



Phase I Geo-Environmental Desk Study

Saltbox

Shripney Road
Bognor Regis
PO22 9NW

Prepared for:

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SALTBOX, BOGNOR REGIS

NON TECHNICAL CLIENT SUMMARY

This report presents the findings of a Phase I Geo-Environmental Desk Study which was carried out to identify potential contamination from previous or current uses of the site and surrounding area and to provide an initial assessment of geological and geotechnical aspects of the site and how the proposed development or surrounding environment might be affected.

- The study area comprises an open, undeveloped field, which is currently used as arable farmland. This land use has remained largely consistent throughout the recorded history, although a small barn was formerly present towards the centre of the southern boundary, which was demolished sometime in the late 1950's.
- Despite limited former use, the site is situated in a relatively sensitive setting, with nearby drainage channels marking the northern and eastern boundaries, and River Terrace Deposits (sand, silt and clay) overlying the Lewes Nodular Chalk beneath, both of which are considered to have notable potential as a groundwater resource.
- The site lies within flood zone 3, which is the area defined as having a high risk of flooding and on this basis, a flood risk assessment is likely to be required in order to fulfil the planning requirements.
- Although it is recognised that a limited area of Made Ground (infill) material may remain due to the demolition of the former barn. It is considered that this will only be of any significance, if present within areas of future soft landscaping; which are uncommon within current commercial development proposals. However, to ensure future site users are not exposed to this material, a few precautionary control measures have been recommended, including removal of any Made Ground (if encountered) within future soft landscaped areas, with subsequent assessment to identify the most appropriate method of disposal or reuse.
- A copy of this report should be forwarded to Arun District Council for inclusion into their land quality records and to support/for consideration alongside any future planning application.

By their very nature, the above bullet points represent a simplified summary of our work and should not be relied upon to form the basis for key decisions for the proposed development. A full picture is provided in the following report, or alternatively give us a call and we'll talk you through it.



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The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' in house quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.



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1 INTRODUCTION

In May 2017, Environmental Protection Strategies Ltd (EPS) was commissioned by Mr. David Langmead to complete a Phase I Geo-Environmental Desk Study for Saltbox, Bognor Regis ('the site'); see Figure 1.

The work was commissioned in order to fulfil pre-planning requirements for a commercial development comprising a number of trade and retail units.

This report presents the findings, conclusions, and recommendations of the Phase I Desk Study undertaken for the site as instructed.

1.1 Background

A Desk Study comprises the first stage of any geo-environmental assessment, the purpose of which is to determine what potentially contaminative activities may have occurred at the property or the surrounding area which may pose an environmental or geological risk to site users, the surrounding environment or proposed development, either at present or in the future.

The method used in this investigation to assess the environmental risk posed is based on the concept of 'contaminant linkage', which considers the following three factors:

Source	The location from which an environmentally hazardous / contaminative substance is, (or was,) derived.
Receptor	An environmentally sensitive object or condition e.g. person, property, controlled water, or ecological system, which may be present now or in future.
Pathway	A route or mechanism via which a source could come into contact with a receptor to cause significant harm.

If all three factors are identified, there is the potential for a 'contaminant linkage' to be active, which could result in significant harm being caused to the environment or human health.

1.2 Objectives

The purpose of this desk study is to evaluate the potential contaminant linkages which may be active at the site in its current condition, or could become active in future, and to determine if any action is required to investigate them further or to break them.

This is achieved by carrying out the following activities:

- Examining the site history - late 1800s to present day, through collection of historical maps of the area, site records, records held by relevant local authorities, the Environment Agency and review of other information databases.
- Characterising the site's environmental and geological sensitivity through examination of existing geological, hydrogeological, topographical, and historical maps and aerial photographs of the area.
- Identifying Potential Areas of Concern (PAOCs) through a combination of historical map and data review.



- d) Consideration of any future plans for the site and the effects any proposed changes may have on contaminant linkages over time.
- e) Development of a site conceptual model and contaminant linkage assessment.

1.3 Project Limitations and Constraints

The purpose of this report is to present the findings of a Phase I Geo-Environmental Desk Study conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, EPS makes the following statements:

This report does not include specific investigation for the presence of either Potential Asbestos Containing Material (PACM) or Japanese Knotweed at the subject site however, if obvious evidence of either is observed during EPS site walkover, details will be provided in this report. Specialist contractors should be commissioned to make detailed assessments and recommendations if these materials are suspected.

2 GEO-ENVIRONMENTAL SETTING

The following section provides a summary of the information collected in relation to the site location and history. All distances referenced within Section 2 are taken from the centre of the study area, unless stated otherwise.

