STN5	524261.844	322283.756	3.216	P-K NAIL

The survey grid is the National Grid obtained from ETRS89 GPS Coordinates with OSTN02 transformation. Levels shown to Ordnance Survey datum using ETRS89 GPS with OSGM02 transformation.

Surveyed boundary features are not necessarily legal boundaries

All utilities have been identified to the best of the surveyors knowledge. The correct identification can not be 100% guaranteed and should be independently verified prior to use in any design or building works.

Services may be obscured by parked cars, leaf litter or building materials etc.

Rev	Date	Remarks

Status: FOR INFORMATION

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Project: Site Survey at 19 Green Lane, Spalding Lincs, PE11 2YD

Title: Topographical Survey

Date	Nov. 2015	Scale	1:200	@A1
Drawn	AS	Checked	SRC	
Design	-	File Name	36515-01	

DRG No. 36515/01 — Rev -

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Figure 2 Proposed Development Plan(s).

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PROPOSED 1.8m HIGH CLOSE BOARDED TIMBER FENCE

ELEAGNUS TREE TO BE REMOVED

EXISTING BUNGALOW TO BE REMOVED

TREE TO BE REMOVED

TREES TO BE REMOVED

ROW OF EXISTING POPLAR TREES TO BE REMOVED

Existing Timber Fence to remain

LINE OF EXISTING GARAGES TO BE REMOVED

GRASSED AREA

PERMEABLE BLOCK PAVED PRIVATE DRIVE

BIN STORE

SPEED RAMP

STN C4

STN C5

PARKING

6000 RADIUS

9000

6000

1 2 4 5 6 7 8 9

N

SITE AREA 0.246Ha.

BLOCK PLAN 1:200

GREEN LANE

Barrier

Tarmac Path

Block Paving

Tarmac Path

Foot Bridge

HAVELOCK STREET

GARAGES

El Sub Sta

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LOCATION PLAN 1:1250

LIMITATIONS:
This drawing is issued in the amount of information contained and does not purport to contain all specification of the works. It is solely for the purpose of obtaining Planning/Building Regulation approval.
The drawing must not be used for any purpose other.
All dimensions shall be taken from site upon actual work. Under no circumstances shall measurements be scaled from the drawing for construction or ordering purposes.
All other dimensions shall be checked by the Builder/Contractor and will be his responsibility upon commencement of any works.
The works will not be supervised or inspected on site by C.A.D. or any representative thereof. It is the client or their appointed agents responsibility to control workmanship, subcontractors or materials, adherence to specification, conditions to contract etc.

COPYRIGHT (RESERVED):
Copies of this drawing must be made only with the written permission of Cooper Architectural Design.

STANDARDS:
All materials to be new unless otherwise noted and all components and materials are to be used fitted and installed etc. in strict accordance with manufacturers instructions and relevant Code of Practice.
Materials shall conform to appropriate British Standard Specification or BBA Certificate or European Code equivalent.

HEALTH & SAFETY:
The Employer/Client shall ensure that the selected contractor is competent with and adopts all measures necessary to achieve compliance with Health & Safety Legislation for Building Sites and Work Places.
The Employer /Client is advised that, should the works need to comply with the Construction Design and Management Regulations an independent Planning Supervisor will be required.

SCOPE OF THE WORKS:
The works shall comprise of all that is shown on the drawing and design. Work that may not be specifically shown but may be reasonably assumed as necessary to carry out the works shall be deemed to be included.

revision	date	init.	revision details.

COOPER ARCHITECTURAL DESIGN
80 WINSOVER ROAD
SPALDING, LINCS PE11 1HA
Tel: 01775 711174
Mobile : 07808 125 778
E-MAIL : c.a.d@btconnect.com

Client.

Project.
PROPOSED RESIDENTIAL DEVELOPMENT
19 GREEN LANE
SPALDING
LINCS
PE11 2NT

Drawing.
PROPOSED BLOCK PLAN
LOCATION PLAN

Scale	Drawing No. 1641-01
Date. DEC. '15	Drawn. J.C.

Appendix A Planning Permission.

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Council Offices
Priory Road
Spalding
Lincolnshire
PE11 2XE
Admin 01775 764723
DC Officers 01775 764703
facsimile 01775 762937
planningadvice@sholland.gov.uk
www.sholland.gov.uk

Cooper Architectural Design Ltd
90 Winsover Road
Spalding
Lincolnshire
PE11 1HA

TOWN AND COUNTRY PLANNING ACT 1990

OUTLINE

Reference: H16-0006-16 **Date of Decision:** 7th March 2016

Applicant: Mrs J Melling
C/O R Longstaff & Co
5 New Road
Spalding
Lincs
PE11 1BS

Location: 19 Green Lane Spalding

Description: Residential Development

South Holland District Council hereby give notice that this application has been GRANTED (or equivalent) subject to the following condition(s):

1 Application for approval of reserved matters must be made not later than three years beginning with the date of this permission, and the development must be begun before the expiration of two years from the final approval of reserved matters or in the case of approval on different dates, the final approval of the last such matter to be approved.

Reason: As required by Section 92 of the Town and Country Planning Act 1990 as amended by the Planning and Compulsory Purchase Act 2004.

2 The development hereby permitted shall be carried out in accordance with the following approved plans:
Dwg. No's: 1541-01 (indicative layout only) and 36515/01.
Flood Risk Assessment (prepared by SM Hemmings, dated 4th January 2016).

Reason: For the avoidance of doubt and in the interests of proper planning.

3 The following matters are reserved for subsequent approval by the Local Planning

Authority and no development to which these matters relate shall be carried out until these matters have been approved, viz:

i) detailed drawings of the estate layout to a scale of not less than 1:500 and including road and plot layouts;
ii) detailed drawings to a scale of not less than 1:100 showing the siting, design and external appearance of each building, including a schedule of the materials to be used for external walls and roof;
iii) the means of foul and surface water disposal;
iv) details of landscaping and tree planting;
v) the existing and proposed site levels and floor levels of the buildings and hard surfaced areas.
vi) details of secure cycle storage for each dwelling;
vii) details of the means of storage and disposal of refuse and recycling and arrangement for its on-going maintenance;
viii) details of the design and positions of all external boxes for gas and electricity supplies and of any gas flues and soil vent pipes.

Reason: The application was submitted in outline only and the above details are required to enable the Local Planning Authority to assess the detailed design, scale, appearance and layout of the development as well as ensure that appropriate access and services are provided to serve the development.
This Condition is imposed in accordance with Policies SG12, SG13, SG14 and SG18 of the South Holland Local Plan, 2006 and national guidance contained in Section 10 of the National Planning Policy Framework, 2012.

4 When application is made to the Local Planning Authority for the approval of reserved matters, that application shall be accompanied by the following details:

i) a plan providing the following information for each tree on site with a trunk diameter exceeding 100mm measured over the bark at a point 1.5 metres above ground level:
-a reference number
-its location
-its species
-an accurately drawn canopy and measurements of its radius
-its approximate height
-an assessment of its general state of health and stability;
ii) details of which trees are proposed to be removed;
iii) details of any proposed topping or lopping of any retained tree, or of any tree on land adjacent to the site.

None of the existing trees on the site shall be cut down, up-rooted, destroyed, topped or lopped until the above information has been submitted to and approved by the Local Planning Authority unless first agreed in writing by the Local Planning Authority.

Reason: To ensure the protection of those trees on the site which are of amenity value, in the interest of the visual amenity of the locality.
This Condition is imposed in accordance with Policy SG18 of the South Holland Local Plan, 2006 and national guidance contained in Section 11 of the National Planning Policy Framework, 2012.

5 When application is made to the Local Planning Authority for approval of reserved matters, that application shall be accompanied by a scheme of landscaping and tree planting indicating, inter alia, the number, species, heights on planting and positions of all trees in respect of the land to which that application relates, together with details of post-planting maintenance and such a scheme shall require the approval of the Local Planning Authority before any development is commenced. Such scheme as is approved by the Local Planning Authority shall be carried out in its entirety within a period of twelve months beginning with the date on which development is commenced. All trees, shrubs and bushes shall be maintained by the owner or owners of the land on which they are situated for the period of five years beginning with the date of completion of the scheme and during that period all losses shall be made good as and when necessary.

Note: The applicant is recommended to employ a qualified and experienced landscape designer to produce a landscaping scheme for the development.

Reason: To ensure that the development is adequately landscaped, in the interests of its visual amenity and that of the area in which it is set. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with Policy SG18 of the South Holland Local Plan, 2006.

6 When application is made to the Local Planning Authority for approval of reserved matters, details of the proposed boundary treatment, including a schedule of materials, and details of the size and species of any hedging, shall be submitted to and approved in writing by the Local Planning Authority, and the details so approved shall be implemented in full before the development is first brought into use.

Reason: In the interests of the character and appearance of the development and the visual amenity of the area in which it is set.
This Condition is imposed in accordance with Policy SG14 of the South Holland Local Plan, 2006.

7 No development shall be commenced until a scheme for the provision and phasing of a minimum of one third of the total residential units as affordable housing on the site to meet local housing needs has been submitted to and approved in writing by the Local Planning Authority. The scheme shall identify how the affordable housing is to be provided in each phase, whether by means of a non-profit registered provider or otherwise, and the timing of delivery. In the submission of the details of the design and layout of each phase, the location of each affordable housing unit shall be indicated, along with the size and tenure, the type of affordable housing, and arrangements for ensuring that the affordable housing to be provided meets identified local housing need. Not more than 50% of the total number of the approved dwellings within each phase, excluding the affordable element, shall be occupied until there has been a material commencement on the affordable housing units in that phase and not more than 90% of the approved dwellings, excluding the affordable element, shall be occupied until all the affordable housing units have been completed.

Note:
In order to comply with this condition it may be necessary for the applicant/developer to

enter into a planning obligation and/or agreement. You are therefore asked to bear this in mind when determining the timing of your submissions.

Reason: To ensure that affordable dwellings are provided to meet identified local need, and remain affordable in perpetuity. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with Policy HS8 of the South Holland Local Plan 2006.

8 The development hereby permitted shall not be commenced until a scheme to deal with any contamination of land or pollution of controlled waters has been submitted to and approved in writing by the Local Planning Authority (LPA) and until the measures approved in that scheme have been implemented. The scheme shall include all of the following measures:

i) a desk-top study carried out to identify and evaluate all potential sources of contamination and the impacts on land and/or controlled waters, relevant to the site. The desk-top study shall establish a 'conceptual site model' and identify all plausible pollutant linkages. Furthermore, the assessment shall set objectives for intrusive site investigation works/Quantitative Risk Assessment (or state if none required). Two full copies of the desk- top study and a non-technical summary shall be submitted to the LPA without delay upon completion.
ii) if identified as being required following the completion of the desk-top study, a site investigation shall be carried out to fully and effectively characterise the nature and extent of any land contamination and/or pollution of controlled waters. It shall specifically include a risk assessment that adopts the Source-Pathway-Receptor principle, in order that any potential risks are adequately assessed taking into account the sites existing status and proposed new use. Two full copies of the site investigation and findings shall be forwarded to the LPA without delay upon completion.
iii) thereafter, a written method statement detailing the remediation requirements for land contamination and/or pollution of controlled waters affecting the site shall be submitted to and approved in writing by the LPA, and all requirements shall be implemented and completed to the satisfaction of the LPA. No deviation shall be made from this scheme. If during redevelopment contamination not previously considered is identified, then the LPA shall be notified immediately and no further work shall be carried out until a method statement detailing a scheme for dealing with the suspect contamination has been submitted to and agreed in writing by the LPA.
iv) two full copies of a full closure report shall be submitted to and approved in writing by the LPA. The report shall provide verification that the required works regarding contamination have been carried out in accordance with the approved Method Statement(s). Post-remediation sampling and monitoring results shall be included in the closure report to demonstrate that the required remediation has been fully met.

Note
The applicant is advised that the phased risk assessment required by the Contaminated Land Scheme Condition should be carried out in accordance with the procedural guidance of the Environmental Protection Act 1990 Part 11A.
The applicant's attention is also drawn to the document entitled "Developing Land Within Lincolnshire - A guide to submitting planning applications to develop land that may be contaminated", which can be obtained through the Local Environmental Health

Department.

Reason: To assess whether the site is polluted and to address any pollution to ensure a satisfactory development. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with Policy SG13 of the South Holland Local Plan, 2006.

9 Prior to the commencement of the development, a detailed plan setting out proposals for the management of the ecology of the site shall be submitted to and approved in writing by the Local Planning Authority. The plan shall include proposals for the protection of wildlife and its habitat within the site, appropriate mitigation measures, a programme for implementation, proposals for longer-term arrangements and supervision by a qualified ecologist.

Reason: In the interests of the protection of the ecology and associated habitat of the site. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with national guidance contained in Section 11 of the National Planning Policy Framework, 2012.

10 In accordance with the submitted Flood Risk Assessment (prepared by SM Hemmings, dated 4th January 2016) finished floor levels shall be set 400mm above average existing ground levels (3.70m OD).

Reason: To ensure that the development does not increase the risk of flooding or be at risk of flooding.
This Condition is imposed in accordance with national guidance contained in Section 10 of the National Planning Policy Framework, 2012.

Notes:

The Local Planning Authority has acted positively and proactively in determining this application by assessing it against all material considerations, including national guidance, planning policies and representations that have been received during the public consultation exercise, and subsequently determining to grant planning permission.

This decision notice, the relevant accompanying report and the determined plans can be viewed online at http://planning.sholland.gov.uk/OcellaWeb/planningSearch

Paul Jackson
Place Manager
South Holland District Council

BUILDING REGULATIONS:

This decision refers only to planning permission as granted under the Town and Country Planning Act 1990. The works that you are proposing may also require Building Regulations and this planning permission does not give authority under Building Regulations to commence work. Please contact the Building Control section for further information on 01775 764557 or bcadmin@sholland.gov.uk

RIGHTS OF APPEAL

Appeals to the Secretary of State

If you are aggrieved by the decision of your Local Planning Authority to refuse permission for the proposed development or grant consent subject to conditions, then you can appeal to the Secretary of State under Section 78 of the Town and Country Planning Act 1990 or Section 20 of the Planning (Listed Building and Conservation Areas) Act 1990.

Timescales for appealing

The deadlines for appeals are calculated from the **date of decision** and are as follows for the types of applications below:

12 Weeks	6 Months	8 Weeks
Householder Applications	Planning Permission	Consent to Display Adverts
Minor Commercial Development	Listed Building Consent	
Agricultural Determinations	Other Prior Approval Applications	
Householder Prior Approval Applications		

Enforcement Notices

If an enforcement notice was served prior to the planning application being determined then the deadline for appealing is 28 days from the date of the **planning refusal**

If an enforcement notice is served after the planning application is determined then the deadline for appealing is 28 days from the date of the **enforcement notice** OR **the timescales stated above for each application type** from the date of the planning refusal - whichever is sooner.

All appeals must be made using an Appeal Form which you can get from The Planning Inspectorate at Temple Quay House, 2 The Square, Bristol, BS1 6PN (tel: 0303 444 5000) or you can submit your appeal online at:

http://www.planningportal.gov.uk/planning/appeals/online/makeanappeal

The Secretary of State can allow a longer period for giving notice of an appeal but he will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to him that the Local Planning Authority could not have granted planning permission for the proposed development or could not have granted it without the conditions it imposed, having regard to the statutory requirements, to the

provisions of the development order and to any directions given under the order. In practice the Secretary of State does not refuse to consider appeals solely because the Local Planning Authroity based its decision on a direction given by him.

For detailed information on appeals, appeal types and guidance on the appeals process please visit:

http://www.planningportal.gov.uk/planning/appeals/planningappeals

Purchase Notices

If either the Local Planning Authority or the Secretary of State refuses permission to develop land or grant it subject to conditions the owner may claim that he can neither put the land to a reasonably beneficial use in its existing state nor can he render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances the owner may serve a purchase notice on the Council in whose area the land is situated. This notice will require the Council to purchase his interest in the land in accordance with the provisions of the Part VI of the Town and Country Planning Act 1990 or Section 32 of the Planning (Listed Building and Conservation Areas) Act 1990.

Compensation

In certain circumstances compensation may be claimed from the Local Planning Authority if permission is refused or granted subject to conditions by the Secretary of State on appeal or on reference of the application to him.

These circumstances are set out in Section 114 and related provisions of the Town and Country Planning Act 1990 and Section 27 of the Planning (Listed Building and Conservation Areas) Act 1990.

Appendix B TGEN Protocol.

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1.0 REGULATORY FRAMEWORK

Throughout this document and in particular this section it is important to differentiate between contaminated land, which is used to mean land which meets the legal definition of contaminated land and other terms, such as land affected by contamination or land contamination etc., which are used to describe the much broader categories of land where contaminants are present or suspected, potentially requiring some form of mitigation, but usually not at a sufficient level of risk to meet the legal definition of contaminated land.

1.1 Part IIA Framework

Part IIA of the Environmental Protection Act (1990) (Part IIA) introduced a statutory legal definition for contaminated land, as follows:

"*…any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*

a) significant harm is being caused or there is a significant possibility of such harm being caused, or

b) pollution of controlled waters is being, or is likely to be caused"

Under Part IIA, the default assumption should be that land is not contaminated land unless there is sufficient reason to consider otherwise. DEFRA (2012a) is the statutory guidance (the guidance) in support of the contaminated land regulations produced by DEFRA (2012b), which amended the 2006 regulations, which in turn revoked the 2000 regulations. The 2000 regulations enabled the Part IIA regime.

The guidance details how the Part IIA regime should be implemented. The guidance also details the decision process required to determine whether land is contaminated or not, along with remediation provisions, the goals of remediation, how regulators should ensure that the remediation requirements are reasonable and the process by which the enforcing authority may recover the costs of remediation from liable parties.

The government's objectives with respect to contaminated land are to:

- Identify and remove unacceptable risks to human health and the environment.
- Seek to ensure that contaminated land is made suitable for its current use.
- Ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.

These three objectives underlie the fitness for purpose approach to remediation of contaminated land within the UK. The fitness for purpose approach consists of three elements:

- Ensuring that land is suitable for its current use by identifying any land where contamination is causing unacceptable risks to human health and/or the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer exist (i.e. through remediation of the land).
- Ensuring that land is made suitable for any new use as granted by planning permission by assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before final approval is given for the development and, where necessary to avoid unacceptable risks to human health and/or the environment, remediating the land before the new use commences. This is the role of the town and country planning and building control regimes.
- Limiting the requirements for remediation to the work necessary to prevent unacceptable risks to human health and/or the environment in relation to the current use or future use of the land for which planning permission is being sought by recognising that the risks from contaminated land can be satisfactorily assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby risking distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

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In implementing the Part IIA regime, the local authority is required to strike a reasonable balance between:

- Dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks.
- The potential impacts of regulatory intervention including the financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight and burdens on affected people.

In most cases, Part IIA is regulated by the local authority and their role is to:

- Inspect their area to identify contaminated land.
- Establish responsibilities for remediation of the land.
- See that appropriate remediation takes place through agreement with those responsible, or if not possible by serving a remediation notice or by the use of other powers, or in certain circumstances carrying out the work themselves.
- Keep a public register detailing the regulatory action which they have taken.

For special sites the Environment Agency (EA) will take over from the local authority as regulator. Special sites typically include:

- Contaminated land which affects controlled water and its quality.
- Oil refineries.
- Nuclear sites.
- Waste management sites.

Liability for remediation of contaminated land would be assigned to persons, organisations or businesses if they caused, or knowingly permitted contamination, or if they own or occupy contaminated land in a case where no polluter can be found.

The authority is required to take a precautionary approach to the risks raised by contamination, whilst avoiding disproportionality given the circumstances of each case. The aim being to consider the various benefits and costs of taking action with a view to ensuring that the regime produces net benefits, taking account of local circumstances.

Most remediation of land contamination in the UK takes place when a site is redeveloped for a new use. Conditions requiring remediation are normally attached to the planning consent. Where no redevelopment is proposed, a remediation notice can be served under the contaminated land regime introduced under Part IIA. Government policy is to encourage voluntary remediation of contamination through site redevelopment wherever possible rather than regulation under the contaminated land regime.

The Part IIA legislation is typically reserved for the most contaminated sites. The presence of harmful chemicals could provide a source in a pollutant linkage allowing the regulator to determine if there is a significant possibility of harm being caused to humans, buildings or the environment. Under such circumstances, the regulator would determine the land as contaminated under the provision of the legislation requiring the remediation process to be implemented.

Part IIA takes a risk-based approach to defining contaminated land. For the purposes of the guidance, risk means the combination of the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land and the scale and seriousness of such harm or pollution if it did occur. Under Part IIA, risks should be considered only in relation to the current use of the land. For the purposes of the guidance, the current use means:

- The use which is being made of the land currently.
- Reasonably likely future uses of the land that would not require a new or amended grant of planning permission.
- Any temporary use to which the land is put, or is likely to be put, from time to time within the bounds of current planning permission.
- Likely informal use of the land, for example children playing on the land, whether authorised by the owners or occupiers, or not.
- In the case of agricultural land, the current agricultural use should not be taken to extend beyond the growing or rearing of the crops or animals which are habitually grown or reared on the land.

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Under Part IIA, for a risk to exist there needs to be one or more contaminant-pathway-receptor linkages by which a relevant receptor might be affected by the contaminants in question. Therefore for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property, or significantly pollute controlled waters.

- A contaminant is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor or to cause significant pollution of controlled waters.
- A receptor is something that could be adversely affected by a contaminant, i.e. a person, an organism, an ecosystem, property or controlled waters. The various types of receptors that are relevant under the Part IIA regime are explained in later sections.
- A pathway is a route by which a receptor is or might be affected by a contaminant.

All three elements of a contaminant linkage must exist in relation to land before it can be considered potentially to be contaminated land under Part IIA. The term significant contaminant linkage means a contaminant linkage, which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term significant contaminant means a contaminant that forms part of a significant contaminant linkage.

The Part IIA regime was introduced to help identify and deal with land that poses unacceptable levels of risk. It is not intended to apply to land with levels of contaminants in soil that are commonplace and widespread and for which, in the very large majority of cases, there is no reason to consider that there is an unacceptable risk.

Normal background concentrations (NBC) of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise. Therefore, if it is established that land is at or close to NBC of particular contaminants, it should usually not be considered further in relation to the Part IIA regime.

In terms of the guidance, NBC of contaminants in soil may result from:

- The natural presence of contaminants (e.g. caused by soil formation processes and underlying geology) at levels that might reasonably be considered typical in a given area and have not been shown to pose an unacceptable risk to health or the environment.
- The presence of contaminants caused by low level diffuse pollution and common human activity other than specific industrial processes. For example, this would include diffuse pollution caused by historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts, and the spreading of domestic ash in gardens at levels that might reasonably be considered as typical.

NBC of contaminants in English soils have recently been established by DEFRA (2012c) following work undertaken by the British Geological Survey (BGS). The primary data sets used were the BGS geotechnical baseline survey of the environment and the English national soil inventory. NBC of arsenic, benzo(a)pyrene, cadmium, copper, lead, mercury and nickel have been determined for specific domains, such as the underlying parent rock/material, mineralisation/mining activity or an urban setting. That remaining is termed the principal domain.

Under Part IIA, there is a requirement to determine whether there is a possibility of significant harm. In terms of human health, this means the risk posed by one or more relevant contaminant linkage(s) relating to the land. It comprises:

- The estimated likelihood that significant harm might occur to an identified receptor, taking account of the current use of the land in question.
- The estimated impact if the significant harm did occur i.e. the nature of the harm, the seriousness of the harm to any person who might suffer it and (where relevant) the extent of the harm in terms of how many people might suffer it.

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In estimating the likelihood that a specific form of significant harm might occur the local authority should, among other things, consider:

- The estimated probability that the significant harm might occur if the land continues to be used as it is currently being used and where relevant, if the land were to be used in a different way (or ways) in the future.
- The strength of evidence underlying the risk estimate. It should also consider the key assumptions on which the estimate of likelihood is based and the level of uncertainty underlying the estimate.

In the context of the Part IIA regime the following health effects would be considered to constitute significant harm to human health:

- Death.
- Life threatening diseases (e.g. cancers).
- Other diseases likely to have serious impacts on health.
- Serious injury.
- Birth defects.
- Impairment of reproductive functions.

Other health effects may be considered to constitute significant harm. For example, a wide range of conditions may or may not constitute significant harm (alone or in combination) including physical injury, gastrointestinal disturbances, respiratory tract effects, cardiovascular effects, central nervous system effects, skin ailments, effects on organs such as the liver or kidneys or a wide range of other health impacts. In deciding whether or not a particular form of harm is significant harm, the local authority should consider the seriousness of the harm in question including the impact on the health, and quality of life, of any person suffering the harm; and the scale of the harm. The authority should only conclude that harm is significant if it considers that treating the land as contaminated land would be in accordance with the broad objectives of the regime.

In deciding whether or not land is contaminated land on the grounds of significant possibility of significant harm to human health (SPOSH), the guidance introduces four categories. Categories 1 and 2 encompass land which is capable of being determined as contaminated land on the grounds of SPOSH to human health and Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.

Category 1 (Human Health)

A SPOSH exists in any case where there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action were taken to stop it. In such cases, the land should be deemed to be Category 1 where:

- Similar land or situations are known, or are strongly suspected, on the basis of robust evidence, to have caused such harm before in the UK.
- Similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected, on the basis of robust evidence, to have caused such harm before in the UK or elsewhere.
- Significant harm may already have been caused by contaminants in, on or under the land, and that there is an unacceptable risk that it might continue or occur again if no action is taken. Among other things, the authority may decide to determine the land on these grounds if it considers that it is likely that significant harm is being caused, but it considers either that there is insufficient evidence to be sure of meeting the balance of probability test for demonstrating that significant harm is being caused, or that the time needed to demonstrate such a level of probability would cause unreasonable delay, cost, or disruption and stress to affected people particularly in cases involving residential properties.

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Category 4 (Human Health)

If the level of risk posed is low or there is no perceived risk then it should not be assumed that land poses a SPOSH. Such land is referred to as Category 4. The following types of land should be placed into Category 4:

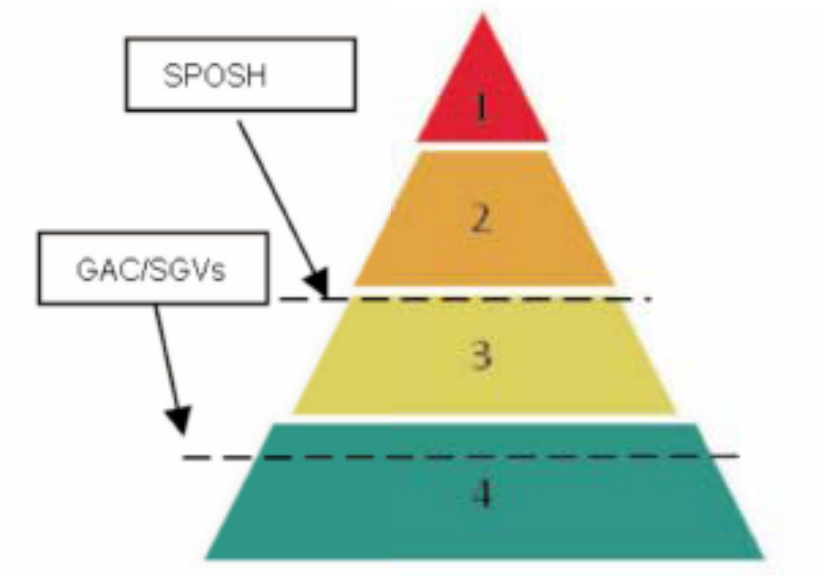
- Land where no relevant contaminant linkage has been established.
- Land where there are only NBC of contaminants in soil.
- Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment.
- Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

Categories 2 and 3 (Human Health)

Land that cannot be placed into Categories 1 or 4 should be placed into either Category 2, in which case the land would be capable of being determined as contaminated land on the grounds of SPOSH or Category 3, in which case the land would not be capable of being determined on such grounds.

Land should be placed into Category 2 if there is a strong case for considering that the risks from the land are of sufficient concern that the land poses a SPOSH with all that this might involve. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure have caused harm before, but nonetheless there is a strong case for taking action under Part IIA on a precautionary basis.

Land should be placed into Category 3 if the strong case (as described for Category 2) does not exist, and therefore the legal test for SPOSH is not met. Category 3 may include land where the risks are not low but nonetheless regulatory intervention under Part IIA is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part IIA regime if they choose.



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Generic assessment criteria (GAC) and soil guideline values (SGV) relating to human health in representative end use scenarios are considered to represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health (i.e. Category 4). With regard to such criteria/values:

- GAC/SGV may be used to indicate when land is very unlikely to pose a SPOSH to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a SPOSH to human health.
- GAC/SGV should not be used as direct indicators of whether a SPOSH to human health may exist. Also, the degree by which they are exceeded should not be viewed as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.
- GAC/SGV should not be seen as screening levels which describe the boundary between Categories 3 and 4 (i.e. the two categories in which land would not be contaminated land on the grounds of risks to human health). In the very large majority of cases, the GAC/SGV thresholds should describe levels of contamination from which risks should be considered to be comfortably within Category 4.
- GAC/SGV should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part IIA.
- GAC/SGV should not be used as generic remediation targets under the Part IIA regime. Nor should they be used in this way under the planning system (e.g. in relation to ensuring that land affected by contamination does not meet the Part IIA definition of contaminated land after it has been developed).

In terms of the Part IIA regime, only the forms of harm to non-human receptors described in the table below should be considered as relevant in considering whether significant harm is being caused or there is a significant possibility of such harm.

Relevant Types of Receptor	Significant Harm	SPOSH
Any **ecological system**, or living organism forming part of such a system, within a location which is: - A site of special scientific interest (under section 28 of the Wildlife and Countryside Act 1981). - A national nature reserve (under s.35 of the 1981 Act). - A marine nature reserve (under s.36 of the 1981 Act). - An area of special protection for birds (under s.3 of the 1981 Act). - A European site within the meaning of regulation 8 of the Conservation of Habitats and Species Regulations 2010. - Any habitat or site afforded policy protection under paragraph 6 of Planning Policy Statement (PPS 9) on nature conservation (i.e. candidate Special Areas of Conservation (SAC), potential Special Protection Areas (SPA) and listed Ramsar sites). - Any nature reserve (NNR) established under section 21 of the National Parks and Access to the Countryside Act 1949.	The following types of harm should be considered to be significant: - Harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any substantial part of that location. - Harm which significantly affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location. In the case of European sites, harm should also be considered to be significant harm if it endangers the favourable conservation status of natural habitats at such locations or species typically found there. In deciding what constitutes such harm, the local authority should have regard to the advice of Natural England and to the requirements of the Conservation of Habitats and Species Regulations 2010.	Conditions would exist for considering that a SPOSH exists to a relevant ecological receptor where the local authority considers that: - Significant harm of that description is more likely than not to result from the contaminant linkage in question. - There is a reasonable possibility of significant harm of that description being caused, and if that harm were to occur, it would result in such a degree of damage to features of special interest at the location in question that they would be beyond any practicable possibility of restoration. Any assessment made for these purposes should take into account relevant information for that type of contaminant linkage, particularly in relation to the ecotoxicological effects of the contaminant.

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Relevant Types of Receptor	Significant Harm	SPOSH
Property in the form of: • Crops, including timber. • Produce grown domestically, or on allotments, for consumption. • Livestock. • Other owned or domesticated animals. • Wild animals which are the subject of shooting or fishing rights.	For crops, a substantial diminution in yield or other substantial loss in their value resulting from death, disease or other physical damage. For domestic pets, death, serious disease or serious physical damage. For other property in this category, a substantial loss in its value resulting from death, disease or other serious physical damage. The local authority should regard a substantial loss in value as occurring only when a substantial proportion of the animals or crops are dead or otherwise no longer fit for their intended purpose. Food should be regarded as being no longer fit for purpose when it fails to comply with the provisions of the Food Safety Act 1990. Where a diminution in yield or loss in value is caused by a contaminant linkage, a 20% diminution or loss should be regarded as a benchmark for what constitutes a substantial diminution or loss. This description of significant harm is referred to as an animal or crop effect.	Conditions would exist for considering that a SPOSH exists to the relevant types of receptor where the local authority considers that significant harm is more likely than not to result from the contaminant linkage in question, taking into account relevant information for that type of contaminant linkage, particularly in relation to the ecotoxicological effects of the contaminant.
Property in the form of buildings. For this purpose, building means any structure or erection, and any part of a building including any part below ground level, but does not include plant or machinery comprised in a building, or buried services such as sewers, water pipes or electricity cables.	Structural failure, substantial damage or substantial interference with any right of occupation. The local authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it is or was intended. In the case of a scheduled ancient monument (SAM), substantial damage should also be regarded as occurring when the damage significantly impairs the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument was scheduled. This description of significant harm is referred to as a building effect.	Conditions would exist for considering that a SPOSH exists to the relevant types of receptor where the local authority considers that significant harm is more likely than not to result from the contaminant linkage in question during the expected economic life of the building (or in the case of a SAM the foreseeable future), taking into account relevant information for that type of contaminant linkage.

1.2 Planning Framework

In accordance with DCLG (2012) development of land is required to be carried out in a sustainable manner. Contamination is a material planning consideration and where development is proposed conditions can be attached to any permission granted for development requiring assessment and subsequent management. Remediation schemes can also need planning permission in their own right.

Land owners and/or developers are required to ensure the proposed development is safe and suitable for use for the purpose for which it is intended.

The developer is thus responsible for determining whether land is suitable for a particular development or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:

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- Whether the land in question is already affected by contamination through source-pathway-receptor pollutant linkages and how those linkages are represented in a conceptual model.
- Whether the development proposed will create new linkages (e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors).
- What action is needed to break those linkages and to avoid new ones, deal with any unacceptable risks and enable safe development and future occupancy of the site and of neighbouring land.

1.3 Building Control Framework

Building control authorities enforce compliance with DCLG (2010). Practical guidance is provided in approved documents, one of which is Part C: Site Preparation and Resistance to Contaminants and Moisture, which seeks to protect the health, safety and welfare of people in and around buildings, and includes requirements for protection against harm from chemical contaminants.

1.4 Controlled Water Framework

Part IIA defines pollution of controlled waters as the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter.

The term controlled waters in relation to England has the same meaning as in Part 3 of the Water Resources Act 1991, except that ground water does not include water contained in underground strata above the saturation zone (e.g. perched water).

Given that the Part IIA regime seeks to identify and deal with significant pollution (rather than lesser levels of pollution), the local authority should seek to focus on pollution which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, which may result in damage to material property or which may impair or interfere with amenities and other legitimate uses of the environment.

The following types of pollution should be considered to constitute significant pollution of controlled waters:

- Pollution equivalent to environmental damage to surface water or groundwater as defined by DEFRA (2009c), but which cannot be dealt with under those regulations.
- Inputs resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for human consumption such that additional treatment would be required to enable that use.
- A breach of a statutory surface water environment quality standard (EQS), either directly or via a groundwater pathway.
- Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants as defined in Article 2(3) of EU (2006).

Paragraphs A36 and A39 of DETR (2000) further define the basis on which land may be determined to be contaminated land on the basis of pollution of controlled waters, as before determining that pollution of controlled waters is being, or likely to be, caused, the local authority should be satisfied that a substance is continuing to enter controlled waters, or is likely to enter controlled waters. For this purpose, the local authority should regard something as being likely when they judge it more likely than not to occur.

Land should not be designated as contaminated land where:

- A substance is already present in controlled waters.
- Entry into controlled waters of that substance from the land has ceased.
- It is not likely that further entry will take place.

Substances should be regarded as having entered controlled waters where:

- They are dissolved or suspended in those waters.
- If they are immiscible with water, they have direct contact with those waters, or beneath the surface of the waters.

Controlled waters are defined in statute to be territorial waters which extend seawards for three miles, coastal waters, inland freshwaters, that is to say, the waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and groundwater, that is to say, any waters contained in underground strata.

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Category 1 (Water)
This covers land where there is a strong and compelling case for considering that a significant possibility of significant pollution of controlled waters exists. In particular this would include cases where there is robust science-based evidence for considering that it is likely that high impact pollution would occur if nothing were done to stop it.

