

Geoenvironmental Desk Study:
Land at Bartons Road, Havant

The Southern Co-operative

October 2011

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EXECUTIVE SUMMARY

Site Name & Address	**Land at Bartons Road, Havant, nearest postcode: PO9 5NP**
Site Use and Development Summary	The site is currently undeveloped open land to the north of Bartons Road, Havant. Significant development has not taken place at the site historically; however, anecdotal information suggests that the site was likely temporarily utilised during World War II for military purposes. The site is proposed for the development of a crematorium with associated areas of infrastructure, vehicular parking and landscaping. Parts of the site are likely to be dedicated for the scattering of ashes.
Geoenvironmental Setting	Geological mapping indicates the site to be sequentially underlain by superficial deposits of Head and, in turn, the London Clay Formation. Made Ground is not anticipated to be present to a significant extent. The Head is designated as a Secondary 'A' Aquifer. An unnamed ditch flows along the northern boundary of the site and a pond is present immediately to the north east. It is considered likely that groundwater flows towards the south.
Preliminary Risk Assessment	Significant widespread contamination is not anticipated at the site; however, the potential exists for local contamination to be present, predominantly associated with the former anecdotal use of the site for military activities. A historical landfill site has been identified approximately 80m to the east of the site and may represent a source of contamination and/or landfill gas; although, active gas abstraction at the landfill site is on-going. There is considered to be a low to moderate risk from contamination to human health and buildings/services, given the potential for localised contamination and the generation of landfill gas nearby. A low risk has been determined for future site users under the currently intended scenario given appropriate mitigation during construction. A low risk has been determined for controlled waters and third party land. Post development, cremated ashes are considered unlikely to represent a significant risk to human health and/or controlled waters given their predominant composition of carbon calcium phosphate, sodium and potassium (i.e. essentially ground bone).
Recommendations	It will be necessary to undertake intrusive ground investigation works to provide detailed information on ground conditions, any potential contamination and to inform foundation, pavement and earthworks design. The ground investigation should consider the potential for landfill gas migration to the site and the risks posed to future buildings and their users. An Unexploded Ordnance Survey should be conducted in accordance with the recommendations of the local Environmental Control Officer.

1 INTRODUCTION

1.1 AUTHORISATION

WSP Environment & Energy (WSP) was commissioned by Alliance Planning on behalf of The Southern Co-operative to undertake a Geoenvironmental Desk Study of an area of open, undeveloped land north of Bartons Road, Havant.

The offer to carry out the works was contained in WSP Proposal Reference 00022254-P01, dated 13th April 2011.

1.2 AIMS AND OBJECTIVES

The main aim of the assessment is to provide a broad understanding of the site geology, hydrogeology, physical soil properties and a preliminary assessment of likely soil contamination. The assessment is designed to inform the developer and interested parties about potential geoenvironmental constraints to development.

1.3 SCOPE OF WORKS

The Geoenvironmental Desk Study considers the following elements:

- Review of contemporary and historical Ordnance Survey maps to assess the historical usage of the site in order to identify potential contaminative land uses and geotechnical issues;
- Review of information pertaining to geology, hydrogeology and hydrology of the site and surrounding area to assess ground conditions and the presence of sensitive environmental targets;
- Research on the typical composition of crematorium ashes;
- Obtain and review a Landmark Envirocheck report to provide more complete geoenvironmental information with particular regard to landfill sites and waste treatment facilities, fuel station entries, contaminated land register entries, pollution incidents to controlled waters, discharge consents, abstraction licences and locally sensitive receptors;
- Detailed site reconnaissance to provide a visual assessment of the site and supplement the determination of current potential environmental or geotechnical concerns and nearby receptors;
- Assess likelihood of potential sources of land contamination in order to provide a qualitative assessment of whether contaminated land poses a significant risk through the development of a conceptual model (i.e. through the identification of potential contamination sources (potential pollutant) – pathway – receptor relationships (pollution linkages) in the context of the site and surrounding area); and,
- Recommendations for intrusive ground investigation work, if applicable.

The general limitations to the nature of the assessment are outlined in the Notes on Limitations presented in **Appendix A**. Specific limitations imposed by the subject site are discussed where relevant throughout the report.

It should be noted that the atmospheric emissions from the process of cremation have not been discussed within this report and will need to be considered separately under the planning process.

2 SITE LOCATION AND SETTING

2.1 SITE DETAILS

Table 2.1 – Site Details

Site Address	**Land north of Bartons Road, Havant. Nearest postcode: PO9 5NP**
Ordnance Survey Grid Reference	473482, 108375
Size	Approximately 3.25 hectares
Site Location	The site is located to the north of Bartons Road to the north-east of Havant. A site location plan is provided as **Figure 1**.
Current Use	The site is currently undeveloped open land.
Surrounding Land Use	Immediately to the south-east of the site is Spire Portsmouth Hospital, to the north of which is The Slip (deciduous woodland). Bartons Copse (deciduous woodland) forms the northern and western boundaries and open land is situated to the south, beyond which is Bartons Road. Sports fields and residential properties are located approximately 200m to the west of the site, beyond a railway line.

2.2 SITE RECONNAISSANCE

A walkover of the site was not conducted within the timeframe of this assessment.

Based on available aerial photography (Google Maps) and the topographical survey for the site (local grid and elevation only), the site is currently open and grassed. The site is partially divided by low fencing and utilised for pasture. The site generally slopes down to the west with a drop in elevation from east to west of around 5.5m.

3 HISTORICAL LAND USE AND POTENTIAL CONTAMINATION

3.1 SITE HISTORY

A study of historical Ordnance Survey maps provided as part of an Envirocheck Report (a database of environmental information) obtained for the development site (Ref: 34630544_1_1, dated 28th April 2011) has been undertaken to identify any potential contaminative former land uses.

The available map information, extracts of which are included within **Appendix B**, indicates that the site has remained undeveloped open land since prior to circa 1886.

Anecdotal information obtained from a local resident employed by WSP suggests that the woodland adjacent to the site may have been used during World War II for concealing American WWII personnel; however, no documentary evidence has been reviewed to confirm this.

3.2 HISTORICAL USES IN SURROUNDING AREA

Table 3.1 provides a summary of the pertinent available map information relating to the area within the general vicinity of the site.

Table 3.1 – Summary of Pertinent Land Uses within Vicinity of the Site

Date	Land Use	Distance (m)	Direction
1866 – Present	Woodlands; gradual development over time to include tracks and interspersed with farms/lodges	Adjacent	North, East and West
1870 – Present	Railway line (London and South Western Railway the Southern Railway)	200	West
1870 – 1975	Gravel pits	250	South-east
1963	Various factories and works	750	South-west
1984 – Present	Hospital	Adjacent	South-east

3.3 DEVELOPMENT DETAILS

The site is proposed for development as a crematorium with associated areas of infrastructure, vehicular parking and landscaping areas dedicated to the scattering of ashes. The indicative layout for the site is presented as HED Landscape Architects Drawing - Landscape Strategy Ref HED.923.SK.91, dated December 2010.

3.4 REGULATORY INFORMATION

The land use data detailed in Table 3.2 has been obtained from a summary of publicly available information.

Table 3.2 – Regulatory Information

Land Use	0 – 250m	250 – 1,000m	Details
Environment Agency Records			
Historic and Local Authority Recorded Landfill Sites	4	5	The closest potentially active landfill to the site is located approximately 80m to the east and is categorised as a co-disposal facility. From the records, this facility may form part of a wider complex of landfill sites.
Registered/closed waste	0	0	N/A

Land Use	0 – 250m	250 – 1,000m	Details
management/treatment facilities			
Authorised industrial processes (LAPPC/IPC/IPPC)	0	3	The closest IPPC is located approximately 350m to the east for biological treatment of non-hazardous waste at a landfill facility. This entry is listed as being superseded by variation.
Contemporary trade directory entries	2	56	The closest active entry is located approximately 80m to the south-east as Spire Portsmouth Hospital.
Fuel station entries	0	0	N/A
Planning Hazardous Substance Consents or Enforcements	0	3	The closest planning hazardous substance consent is located approximately 890m to the south west to British Gas Plc for liquefied extremely flammable gas and natural gas; however, the decision is listed as unknown. There are no planning hazardous substance enforcements listed within 1km.
Control of Major Accident Hazards Sites (COMAH)	0	1	An active Lower Tier COMAH site is located approximately 920m to the south west and operated by Transco Plc.
Notifications of Installations Handling Hazardous Substances (NIHHS)	0	1	An NIHHS is positioned approximately 920m to the south west. This entry is listed as active by Transco Plc.
Registered Radioactive Substances and Explosive Sites	0	0	N/A
Ecology			
Classification recognised by DETR Circular on Contaminated Land, 2006: *Local Nature Reserves, Marine Nature Reserves, National Nature Reserves, Ramsar Sites, Sites of Special Scientific Interest, Special Areas of Conservation or Special Protection Areas.*	0	0	N/A
Other Classifications: *Areas of Adopted Green Belt, Areas of Unadopted Green Belt, Areas of Outstanding Natural Beauty, Environmentally Sensitive Areas, Forest Parks, National Parks, Nitrate Vulnerable Zones or Nitrate Sensitive Areas.*	1	0	The site is located within a Nitrate Vulnerable Zone
Archaeology*			
Scheduled Monuments or World Heritage Sites	0	0	N/A

* Multi-Agency geographic Information for the Countryside (MAGIC) website accessed on 28th April 2011

3.5 ENVIRONMENTAL DATABASE SEARCH INFORMATION

Publicly available contaminated incident data in Table 3.3 has been summarised from the information provided in the Envirocheck Report.

Table 3.3 – Reported Contamination Incidents

Issue and Regulatory Body	0 – 250m	250 – 1,000m	Details
Environment Agency Records			
Contaminated land register entries and notices or enforcement and prohibition notices	0	0	N/A
Pollution incidents to controlled waters	0	1	The closest pollution incident to controlled waters is listed approximately 680m to the north west of the subject site. The entry is summarised as relating to diesel within a ditch in 1996 and is classified as a Category 2 (Significant) incident.
Prosecutions relating to controlled waters or authorised processes	0	1	A prosecution relating to an authorised process is listed approximately 320m to the east of the site. The incident occurred in 2001 and related to a breach of a Waste Management Licence (failure to cover waste with topsoil).
Substantiated pollution incidents register	0	5	The closest substantiated incident is listed approximately 530m to the east and dates to 2004 involving a landfill odour. No impact is listed for land or water impacts; however, a significant impact to air is recorded.
Water industry act referrals	0	0	N/A

3.6 ENVIRONMENTAL HEALTH

The Environmental Control Officer (ECO) at Havant Borough Council (*Mr. Jonathon Driver*) was contacted via telephone on the 5th May 2011. The ECO confirmed the following:

- There is strong anecdotal information to support the historical use of the site for military purposes and an Unexploded Ordnance (UXO) Survey would be prudent;
- The historical landfill site located approximately 80m to the east only recently ceased operation and was well managed with active gas abstraction and management on-going. However, the ECO did state that a limited period (nominally four weeks) of ground gas monitoring would be prudent at the subject site to ensure there are no impacts; and,
- The ECO has no other concerns with regards land contamination at the site and, given the proposed development, commented that intrusive investigations would best remain targeted to any identified areas of concern.

3.7 ENVIRONMENT AGENCY LIAISON

The local groundwater specialist at the Environment Agency (*Mr. Simon Deacon*) was contacted via telephone on the 5th May 2011. WSP are currently awaiting a response.

3.8 CREMATORIUM ASHES

As part of the development proposals, ashes from the crematorium are to be scattered within the grounds of the facility.

Cremated remains are mostly dry calcium phosphates with some minor minerals, such as salts of sodium and potassium. Sulphur and most carbon are driven off as oxidized gases during the process, although a relatively small amount of carbon as carbonate may remain. The remains are not ashes in the usual sense, but dried bone fragments

that have been mechanically pulverized. This leaves the bone as a fine sand able to be scattered without need for mixing with any foreign matter. Cremation of an average adult can result in 2-3kg of ash.

In the UK, the undertaker is required to remove pacemakers prior to delivering the body to the crematorium. Some other materials from medical implants, coffin fittings, etc., may also remain post cremation. Jewellery or spectacles may be worn by the deceased at the request of kin, so lumps of metal or glass from these may be left behind as well. Such objects are normally removed prior to the ashes being handed over to the deceased's family.

Cremated ashes do not generally contain contaminants with the potential to significantly impact the chemical quality of soil or controlled waters (surface water and groundwater). However, the long-term addition of ashes may affect physical soil quality.

The Environment Agency state in their guidance document '*Funeral practices, spreading ashes and caring for the environment*' there is no evidence to suggest that the disposal of human ashes in rivers and streams has a negative impact on the environment. Concerns with disposal near water courses is mainly due to practices such as casting tributes and other objects into the water at the same time as the ashes. They do recommend that spreading ashes in water courses should be done more than 1km upstream of any surface water abstractions.

4 GEOENVIRONMENTAL SETTING

4.1 HYDROLOGY

4.1.1 General

Table 4.1 presents those surface water features within the potential influence of the subject site.

Table 4.1 – Surface Water Features

Surface Water Feature	Distance	Direction	Quality*
Unnamed pond	On-site	North-east corner	Unknown
Drain	Adjacent	North	Unknown
Lavant	200m	West	A (Very Good)

* chemical water quality as classified under the Environment Agency's General Quality Assessment (GQA) Scheme (website)

In addition to the features listed in Table 4.1, a number of other drains, issues and ponds have been identified from the available mapping within a 1km radius. These and those features identified above typically flow towards the south and into Langstone Harbour or Chichester Harbour.

4.1.2 Surface Water Discharge Consents

The Envirocheck Report indicates that ten surface water discharge consents either have been/or are active within 1km of the site. The closest potentially active consent is located approximately 500m to the south for storm sewage overflow by Southern Water Services Limited.

4.1.3 Surface Water Abstractions

The Envirocheck Report does not list any surface water abstractions within 1km of the site.

4.1.4 Floodplain

The site is at an elevation of approximately 35m above Ordnance Datum (m AOD). The Environment Agency (EA) website, accessed on 28th April 2011, stated that the EA does not have an assessment of flood risk from rivers, the sea or reservoirs for the subject site.

It should be noted that various surface water features have been identified within the general vicinity of the site that may be subject to localised flooding.

4.2 GEOLOGY

4.2.1 General

Published geological mapping indicates the site to be directly underlain by Head (superficial deposits) which are briefly described by the BGS as comprising poorly sorted and poorly stratified clay, sand and gravel. A selection of BGS borehole logs (**Appendix C**) obtained from within the general vicinity of the site indicate that superficial deposits may be present to depths of between approximately 1.5m and 2.1m below ground level (bgl) and consist of gravel with some clay.