2.1 Site Location and Description

Detail	Description
Location	The site is located on the southern outskirts of Shripney, a small village situated around 2.5km north east of Bognor Regis town centre.
National Grid Reference	493810, 101630
Topography	Topographic elevation is approximately 1-2m Above Ordnance Datum (AOD) with levels sloping gently towards the south west.
Site Description	The area currently comprises a roughly rectangular parcel of land that is slightly wider towards its southern boundary and is used as an arable field. The area is accessed off Shripney Road via a formal gateway, present towards the centre of the eastern boundary. No formal structures are noted within the site limits, which are all marked with low level shrubs or hedgerows.
Surrounding Land Use	The site is located within an area of fairly limited development, with the majority of surrounding land also used for agricultural purposes. However, a caravan site is situated to the south, with a series of residential dwellings present adjacent to its north eastern corner, along Shripney Road, which runs parallel to the eastern boundary. A notable commercial estate is located around 450m south and south east and comprises a series of large standalone units.

A plan showing the site location is provided as Figure 1, the current site layout is detailed on Figure 2 and an aerial photograph is included as Figure 3. A proposed development plan as Appendix A and relevant extracts of the Envirocheck report are included as Appendix B.

2.2 Environmental Setting

Detail	Description
Geology	Geological maps of the area indicate the ground conditions to comprise River Terrace Deposits (comprising clay, silt and sand) overlying the Lewes Nodular Chalk Formation. Information on the site's geological context is included as Appendix C.
British Geological Survey (BGS)	A historic borehole log was acquired from the British Geological Survey (BGS) for a location roughly 275m south east and reports a notable layer of reworked ground overlying River Terrace Deposits (comprising clayey gravelly sand to 2.8m) overlying chalk bedrock, present to beyond the full extent of the borehole to 4.0m below ground level (bgl). Groundwater was not encountered throughout the drilling process. A copy of the historic borehole log is also included in Appendix C.
Geological Hazards	Hazard
	Mining
	Collapsible Ground
	Compressible Ground
	Ground Dissolution
	Running Sand
	Landslide
	Shrinking / Swelling Clay
	On Site Risk
	No Hazard
	Low
	No Hazard
	Very Low
	Low
	Very Low
	Low
Radon	Based on the British Geological Survey, National Geoscience Information Service, the property is in a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level) and no radon protective measures are necessary in the construction of new dwellings or extensions.
Hydrogeology	Groundwater vulnerability maps for the area show that the underlying superficial geology is classified as a Secondary Aquifer with the Lewes Nodular Chalk Formation classified as a Principal Aquifer. The site does not lie within a Source Protection Zone (SPZ) for groundwater abstraction. Groundwater vulnerability maps are included in this report as Appendix D. No groundwater abstractions are highlighted within 1km.

Detail	Description		
Hydrology	The nearest surface water feature is a drainage channel which runs along the northern and western boundaries of the study area. Further ditches are networked to the east, west and south respectively, the majority of which join a more significant stream around 1.2m south east, which flows in a generally southerly direction.		
	Review of the Environment Agency (EA) flood zone map for the area indicates that the site lies within flood zone 3, which is the area defined as having a high risk of flooding within Table 1 of technical guidance to the National Planning Policy Framework (NPPF). It should be noted that the EA maps do not take into account the presence of flood defences or flooding from other potential sources of floodwater, such as from poor drainage, or groundwater. On this basis, a flood risk assessment is likely to be required in order to fulfil the planning requirements. A copy of relevant flood risk mapping is also provided within Appendix D.		
	The EA database lists two surface water abstraction points within 1km, the most pertinent of which is utilised by a local farm holding for spray irrigation purposes around 475m south.		
	There are thirteen discharge consents recorded within 500m. The closest record comprises discharge of other matter (surface water) produced by a caravan site and released to a local watercourse around 320m south, but was revoked in the late 1990's.		
Landfill & Waste	The EA public database lists a single historic landfill approximately 880m south east. The site was operational between December 1970 and June 1981 by LEC Refrigeration and received inert and industrial waste, including liquid sludge.		
	Ten areas of potentially infilled land are also highlighted in the surrounding area within the Envirocheck report, the nearest of which is positioned 290m east. However, all of these areas are noted to be water filled.		
Industrial Land Use	The Envirocheck report lists a number of industrial land uses in the area the most pertinent of which are summarised below.		
	Land Use	Approximate Distance (Direction)	Status
	F & G Transport (Road Haulage Services)	475m (SE)	Inactive
	Kwik Fit (Tyre Dealers)	475m (SE)	Active
	Paul Rutting Land Rovers (Car Dealers)	475m (SE)	Active
	Southern Cross Garage (Garage Services)	475m (SE)	Active
	Tesco Bognor (Petrol Filling Station)	500m (SE)	Active

Detail	Description
Pollution Incidents	One pollution incident to controlled waters is reported nearby (355m north) and involved leaking heating oil from a storage tank, recorded to have had a minor impact on a drainage ditch in February 1996.
Sensitive Land Use	The site lies within a Nitrate Vulnerable Zone where surface water is identified as being at risk from nitrates leaching from agricultural land.