Category 2 (Water)
This covers land where the strength of evidence to put the land into Category 1 does not exist but, nonetheless, on the basis of the available scientific evidence and expert opinion, the risks posed by the land are of sufficient concern that the land should be considered to pose a significant possibility of significant pollution of controlled waters on a precautionary basis, with all that this might involve (e.g. likely remediation requirements and the benefits, costs and other impacts of regulatory intervention). Among other things, this category might include land where there is a relatively low likelihood that the most serious types of significant pollution might occur.

Category 3 (Water)
This covers land where the risks are such that the tests set out in Categories 1 and 2 above are not met, and therefore regulatory intervention under Part IIA is not warranted. This category should include land where it is very unlikely that serious pollution would occur or where there is a low likelihood that less serious types of significant pollution might occur.

Category 4 (Water)
This covers land where there is no risk or that the level of risk posed is low. In particular, where:

- No contaminant linkage has been established in which controlled waters are the receptor in the linkage.
- The possibility only relates to types of pollution that should not be considered to be significant.
- The possibility of water pollution is similar to that which might be caused by background contamination.

1.5 Other Frameworks

There are a number of other regulatory and non-regulatory frameworks which can, or do, impact the assessment and/or the development of land affected by contamination. A detailed description of all of these frameworks is beyond the scope of this document. A summary of those frameworks most commonly impacting on the assessment of contamination at a site is however provided below.

1.5.1 Environmental Permitting Regulations

DEFRA (2010a) introduced the environmental permitting regulations (EPR) in E&W thereby replacing the former 2007 regulations. The EPR initially combined the pollution prevention and control (PPC) and waste management licensing (WML) regulations. Their scope has since been widened to include water discharge and groundwater activities, radioactive substances and provision for a number of directives.

Cornerstones of the EPR are contained in statutory guidance, such as EA (2013b). This guidance covers most of the standards and measures that apply to standard rules that are available for many activities, as well as the basic standards and measures that apply to all other activities subject to the EPR. The guidance was drafted to recognise the range of activities regulated through environmental permitting, both in terms of size and environmental risk. For some activities there are additional, sector-specific technical guidance notes.

Horizontal guidance was produced in support of EA (2013b). The purpose of horizontal guidance is to provide in depth information relevant to all sectors regulated under EPR, such as risk assessment, amenity, noise and vibration, odour, fugitive emissions (dust and pests), visible plumes, accidents, energy efficiency and the protection of controlled waters, and land. The horizontal guidance also helps to assess risks to the environment and human health when applying for a bespoke permit under the EPR.

EA (2008a) provides guidance and templates for producing a site condition report (SCR). In principle, a SCR is required for any facility regulated under the EPR, where there may be a significant risk to land or groundwater, or where one is necessary to satisfy requirements of the Integrated Pollution Prevention and Control Directive (2008/1/EC) (IPPC). A SCR describes and records the condition of the land and groundwater at a site. It will enable an operator to demonstrate that they have protected

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land and groundwater during the lifetime of the site and it is in a satisfactory state when they come to surrender their permit.

IPPC is designed to prevent, reduce and eliminate pollution at source by using natural resources efficiently. It is intended to help industries operate in a more environmentally sustainable way. The activities covered include those arising from energy, metals, mineral, chemical, waste management industries, as well as others such as paper/board production, slaughterhouses, food and drink production, intensive pig and poultry farms. To comply with the regulations, operators need a permit and must use best available techniques to prevent emissions to air, land and water or, where that is not practicable, they must reduce them to an acceptable level. They must also minimise waste and recycle it where they can, conserve energy, prevent accidents and limit their environmental consequences, and return the site to a satisfactory state after operations cease.

The directive was implemented by DEFRA (2010a). Competent authorities for these regulations are:

- The EA, which has responsibility for A(1) installations, the most polluting of the three industrial categories.
- Local authorities, which have responsibility for A(2) and Part B installations.

This legislation helps deliver the Water Framework Directive (EU 2000a) objectives in a number of ways, including, for example, objectives for priority hazardous substances (cease or phase out discharges, emissions and losses) and by minimising other releases from major installations. The regulations are supported by Europe wide guidance notes on best available techniques.

The Revised Waste Framework Directive (EU 2008b) deals with the protection of human health and the environment against harmful effects caused by the collection, transport, treatment, storage and tipping of waste. Regulation under this legislation includes a system of permits and plans, which set out the essential factors to be taken into consideration in respect of the various waste disposal and recovery operations.

Waste operations that give rise to point and diffuse sources of pollution are controlled through DEFRA (2010a). Part II of the Environmental Protection Act (1990) includes a prohibition on the general deposit of waste or knowingly causing or permitting such waste to be deposited in or on any land except in accordance with an appropriate environmental permit. This is reinforced by the waste duty of care, which includes a duty on those producing waste to ensure that it is only passed to an authorised person and to take appropriate reasonable measures to prevent the escape of waste from their control or that of another person.

1.5.2 Environmental Impact Assessment (EIA)

Under the Environmental Impact Assessment Directive (2011/92/EU) before consent is given for certain development projects, such as large scale industrial or infrastructure projects, an assessment of the effects the development may have on the environment must be made, so that the competent authority that grants consent is aware of these possible consequences.

The developer makes the assessment and presents this in an environmental statement, which is consulted on widely. The environmental statement must identify, describe and assess impacts on people, plants and animals, soil, water, air, climate and the landscape, the built environment and cultural heritage, including how these factors link together. Consenting authorities can then assess whether a proposed development will have significant impacts on water bodies, and whether it may prevent environmental objectives being achieved.

The directive is implemented through a number of statutory instruments, covering the consenting procedures for various categories of development, including activities such as forestry and quarrying. Projects that require planning permission are governed by DCLG (2011).

1.5.3 Environmental Liability

The Environmental Liability Directive (2004/35/EC) seeks to achieve the prevention and remedying of environmental damage to habitats and species protected under EC law and to species or habitat on a site of special scientific interest for which the site has been notified, damage to water resources and land contamination which presents a threat to human health. It reinforces the polluter pays principle and makes operators financially liable for threats of or actual damage.

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The directive is implemented in England through the Environmental Damage (Prevention and Remediation) Regulations (2009). The regulations apply only to the most serious types of damage. For water and biodiversity damage the regulations require much more extensive remediation than under existing legislation.

1.5.4 Habitats Directive

The Conservation of Natural Habitats and of Wild Fauna and Flora Directive (92/43/EEC), aims to contribute towards ensuring biodiversity through the conservation of natural habitats and wild plants and animals. Measures must be introduced to maintain or restore to favourable conservation status the natural habitats and populations of wild plants and animals identified as important within the EU. Representative areas with these habitats and species must be designated as SAC. SAC and SPA designated under the Birds Directive (2009/147/EC) form a network of protected areas known as Natura 2000.

The directive introduced for the first time for protected areas, the precautionary principle; that is that projects can only be permitted having ascertained no adverse effect on the integrity of the site. Projects may still be permitted if there are no alternatives, and there are imperative reasons of overriding public interest. In such cases compensation measures will be necessary to ensure the overall integrity of network of sites. As a consequence of amendments to the Birds Directive these measures are also applied to SPA. The directive is implemented by the Conservation of Habitats and Species Regulations (2010), which are administered by Natural England and the Countryside Council for Wales. SAC and SPA are also notified as Sites of Special Scientific Interest (SSSI).

1.5.5 Financial

The National House-Building Council (NHBC) is the standard setting body and the leading warranty and insurance provider for new and newly converted homes in the UK. Approximately 80% of new homes built in the UK each year are registered with NHBC and benefit from their ten year Buildmark warranty and insurance policy. In 1999, Buildmark was extended to provide the homeowner with contamination cover to provide protection against the issue of a statutory notice. This was done in the anticipation of Part IIA, which came into force a year later.

The NHBC identifies land affected by contamination in several possible ways:

- By builder declaration through the NHBC registration process.
- By review of site investigation reports submitted with building control/Buildmark applications.
- By the NHBC through the screening of commercial, environmental databases for previous land use or through inspection.

NHBC seeks to ensure that any contamination hazards identified are managed in accordance with NHBC (2008) and NHBC (2011). The specific standard relating to contamination is provided in Chapter 4.1: Land Quality - Managing Ground Conditions. The NHBC will carry out a technical assessment on all sites, which have been identified as being potentially contaminated. Where remediation is undertaken, validation is usually sought from the builder/consultant to confirm that this has been carried out.

Land contamination assessments may also be driven by other financial institutes, such as lenders, as part of pre-acquisition surveys and/or due diligence audits.

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2.0 TGEN APPROACH

The Terragen Environmental Consultants Limited (TGEN) methodology for the assessment, investigation and subsequent management of land contamination within the UK is based upon a phased approach. Assessment may be required in the context of the Part IIA framework, the planning framework, the building control framework, the controlled water framework and the other frameworks, or a combination of all. The basis of an assessment involves:

- Identifying a source of contamination.
- Identifying a pathway/media through which the contamination may migrate.
- Identifying a receptor or target at risk from the contamination.

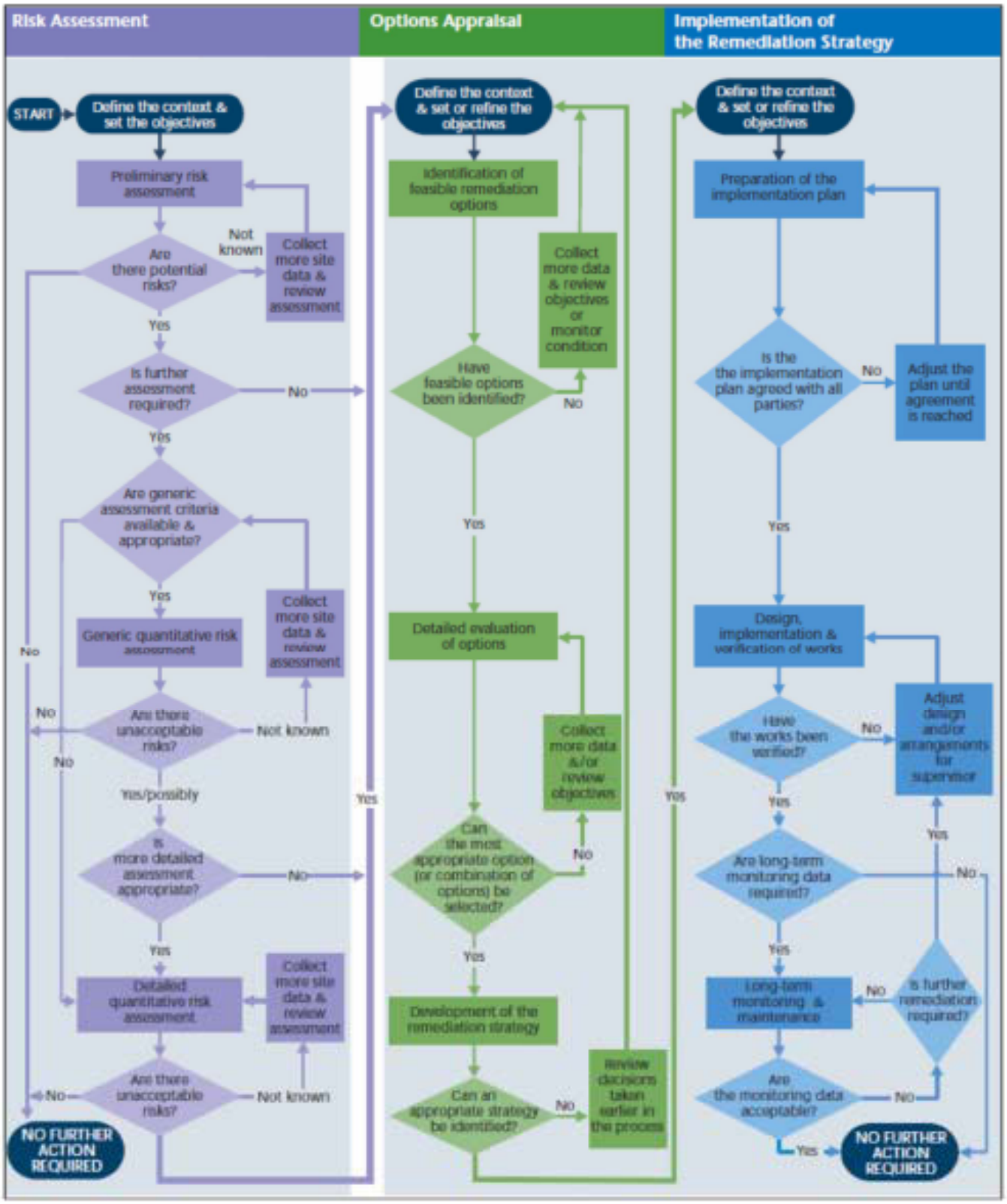
If there is a significant pollutant linkage (SPL) i.e. a source of contamination, a sensitive receptor and a plausible pathway linking the two, then a risk is present. Through an appropriate investigation the significance of the SPL is estimated or quantified. Where the SPL and therefore the risk of harm is deemed significant then within the context of Part IIA the site may be designated as contaminated land. The source-pathway-receptor model used to assess sites is widely accepted in the industry however it does not take into account less scientific factors such as perceived risk.

The full list of statutory and non-statutory guidance documents, regulations, reports, models, tools and standards used to plan, undertake, risk assess and report site investigations for contaminated land are presented in Section 9. However, the main structure and format of our investigations is as specified in BSI (2013b), BSI (2015a), EA (2010a,b,c) and EA (2004).

As detailed in EA (2004) the process of managing land contamination is through risk assessment (i.e. is the contamination a problem or could it become one in the future?), options appraisal (i.e. assessment of potential actions and how such actions could be implemented) and implementation of the remediation strategy (i.e. dealing with the contamination and proving that it has been carried out successfully).

As detailed in EA (2004) the process for each stage of the process of managing land contamination is as follows:

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2.1 Risk Assessment

Our risk assessment process is split into three stages, which comprises two phases of investigation as summarised below:

Phase	Stage	Activities
Phase 1	Preliminary Risk Assessment (PRA)	Define the project objectives. Desk study and site reconnaissance. Develop a preliminary outline conceptual site model.
Phase 2	Generic Quantitative Risk Assessment (GQRA)	Design and undertake site investigations and analysis. Undertake risk assessment using generic assumptions. Refine the conceptual site model.
	Detailed Quantitative Risk Assessment (DQRA)	Design and undertake site investigations and analysis. Undertake risk assessments using site specific data and sometimes complex numerical models. Refine the conceptual site model.

2.1.1 Phase 1 PRA

A Phase 1 PRA defines the objectives of the overall assessment and provides an assessment of SPL, the culmination of which is the development of a preliminary conceptual site model (CSM) and the identification of any areas of potential concern (AoPC) within the site. Information relating to potential sources of contamination is obtained through a study of available documents and evidence, including current and historical land use, database survey, correspondence with regulatory authorities, site reconnaissance and an assessment of the results derived from previous intrusive investigations at the site. Investigations undertaken as part of a Phase 1 PRA are designed to:

- Provide information on past and current uses of the site and surrounding area and the nature of any hazards and physical constraints.
- Identify current and likely future receptors, potential sources of contamination and likely pathways, and any features of immediate concern, including those that could be introduced in the future.
- Identify any aspect of the site requiring immediate attention (e.g. insecure fences, hazardous substances accessible to trespassers or likely to be dispersed by wind or water etc.).
- Provide information on the geology, geochemistry, soil, hydrogeology and hydrology of the site.
- Identify potentially different sub-areas (zones) of a site, based on differing ground conditions, potential contamination and past, present and future uses.
- Produce an initial conceptual model for the site as a whole and/or for any zones within the site.
- Identify areas where informed decisions are to be made using specialist assessment techniques or advisors (e.g. if there are ecological, unexploded ordnance (UXO) or archaeological considerations etc.).
- Provide data to assist in the design of potential subsequent exploratory and main investigations, and to give an early indication of possible remedial requirements.
- Provide information relevant to worker health and safety, and to the protection of the environment during field investigations.
- Identify the need to involve regulatory bodies prior to intrusive investigation.

The potentially active SPL identified in the CSM are then assessed in terms of the potential risk of harm to the identified receptors through a combination of the probability of occurrence and the potential severity of the consequence. The assigned risk takes into account the potential for regulatory or third party liability, the potential for affecting value and saleability, and the potential for extraordinary environment related development costs. The Phase 1 PRA risk matrix summarised below is based on guidance contained in CIRIA (2001). Definitions of the risk classifications presented in the guidance are as follows:

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Risk Matrix		Severity of Consequence			
		Severe	Medium	Mild	Minor
Probability of pollutant linkage	High Likelihood	Very High Risk [16]	High Risk [15]	Moderate Risk [13]	Low/Moderate Risk [10]
	Likely	High Risk [14]	Moderate Risk [12]	Low/Moderate Risk [9]	Low Risk [6]
	Low Likelihood	Moderate Risk [11]	Low/Moderate Risk [8]	Low Risk [5]	Very Low Risk [3]
	Unlikely	Low/Moderate Risk [7]	Low Risk [4]	Very Low Risk [2]	Very Low Risk [1]

- **Very High Risk** – there is a high probability that severe harm could arise to a designated receptor from an identified source; or there is evidence that severe harm to a designated receptor is currently happening.
- **High Risk** – harm is likely to arise to a designated receptor from an identified source.
- **Moderate Risk** – it is possible that harm could arise to a designated receptor from an identified source. It is 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.
- **Low Risk** – it is possible that harm could arise to a designated receptor from an identified source, 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.

In instances where SPL are not present or a very low to low risk is identified then the assessment will conclude with the completion of the Phase 1 PRA. Where active (or potentially active) SPL are identified or more elevated risk rankings assigned, then additional assessment will be required to quantify those risks.

The findings of the Phase 1 PRA form the basis upon which the requirement for, scopes of and phasing of subsequent investigations are decided and designed.

The Phase 1 PRA and the objectives of the investigation are reviewed and the need for further investigation considered, based upon the quantity and quality of previous site investigation information available, the level of confidence required from the actual characterisation of ground conditions and hazards, and the results of the risk assessment. Where applicable a summary/scope of future works is normally included.

2.1.2 Phase 2 GQRA and DQRA

Where the outcome of the Phase 1 PRA identifies potential SPL and therefore potential risk, a Phase 2 GQRA and/or DQRA would be undertaken in order to provide quantification of the SPL and therefore greater certainty of the significance of risk. If necessary, an intrusive site investigation together with suitable chemical analysis of soil, leachate and/or water samples, ground gases etc. is designed and implemented in order to gather sufficient information to provide quantification of the risks identified within the Phase 1 PRA.

The information gathered as part of the intrusive investigation is initially compared against generic assessment criteria (GAC) to assess the significance of links within the source-pathway-receptor model and as part of the Phase 2 GQRA a refined CSM can then be produced to assess the identified risks. Remedial measures and/or further works are then designed to either mitigate or further assess the identified risks.

Where necessary, the information gathered as part of the site investigation (and supplemented with additional information) can be compared against site specific assessment criteria (SSAC) in order to more fully rationalise any identified risks.

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The scope of the Phase 2 works would be dependent upon the outcome of the Phase 1 PRA but would potentially involve the following:

- Intrusive investigation (see Section 3.0).
- Assessment of risks to human health (see Section 4.0).
- Assessment of risks to controlled water (see Section 5.0).
- Assessment of risks to other sensitive receptors (see Section 6.0).
- Assessment of risks from ground gas (see Section 7.0).

The outcome of the Phase 2 GQRA or DQRA may be that the risk is not significant and therefore further works or mitigation is not required. If the risk is identified as being significant, or is such that the site is not deemed suitable for the proposed use, then remedial measures may be required in order to break the identified SPL and in so doing reduce the risk to an acceptable level.

2.2 Remediation

2.2.1 Phase 3 Options Appraisal

Where the Phase 1 PRA, Phase 2 GQRA and/or DQRA identify unacceptable risks in the context of the current or proposed use of a site, then remedial measures would be required. There are a wide range of remedial methods available with the method chosen being dependent upon the contaminant(s) identified, the site conditions, the proposed development, timescales and budget available. The first stage of Phase 3 involves a detailed assessment of potential options for remediation. Our approach is detailed in the table below.

Stage	Activities
Identify Feasible Remediation Options	Review and refine the conceptual model. Identify management and technical objectives. Define remediation objectives and criteria. Identify a shortlist of feasible remediation options.
Detailed Evaluation of Options	Evaluate and analyse options individually and in combination. Decide which of the options is/are most appropriate.
Develop a Remediation Strategy	Consider the zoning and timing of remediation. Decide how the strategy will be verified. Review costs and benefits. Develop a practical strategy for the remediation.

In some cases the simplest remediation method that is generally accepted for contamination that has been identified as posing a potential risk to humans, but not to other receptors, is to provide a barrier between occupiers/users of a site and the identified contamination. This barrier normally comprises a clean covering of soil. This remediation method is only suitable for contaminants that are of low volatility and/or mobility.

In accordance with UK policy and where feasible the removal of soil from site is minimised and disposal offsite as waste to landfill is considered as a last resort.

2.2.2 Phase 3 Implementation of Remediation

Once a method of remediation has been selected a plan would be prepared detailing how the measures would be implemented, monitored (where necessary) and verified as detailed in the table below.

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Stage	Activities
Prepare an Implementation Plan	Identify management responsibilities. Consult with relevant parties (e.g. regulators, land owners etc.). Confirm if regulatory permits are required. Develop phasing and timetable.
Design, Implement and Verify the Remediation	Complete pilot trials (may need a permit). Procure contractors. Obtain permits. Produce a verification plan. Carry out remediation. Verify (in reports) what has been done.
Long Term Monitoring and Maintenance	Monitor how well the remediation has worked. Review and adjust the monitoring programme as necessary. Analyse results and report them. Take action if results indicate a need.

2.3 Verification and Closure

During the implementation of the approved remediation strategy we would attend site to carry out the necessary verification works (e.g. sampling, records and documentation of site works etc.). Upon the successful completion of the remediation all of the verification records would be compiled in a closure report detailing all of the works undertaken.

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3.0 INTRUSIVE INVESTIGATION

If necessary an intrusive site investigation together with suitable chemical analysis of soil, leachate and/or water samples, ground gases etc. is designed and implemented by TGEN in order to gather sufficient information to provide quantification of the risks identified within the Phase 1 PRA and to inform a Phase 2 GQRA or DQRA. The site investigation itself may be split into several sub-phases, dependent upon the size and scale of the site as detailed in the following sections.

3.1 Exploratory Investigation

An exploratory investigation is often used on sites identified as a low risk as part of the Phase 1 PRA in order to confirm that assessment. For more complex sites or those allocated a higher risk, an exploratory investigation may be implemented as a precursor to, and to inform the design of, a main investigation. If implemented, an exploratory investigation would be designed to:

- Test the contamination and site characteristics identified within the preliminary CSM.
- Obtain further information in relation to potential sources of contamination, likely pathways and features of immediate concern.
- Obtain further information on the geology, geochemistry, soil, hydrogeology and hydrology of the site.
- Provide further information to aid the design of a main investigation, including health and safety aspects.
- Provide data for a review of the CSM and to update the risk assessment.

3.2 Main Investigation

The main investigation would be designed to:

- Obtain data on the nature and extent of contamination, the geology, geochemistry, soil, hydrogeology and hydrology of a site.
- Provide data to review the preliminary CSM and to update the risk assessment.
- Provide data for the selection and design of remedial works.

3.3 Supplementary Investigation(s)

In cases where an exploratory and/or main investigation highlight specific issues at a site then a supplementary investigation(s) would be designed in order to:

- Provide clearer delineation of a particular area (zone) of contamination or a contamination plume.
- Address or clarify specific technical matters (e.g. to confirm the applicability and feasibility of potential remedial options or obtain information for their design etc.).

3.4 In Situ Testing

Where necessary, during the intrusive investigation(s), an assessment of soils for the presence of volatile organic compounds by visual and olfactory means is supplemented with the use of a PhoCheck Plus 2000 photo ionisation detector (PID) calibrated with isobutylene gas and fitted with a 10.6eV UV lamp. Subsamples are placed into a polythene bag, which is then sealed to exclude as much atmospheric air as possible. The soil samples are gently broken up within the bags and left for circa thirty minutes in order to facilitate volatilisation from the pore spaces. Following this the PID is inserted into the polythene bag to test for the presence ionisable volatile compounds.

3.5 Laboratory Testing

During the intrusive investigation(s) samples of soil, water, gas etc. are recovered from representative locations and submitted to an approved UKAS/MCERTS accredited laboratory.

Collection

Dedicated amber jars, bottles, epa vials, plastic tubs, gas bags/tubes etc. provided by the laboratory, are used for the collection of samples. To minimise the potential for cross contamination, disposable gloves are changed for each sample collected and equipment used is cleaned between each sampling event.

Preservation

Loss of volatile compounds through desorption and volatilisation from the samples is limited by filling and tightly enclosing the samples in dedicated amber jars, thus ensuring minimal headspace, and

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storing at a low temperature (i.e. a refrigerated cool box), which further minimises biodegradation of organic compounds.

Transport

Samples are transported to the laboratory in dedicated containers maintained at a low temperature. All samples and analytical requests are recorded on the laboratory chain of custody form prior to dispatching for analysis.

3.6 Assessment of Potential Contaminants

Two criteria are used for the selection of potential contaminants to test for during ground investigations:

- Contaminants must be likely to be present on many sites affected by current or former industrial use in the UK in sufficient concentrations to cause harm. The purpose of this criterion is to exclude substances that are rarely found or are unlikely to be present in harmful concentrations.
- Contaminants must pose a potential risk to human beings and/or other sensitive receptors (e.g. the water environment, ecology, plants, construction or building materials and property etc.).

Only substances meeting both of the above criteria are selected for analysis. Therefore, the selected substances are:

- Likely to occur on many industrial sites in sufficient concentrations to cause harm or pollution.
- Known or suspected to pose significant risk to humans (death, serious injury, cancer or other disease, genetic mutation, birth defects or the impairment of reproductive functions).
- Known or suspected to pose a significant risk to the water environment, or likely to cause other adverse impacts in the water environment as a result of their presence on land.
- Known or suspected to pose a significant risk to ecology as a result of their presence on land.
- Known or suspected to have a significant effect on buildings or building materials.
- Known or suspected to be persistent and mobile in soils or have tendency to bio-accumulate through exposure of sensitive organisms.

The following documents are the primary sources for identifying those contaminants likely to be present:

- EA (2002) identified priority contaminants, selected on the basis that they are likely to be present on many current or former sites affected by industrial or waste management activity in the UK in sufficient concentrations to cause harm.
- DoE (1995a) describe specific industrial processes and the chemicals that are commonly found on industrial land.

The information gathered during the investigation(s) is then compared against generic assessment criteria (GAC) to assess links within the source-pathway-receptor model (see Sections 4 to 7).

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4.0 RISKS TO HUMAN HEALTH

4.1 TGEN Approach

The TGEN approach is to generate GAC for chronic risks to human health using CLEA v1.06. In generating GAC, input parameters consistent with the most recent EA publications have been adopted (see Section 9). In March 2002, DEFRA and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land.

4.1.1 Substance Specific Information (Health Criteria Values)

Toxicological data for respective contaminants have been chosen for use based on the guidance in EA (2009a). Where UK guidance is available (i.e. existing published TOX reports) the appropriate health criteria values (HCV) have been adopted. Where no TOX report is available the following approaches has been used (given in order of preference):

- Published toxicity reviews to derive HCV within CIEH (2009).
- Other appropriate UK sources.
- Authoritative European sources.
- International organisations (e.g. WHO).
- Appropriate, authoritative US sources (e.g. USEPA).

4.1.2 Substance Specific Information (Physico Chemical Characteristics)

Fate and transport characteristics for the contaminants for which GAC have been derived were chosen using the following hierarchy of data sources:

- EA (2008b).
- EA (2003).
- Other UK government documents.
- European data sources (e.g. NIPHE 2001).
- International data sources (e.g. WHO and USEPA).

4.2 CLEA Model

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in EA (2009b) as summarised below:

- Ingestion (Outdoor soil, Indoor dust, Home-grown produce, Soil attached to home grown produce).
- Dermal Contact (Outdoor soil, Indoor dust).
- Inhalation (Outdoor dust, Indoor dust, Outdoor vapour, Indoor vapour).

4.2.1 Model Settings

In the generation of GAC, default settings have been used for the following exposure scenarios:

- Residential with Plant Uptake.
- Residential without Plant Uptake.
- Allotments.
- Commercial/Industrial.

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The default soil type is set as a sandy loam with a pH of 7. Soil organic matter (SOM) contents of 1%, 3% and 6% have been considered, where appropriate.

The following table details the receptor exposure factors used to generate the GAC.

Receptor Parameters	Unit	Residential	Source	Commercial	Source
Lifetime	yr	6	EA (2009b) Section 3.2.3.	49	EA (2009b) Section 3.4.1.
Body Weight	kg	14.2	EA (2009b) Table 3.2 (average over age 0-6 considering child age 0-1 has 0.5yr exposure).	70	EA (2009b) Section 4.1.
Indoor Air Exposure (Frequency)	days/yr	365	EA (2009b) Table 3.1.	230	EA (2009a) Table 3.9.
Indoor Air Exposure (Duration)	yr	6	EA (2009b) Section 3.2.3.	49	EA (2009a) Section 3.4.1.
Lung Retention Factor	fraction	1	Conservative assumption.	1	Conservative assumption.
Inhalation Rate Indoors	m^3/hr	0.5	EA (2009b) Table 4.14 (calculated average).	0.56	EA (2009b) Table 4.14 (calculated average).
Time Indoors	hr/day	21.7	EA (2009b) Table 3.2.	8.3	EA (2009b) Box 3.6.
Bioavailability for All Contaminants	%	100	Default conservative assumption.	100	Default conservative assumption.

Default building parameters that have been utilised in the generation of the groundwater GAC values as presented in the following table:

Building Parameters	Unit	House	Source	Office	Source
Footprint Area	m^2	28	EA (2009b) Table 3.3.	424	EA (2009b) Table 3.10.
Volume	m^3	134.4	EA (2009b) Table 3.3.	4070.4	EA (2009b) Table 3.10.
Air Exchanges Per Day	no.	12	EA (2009b) Table 3.3.	24	EA (2009b) Table 3.10.
Foundation Thickness	m	0.15	EA (2009b) Table 3.3.	0.15	EA (2009b) Table 3.10.
Foundation Cracks	fraction	0.001429	EA (2009b) Table 3.3.	0.000389	EA (2009b) Table 3.10.
Porosity of Foundation Cracks	factor	1	Assumes crack fraction is entirely available for vapour ingress.	1	Assumes crack fraction is entirely available for vapour ingress.
Water Content in Foundation Cracks	cm^3/cm^3	0	Conservative assumption.	0	Conservative assumption.

House (small two storey terrace). Office (pre-1970 three storey).

In the absence of UK guidelines, the exposure scenario adopted has considered a groundwater source 0.5m below the base of the building as a conservative approach representing an example of a very shallow aquifer and corresponding with the depth of a soil source as adopted in the generic scenario in the CLEA model. The appropriateness of this assumption is assessed on a site by site basis considering the conceptual model for the site. The groundwater model parameters are presented in the following table:

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Groundwater Parameters	Units	Value	Source
Distance Between Building Foundation and Groundwater	m	0.50	EA (2009b) Page 51.
Total Porosity in Source Zone	cm^3/cm^3	0.53	EA (2009b) Table 4.4 (i.e. sandy loam).
Water Content in Source Zone	cm^3/cm^3	0.33	EA (2009b) Table 4.4 (i.e. sandy loam).
Thickness of Capillary Fringe	cm	10	Estimate.
Air Content in the Capillary Fringe	cm^3/cm	0.01	Estimate.

For many contaminants, no risk is calculated at concentrations below the pure phase solubility of the contaminant. Caution is applied when non-aqueous phase liquids (NAPL) are likely to be present, either where these have been detected during monitoring or where the concentration of a component in a mixture exceeds 10% of its calculated effective solubility. In such cases, a separate assessment of the generation of volatile vapours from NAPL via modelling or a soil vapour survey may be undertaken.

It is important to note that the values are only applicable to human health and cannot be used to determine the potential risks to controlled waters.

4.2.2 Soil Saturation

With the exception of petroleum hydrocarbon fractions, GAC have been limited to the calculated soil saturation limit for organic species, which is in accordance with the approach taken by the EA in the production of SGV. Petroleum hydrocarbon fractions are assessed, where appropriate, based on hazard index and so have not been limited to soil saturation.

4.2.3 Cyanides

The primary risk to human receptors from free cyanide in soils is an acute risk (i.e. a single dose could have a lethal affect as opposed to adverse effects from cumulative intake (chronic affect)).

There is no current UK guidance available for calculating acute risks from free cyanide. As such, the (officially withdrawn) SNIFFER (2003) methodology has been used to derive an acute GAC of 60 mg/kg for all exposure scenarios. The value is given for free or easily released cyanide but can be used to assess total cyanide in the absence of cyanide speciation. In cases where the total cyanide exceeds the GAC then analysis of free or easily released cyanide is completed.

4.2.4 Limitations of the CLEA Model

In the application of GAC (and SGV) to a site, the limitations of the CLEA model have been recognised. Specifically, these relate to the absence of certain pollutant considerations such as risks to services, of fire and explosion, aesthetics, institutional perception, groundwater, surface waters, eco-toxicological risk and risks to buildings (amongst others).

In addition, the GAC specifically do not meet the requirements of the legal definition of significant possibility of significant harm but provide a benchmark below which concentrations of contaminants are not considered to warrant further consideration in the context of the land use scenario.

The CLEA model also does not explicitly consider the potential for chronic impact to human health from indoor inhalation of concentrations of volatile vapours from dissolved phase contamination. The potential exists for this to be an important exposure route for a limited number of highly volatile contaminants. As such, GAC have been calculated for volatile contaminants for volatilisation from groundwater using RISC 4. It should be noted that the RISC 4 approach does not include advection into buildings and we consider alternative approaches where this is likely to be a significant issue.

Exposure factors required for the model have been derived using the information contained within EA (2009a,b,c,d). Where ranges of values are provided for input parameters, an appropriate conservative single value has been chosen for input into the RISC 4 model.

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4.3 Soil Guideline Values

In order to undertake a Phase 2 GQRA, contaminant concentrations from samples generated from a Phase 2 site investigation need to be compared to appropriate GAC. Current industry practice is to use, as first preference, SGV published by the EA and derived using the CLEA model. The CLEA model provides an approach for the assessment of chronic risks to human health from concentrations of a substance within soil, where appropriate.

The current version of the model (v1.06) was published in 2009 and, following its publication, a number of SGV have also been produced. Where published SGV do not exist, other published GAC values derived from a risk-based assessment of human toxicological and/or ecotoxicological data have been utilised in accordance with the following hierarchy:

- GAC prepared in accordance with the CLEA v1.06 model by authoritative bodies (e.g. CL:AIRE, CIEH, EIC etc.).
- GAC prepared in accordance with the CLEA v1.06 model and associated documents by TGEN.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in EA (2009b) are:

- Residential land use; A typical residential property consisting of a two story terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 to 6 year old female.

  Active exposure pathway are: ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

- Allotments A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 to 6 year old female and there is no building present onsite.

  Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

- Commercial and industrial land use. A typical commercial or light industrial property consisting of a three-storey office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 to 65 years.

  Active exposure pathway are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

The primary purpose of the SGVs are as trigger values for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs).
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances.

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GAC) for eighty two substances including metals, petroleum hydrocarbons, PAH and explosive substances for a variety of soil types and the three default land uses (residential, allotments and commercial end uses) as described in EA (2009b).

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4.4 Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). CL:AIRE (2014) proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

- Public Open Space: Residential for public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource for children and the area is near the homes. The critical receptor is a female child age >3 to <9 years old (CLEA age class 4 to 9) as younger children are unlikely to play outdoors unsupervised.

  Active exposure pathways are: ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

- Public Open Space: Park A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following: (Family visits and picnics, Children's play area, Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch) and Dog walking). The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil. The critical receptor is a female child with CLEA age classes 1 to 6.

  Active exposure pathways are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part 2A of the EPA 1990 to quickly screen out Category 4 sites where there is "no risk or that the level of risk posed is low". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

The SGV for lead was withdrawn in 2011. The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

4.5 LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009.

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4.6 Use of Statistical Tests in Data Interpretation

4.6.1 Averaging Zones

CLEA methodology requires the definition of averaging zones based on previous/current/future spatial land use, soil type, proposed site end uses or other distinguishing features. Where there is similar historic and/or contemporary land use across a site and the redevelopment plans indicate that the site is to be under a single end use then horizontally the whole site is taken as one averaging area.