The superficial deposits are shown to overlie bedrock geology of the London Clay Formation briefly described by the BGS as "*fine, sandy, silty clay*". The BGS borehole logs describe this strata as being firm to stiff grey brown clay.

Given the lack of substantial development at the subject site indicated on the available mapping, it is considered that Made Ground, if present at the site, will likely be limited in its extent and depth.

4.2.2 Coal Mining and Mineral Extraction

The Coal Authority Gazetteer for England and Wales indicates that a mining report is not required for the site and the Envirocheck Report states that the site is in an area which may not be affected by coal mining.

The Envirocheck Report lists two inactive BGS recorded mineral sites within 1km of the subject site for the extraction of sand and gravel by opencast methods; the closest of which is located approximately 320m to the north-east. In addition to this, the landfill facility located approximately 80m to the east of the site is set within a former gravel pit.

4.2.3 Radon

The BRE document 'Radon: Guidance on Protective Measures for New Buildings' (BR211) dated 2007 indicates that the site lies in an area as having radon potential. The Envirocheck Report indicates that the site is in a lower probability radon area and that no radon protection measures are necessary in the construction of new dwellings or extensions.

It should be recognised that the Envirocheck Report represents a site specific review and that the BR211 document is based on 1km grid squares of lesser resolution. Therefore, it is considered that the information provided within the Envirocheck Report is most relevant in this instance.

4.3 HYDROGEOLOGY

4.3.1 General

The Environment Agency has designated the superficial deposits (Head) as a Secondary 'A' Aquifer. The underlying London Clay Formation has not been designated; therefore, an overall Secondary 'A' classification should be adopted for the site based on the Environment Agency's Groundwater Protection Policy.

Given the general topography of the surrounding area, the indicated flow directions of various drains and the proximity of the coastline it is considered likely that groundwater will typically flow towards the south.

4.3.2 Groundwater Abstractions

Publicly available information held by the Envirocheck database indicates that there are no groundwater abstractions within 1km of the subject site. The site is not located within a groundwater Source Protection Zone; however, a Zone of Special Interest is located within close proximity of the north of the site. It is recognised that this is a definition that, according to the EA, will either be incorporated into other zones in the future or become a safeguard zone. Nevertheless, these zones formerly "*usually represented a surface water catchment which drains into the aquifer feeding the groundwater supply*".

5 PRELIMINARY RISK ASSESSMENT

5.1 CONTAMINATED LAND RISK ASSESSMENT APPROACH

The presence of contaminated materials on a site is generally only of concern if an actual or potentially unacceptable risk exists. Part 2A was introduced into the EPA by the Environment Act 1995. Part 2A, its accompanying regulations and Statutory Guidance contained in DEFRA Circular 01/2006 Contaminated Land presented the statutory definition of "contaminated land". For the purposes of Part 2A, contaminated land is defined as: "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".

The Part 2A regime was designed and intended to encourage voluntary remediation rather than regulatory action and to work with the established role of planning and building control in those cases where the land is suitable for or scheduled for redevelopment.

DEFRA Circular 01/2006 makes clear that, where new development is taking place, it is the developer's responsibility for ensuring that development is safe and suitable for use for the purpose for which it is intended and thus to carry out the necessary remediation. In most cases the enforcement of remediation requirements is therefore through planning conditions and building control rather than through a remediation notice under Part 2A. Planning Policy Statement 23 (PPS23) Annex 2, states that '*As a minimum, after carrying out the development and commencement of its use, the land should not be capable of being determined as contaminated land under Part 2A of the EPA 1990.*'

A developer will need to satisfy the local authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

In the context of land contamination, there are considered to be three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm to human health, property, specified ecological receptors, or to cause pollution of controlled waters;
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body; and,
- A **pathwa**y – a route or means by which a receptor can be exposed to, or affected by, a contaminant source.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant source–pathway–receptor is described as a **pollutant linkage**.

Without a pollutant linkage, there is not a risk – even if a contaminant is present. Even where there is a pollutant linkage and therefore some measure of risk, the question still needs to be asked as to whether the level of risk justifies remediation. In the context of land contamination 'risk' is a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

To provide a framework for making such an assessment, Environment Agency publication CLR11: Model Procedures for the Management of Contaminated Land, (2004) identifies three tiers of risk assessment:

- Tier 1 – Preliminary Risk Assessment (PRA);
- Tier 2 – Generic Quantitative Risk Assessment (GQRA); and,
- Tier 3 – Detailed Quantitative Risk Assessment (DQRA).

The tiers are applied to the circumstances of the site under consideration with an increasing level of detail required by the assessor in progressing through the tiers. This report includes a *Tier 1 Preliminary Risk Assessment* which is presented in the following sections. Further information on the approach used is given in **Appendix D**.

5.2 PRELIMINARY CONCEPTUAL MODEL

The following section presents a preliminary Conceptual Site Model (CSM), considering the information collected in the previous sections. The assessment has been undertaken with regard to the proposed development of the site as a crematorium; should a significantly different development be proposed then reassessment will be required.

Based on the current findings, the potential sources of contamination pertinent to the intended development are discussed in Table 5.1.

Table 5.1 – Summary of Likely Sources of Contamination

Likely Contamination Source	Potential Contaminated Issue and Justification
On-site contamination sources	The site has remained largely undeveloped throughout its documented history; therefore, significant contamination is unlikely to have occurred due to on-site sources. Nevertheless, anecdotal evidence indicates that the site and surrounding woodland was likely used for military purposes during World War II and, as such, localised areas of contamination may exist associated with the storage and dispensing of fuel/oil and potential fired residues (i.e. ash). It is considered unlikely that substantial unexploded ordnance will remain on-site; however, an appropriate survey should be undertaken to further clarify this prior to construction. Post development, cremated ashes will be scattered within the grounds of the site but these are not considered to represent a source of contamination.
Off-site contamination sources	A railway line and various factories have been identified to the west and south-west of the site respectively; however, these are beyond 200m from the site boundary and anticipated to be down-hydraulic-gradient, limiting the migration of potential contamination to the subject site. A historical landfill site has been identified approximately 80m to the east. With the exception of the adjacent hospital and agricultural practices in the general vicinity, no other major off-site sources of contamination have been identified.

Given the intended development, the potential exposure pathways are summarised in Table 5.2.

Table 5.2 – Summary of Potential Exposure Pathways

Exposure Pathway	Receptor Summary
Ingestion and inhalation of dusts/ashes; dermal contact and inhalation of vapours from on-site sources.	Human Health
Leaching of contaminants from soils, surface run-off, migration under gravity to groundwater and subsequent migration to surface water features.	Controlled Waters
Ground/landfill gas may migrate into structures; contaminant permeation of water supply pipes could occur and aggressive ground conditions could impact buried concrete.	Buildings and Structures
Contaminant migration via leaching and/or drainage.	Third Party Land
Uptake of contaminants by plants/vegetation.	Ecology

Table 5.3 presents the potential receptors for consideration, based on the identified sources and exposure pathway assessment.

Table 5.3 – Summary of Potential Receptors

Receptor Group	Comments
Human Health	Construction workers, future site users, future maintenance workers and neighbouring site users.
Controlled Waters	On-site pond and nearby surface water features (including ditch running along northern boundary) and underlying Secondary 'A' Aquifer.
Buildings and Services	Future structures forming the proposed crematorium.
Third Party Land	Neighbouring hospital.
Ecology	Adjacent woodland areas and any vegetation retained/planted as part of the development.

5.3 PRELIMINARY RISK ASSESSMENT

Having evaluated the information gathered during this study and described in the previous sections, Table 5.4 presents an assessment of potential risk with respect to contaminated land issues and the different active receptor groups based on the intended development of the site. The assessment of risk has considered the terms describing 'Probability and Consequence' as described in CIRIA C552 (**Appendix D**).

Table 5.4 – Summary of Likely Significance of Risks to Identified Receptor Groups

Receptor Group	Likely Significance of Risk	Justification
Human Health	Low to Moderate	Localised sources of contamination may represent a moderate risk to human health during any construction and/or enabling works. Furthermore, the potential exists for residual light ammunition (bullets, flares etc.) to remain at the site that may pose a risk to such workers. Post development, potential risks are considered to be low given the likely management of localised potential existing contamination sources during construction works; however, the requirement for on-site migration of contamination from the nearby historical landfill site (80m east) cannot be discounted. Cremated ashes are unlikely to represent a significant risk to human health.
Controlled Waters	Low	Localised sources (i.e. fuel/oil spillage or localised waste burial from military or agricultural use) may have resulted in impact to soils which may represent an on-going risk to controlled waters, particularly the underlying Secondary 'A' Aquifer and nearby surface water courses. Nevertheless, it is considered that significant impact is unlikely to have occurred and any residual contamination that may be present could be easily managed during the construction phase of the development. Cremated ashes are of granular form (essentially ground bone) and are unlikely to represent a significant risk to controlled waters. Once strewn on the ground, biochemical processes will break them down within a relatively short time. Cremated remains are predominantly composed of calcium phosphates with lesser proportions of sodium and potassium and are unlikely to represent a significant risk to controlled waters.
Buildings and Services	Low to Moderate	It is considered that there is a low potential for aggressive ground conditions to exist at the site. A historical landfill site has been identified approximately 80m to the east of the site (albeit with on-going active gas abstraction) and the potential migration of landfill gas is considered to represent a low to moderate risk to adversely affect future buildings and their users.

Receptor Group	Likely Significance of Risk	Justification
Third Party Land	Low	It is considered unlikely that site derived contamination will result in significant impact to third party land. Residual contamination from historical localised sources may have migrated off-site; however, such occurrences will likely be managed during the construction phase.
Ecology	Low	No significant risks to site ecology or the ecology of the surrounding area have been identified. Cremated ashes will not present a risk to plant growth.
Overall Classification	**Low to Moderate**	

5.4 GEOTECHNICAL HAZARD ASSESSMENT

Having evaluated the information gathered during this study and described in the previous sections, Table 5.5 presents an assessment of the potential risks with respect to geotechnical issues.

Table 5.5 – Geotechnical Hazard Assessment Summary

	Issue	Risk Category	Justification
Geotechnical Issue	Potential for variable depth of Made Ground and/or residual structures	Low	The site is in keeping with the natural topography of the surrounding area. There has been no substantial development at the site throughout its documented history. Made Ground is anticipated to be limited both in extent and depth. Residual below ground structures are not expected.
	Slopes and uneven ground	Low	The site generally slopes to the west and it some earthworks are likely to be required to create a development platform for the proposed building and car parking. Although existing site slopes are not significant some minor retaining structures or slopes may be required externally.
	Presence of variable quality superficial deposits	Low	Geological mapping indicates the site to be directly underlain by Head, described by the BGS as poorly sorted clay, sand and gravel. Available borehole logs within the general vicinity indicate that these deposits are unlikely to be present much beyond 2-3m bgl.
	Semi-mature/mature trees	Low	Woodland trees and other species surround the site to the north, east and west and have the potential to affect the behaviour of clays (i.e. shrinking/swelling) to various depths within their vicinity; however, these are predominantly beyond the site boundaries and soils are anticipated to be largely granular.
Construction Consequences	Risk of future damage to property	Low	A low potential exists with respect to damage to property from potential geotechnical hazards providing suitable designs are adopted in the construction of future structural elements (including floor slabs etc.).
	Implications for redevelopment	Low	Adequate intrusive ground investigation would be required prior to any construction at the site to clarify the underlying ground conditions and obtain information for foundation, pavement and earthworks design.
Overall Risk		**Low**	

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

6.1.1 Anticipated Ground Conditions

The topography of the site is generally sloped down to the west and the underlying geological sequence if likely to comprise Head overlying the London Clay Formation. Made Ground is likely to be limited in its extent and depth given the lack of substantial development at the site throughout its documented history.

6.1.2 Site Contamination

Past and current uses of the site are unlikely to have resulted in significant widespread contamination of site soils. Nevertheless, the presence of localised contamination cannot be discounted. There is anecdotal evidence indicating that the site and adjacent woodland were utilised for military activities during World War II, and some remnant ordnance may be present on the site.

It is unlikely that significant contamination has migrated onto the site from off-site sources. However, a historical landfill site has been identified approximately 80m to the east and may represent a source of on-site migration of contamination and/or landfill gases.

6.1.3 Preliminary Conceptual Model

The site is proposed for the development of a crematorium, with areas of associated landscaping.

The preliminary conceptual model developed for the site has identified potential pollutant linkages requiring further consideration. These are primarily focussed on the following aspects:

- The potential for localised contamination to be present and likely derived from the anecdotal use of the site and surrounding area for military activities during World War II and this may represent risks to human health and controlled waters; and,
- The presence of a historical landfill approximately 80m to the east of the site which may present a source of contaminant and/or landfill gas migration to the subject site and represent a risk to site users and structures.

It is considered that aggressive ground conditions are unlikely to represent a significant risk to the current development proposals.

The likelihood of liabilities arising from the off-site migration of site derived contamination is considered to be low; however, not discountable based on the potential for localised impacts, the underlying Secondary ‘A’ Aquifer and nearby surface water courses.

It is considered that widespread contamination is unlikely to be present at the site and that any potentially significant impacts could be mitigated during the process of construction and enabling works. Nevertheless, the potential for landfill gas to migrate to the subject site has been identified and any potential risks will need to be clarified.

6.1.4 Geotechnical Constraints

No significant geotechnical constraints have been identified. Made Ground is not anticipated to be widespread across the site; however, may exist locally. The site is underlain sequentially by Head of likely variable composition and quality and, in turn, the London Clay Formation.

6.2 RECOMMENDATIONS

6.2.1 Unexploded Ordnance Survey

Based on the anecdotal information to support the previous use of the site and surrounding area for military purposes and on the recommendation of the local Environmental Control Officer, a suitable desk top Unexploded Ordnance Survey should be undertaken. The findings of the report will need to be considered within later phases of work.

6.2.2 Ground Investigation

It will be necessary to undertake intrusive ground investigation works to provide detailed information on ground conditions, inform foundation, pavement and earthworks design, and quantify the potential risk posed by the migration of landfill gas to the site. A ground investigation report will likely be required prior to construction and investigations should focus on:

- A ground model for foundation design and earthworks;
- Design parameters for infrastructure and pavement design; and,
- The potential migration of landfill gas from the historical facility identified approximately 80m to the east.

Given the anticipated lack of significant contamination at the site, targeted investigations are not considered to be required to identify areas of potential concern. Nevertheless, it would be prudent to provide basic chemical characterisation of the site soils during the necessary investigation works to provide a baseline for future reference.

A detailed remediation strategy is not likely to be required; however, it will be necessary to ensure that any areas of contamination identified during either the ground investigation works or future construction works have been appropriately managed.

6.2.3 Site Waste Management Plan

The Site Waste Management Plan Regulations 2008 require that a Site Waste Management Plan (SWMP) is prepared for all construction projects with an estimated cost exceeding £300,000. The Local Authority may wish to comment on the SWMP for the site as part of their planning policy.