2.3 Site History

A summary of historical map data from 1876 to 2017 is provided below and copies of relevant historic maps and any others examined during the investigation are included in this report as Appendix E.

- During the late 1800s the vast majority of the site appeared as an open, undeveloped field, anticipated to be used as arable farmland due to the presence of a small outbuilding labelled 'Lower Barn' present towards the centre of the southern boundary. At this time, several footpaths and a track were also noted to intersect the land and to provide access to the barn off Shripney Road respectively. The footprint of this barn remained consistent until sometime around the mid to late 1950's when it was removed, with no temporary or permanent structures noted within the property boundary since. A pond was noted towards the south western corner of the site, which is anticipated to be a section of a widened ditch, which has been maintained to present day.
- In the immediate surroundings, a single residential property was noted adjacent to the eastern boundary within initial records, however this was no longer shown post the early 1930's. Within a similar period, and throughout the mid 1900's, small pockets of land were adopted for residential use, particularly focused to the north / north east. Furthermore, a medium sized caravan site was developed adjacent to the south by the early 1970's.
- Commercial land use was largely not identified within the map series, with the notable exception of 'Southern Cross Industrial Estate' which was initially established in the late 1970's, around 450m south. This area expanded over the next 30 years, and is now the focus of the majority of nearby industrial land uses highlighted in section 2.2 above. A railway line has also been illustrated throughout the entire map series, positioned around 825m east at its closest proximity.
- Two small ponds were also recognised within initial maps, located around 205m south and 290m south east of the nearest boundary. These were anticipated to have been infilled by early 1900's and are not highlighted as areas of potentially infilled land (non-water) with Envirocheck data report.

3 ENVIRONMENTAL CONCEPTUAL MODEL

The following section provides a review of the contaminant linkages that may be active at the site through the process of a Preliminary Risk Assessment, whereby EPS have examined the potential sources that may be present as a result of historic and / or current site activities and where potential interaction between these sources and the identified human / environmental receptors may occur.

3.1 Source Characterisation

The following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current & Historic Site Use	Localised in-fill material of unknown origin (Made Ground) used to level areas beneath existing / historic buildings and hardstanding.	PAH, Metals, ACM
Current and Historic Surrounding Land Use	Presence of a number of commercial properties in the surrounding area including a road haulier, tyre and car dealers, garages and a Petrol Filling Station, the majority of which are focused within 'Southern Cross Industrial Estate', starting around 450m south / south east of the centre of the site.	TPH, PAH, VOC, Metals, ACM
	Railway line to the east.	TPH, PAH, Metals, ACM
	A number of small ponds around 200-300m from the boundary.	Ground Gas (CH ₄ , CO ₂)

Notes: PAH Polycyclic Aromatic Hydrocarbons ACM Asbestos Containing Materials
TPH Total Petroleum Hydrocarbons VOC Volatile Organic Compounds
CH₄ Methane CO₂ Carbon Dioxide

3.2 Potential Receptors

A framework for the assessment of risks arising from the presence of contamination in soils has been produced by the Environment Agency and the Department for the Environment, Food and Rural Affairs (DEFRA) and is presented with the report: 'Using Science to Create A Better Place: Updated Technical Background to the CLEA Model – Science Report SC050021/SR3'. This guidance document defines a series of standard land-uses, which form a basis for the development of an Environmental Conceptual Model.

The proposed development plan for the site includes a commercial development comprising a number of trade and retail units. This proposed future land use, as defined within Science Report SC050021/SR3, has been considered as:

- Commercial

In view of the environmental setting, current and potential future land use of the site and surrounding sites, the potential receptors for any contaminant impact are discussed below:

Receptor	Site Specific Description
Human	Future site users, site workers involved in the site redevelopment, and those working and living in the surrounding area have the potential to be at risk from exposure to potential contaminants of concern (CoCs).
Groundwater	The underlying geology comprises Lewes Nodular Chalk, which is classified by the EA as Principal Aquifer although the historic borehole log does not indicate that shallow groundwater is likely to be present. Whilst the site does not lie within a SPZ for nearby groundwater abstraction, the underlying geology is an important groundwater resource and therefore groundwater should be considered as a potential receptor to site derived contaminants.
Surface Water	A number of surface watercourses are present within the surrounding area including a series of drainage channels located adjacent to the northern and western property boundaries. It is possible that site derived contaminants of concern may enter these watercourses by overland flow, migration through unsaturated soils or entering shallow surface drainage / historical land drainage which discharges to these drains, therefore surface waters must also be considered as a sensitive receptor within the conceptual site model.
Flora and Fauna	The proposed development includes the provision of some landscaped areas. Some of the identified contaminants of concern are known to be phytotoxic and as such, the potential for this impact should be considered.
Buildings & Infrastructure	Subsurface structures are likely to be present at the site which may be adversely affected by the potential presence of the identified contaminants of concern. These include concrete used in building foundations, buried potable water supply pipes and other service lines and pipes.
Adjacent Land	Given the limited mobility of the site-derived contaminants of concern, adjacent properties including private residential dwellings are not considered to be at risk from potential contaminants.