4.6.2 Sample Depths

It is intended that the CLEA statistical analysis is applied to soils from <1.0mbgl. This is due to the greatest likelihood that site end users would be exposed to these soils. Samples tested from below this depth during an assessment would be subjected to a similar analysis to assess the chemical characteristics of natural soils and deeper areas of fill. Where samples are included within the dataset(s) that are >1mbgl, it is assumed, with regards to human health, that excavation associated with the development may result in soils from these greater depths being within 1m of final levels in areas of sensitive end use at the site. This could be considered as an additional layer of conservatism within the approach adopted.

In addition, it should be noted that the methodology makes depth based assumptions regarding risks to human health from soils, which can be summarised as follows:

- For direct ingestion of soil and dust, dermal contact with soil outdoors and soil derived dust indoors, and inhalation of soil derived dust outdoors and indoors contamination is assumed to be present in the top 0.1m of the soil profile.
- For consumption of vegetables and ingestion of soil attached to them it is assumed that the contamination is present in the top 0.5m of the soil profile.
- For inhalation of soil vapours outdoors, the contamination is assumed to be at a depth of 1.0m.
- For inhalation of soil vapours indoors, the contamination is assumed to be directly below the building.

Where necessary (and feasible), the different depths of the potential risks to human health are taken into account in designing and/or assessing site investigations.

4.6.3 Statistical Approach

A statistical basis for the assessment of the analytical results obtained during the site investigation is detailed within CL:AIRE (2008). The premise is to review an entire data set in an appropriate way in comparison to selected GAC. The assumption made is that the results from the site investigation are to some degree representative of the contaminant concentration throughout that area or volume of soil represented by the sample or samples. The most appropriate method for assessing a given dataset is dependent upon a range of site specific factors together with the quantity and quality of the data generated and the chosen approach differentiated for datasets where random or targeted sampling has been undertaken and where a site is being considered in a planning or Part IIA context.

Where it is required to draw conclusions about the condition of the land under scrutiny as part of a planning scenario comparison is made between a value larger than the sample mean, in this case the upper confidence limit (UCL) and the critical concentration (GAC) as opposed to the Part IIA scenario (whereby comparison is made between the lower confidence limit (LCL) and the critical concentration). The UCL provides an estimate of the population mean, based on test data, with a 95% confidence that the actual mean does not exceed this value.

In the first instance, the approach to statistical assessment involves a qualitative assessment of the dataset. This involves a summary of the number of tests, maximum concentration, mean concentration, standard deviation and number of non-detects. In instances where both the maximum and mean concentrations are below the prescribed GAC then further assessment is not considered necessary.

For compounds where the maximum or mean concentration exceeds the respective GAC, a statistical assessment is undertaken in accordance with CL:AIRE (2008). The USEPA ProUCL Version 5.0 (2013) is used to determine the presence of statistical outliers within the dataset, the normality of the

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distribution and the upper confidence limit at a 95% confidence interval (UCL_{95}) concentration using an appropriate statistical tool.

Where statistical outliers (not representative of the dataset) are identified, the respective samples/locations are considered to be hotspots and are removed from the dataset for consideration in isolation from the remaining samples.

Following the removal of any outliers, the dataset is re-evaluated. The distribution of the dataset is determined in accordance with the Shapiro-Wilk normality test. For datasets with a normal distribution, the UCL_{95} concentration is determined using the Students t-test at a 95% confidence interval. For lognormal distributions, the UCL_{95} concentration is determined using the Chebyshev Theorem at a 95% confidence interval.

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5.0 RISKS TO CONTROLLED WATERS

5.1 Control of Residual Contamination

Part IIA introduced the regime for the identification and remediation of contaminated land. Land may be classified as contaminated under the regime by virtue of actual or likely pollution of controlled waters caused by substances in, on or under the land. The EA is a statutory consultee in relation to controlled waters issues. In situations where there is no existing pollutant linkage, Section 161 of the Water Resources Act (1991) (as amended 2003) and the Anti-Pollution Works Regulations (1999) can be used to address contamination, which could represent a potential risk.

5.2 Control of Contamination from Ongoing Activities

The existing Groundwater Directive (80/68/EEC) aims to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater. In the UK, the directive is implemented through the Groundwater Regulations (DETR 1998b). Groundwater pollution is prevented under these regulations by preventing or limiting the inputs of listed substances into groundwater. Substances controlled under the regulations fall into two lists:

List 1	List 2
▪ Organohalogen compounds and substances, which may form such compounds in the aquatic environment. ▪ Organophosphorus compounds. ▪ Organotin compounds. ▪ Substances which possess carcinogenic, mutagenic or teratogenic properties in or via the aquatic environment (including substances which have those properties which would otherwise be in List 2). ▪ Mercury and its compounds. ▪ Cadmium and its compounds. ▪ Mineral oil and hydrocarbons. ▪ Cyanides.	▪ Metals, metalloids and compounds of antimony, arsenic, barium, beryllium, boron, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, tellurium, thallium, tin, titanium, uranium and zinc. ▪ Biocides and their derivatives not appearing in List 1. ▪ Substances which have a deleterious effect on the taste or odour of groundwater and compounds liable to cause the formation of such substances in such water and to render it unfit for human consumption. ▪ Toxic or persistent compounds of silicon and substances which may cause the formation of such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances. ▪ Inorganic compounds of phosphorus and elemental phosphorus. ▪ Fluorides. ▪ Ammonia and nitrites.

List 1 substances are the most toxic and must be prevented from entering groundwater. Substances in this list may be disposed of to the ground, under a permit, but must not reach groundwater.
List 2 substances are less dangerous and can be discharged to groundwater under a permit, but must not cause pollution.

Listed dangerous substances have assessment criteria in the form of EQS. The dangerous substance is not believed to be detrimental to aquatic life at a concentration below its EQS limit (see EU 2008a).

The old Groundwater Directive was repealed by the Water Framework Directive (WFD) in 2013. DEFRA (2010b) has been used to enact both the WFD and its daughter directive on the protection of groundwater in E&W. This new Groundwater Directive (2006/118/EC) is commonly referred to as the Groundwater Daughter Directive (EU 2006a).

The existing principle of preventing or limiting the inputs of List 1 or List 2 substances respectively into groundwater under the original Groundwater Regulations (DETR 1998b) remains, but have been expanded and will continue to expand to encompass any substance liable to cause pollution. In addition, the WFD provides a risk based framework for regulation.

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5.3 Water Framework Directive

The WFD (EU 2000a) came into force in England and Wales (E&W) through the Water Environment (Water Framework Directive) (England and Wales) Regulations (SI 2003:3242). The WFD establishes the legal framework to protect and restore clean water across the EU and ensure its long term, sustainable use. It sets specific deadlines for member states to protect aquatic ecosystems and sets the goal of achieving a good (chemical and ecological) status for all surface water (rivers, estuaries and coastal water) and groundwater (aquifers) in the EU by 2015.

Good status is considered to be a function of concentrations of pollutants which:

- Do not exceed the quality standards under relevant EU legislation.
- Would not result in a failure of associated surface water bodies to achieve environmental objectives.
- Would not result in a significant diminution of the ecological or chemical quality of associated surface water bodies.
- Would not result in any significant damage to groundwater dependent terrestrial ecosystems.

The WFD is designed to:

- Enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, which depend on the aquatic ecosystems.
- Promote the sustainable use of water.
- Reduce pollution of water, especially by priority and priority hazardous substances.
- Ensure the progressive reduction of groundwater pollution.

The measures to achieve the objectives are set out in River Basin Management Plans (RBMP) of which there are eleven in E&W. They were enacted by DEFRA (2009a).

The WFD requires, as a matter of priority, the causes of pollution to be identified and emissions to be dealt with at source in the most economically and environmentally effective manner. In accordance with Article 4, all member states should implement necessary measures with the aim of progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances.

EU (2008a) (EQSD) has replaced the List of Priority Substances (2455/2001/EC) since its implementation on 13/01/2009. Similarly, the EQSD has repealed the limit values contained in a number of specific daughter directives to the old Dangerous Substances Directive (see below), such as those for mercury (82/176/EEC and 84/156/EEC), cadmium (83/513/EEC), HCCH (84/491/EEC) and the List 1 Daughter Directive (86/280/EEC), as amended by 88/347/EEC and 90/415/EEC, although the directives themselves remained in force until fully repealed on 22/12/2012. The EQSD is a daughter directive to the WFD and was enacted in E&W by DEFRA (2010b).

The WFD repealed the Drinking Water Abstraction Directive (75/440/EEC) on 22/12/2007 and repealed on 22/12/2013 the following directives:

- EU (2006a) (GWD) repealed 80/68/EEC, which was implemented in E&W by The Groundwater Regulations (SI 1998:2746). The GWD is a daughter directive of the WFD and came into force in the EU on 16/01/2009 but was itself repealed by the WFD. The main aim of the GWD is to protect groundwater against pollution and deterioration. The new GWD has been implemented in E&W by DEFRA (2010b).
- The Shellfish Waters Directive (2006/113/EEC) (SWD) is a codified version, which repealed 79/923/EEC and came into force on 16/01/2007. The values set by the SWD came into force on 16/01/2013, when the WFD repealed the SWD.
- The Fresh Waters Fish Directive (2006/44/EC) (FWFD) is a codified version, which repealed 78/659/EEC. It was brought into force in E&W by the Surface Waters (Fishlife) (Classification) Regulations (SI 1997:1331), as amended by SI 2003:105.
- The Dangerous Substances Directive (2006/11/EC) (DSD) is a codified version, which repealed 76/464/EEC. The DSD has been integrated into the WFD and will be used to implement the EU wide good status of all water bodies by 2015. The current regulations used to implement the DSD into E&W legislation, such as the Surface Waters (Dangerous Substances) (Classification) Regulations (SI 1997:2560) as amended by SI 1998:389, are still in force until repealed by the WFD.

Although the WFD has/will repeal the Directives listed above, and of course all relevant regulations used to introduce the directives into E&W law, the EQS values selected for the WFD must be at least

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as stringent as those that they replace. The RBMP must contain measures to implement a number of directives (as listed below), which will remain in force and are not superseded by the WFD:

- The IPPC Directive (2008/1/EC) (IPPCD) is a codified version, which repealed 96/61/EC.
- The Bathing Water Directive (2006/7/EEC) (BWD), which repealed 76/160/EEC.
- The Drinking Water Directive (98/83/EC) (DWD) is a codified version, which repealed 80/778/EEC. It was brought into force in E&W by the Water Supply (Water Quality) Regulations (SI 2000:3184) and amended by SI 2007:2734.
- The Urban Waste Water Treatment Directive (98/15/EC) (UWWTD) amended 91/271/EEC.
- The Nitrates Directive (91/676/EEC) (ND).
- The Sewage Sludge Directive (86/278/EEC) (SSD).

Similarly, other directives to be taken into account include:

- The Marine Strategy Framework Directive (2008/56/EC) (MSFD) is the equivalent of the WFD for marine waters. The MSFD had to be transposed by member states by July 2010 with the aim of achieving good status across the EU by 2020.
- The Biocidal Products Directive (98/8/EC) (BPD).
- The Plant Protection Products Directive (91/414/EEC) (PPPD).

5.4 TGEN Approach

At the GQRA level, assessment typically comprises the following:

- Consideration of soil concentrations of organic substances in the context of soil saturation to determine the potential for migration under gravity.
- Comparison of soil leachate concentrations against appropriate GAC.
- Comparison of groundwater concentrations against appropriate GAC.

This approach is equivalent to Tier 1/Level 1 assessment as undertaken using ConSim v2.5 (2009) and/or EA (2006a).

The ideal remediation standard from the regulatory perspective is natural background quality, namely, there should be no significant deterioration in the water quality at the receptor (that is, it should not be detectable against natural background variations). This data may be obtained from up hydraulic gradient locations or regional datasets. The EA has published information on the baseline condition of several aquifers. It is recognised, however, that such data is rarely available and remediation to such a standard is often not technically achievable or cost effective. For this reason target concentrations utilised as GAC may be based on water quality standards that are appropriate for the intended use or to ensure that objectives for a groundwater or associated water body are met. The standards selected (as appropriate) are listed below in Section 5.5 and the sources of information listed in Section 9. In E&W, priority is given to UK standards, then EU standards with those that are statutory taking precedence over those that are non-statutory. Where data is not available for a specific substance, additional standards such as those published by WHO or USEPA are used if appropriate.

5.5 Controlled Water GAC

Controlled water GAC used are from current and/or proposed EQS values from directly relevant EU Directives or UK Regulations or DEFRA/EA statutory guidance values, where relevant the chosen EQS value is based on alkalinity and/or upland vs lowland waters etc. Where necessary the map of areas of hard and soft water (produced by the UK Drinking Water Inspectorate or EA records, or results of analyses) is/are used to determine the hardness of controlled waters in the vicinity of a site.

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6.0 RISKS TO OTHER RECEPTORS

6.1 Ecological

EA (2008c) has developed an ecological risk assessment (ERA) framework for contaminated soils in collaboration with relevant statutory authorities and industry. The ERA framework aims to provide a structured approach for assessing the risks to ecology from chemical contamination in soils, a requirement under Part IIA (contaminated land) of the Environmental Protection Act 1990. Where a statutory ecological receptor is identified on, or in close proximity to a site, an assessment in accordance with the current EA ERA framework is undertaken.

The ERA framework has been designed to:

- Establish whether pollutant linkages are likely to exist between contamination on a site and the identified designated ecological receptors by undertaking a desk study and compilation of a preliminary conceptual site model.
- Gather sufficient information for making decisions regarding whether harm to these receptors is occurring or could occur in the future by undertaking a screening step based on a comparison of chemical analyses of site soils with a soil screening value (SSV) for the contaminants of potential concern or by use of ecological surveys and/or biological testing to gather evidence for any harm to ecological receptors present at the designated site and then seeking to attribute the harm to the chemical contamination.

The document describing the ERA framework (SR1) is supported by six guidance documents:

- Desk studies and conceptual site models (SR2a).
- Use of soil screening values (SR2b).
- Use of bioassays (SR2c).
- Use of ecological surveys (SR2d).
- Attribution of cause and effect (SR2e).
- Standard operating procedures for bioassays (SR3).

The ERA framework for contaminants in soils is based on best practice in risk assessment and consequently can also be used in contexts other than Part IIA, such as within conservation regulations, and planning, and pollution control.

6.1.1 Part IIA

Ecological harm within Part IIA is confined to specified receptors, which are any ecological systems or living organisms forming part of such systems within a location which is:

- A SSSI notified under section 28 of the Wildlife and Countryside Act 1981.
- A NNR declared under section 35 of the above act.
- A marine nature reserve designated under section 36 of the above act.
- An area of special protection for birds under section 3 of the above act.
- Any habitat or site afforded policy protection under paragraph 6 of PPS 9 on nature conservation.
- Any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949.
- Any European site within the meaning of regulation 10 of the Conservation (Natural Habitats etc.) Regulations 1994.
- Any candidate SAC or potential SAC given equivalent protection.

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6.1.2 Habitats Directive

Regulation 3 of the Conservation Regulations 1994 (commonly known as the Habitats Regulations) implements the requirements of the European Habitats Directive 92/43/EEC in the UK. It also secures the protection of areas classified under the Wild Birds Directive 79/409/EEC.

The EA applies the regulations when considering all applications for authorisations, permissions, permits, consents and environmental licenses and for all relevant EA policy and operational activities. A risk assessment process is initiated in situations where an application under the UK system of land use planning or a review of permits, licenses, etc. is likely to impact on sites protected under the regulations. The ERA framework is used in this process.

6.1.3 Planning and Pollution Control

ODPM (2004) states that land contamination, or the possibility of it, is a material planning consideration in the preparation of development plan documents and in taking decisions on individual planning applications. Development plans and decisions on individual planning applications should take into account the potential sensitivity of the area to adverse effects from pollution, including nature conservation interests such as:

- SSSI.
- National Parks.
- Areas of Outstanding Natural Beauty (AONB).
- SAC and SPA.
- Wetlands of international importance (RAMSAR sites).

Where appropriate, SSV and the wider ERA framework is used to assess the possible risks to nature conservation interests when potentially polluting activities are proposed. Where necessary, they are also applied to the assessment and remediation of historic contamination.

6.2 Soil and Landscape Planting

Where soils are to be used (reused or imported) for landscape planting, an assessment is made in accordance with BSI (2015b) unless composted materials are used, in which case BSI (2011) is referred to. Dependent upon the risk scenarios identified, reference to other publications such as Dickinson et al (2000), NIPHE (2001) and specific scientific/research papers published by ourselves or contained in our extensive library may be made.

6.3 Buildings and Construction Materials

Building materials are often subjected to aggressive environments which cause them to undergo chemical or physical changes. These changes may result in loss of strength or other properties that may put at risk their structure integrity or ability to perform to design requirements. Aggressive conditions include:

- Severe climates.
- Coastal conditions.
- Polluted atmospheres.
- Contaminated soil.

In aggressive ground conditions, the potential for contaminant attack depends on the following:

- The presence of water as a carrier of chemical contaminants.
- The availability of the contaminant in terms of solubility, concentration and rates of replenishment.
- Contact between the contaminant and the building material.
- The nature of the building materials and its capability of being attacked by contaminants.

In general the thicker the building material the less likelihood there is for contaminant attack to cause damage to the integrity of the structure.

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6.3.1 Hazard Identification and Assessment

The identification of hazards is based on the findings of the investigation primarily relating to former land uses (i.e. the potential for chemical contamination and the likely forms present) and laboratory determination of the concentration of chemical contaminants. Clearly, the scope of laboratory testing is determined with respect to former land uses and contaminants which may cause harm to human health, and water resources.

The identification of hazards from contamination and subsequent assessment of risks is based on the following:

- The contaminants present on a site.
- The nature of the contaminant (e.g. calcium sulphate is much less soluble than sodium or magnesium sulphate and is, therefore, less of a concern with regards to sulphate attack).
- The concentration of contaminants. In general, the higher the concentration the greater the hazard.
- The solubility of the contaminants. Those that are not soluble will not generally react with materials.
- The permeability of the soils (i.e. the pathway through which fluids can transport contaminants to the building).

The process of risk assessment for building materials is concerned with identification of the hazard (contaminants at the site a source) and subsequently how the contaminants can reach the building (pathway) and how they can react with the building (receptor). Thus the risk assessment produced is based on the source-pathway-receptor model.

In this context, buildings include construction materials, underground structures and services. An assessment of potential risks to buildings and construction materials is undertaken in accordance with statutory guidance such as DCLG (2010) and other guidance such as DoE (1987 and 1992), BRE (1994), Highways England (1998), EA (2000a and 2001a) and other references as summarised in Section 9. Where required, concentrations of contaminants are compared against the threshold values given in DoE (1987) and DoE (1992) for organic contaminants, BRE (2005) for protection of concrete, Highways England (1998) for protection of earthworks, UKWIR (2010) and Water UK (2014) for the selection of potable water supply pipe materials and other references as summarised in Section 9.

6.4 Property

In this context, property is defined as crops, home grown/allotment produce, pets, livestock and wild animals, subject to shooting/fishing rights etc. It excludes buildings, underground structures, services, plant and machinery. A summary of the documents referred to in undertaking property risk assessments is contained in Section 9 and includes Alloway (2004) BSI (2011), DEFRA (2012c), Dickinson et al (2000), DoH (2010), EA (2007b), EU (2002), ICRCL (1990) and MAFF (1998) as superseded by DEFRA (2009b).

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7.0 RISK FROM GROUND GAS

7.1 Legislative Framework

The presence of harmful ground gasses could provide a potential source within in a pollutant linkage allowing the regulator (local authority or the EA) to determine if there is a significant possibility of harm being caused to humans, buildings or the environment.

With regards to planned future use, ODPM (2004) requires developers to undertake appropriate risk assessments to demonstrate to the local authority that proposals adequately mitigate any potential hazards associated with contamination including ground gas. The Town and Country Planning (General Development Procedure) Order 1995, requires the local authority to consult with the EA before granting planning permission for development within 250m of land which is being used for the deposit of waste or has been at any time in the last 30 years, or it has been notified for the purposes of that provision.

Building control bodies enforce compliance with DCLG (2010). Practical guidance is provided in approved documents, one of which is Part C (site preparation and resistance to contaminants and moisture), which seeks to protect the health, safety and welfare of people in and around buildings, and includes requirements for protection against harm from ground gas.

In complying with DCLG (2010), a risk assessment approach is required in relation to gaseous contamination based on the source-pathway-receptor conceptual model procedure. We have adopted procedures described in the relevant documents along with BSI (2013a) for investigation and assessments of risk of a development being affected by ground gases and if appropriate the identification of mitigation measures.

An assessment of the risk of the site being affected by ground gases is based on the following aspects:

- Source of the gas.
- Investigation information.
- Migration feasibility.
- Sensitivity of the development and its location relative to the source.

7.2 General

The following assessment relates to the potential for, and the effects of, gasses generated by biodegradable matter. A separate but related class of problem involves the migration of hydrocarbon vapour phase resulting for example from spillages of petroleum products and/or solvents. The principal ground gasses are carbon dioxide (CO_2) and methane (CH_4). The potential for the development to be affected by radon gas is also considered within the Phase 1 PRA.

Where risks from ground gases are identified as a potential SPL, then an appropriate programme of gas monitoring and/or risk assessment is undertaken.

During the site investigation, the design of any gas monitoring is based upon the CSM derived as part of the Phase 1 PRA. An appropriate number of boreholes excavated during the site investigation and sited to target the SPL would be installed with standpipes (e.g. a 19mm to 50mm diameter HDPE monitoring standpipe, protected by an end cap and gravel pack, completed with a bung, valve and metal cover etc.). The response zone (the slotted section of the pipe) would be confined to the strata identified as the potential pathway for the migration of ground gases. Typically, the first one metre from ground level comprises plain standpipe with a bentonite seal to prevent the ingress of atmospheric gases.

In accordance with CIRIA (2007) and based on the gas hazard and site sensitivity, an appropriate density/spacing for the boreholes would be chosen. Subsequently, in accordance with CIRIA (2007) and based on the generation potential, and site sensitivity for the development, an appropriate programme of monitoring over an appropriate period of time would be designed and implemented, ideally during which at least one set of monitoring would be undertaken during low/falling atmospheric pressure.

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The results of the gas monitoring assessment are then used to generate a gas screening value (GSV) for the worst case concentration of the gas at the worst case steady state flow, which would then be compared with relevant guidance such as NHBC (2007), BSI (2016) and CIRIA (2007) etc.

It should be noted that the NHBC traffic light system is specifically for low rise housing developments with a clear, ventilated subfloor void, whereas CIRIA is for residential (not low rise) developments and/or office/commercial/industrial developments.

Where appropriate, the local environmental health department and/or building control are consulted on the scope of any proposed measures to be adopted at the earliest opportunity.

7.3 Ground Gas GAC

7.3.1 NHBC Traffic Light System

The table below contains typical maximum concentrations and Gas Screening Values (GSV) for the traffic light system detailed in NHBC (2007).

Traffic Light Classification	Methane		Carbon Dioxide	
	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)
Green	1	0.13	5	0.78
Amber 1	5	0.63	10	1.60
Amber 2	20	1.60	30	3.10
Red				

Based on the traffic light classification, the following recommendations for gas protection measures are provided by NHBC (2007):

Traffic Light Classification	Ground Protection Measures Required
Green	Ground gas protection measures are not required.
Amber 1	Low level ground gas protection measures are required, using a membrane and ventilated subfloor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE (2001). Ventilation of the subfloor void should be designed to provide a minimum of one complete volume change per 24hrs.
Amber 2	High level ground gas protection measures are required, creating a permeability contrast to prevent ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE (2001). Membranes used should always be fitted by a specialist contractor and should be fully certified. As with Amber 1, ventilation of the subfloor void should be designed to provide a minimum of one complete volume change per 24hrs.
Red	Standard residential housing is not normally acceptable without further ground gas risk assessment and/or possible remedial mitigation measures to reduce/remove the source of the ground gases. In certain circumstances, active protection methods could be applied, but only when there is a legal agreement assuring the management and maintenance of the system for the life of the property.

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7.3.2 CIRIA System

GAC for ground gas based on the modified Wilson and Card and the CIRIA recommendations for gas protection measures (CIRIA 2007) are summarised in the tables below:

Characteristic Situation	Risk Classification	GSV (l/hr) (CH_4 or CO_2)	Additional Factors	Typical Sources
1	Very low risk	<0.07	Typically CH_4 <1%v/v and/or CO_2 <5%v/v. Otherwise consider increase to Situation 2.	Natural soil with a low organic content and typical made ground.
2	Low risk	<0.7	Borehole flow rate not to exceed 70l/hr. Otherwise consider increase to Situation 3.	Natural soil with a high peat/organic content and typical made ground.
3	Moderate risk	<3.5	None.	Old landfill, inert waste and flooded mine working.
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mine working susceptible to flooding and completed landfill (DoE 1991 & 1995b).
5	High risk	<70	None.	Un-flooded and inactive mine with near surface workings.
6	Very high risk	>70	None.	Recent landfill sites.

Characteristic Situation	Residential Building (Not Low Rise)		Commercial/Industrial Development	
	Levels of Protection	Typical Scope of Protective Measures	Levels of Protection	Typical Scope of Protective Measures
1	None	No special precautions.	None	No special precautions.
2	2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM9 and underfloor venting. b) Beam and block or precast concrete and 2000g DPM/reinforced gas membrane and underfloor venting. All joints and penetrations sealed.	1 to 2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM9. b) Beam and block or precast concrete slab and minimum 2000g DPM/reinforced gas membrane. c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor subspace.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000g DPM/reinforced gas proof membrane and passively ventilated underfloor subspace or positively pressurised underfloor subspace.
4	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor subspace or positively pressurised underfloor subspace, oversite capping or blinding and in ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor subspace with monitoring facility.
5	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor subspace, oversite capping and in ground venting layer, and in ground venting wells or barriers.	3 to 4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor subspace with monitoring facility. In ground venting wells or barriers.

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8.0 WASTE CLASSIFICATION

8.1 Revised Waste Framework Directive

One of the relevant objectives of EU (2008b) (RWFD) is to ensure that waste is recovered or disposed without endangering human health and without using processes or methods which could harm the environment, and in particular without:

- risk to water, air, soil, plants or animals.
- causing nuisance through noise or odours.
- adversely affecting the countryside or places of special interest.

The RWFD also provides the general framework of waste management requirements and sets the basic EU waste management definitions. EU (2000b) (LoW) establishes the classification system, including the distinction between hazardous and non-hazardous wastes. It is closely linked to the main characteristics that render waste hazardous as contained in Annex III of the RWFD. The LoW has been amended by EU (2014a) and Annex III of the RWFD replaced by EU (2014b). Both of these new regulations came into force in order to align waste classification with relevant sections of and approaches used in EU chemicals regulations, such as EU (2006b) (REACH) and EU (2008c) (CLP), which in turn adapt for the EU the UN globally harmonised system for chemicals classification.

Waste is not considered to be a substance, a mixture or an article. Consequently, obligations under the REACH and CLP regulations do not apply for producers or holders of waste. Nevertheless, information generated in the frameworks of REACH and CLP that set criteria for substances to be classified as hazardous are related to some of the hazardous properties applicable to the classification of waste. In particular, Annex VI of CLP contains official harmonised classifications of substances, which have to be taken into account where the classification of waste depends on the presence of hazardous substances. The classification of substances is periodically updated by ECHA in the form of a new EU regulation, which automatically amends EU (2008c).

8.2 Landfill Directive

EU (1999) (LFD) defines the categories of waste applicable to landfill sites as hazardous, non-hazardous, municipal and inert. A landfill is defined as a waste disposal site for the deposit of waste onto or into land. Landfills are divided into three classes:

- Landfills for hazardous waste.
- Landfills for non-hazardous waste.
- Landfills for inert waste.

The three main categories of waste and the options for landfilling are as follows:

- Hazardous with or without additional treatment prior to landfill or SNRHW suitable for placement in a dedicated cell in a suitably permitted non-hazardous landfill site.
- Non-hazardous.
- Inert and suitable for disposal to an appropriately permitted landfill site.

In order to establish the presence and significance of hazards associated with any CD&E arisings and therefore the resultant options for management of the materials, and where necessary the appropriate class of facility the waste can be taken to, it is therefore necessary to:

- determine the presence of hazardous properties within the materials.
- determine the category of the waste.
- determine if the waste meets the requirements for reuse onsite, recovery/recycling on or offsite, or disposal offsite as waste.

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8.3 Hazardous Waste Assessment

The main statutory guidance document used to properly classify waste as either hazardous or non-hazardous is UKEA (2015). The stepped methodology for classifying a waste and assessing any hazardous properties is as follows:

- Check if the waste needs to be classified.
- Identify the code(s) that may apply to the waste.
- Identify the assessment required to select the correct code(s).
- Determine the chemical composition of the waste.
- Determine if the substances in the waste are hazardous substances or persistent organic pollutants.
- Assess the hazardous properties of the waste.
- Assign and describe the classification code(s).

8.4 Inert Waste Assessment

The waste types disposed to a landfill site permitted to accept inert waste or recovered at a site permitted or exempted in accordance with DEFRA (2010a) should be classified as inert. No hazardous or contaminated wastes, as defined in EU (2003), should be accepted at such sites.

The source and origin of the waste along with a description (e.g. physical form, consistency, composition, colour, odour and likely behaviour etc.) should be determined for all material accepted at such inert waste facilities. The materials should be stable, non-reactive and with a sufficient bearing capacity for the end use.

In accordance with the LFD and statutory guidance, the only materials allowed for disposal/recovery at such inert waste facilities without more detailed information (e.g. chemical analyses, site investigation data etc.) should be restricted to single source material from a known site and a reliable producer. The material from the site/source should not be contaminated and should not contain significant quantities of deleterious materials such as wood, plastic etc. Materials potentially suitable for recovery at such inert waste facilities without laboratory analysis should be restricted to the following:

LoW Code	Description	Restrictions
17 01 01	Concrete	Selected CD&E waste only
17 01 02	Bricks	Selected CD&E waste only
17 01 03	Tiles & Ceramics	Selected CD&E waste only
17 01 07	Mixture of Concrete, Bricks, Tiles & Ceramics	Selected CD&E waste only
17 05 04	Soil & Stones (e.g. natural clay & sand etc.)	Selected CD&E waste not from contaminated sites (excluding topsoil/peat when used as subsoil or fill)
20 02 02	Soil & Stones (e.g. natural clay & sand etc.)	Selected garden & park waste only (excluding topsoil/peat when used as subsoil or fill)

Notes

- Selected CD&E or garden & park waste with low (non-significant) contents of other types of materials (i.e. metals, plastics, organics, wood, rubber etc.). The origin of the waste must be known and relevant information regarding the waste must have been assessed.
- No CD&E waste from buildings/land contaminated with dangerous substances (e.g. 17 01 06 & 17 05 03).
- No CD&E waste from buildings treated/painted with dangerous substances in significant amounts.
- These materials should only be accepted if they arise from a single identified source.
- Mixtures of different types of these wastes from the same single source are acceptable without testing.
- Mixtures of these wastes from different sources are not acceptable unless pre-testing is carried out.

8.5 Overall Assessment

If as a result of the categorisation exercise the waste materials were considered to be hazardous or potentially inert and required disposal to landfill then a further stage of assessment would be required to determine if the waste meets the requirements for disposal at a particular category of facility. This is done in the form of WAC testing following the procedures laid out in EU (2003), as superseded by DEFRA (2010a). It should be noted that the LFD, EU (2003) and the associated regulations do not apply to the use of suitable uncontaminated waste for redevelopment, restoration and filling in work or for construction purposes, or for recovery activities.

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8.6 Waste Management Options

The assessment methodologies summarised above allow waste materials to be categorised in accordance with statutory requirements. Dependent upon the results of the assessment, the options available to the producer of the CD&E waste can be summarised as follows:

- Potential reuse onsite subject to an environmental risk assessment, relevant permit conditions and/or the development plans for the site.
- Potential reduction in the volume and or the category of waste arisings by treatment onsite (e.g. hotspotting, screening etc.) in accordance with statutory requirements prior to landfill.
- Potential recovery of the arisings at a local landscape restoration or construction project (i.e. suitable permitted facilities or those exempt from waste management regulations) or at recycling facilities (e.g. for screening, washing, treatment etc.).

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Appendix C GroundSure Insight Report.