WSP Environment & Energy

THIRD PARTY DRAWINGS



KEY PROPOSALS

01 Courtyard
02 Meadow
03 Drop Off Area
04 Pick Up Area
05 Car Park
06 Overflow Car Park
07 Approach Road with Avenue Tree Planting
08 Memorial Mound
09 Book Room
10 Memorial Copse (tree planting by others)
11 Feature Memorial Area with Remembrance Wall
12 Existing Pond
13 Feature Paving to Vehicular Area
14 Proposed Water Feature
15 Seating
16 Feature Tree Planting
17 Sculpture/Art Feature
18 Wayfinding Signage
19 Attenuation Pond
20 Swale
21 Pergola
22 Floral Tribute Display Area
23 Feature Hedge
24 Service Yard
25 Service Yard Access
26 Planted Landscaped bund
27 Footpath
28 Woodland Matrix Planting (native shrub and whip planting)
29 Cycle Parking
30 Feature Paving to Pedestrian Area
32 Double Vehicular Gate to Entrance
33 Avenue Tree Planting
34 Adjacent Field

CONSULTANTS

H E D
Hyland Edgar Driver

Landscape Architects and Urban Designers

The Wessex Way Colden Common Winchester Hampshire SO21 1WG
Telephone 01962 711600 Facsimile 01962 713945

LAND AT BARTON'S ROAD

DRAWING TITLE
ILLUSTRATIVE MASTERPLAN
SITE WIDE

REVISION
-

DRAWING NUMBER
HED.923.202

REV
-

SCALE
NTS @ A3

DRAWN
JW

DATE
MAY 11

CHECKED
-

DATE
-

APPROVED
-

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FIGURES


KEY
Site Boundary
A3(M)
3
3(M)
Hulbert Rd
Neville's Park
B2150
Leigh Park Gardens
Lodge Rd
Whichers Gate Rd
B2149
Currants Rd
Petersfield Rd
B2148
Comley Hill
Spire Portsmouth Hospital
H
Stansted
Emsw
Monk's Hill
North St
Horndean Rd
P
Bedhampton
Havant
New Rd
Havant War Memorial Hospital
1 km
Map data ©2011 Tele Atlas, Imagery ©2011 DigitalGlobe, Infoterra Ltd & Bluesky, GeoEye, Getmapping plc, The GeoInformation Group, Terrame
Google
WSP
TITLE:
SITE LOCATION PLAN
FIGURE No:
FIGURE 1

APPENDIX A NOTES ON LIMITATIONS

General

WSP Environmental Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from WSP Environmental Limited; a charge may be levied against such approval.

WSP Environmental Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) this document to any third party with whom an agreement has not been executed.

Phase I Environmental Audits

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP Environmental Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and groundwater.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those actually encountered.

The risk assessment and opinions provided, inter alia, take in to consideration currently available guidance values relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Geo-environmental Investigations

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to site remediation these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

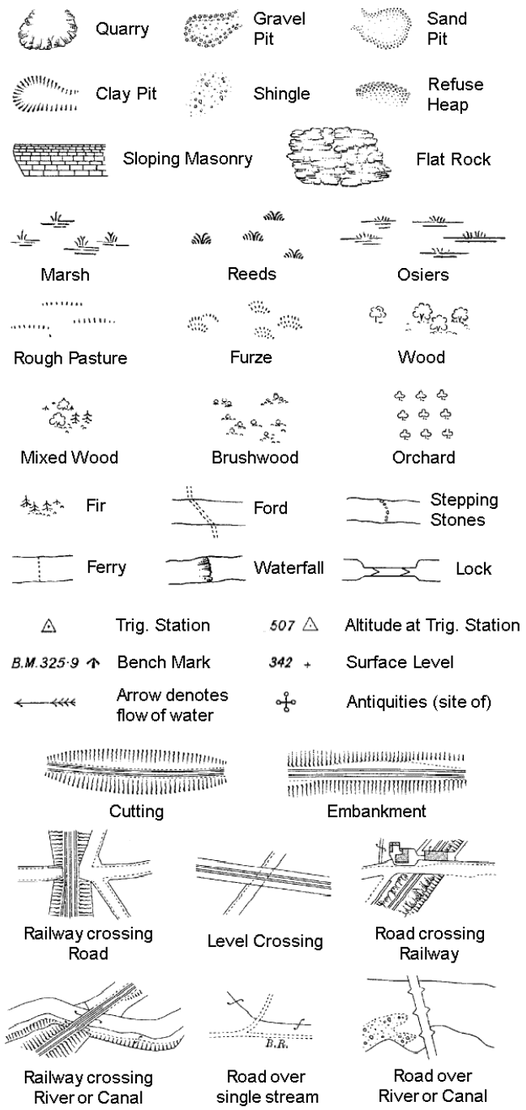
The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided, inter alia, take in to consideration currently available guidance values relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B HISTORICAL MAP EXTRACTS

Historical Mapping Legends

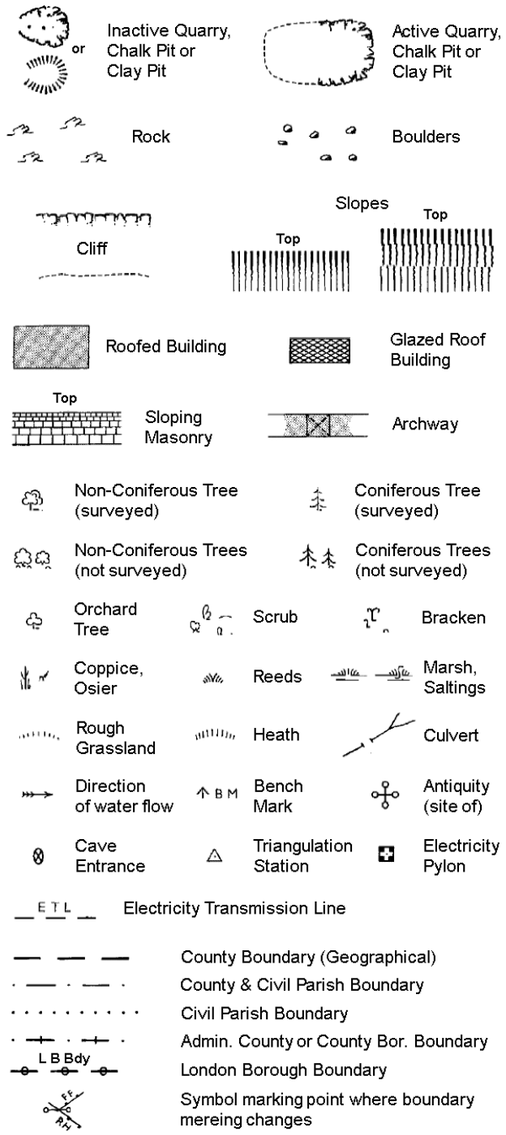
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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	St.	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

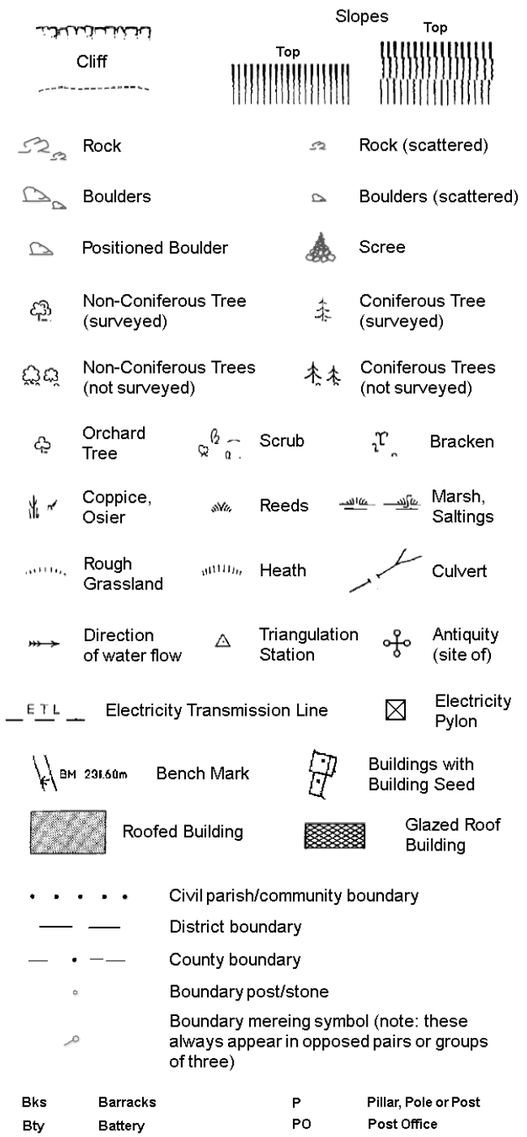
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



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)

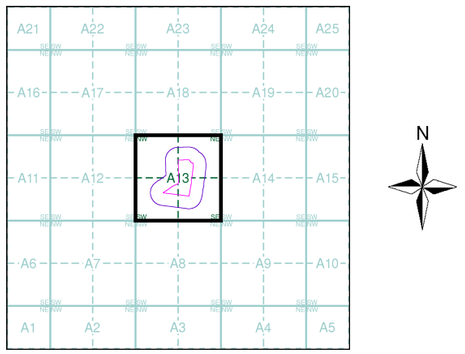
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity 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

WSP

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Hampshire & Isle Of Wight	1:2,500	1866 - 1878	2
Hampshire & Isle Of Wight	1:2,500	1866	3
Hampshire & Isle Of Wight	1:2,500	1868 - 1893	4
Sussex	1:2,500	1889	5
Hampshire & Isle Of Wight	1:2,500	1897	6
Sussex	1:2,500	1898	7
Hampshire & Isle Of Wight	1:2,500	1909	8
Sussex	1:2,500	1912	9
Hampshire & Isle Of Wight	1:2,500	1932	10
Ordnance Survey Plan	1:1,250	1967	11
Ordnance Survey Plan	1:2,500	1970 - 1972	12
Additional SIMs	1:2,500	1984 - 1990	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1996	15

Historical Map - Segment A13



Order Details

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Customer Ref:	22254-0001
National Grid Reference:	473450, 108330
Slice:	A
Site Area (Ha):	3.49
Search Buffer (m):	100

Site Details

Site at 473480, 108380

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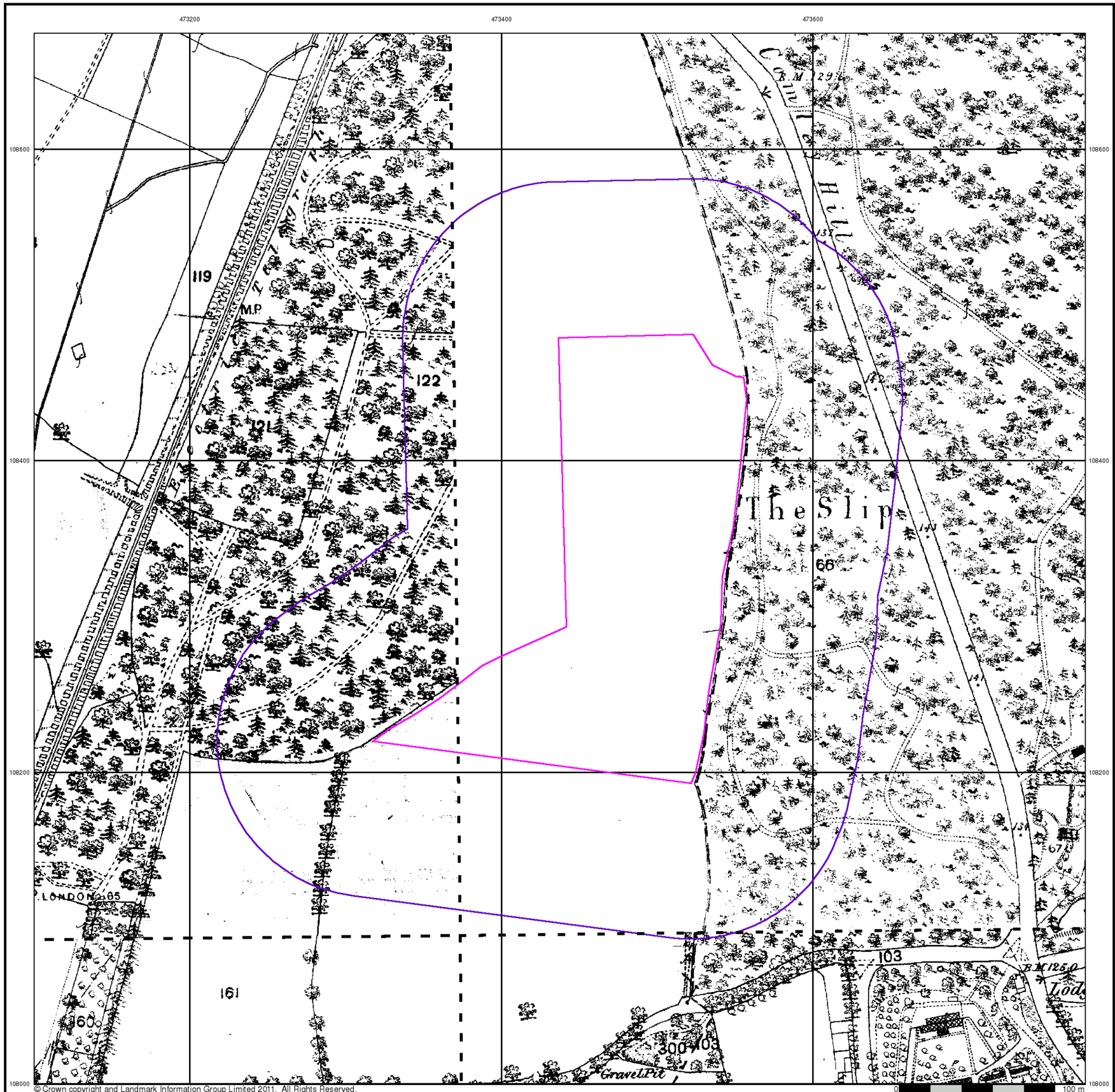
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Hampshire & Isle Of Wight

Published 1866 - 1878

Source map scale - 1:2,500

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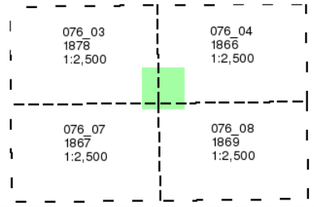
Map Name(s) and Date(s)



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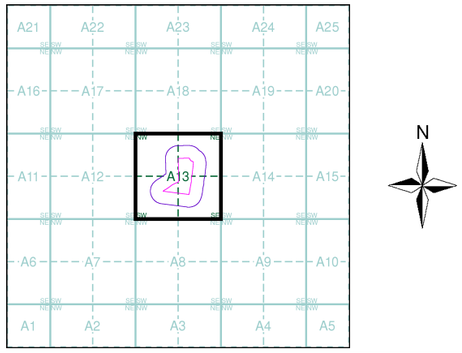

