Report Title:

Phase 1 Geo-Environmental Desk Study

Project Name:

Land South of Chiswell Green Lane

Report Reference: BRD3604-OR1-C

Date: March 2022

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REPORT CONTROL SHEET

REPORT TITLE	PHASE 1 GEO-ENVIRONMENTAL DESK STUDY
PROJECT	LAND SOUTH OF CHISWELL GREEN LANE
CLIENT	REDINGTON CAPITAL & CALA HOMES

REPORT REFERENCE	ISSUE DETAIL	DATE	PREPARED BY	CHECKED BY
BRD3604-OR1-A	First Issue	15/01/2020	J Hand	M Morgan
BRD3604-OR1-B	Updated Client details and site condition.	27/09/2021	M Morgan	J Brockwell
BRD3604-OR1-C	Updated site plans and development description.	31/03/2022	J Brockwell	J Brockwell

BRD Environmental Limited

Geotechnical and Environmental Services

- Ground Investigation
- Japanese Knotweed Removal
- Soil, Water and Gas Testing
- Contamination Assessment
- Geotechnical Advice
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REPORT LAYOUT

This report is divided into the following four sections: Summary Report, Technical Report, Supporting Information and Appendices.

SUMMARY REPORT

This expanded executive summary provides the main findings of the work undertaken in brief non-technical language. This section provides an overview of the key outcomes for the benefit of non-specialists and concludes with the main recommendations. This section should only be relied upon in the context of the whole report and the Technical Report should be referred to with respect to any design decisions.

TECHNICAL REPORT

The main report section is intended to provide the technical detail of the investigation and is intended to provide the level of information required by current guidance documents and practice. The Technical Report is written in a language that, in part, assumes knowledge of subject matter so that it can be written in as concise a form as possible. Its intended audience is peers, regulators and other professionals in related disciplines.

SUPPORTING INFORMATION

This section of the report provides background details of a generic nature together with specific technical approaches adopted by BRD and details of the guidance documents that are commonly referenced in the report. The section also includes explanations of technical terms to assist non-specialist readers in understanding the Technical Report. It should be noted that not all the information within this section is necessarily applicable to this specific report.

APPENDICES

The final section of the report presents the factual data collected and employed as part of the investigation.

APPENDIX 1	SITE PLANS & PHOTOGRAPHS	
	Site Location Plan	McBains 'Site Location Plan' drawing ref. REDC01 MCB ZZ ZZ DR A 0201 S3 P5, dated 30/03/2022.
	Walkover Photographs	Ref. BRD3604-OP2-B
	Site Layout Plan	JB Planning Associates 'Site Location and Ownership Plan' drawing ref. 1298.04 dated 26/02/2021.
	Initial Conceptual Site Model	Ref. BRD3604-OP3-B
APPENDIX 2	HISTORICAL PLANS	
	Order No. 228564710_1_1	44 x A3 pages
APPENDIX 3	ENVIROCHECK REPORT	
	Order No. 228564710_1_1	59 x A4 pages & 17 x A3 pages

SUMMARY REPORT

SUBJECT	COMMENTS
CURRENT SITE CONDITION	The site comprises predominantly open fields and paddocks. A small farm with stables is present in the north east and a riding school with further stables and a manège in the north west of the site. The garden to the farmhouse contains a disused outdoor swimming pool. In the south of the site is an open field with a small coppice of mature trees. Within this area are several shipping containers, building materials and used containers where a building contractor previously stored building supplies. In the east of the site is a small fenced off former paddock and a dilapidated breezeblock building.
PROPOSED DEVELOPMENT	The proposed development comprises the demolition of existing structures and construction of up to 391No. dwellings (Use Class C3), the provision of land for a new 2FE Primary School, open space provision and associated landscaping and new access arrangements.
HISTORICAL SUMMARY	Chiswell Green Farm has been historically present in the northeast of the site and the remainder of the site has remained largely undeveloped comprising open fields and paddocks. Several buildings were constructed in the mid-20th Century as part of Chiswell Green Farm. By the turn of the 21st Century the northwest corner of the site was being utilised as a riding school and more recently the coppice in the southern extent of the site has been utilised by a building contractor to store materials.
PUBLISHED GEOLOGY	The northern and southern extents of the site are shown to be underlain by superficial deposits comprising sand and gravels of the Kesgrave Catchment Subgroup. The shallowest bedrock unit is shown to be Lewes Nodular Chalk Formation and Seaford Chalk Formation.
RADON GAS	Radon gas protection measures are not required.
HYDROGEOLOGY	A proportion of the site is situated upon superficial deposits designated a Secondary A Aquifer. The underlying bedrock geology is designated a Principal Aquifer and the site is located within a groundwater Source Protection Zone 2 (Outer Protection Zone).
HYDROLOGY	The closest surface water feature to the site is a pond group of small ponds approximately 50m to 70m west of the site. The River Ver is approximately 1.5km east of the site running north to south. The site is not in an area indicated to be at risk of flooding.
PREVIOUS GROUND REPORTS	BRD is not aware of any previous ground investigation at the site, however a Desk Study was undertaken by Geo-Environmental Services Ltd in 2014 for the northern portion of the site including Chiswell Green Farm and the riding school on Chiswell Green Lane.

PRELIMINARY CONTAMINATION RISK ASSESSMENT	
The vast majority of the site is unlikely to be significantly contaminated. However, some localised contamination may have derived from the farmyard at Chiswell Green Farm in the northeast of the site, and any spillages from either of the two above ground fuel / oil storage tanks that have been present on the site. Limited pesticide residue may be present on the site due to the historic use of the site as an orchard and agricultural fields. Additionally, evidence of waste materials are present on the site and may pose a localised contamination risk.	
PRELIMINARY GEOTECHNICAL ASSESSMENT	
Several buildings are currently present on the site, and historically a few other buildings have been shown to be present primarily in the eastern area of the site before being demolished. Additionally, a disused swimming pool is present in the rear garden of the farm house. Complications to the design and construction of foundations may arise where removal of existing and historical structures has disturbed the subsurface. Parts of the site are shown to be within areas of moderate risk with regards to Chalk dissolution features, therefore such features may be present resulting in areas of loose soils or unstable ground. This relates to the area where the superficial deposits overly the bedrock in the northern and southern parts of the site. The Chalk is shown to outcrop in the central area of the site, indicating that the sand and gravel deposits in the northern and southern extents of the site may not be thick. However, soakaways within either medium is anticipated to be feasible.	
RECOMMENDATIONS	
PHASE 2 CONTAMINATION ASSESSMENT	Potential localised contamination risks have been identified by this Phase 1 Desk Study and therefore a Phase 2 Contamination Assessment is necessary to assess the significance of these potential pollutant linkages. It is recommended that this next phase of assessment includes a combination of trial pits and windowless sampling boreholes to assess the underlying ground conditions and to target any potential contamination as a result of the previous uses of the site. Although there is a need for a Phase 2 Contamination Assessment, this Phase 1 report has confirmed that there should be no significant contamination on the site, which would preclude any redevelopment and therefore no reason why the subsequent contamination assessment could not be addressed through appropriately worded conditions on any future planning permission for the proposed development.
GEOTECHNICAL GROUND INVESTIGATION	It is then recommended that a geotechnical ground investigation is undertaken to determine the nature of any disturbed ground present at the site, the geotechnical properties of the underlying bedrock and the presence of any solution features.

1. INTRODUCTION TO TECHNICAL REPORT

1.1. CONTRACT DETAILS

CLIENT	Joint Clients comprising Redington Capital Limited trading as Redington Capital and CALA Homes (Chiltern) Limited trading as CALA Homes.
SITE	Land south of Chiswell Green Lane in the village of Chiswell Green, St Albans.
CLIENT'S ADVISORS	BRD Environmental Limited (BRD) has been commissioned directly by the joint Clients.
REPORT CONTEXT	It is understood that the joint Clients own the site and plan to develop and submit a planning application for a housing development and primary school.
REPORT TYPE	Factual and interpretative geo-environmental desk study.
REPORT OBJECTIVES	The purpose of the report is to undertake a Phase 1 contamination assessment to support a planning application to St Albans City and District Council.

1.2. SCOPE OF WORKS

The agreed scope of works was:

- Desk based research through the purchase of an Envirocheck report, including:
    - Environmental database search.
    - Environment Agency data.
    - BGS radon maps.
    - Mining and natural cavities database search.
    - Available historical Ordnance Survey plans.
- Interpretation of the geological, hydrogeological and hydrology setting of the site from published sources.
- A site walkover will be undertaken as part of the Phase 2 ground investigation works to identify any potential sources of contamination or indication of other ground related hazards at the site and its surroundings.
- Prepare a Phase 1 desk study report including copies of the purchased information, interpretation of the collected data to identify and assess contamination hazards together with any other environmental/geotechnical issues.

In 2021 it was agreed to update the report for a new planning application and this comprised the following additional scope of works:

- A site walkover will be undertaken by a Geo-Environmental Consultant to confirm site conditions.
- Update existing Phase 1 desk study report to reflect current site conditions.

1.3. REPORT LIMITATIONS

Any site boundary lines depicted on plans included within this report are approximate only and do not imply legal ownership of land. Any observations of tree species, asbestos containing materials within structures or invasive weeds, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. In the case of Japanese Knotweed, BRD can undertake separate surveys for this plant undertaken by a Property Care Association qualified surveyor.

The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

It is emphasised that a desk study and walkover can only indicate the potential for contamination on the site. This study aims to highlight potential pollutant linkages in line with current guidance. The plausibility of these linkages can only be proved by an intrusive ground investigation.

It should be noted that a desk study and walkover can only reveal the potential for certain types of ground conditions and geotechnical hazards. For any form development an intrusive ground investigation is recommended. The scope of this investigation excludes a formal slope stability study and any observations made regarding slopes are for information only.

2. SITE CHARACTERISTICS

2.1. SITE SETTING

SITE ADDRESS AND POST CODE	Land south of Chiswell Green Lane and west of Forge End, Chiswell Green, St Albans, Hertfordshire, AL2 3AJ.
NATIONAL GRID REFERENCE	513100E, 204290N.

2.2. SITE DESCRIPTION

INSPECTION DATE	22nd September 2021.
CURRENT USE	The southern part of the site comprises primarily a large open field and a small coppice near the southern boundary, which surrounds an area previously used by a building contractor to store materials. In the east of the site is a small disused partially collapsed breezeblock building adjacent to several small redundant paddocks. The northern section consists of an active livery yard, "Chiswell Green Riding School", with a manège in the north western corner and an old farm yard, stables and house in the north eastern area. The remainder of this section consists of a series of horse paddocks.
AREA	Approximately 14.7 hectares in total.
SHAPE	The site is irregular in shape.
ACCESS	Access to the southern parcel of the site via a large metal gate from a hard surfaced drive off Forge End at the north eastern corner of this section. There is also another access point through a metal gate in a gap between some houses along the south eastern boundary. Access is also possible via a track off Noke Side to the south of the site. The livery yard present in the northwest of the site and the farm in the northeast of the site are accessible directly from Chiswell Green Lane.
BOUNDARIES	Surrounding each of the paddocks are wooden posts with metal wire fencing and access via wooden and metal bar gates. The eastern and southern boundaries along the rear gardens of the properties along Forge End and Long Fallow comprise a mixture of hedgerows, trees and fencing. The south western boundary comprises wooden posts with connecting wire. Along the western boundary with Butterfly World are high wire fences with barbed wire across the top and this boundary has recently become heavily overgrown. The southern section of the site is separated from the northern section by several trees and barbed wire fencing along the edge of the paddocks. In the north eastern section, the barn of Chiswell Green Farm is present along the northern boundary with Chiswell Green Lane. A wooden post fence with gate access to the farm is present at the northern end of the farm and continues along the edge of a paddock to the west. The northern

	boundary of the livery yard adjacent to Chiswell Green Lane consists of a large hedgerow with some mature trees. The mid-section of the northern boundary is adjacent to some residential properties off Chiswell Green Lane and this consists of a mixture of wooden fencing and hedgerows.
TOPOGRAPHY	The site gently slopes in a southerly direction from approximately 100m above ordnance datum (AOD) in the north to approximately 85m AOD in the south of the site.
SURFACING	The vast majority of the site consists of grass covered paddocks or open fields. In the southern part of the site there is a small section of concrete hardstanding adjacent to the easterly access point and a dilapidated breeze block shed. The north easterly farm yard areas contain two concrete yards linked by a tarmac access road. At the livery yard there is a gravel covered parking area in the north western corner and a gravel track surrounding a manège, which has specialist sand surfacing. The track leads to another area of gravel hardstanding to the south east. There is also a stable block to the south of the manège and this contains a central concrete yard.
BUILDINGS	A dilapidated breezeblock building is present in the east of the site adjacent to the access from Forge End. By the 2021 walkover the western façade had collapsed. At the livery yard there is a wooden stable block as well as another small brick building that appeared to be used as an office. At the farm yard area there is an old timber framed barn and similar style timber framed sheds in the north eastern corner. To the south of the barn is an old stable block and to the south west is a residential house which appears to date back from the mid to early 20th Century but is still more modern than the barn buildings. The house did not appear to be inhabited and appeared to be used for storage. To the south of the house is an old swimming pool with a small building associated with it. There is a second concrete yard to the west of the house and this contained two large metal shipping containers used for storage.
VEGETATION	Along the boundaries there are multiple hedgerows and a range of semi-mature and mature trees. Within the area of the farm are several mature coniferous trees exceeding 10m and multiple mature non-coniferous trees. The coppice in the south of the site comprises multiple mature trees, some exceeding 20m in height. Additionally, many of the adjacent residential properties have trees within their rear gardens within close proximity of the site boundary, and a small woodland is present adjacent to the site along the eastern boundary.