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Groundsure Enviro Insight

Address:	**19 Green Lane,Spalding,Lincolnshire,PE11 2YD,**
Date:	**2 Dec 2016**
Reference:	**EMS-395913_529590**
Client:	**EmapSite**

NW N NE



W E

SW S SE

Aerial Photograph Capture date:	06-Apr-2015
Grid Reference:	524246,322290
Site Size:	0.24ha

Report Reference: EMS-395913_529590
Client Reference: EMS_395913_529590

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	10	48	68
1.2 Additional Information - Historical Tank Database	0	0	5	1
1.3 Additional Information - Historical Energy Features Database	0	0	7	36
1.4 Additional Information - Historical Petrol and Fuel Site Database	0	0	2	0
1.5 Additional Information - Historical Garage and Motor Vehicle Repair Database	0	0	8	4
1.6 Potentially Infilled Land	0	5	5	9

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	3
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	1	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	1
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency Historic Landfill Sites	0	0	0	0	0	2
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency Licensed Waste Sites	0	0	0	0	0	1

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	1	5	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	1	3
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	0	0	0	0	Not searched	Not searched

	On-site	0-50m	51-250	251-500	501-1000	1000-1500

Section 6: Hydrogeology and Hydrology	0-500m					
6.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	Yes	Yes
6.10 Detailed River Network entries within 500m of the site	0	0	0	1	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 7: Flooding	
7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
7.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site	Yes
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Medium
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Not Prone
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Not Applicable

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	1
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	2	0	0	1	0	1
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Moderate
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Negligible
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Moderate
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	No
10.3 Are there any brine affected areas within 75m of the study site?	No

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Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

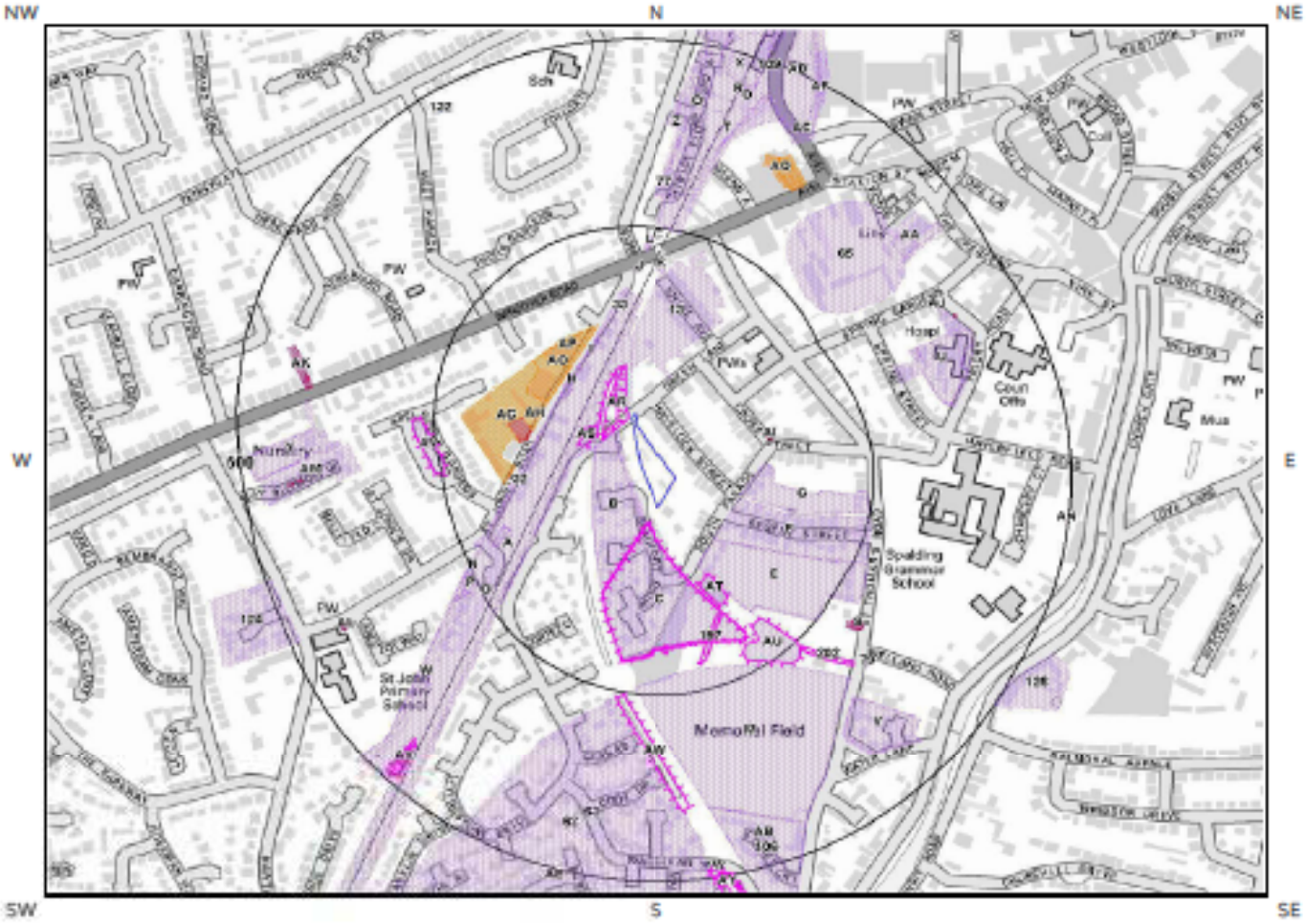
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



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Site Outline

250
500
Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

Industrial Land Use

Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 126

ID	Distance [m]	Direction	Use	Date
1A	11	NW	Railway Sidings	1938
2A	11	NW	Railway Sidings	1903
3B	18	W	Nursery	1932
4C	21	SW	Unspecified Works	1950
5B	22	W	Nursery	1938
6B	22	W	Nursery	1950
7C	24	SW	Sewage Works	1938
8C	24	SW	Sewage Works	1932
9C	24	SW	Sewage Works	1932
10D	49	NW	Railway Sidings	1887
11AS	53	W	Unspecified Pit	1887
12D	54	NW	Railway Sidings	1932
13	58	N	Nursery	1932
14D	59	NW	Railway Sidings	1950
15F	81	SE	Nursery	1903
16E	81	SE	Nursery	1950
17E	82	SE	Nursery	1932
18F	83	SE	Nursery	1903
19E	83	SE	Nursery	1938
20G	84	E	Nursery	1903
21G	85	E	Nursery	1903
22H	85	NW	Railway Building	1903
23H	86	NW	Railway Sidings	1903
24H	86	NW	Railway Building	1938
25H	88	W	Railway Building	1932
26H	88	NW	Railway Building	1950
27I	95	NW	Railway Building	1938
28I	96	NW	Railway Buildings	1950
29I	97	NW	Railway Buildings	1932
30I	104	NW	Railway Building	1938
31AT	108	SE	Unspecified Heap	1990
32	114	W	Railway Sidings	1903
33	136	N	Railway Building	1903
34A	183	W	Railway Building	1887

35A	184	W	Railway Building	1903
36A	184	W	Railway Building	1938
37A	185	W	Railway Building	1932
38A	186	W	Railway Building	1903
39A	187	W	Railway Building	1950
40J	187	N	Railway Building	1903
41J	189	N	Railway Building	1950
42J	190	N	Unspecified Tank	1938
43J	191	N	Railway Building	1932
44K	192	N	Railway Building	1990
45K	192	N	Railway Building	1980
46AU	197	SE	Unspecified Heap	1990
47L	217	N	Railway Buildings	1938
48L	217	N	Railway Buildings	1950
49L	220	N	Railway Building	1932
50M	220	S	Nursery	1932
51M	221	S	Nursery	1950
52N	243	W	Railway Building	1938
53AV	244	W	Unspecified Heaps	1990
54N	245	W	Railway Buildings	1950
55N	245	W	Railway Buildings	1932
56O	247	N	Railway Sidings	1980
57O	249	N	Railway Sidings	1950
58P	249	W	Railway Buildings	1887
59P	252	SW	Railway Building	1938
60P	252	SW	Railway Building	1903
61P	253	SW	Railway Buildings	1903
62	258	S	Nursery	1950
63	260	S	Nursery	1980
64W	266	SW	Railway Sidings	1903
65	266	NE	Police Station	1887
66P	274	SW	Railway Building	1938
67O	287	N	Railway Sidings	1887
68Q	290	N	Railway Sidings	1929
69Q	290	N	Railway Sidings	1929
70O	291	N	Railway Sidings	1938
71R	291	N	Railway Sidings	1950
72R	291	N	Railway Sidings	1903
73S	292	SE	Electric Substation	1980
74S	292	SE	Electric Substation	1990
75T	294	N	Railway Sidings	1929
76T	294	N	Railway Sidings	1929
77	303	N	Railway Building	1950
78U	310	NE	Hospital	1938
79	331	SE	Railway Building	1938
80U	339	NE	Hospital	1980

81U	339	NE	Hospital	1990
82U	339	NE	Hospital	1950
83U	343	NE	Hospital	1932
84U	345	NE	Hospital	1887
85AM	350	W	Unspecified Works	1990
86V	352	SE	Nursery	1932
87V	352	SE	Nursery	1950
88V	354	SE	Nursery	1938
89W	371	SW	Railway Building	1903
90W	372	SW	Railway Building	1938
91Y	380	W	Nursery	1932
92AA	381	NE	Police Station	1938
93X	381	N	Railway Station	1929
94X	381	N	Railway Station	1929
95Z	385	N	Railway Building	1950
96Y	388	W	Nursery	1990
97Z	389	N	Railway Building	1950
98Y	394	W	Nursery	1938
99AA	396	NE	Police Station	1950
100AA	396	NE	Police Station	1932
101Y	397	W	Nursery	1950
102AA	402	NE	Police Station	1990
103AA	402	NE	Police Station	1980
104AB	404	S	Nursery	1932
105AB	405	S	Nursery	1950
106	407	S	Nursery	1938
107AC	426	NE	Railway Building	1950
108AC	427	NE	Railway Building	1950
109	427	NE	Railway Sidings	1990
110AD	438	NE	Railway Sidings	1929
111AD	438	NE	Railway Sidings	1929
112X	452	N	Railway Station	1887
113X	452	N	Railway Station	1950
114X	452	N	Railway Station	1903
115X	457	N	Railway Station	1950
116X	458	N	Railway Station	1938
117X	461	N	Railway Station	1990
118X	461	N	Railway Station	1980
119AE	461	S	Nursery	1932
120AE	466	S	Nursery	1938
121AF	482	NE	Railway Buildings	1950
122AF	483	NE	Railway Building	1950
123AF	483	NE	Railway Building	1903
124	487	W	Nursery	1932
125AF	488	NE	Railway Building	1887
126	499	SE	Unspecified Malthouses	1903

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 6

ID	Distance (m)	Direction	Use	Date
127AG	152	W	Tanks	1967
128AG	152	W	Tanks	1973
129AG	152	W	Tanks	1982
130AG	152	W	Tanks	1986
131N	249	W	Unspecified Tank	1931
132	471	NW	Unspecified Tank	1932

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 43

ID	Distance (m)	Direction	Use	Date
133AH	121	W	Electricity Substation	1982
134AH	121	W	Electricity Substation	1986
135AH	122	W	Electricity Substation	1973
136AI	127	NE	Electricity Substation	1986
137AI	131	NE	Electricity Substation	1967
138AI	132	NE	Electricity Substation	1973
139AI	135	NE	Electricity Substation	1982
140S	283	SE	Electricity Substation	1992
141S	283	SE	Electricity Substation	1986
142S	286	SE	Electricity Substation	1998
143S	286	SE	Electricity Substation	1996
144S	286	SE	Electricity Substation	1996
145S	287	SE	Electricity Substation	1967
146S	287	SE	Electricity Substation	1973
147S	289	SE	Electricity Substation	1982
148AJ	400	NE	Electricity Substation	1986
149AJ	400	NE	Electricity Substation	1992
150AK	406	W	Electricity Substation	1967

151AJ	409	NE	Electricity Substation	1982
152AK	410	W	Electricity Substation	1979
153AK	411	W	Electricity Substation	1982
154AK	411	W	Electricity Substation	1997
155AJ	412	NE	Electricity Substation	1967
156AK	413	W	Electricity Substation	1989
157AK	413	W	Electricity Substation	1986
158AK	413	W	Electricity Substation	1992
159AJ	413	NE	Electricity Substation	1973
160AJ	414	NE	Electricity Substation	1998
161AJ	414	NE	Electricity Substation	1996
162AJ	414	NE	Electricity Substation	1996
163AL	424	W	Electricity Substation	1979
164AL	424	W	Electricity Substation	1967
165AL	424	W	Electricity Substation	1982
166AM	425	W	Electricity Substation	1979
167AM	426	W	Electricity Substation	1982
168AL	426	W	Electricity Substation	1997
169AL	428	W	Electricity Substation	1992
170AM	437	W	Electricity Substation	1997
171AM	439	W	Electricity Substation	1989
172AM	439	W	Electricity Substation	1986
173AM	439	W	Electricity Substation	1992
174AN	494	E	Electricity Substation	1986
175AN	499	E	Electricity Substation	1992

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 2

ID	Distance (m)	Direction	Use	Date
176AG	128	W	Petroleum Depot	1973
177AG	128	W	Petroleum Depot	1967

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 12

ID	Distance (m)	Direction	Use	Date
178AO	100	NW	Garage	1992
179AO	100	NW	Garage	1982
180AO	100	NW	Garage	1986
181AO	101	NW	Garage	1973
182AG	101	NW	Garage	1967
183AP	107	NW	Garage	1996
184AP	107	NW	Garage	1998
185AP	107	NW	Garage	1996
186AQ	356	NE	Garage	1986
187AQ	357	NE	Garage	1967
188AQ	359	NE	Garage	1982
189AQ	360	NE	Garage	1973

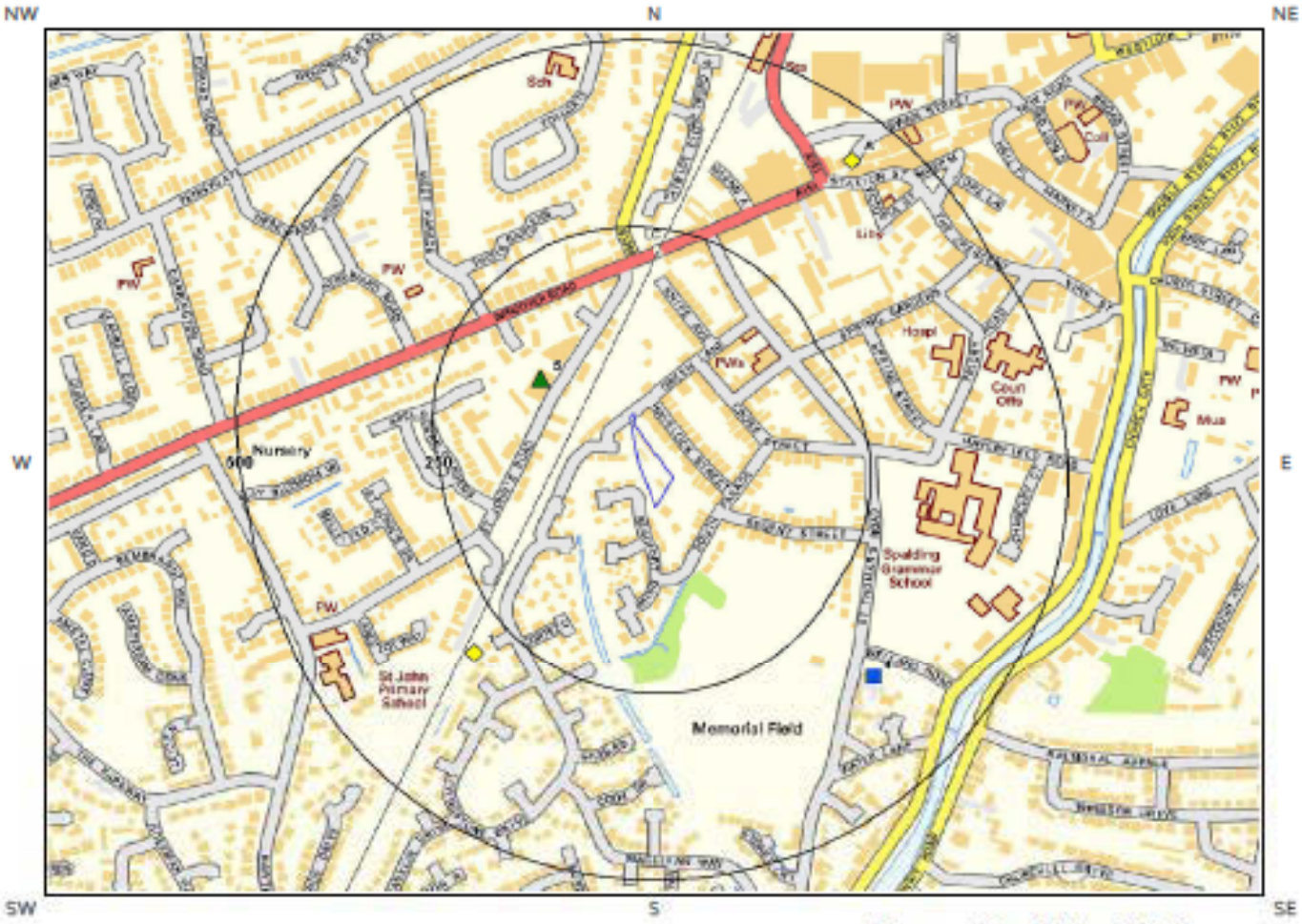
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 19

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
190AR	5	W	Pond	1887
191AR	19	W	Pond	1950
192C	24	SW	Sewage Works	1938
193C	24	SW	Sewage Works	1932
194C	24	SW	Sewage Works	1932
195AS	53	W	Unspecified Pit	1887
196AT	108	SE	Unspecified Heap	1990
197	160	SE	Pond	1887
198AU	197	SE	Unspecified Heap	1990
199AV	244	W	Unspecified Heaps	1990
200AW	253	S	Ponds	1980
201AW	253	S	Ponds	1990
202	260	SE	Pond	1887
203AX	436	SW	Pond	1887
204AX	446	SW	Pond	1980
205AY	488	S	Pond	1950
206AY	496	S	Pond	1980
207AY	496	S	Pond	1990
208AY	497	S	Pond	1887

2. Environmental Permits, Incidents and Registers Map



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- Site Outline
- Search Buffers (m) — 250 — 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

3

The following List 2 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	303	SW	524020 322040	Name: Emg Ford Status: Not Active Receiving Water: Na	Authorised Substances: pH
2A	437	NE	524500 322700	Name: Spalding Launderette Status: Not Active Receiving Water: Na	Authorised Substances: pH
3A	437	NE	524500 322700	Name: Sainsburys Petrol Filling Station Status: Not Active Receiving Water: Na	Authorised Substances: pH

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
5	124	NW	524104 322405	Address: Lovells, St Johns Road, Spalding, Lincs, PE11 1JA Process: Vehicle Refinishers Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

1

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
4	357	SE	524528 322008	Address: WELLAND ROAD SPS, WELLAND ROAD, SPALDING, LINCS, PE11 2XZ Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AWSNF666 Permit Version: 1	Receiving Water: River Welland Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 09/06/1977 Effective Date: 09-Jun-1977 Revocation Date: -

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

0

Database searched and no data found.

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

Database searched and no data found.

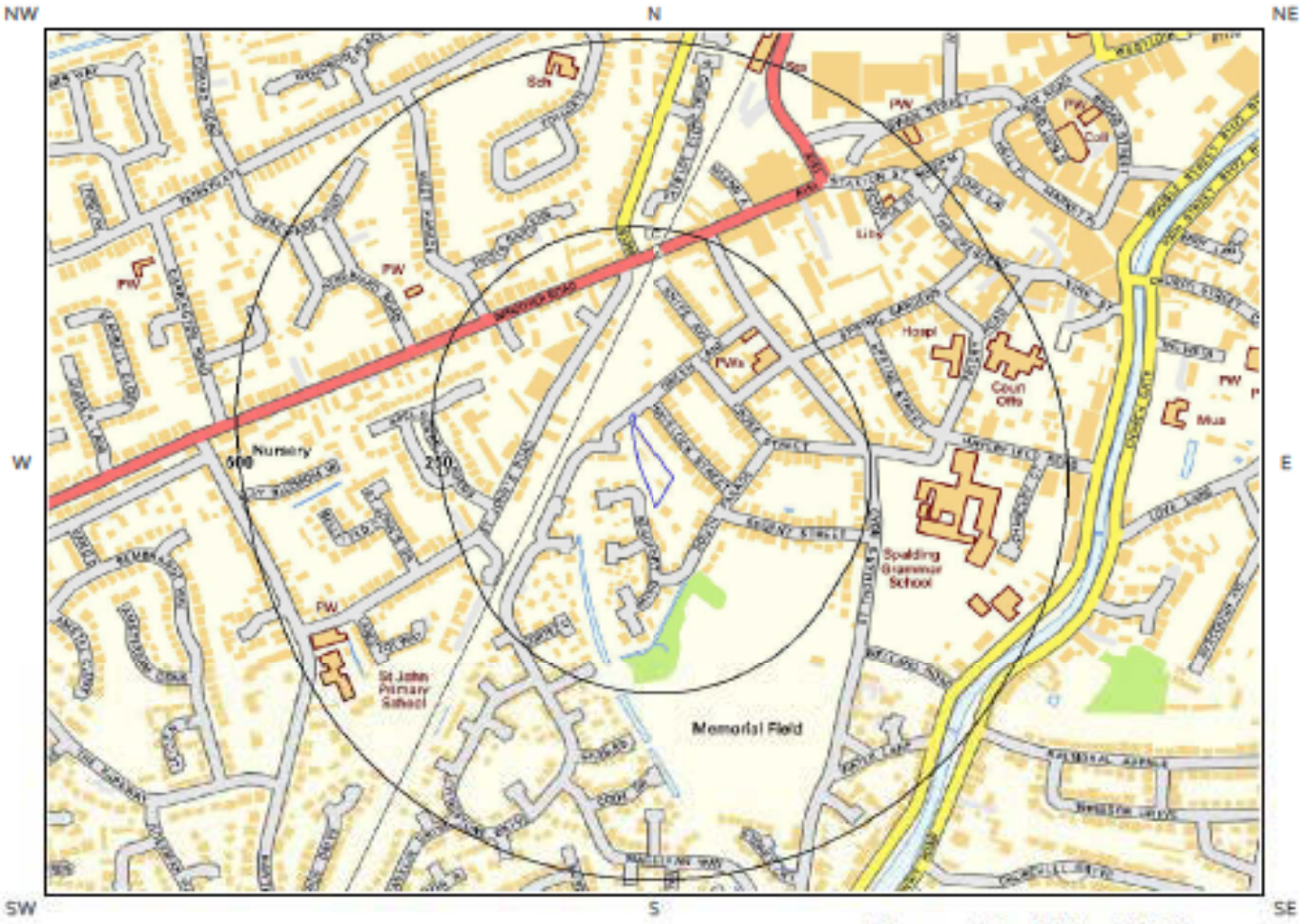
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

---

3. Landfill and Other Waste Sites Map



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Site Outline

250
500
Search Buffers (m)

E.A. Active Landfill

E.A. Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

E.A. Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

2

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1379	N	524300 324000	Site Address: Woolram Wygate, Spalding, Lincolnshire Waste Licence: - Site Reference: RD7-71-01/89, SH-71-01/89, 2500/5041 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1471	N	524300 324000	Site Address: Woolram Wygate, Spalding, Lincolnshire Waste Licence: - Site Reference: RD7-71-01/89, SH-71-01/89, 2500/5041 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

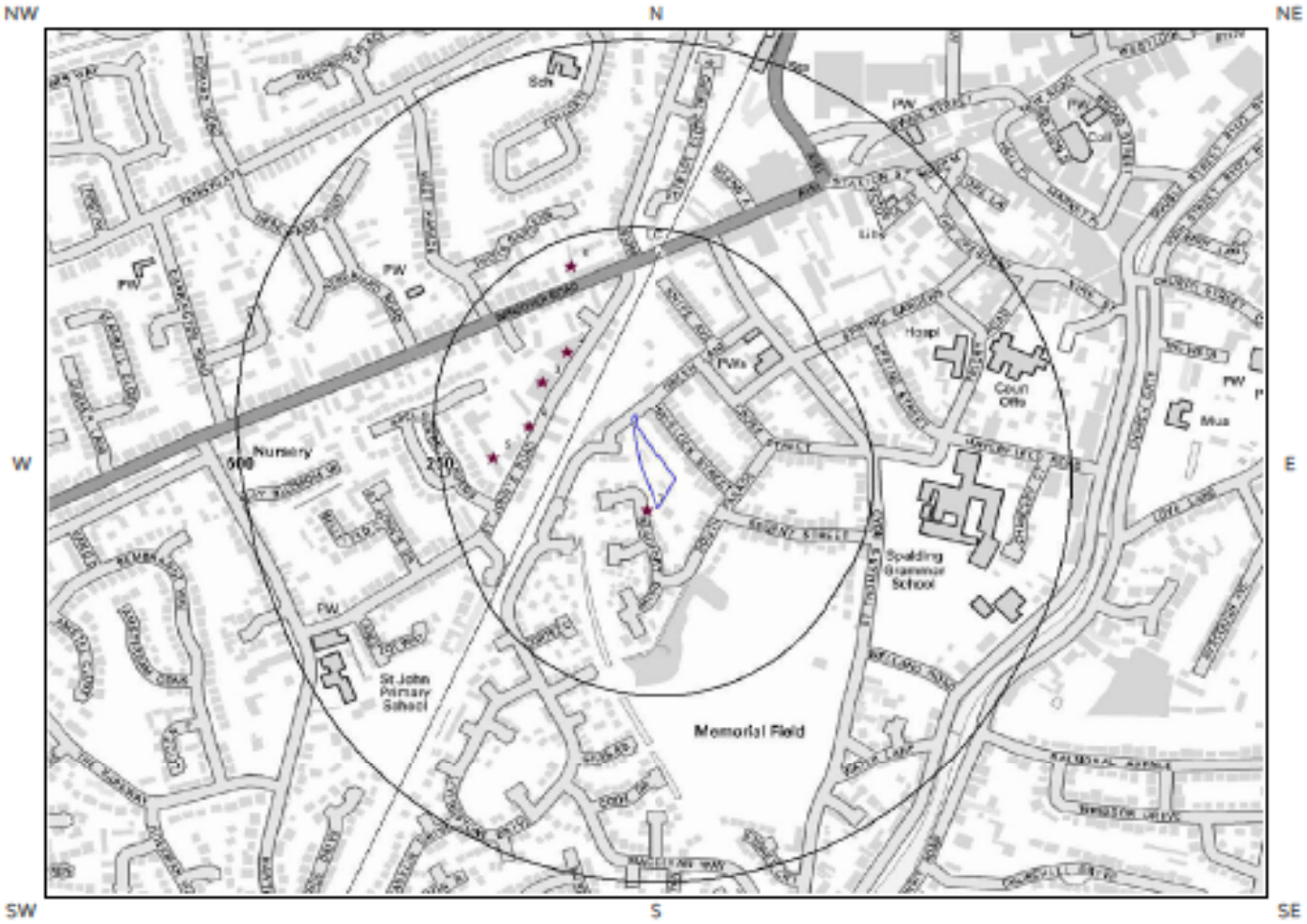
3.2.2 Records of Environment Agency licensed waste sites within 1500m of the study site:

1

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1363	SE	525400 321500	Site Address: Street Mr T J, Elvander, Clay Lake, Spalding, Lincolnshire, PE12 6BL Type: Metal Recycling Site (Vehicle Dismantler) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: STR002 EPR reference: EA/EPR/TP3198NV/A001 Operator: Street Mr T J Waste Management licence No: 71027 Annual Tonnage: 5000.0	Issue Date: 09/09/1992 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Bridge Cottage, Clay Lake Correspondence Address: -

4. Current Land Use Map



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Site Outline

Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 6

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	14	W	Electricity Sub Station	524237 322234	PE11	Electrical Features	Infrastructure and Facilities
2	121	NW	Rapid Fit	524136 322446	St Johns Road, Spalding, PE11 1JA	Vehicle Repair, Testing and Servicing	Repair and Servicing
3	123	NW	E M G Motor Group	524104 322404	St. Johns Road, Spalding, PE11 1JA	New Vehicles	Motoring
4	130	W	Electricity Sub Station	524088 322346	PE11	Electrical Features	Infrastructure and Facilities
5	182	W	Lovells Car & Van Rental	524042 322304	St. Johns Road, Spalding, PE11 1JA	Vehicle Hire and Rental	Hire Services
6	215	N	Tulip Mobility	524141 322560	86, Winsover Road, Spalding, PE11 1HA	Disability and Mobility Equipment	Consumer Products

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
TFD	TIDAL FLAT DEPOSITS	CLAY AND SILT [UNLITHIFIED DEPOSITS CODING SCHEME]

5.3 Bedrock and Solid Geology

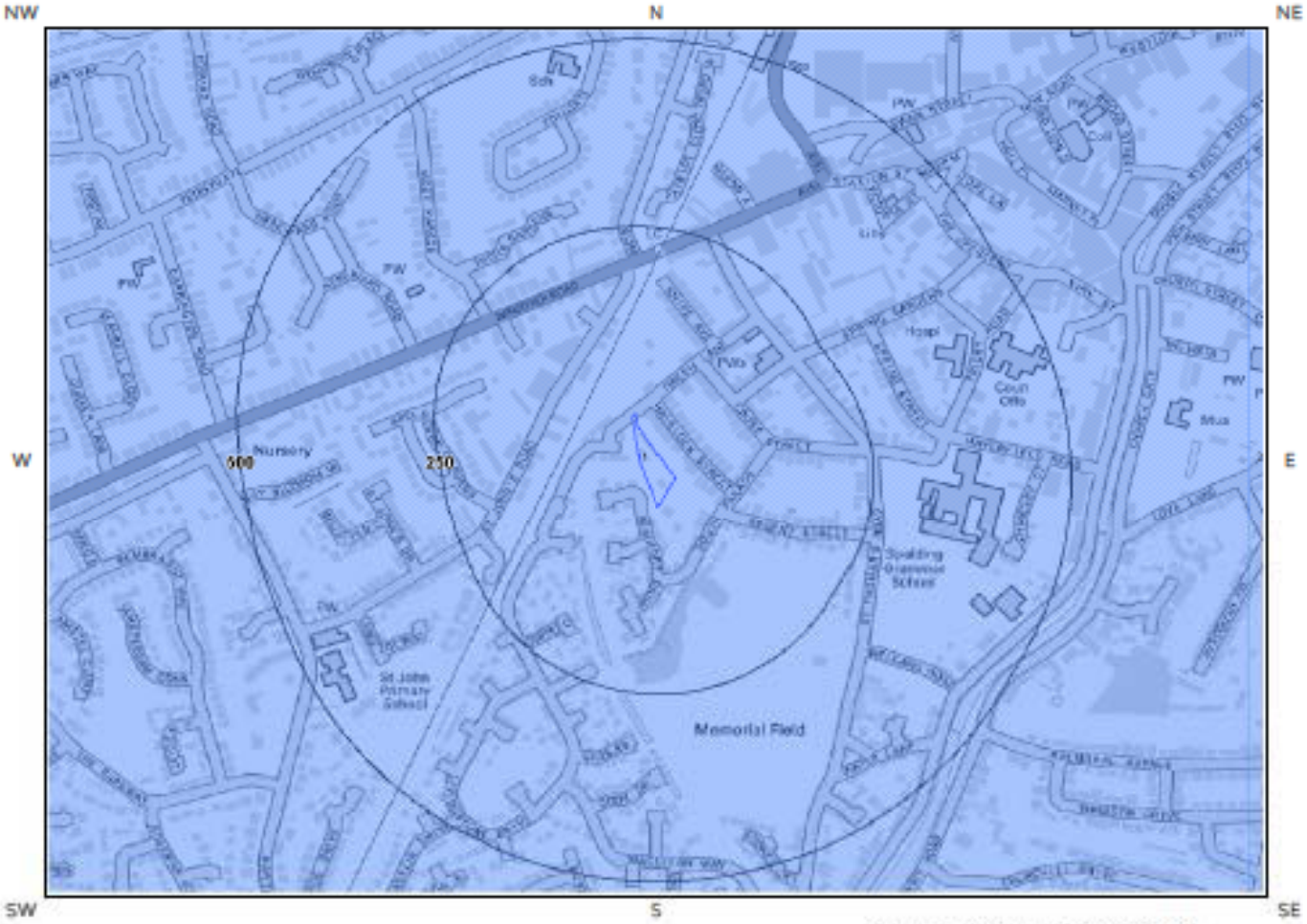
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
OXC-MDST	OXFORD CLAY FORMATION	MUDSTONE

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

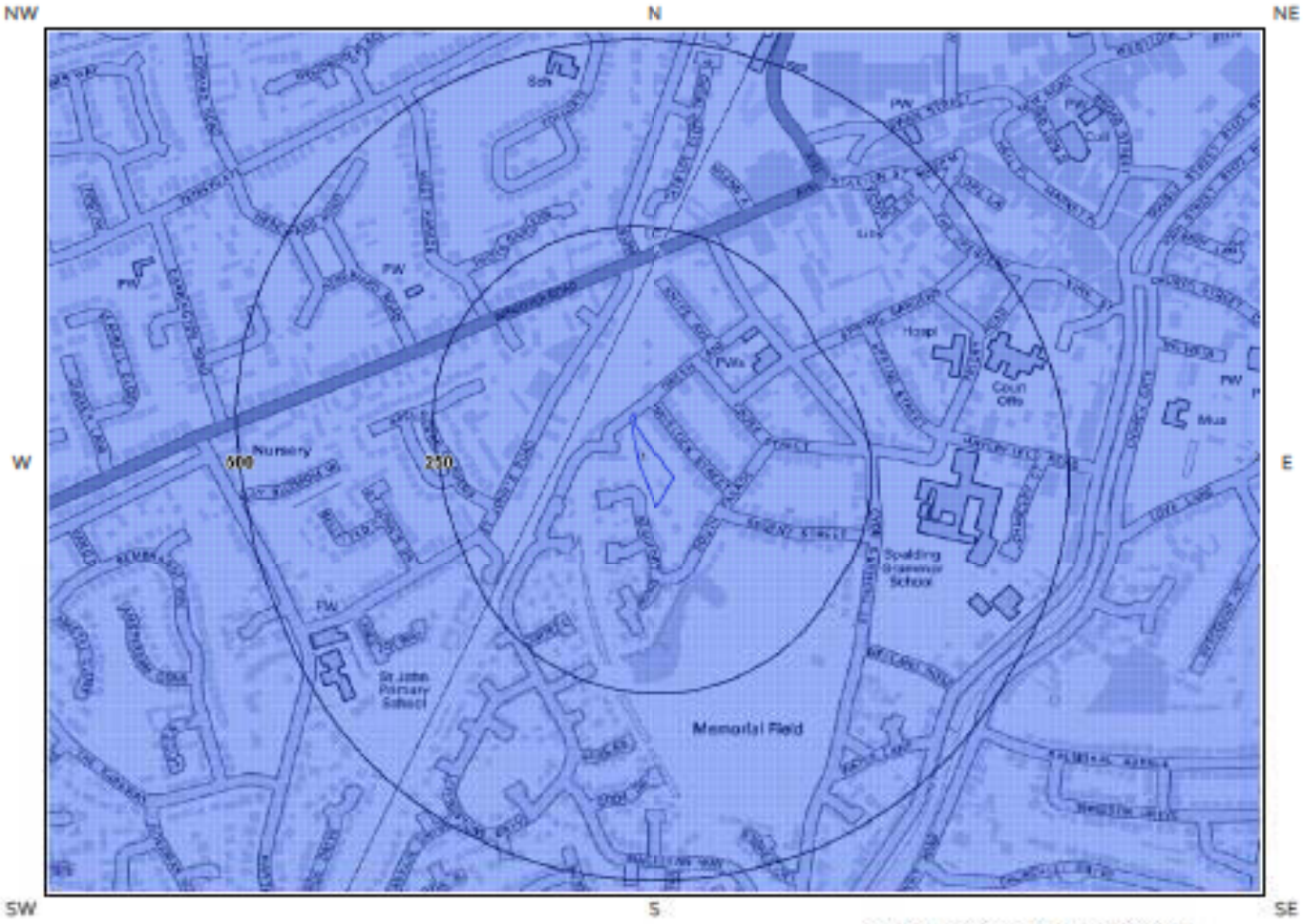
6a. Aquifer Within Superficial Geology



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Site Outline
250
500
Search Buffers (m)
Principal Aquifer
Secondary (A) Aquifer - Permeable Layers
Secondary (B) Aquifer - Lower Permeability Layers
Secondary Aquifer - Undifferentiated Layers
Unproductive
Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



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Site Outline

250 — 500 — Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

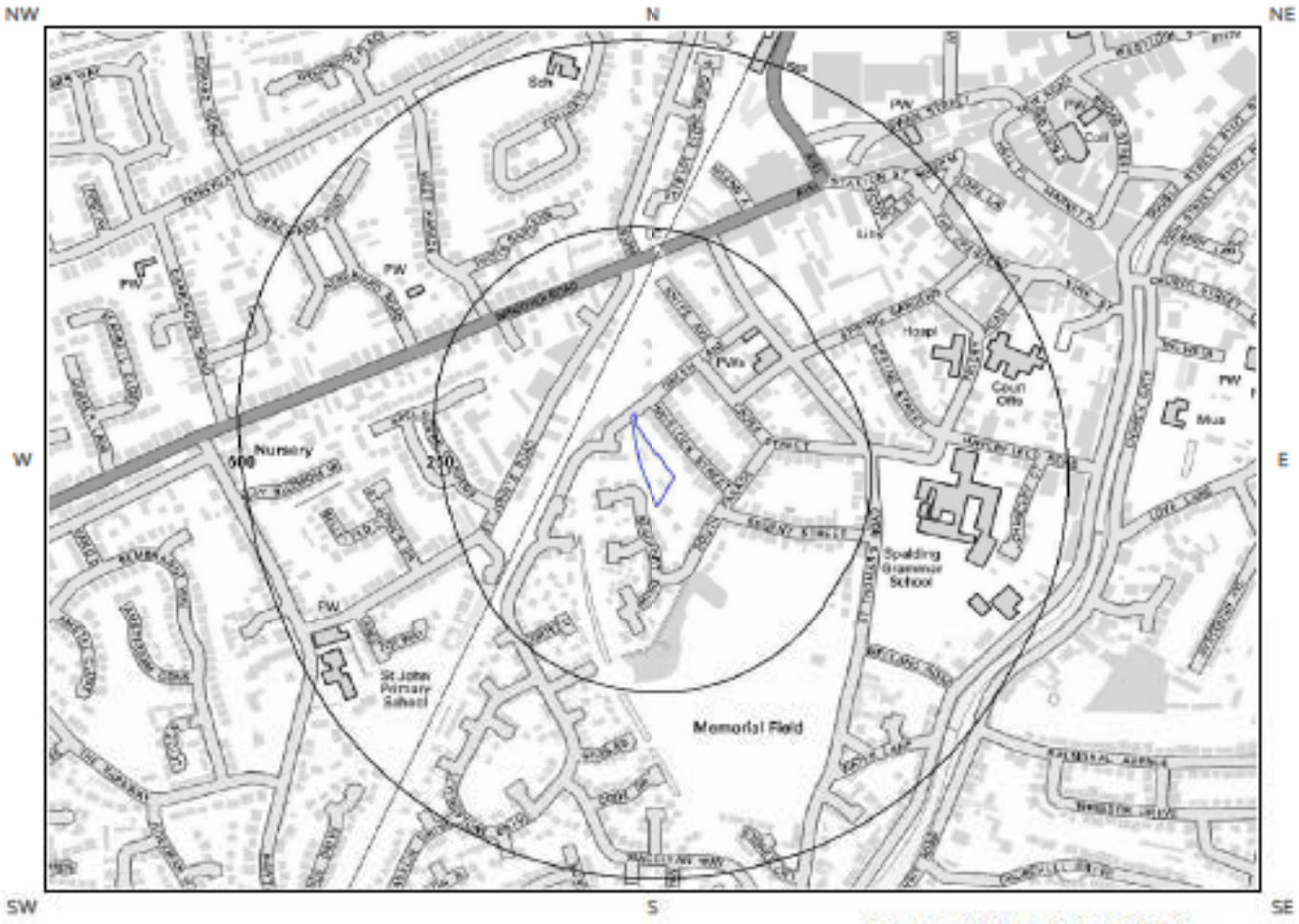
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