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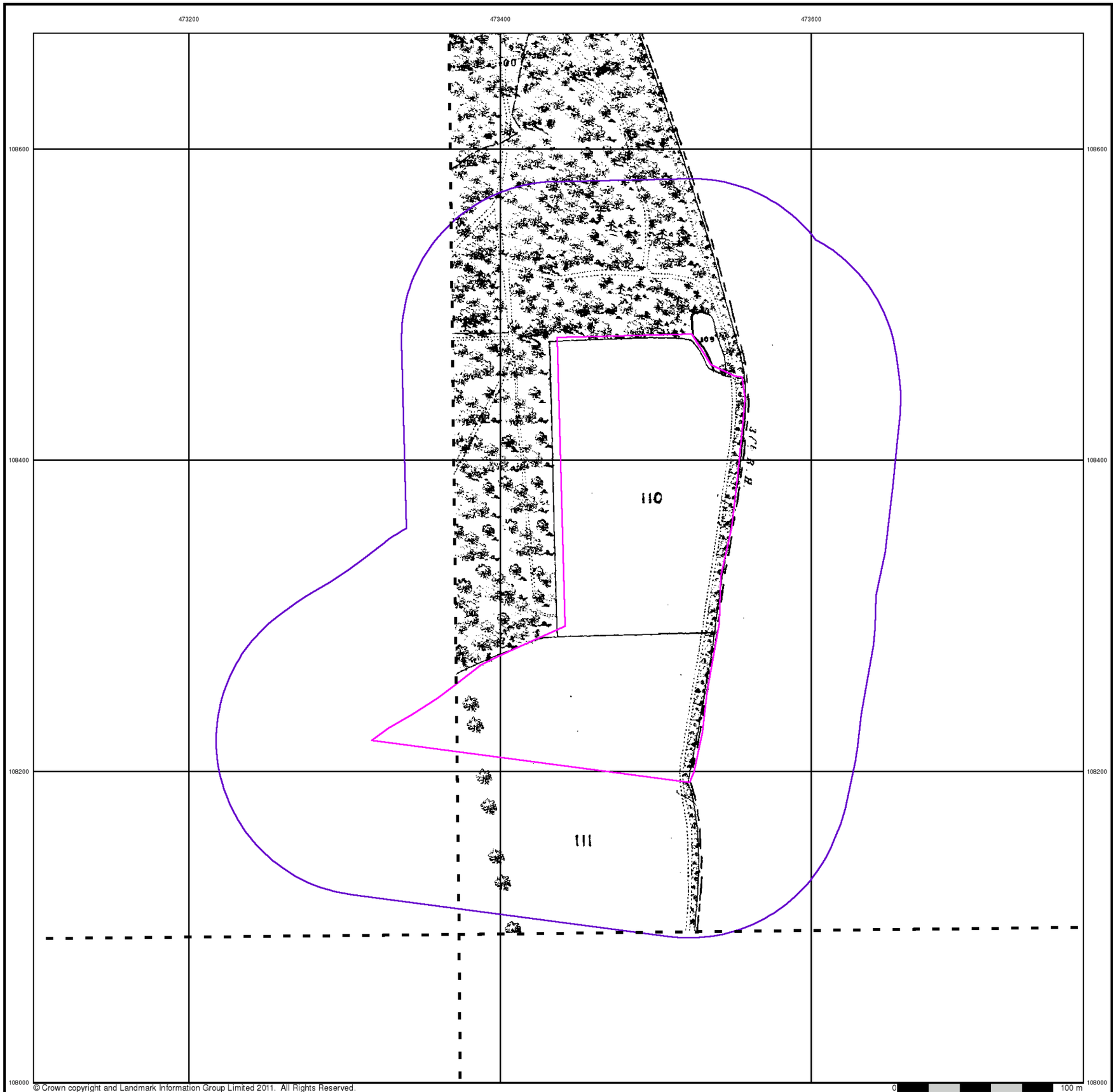

Hampshire & Isle Of Wight

Published 1868 - 1893

Source map scale - 1:2,500

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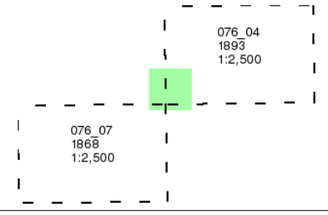

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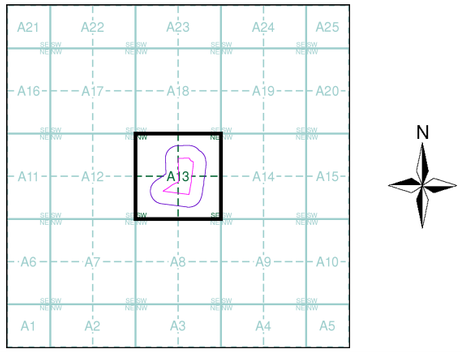

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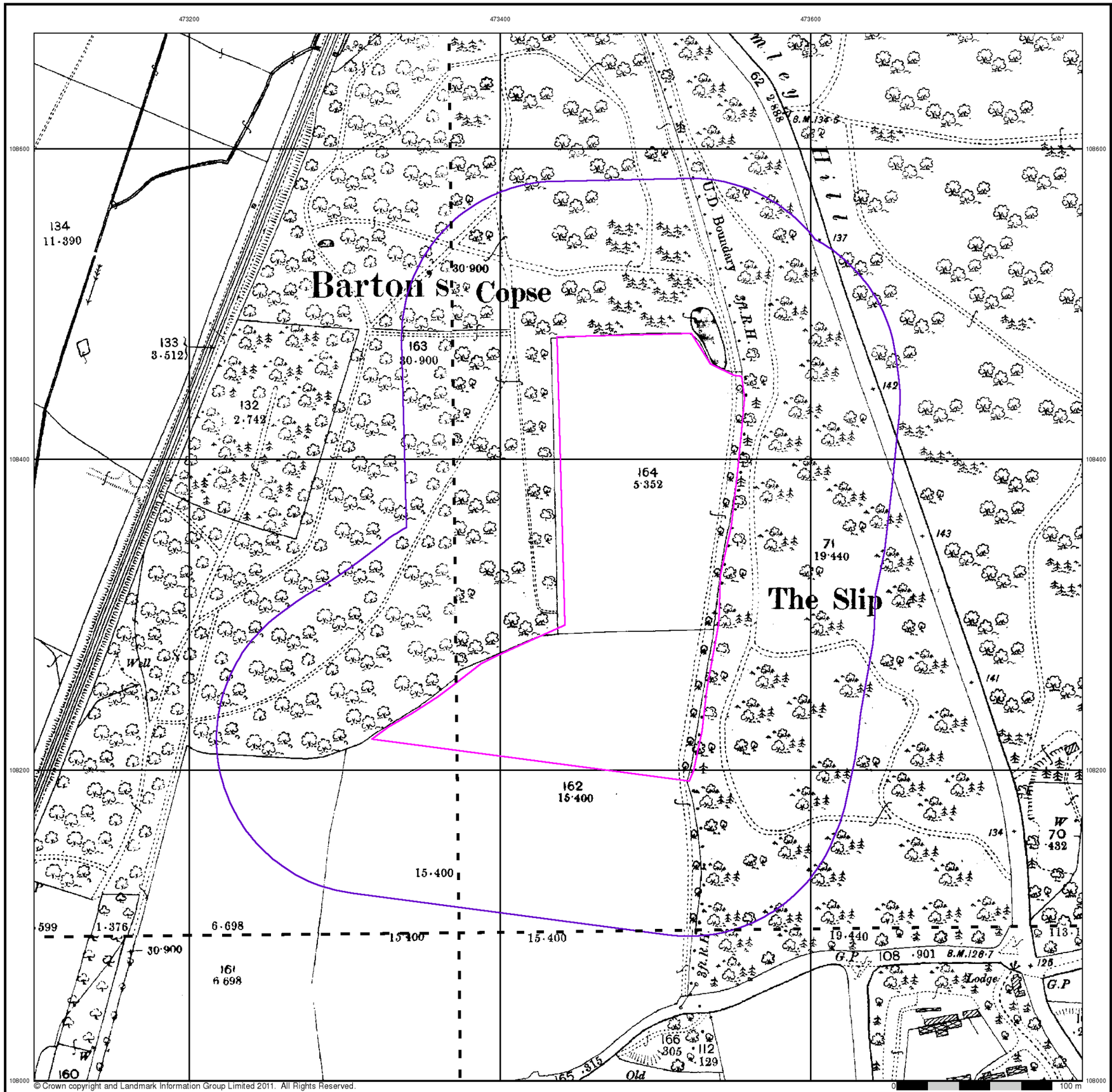

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Hampshire & Isle Of Wight

Published 1897

Source map scale - 1:2,500

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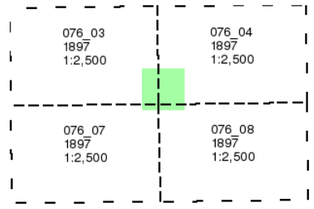
Map Name(s) and Date(s)



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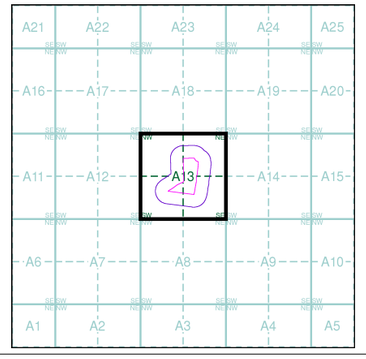

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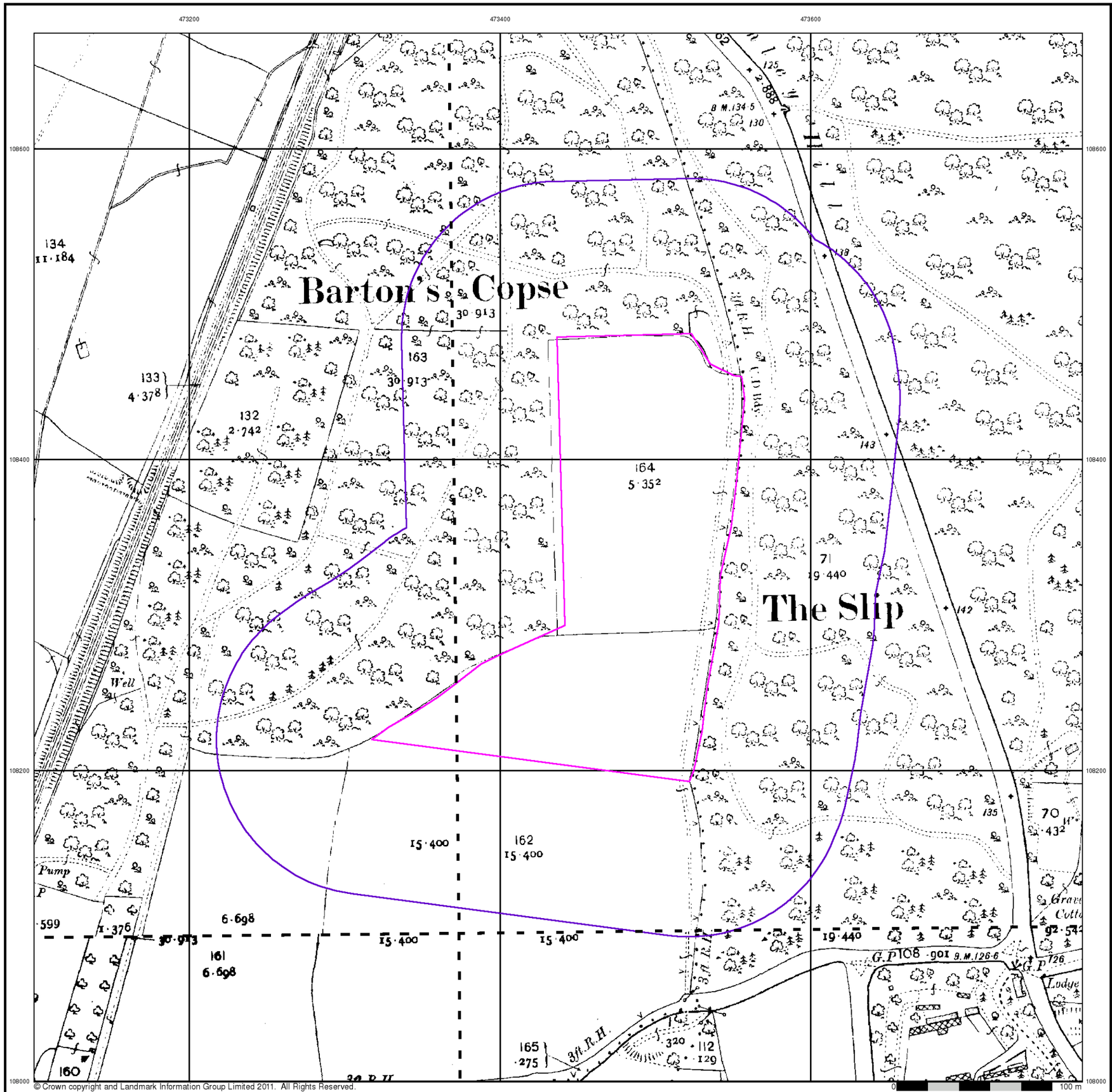

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Hampshire & Isle Of Wight

Published 1909

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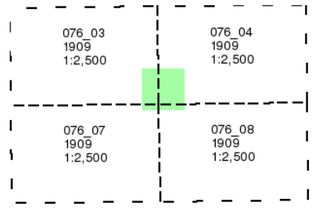

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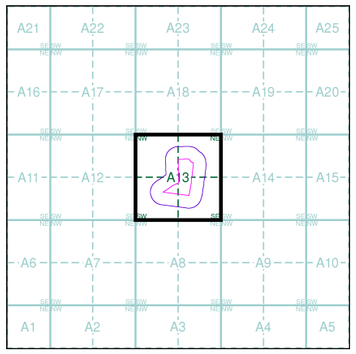