NOTABLE FEATURES AND OBSERVATIONS	Waste materials, used oil / fuel barrels and canisters were observed around the breezeblock building located in the east of the site and further rubbish had been dumped in the southern section of the site, adjacent to the boundary with the northern section of the site. In the open area within the coppice in the southern section are several large metal storage containers. Building supplies, waste materials and an old mobile fuel tank were also noted within this area although this had been removed by the 2021 walkover. There is also a small pile of asbestos cement sheets resting upon a pile of stacked timber. In the south western part of the livery yard area (in the northern section) is a large muck pile and beyond this there is an 'L' shaped soil bund, although this is quite overgrown. In the farm yard section, it was noted that the barn buildings (where accessible) were used to store various equine equipment and feed. To the south west of the farmhouse is a concrete yard, which contained an old shipping container, an old enclosed lorry trailer, a skip, several bins and some piles of various waste including pallets, plastic and some old oil drums. However, there was no obvious signs of any spillages of fuel or chemicals. To the south of the old farmhouse is an old swimming pool which appeared to have been abandoned for several years. The water had been drained and the area had become heavily overgrown. The pool contained some fallen branches and garden waste but had not been backfilled with any soil or other waste. There is an adjacent small building accessed off the south westerly yard area and linked to the pool and this has frosted glass windows and may be a changing room or plant room. There is also a metal above ground fuel tank to the west of the pool on the edge of a heavily overgrown area adjacent to the paddock and this may have provided heating oil to power a boiler to heat the pool.

SURROUNDING LAND USE	The site is set within a mixed area of residential, commercial and pastoral land.
TO THE NORTH	The site is bound to the north by Chiswell Green Lane. The land north of the road is agricultural to the west and residential to the east.
TO THE EAST	The site is adjacent to several residential developments forming part of Chiswell Green.
TO THE SOUTH	South of the site are further residential properties and directly southwest of the site is a small paddock with several stables.
TO THE WEST	West of the site is the largely vacant complex of "Butterfly World", which closed in 2015 and now appears to be used for vehicle storage.

2.3. SITE HISTORY

MAPPED HISTORY		
DATE RANGE	SITE	SURROUNDING AREA
1872-1925	The site is largely open agricultural fields. Several buildings are present in the northeast corner of the site, and a small orchard is present along Chiswell Green Lane to the west of the buildings.	The site is surrounded by several large fields. The site is bound to the north by Chiswell Green Lane, with several houses present on the opposite side of the road. Several terraced properties are present where the northern boundary indents into the site. A smithy is noted approximately 170m east of the site adjacent to the Three Hammer public house, however this is not recorded after 1899. A small gravel pit is recorded approximately 120m southeast in 1872 of the site, and increases in size towards the south east by 1925.
1937-1960	Boundaries are present in the southeast of the site comprising two small parcels of land.	Residential houses have been constructed along the southern and eastern boundary of the site fronting onto Watford Road.
1962-1978	The building near the southern boundary is no longer present. In the north eastern extent of the site, several buildings have been constructed as part of Chiswell Green Farm.	Extensive residential development is shown to the north, east and south of the site. Where the eastern boundary indents into the site an orchard and woodland is present. An orchard is shown adjacent to the site to the southwest. Adjacent to the northern boundary a building has been constructed along the rear of the Victorian terraced properties.
1992	A building that was present in the east of the site south of Chiswell Green Farm has been demolished.	The surrounding area remains relatively unchanged.
1999-2006	Stables have been constructed in the north west corner of the site with an adjacent manège.	
2019	No significant changes to the site.	By this map edition, Butterfly World is shown to the west of the site (although is known to have shut in 2015).

AERIAL IMAGERY	Google Earth imagery from 1999 is available for part of the site and shows that the site is largely open pastures and paddocks at this time. In the north eastern corner are several buildings comprising Chiswell Green Farm. The pool is present in the back garden of the farm building. Imagery is available for the whole site from 2000 showing the stables and paddocks in the northwest of the site. Adjacent to the stables there is an open area along the western boundary where a muckheap is visible. Google Earth imagery from 2009 shows the construction of Butterfly World directly to the west of the site. Imagery from 2012 shows several small sheds adjacent to the access from Forge end in the south west of the site, further imagery from 2016 shows containers and some stored materials in the south of the site to the rear of the properties along Forge End. Between 2017 and 2018 further containers and materials are shown in the western most area off Forge End and several sheds have been constructed in the access area of Forge End. An aerial 'Britain from Above' photograph from 1951 shows Chiswell Green Farm comprising several buildings and the adjacent fields are used agriculturally. An area directly east of the site is shown as allotments at this time.
INTERNET SEARCH	No information specific to the site was identified.
ANECDOTAL	No anecdotal evidence of site history was gained during the study.

2.4. GEOLOGY

GEOLOGICAL CONTEXT	The site is in an area dominated by Chalk, where to the northwest are the older Chalks of the White and Grey Chalk Subgroup. The bedrock geology becomes younger towards the southeast, where estuarine sediments of the Lambeth Group are present. Locally the overlying superficial deposits of sands and gravels have been quarried for aggregate.
SUPERFICIAL DEPOSITS	Superficial deposits of the Kesgrave Catchment Subgroup are shown only in the northernmost and southernmost parts of the site. A band absent of superficial deposits is indicated to be present from the southwest to northeast across the central area of the site. The Kesgrave Catchment Subgroup is typically characterised as interbedded quartz and quartzite rich sands and sandy gravels deposited in a fluvial environment up to 3 million years ago.
BEDROCK GEOLOGY	The bedrock geology is shown as the Lewes Nodular Chalk Formation and Seaford Chalk Formation composed of hard to very hard nodular Chalks with interbedded soft to medium hard Chalks and marls. The Chalks here formed during the Cretaceous period approximately 84 to 94 million years ago when the local environment was dominated by shallow warm Chalk seas.

MINING AND GROUND STABILITY HAZARDS	The potential for stability hazards associated with compressible and collapsible ground is recognised as very low and potential for stability hazards associated with land sliding, running sand and shrinkage / swelling is not recognised as a hazard for the site. The potential for ground dissolution stability hazards is very low in the central area of the site to moderate in the northern and southern extents of the site where the Kesgrave Catchment Subgroup deposits are anticipated above the Chalk. Chalk dissolution could have occurred when the fluvial sands and gravels were deposited. Dissolution features have been recorded within the wider area of the site including solution pipes and a sinkhole approximately 522m northwest and 537m north east of the site respectively. Bonehill and Daneswick opencast Chalk pits have been recorded 511m northwest of the site and 833m west of the site respectively. A Chalk mining cavity has been recorded 708m west of the site and likely associated with the opencast activities at Daneswick. Quarrying of sand and gravel has also been recorded within the local area of the site approximately 158m southeast of the site and 608m southwest of the site. Additionally, a potential for mining instabilities has been identified on the site. However, the records for mines and quarries in the area suggest this is unlikely to be the case.
BGS BOREHOLE RECORDS	Approximately 350m and 420m west of the site at Bone Hill two British Geological Survey (BGS) boreholes are recorded from 1972 and 1998 respectively. In the eastern most of the two boreholes beneath a layer of topsoil, sand and Gravels interpreted as glacial in origin were encountered to 8.0m comprising very clayey gravel of flint with some quartz and quartzite. The Sands and Gravels are subsequently underlain by what is described as soft white Chalk. The westernmost borehole was conducted to 57.0m to investigate the Chalk aquifer. Brown clay and flints were encountered to 4.0m with underlying hard Chalk and flints to 57.0m. Water was struck at 32m and resting ground water level was identified at 31m below datum. A BGS borehole record is also present approximately 330m south of the site adjacent to the North Orbital Road from 1946. The record indicates gravels were encountered to a depth of 2.7m, overlaying sands to 4.2m, and clay and flints 12m subsequently underlain by Chalk identified to a depth of 28.7m. Resting ground water level was identified at a depth of approximately 17.7m.
SOIL GEOCHEMISTRY	The site is not situated in an area where the natural background concentrations of metals is elevated.

2.5. RADON

The site is not situated within an area where radon gas protection measures are required in new buildings.

2.6. HYDROGEOLOGY

SUPERFICIAL AQUIFER	Where the superficial deposits are present they are characterised as a Secondary A aquifer.
BEDROCK AQUIFER	Principal aquifer.
AQUIFER PROPERTIES	The BGS hydrogeological maps indicate the surface of the Chalk aquifer is at approximately 70m above Ordnance Datum (AOD) within the region of the site and the groundwater level at approximately 60m AOD. The Chalk aquifer dips towards the south east, and the groundwater gradient correlates anticipating flow towards the southeast. Given that the site is approximately 90m AOD, it is anticipated that the water table is approximately 30m below ground level. The BGS boreholes indicate a groundwater level of approximately 80m AOD west of the site and approximately south of the site 67m AOD corroborating a groundwater gradient towards the southeast.
LICENSED GROUNDWATER ABSTRACTIONS	None within 250m from the site.
GROUNDWATER SOURCE PROTECTION ZONE (SPZ)	Zone 2 (Outer Protection Zone).

2.7. HYDROLOGY

SITE DRAINAGE CHARACTERISTICS	The majority of the site is soft cover so any incident rainfall will be subject to direct infiltration. In the southern part of the site no formal drainage infrastructure was identified. In the northern section of the site most of the buildings had guttering and the water is presumed to drain by some form of soakaway.
SURFACE WATER FEATURES	The closest surface water feature to the site is a group of small ponds approximately 50m to 70m west of the site. A stream within catchment of the River Ver is present approximately 350m north of the site. The River Ver is approximately 1.5km east of the site running north to south.
SURFACE WATER ABSTRACTIONS	None within 250m from the site.
DISCHARGE CONSENTS	None relevant to consideration of the site.
FLOODING	The site is in a Zone 1 area and is highly unlikely to be affected by flooding. As the site is greater than one hectare in area, a Flood Risk Assessment will still have to be undertaken for the site.

2.8. ENVIRONMENTAL ASPECTS

LANDFILL	There are no recorded landfill sites within 250m of the site. However, there is some potentially infilled land approximately 100m southeast of the site associated with the former gravel pit located along Watford Road. This has since had houses built over it.
CONTEMPORARY TRADE DIRECTORY ENTRIES	A petrol filling station is located approximately 230m south of the site. There are no other nearby contemporary trade entries of relevance to assessment of the site.
REGISTERED HAZARDOUS SITES	None within 250m of the site.
POLLUTION INCIDENTS TO CONTROLLED WATERS	There has been one significant (Category 2) pollution incident to controlled waters of unknown oils dated 1996 approximately 240m south of the site. However, given the distance and that the incident took place down topographic and groundwater gradient to the site it is not considered to present a risk to the site and as such is not considered further.
ECOLOGICALLY SENSITIVE LAND USE	None identified within 250m.

2.9. PREVIOUS GROUND INVESTIGATIONS

BRD is not aware of any previous ground investigation at the site, however a Desk Study was undertaken by Geo-Environmental Services Ltd during May 2014 for the northern portion of the site including Chiswell Green Farm and the riding school on Chiswell Green Lane.

At the time of the walkover conducted in 2014 the site was noted to be primarily undeveloped and in use as horse paddocks. Chiswell Green Farm in the northeast of the site was recorded to comprise the farm house and gardens, with three outbuildings present along the northern boundary.

The riding school present in the northwest of the site was described as comprising a rectangular manège, a horseshoe shaped stable block and a separate rectangular stable block to the east.

The Desk Study also identified a disused swimming pool in the rear garden of the farm house, with an associated pump, a potentially oil fired boiler and an above ground storage tank.

Potential sources of contamination were determined as heavy metals, total petroleum hydrocarbons (TPH), poly-aromatic hydrocarbons (PAH) and pesticides due to historic use of the site as a farm, orchards, open pasture and paddocks.

BRD would concur with this assessment and accordingly the following preliminary contamination risk assessment assesses all of these potential sources of contamination.

3. PRELIMINARY CONTAMINATION RISK ASSESSMENT

3.1. HAZARD IDENTIFICATION

INVALID CONTAMINATION SOURCES	
HISTORIC LAND USE	DISCUSSION AS TO WHY THE HISTORICAL USE IS NOT CONSIDERED TO PRESENT A PLAUSIBLE HAZARD
Petrol filling station approximately 230m from the site.	The petrol filling station is down gradient of the site and given the distance from the site and the anticipated direction of groundwater flow, it is not considered a potential hazard to the site.
Historic smithy approximately 160m east of the site.	The former smithy is not considered a potential hazard due to its distance from the site and small scale.
Potentially infilled gravel pit approximately 120m southeast of the site.	Given the distance from the site and that the infilled quarry had been built upon by the mid 1970s, it is unlikely that this will pose a potential risk to the site given the long timescales since any potential infilling (50 years) and the distance from the site. As such it is not considered to be a valid contamination source.

POTENTIAL ON SITE SOURCES		
HISTORIC LAND USE	DESCRIPTION OF POTENTIAL CONTAMINATION HAZARD	POTENTIAL CONTAMINANTS OF CONCERN
Agricultural fields.	Due to the historical use of the site as being open fields and an orchard, it is unlikely that there is any on site source of contamination. However, pesticides may have been previously used on the site resulting in trace residues still being present.	Pesticides.
Above ground fuel tanks.	A fuel tank was identified in the building contractors' storage area. Another tank was identified at the farm most likely associated with the heating system for the old swimming pool. Spillages may have occurred during refuelling or leaks from the tanks could have occurred.	Petroleum hydrocarbons (diesel or heating oil).

POTENTIAL ON SITE SOURCES		
HISTORIC LAND USE	DESCRIPTION OF POTENTIAL CONTAMINATION HAZARD	POTENTIAL CONTAMINANTS OF CONCERN
Farm yard in the north eastern section.	The farm in the northeast of the site appears to be a small holding however storage of plant machinery and/or a variety of chemicals in support of the agricultural operations is evident. Fuel may have been stored for the plant and therefore spilled. The small scale storage of potentially contaminative chemicals and lubricants is also common practice in farm operations and therefore can also be identified as a potential localised hazard. On site waste disposal activities and waste burning may have occurred with the potential to cause contamination by metals and Polycyclic Aromatic Hydrocarbons.	Petroleum hydrocarbons (diesel, lubricating oils, greases and/or petrol). Pesticides. Metals. Polycyclic Aromatic Hydrocarbons (PAH).
Localised dumping of waste materials.	Rubbish, used fuel containers and barrels were noted around the area of the breezeblock building, beside the eastern paddock and within the area utilised by the building contractor. Where used fuel containers and barrels are present, spillages may have previously occurred. Waste disposal activities and waste burning may have occurred with the potential to cause contamination by metals and Polycyclic Aromatic Hydrocarbons.	Petroleum hydrocarbons (diesel). Metals. Polycyclic Aromatic Hydrocarbons (PAH). Asbestos containing materials
Livery yard – manège and soil bund	Manège surfacing can regularly contain recycled materials such as shredded tyres or rubber mixed with organic material or sand. The material can be layered up over the years resulting in older layers at the base. It has been known that these materials can contain elevated contaminants or materials unsuitable for re-use in a residential setting. The soil bund is most likely made up of site derived soils, but could consist of imported waste soils which has the potential to contain hazardous substances / materials.	Metals. Polycyclic Aromatic Hydrocarbons (PAH).