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Site Outline

250 — 500 — Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

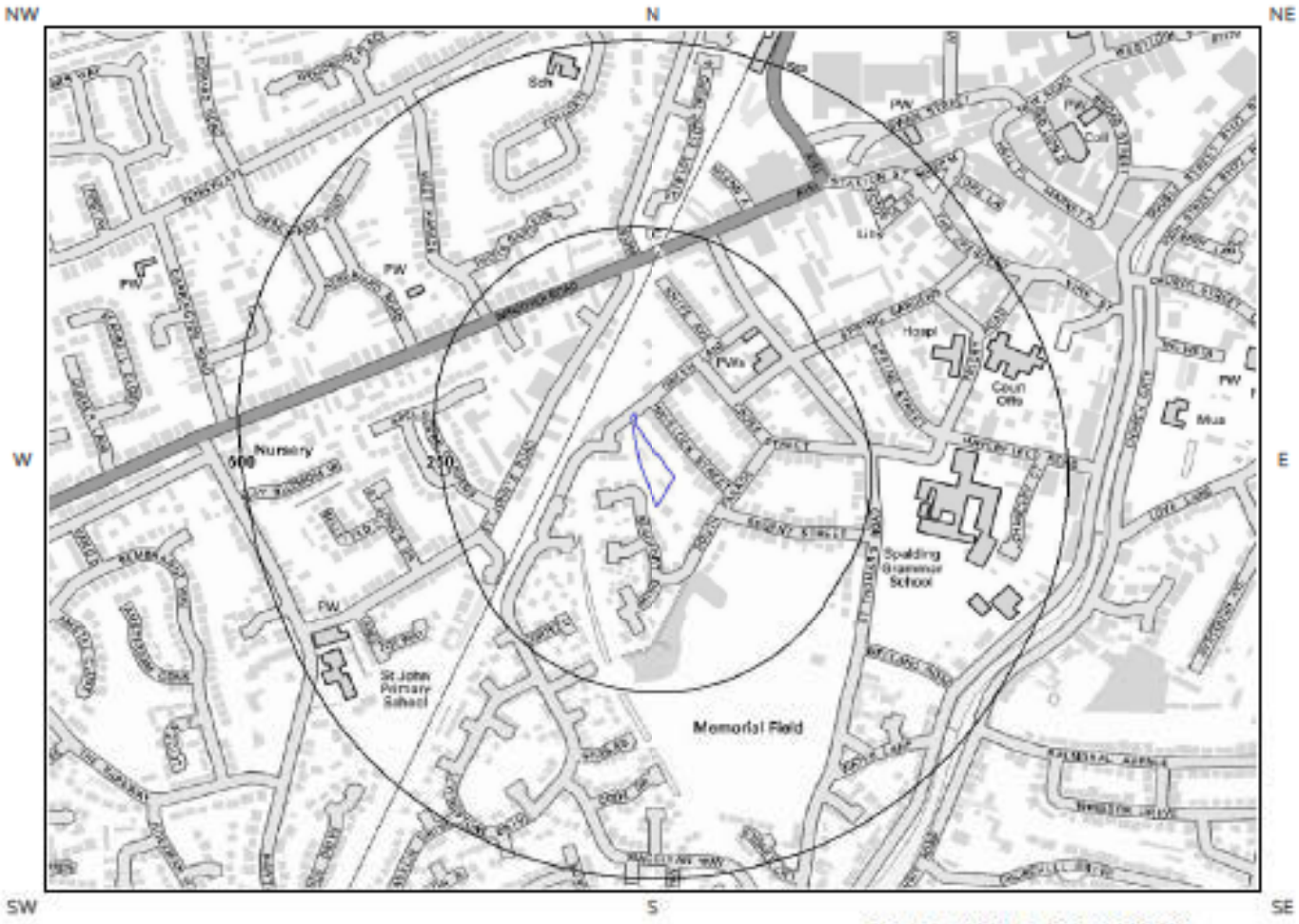
Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



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Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

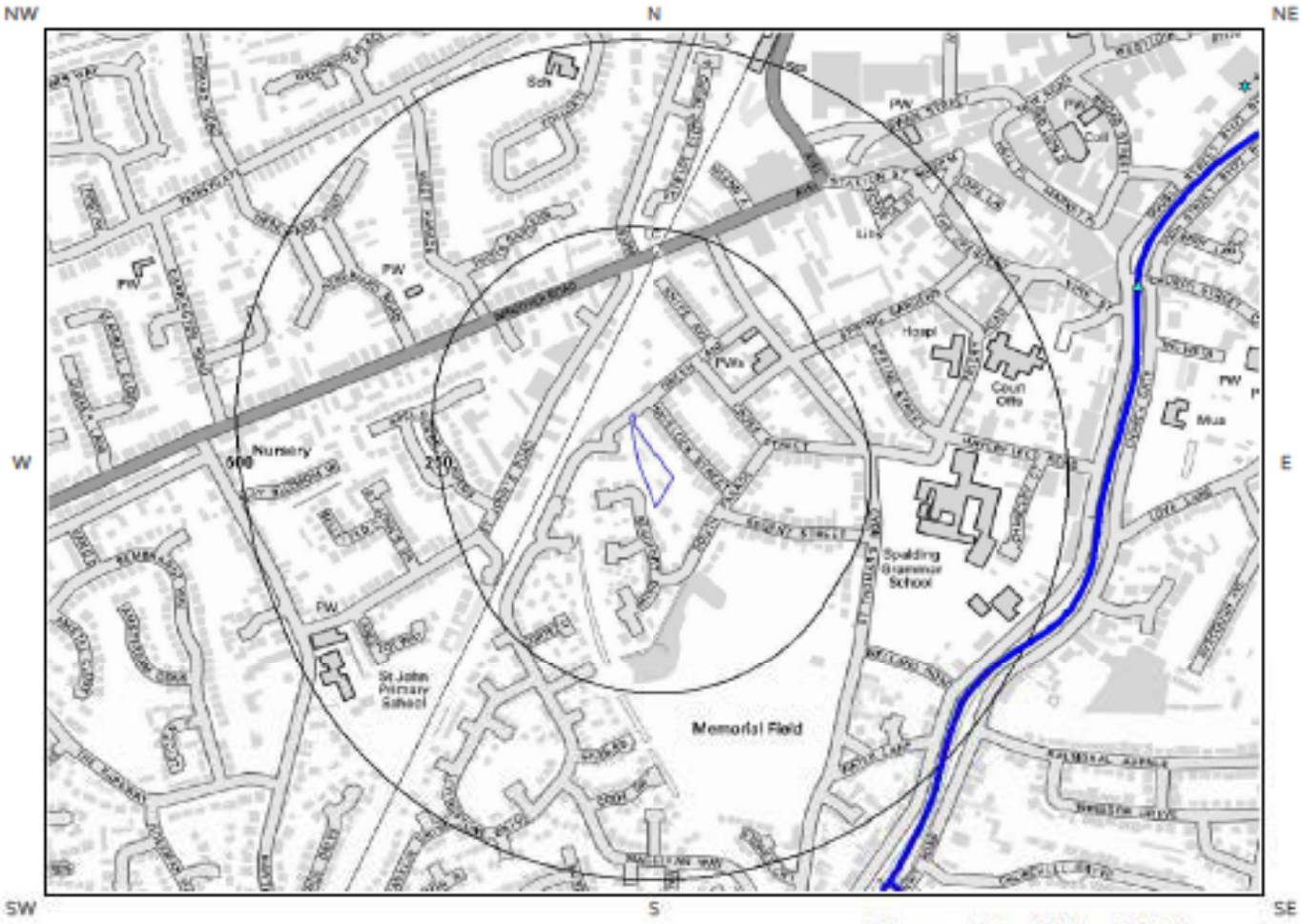
Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

Site Outline

250 — 500 — Search Buffers (m)

6e. Hydrology – Detailed River Network and River Quality



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Site Outline

250 — Search Buffers (m)
500 —

Primary River
Secondary River
Tertiary River
Lake/Reservoir
Underground River (inferred)
General Quality Assessment: Biology
General Quality Assessment: Chemistry

Canal
Canal Tunnel
Culvert
Multiple Channel Culvert
Underground River (Potential Sewer)
Underground River (local knowledge)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? Yes

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
Not shown	638	SE	524600 321700	Status: Historical Licence No: 5/31/14/*S/0113 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: R Welland (coronation Channel) Data Type: Point Name: C SLOOTEN LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 1/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/2/1966 Version End Date:
Not shown	1493	NW	523900 324000	Status: Active Licence No: 5/31/14/*S/0117 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Vernatts Drains - South Holland Data Type: Line Name: C W DOBBS & SON LTD	Annual Volume (m³): 5455 Max Daily Volume (m³): 1027 Application No: N1226 Original Start Date: 1/3/1966 Expiry Date: - Issue No: 101 Version Start Date: 29/11/2001 Version End Date:
Not shown	1597	E	525800 321800	Status: Historical Licence No: 5/31/14/*S/0157 Details: Make-Up or Top Up Water Direct Source: Surface Water Source Of Supply Point: Coronation Channel Data Type: Point Name: LINCOLNSHIRE TRUST FOR NATURE CONSERVATION	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 1/1/1982 Expiry Date: - Issue No: 100 Version Start Date: 1/12/1992 Version End Date:
Not shown	1612	E	525850 321930	Status: Active Licence No: 5/31/14/*S/0157 Details: Make-Up Or Top Up Water Direct Source: Surface Water Source Of Supply Point: Coronation Channel - Spalding Data Type: Point Name: LINCOLNSHIRE WILDLIFE TRUST	Annual Volume (m³): 2500 Max Daily Volume (m³): 224 Application No: NS968 Original Start Date: 1/1/1982 Expiry Date: - Issue No: 101 Version Start Date: 8/5/2007 Version End Date:

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? No

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency information on groundwater vulnerability and soil leaching potential within 500m of the study site? No

Database searched and no data found.

6.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? Yes

6.9.1 Biological Quality:

Biological Quality data describes water quality in terms of 83 groups of macroinvertebrates, some of which are pollution sensitive. The results are graded from A ('Very Good') to F ('Bad').

The following Biological Quality records are shown on the Hydrology Map (6e):

ID	Distance (m)	Direction	NGR	River Quality Grade	Biological Quality Grade				
					2005	2006	2007	2008	2009
4A	892	NE	525000 322800	River Name: Welland (coronation Cut) Reach: New River Spalding...tidal Limit (2) End/Start of Stretch: Start of Stretch NGR	B	B	B	B	B
5A	892	NE	525000 322800	River Name: Welland (coronation Cut) Reach: New River Spalding...tidal Limit (1) End/Start of Stretch: End of Stretch NGR	B	B	B	B	B
Not shown	1136	S	524200 321100	River Name: Welland (coronation Cut) Reach: New River Spalding...tidal Limit (1) End/Start of Stretch: Start of Stretch NGR	B	B	B	B	B

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

					Chemical Quality Grade				
ID	Distance (m)	Direction	NGR	River Quality Grade	2005	2006	2007	2008	2009
Not shown	608	SE	524568 321715	River Name: Welland Reach: New River Spalding Tidal Limit (1) End/Start of Stretch: Sample Point NGR	C	C	B	B	B
8	642	NE	524864 322531	River Name: Welland Reach: New River Spalding Tidal Limit (2) End/Start of Stretch: Sample Point NGR	C	C	B	B	B
9A	892	NE	525000 322800	River Name: Welland Reach: New River Spalding Tidal Limit (2) End/Start of Stretch: Start of Stretch NGR	C	C	B	B	B
10A	892	NE	525000 322800	River Name: Welland Reach: New River Spalding Tidal Limit (1) End/Start of Stretch: End of Stretch NGR	C	C	B	B	B
Not shown	1136	S	524200 321100	River Name: Welland Reach: New River Spalding Tidal Limit (1) End/Start of Stretch: Start of Stretch NGR	C	C	B	B	B
Not shown	1136	S	524200 321100	River Name: Welland Reach: Folly River New River Spalding End/Start of Stretch: End of Stretch NGR	B	C	B	B	B

6.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	467	SE	River Name: River Welland Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined

6.11 Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
97	SE
111	SW

7a. Environment Agency Flood Map for Planning (from rivers and the sea)



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Site Outline

Search Buffers (m)

Zone 2 Floodplain

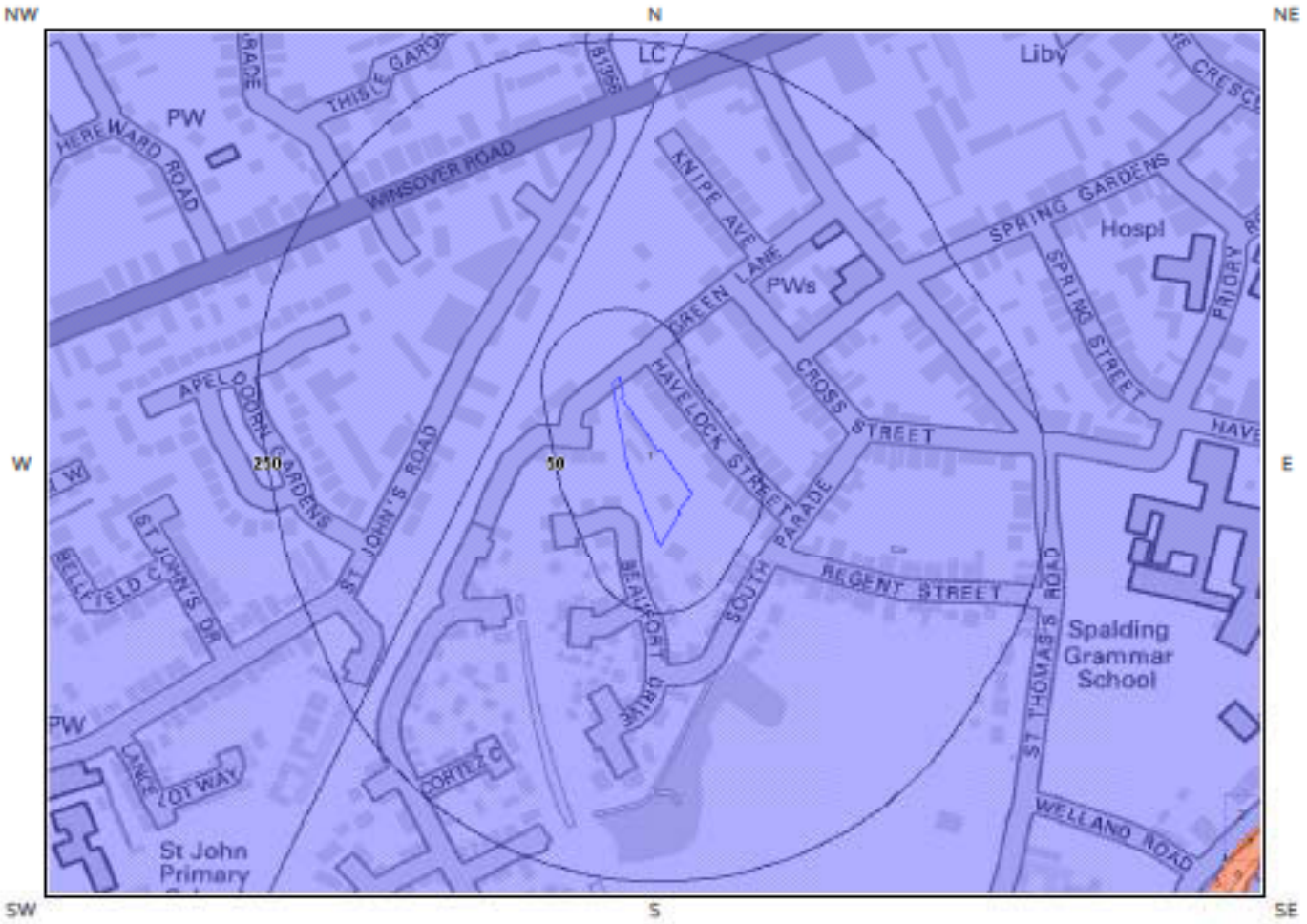
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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Site Outline

Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency Zone 2 floodplain? Yes

Environment Agency Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	09-Sep-2016	Zone 2 - (Fluvial/Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency Zone 3 floodplain? Yes

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	0	On Site	09-Sep-2016	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite? Medium

The Environment Agency RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Medium (greater than 1 in 100 but less than 1 in 30) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk
1	0.0	On Site	Medium

7.4 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

---

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

---

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? No

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Not Prone

The area is not considered to be prone to groundwater flooding based on rock type.

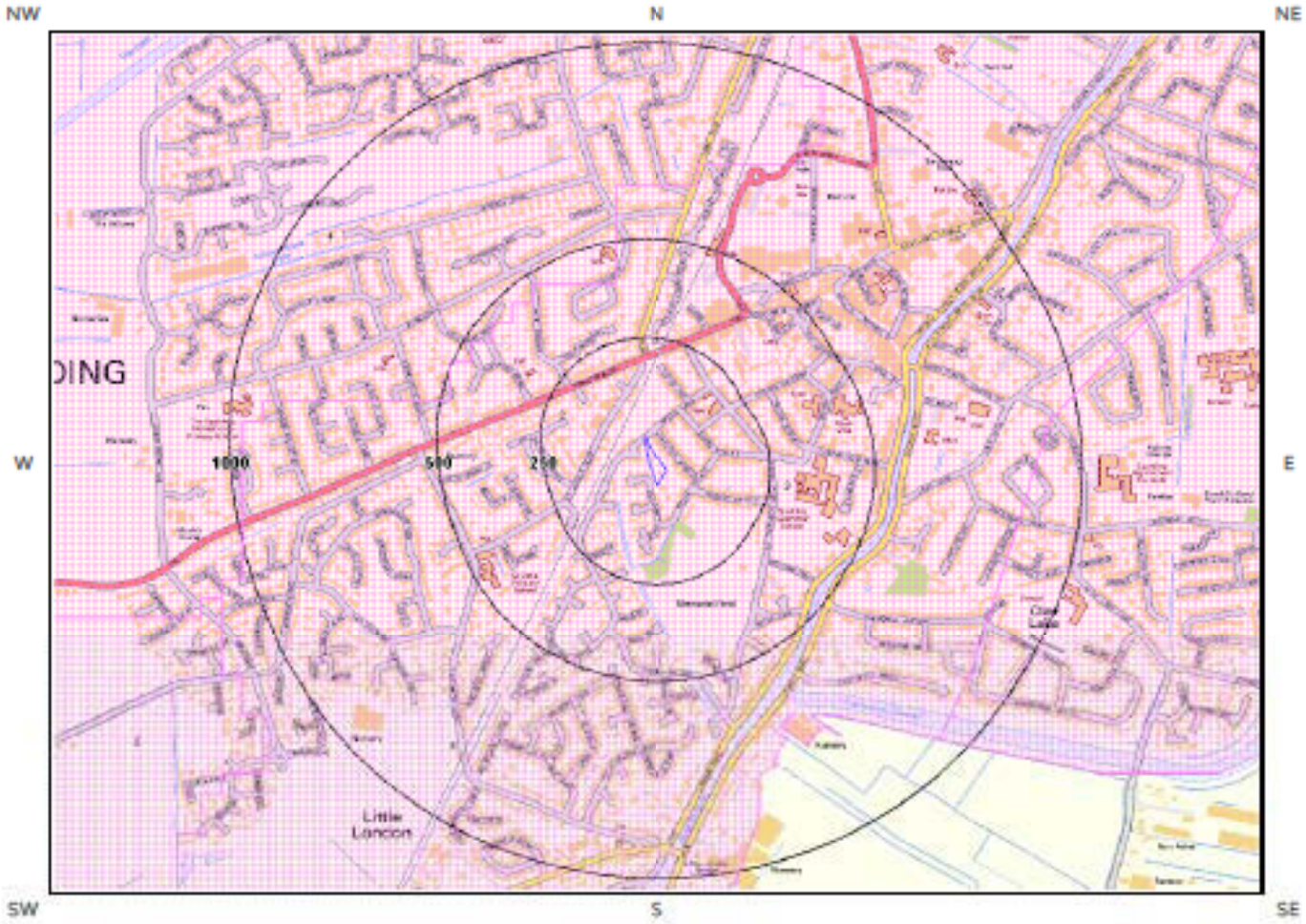
7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Not Applicable

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



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Site Outline
Search Buffers (m)

AONB
National Park
SSSI
Special Protection Areas
Nitrate Vulnerable Zones
Green Belt
Environmentally Sensitive Areas
Special Areas of Conservation
World Heritage Sites
Nitrate Sensitive Areas
Ancient Woodland
National Nature Reserve
Local Nature Reserves
Ramsar Sites

8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site?	Yes

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

0

Database searched and no data found.

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

1

The following Local Nature Reserve (LNR) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	LNR Name	Data Source
Not shown	1772	N	Vernatts	Natural England

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

4

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
2	0	On Site	New	DEFRA
3	0	On Site	Existing	DEFRA
4	395	N	Existing	DEFRA
5	1085	W	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a **Groundsure Geo Insight**, available from **our website**. The following information has been found:

9.1.1 Shrink Swell

What is the maximum Shrink-Swell*[*] hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

What is the maximum Running Sand* hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build consider the consequences of soil and groundwater conditions during and after construction. For existing property possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

* This indicates an automatically generated 50m buffer and site.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Are there any coal mining areas within 75m of the study site? No

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary? No

Database searched and no data found.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? No
Guidance: No Guidance Required.

Contact Details

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https://www.groundsure.com/terms-and-conditions-sept-2016

Groundsure Geo Insight

Address:	**19 Green Lane,Spalding,Lincolnshire,PE11 2YD,**
Date:	**2 Dec 2016**
Reference:	**EMS-395913_529589**
Client:	**EmapSite**

NW N NE



W E

SW S SE

Aerial Photograph Capture date:	06-Apr-2015
Grid Reference:	524246,322290
Site Size:	0.24ha

Groundsure

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LOCATION INTELLIGENCE

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Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: **Geology**		
1.1 Artificial Ground	1.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?	Yes
	1.2.2 Are there any records relating to permeability of superficial geology within the study site boundary?	Yes
	1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	1.2.4 Are there any records relating to permeability of landslips within the study site boundary?	No
1.3 Bedrock, Solid Geology & Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records relating to permeability of bedrock within the study site boundary?	Yes
	1.3.3 Are there any records of faults within 500m of the study site boundary?	No
1.4 Radon data	1.4.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level
	1.4.2 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

Section 2: **Ground Workings**	On-site	0-50m	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	3	5	Not Searched	Not Searched
2.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
2.3 Current Ground Workings	0	0	0	0	0

Section 3: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	0
3.2 Coal Mining	0	0	0	0	0
3.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
3.4 Non-Coal Mining	0	0	0	0	0
3.5 Non-Coal Mining Cavities	0	0	0	0	0
3.6 Natural Cavities	0	0	0	0	0
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

Section 4: Natural Ground Subsidence	On-site
4.1 Shrink Swell Clay	Low
4.2 Landslides	Very Low
4.3 Ground Dissolution of Soluble Rocks	Negligible
4.4 Compressible Deposits	Moderate
4.5 Collapsible Deposits	Negligible
4.6 Running Sand	Moderate

Section 5: Borehole Records	On-site	0-50m	51-250
5 BGS Recorded Boreholes	0	0	8

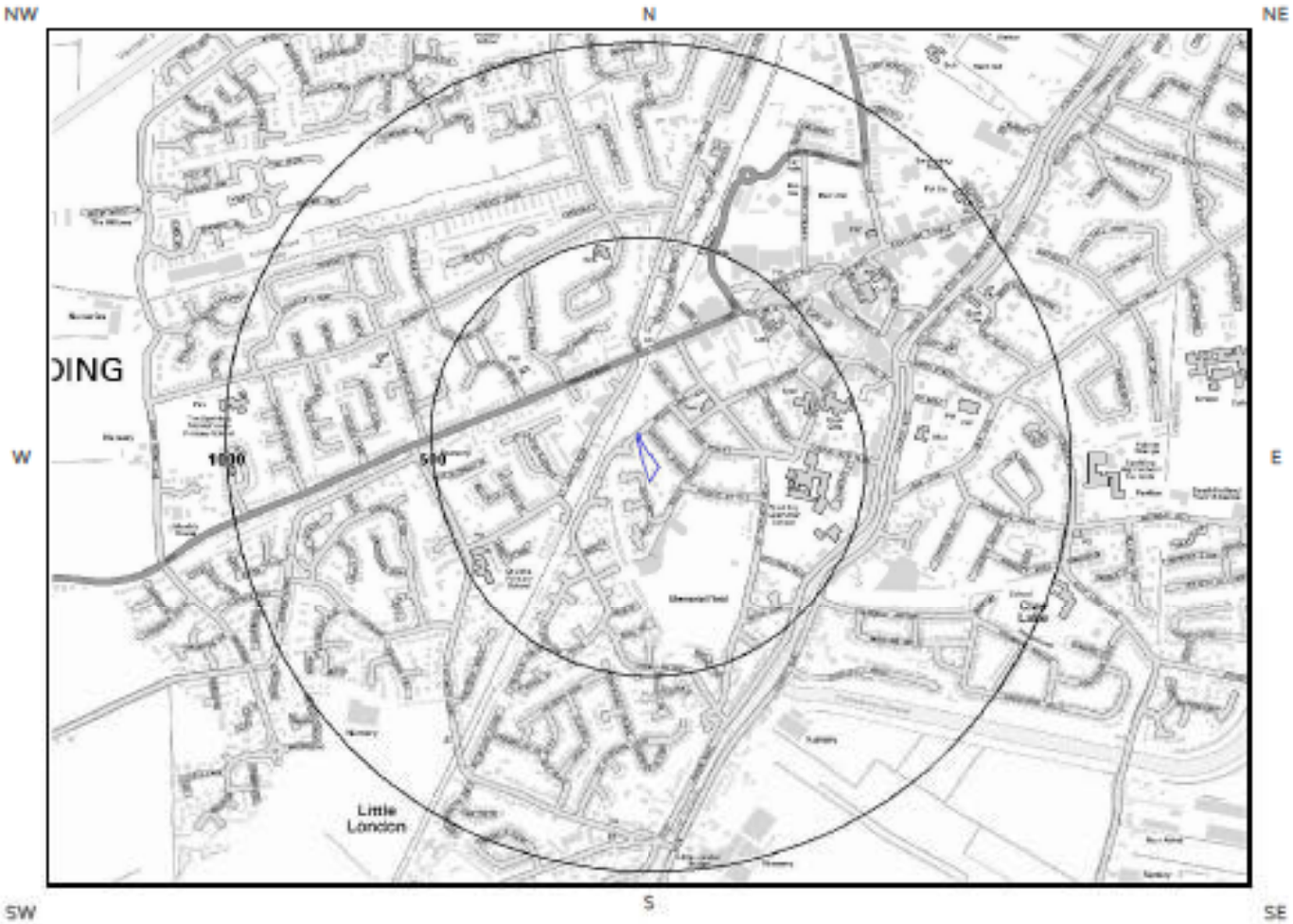
Section 6: Estimated Background Soil Chemistry	On-site	0-50m	51-250
6 Records of Background Soil Chemistry	1	0	4

Section 7: Railways and Tunnels	On-site	0-50m	51-250	251-500
7.1 Tunnels	0	0	0	Not Searched
7.2 Historical Railway and Tunnel Features	3	3	13	Not Searched
7.3 Historical Railways	0	2	2	Not Searched
7.4 Active Railways	0	0	3	Not Searched

Section 7: **Railways and Tunnels**	On-site	0-50m	51-250	251-500
7.5 **Railway Projects**	0	0	0	0

1 Geology

1.1 Artificial Ground Map



Artificial Ground Legend

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Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1 Geology

1.1 Artificial Ground

1.1.1Artificial/ Made Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:144

Are there any records of Artificial/Made Ground within 500m of the study site boundary? No

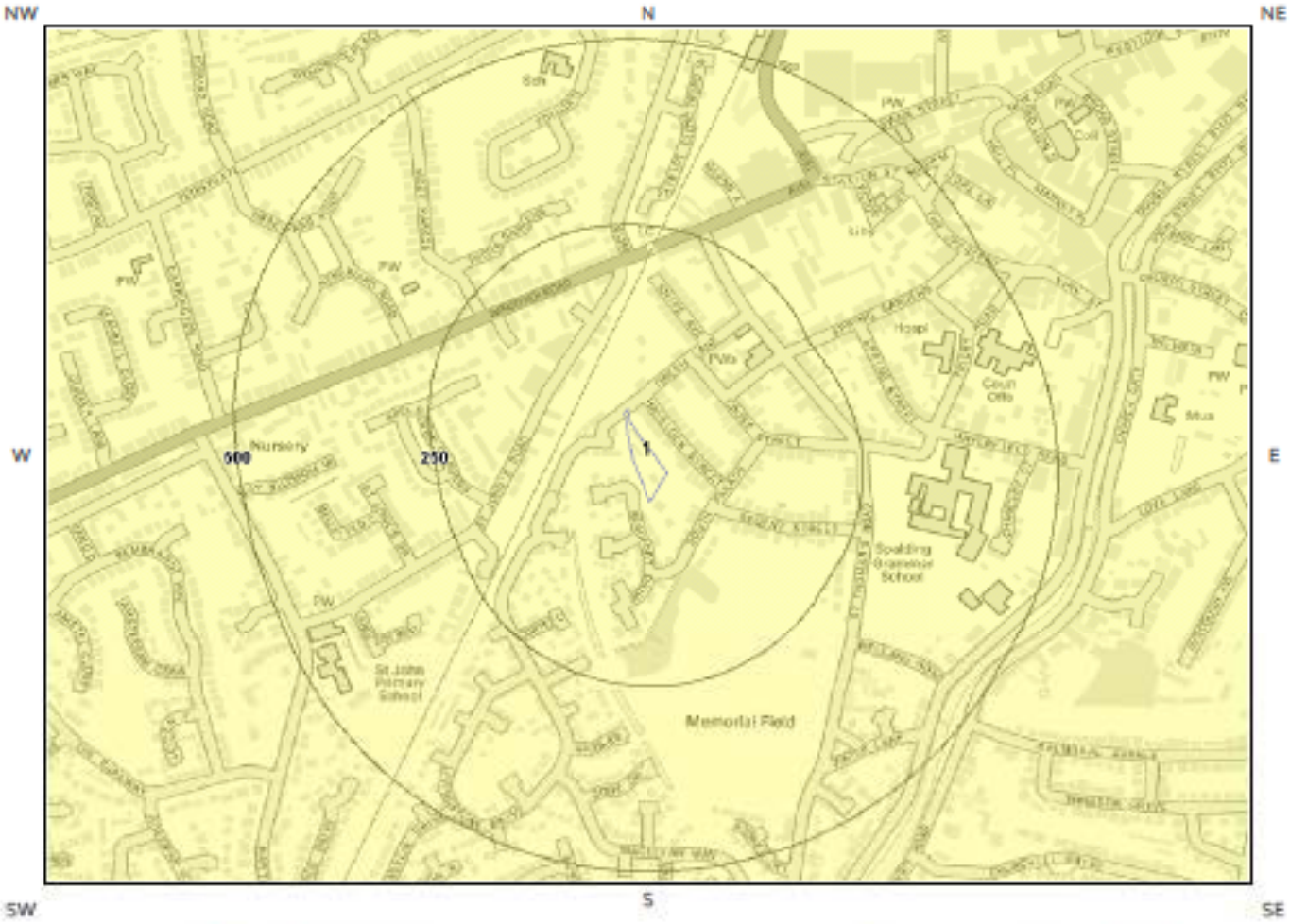
Database searched and no data found.