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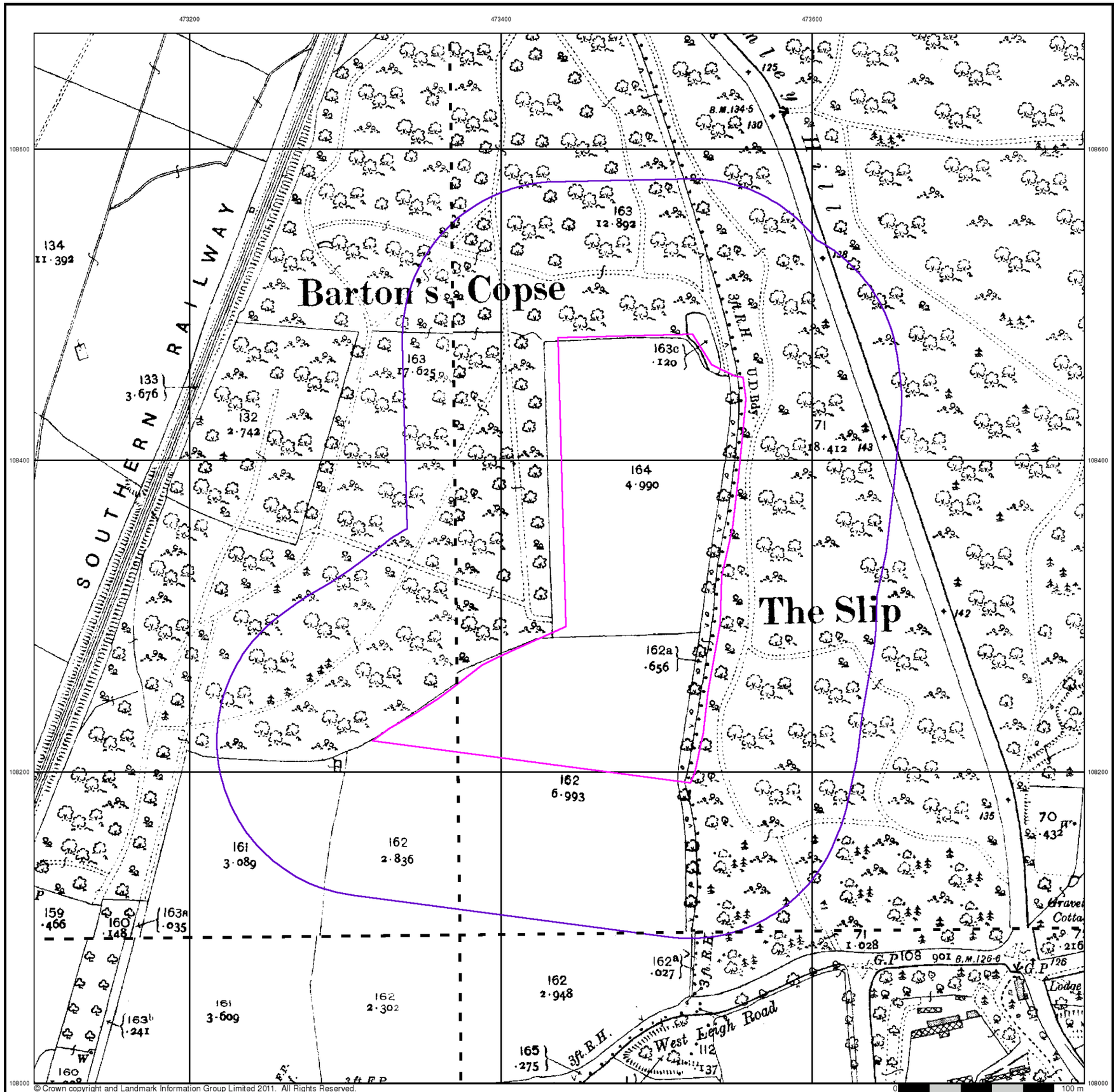

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Hampshire & Isle Of Wight

Published 1932

Source map scale - 1:2,500

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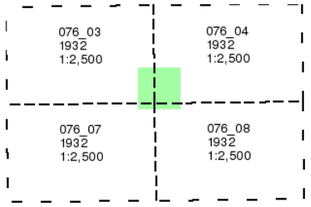
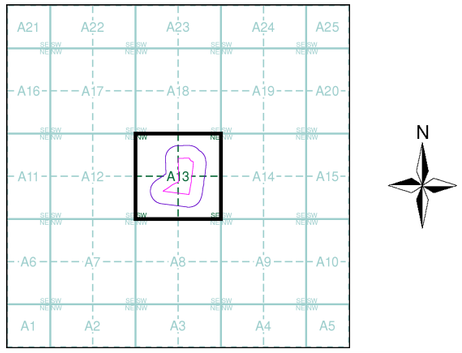


Historical Map - Segment A13



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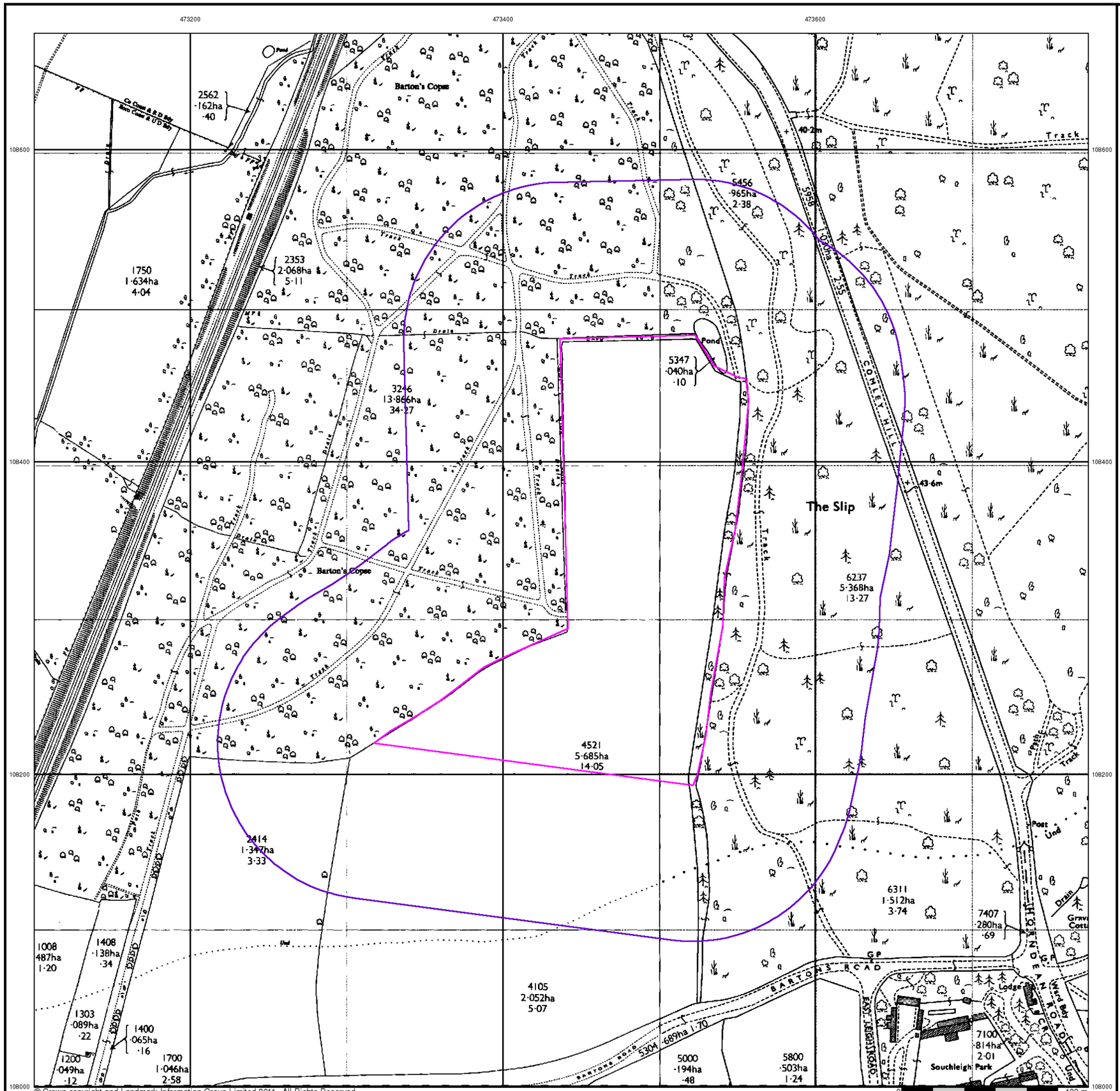

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Ordnance Survey Plan

Published 1970 - 1972

Source map scale - 1:2,500

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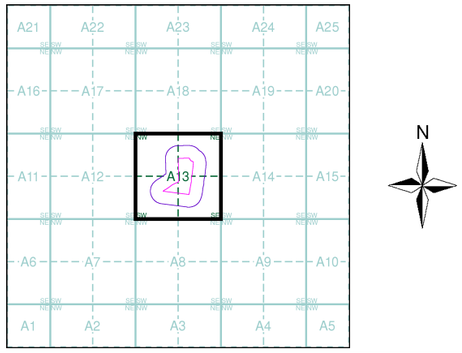
Map Name(s) and Date(s)

SU7308
1970
1:2,500

SU7307
1972
1:2,500

Historical Map - Segment A13



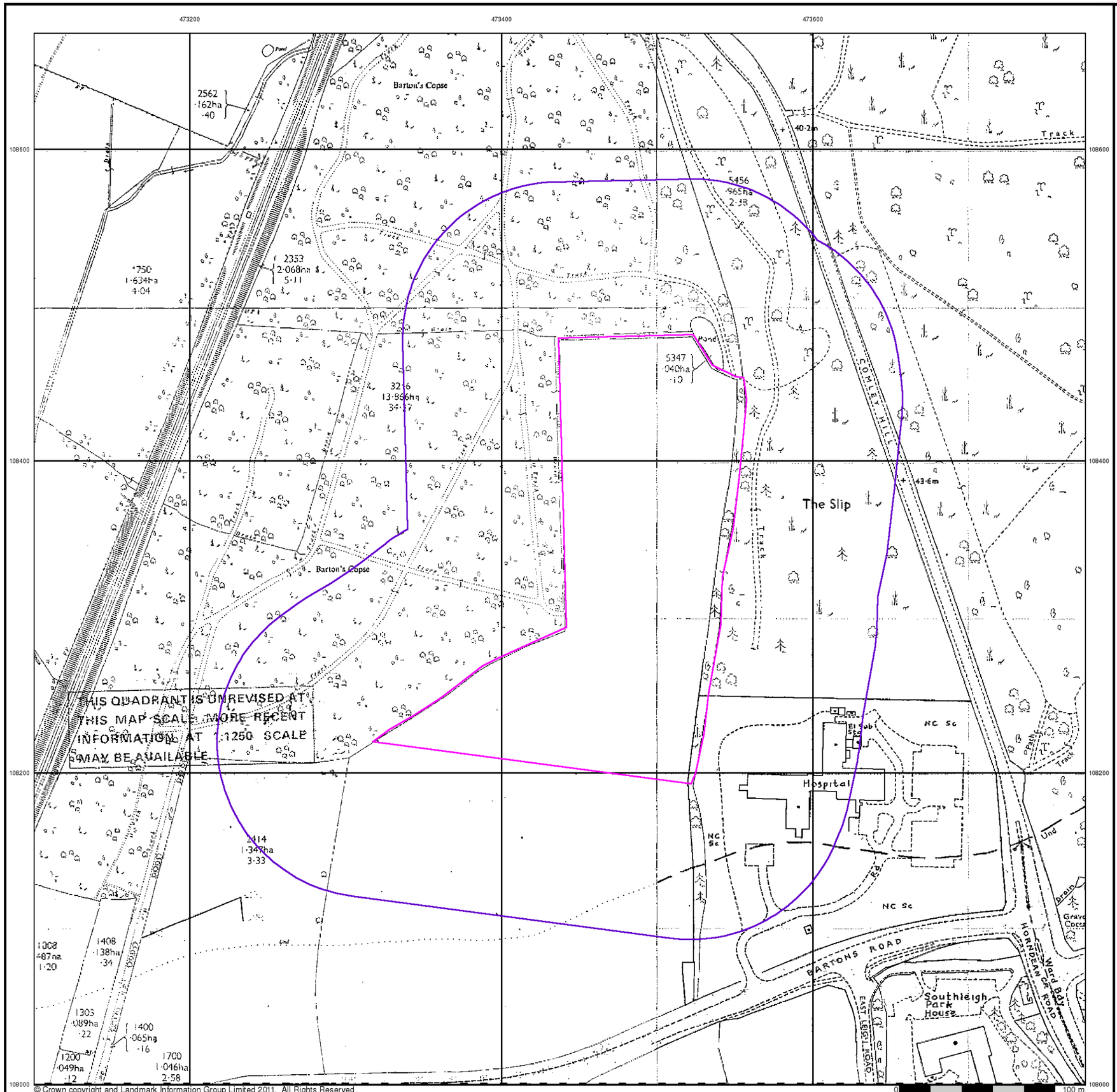
Order Details

Order Number:	34630544_1_1
Customer Ref:	22254-0001
National Grid Reference:	473450, 108330
Slice:	A
Site Area (Ha):	3.49
Search Buffer (m):	100

Site Details

Site at 473480, 108380

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


473200
473400
473600
108600
108400
108200
108000
Barton's Copse
Barton's Copse
2562
·162ha
·40
1750
1·634ha
4·04
2353
2·068ha
5·11
3216
13·886ha
34·57
5456
·965ha
2·38
5347
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·10
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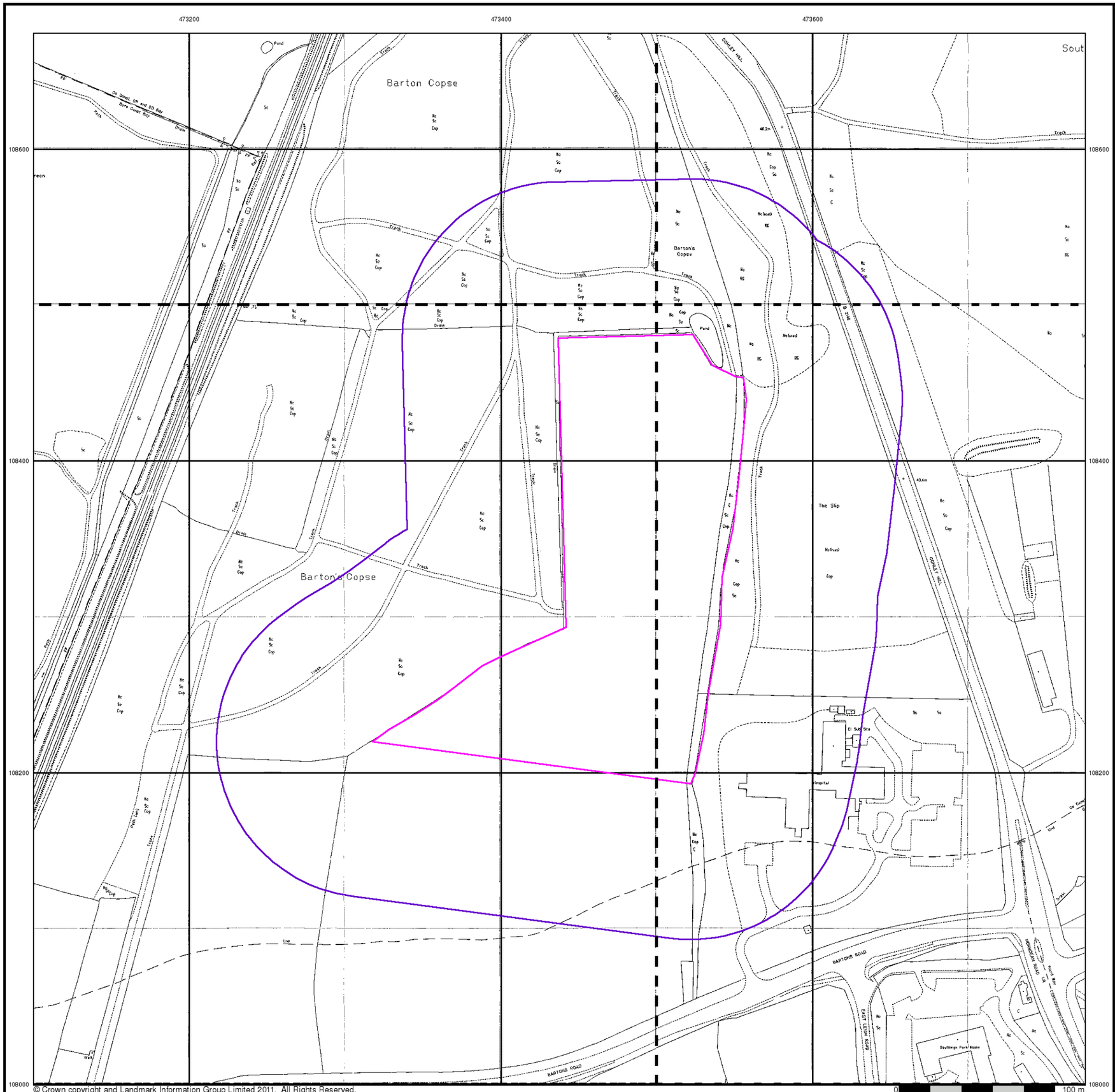