POTENTIAL OFF SITE SOURCES		
HISTORIC LAND USE	DESCRIPTION OF POTENTIAL CONTAMINATION HAZARD	POTENTIAL CONTAMINANTS OF CONCERN
No significant potential off site contamination sources have been identified in the surrounding area.		

3.2. RECEPTOR ASSESSMENT

CONTEXT	
ASSESSMENT LAND USE CATEGORY	Residential.
DESCRIPTION OF PROPOSED LAND USE	The proposed development comprises the demolition of existing structures and construction of up to 391No. dwellings (Use Class C3), the provision of land for a new 2FE Primary School, open space provision and associated landscaping and new access arrangements.

RECEPTORS	
RECEPTOR	DISCUSSION
HUMAN HEALTH	Residents and school students with zero to 6 year old child most sensitive receptor.
CONTROLLED WATERS GROUNDWATER	Principal aquifer and Secondary Aquifer.
CONTROLLED WATERS SURFACE WATER	Not considered to be a valid receptor as no nearby surface water bodies.
BUILDING MATERIALS AND SERVICES	Water service pipes. Buried concrete.

3.3. INITIAL CONCEPTUAL MODEL

POLLUTANT LINKAGES	The pollutant linkages are best presented in a diagrammatic form and therefore the initial conceptual site model plan is presented in Appendix 1. The individual pollutant linkages as numbered on the plan are described further in Section 3.4.
INVALID POLLUTANT LINKAGES	Pesticide residue if present is only likely to be in the surface soils and therefore does not pose a risk to groundwater or buried services. The same can be said of the riding school manège and soil bund in terms of groundwater which are unlikely to contain any contaminants at risk of significant leaching.

LIMITATIONS AND UNCERTAINTIES	Some parts of the site were heavily overgrown, in particular, the western boundary and parts of the north eastern farm yard area. Therefore these sections could not be fully inspected. The preliminary conceptual model has been developed based solely on desk based research and the site walkover of the southern portion of the site. The only way to conclusively determine the presence or absence of contamination is with intrusive site investigation.

3.4. PRELIMINARY ASSESSMENT OF CONTAMINATION RISKS

The following table identifies the potential risks that exist to the receptors through each of the identified pollutant linkages in the conceptual site model. It should be noted that the numbers referred to for each of the pathways refers to the numbered pollutant linkages from the Initial Conceptual Site Model Plan, as presented in Appendix 1.

POTENTIAL SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	HAZARD SEVERITY	PROBABILITY OF OCCURRENCE	POTENTIAL RISK
Agricultural fields. - Pesticides	Ingestion of dust Inhalation dust and vapours Dermal contact Consumption of home grown produce [1]	Residents an school students	Human health effects [Mild]	The site had a limited use as an orchard and for growing crops, therefore if any pesticide contamination is anticipated to be minimal [Low likelihood]	Low Risk
Above ground fuel tanks. - Petroleum hydrocarbons (diesel).	Ingestion of dust Inhalation dust and vapours Dermal contact Consumption of home grown produce [2]	Residents school students	Human health effects [Medium]	Spillages are common when refuelling plant. Where the tank was present in the builder's yard, the area was not hard surfaced and therefore any spillages would contaminate the underlying soils although it is likely that the tank was only being stored temporarily and has since been removed. However, any	Moderate/Low Risk
	Horizontal & vertical migration [3]	Groundwater	Contamination of the Principal and Secondary A Aquifers in an outer SPZ. [Medium]		Moderate/Low Risk

POTENTIAL SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	HAZARD SEVERITY	PROBABILITY OF OCCURRENCE	POTENTIAL RISK
	Direct contact [4]	Building materials and services	Degradation of subsurface buried concrete and water supply pipes [Medium]	contamination present is anticipated to the highly localised to the areas of the tanks. [Low likelihood]	Moderate/Low Risk
Chiswell Green Farm. - Petroleum hydrocarbons (diesel, lubricating oils, greases and/or petrol). - Pesticides. - Metals. - Polycyclic Aromatic Hydrocarbons (PAH).	Ingestion of dust Inhalation dust and vapours Dermal contact Consumption of home grown produce [5]	Residents and school students	Human health effects [Medium]	Although the northeast area of the site has had a longstanding use as a farm, it appears to be a small operation associated with the stables. Therefore, any contamination is anticipated to be limited [Low likelihood]	Moderate / Low Risk
	Horizontal & vertical migration [6]	Groundwater	Contamination of the Principal and Secondary A Aquifers in an outer SPZ. [Medium]		Moderate / Low Risk
	Direct contact [7]	Building materials and services	Degradation of subsurface buried concrete and water supply pipes [Medium]		Moderate / Low Risk
Dumping of waste materials. - Petroleum hydrocarbons (diesel). - Metals. - PAH.	Ingestion of dust Inhalation dust and vapours Dermal contact Consumption of home grown produce [8]	Residents and school students	Human health effects [Medium]	Evidence of waste materials and empty fuel containers were visible is several locations across the site, and therefore localised contamination may be present. [Low likelihood]	Moderate/Low Risk
	Horizontal & vertical migration [9]	Groundwater	Contamination of the Principal and Secondary A Aquifers in an SPZ. [Medium]		Moderate/Low Risk

POTENTIAL SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	HAZARD SEVERITY	PROBABILITY OF OCCURRENCE	POTENTIAL RISK
	Direct contact [10]	Building materials and services	Degradation of subsurface buried concrete and water supply pipes [Medium]		Moderate/Low Risk
Livery yard manège and soil bund. - Metals - PAH	Ingestion of dust Inhalation dust and vapours Dermal contact Consumption of home grown produce [11]	Residents and school students	Human health effects [Medium]	Based on site inspection, it is unlikely that contaminated materials will have been used. [unlikely]	Low Risk
	Direct contact [12]	Building materials and services	Degradation of subsurface buried concrete and water supply pipes [Medium]		Low Risk

3.5. RECOMMENDATIONS

Potential contamination risks have been identified by this Phase 1 Desk Study and therefore a Phase 2 Contamination Assessment is necessary to assess the significance of these potential pollutant linkages. It is recommended that this next phase of assessment includes a combination of trial pits and windowless sampling boreholes to assess the underlying ground conditions and to target any potential contamination as a result of the previous uses of the site.

Although there is a need for a Phase 2 Contamination Assessment, this Phase 1 report has confirmed that there should be no significant contamination on the site which would preclude any redevelopment and therefore no reason why the subsequent contamination assessment could not be addressed through appropriately worded conditions on any future planning permission for the proposed development.

4. IMPLICATIONS FOR CONSTRUCTION

4.1. GEOTECHNICAL CONSIDERATIONS

The following is a checklist summary of geotechnical hazards and their likelihood to have an impact on the proposed development of the site.

GEOTECHNICAL HAZARD	LIKELY TO AFFECT SITE?	COMMENT
Removal of existing sub-structures affecting new foundations.	✓	Several buildings are present on the site including those comprising Chiswell Green Farm and the riding school within the northern extent of the site. Additionally within the rear garden of the farmhouse is an outdoor pool. A breezeblock building is also present in the east of the site. The removal of these structures may cause disturbance to the ground, and therefore may complicate the design and construction of foundations in these areas of the site.
Deep Made Ground.	✘	
Historic wells.	✘	
Soft or compressible natural deposits such as Alluvium or Peat.	✘	
Changes in ground conditions within short distances.	✓	Kesgrave Catchment Subgroup sands and gravels are only present in the northernmost and southernmost areas of the site, which may complicate the design and construction of foundations at the areas of transition.
Fine soils that have a volume change capacity.	✘	

GEOTECHNICAL HAZARD	LIKELY TO AFFECT SITE?	COMMENT
Dissolution features or 'swallow holes'.	✓	Where the Kesgrave Catchment Subgroup deposits are overlying the Chalk in the northernmost and southernmost areas of the site there is a moderate potential for ground dissolution stability hazards. Ground stabilisation may be required and this may affect foundation design and construction. Dissolution features have been recorded within area of the site including solution pipes and a sinkhole approximately 522m northwest and 537m northeast of the site respectively.
Cambering of valley sides with possibility of 'gulls'.	✘	
Risk of slope instability.	✘	
Shallow groundwater.	✘	There is a limited potential for groundwater flooding on the site.
Underground mining.	✘	A potential for mining instabilities has been identified on the site. However, the nearest suspected mine cavity is shown 708m to the west of the site.
Geological faults.	✘	
Aggressive chemical environment for concrete e.g. expansive slag or high sulphate soils.	✘	

4.2. PRELIMINARY GEOTECHNICAL ASSESSMENT

The Kesgrave Catchment Subgroup and the Chalk underlying the site is anticipated to be non-shrinkable and therefore is unlikely to have an influence on foundation depths for the proposed development.

Several buildings are currently present in the northern part of the site as well as a disused swimming pool in the rear garden of the farm house. Complications to the design and construction of foundations may arise where removal of existing and historical structures has disturbed the subsurface.

Parts of the site are shown to be within areas of moderate risk with regards to Chalk dissolution features, therefore such features may be present resulting in areas of loose soils or unstable ground. As such a cavities occurrence assessment should be sourced from Peter Brett Associates to determine the likelihood of such features being on the site.

The Chalk is shown to outcrop in the central area of the site, indicating that the sand and gravel deposits in the northern and southern extents of the site may not be thick. However, soakaways within either medium is anticipated to be feasible.

For any form of development, BRD recommend that an intrusive ground investigation is undertaken in order to confirm ground conditions and allow design of the new structures. It is recommended that a ground investigation for the geotechnical assessment is utilised to determine the nature of any disturbed ground present at the site, the geotechnical properties of the underlying bedrock and the presence of any solution features.

4.3. CONSTRUCTION CONSIDERATIONS

As with any construction site, if any anomalous material is encountered during the redevelopment then expert environmental advice should be sought.

In accordance with Health and Safety Executive (HSE) guidance, a 'Refurbishment Demolition Survey' (RDS) should be undertaken to identify whether or not asbestos containing materials are present in the existing structure(s) prior to demolition or refurbishment. The results of the survey should then be used to plan for the safe management, removal and disposal of asbestos containing materials from the existing buildings and infrastructure should such materials be present.

REPORT SPECIFIC REFERENCES

- British Geological Survey sheet 239 “Hertford” Drift edition (1:50,000), published 1978.
- British Geological Survey sheet 14 “: Hydrogeological Map of the Area Between Cambridge and Maidenhead” (1:100,000), published 1984.
- ‘Land off Chiswell Green Lane, St. Albans - Desk Study Report’, Geo-environmental Services Ltd, ref: GE9977, May 2014.

SUPPORTING INFORMATION

SITE CHARACTERISTICS

The site characteristics are collated from various information sources, including but not limited to Ordnance Survey, British Geological Survey (BGS), Environment Agency (EA) and local authorities.

BRD generally commission the Landmark Information Group to produce an Envirocheck Report for study sites and where employed this is included in the Appendices. It should be noted that some of the data provided in the Envirocheck report is not considered within BRD's interpretation for the site characteristics as it is not relevant. Examples of this are:

- *Nitrate Sensitive Zones and Nitrate Vulnerable Zones are ignored as these are only applicable to agricultural activities relating to the application of manure and fertilisers to land.*
- *River Quality is ignored as at this preliminary stage of risk assessment as all surface water bodies are considered equally sensitive to contamination risks.*

In assessing site characteristics, BRD also consider the area within a surrounding 250m buffer zone extending from the site boundary.

HISTORY

Mapped History

The site history summarises the changes in use or layout of the site over time and is largely developed from a study of available Ordnance Survey maps. It should be noted that changes to the site may have occurred between the editions of the maps employed to assess the history of the site. Historical information of relevance within the 250m surrounding the site is also discussed in a separate section. The historical plans referred to in the text are generally included in an Appendix.

Aerial photography

As a minimum, current and historical aerial images of the site and surrounding areas are studied from the Google Earth program. Where additional historic aerial photographs have been purchased then these are referenced within the technical report.

Internet Searches

A simple search of the internet for relevant material relating to the use or history of the site is made. Information obtained from internet searches has been accepted as fact without validation by BRD except for ensuring the source is reputable. It should be recognised that due to programme and budgetary constraints the search conducted may not have revealed all the information available.

GEOLOGY

The geology of the site is assessed by reference to the relevant British Geological Survey (BGS) 1:50,000 scale sheet in Bedrock and Superficial (historically Solid and Drift) edition. Many of these geological maps are relatively old with superseded terminology and descriptions. BRD therefore employ the BGS Open Geoscience website to determine current nomenclature of strata and to assist in determining geological boundaries against current topographic features. BRD also employ BGS Regional Geology Guides to assist in understanding the geological context of the site.

Ground Stability Hazards

Ground stability hazards caused by mining, ground dissolution, landslide potential, collapsible ground and natural cavities are identified by the Envirocheck database search of records held by The Coal Authority, British Geological Survey and studies completed by Ove Arup and Peter Brett Associates.

The Envirocheck database ground stability hazard entries for compressible ground, running sands and shrinking or swelling clays are not discussed directly. This is because these hazards are very common and are considered within the preliminary geotechnical assessment where necessary.

Radon

Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every house contains radon, some houses built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken during construction to reduce this risk.

Radon can move through cracks and fissures in the soil into the atmosphere or into buildings via basements and/or underfloor voids. If radon enters the living space of buildings its concentration can potentially increase and provide a risk to human health as the inhalation of the radioactive decay products of radon gas can increase the risk of developing lung cancer.

The maps contained within 'Radon: Guidance on protective measures for new buildings' (2015) identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new buildings together with supplementary advice concerning extensions, conversions and refurbishments. However, some local authorities have local bylaws, that BRD may not be aware of, that insist on radon protection to all new dwellings within their area regardless of the recommendations of the 'Radon: Guidance on protective measures for new buildings' (2015) report.

Basic radon protection measures comprise incorporation of a continuous gas resistant membrane sealed at joints and around service entries into the floor construction and extended across the cavity tray.