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

1.2 Superficial Deposits and Landslips Map



Superficial Deposits and Landslips Legend

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Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TFD	TIDAL FLAT DEPOSITS	CLAY AND SILT [UNLITHIFIED DEPOSITS CODING SCHEME]

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Low	Very Low

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

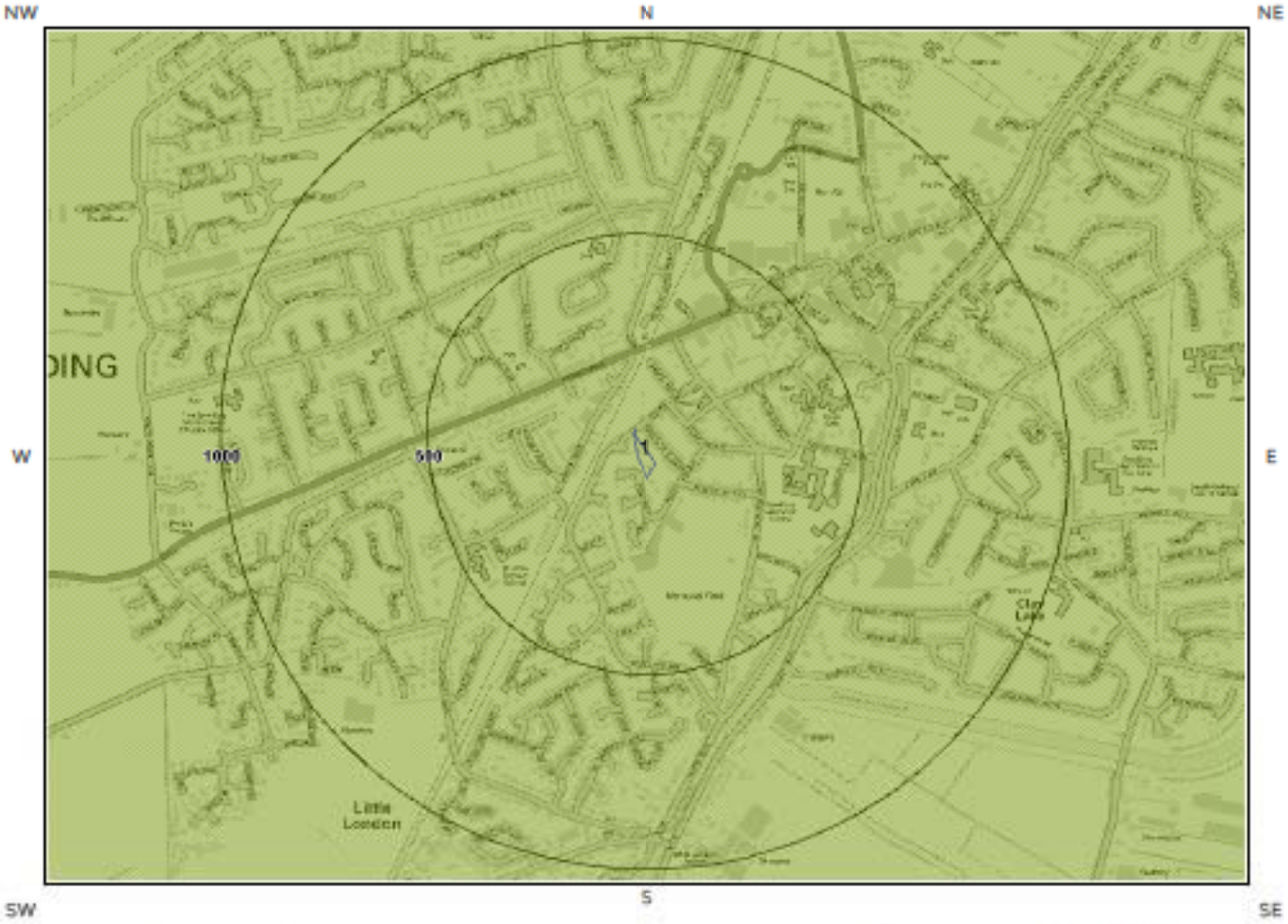
1.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site* boundary? No

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site

1.3 Bedrock and Faults Map



Bedrock and Faults Legend

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Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:144

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	OXC-MDST	Oxford Clay Formation - Mudstone	Oxfordian / Callovian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Low	Very Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

* This includes an automatically generated 50m buffer zone around the site

1.4 Radon Data

1.4.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level

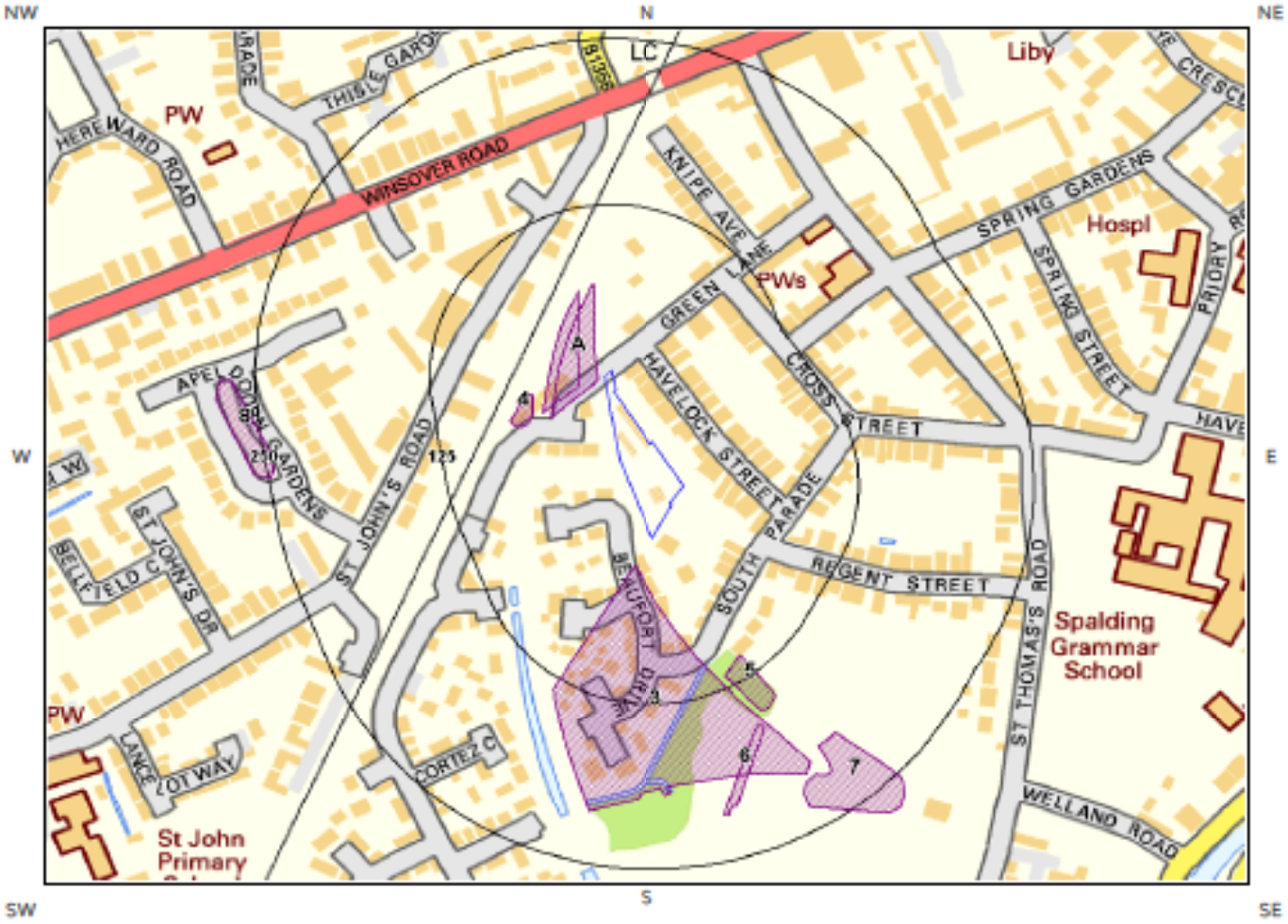
---

1.4.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary

---

2 Ground Workings Map



Ground Workings Legend

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Site Outline

128
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2 Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
1A	5.0	W	524197 322376	Pond	1887
2A	19.0	W	524188 322376	Pond	1950
3	24.0	SW	524273 322122	Sewage Works	1938
4	53.0	W	524159 322331	Unspecified Pit	1887
5	108.0	SE	524322 322126	Unspecified Heap	1990
6	160.0	SE	524318 322060	Pond	1887
7	197.0	SE	524397 322058	Unspecified Heap	1990
8	244.0	W	523960 322318	Unspecified Heaps	1990

2.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

2.3 Current Ground Workings

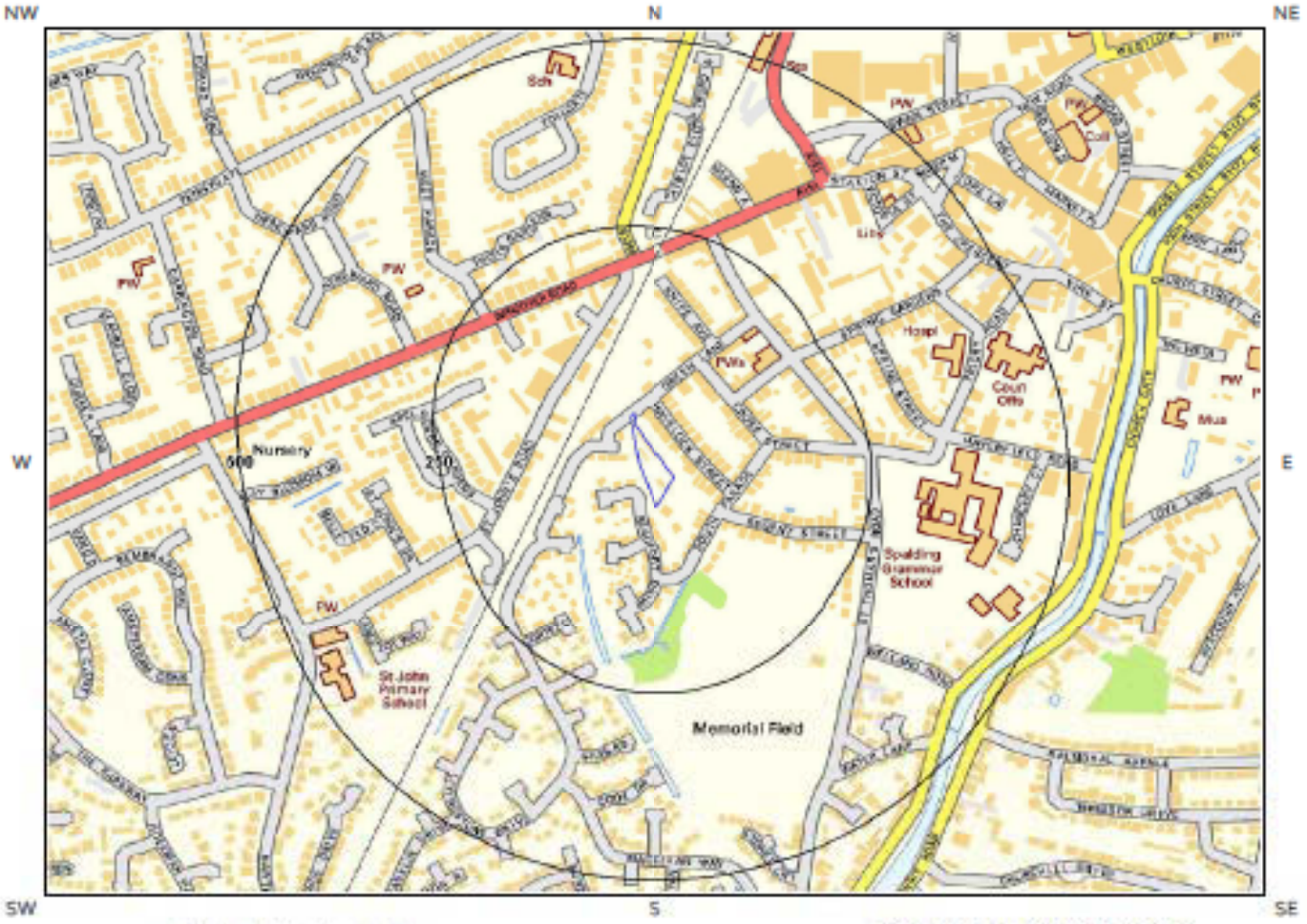
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

---

3 Mining, Extraction & Natural Cavities Map



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Mining, Extraction and Natural Cavities Legend

Site Outline

Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities

Non-Coal Mining

Highly likely

Likely

Unlikely

Highly unlikely

Rare

3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

3.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

3.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.10 Clay Mining

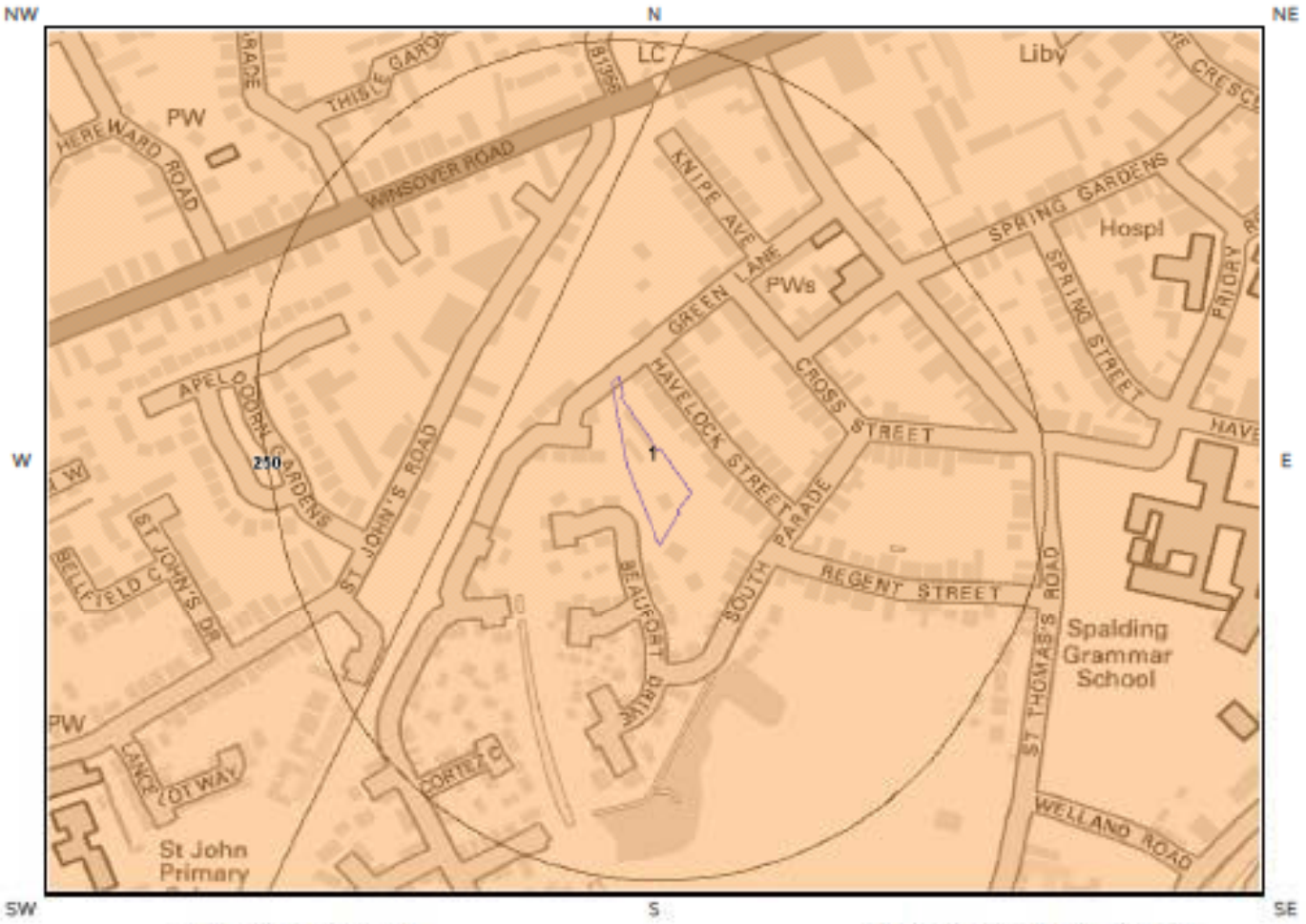
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

4 Natural Ground Subsidence

4.1 Shrink-Swell Clay Map



Shrink Swell Clay Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

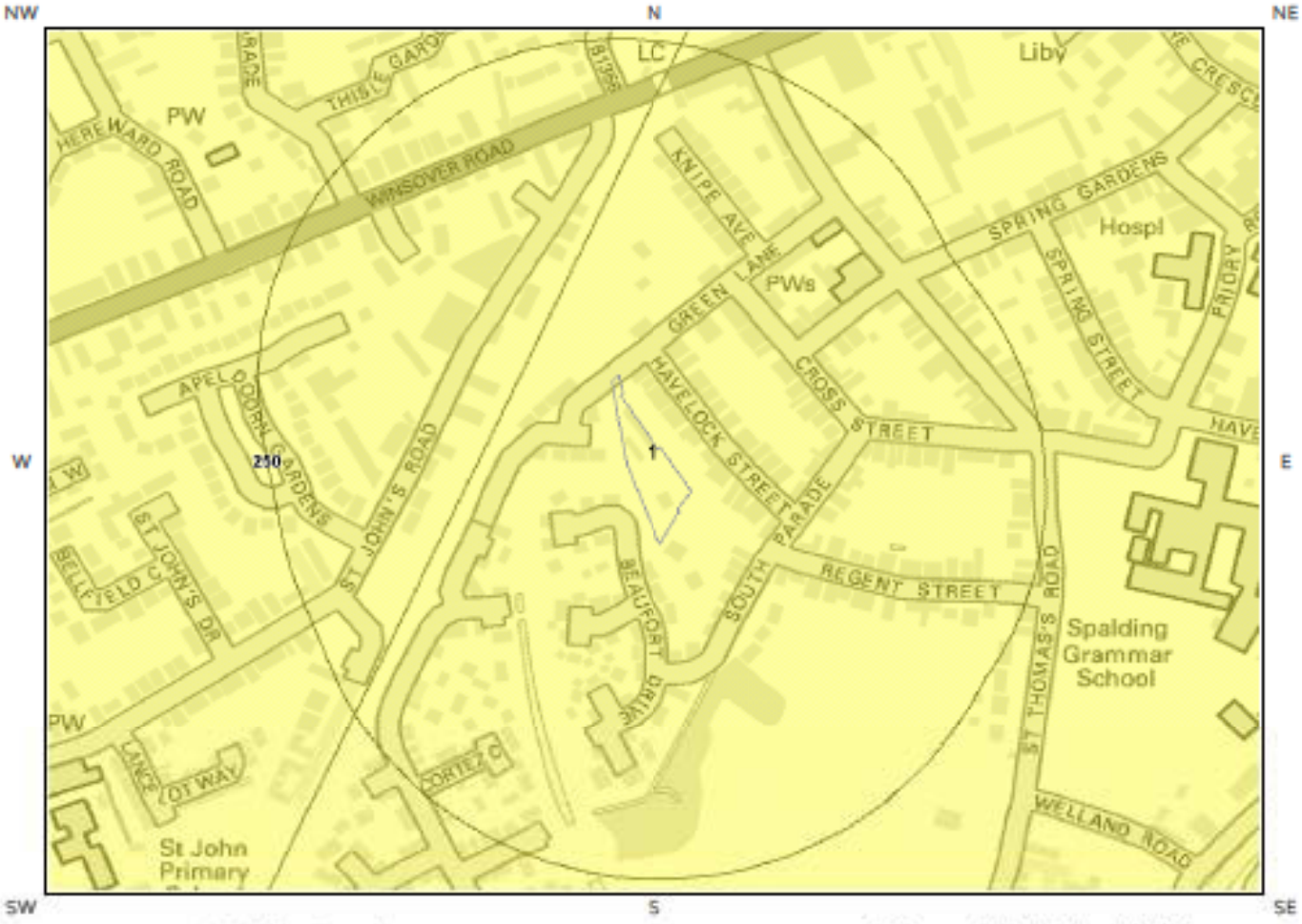
Very Low

Low

Moderate

High

4.2 Landslides Map



Landslides Legend

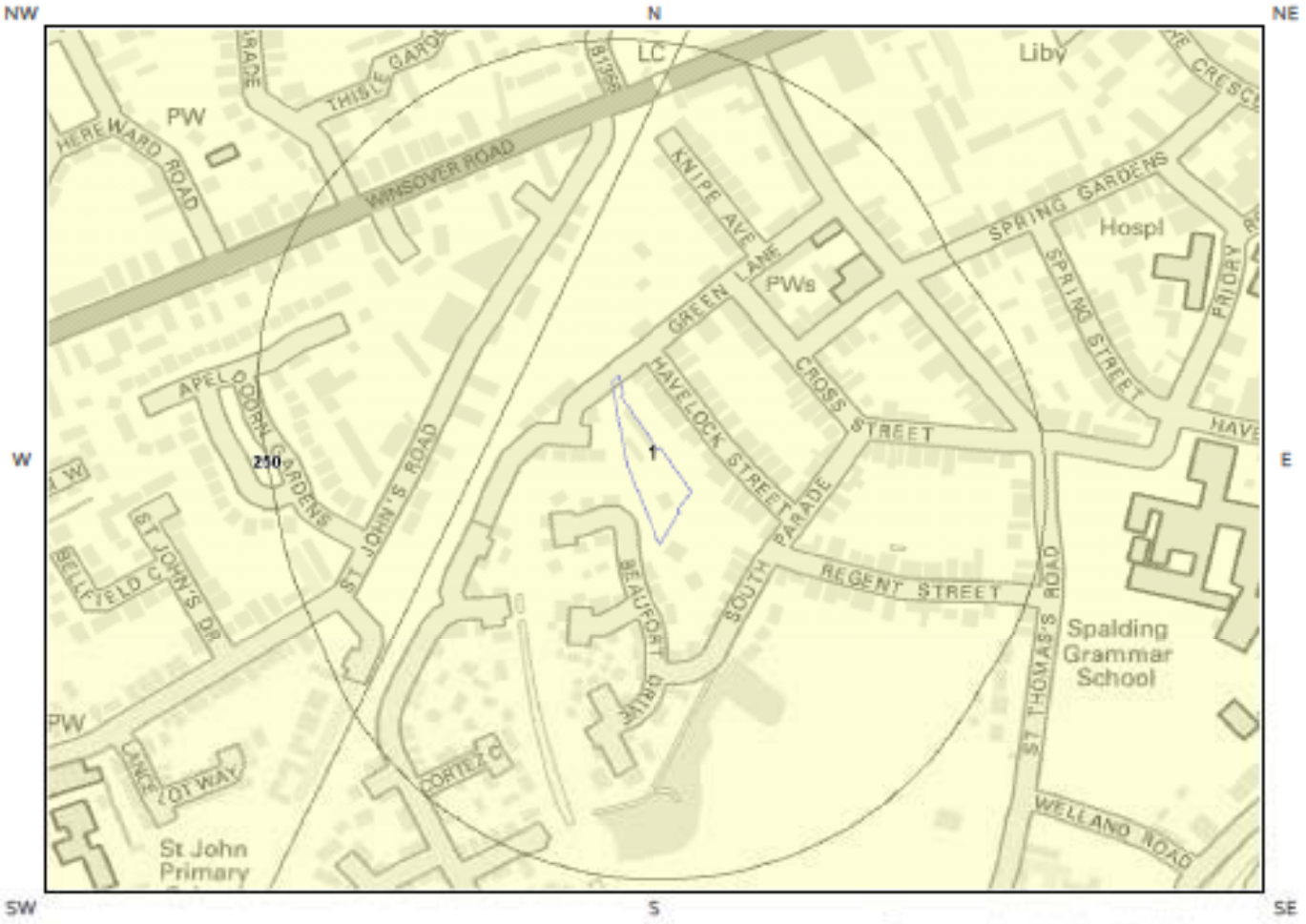
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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low
Low
Moderate
High

4.3 Ground Dissolution Soluble Rocks Map



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Ground Dissolution Soluble Rocks Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

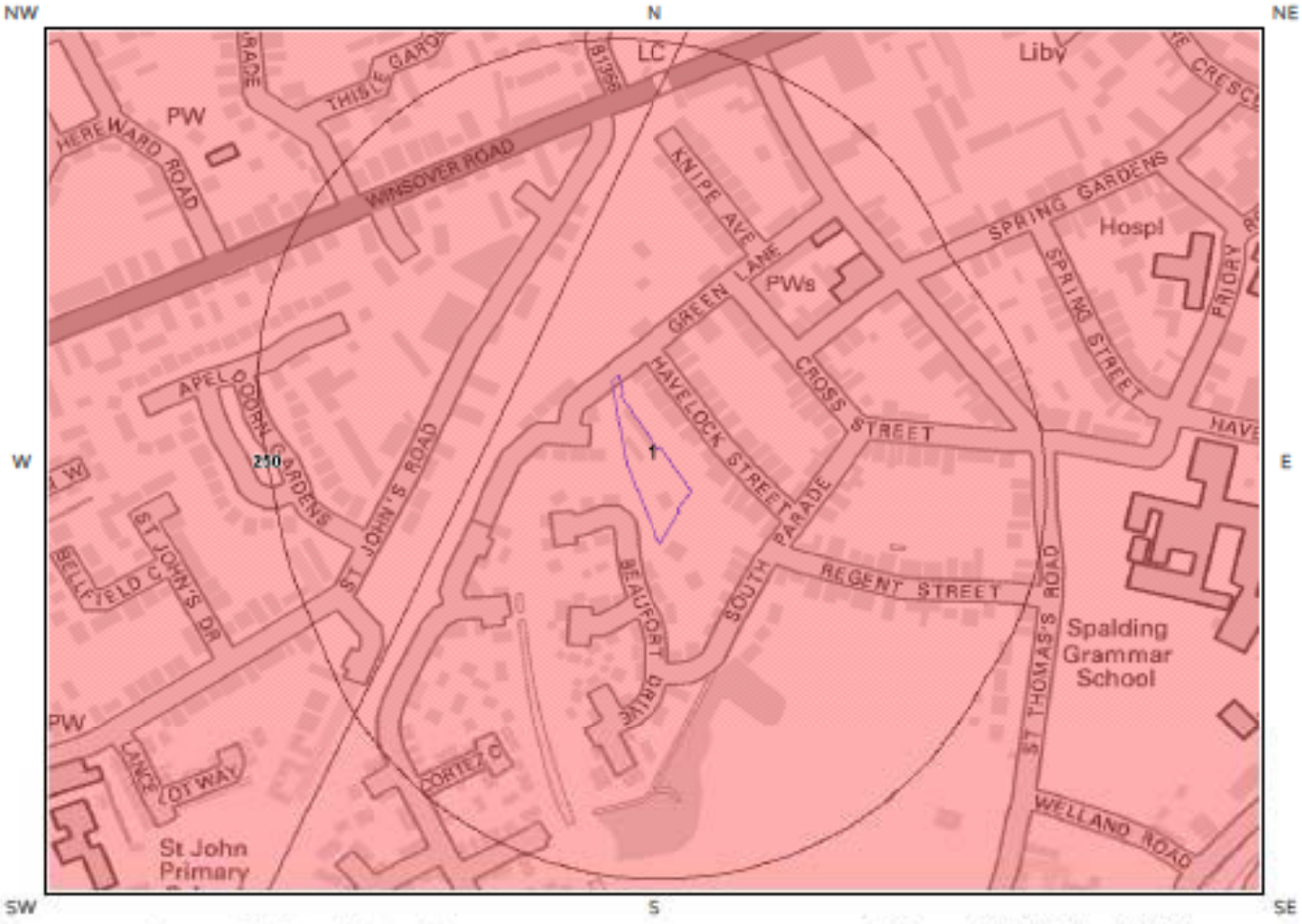
Very Low

Low

Moderate

High

4.4 Compressible Deposits Map



Compressible Deposits Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

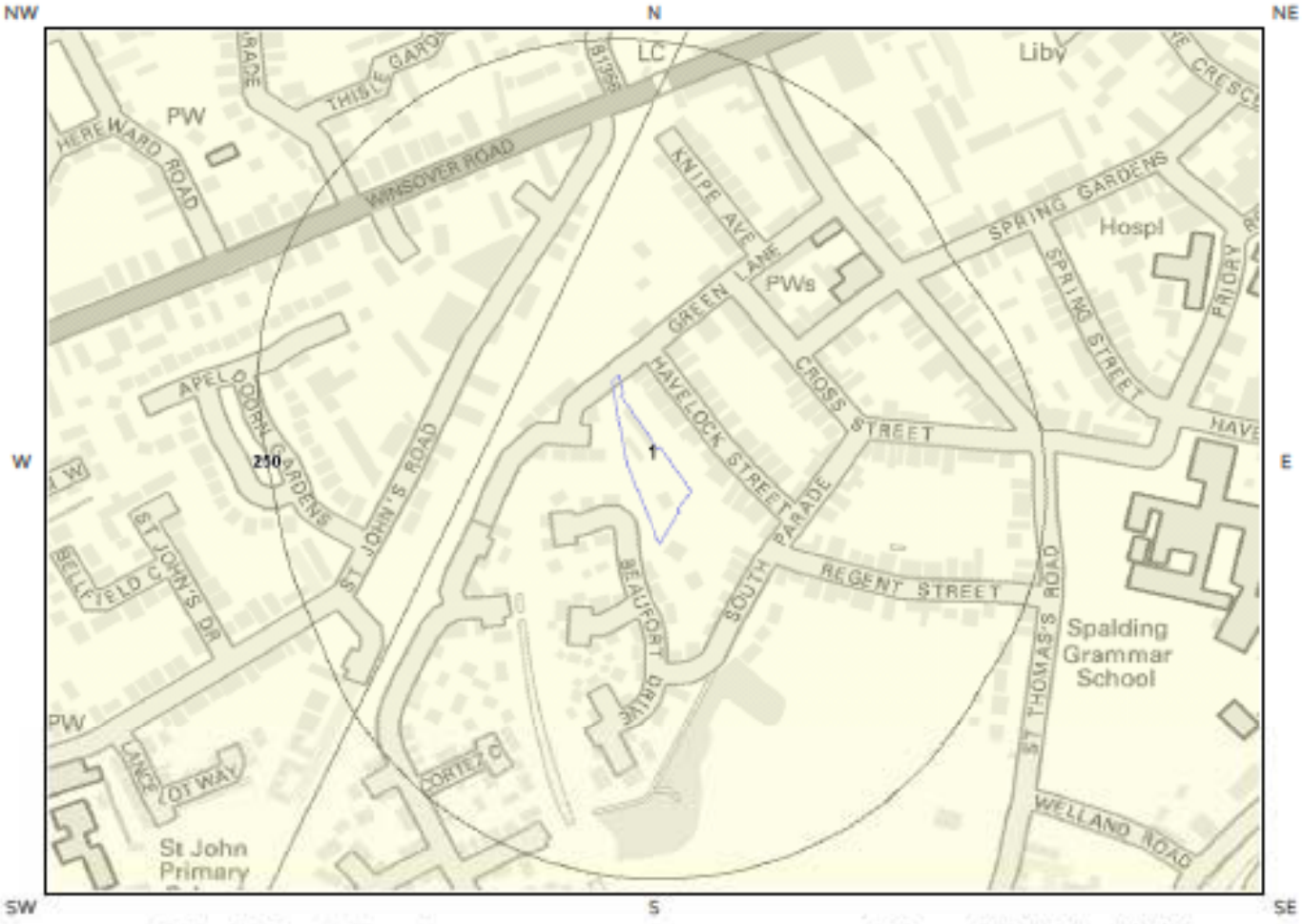
Very Low

Low

Moderate

High

4.5 Collapsible Deposits Map



Collapsible Deposits Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

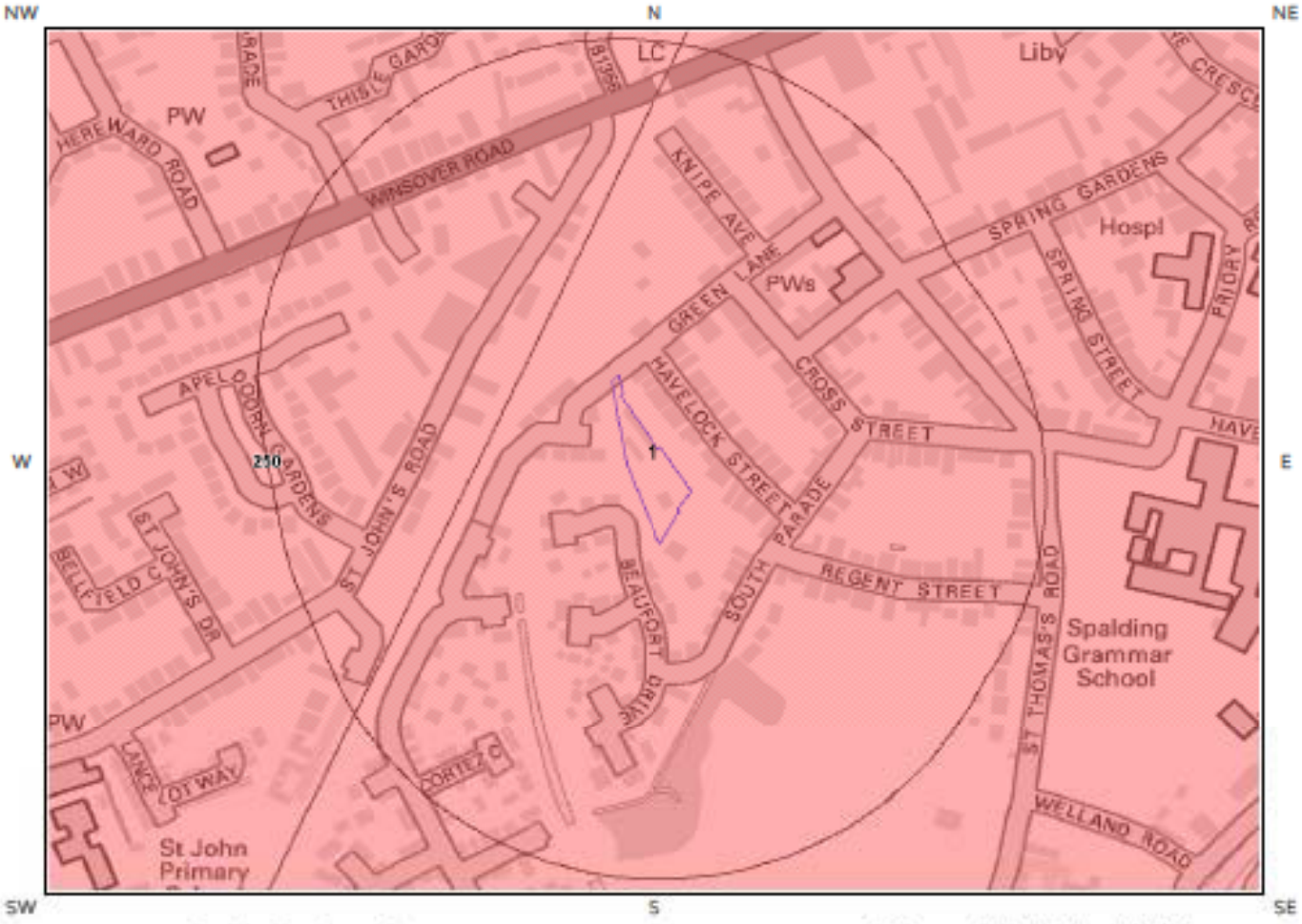
Very Low

Low

Moderate

High

4.6 Running Sand Map



Running Sand Legend

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Site Outline

Search Buffers (m)

No Data / Null

Negligible

Very Low

Low

Moderate

High

4 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site** boundary? Moderate

4.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This includes an automatically generated 50m buffer zone around the site

4.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	Significant potential for compressibility problems. Do not drain, load or de-water ground near the property without technical advice. For new build, consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property, possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

4.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

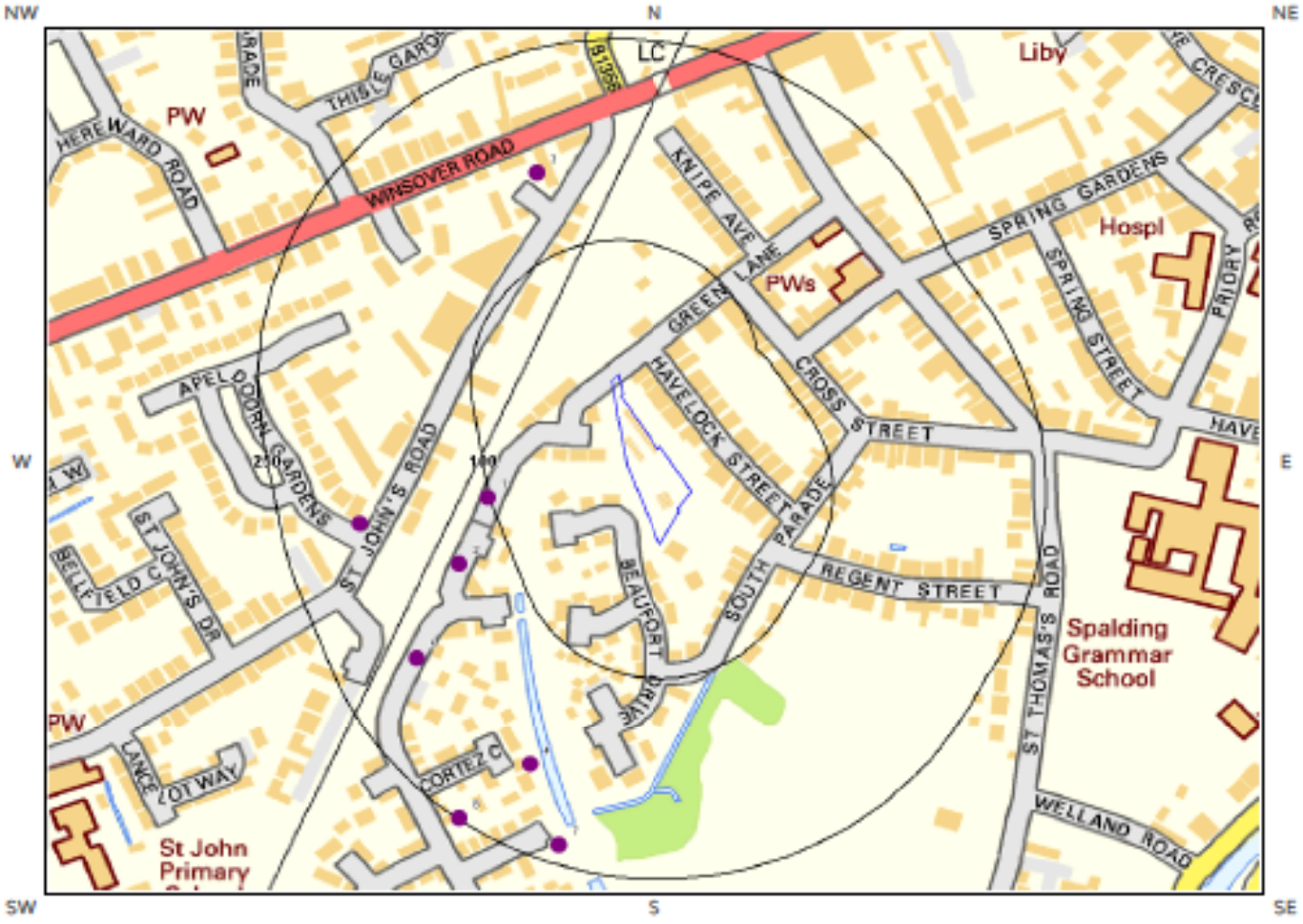
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

4.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build, consider the consequences of soil and groundwater conditions during and after construction. For existing property, possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

5 Borehole Records Map



Borehole Records Legend

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Site Outline

Borehole Locations

125
250
Search Buffers (m)

5 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 8

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	102.0	W	524130 322270	TF22SW201	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP1
2	138.0	W	524110 322220	TF22SW202	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP2
3	161.0	N	524165 322512	TF22SW61	1.5	A16 TRUNKROAD SPALDING TO SUTTON TP 7
4	189.0	SW	524160 322070	TF22SW204	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP4
5	192.0	SW	524080 322150	TF22SW203	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP3
6	194.0	W	524040 322250	TF22SW36	1.0	ST. JOHN'S ROAD,SPALDING 1
7	236.0	S	524180 322010	TF22SW206	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP6
8	249.0	SW	524110 322030	TF22SW205	-1.0	MAGELLAN WAY SPALDING PHASE 4 TP5