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WSP

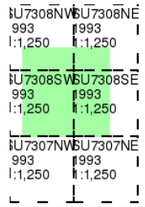
Large-Scale National Grid Data

Published 1993

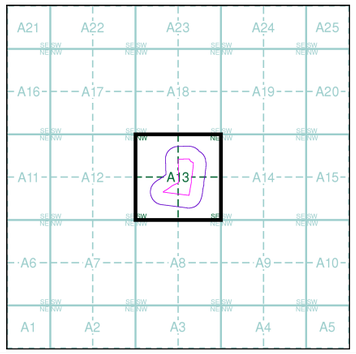
Source map scale - 1:1,250

'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)



Historical Map - Segment A13



Order Details

Order Number:	34630544_1_1
Customer Ref:	22254-0001
National Grid Reference:	473450, 108330
Slice:	A
Site Area (Ha):	3.49
Search Buffer (m):	100

Site Details

Site at 473480, 108380

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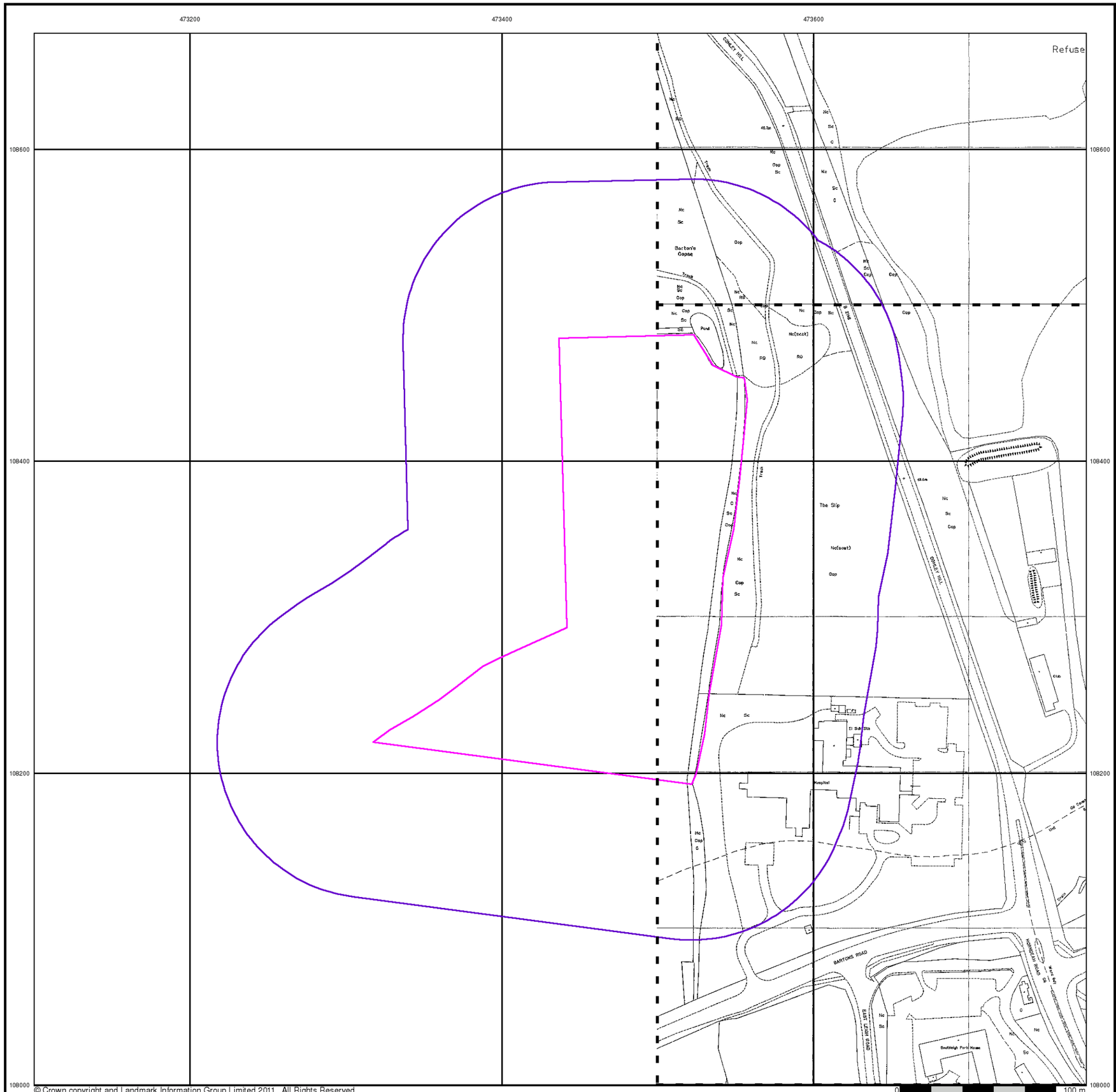

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WSP

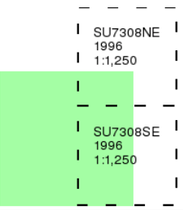
Large-Scale National Grid Data

Published 1996

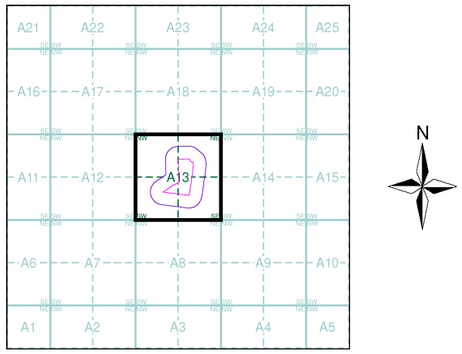
Source map scale - 1:1,250

'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)



Historical Map - Segment A13



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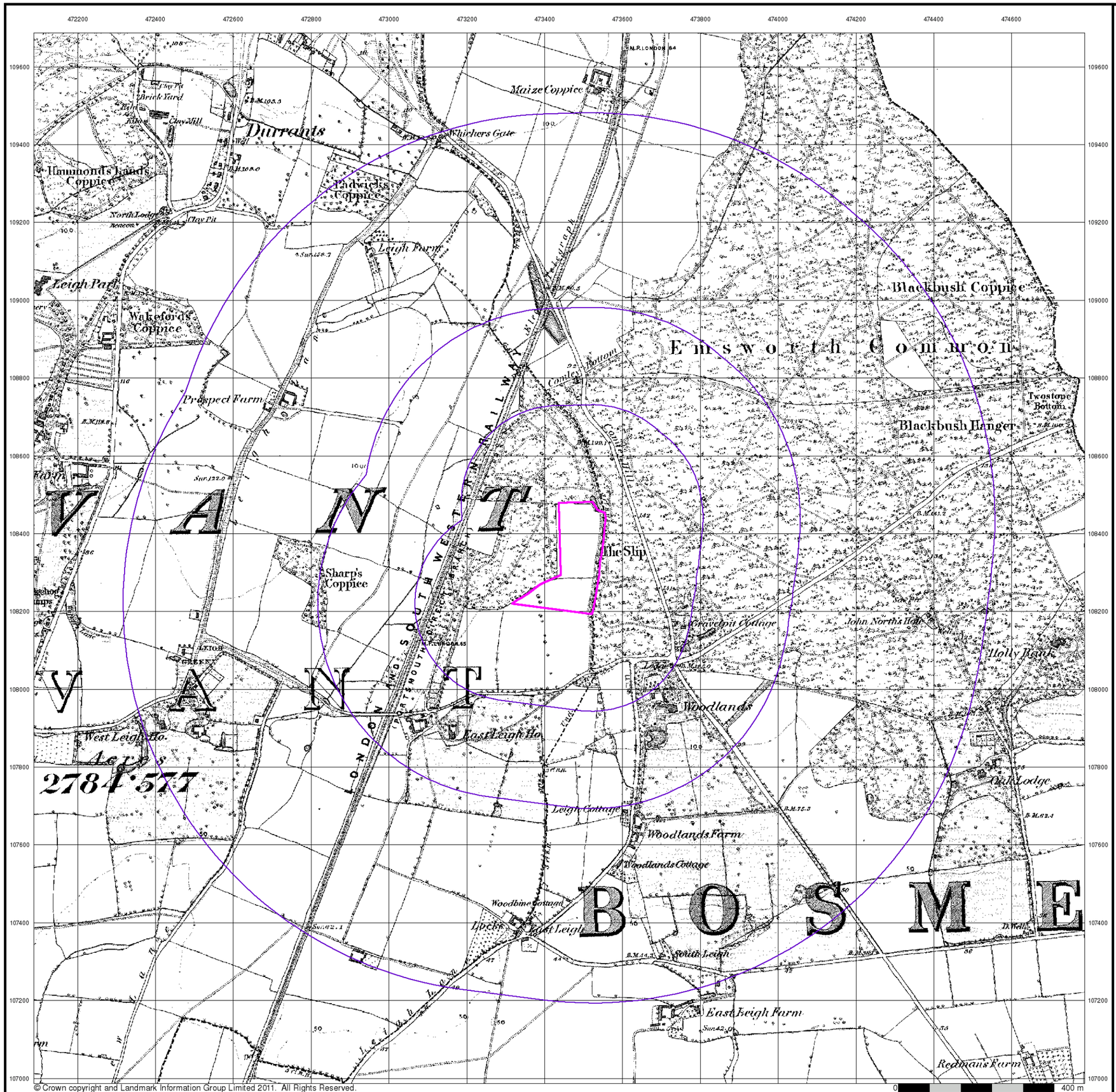

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WSP

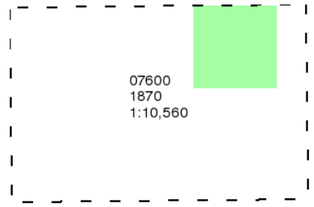
Hampshire & Isle Of Wight

Published 1870

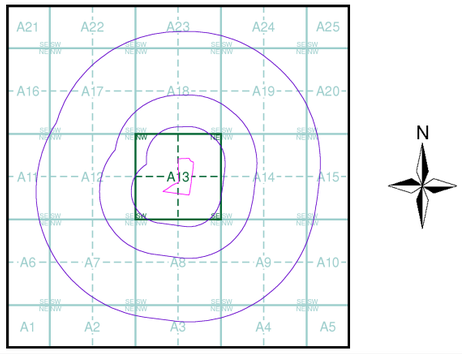
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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Slice:	A
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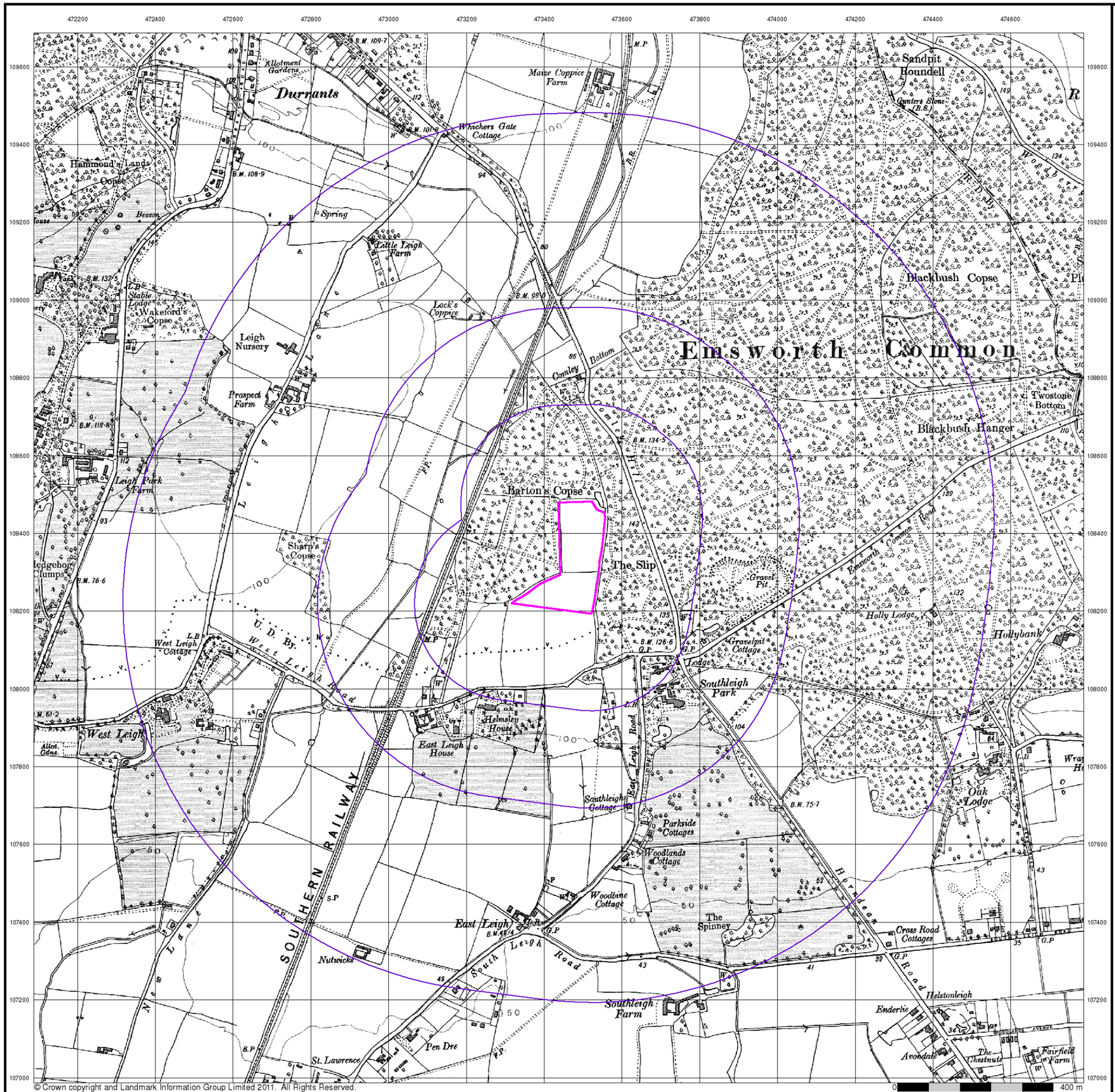