Full radon protection measures comprise incorporating a continuous gas resistant membrane into the floor construction together with a ventilated sub-floor void through either the use of suspended floor construction or a 'radon sump'. The membrane is sealed at joints and around service entries into the floor and extended across the cavity tray.

'Radon: Guidance on protective measures for new buildings' (2015) should be referred to for detail on the construction of the protective measures.

HYDROGEOLOGY

Aquifer Designations

The Environment Agency's Groundwater Protection Policy uses designations that reflect the importance of aquifers in terms of groundwater as a drinking water resource, but also their role in supporting surface water flows and wetland ecosystems.

In defining groundwater vulnerability, both the superficial (drift) deposits and bedrock (solid) geology are considered separately with the following aquifer designations:

- *Principal Aquifers: These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.*
- *Secondary Aquifers: These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:*
    - *Secondary A - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.*
    - *Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.*
- *Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type.*
- *Unproductive Strata: These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.*

Source Protection Zones

The Environment Agency (EA) has defined Source Protection Zones for groundwater sources, such as boreholes and springs, that are used for public water supply. The EA uses the zones to target pollution prevention measures and monitor the activities of potential polluters within the affected area. There are three types Source Protection Zone:

- *Zone 1(Inner Protection Zone) is the most sensitive area within which pollution could reach the borehole within 50 days. Alternatively it is defined by a minimum 50m radius around the borehole.*
- *Zone 2 (Outer Protection Zone) are defined by the area within which pollution could reach the borehole within 400 days or 25% of the total catchment area.*
- *Zone 3 (Total Catchment) are defined by the total area required to support the removal of water from the borehole.*

HYDROLOGY

Flooding

The Environment Agency has zoned England and Wales in respect of the risk from flooding from 'highly unlikely' in Zone 1 to 'likely' in Zone 3. The zones ignore the presence of flood defences or certain other manmade structures and channel improvements.

National Planning Policy Framework, Department for Communities and Local Government, dated March 2012 states "A site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding".

ENVIRONMENTAL ASPECTS

Landfill

The database of the Environment Agency of active and historic landfills is searched for all sites. Sometimes additional historic landfill data is available from the British Geological Society and local authorities to identify nearby landfill sites. It should be noted that landfill sites that closed prior to 1974 and unlicensed disposal activities will not necessarily be revealed by this search.

Pollution Incidents

The Environment Agency ceased recording 'Pollution Incidents to Controlled Waters' in 2000, when they commenced the replacement 'Substantiated Pollution Incident Register'. BRD do not consider any 'Category 3 – Minor Incident' on the 'Pollution Incidents to Controlled Waters' database as relevant to assessing the site due to the time elapsed and the low level of impact that occurred. Again due to the time elapsed and the fact that remedial measures would have been undertaken at the time, 'Category 1 – Major Incident' and 'Category 2 – Significant Incident' are only considered relevant if the impacted controlled water was on or immediately adjacent to the site.

On the 'Substantiated Pollution Incident Register', BRD approach to this information in the following manner:

- *Pollution incidents impacting 'air' only are not considered relevant.*
- *Pollution incidents to 'water' are only considered where the surface water impacted is either on, flows through or is immediately adjacent to the site.*
- *Pollution incidents to 'land' are only considered where these are on or immediately adjacent to the site unless there are grounds to consider that the incident had the potential to impact groundwater that may have migrated beneath the site.*
- *Category 4 potential pollutant incidents are recorded, but upon investigation were found to have had no impact and accordingly are not considered relevant.*

Ecologically Sensitive Land Use

The land uses that are identified as ecologically sensitive are those identified as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation, Special Protection Areas, Ramsar sites, Natural Parks, Natural Nature Reserves, Marine Nature Reserves, Local Nature Reserves, Green Belt, Forest Parks, Environmentally Sensitive Areas, or Areas of Outstanding Natural Beauty.

CONTAMINATION ASSESSMENT METHODOLOGY

UK Policy

The UK Government's policy in relation to land affected by historic contamination is based on a 'suitable for use' approach. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Contamination risks therefore need to be assessed on a site-by-site basis. The 'suitable for use' approach limits requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to either the current use or future use of the land.

The three main drivers for contamination assessment and remediation are:

- *Voluntary action.*
- *Development as part of the planning regime.*
- *Regulatory action to mitigate unacceptable risks e.g. Part 2A of the Environmental Protection Act 1990.*

Pollutant Linkages

For a contamination risk to exist there must be a 'pollutant linkage' from the contaminant (source) via a pathway (the route from contaminant to receptor) to a receptor (the entity that could be harmed). The absence of a contaminant, pathway or receptor breaks the pollutant linkage and therefore no contamination risk exists.

Contamination is typically present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use, usually as a result of leaks, spills or disposal of residues, wastes and excess raw materials from the industrial processes. Contamination may also be present due to:

- *The deliberate application of chemicals e.g. the spraying of herbicide/pesticide.*
- *Migration of pollutants from adjacent land.*
- *Naturally occurring processes e.g. elevated concentrations of particular heavy metals associated with specific geological strata.*

Conceptual Site Model

The conceptual site model can be defined as a textual or graphical representation of the identified pollutant linkages for a given site. The model forms the basis for designing the investigation as the aim will be to target all of the potential pollutant linkages to determine, through the subsequent phases of risk assessment, whether or not they pose an actual risk.

It is important that the conceptual site model is updated with new information as the various investigation, risk assessment and remediation works are completed.

Technical Guidance

The technical and legal framework for contamination assessment is complex. The process adopted through this report for assessing contamination risks is in general accordance with the following guidance, as listed below:

- *'Investigation of Potentially Contaminated Sites - Code of Practice - BS 10175: 2011', BSi, 2011.*
- *'Model Procedures for the management of Land Contamination - CLR Document No. 11', Environment Agency, 2004.*
- *'Guidance for the safe development of housing on land affected by contamination - R&D66: 2008', NHBC/Environment Agency, 2008.*

Risk Assessment Methodology

In line with the technical guidance, the contamination risk assessment follows a series of phased stages for each particular site:

PHASE	*DESCRIPTION*	*RISK ASSESSMENT STAGE*
PHASE1	*Generally limited to desk based research and a site walkover survey to develop an initial conceptual site model and identify what risks, if any, are likely to be presented by the site.*	*Hazard Identification and Assessment* *A preliminary stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site and identifying potential pollutant linkages.*
PHASE 2	*This phase is concerned with establishing whether contamination is present, usually through intrusive ground investigation, and then evaluating the degree and magnitude of the associated risks.*	*Risk Estimation* *A stage concerned with estimating the likelihood that receptors will suffer adverse effects if they come into contact with, or are otherwise affected by, a hazardous substance or agent under defined conditions.* *Risk Evaluation* *A stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking into account the nature and scale of the risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate risks.*
PHASE 3	*The appraisal and selection of remediation techniques, their implementation and verification.*	*Risk Management* *The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence.*

Risk Classification

The objective of risk assessment is to identify the nature and magnitude of the potential risks and should be based on a consideration of both:

- *The likelihood/probability of an event [taking into account both the presence of the hazard and receptor and the integrity of the pathway].*
- *The severity of the potential consequence [taking into account both the potential severity of the hazard and the sensitivity of the receptor].*

There is a need for a logical, transparent and repeatable system in defining the categories of severity of consequence and likelihood as well as for the risk itself and therefore the following risk rating matrix is employed:

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

These risk classifications are defined as follows:

- *Very High Risk - There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *High Risk - Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *Moderate Risk - It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.*
- *Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.*
- *Negligible Risk - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.*

This preliminary risk assessment matrix and classification system is based on guidance produced by Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in connection with contaminated land assessment.

APPENDIX 1

Notes:
The contractor must verify all dimensions on site before commencing any work on shop drawings, do not scale from this drawing
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KEY:

Planning Application Boundary

Revision	Amendment	Date
P5	Issued for comments	30.03.2022
P4	Issued for comments	28.03.2022
P3	Issued for comments	18.03.2022
P2	Issued for comments	08.03.2022

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Client

CALA

REDINGTON CAPITAL

Project
Land South of Chiswell Green Lane
St. Albans

Drawing Title
SITE LOCATION PLAN

ARCHITECTURE

Drawing / Document Reference	Status
REDC01 - MCB - ZZ - ZZ - DR - A - 0201	D5 - P5
Project Iden. Originator Zone Level Type Discipline Number	Suitability Revision

Site Walkover Photographs

Plate 1: A breezeblock building with corrugated metal doors adjacent to the access way from Forge End on the eastern boundary.

Plate 2: Waste materials kept next to the building including fire extinguishers and empty fuel barrels.

Project Title:	Land at Chiswell Green
Client:	Redington Capital & CALA Homes
BRD Reference:	BRD3604-OP2-B
Date Issued:	September 2021

BRD
01295 272244
info@brduk.com

Site Walkover Photographs

Plate 3: The northwest corner of the building is damaged and part of the roofing is has been removed.

Plate 4: Access to a paddock in the southeast of the site via a metal bar gate.

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Site Walkover Photographs

Plate 5: A track present along the boundary of the site from the access point from Forge End to the south of the site.

Plate 6: Residential properties along the southern boundary of the site fronting onto Forge End.

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Site Walkover Photographs

Plate 7: Several tyres and debris have been dumped in the southern area of the site.

Plate 8: A unit previously used as a building contractors office, some building materials have also been left within this area of the site.

Site Walkover Photographs

Plate 9: A fuel tank was previously located in the southern extent of the site and may have been previously used to fuel plant. Shipping containers etc can be seen in the background.

Plate 10: Stacked asbestos cement sheeting in the south eastern section of the site.

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Site Walkover Photographs

Plate 11: A large open field is present in the south west of the site with hedgerows along the western boundary, paddocks are present west of the site.

Plate 12: Along the south western boundary was a lorry with multiple bails of hay and a disused tractor. By the recent 2021 walkover, the lorry has since been removed but some agricultural machinery still remains.

Site Walkover Photographs

Plate 13: View northwards across the paddocks towards Chiswell Green Farm and Chiswell Green Riding School.

Plate 14: The boundary present between the paddocks and the open field in the south of the site.

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Site Walkover Photographs

Plate 15: Along the southern fence line of the paddocks is a pile of cut branches adjacent to some dumped waste.

Plate 16: In the south eastern area of the site was a small paddock with several jumps made of a mixture of materials but these have since been removed.

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Site Walkover Photographs

Plate 17: Gravel parking area at the entrance to the livery yard.

Plate 18: Manège with parking area beyond.

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Plate 19: Muck heap with soil bund beyond.

Plate 20: Looking east across second gravel area and office to the south east of the stables.

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Site Walkover Photographs

Plate 21: Stable block at the livery yard.

Plate 22: Farm yard area with timber framed barns in the north eastern section.

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Site Walkover Photographs

Plate 23: Timber framed sheds either side of the farm yard entrance.

Plate 24: Access drive through to secondary yard area past the farmhouse.

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Site Walkover Photographs

Plate 25: Possible boiler room or changing rooms for the former swimming pool.

Plate 26: Abandoned swimming pool partially filled with garden waste.

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Site Walkover Photographs

Plate 27: Adjacent paddock with oil tank beyond and swimming pool located in the overgrown area.

Plate 28: Secondary yard area to the south west of the farm house.

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Site Walkover Photographs

Plate 29: Looking north across former garden area towards the farm house. The swimming pool is in the overgrown area to the left.

Plate 30: View of the farmyard section from Chiswell Green Road.

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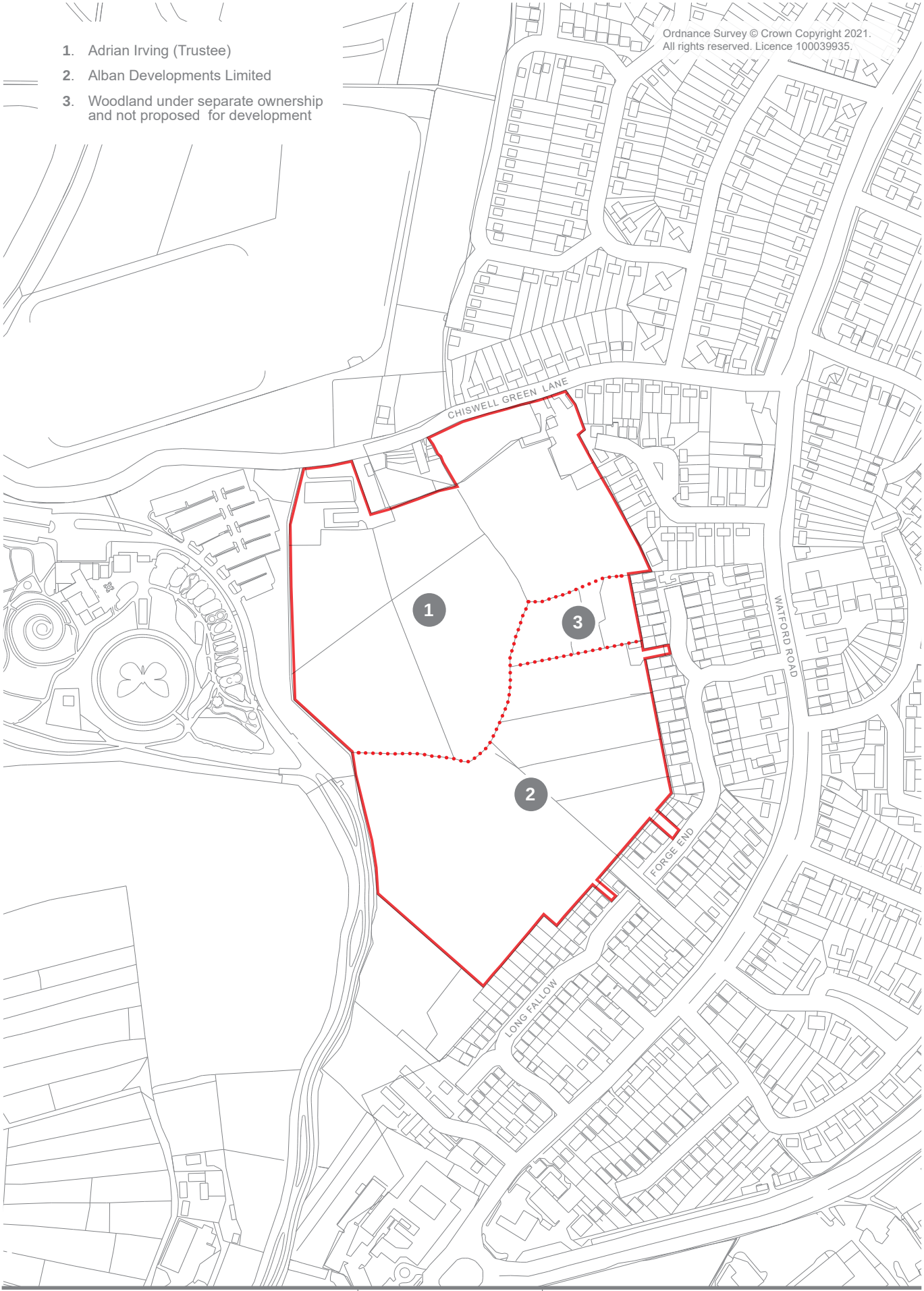
1. Adrian Irving (Trustee)
2. Alban Developments Limited
3. Woodland under separate ownership and not proposed for development