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#3: **scans.bgs.ac.uk/sobi_scans/boreholes/502755**
#6: **scans.bgs.ac.uk/sobi_scans/boreholes/502717**

6 Estimated Background Soil Chemistry

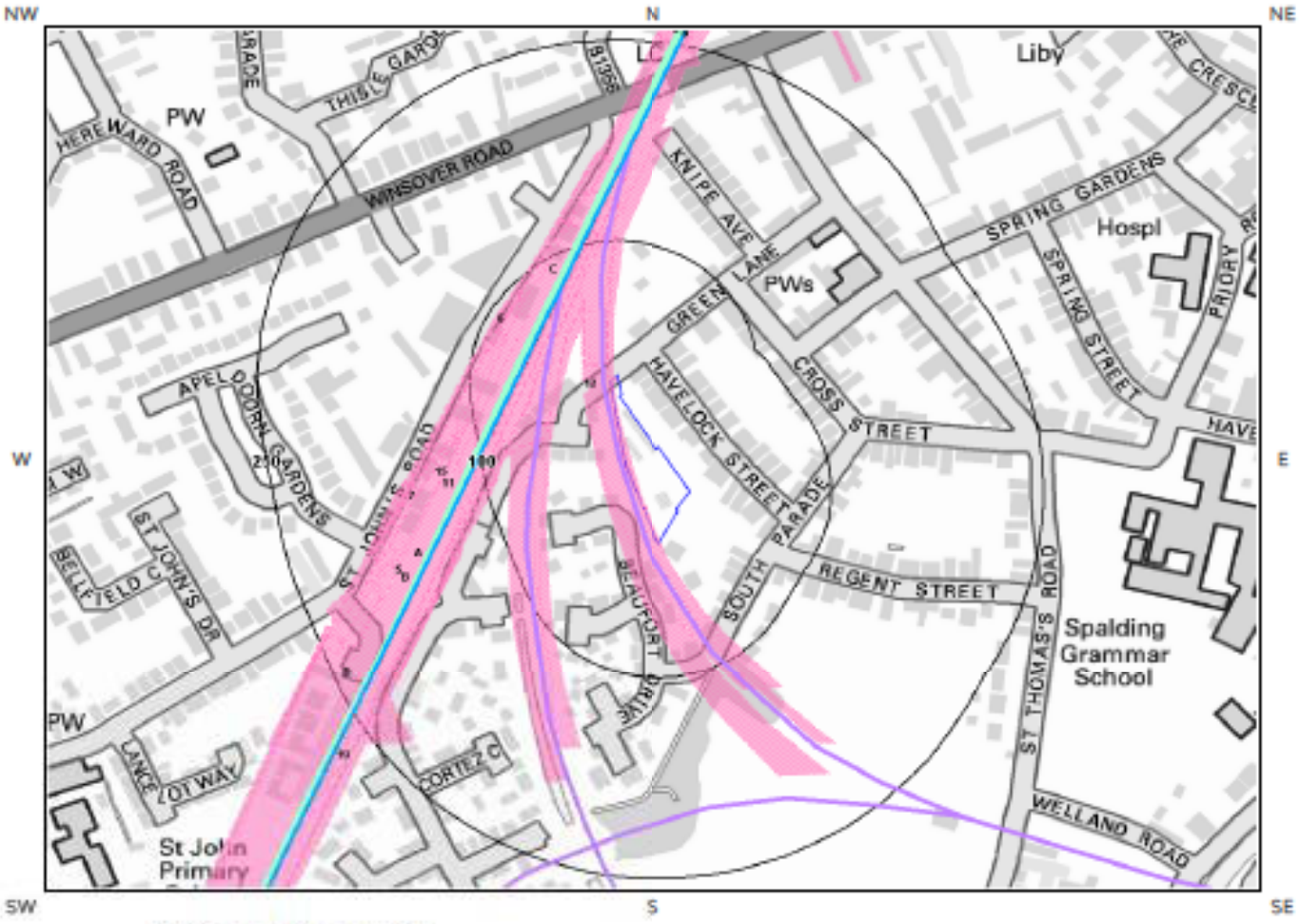
Records of background estimated soil chemistry within 250m of the study site boundary: 5

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
138.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
218.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
225.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
235.0	S	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7 Railways and Tunnels Map



Railways and Tunnels Legend

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- Site Outline
- Search Buffers (m): 250, 500
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- High Speed 2 Revised Proposed Route
- Crossrail 1
- Railway and/or Tunnel Feature from Historical Mapping

7 Railways and Tunnels

7.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? Yes

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Details	Date
10	0	On Site	n/a	Railway	1887
11	0	On Site	n/a	Railway	1931
12	0	On Site	n/a	Railway	1929
1A	11	NW	524046 322179	Railway Sidings	1938
2A	11	NW	524046 322179	Railway Sidings	1903
3B	49	NW	523987 321978	Railway Sidings	1887
4B	54	NW	524009 322054	Railway Sidings	1932

ID	Distance (m)	Direction	NGR	Details	Date
13C	58	W	524183 322451	Railway Sidings	1904
14C	58	W	524183 322451	Railway Sidings	1931
5	59	NW	524006 322056	Railway Sidings	1950
15	73	NW	524094 322277	Railway Sidings	1967
6	86	NW	524142 322402	Railway Sidings	1903
16A	99	W	n/a	Railway	1904
17D	111	W	523999 322117	Railway Sidings	1931
18D	111	W	523999 322117	Railway Sidings	1904
7	114	W	524076 322270	Railway Sidings	1903
19	214	SW	524030 322073	Railway Sidings	1967
8	247	N	524462 323056	Railway Sidings	1980
9	249	N	524460 323096	Railway Sidings	1950

Any records that have been identified are represented on the Railways and Tunnels Map.

7.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? Yes

Distance (m)	Direction	Status
3	W	Abandoned
46	W	Abandoned
104	SW	Abandoned
200	S	Abandoned

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

7.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? Yes

Distance (m)	Direction	Name	Type
61	NW	Not given	Multi Track
65	NW	Peterborough to Lincoln Line	Rail
180	N	Peterborough to Lincoln Line	Rail

Note: multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

7.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

*Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a **Groundsure HS2 and Crossrail 1 Report**.*

Crossrail route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

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Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
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Leicestershire
LE12 6HX

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

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Tel: +44 (0) 1384 262 000
Email:**enquiries.gs@jpb.co.uk**
Website: **www.jpb.co.uk**

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Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

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Website:**http://www1.getmapping.com/**

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County Series 1:10,560 scale

National Grid 1:10,000 scale

GroundSure

Historical Map Pack Legend

County Series & National Grid

1:10,560 scale

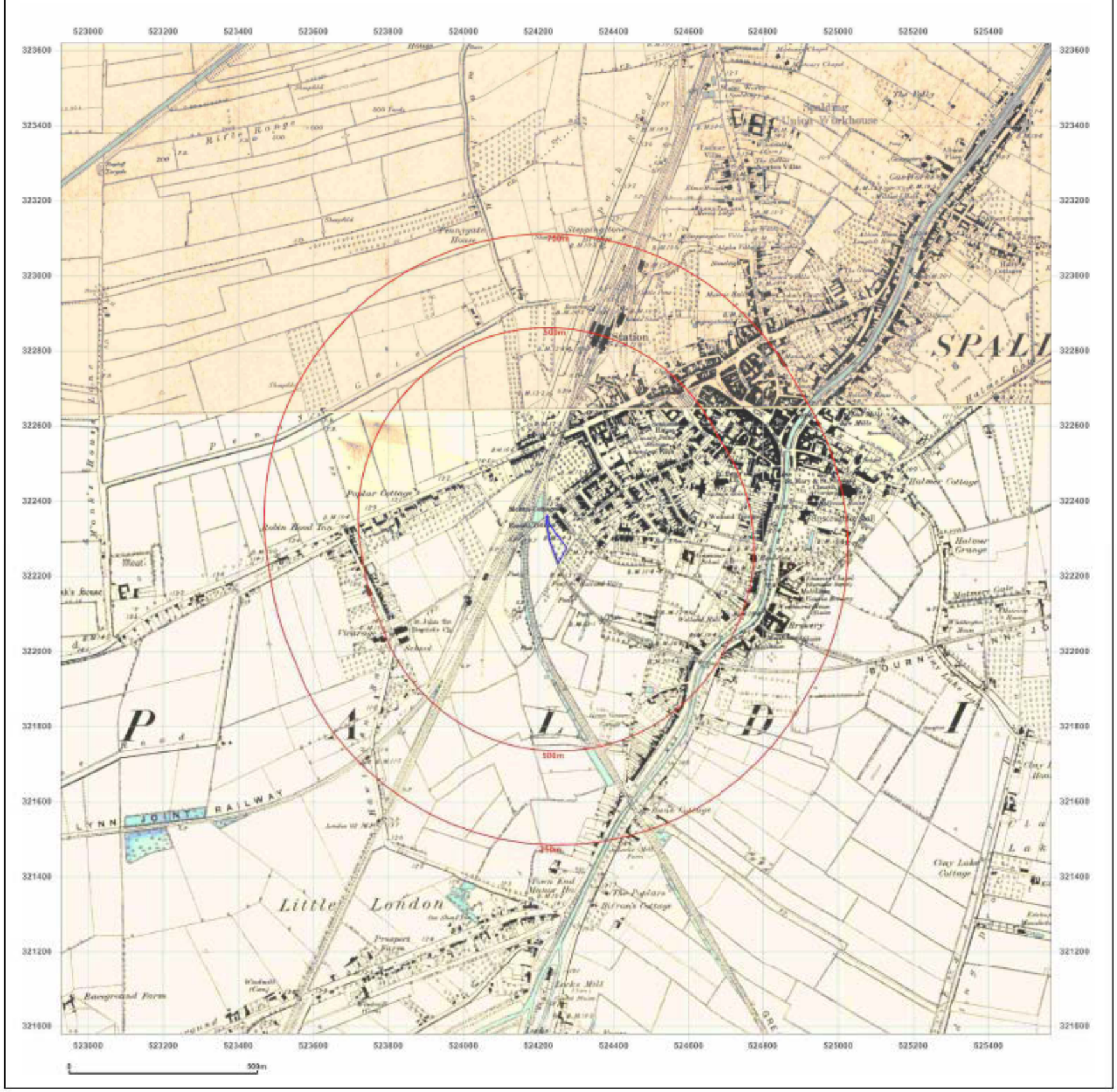
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Site Details:

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1887
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1887
Revised 1887
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1887
Revised 1887
Edition N/A
Copyright N/A
Levelled N/A

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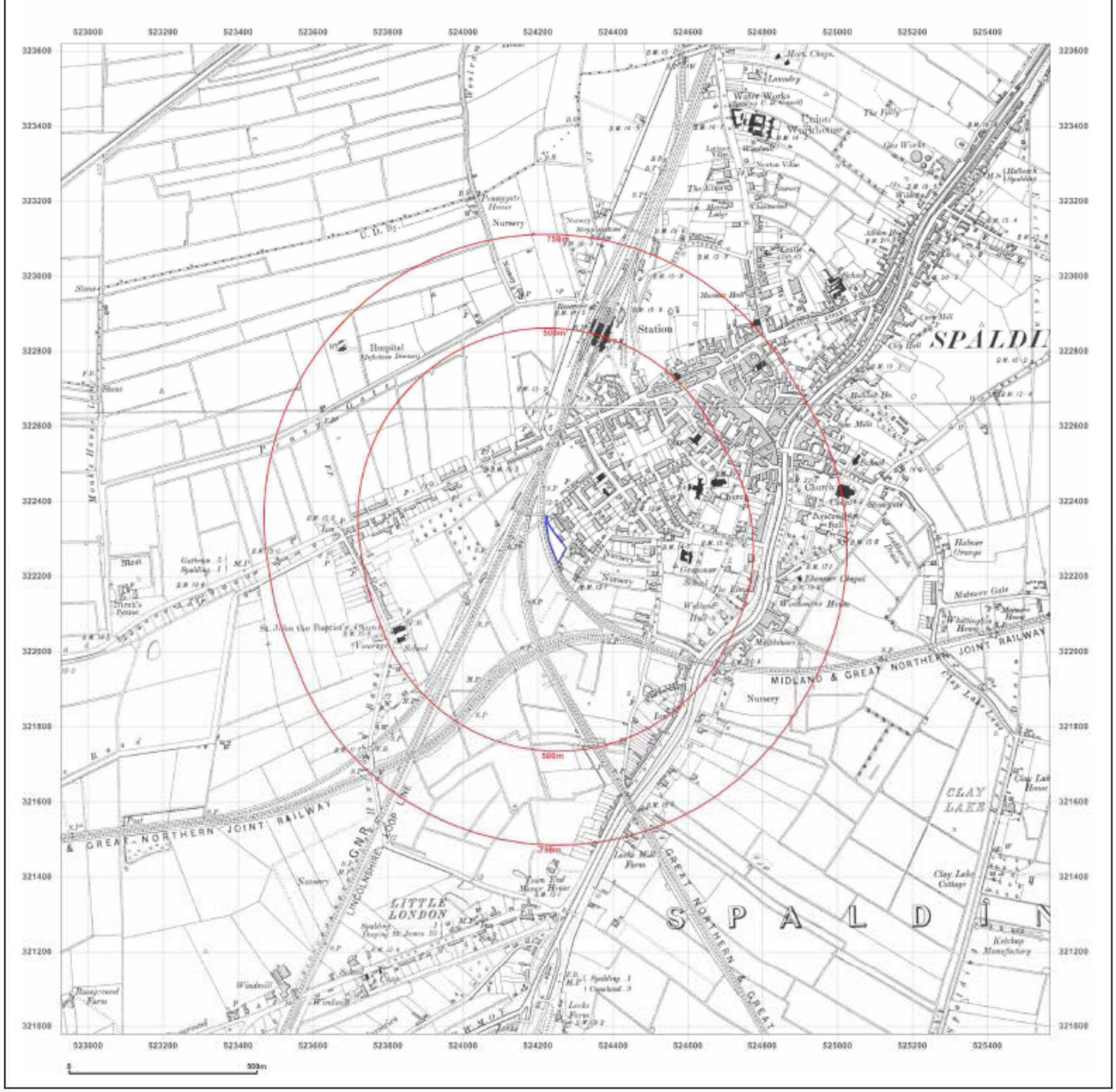
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1903
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1887
Revised 1903
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1887
Revised 1903
Edition N/A
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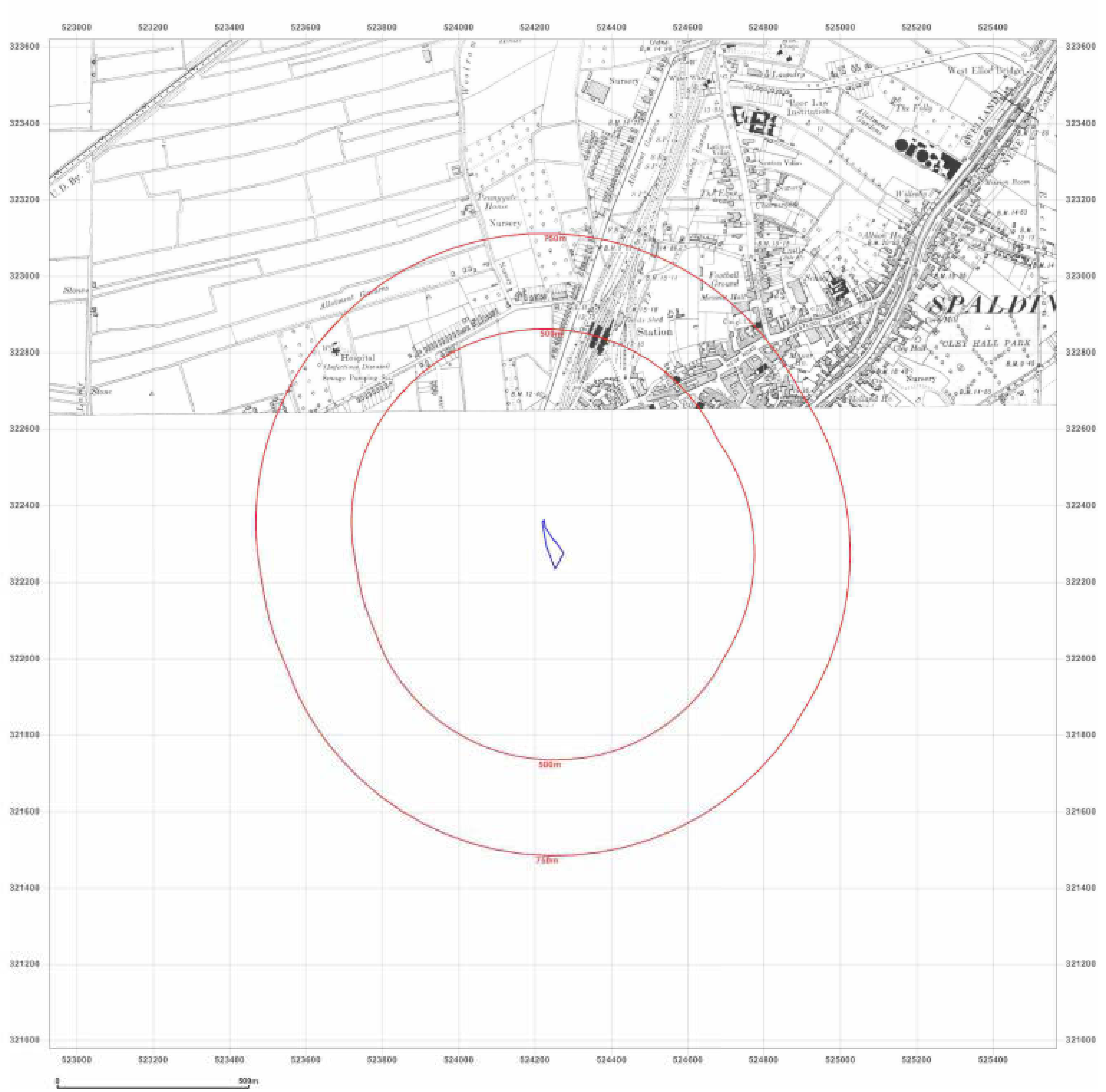
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series

Map date: 1929

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1886
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

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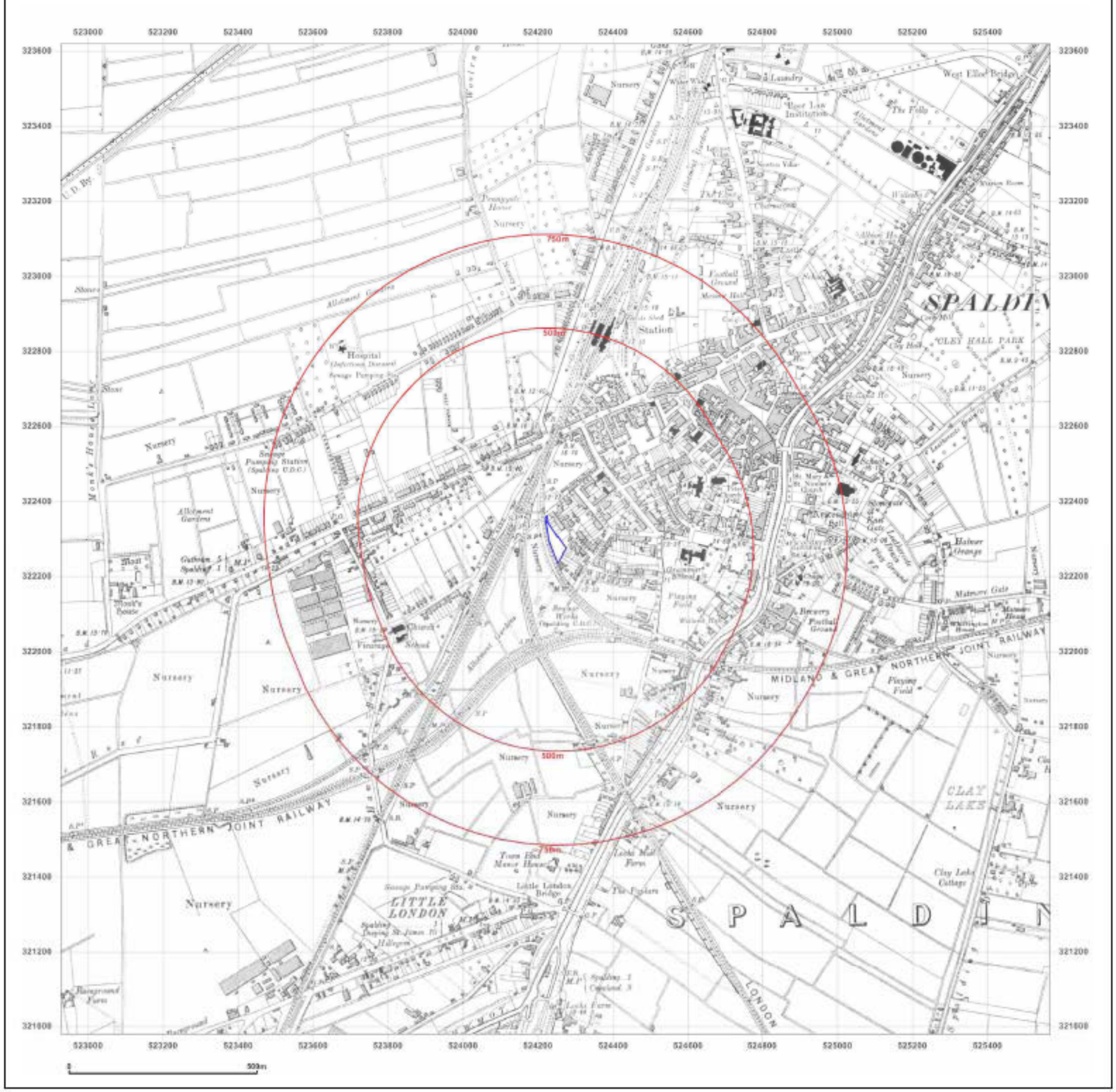
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1929-1932
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1886
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1932
Edition 1932
Copyright N/A
Levelled N/A

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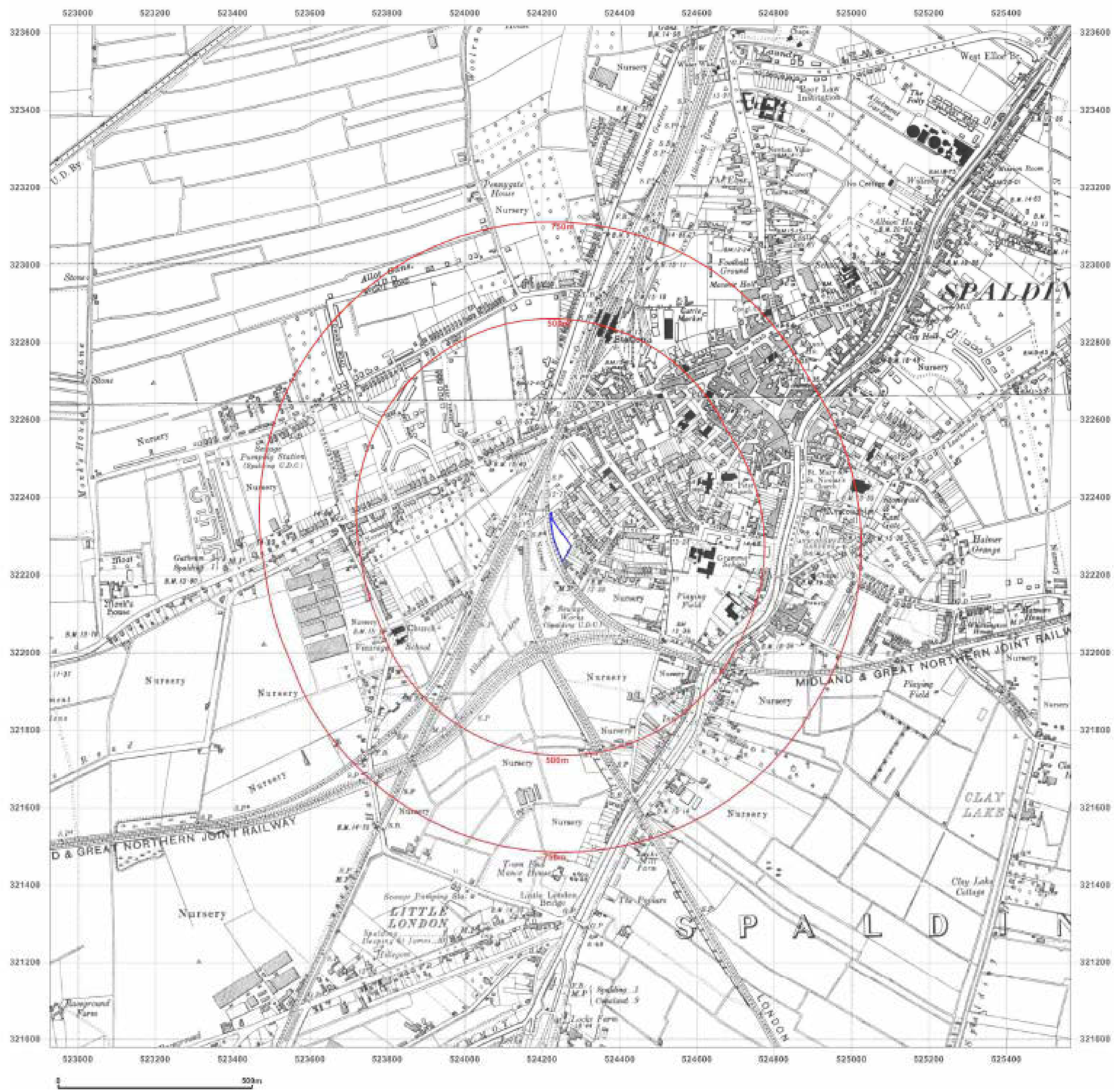
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1886
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

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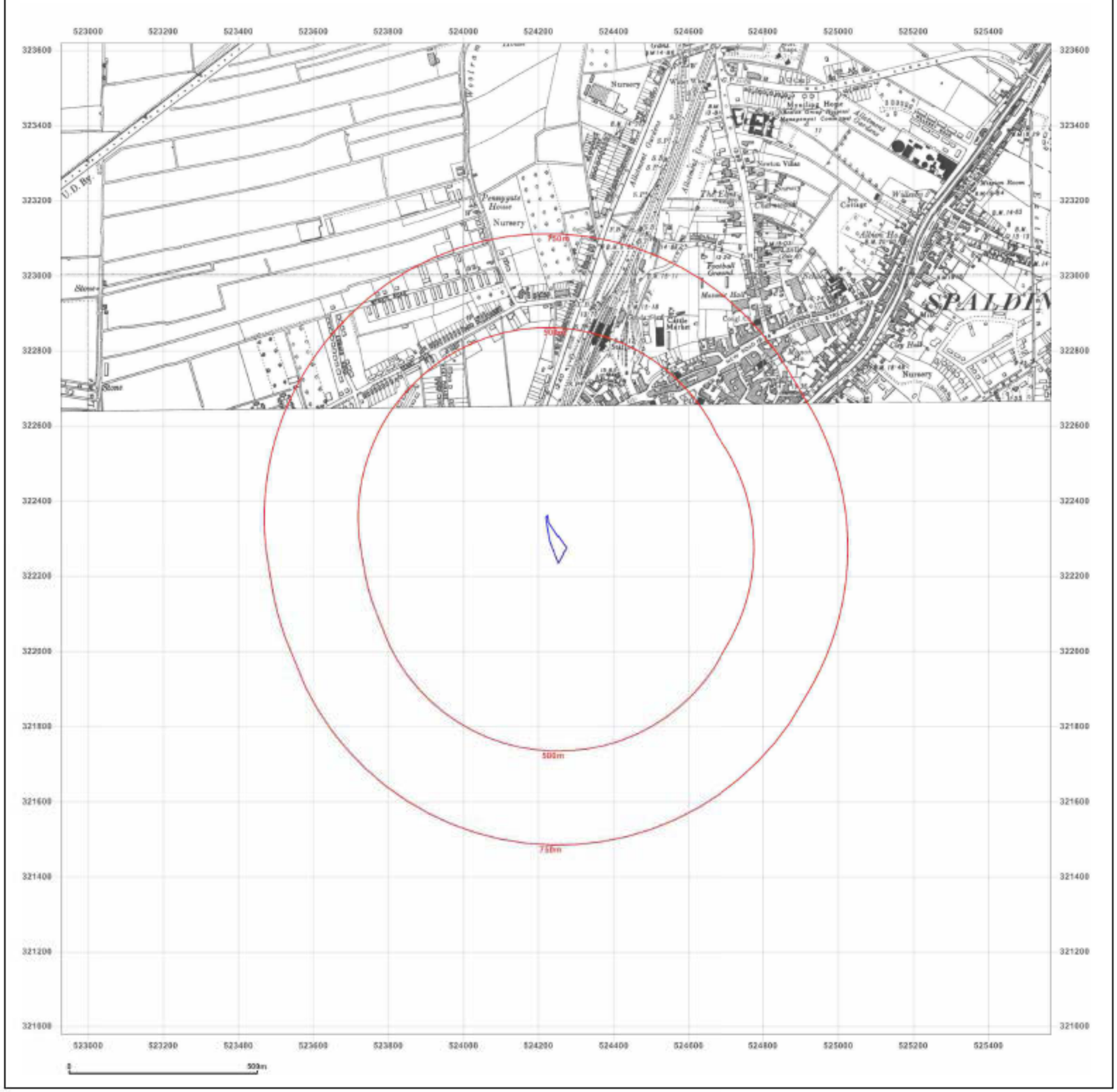
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1950
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1886
Revised 1950
Edition N/A
Copyright N/A
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: Provisional

Map date: 1958-1959

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed N/A
Revised 1958
Edition N/A
Copyright 1959
Levelled N/A

Surveyed N/A
Revised 1958
Edition N/A
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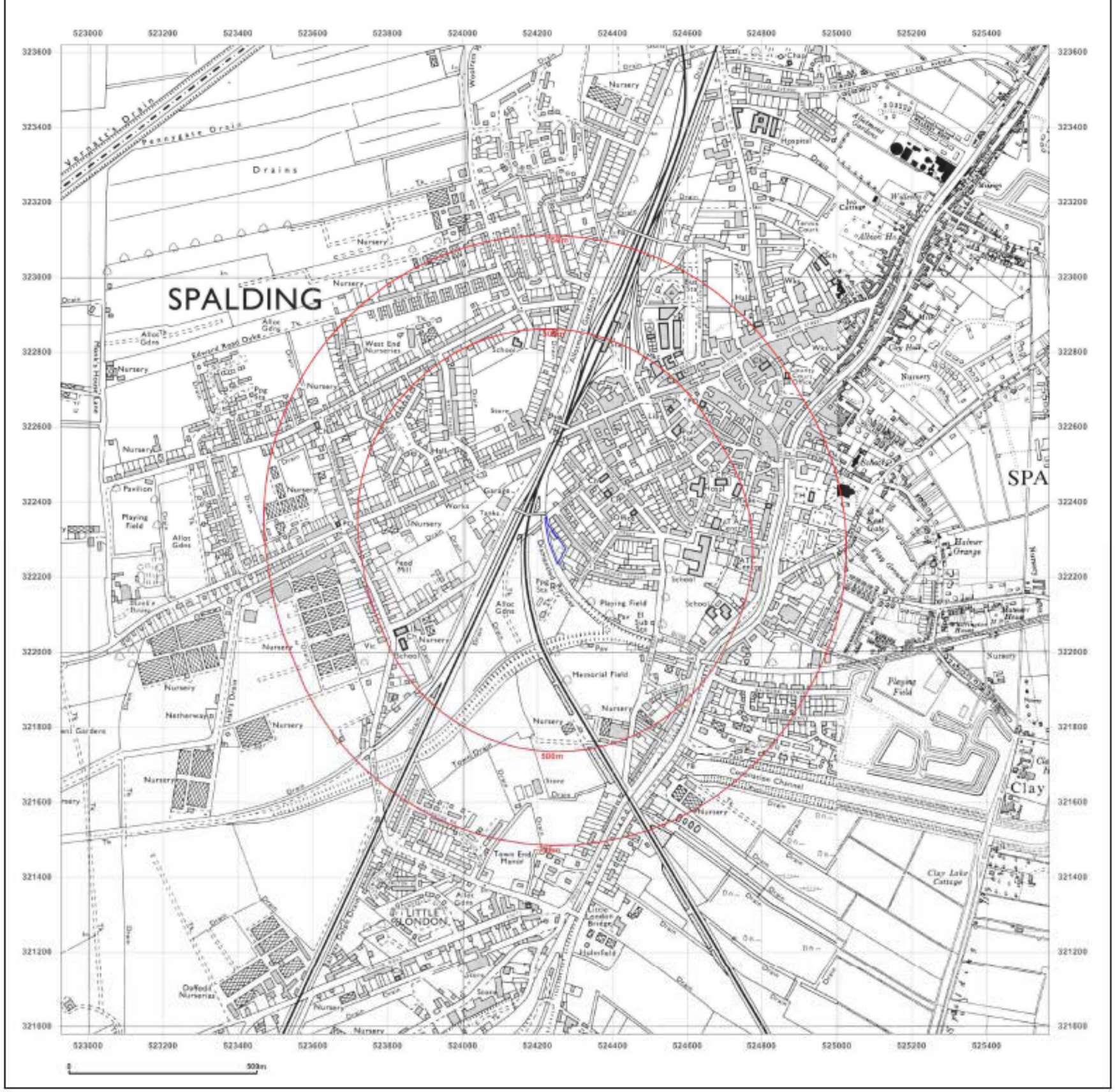
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: Provisional
Map date: **1968-1971**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1969
Revised 1971
Edition N/A
Copyright N/A
Levelled 1969

Surveyed N/A
Revised 1968
Edition 1968
Copyright 1958
Levelled N/A

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1982-1987
Scale: 1:10,000
Printed at: 1:10,000

N
W E
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Surveyed 1980
Revised 1980
Edition N/A
Copyright 1982
Levelled N/A

Surveyed 1979
Revised 1987
Edition N/A
Copyright N/A
Levelled N/A

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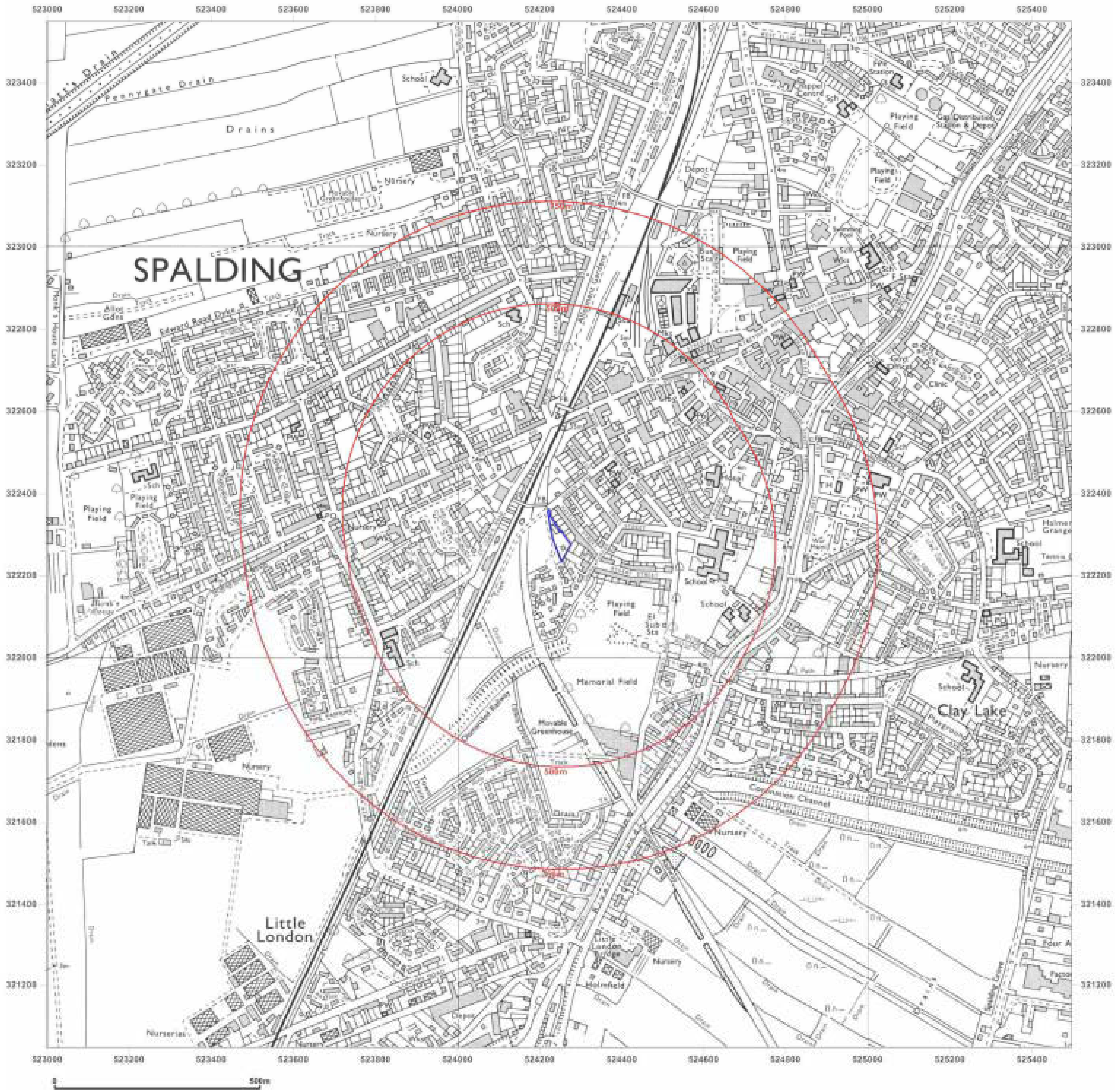
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Lane,Spalding,Lincolnshire,PE11
2YD

Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid

Map date: 1987-1992

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1989
Revised 1990
Edition N/A
Copyright 1992
Levelled N/A

Surveyed 1979
Revised 1987
Edition N/A
Copyright N/A
Levelled N/A

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: 1:10,000 Raster

Map date: 2002

Scale: 1:10,000

Printed at: 1:10,000

N
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2002

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 2010
Scale: 1:10,000
Printed at: 1:10,000

N
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2010

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 2014
Scale: 1:10,000
Printed at: 1:10,000

N
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2014

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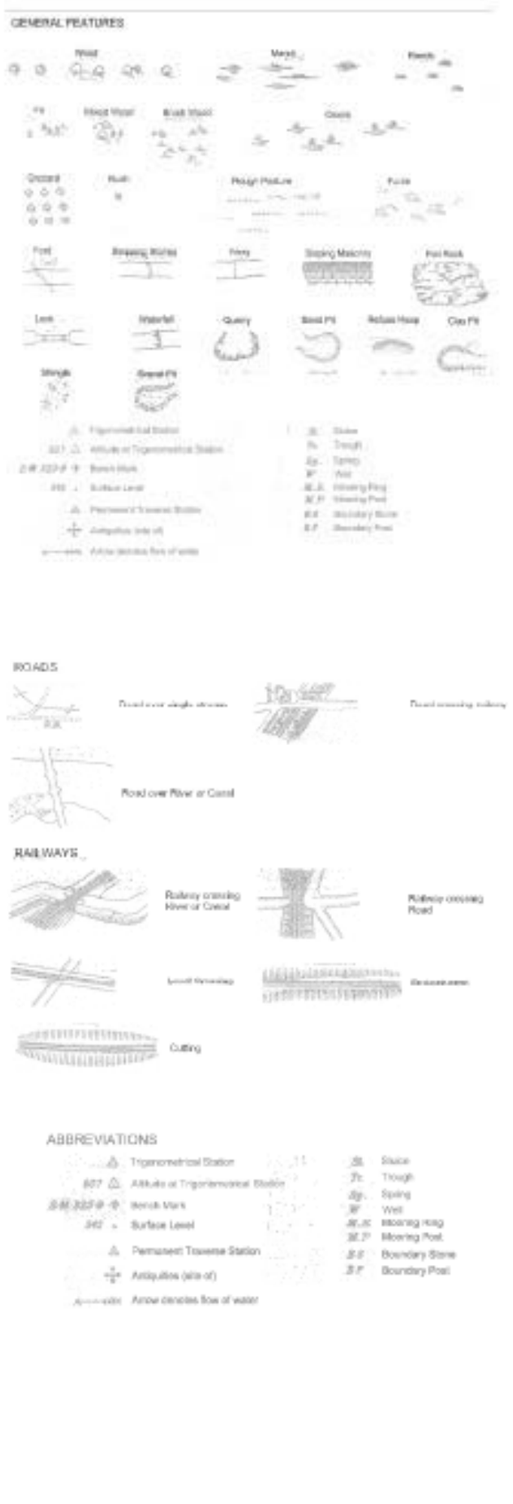
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County Series 1:2,500 scale



National Grid 1:2,500 / 1:1,250 scale



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Historical Map Pack Legend

County Series

1:1,250 scale

~

County Series & National Grid

1:2,500 scale

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series Town Plan
Map date: 1888
Scale: 1:500
Printed at: 1:1,000

N
W E
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Surveyed 1888
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1888
Revised N/A
Edition N/A
Copyright N/A
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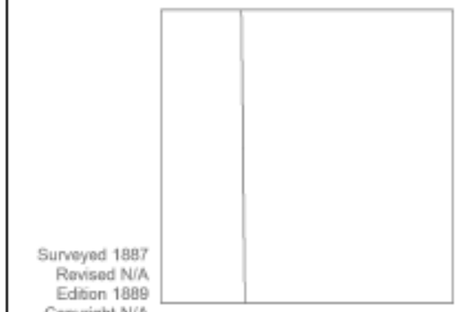
Site Details:

19 Green Lane,Spalding,Lincolnshire,PE11 2YD

Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1889
Scale: 1:2,500
Printed at: 1:2,500

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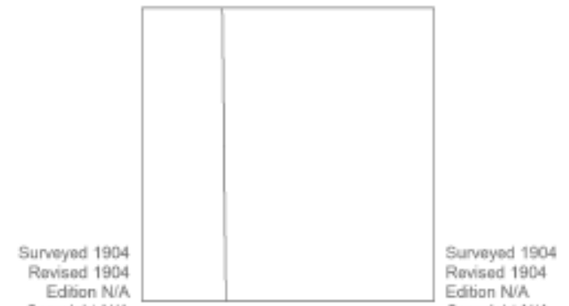
Site Details:

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1904
Scale: 1:2,500
Printed at: 1:2,500

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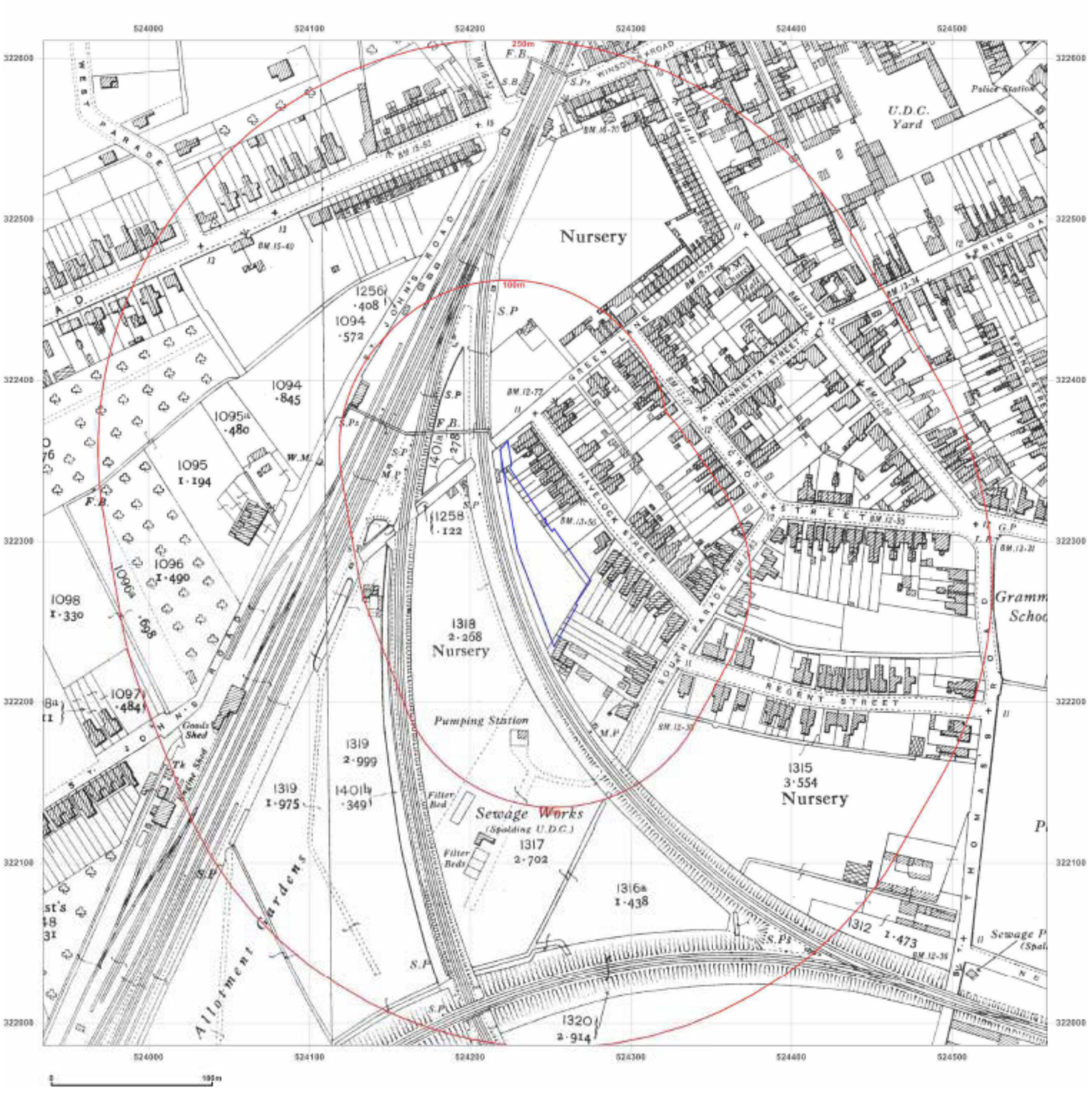
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: County Series
Map date: 1931
Scale: 1:2,500
Printed at: 1:2,500

N
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S

Surveyed 1931
Revised 1931
Edition N/A
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Levelled N/A

Surveyed 1931
Revised 1931
Edition N/A
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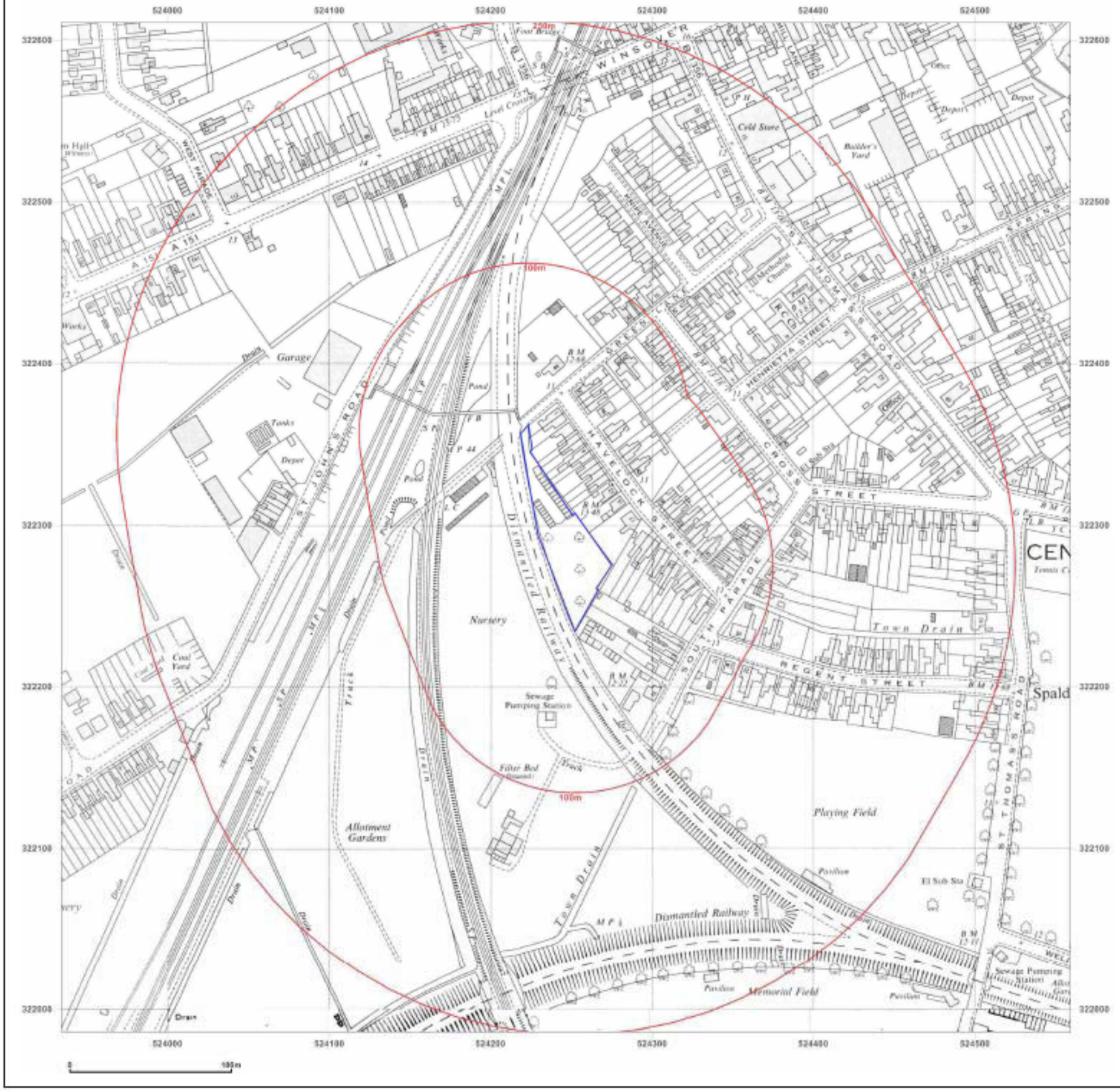
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1965-1967
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1967
Revised 1967
Edition N/A
Copyright 1968
Levelled 1965

Surveyed 1967
Revised 1967
Edition N/A
Copyright 1968
Levelled 1965

Surveyed 1967
Revised 1967
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Levelled 1965

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Revised N/A
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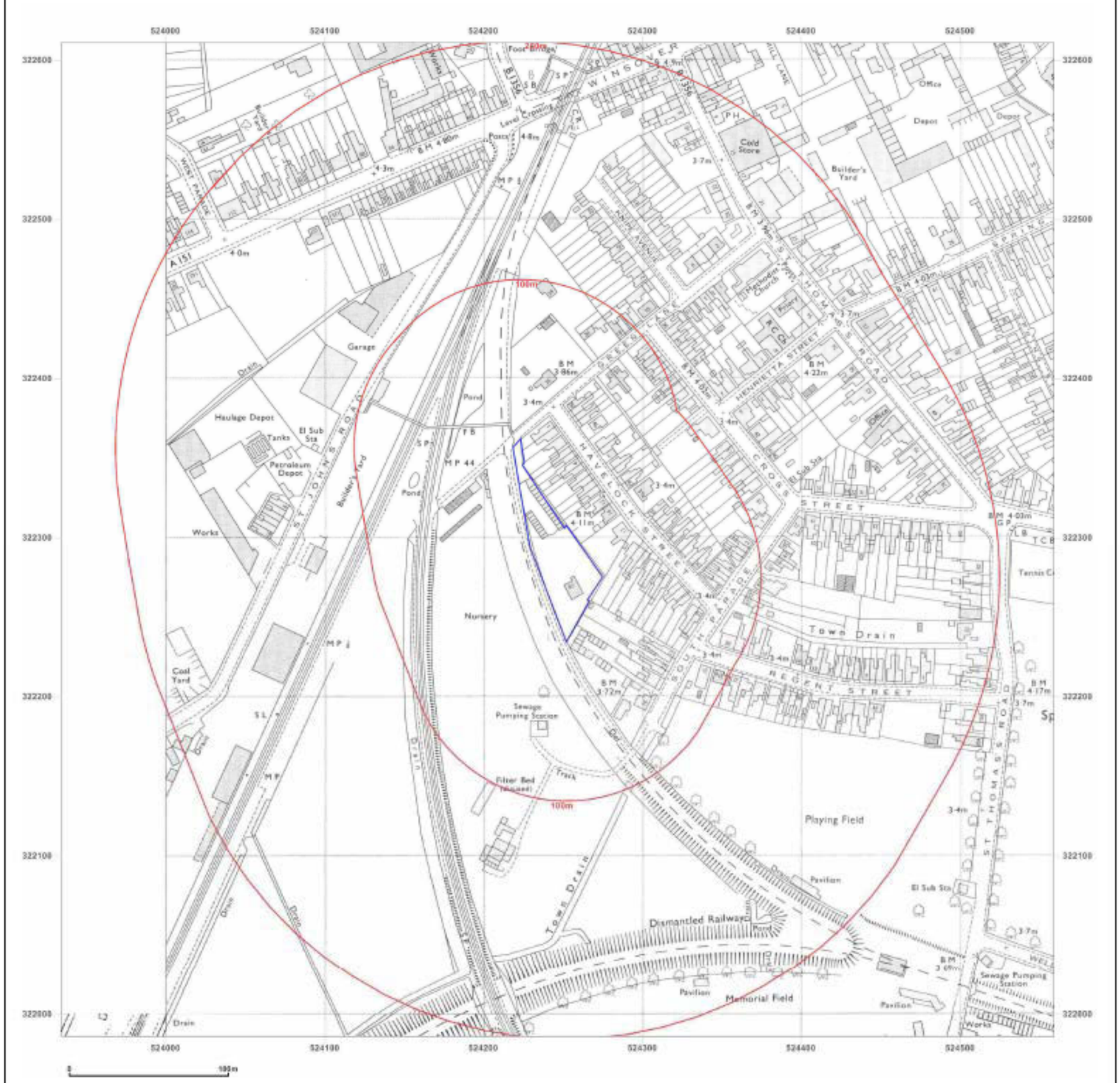
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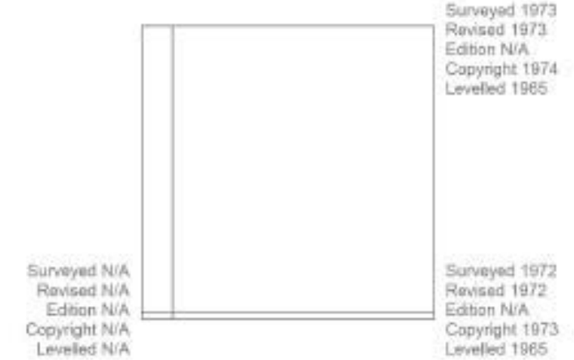
Site Details:

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1972-1977
Scale: 1:2,500
Printed at: 1:2,500

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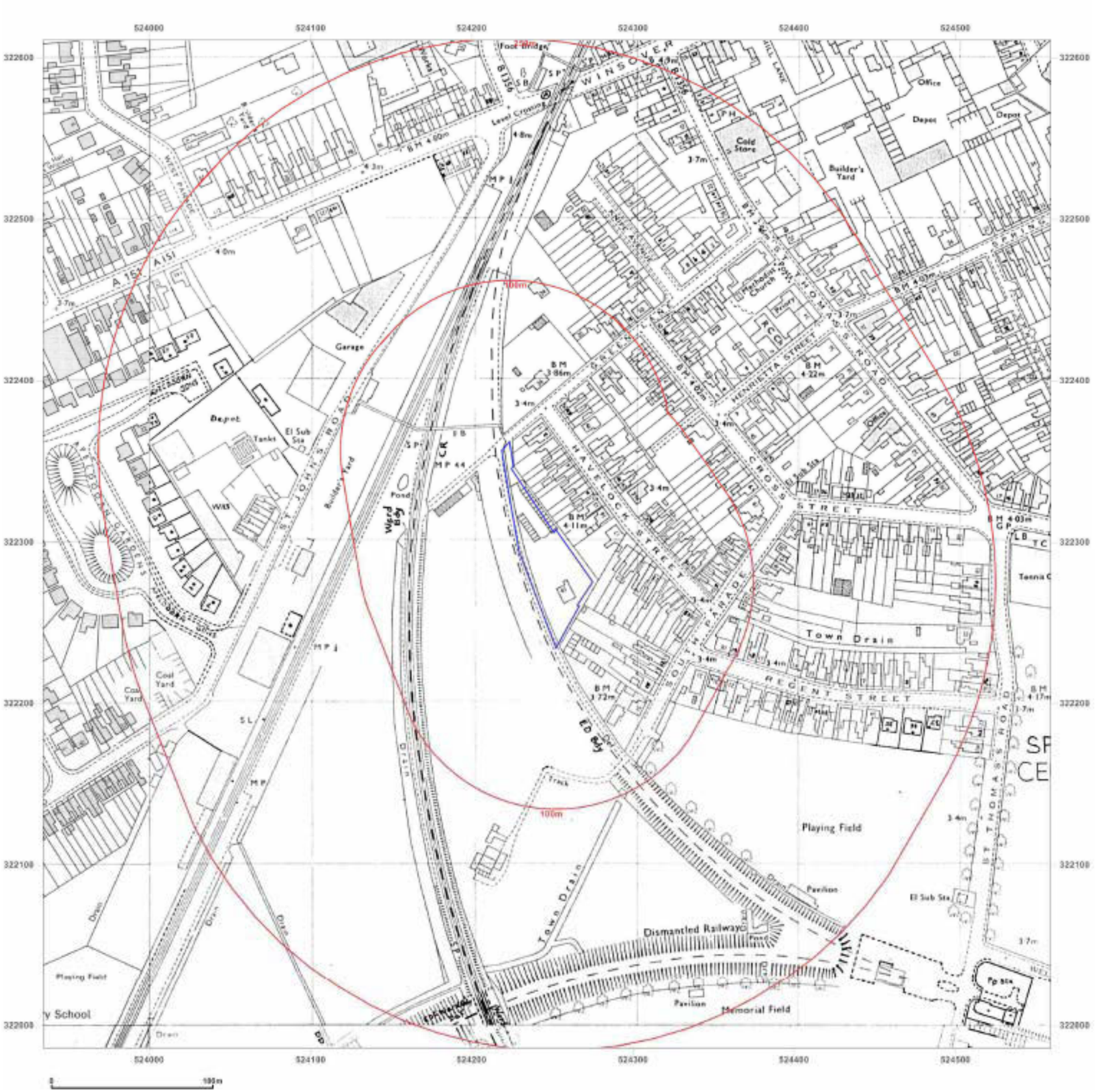
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1982-1986
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1967 Revised 1982 Edition N/A Copyright N/A Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1982 Levelled 1965
Surveyed 1965 Revised 1985 Edition N/A Copyright 1992 Levelled 1965	Surveyed 1965 Revised 1986 Edition N/A Copyright 1986 Levelled 1965

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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1989-1992
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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Surveyed 1967
Revised 1982
Edition N/A
Copyright 1989
Levelled 1965

Surveyed 1992
Revised 1992
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled 1990

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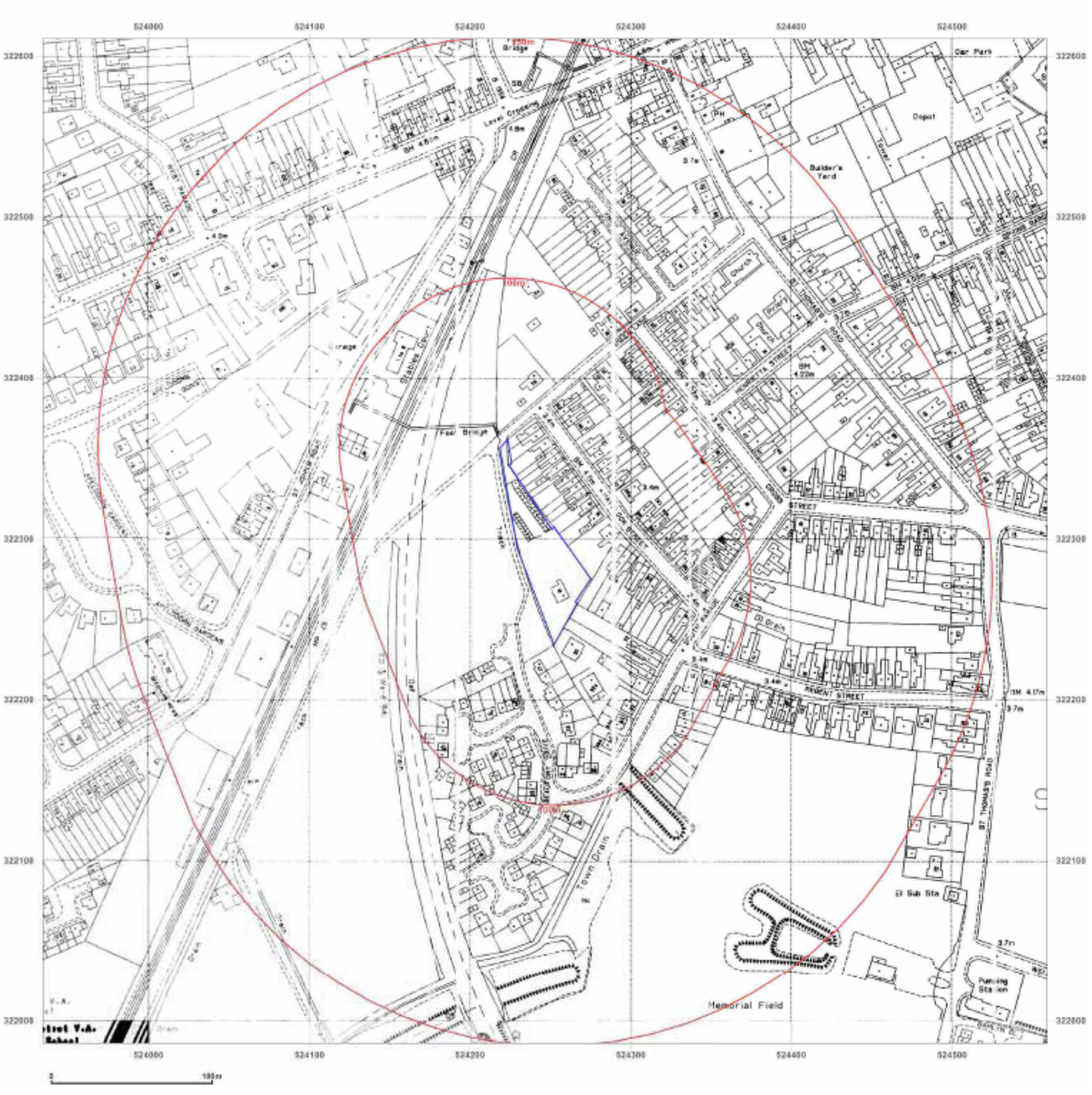
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Client Ref: EMS_395913_529588
Report Ref: EMS-395913_529588
Grid Ref: 524247, 322299

Map Name: National Grid
Map date: 1992-1995
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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Surveyed 1992	Surveyed N/A
Revised 1992	Revised N/A
Edition N/A	Edition N/A
Copyright 1992	Copyright 1995
Levelled N/A	Levelled N/A
Surveyed 1992	Surveyed 1995
Revised 1992	Revised N/A
Edition N/A	Edition N/A
Copyright 1992	Copyright 1995
Levelled N/A	Levelled N/A

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Production date: 02 December 2016

To view map legend click here *Legend*

Appendix D Local Authority Records.

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date: 14 December 2016

ask for: Jeanette Reith

email: jreith@sholland.gov.uk

SOUTH HOLLAND DISTRICT COUNCIL

Council Offices
Priory Road
Spalding
Lincolnshire PE11 2XE
tel: 01775 761161
fax: 01775 711253
www.sholland.gov.uk

Paul Brewer

Terragen Environmental Consultants Limited

The Ridings

4 Village Close

Sherington

Buckinghamshire

MK16 9PZ

Dear Paul

Environmental Search 19 Green Lane, Spalding, PE11 2YD

Order number TJ3117A/PB091216

1. The site has not been identified as 'contaminated land' under Part IIA of the Environmental Protection Act 1990.
2. We do not have a record of any pollution incidents for the site or the surrounding area. The Environment Agency may have more information on this.
3. Environmental Health does not deal with fly tipping so we therefore have no records for this.
4. There are no recorded private water supplies for the site or surrounding area.
5. We do not have any groundwater/surface water abstraction records for this site. The Environment Agency may have more information on this.
6. We do not have a record of any local authority permitted waste or industrial activities for this site or surrounding area.
7. In terms of potentially contaminative uses we have a record of several garages on the northern part of the site. We also have a record of former railways along the western boundary from 1889 - 1992.
8. Apart from the current application there have been no planning applications for the site since 1977.
9. We do not have any historical site investigation reports for this site.

I hope this is the information that you require.

As discussed there is a £50 charge for this search and an invoice will follow shortly.

Please contact me if you require anything else.

Yours Sincerely

Jeanette Reith

Team Leader Environmental Protection

Appendix E Photographic Record.

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Photographic Record



Photograph 01
View of the site entrance from the footbridge to the N



Photograph 02
View from N to S along the access drive



Photograph 03
View from S to N along the access drive



Photograph 04
View of garages in the N part of the site



Photograph 05
View of garages in the N part of the site



Photograph 06
View of garages in the N part of the site



Photograph 07
View of ACM sheets used as shuttering to planting beds



Photograph 08
Greenhouse in garden in S part of the site

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Photograph 09
View from N to S towards the bungalow



Photograph 10
Compost heap in the garden area



Photograph 11
View of the SE part of the garden



Photograph 12
Plastic vent pipe to the E of the bungalow



Photograph 13
Wooden cladding to the bungalow



Photograph 14
Rear (S) frontage of the bungalow in the S part of the site



Photograph 15
View of the garden in the SW of the site



Photograph 16
NW corner of the bungalow

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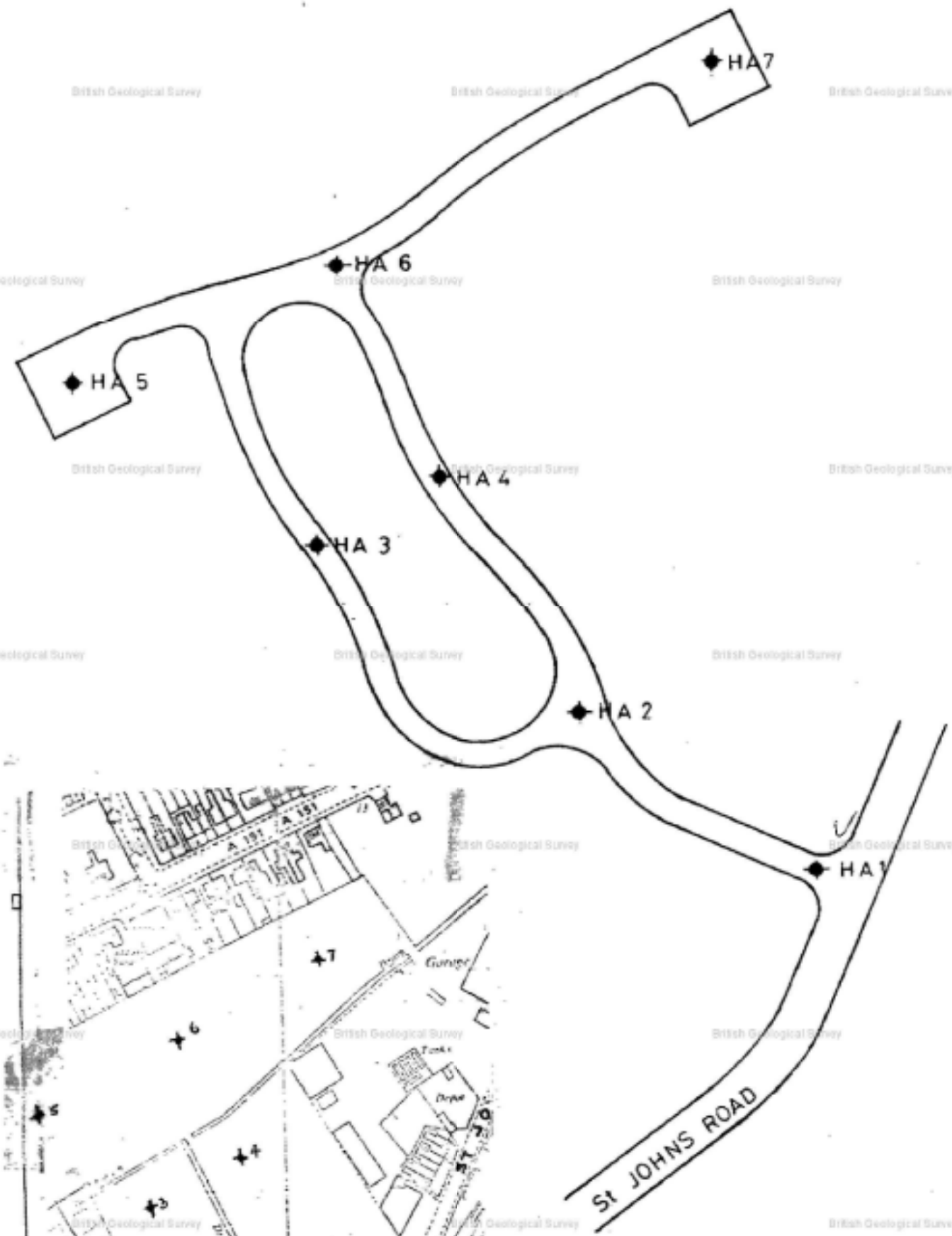
Appendix F BGS Records.

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TF 22 SW 136

PLAN OF ESTATE SHOWING BOREHOLE POSITIONS

1": 144



Form No. H. Z. 371

British Geological Survey British Geological Survey British Geological Survey

LINCOLNSHIRE COUNTY COUNCIL

MATERIALS LABORATORY

BORE HOLE RECORD

Site: St. John's Road, Spalding			
Chainage	Bore Hole No. 1	Hand/Rig/Trial Hole ~~100~~/150/~~300~~ mm dia.	Weather: Fine
Water table m. below surface		Water seeping in hole at m. below surface	Date bored: 2.8.74
Remarks			

British Geological Survey British Geological Survey British Geological Survey

Depth below surface m.	Description of Strata Field Identification
0.00	
	Brown silty soil
0.45	
	Soft brown grey silty clay
1.25	TOTAL DEPTH

Depth below surface m.	P.L.	L.L.	Casagrande Classn.	C.B.R. %	Ø	S.P.T.	Cohesion kN/m²	Density kg/m³ Wet	Density kg/m³ Dry	Natural moisture content %
0.31–1.21	NP	NP		1.0				1914	1567	22.1
1.21										23.4

Symbols: (u) Undisturbed (r) Reconstituted S.P.T. Standard penetration (No. of blows) Ø Angle of internal friction

British Geological Survey British Geological Survey British Geological Survey

TF 2254 [36
2404. 2225

TF 22 SW 61 24165 22512

Contract Name	Trial Pit No. 7
A16 TRUNK ROAD SPALING TO SUTTERTON	Sheet 1 of 1

Method of Excavation Mechanical Excavator [JCB3C]

Ground Level
Start 14.3.85
Finish 14.3.85

Water Levels	In-situ Tests	Samples	Depth (m)	Reduced Level (m.O.D.)	Thickness (m)	Description of Strata	Legend
					0.60	Made Ground [Stiff to hard dark grey and black sandy very silty clay with occasional brick fragments and gravel]	
	V	↕	0.60		0.60	Made Ground[Compact brown silty clayey sand with occasional bricks and vertical root bores]	
		↕	1.20		0.30	Brown clayey very sandy SILT	
			1.50			BOTTOM OF TRIAL PIT	

Notes Hand vane tests @ 0.80 m 43,43, kPa
Pit dry and stable to full depth