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WSP

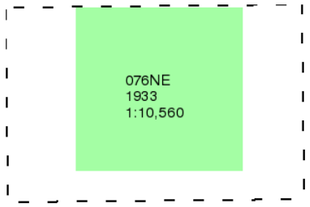
Hampshire & Isle Of Wight

Published 1933

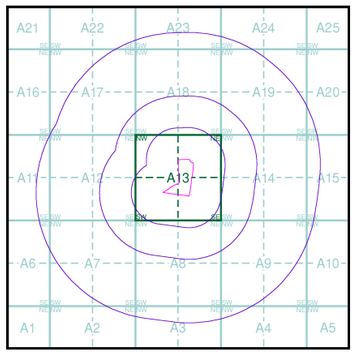
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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Customer Ref:	22254-0001
National Grid Reference:	473450, 108330
Slice:	A
Site Area (Ha):	3.49
Search Buffer (m):	1000

Site Details

Site at 473480, 108380

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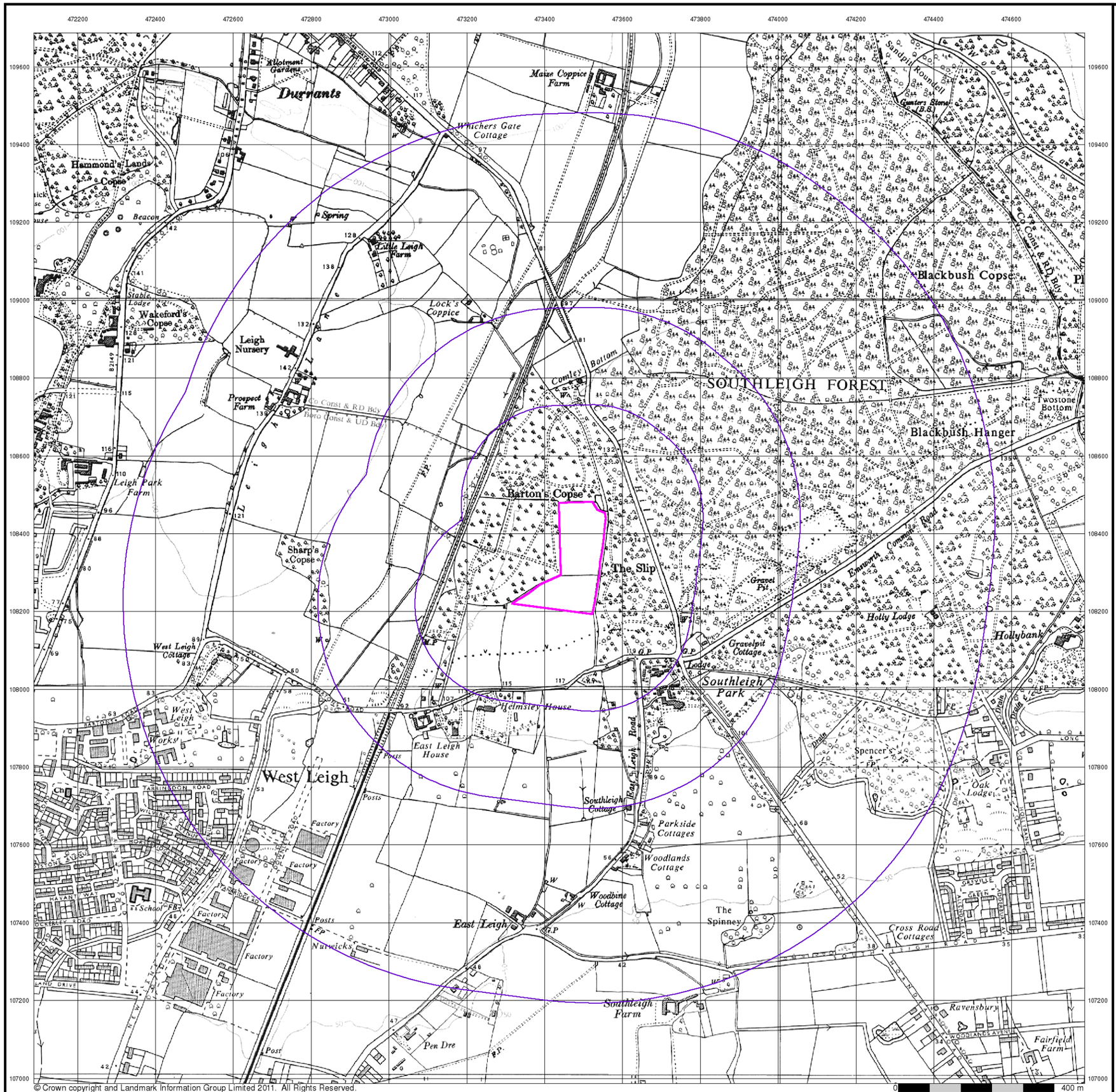

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WSP

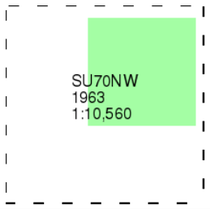
Ordnance Survey Plan

Published 1963

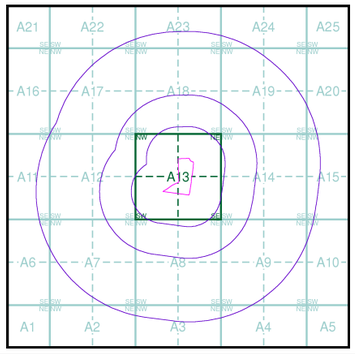
Source map scale - 1:10,000

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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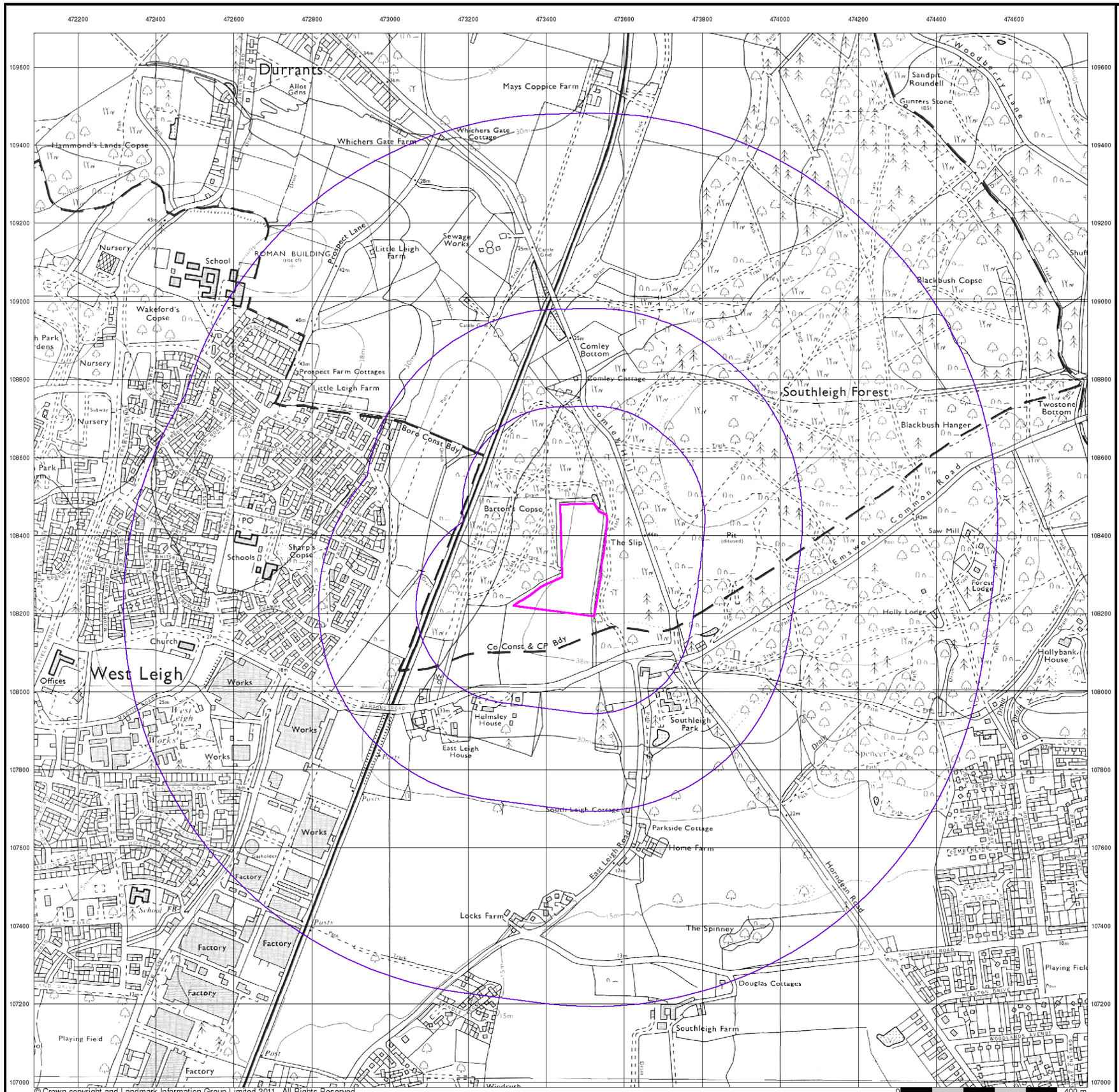

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WSP

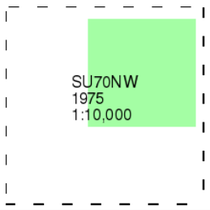
Ordnance Survey Plan

Published 1975

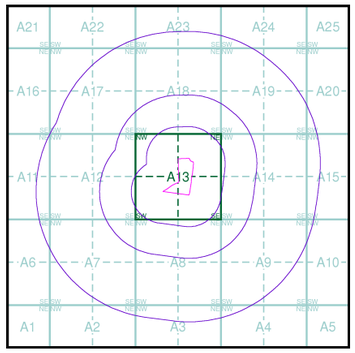
Source map scale - 1:10,000

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	34630544_1_1
Customer Ref:	22254-0001
National Grid Reference:	473450, 108330
Slice:	A
Site Area (Ha):	3.49
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Site Details

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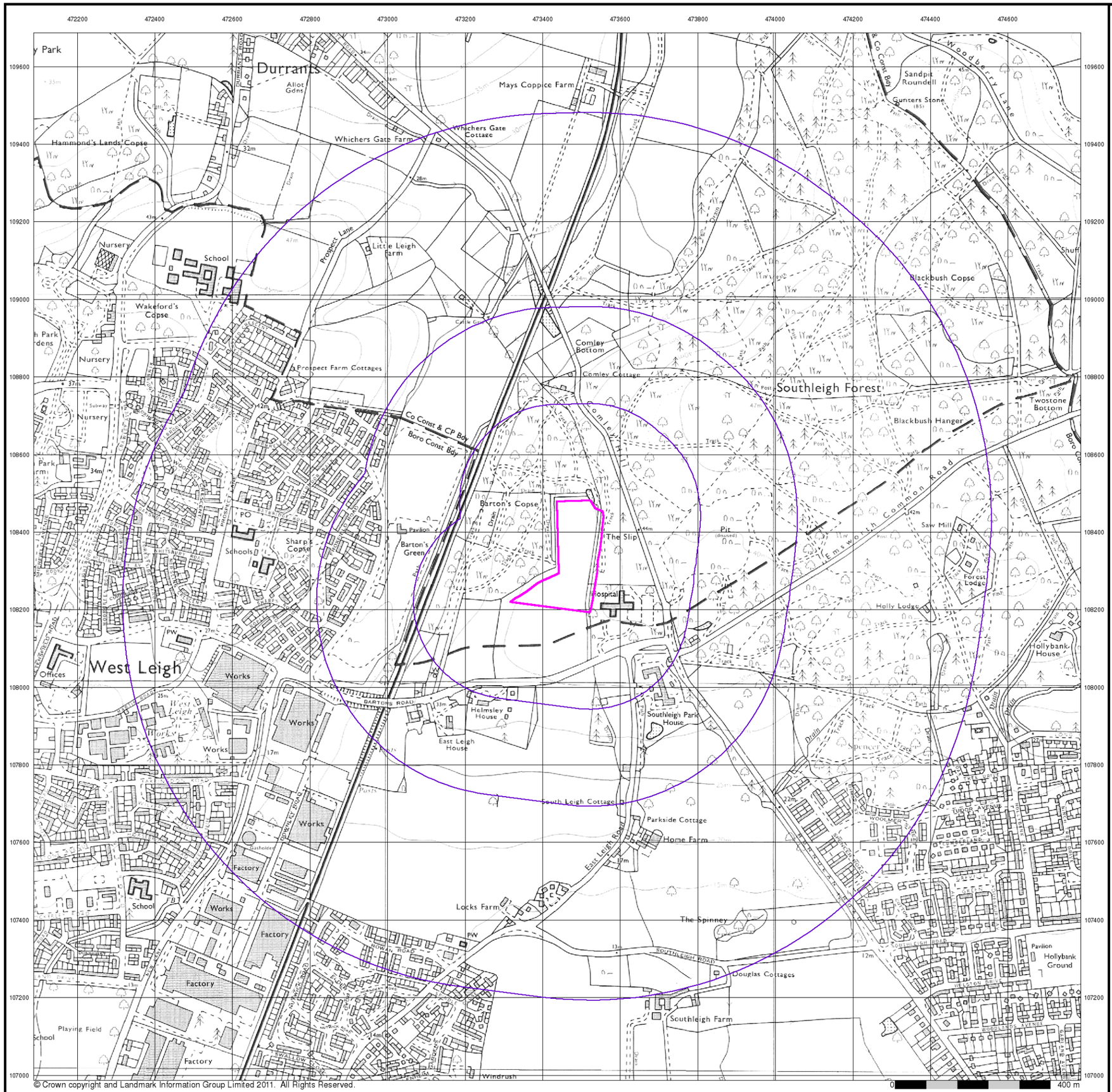