Land at Chiswell Green

SITE LOCATION AND OWNERSHIP PLAN

1298.04
26/02/2021

1:5,000 @ A4

metres 100

N

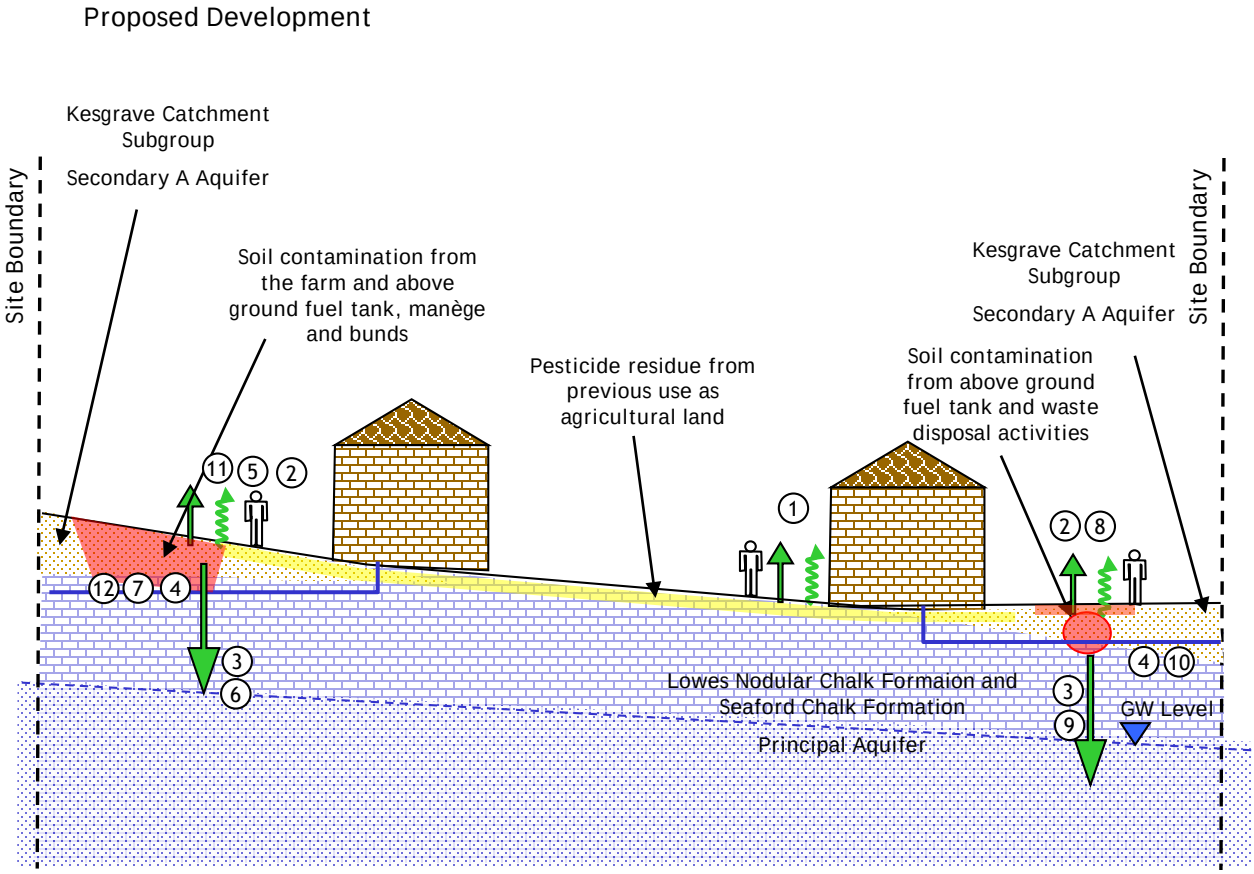
jb planning associates
town planning
and development
consultants

Chells Manor, Chells Lane
STEVENAGE, SG2 7AA

T 01438 312130

info@jbplanning.com
www.jbplanning.com

Initial Conceptual Model



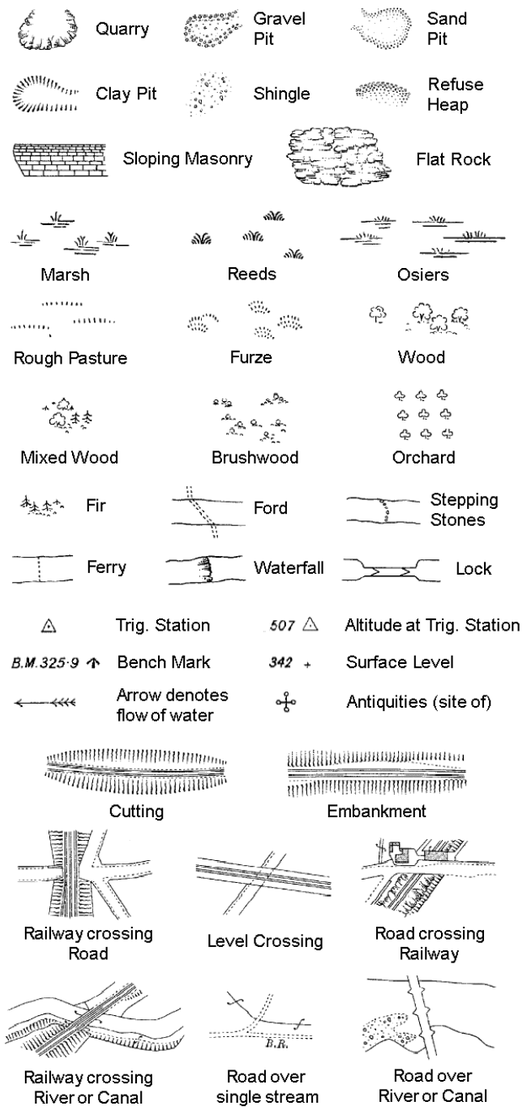
Project Title:	Land at Chiswell Green
Client:	Redington Capital and CALA Homes
BRD Reference:	BRD3604-OP3-B
Date Issued:	September 2021

BRD
01295 272244
info@brduk.com

APPENDIX 2

Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)

County & Civil Parish Boundary

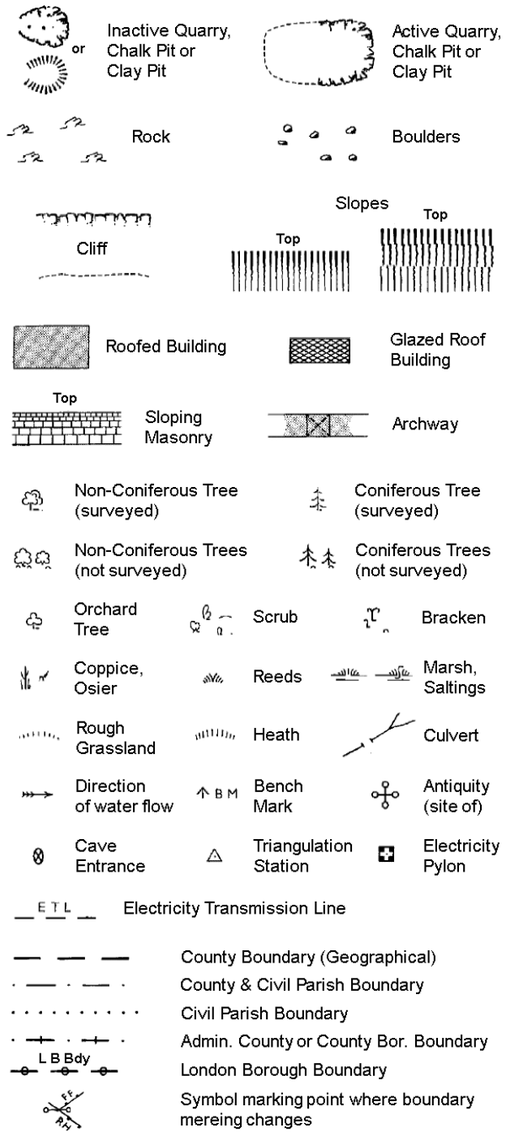
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

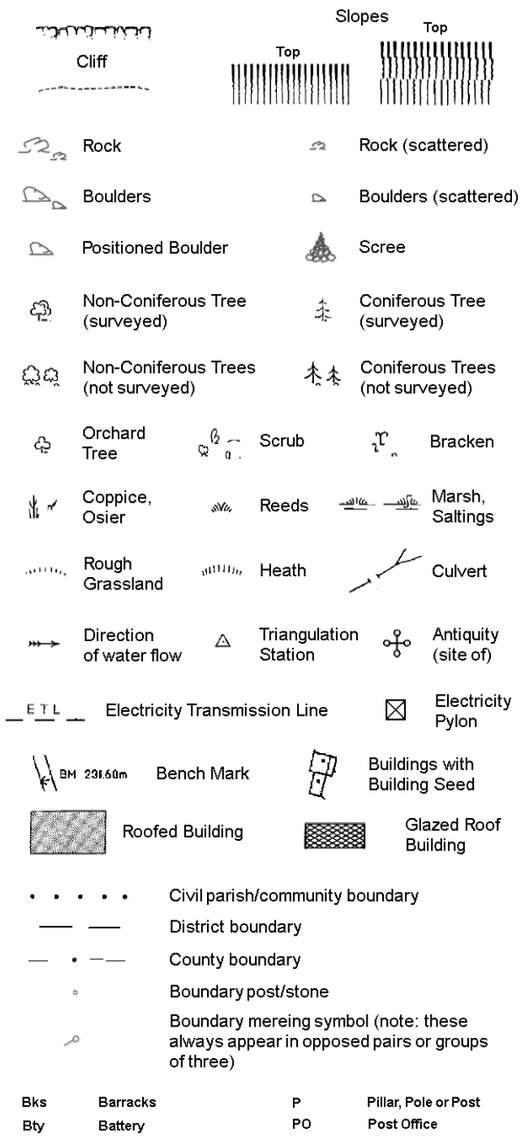
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

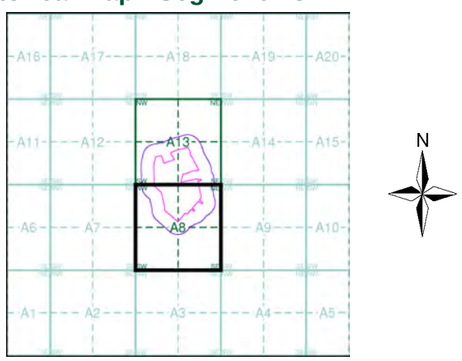
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

BRD

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Hertfordshire	1:2,500	1872 - 1880	2
Hertfordshire	1:2,500	1898	3
Hertfordshire	1:2,500	1924	4
Hertfordshire	1:2,500	1937 - 1938	5
Ordnance Survey Plan	1:1,250	1962	6
Ordnance Survey Plan	1:1,250	1968 - 1972	7
Ordnance Survey Plan	1:2,500	1973	8
Additional SIMs	1:1,250	1979	9
Additional SIMs	1:2,500	1980	10
Additional SIMs	1:2,500	1989	11
Large-Scale National Grid Data	1:1,250	1992	12
Large-Scale National Grid Data	1:2,500	1992	13
Large-Scale National Grid Data	1:1,250	1992	14
Large-Scale National Grid Data	1:2,500	1996	15
Historical Aerial Photography	1:2,500	1999	16

Historical Map - Segment A8



Order Details

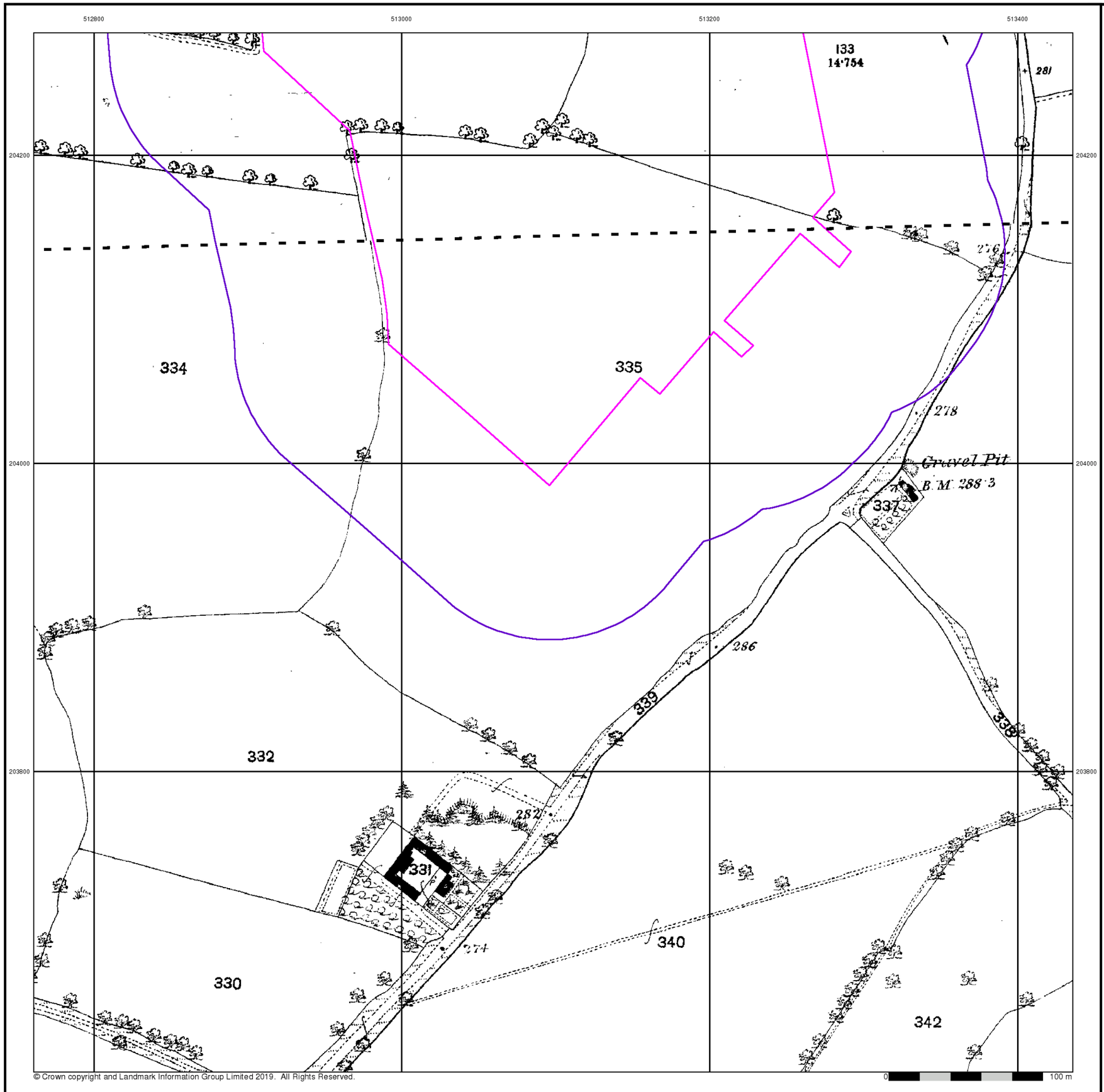
Order Number:	228564710_1_1
Customer Ref:	BRD3604
National Grid Reference:	513100, 204290
Slice:	A
Site Area (Ha):	14.
Search Buffer (m):	100