WSP

Ordnance Survey Plan

Published 1992

Source map scale - 1:10,000

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

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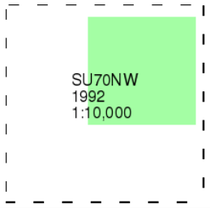
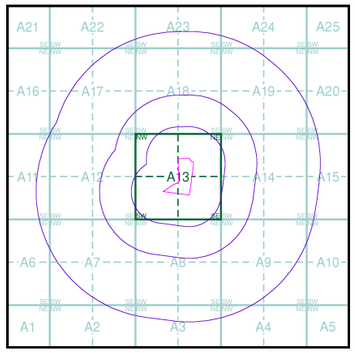


Historical Map - Slice A



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Slice:	A
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Site Details

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Web: www.envirocheck.co.uk



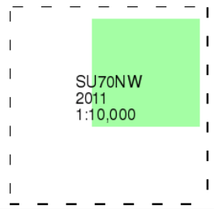
10k Raster Mapping

Published 2011

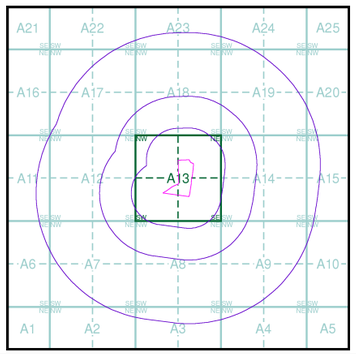
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A



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APPENDIX C BGS BOREHOLE LOGS

SU 70NW/154
7301 0792

SHEET No. 3 OF 3

CONTRACT No. 4394

BOREHOLE RECORD

British Geological Survey

CONTRACT HAVANT (BRIDGE 106)
BOREHOLE No. 4 Bartons Road
ORDNANCE DATUM LEVEL ca +26m
TYPE OF BORING SHELL AND AUGER
DIAMETER OF BORING 6"
REMARKS

DATE STARTED 28/8 FINISHED 29/8/69
OPERATOR D. ROBB
TYPE OF PENETRATION TEST C.P.T. & S.P.T.
WEIGHT 140LBS DROP 21'6"
STANDING WATER LEVEL 23'0"

Depth Feet	O.D. Level	Type & No. of Sample	Boring Details: Penetration	Lining	Water	Legend	Description of Material and Observations
		C.P.T.	36 FOR 12"				FILL, CLAY AND CHALK
		U4/8'0"-9'6"					FIRM BROWN/BLUE CLAY
		U4/13'0"-14'6"					
		U4/15'0"-16'6"					FIRM GREY CLAY
		U4/20'0"-21'6"					
		S.P.T	120 FOR 12"		S.W.L.		HARD BROWN CLAY WITH INSERTS OF GRAVEL.

0
Made
5'
2.1m.
10'
15'
LC
20'
25'
30'

Base at 36' (11.0m)

R.J.W.
20.10.83

Geo Testing Services Ltd

Sheet No 30. of 41.

SU 70 NW/182
7304 0834

Borehole Record

Contract ROWLANDS CASTLE
Borehole No 32.
Ordnance Datum Level 19.625m
Type of Boring SPA
Diameter of Boring 6"

Date started 29/9 Finished 29/9/70
Operator R.C.
Type of Penetration Test
Weight Drop
Standing Water Level 0.762 m

Depth Feet	O.D. Level	Type & No of Sample	Boring Details: Penetration	Lining	Water	Legend	Description
6"	19.473						TOP SOIL
1.32		D			SWL ENTRY		LARGE + MEDIUM COMPACT GRAVEL + FLINTS WITH SOFT BROWN SANDY CLAY.
5'-6"	17.949	D					
6'-0"	17.492	D					FIRM BROWN/GREY MOTTLED SANDY CLAY WITH MEDIUM GRAVEL + FLINTS.
2.133		BOREHOLE TERMINATED					

U. Undisturbed D. Disturbed W. Water

Cg

R.J.W. 19.10.83

British Geological Survey

o Testing Services Ltd

Sheet No 31 of 41

'SU 70 NW/183
7308 0843

Borehole Record

ntract ROWLANDS CASTLE
orehole No 33
rdnance Datum Level 20.225m
ype of Boring S+A
ameter of Boring 6"

Date started 29/9 Finished 29/9
Operator R.C.
Type of Penetration Test
Weight Drop
Standing Water Level 0.914m

Depth Feet	O.D. Level	Type & No of Sample	Boring Details: Penetration	Lining	Water	Legend	Description
6"	20.023						TOP SOIL
152		D			S.W.L. ENTRY		COMPACT LARGE + MEDIUM GRAVEL + FLINT PEBBLES WITH SOME COBBLES + SOFT BROWN SANDY CLAY.
5'0"	18.396	D					
829							STIFF BROWN SANDY CLAY WITH SOME FLINT + GRAVEL
6'0"	17.787	D					
2'4" 744	17.381	D					STIFF BROWN CLAY.
			BOREHOLE TERMINATED				

LC

R.J.W. 19.10.83

U. Undisturbed D. Disturbed W. Water

APPENDIX D SUPPORTING INFORMATION AND ASSESSMENT APPROACH

Regulatory Information Sources

Reference has been made to a Landmark Envirocheck Report. This includes information and data collated from several organisations, including the Environment Agency (EA), Department for Environment, Food & Rural Affairs (DEFRA), Health & Safety Executive (HSE), the National Radiological Protection Board (NRPB), and the British Geological Survey. A copy of this report can be made available on request.

Groundwater Classification Systems

In accordance with the Water Framework Directive, the Environment Agency's Groundwater Protection Policy designates aquifers with respect to their importance as a resource for drinking water supply as well as their influence(s) on surface water flows and wetland ecosystems. The designations are based on geological mapping provided by the British Geological Survey and divide the underlying superficial and bedrock strata of England and Wales into Principal Aquifers, Secondary Aquifers and Unproductive Strata.

Principal Aquifers are described as '…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 are subdivided into three types, described as follows:

- 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'; and,
- Secondary Undifferentiated: assigned where Secondary A or Secondary B classification has not been possible.

Unproductive Strata are described as '…deposits with low permeability that have negligible significance for water supply or river base flow'.

Source Protection Zones

Source Protection Zones (SPZ) have been established by the Environment Agency for the protection of groundwater used for potable water supplies. Source Protection Zones have been classified as follows:

- A Zone I (Inner Protection Zone) is defined by "a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50-metre radius". It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease.
- A Zone II (Outer Protection Zone) is defined by the 400-day travel time, or 25% of the source catchment area, whichever is larger. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.
- A Zone III (Total Catchment) is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

Environment Agency General Quality Assessment Scheme (GQA)

The Environment Agency measures the quality of Rivers within England and Wales at over 7,000 locations. The General Quality Assessment Scheme considers four broad categories for rivers including chemistry, biology, nutrients and aesthetics. The GQA describes quality in terms of chemical measurements which detect the most common types of pollution. It allocates one of six grades (A to F) to each stretch of river, using the same, strictly defined procedures. The grades are as follows:

A – Very Good B - Good C – Fairly Good D - Fair E – Poor F - Bad

The data collected by the Environment Agency is used to monitor the improvement or otherwise of watercourses over time.

Legislative context

Contaminated Land Regime: Part 2A of the Environmental Protection Act 1990

The Contaminated Land Regime in Part 2A of the Environmental Protection Act 1990 (Part 2A) was introduced specifically to address the historical legacy of land contamination. Part 2A includes a statutory definition of "contaminated land":

" 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".

The statutory guidance does not however provide any absolute measurable criteria. Determining whether any land is "contaminated land" is likely to involve local authorities making a judgement in each case based on an assessment of the risks. Part 2A aims to ensure the identification and

remediation of sites that, in the context of their current use, and the relevant circumstances of the land, pose "unacceptable risks" to human health or the wider environment.

The approach to "unacceptable risk" is based on the principles of risk assessment, including the concept of a contaminant, a pathway and a receptor, which if combined form a pollutant linkage. These and other key terms are defined in Part 2A and in statutory guidance set out in Annex 3 to DEFRA Circular 01/2006 (DEFRA 2006a).

Planning and Part 2A

Planning Policy Statement 23 is clear that the standard of remediation to be achieved through the grant of planning permission for new development, including permission for land remediation activities, is the removal of unacceptable risk and making the site suitable for its new use. *As a minimum, after carrying out the development and commencement of its use, the land should not be capable of being determined as contaminated land under Part 2A*.

DEFRA Circular 01/2006 (DEFRA 2006a)

Annex 3 to DEFRA Circular 01/2006 provides, in five Chapters, the detailed framework for Part 2A. The definition and identification of contaminated land are set out in Chapters A and B respectively.

The definition of contaminated land is based upon the principles of risk assessment. For the purposes of this guidance, "risk" is defined as the combination of:

(a) the probability, or frequency, of occurrence of a defined hazard (for example, exposure to a property of a substance with the potential to cause harm); and

(b) the magnitude (including the seriousness) of the consequences.

There are two steps in applying the definition of contaminated land. The first step is for the local authority to satisfy itself that a "contaminant", a "pathway" (or pathways), and a "receptor" have been identified with respect to that land.

A **contaminant** is a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters.

A **receptor** is either:

(a) a living organism, a group of living organisms, an ecological system or a piece of property which

(i) is in a category listed in DEFRA 2006a, Table A as a type of receptor (this includes Human Beings, specified ecological receptors and Property (see below)); and

(ii) is being, or could be, harmed, by a contaminant; or

(b) controlled waters which are being, or could be, polluted by a contaminant; or

(c) any person who is, or could be, subject to lasting exposure so far as attributable to radioactivity.

A **pathway** is one or more routes or means by, or through, which a receptor:

(a) is being exposed to, or affected by, a contaminant, or

(b) could be so exposed or affected.

The identification of each of these three elements is linked to the identification of the others. A pathway can only be identified if it is capable of exposing an identified receptor to an identified contaminant. That particular contaminant should likewise be capable of harming, or, in the case of controlled waters, be capable of polluting that particular receptor.

The second step in applying the definition of contaminated land is for the local authority to satisfy itself that both:

(a) such a pollutant linkage exists in respect of a piece of land; and

(b) that pollutant linkage:

(i) is resulting in significant harm being caused to the receptor in the pollutant linkage,

(ii) presents a significant possibility of significant harm being caused to that receptor,

(iii) is resulting in the pollution of the controlled waters which constitute the receptor,

(iv) is likely to result in such pollution,

(v) is resulting in harm so far as attributable to radioactivity being caused to any person in the pollutant linkage, or

(vi) presents a significant possibility of harm so far as attributable to radioactivity being caused to any person in the pollutant linkage.

Section 78A(4) defines "harm" as meaning "harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property". Section 78A(5) provide that what harm is to be regarded as "significant" and whether the possibility of significant harm being caused is significant shall be determined in accordance with this guidance.

The local authority should regard as significant only harm which is both:

(a) to a receptor of a type listed in DEFRA 2006a, Table A as a type of receptor (this includes Human Beings and Property), and

(b) within the description of harm including death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions (as detailed in Table A).

The authority should disregard any receptors which are not likely to be present, given the "current use" of the land or other land which might be affected. For the purposes of this guidance, the "current use" means any use which is currently being made, or is likely to be made, of the land and which is consistent with any existing planning permission (or is otherwise lawful under town and country planning legislation).

This definition is subject to the following qualifications:

(a) the current use should be taken to include any temporary use, permitted under town and country planning legislation, to which the land is, or is likely to be, put from time to time;

(b) the current use includes future uses or developments which do not require a new, or amended, grant of planning permission;

(c) the current use should, nevertheless, be taken to include any likely informal recreational use of the land, whether authorised by the owners or occupiers or not, (for example, children playing on the land); however, in assessing the likelihood of any such informal use, the local authority should give due attention to measures taken to prevent or restrict access to the land; and

(d) in the case of agricultural land, however, 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.

The guidance on determining whether a particular possibility is significant is based on the principles of risk assessment, and in particular on considerations of the magnitude or consequences of the different types of significant harm caused. The term "possibility of significant harm being caused" should be taken as referring to a measure of the probability, or frequency, of the occurrence of circumstances which would lead to significant harm being caused.

The local authority should take into account the following factors in deciding whether the possibility of significant harm being caused is significant:

(a) the nature and degree of harm;

(b) the susceptibility of the receptors to which the harm might be caused; and

(c) the timescale within which the harm might occur.

In considering the timescale, the authority should take into account any evidence that the current use of the land will cease in the foreseeable future.

Ecological Receptors

Ecological receptors are limited to any ecological system, or living organism forming part of such a system, within a location which is:

- an area notified as an area of special scientific interest under section 28 of the Wildlife and Countryside Act 1981;
- any land declared a national nature reserve under section 35 of that Act;
- any area designated as a marine nature reserve under section 36 of that Act;
- an area of special protection for birds, established under section 3 of that Act;
- any European Site within the meaning of regulation 10 of the Conservation (Natural Habitats etc) Regulations 1994 (i.e. Special Areas of Conservation and Special Protection Areas);
- any candidate Special Areas of Conservation or potential Special Protection Areas given equivalent protection;
- 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, potential Special Protection Areas and listed Ramsar sites); or
- any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949.

Property as a Receptor

The following are considered potential receptors under statutory guidance:

- 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.
- 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.

The migration of contaminants onto third party land may not necessarily cause 'harm' to the listed receptors but may still represent a potential liability.

Tiered Assessment Approach

The approach to risk assessment with respect to risks to human health from contaminated land in the UK is set out in the publication *Guidelines for Environmental Risk Assessment and Management* (DETR 2000). This sets out a tiered approach:

- Tier 1: Risk screening (e.g. establishing potential pollutant linkages) (Preliminary Risk Assessment);
- Tier 2: Generic Quantitative Risk Assessment (GQRA) (e.g. the comparison of contaminant concentrations against Soil Guideline Values); and
- Tier 3: Detailed Quantitative Risk Assessment (DQRA) (e.g. the comparison of contaminant concentrations against site specific assessment criteria).

This report includes a Tier 1 Screening Exercise (Preliminary Risk Assessment)

Risk Assessment Approach

With respect to contaminated land, within this report, CIRIA C552 has been used to provide an estimate as to the potential severity of risk associated with any potential pollutant linkages identified. The following tables have been reproduced from CIRIA C552 and have been used within the risk assessment in this report.

Table 6.3 Classification of consequence

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part 11A. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.) Easily reparable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

Table 6.4 Classification of probability

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

Classification	Definition
Unlikely	There is pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term.