Site Details

Chiswell Green Lane, Chiswell Green, Hertfordshire

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



BRD

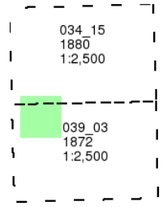
Hertfordshire

Published 1872 - 1880

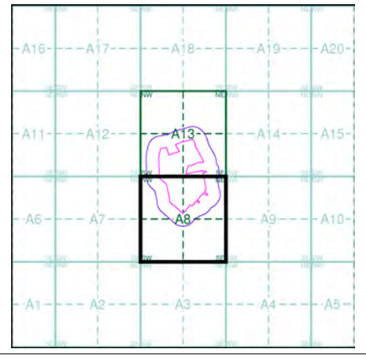
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



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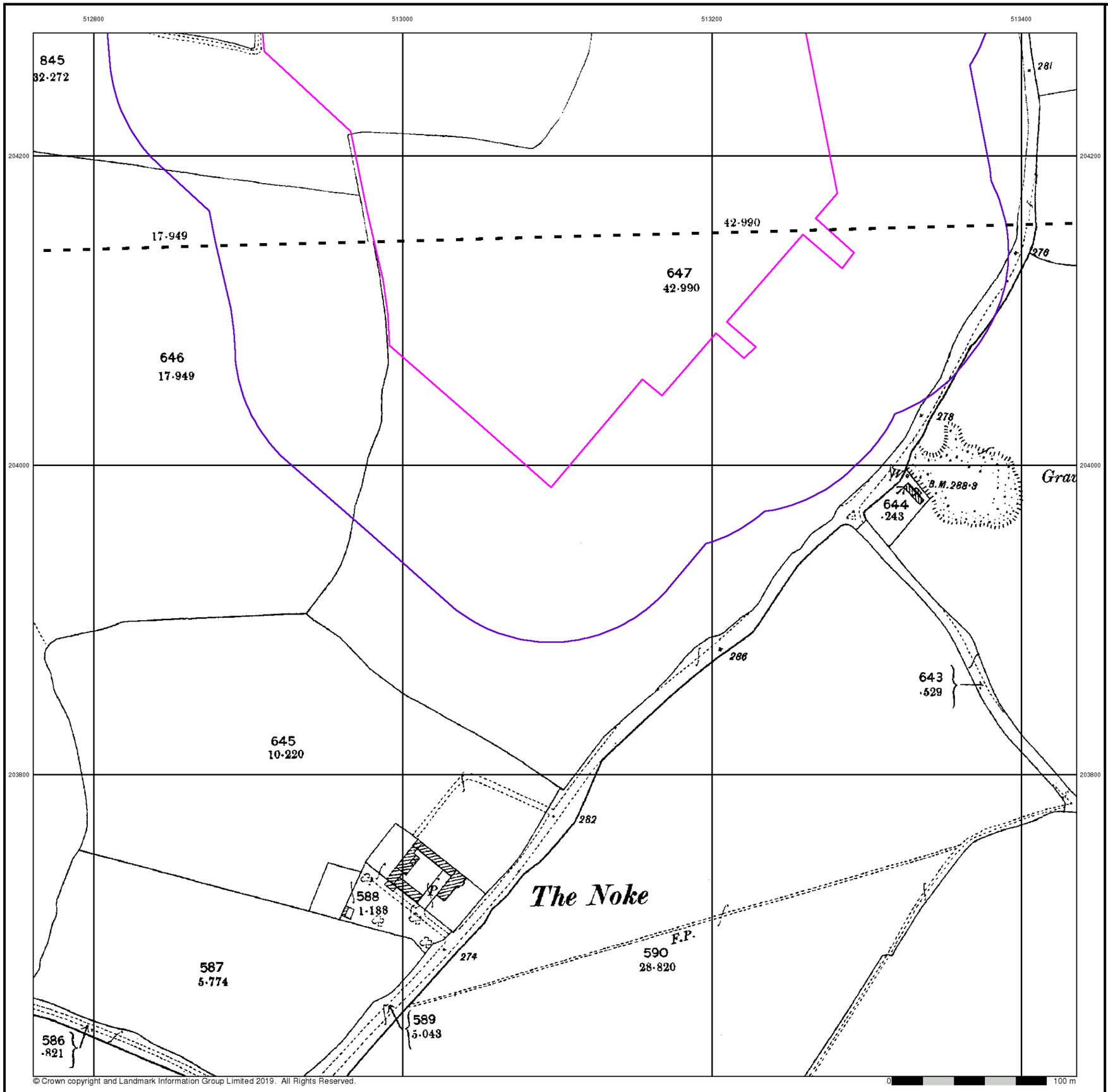


BRD

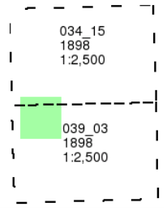
Hertfordshire

Published 1898

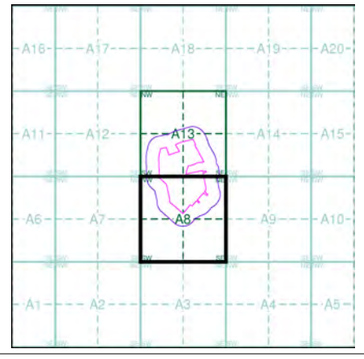
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



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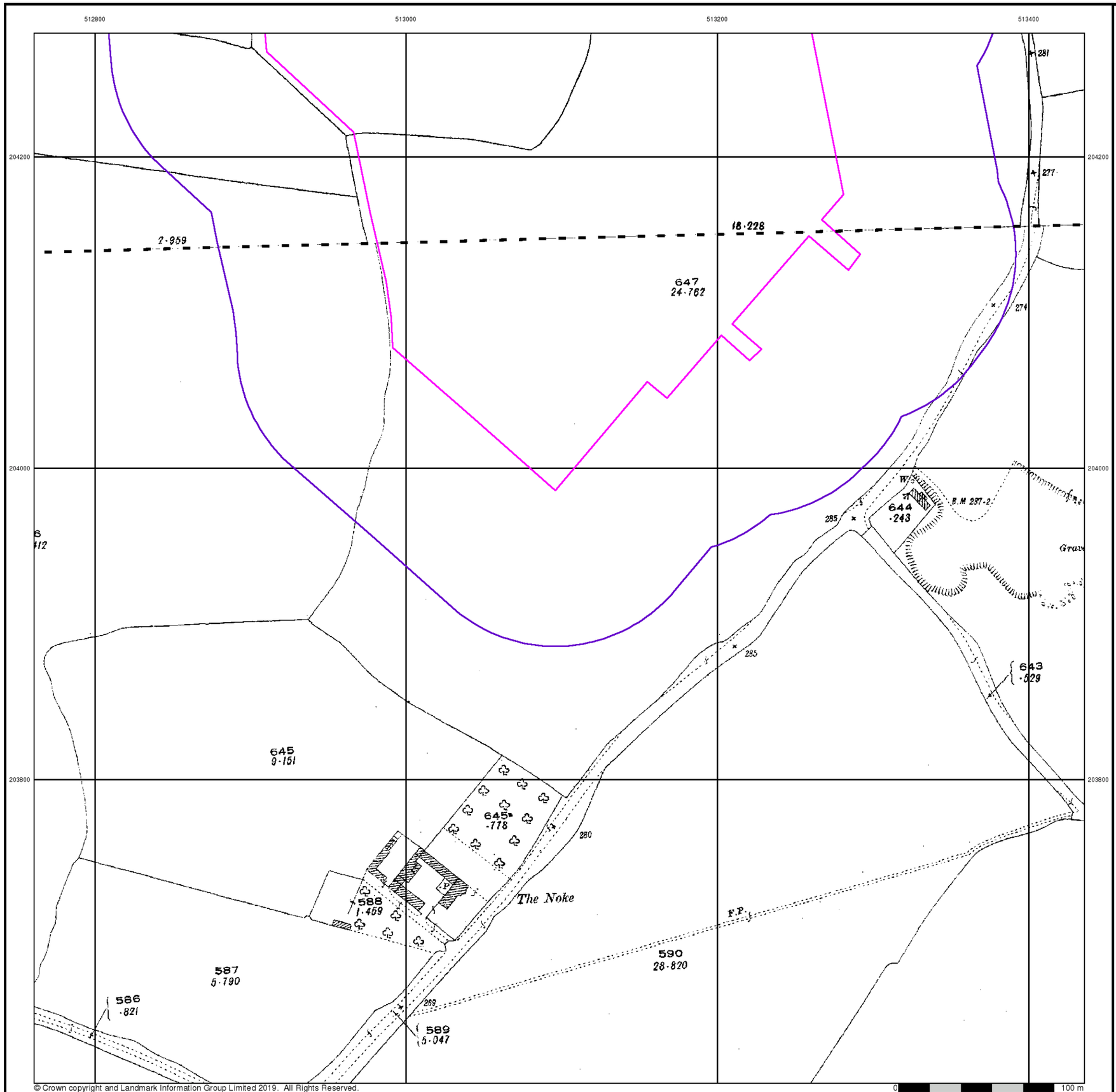


BRD

Hertfordshire

Published 1924

Source map scale - 1:2,500

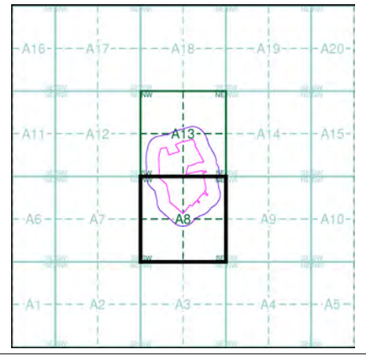
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

034_15
1924
1:2,500

039_03
1924
1:2,500

Historical Map - Segment A8



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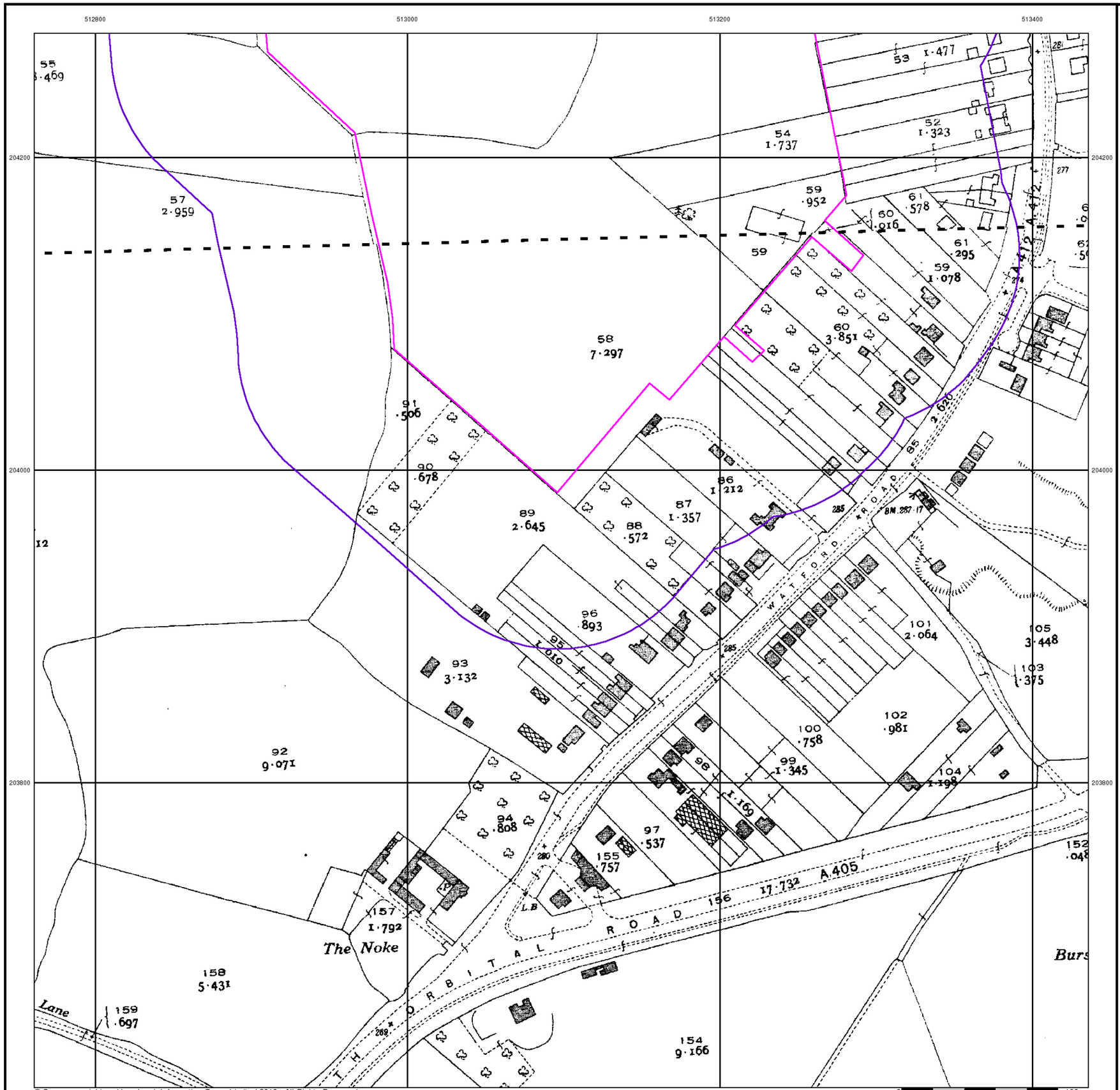


BRD

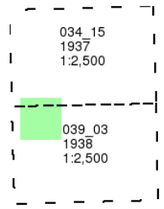
Hertfordshire

Published 1937 - 1938

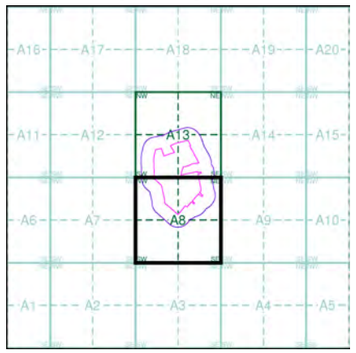
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	228564710_1_1
Customer Ref:	BRD3604
National Grid Reference:	513100, 204290
Slice:	A
Site Area (Ha):	14.
Search Buffer (m):	100

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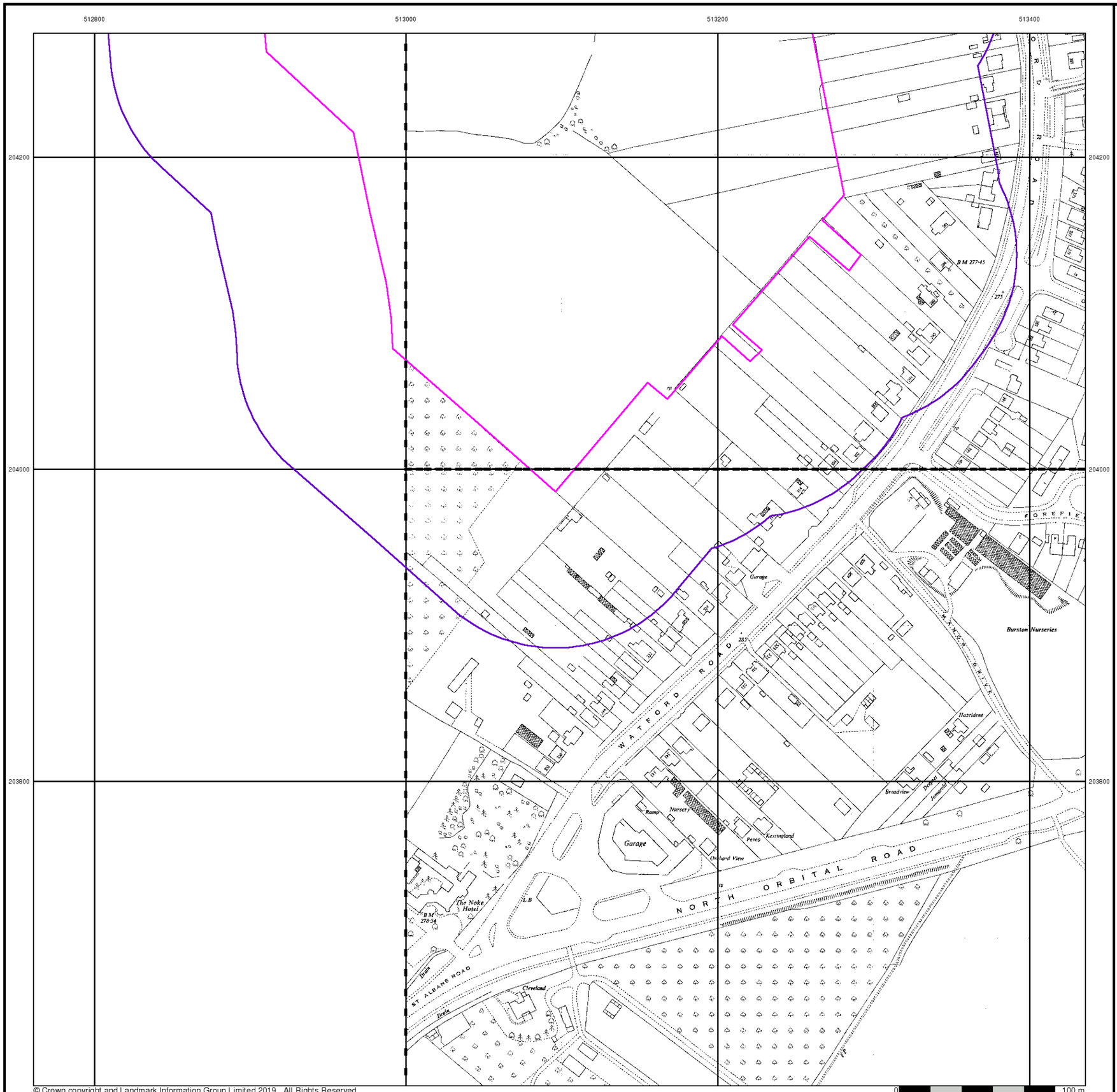


BRD

Ordnance Survey Plan

Published 1962

Source map scale - 1:1,250

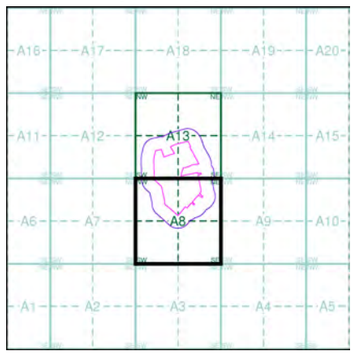
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TL1304SW
1962
1:1,250

TL1303NW
1962
1:1,250

Historical Map - Segment A8



Order Details

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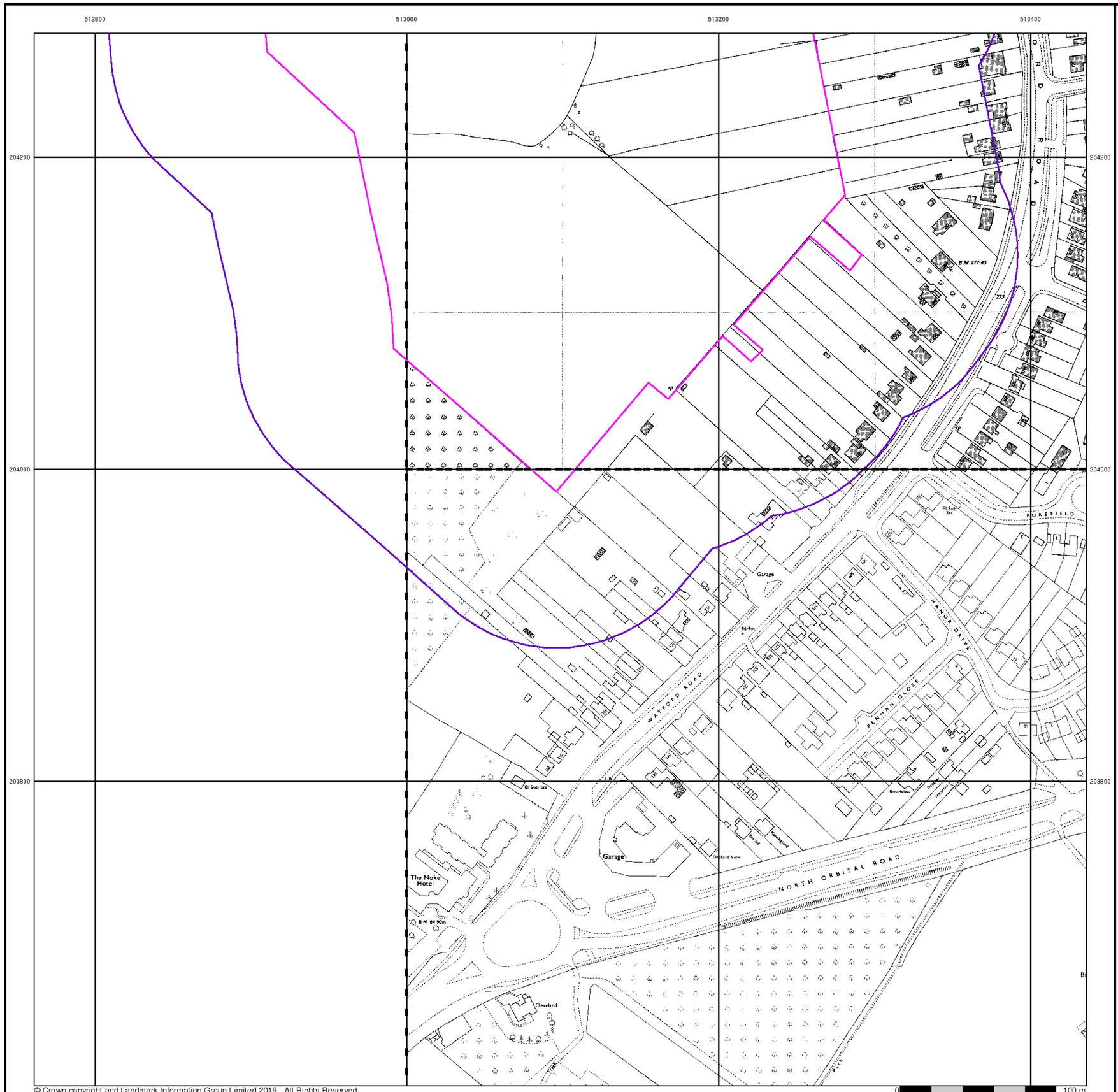

0 100 m

BRD

Ordnance Survey Plan

Published 1968 - 1972

Source map scale - 1:1,250

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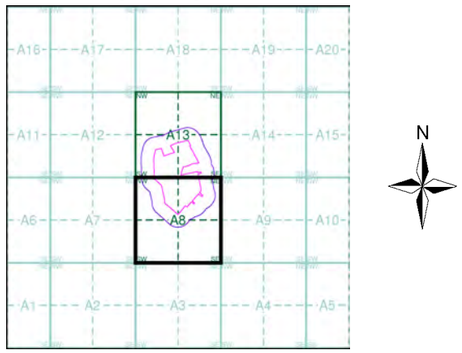
Map Name(s) and Date(s)

TL1304SW
1968
1:1,250

TL1303NW
1972
1:1,250

Historical Map - Segment A8



Order Details

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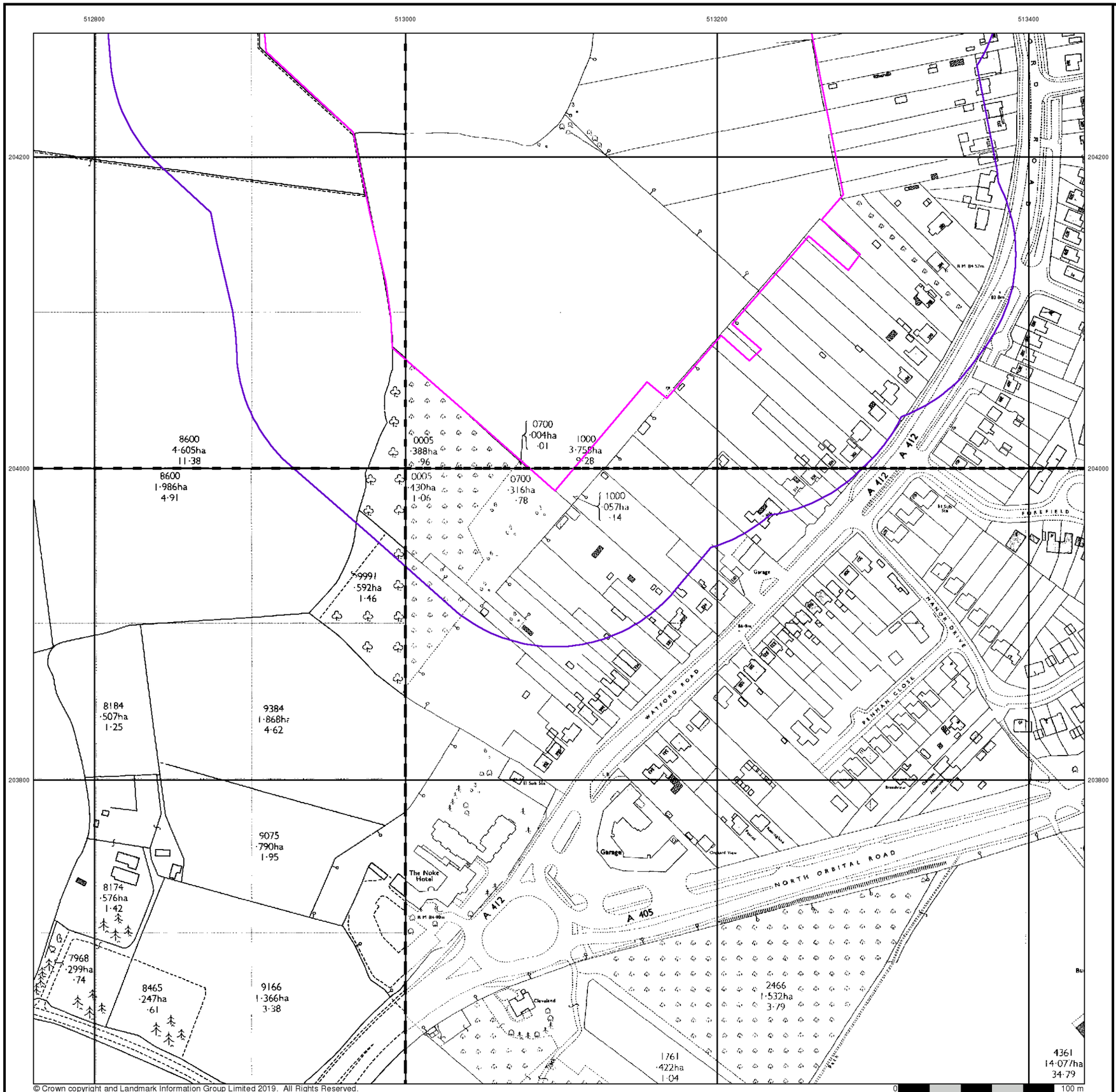

BRD

Ordnance Survey Plan

Published 1973

Source map scale - 1:2,500

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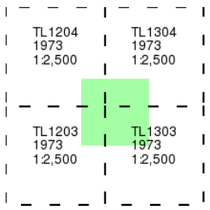
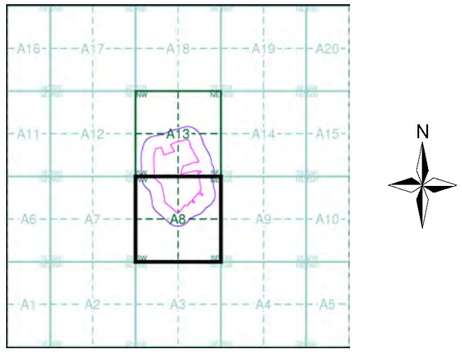
Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	228564710_1_1
Customer Ref:	BRD3604
National Grid Reference:	513100, 204290
Slice:	A
Site Area (Ha):	14.
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Site Details

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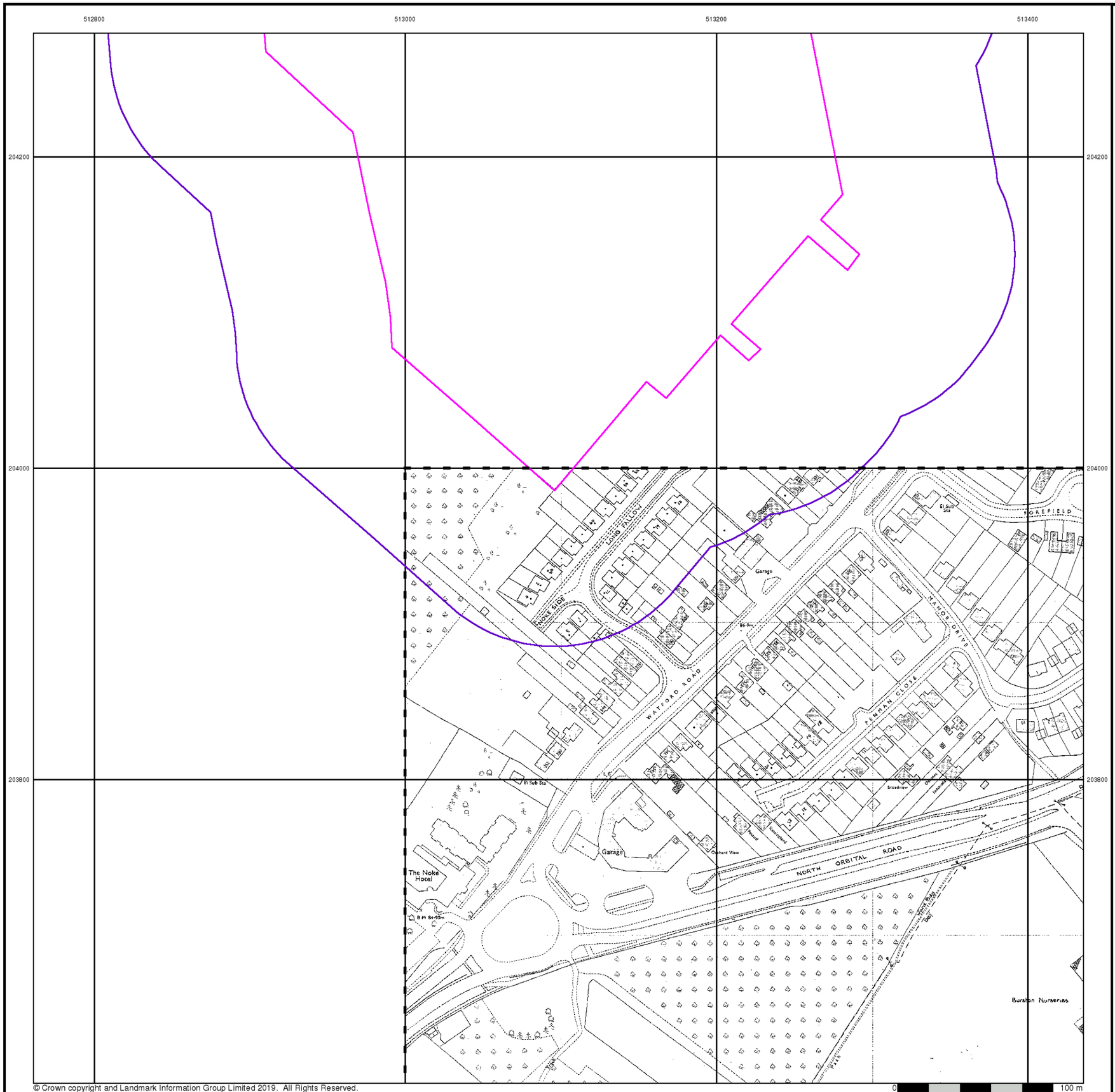
Web: www.envirocheck.co.uk



BRD

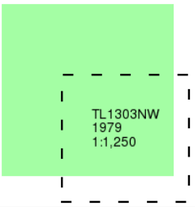
Additional SIMs

Published 1979

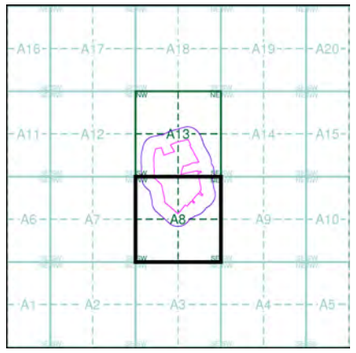
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



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0 100 m

BRD

Additional SIMs

Published 1980

Source map scale - 1:2,500

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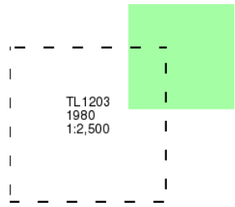
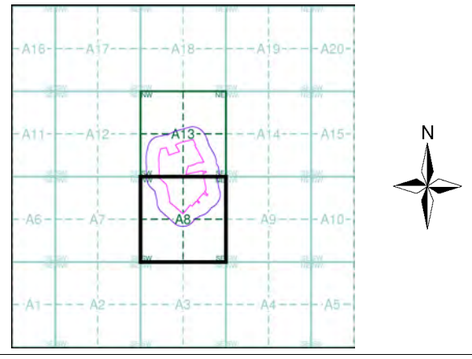
Map Name(s) and Date(s)



Historical Map - Segment A8



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BRD

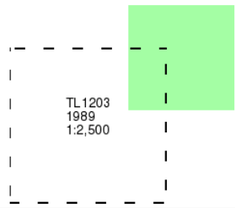
Additional SIMs

Published 1989

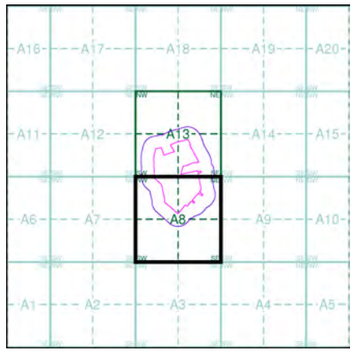
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



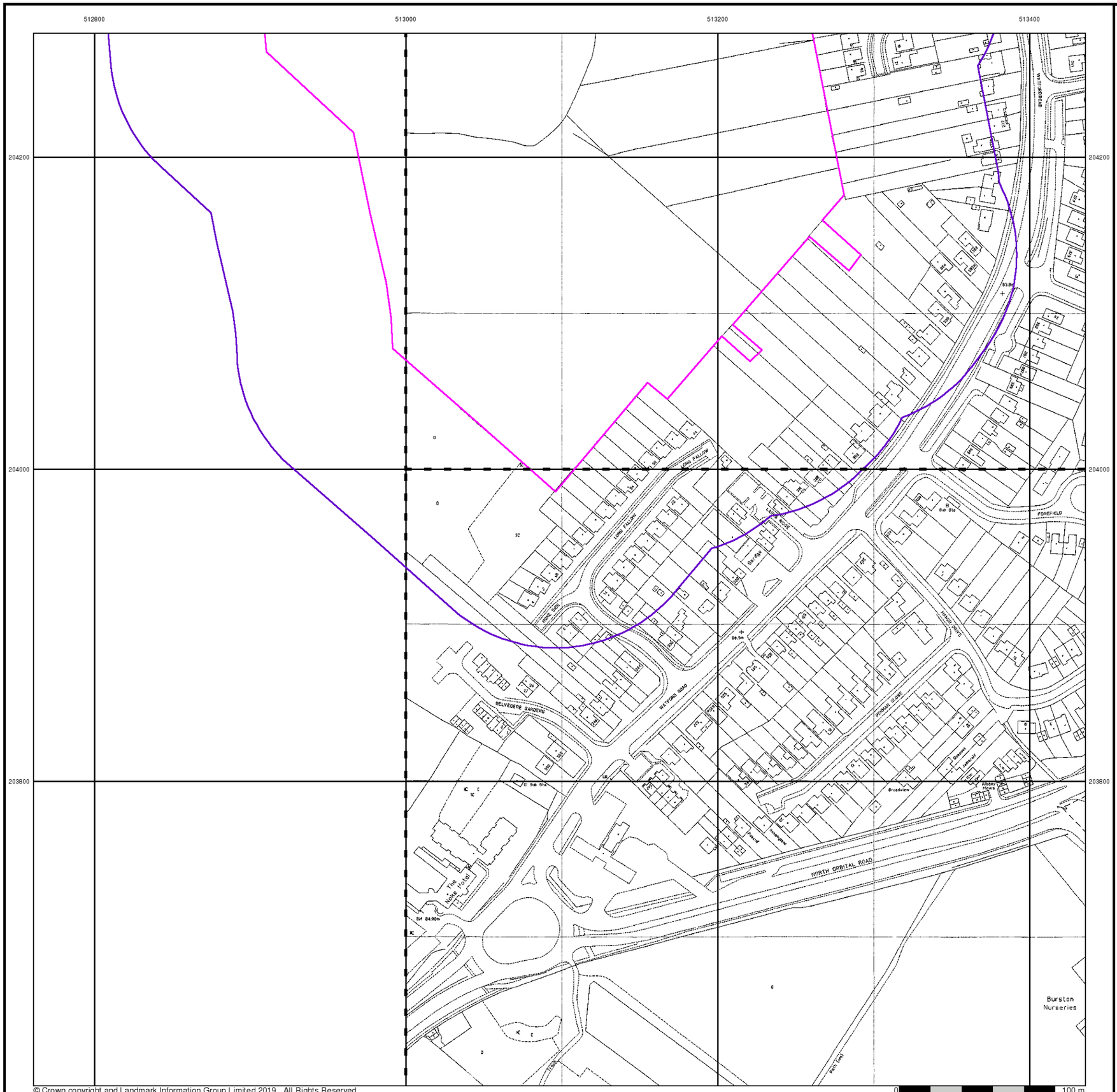
Order Details

Order Number:	228564710_1_1
Customer Ref:	BRD3604
National Grid Reference:	513100, 204290
Slice:	A
Site Area (Ha):	14.
Search Buffer (m):	100

Site Details

Chiswell Green Lane, Chiswell Green, Hertfordshire

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



BRD

Large-Scale National Grid Data

Published 1992

Source map scale - 1:1,250

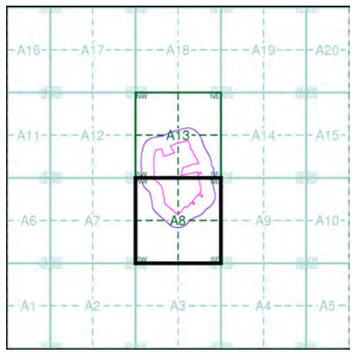
'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TL1304SW
1992
1:1,250

TL1303NW
1992
1:1,250

Historical Map - Segment A8



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0 100 m

BRD

Large-Scale National Grid Data

Published 1992

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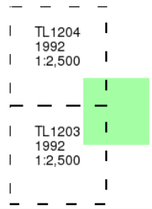
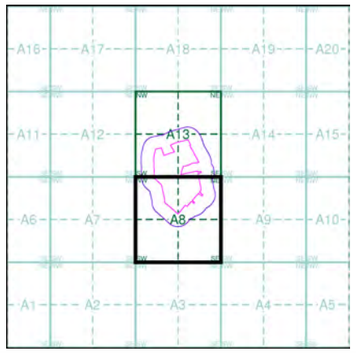
Map Name(s) and Date(s)



Historical Map - Segment A8



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Large-Scale National Grid Data

Published 1992

Source map scale - 1:1,250

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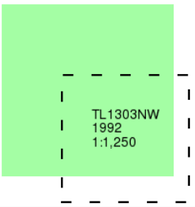
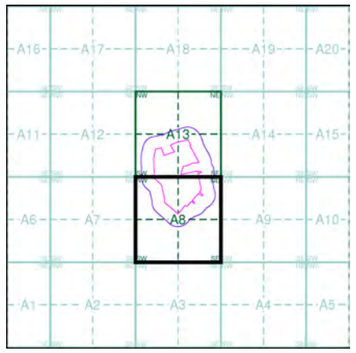
Map Name(s) and Date(s)



Historical Map - Segment A8



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0 100 m

BRD

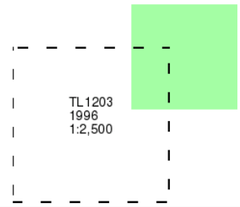
Large-Scale National Grid Data

Published 1996

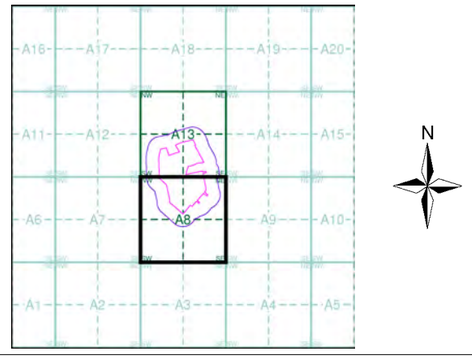
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



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