3.3 Potential Pathways

Where contaminants may be present in soil, there are a number of potential pathways that enable human receptors to come into contact with or be exposed to them. The most direct pathways, considered under current UK legislation, can be summarised as follows:

- Direct ingestion of contaminated soil
- Ingestion of household dust
- Ingestion of contaminated vegetables
- Ingestion of soil attached to vegetables
- Dermal contact with contaminated soil
- Dermal contact with household dust
- Inhalation of fugitive soil dust
- Inhalation of fugitive household dust
- Inhalation of vapours outdoors
- Inhalation of vapours indoors

Clearly, not all of these potential pathways apply for every standard land-use; the simplest example for exclusions being a commercial / industrial site which is covered by concrete hardstanding. The concrete precludes the direct exposure of humans working at the site to any contaminated soils.

However, in addition to direct exposure pathways, a number of physical transport mechanisms / pathways may also exist at a site that allow remote or less accessible contaminants in soil or groundwater to reach human or environmental receptors both at a site and beyond the site boundary. These include the following:

- Downward and lateral movement of contaminants in soil either by gravity or through being 'leached' by percolating rainwater.
- Lateral migration of contaminants dissolved in groundwater.
- Direct seepage or leaching of contaminants from soil into subsurface drains or supply pipework.
- Volatilisation of contaminants from groundwater or unsaturated soils into buildings or outdoor air.

Through examination of the standard land use and environmental setting at each site, the presence of pathways and transport mechanisms described above must be considered when assessing whether a contaminant linkage may plausibly be active, and therefore be included in the conceptual site model.

3.4 Summary of Contaminant Linkages

Considering the site use and environmental setting, and the proposed land use; the plausible contaminant linkages that require further investigation are summarised in the following table:

Source	Pathway	Receptor
Contaminated soil	Direct contact and inadvertent ingestion by eating or smoking with dirty hands	Construction workers during redevelopment & site users
	Inhalation of fugitive dusts	Site users

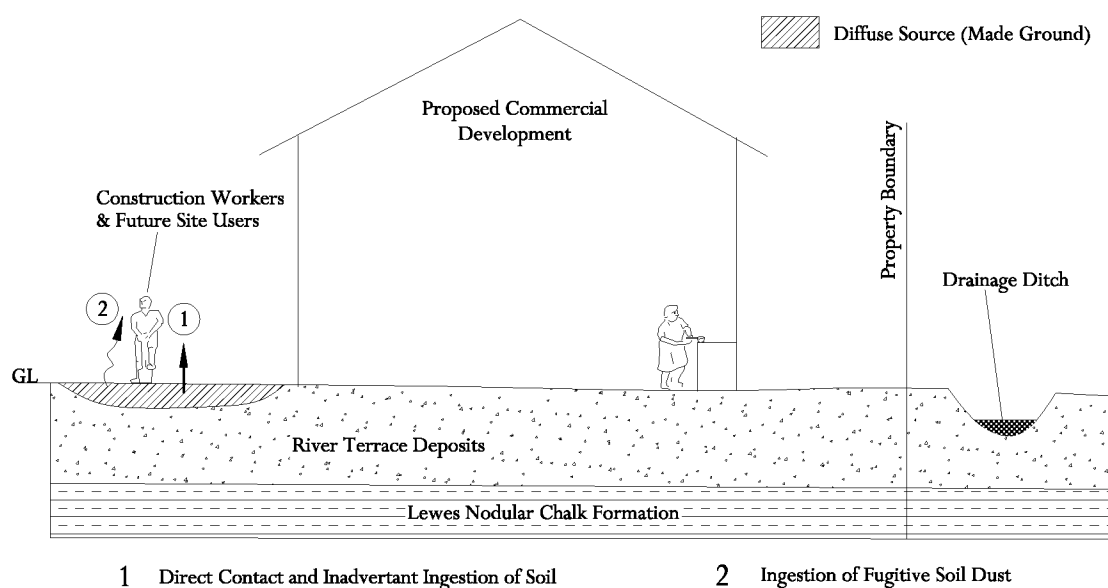
The following comments are made with respect to contaminant linkages which have been considered through development of the conceptual model, but have not been concluded as 'plausible' – i.e. through which a significant possibility of significant harm could occur to an identified receptor:

- PAHs and metals have been identified as contaminants of concern associated with the historic onsite infill, however these contaminants are considered to be relatively immobile in the environment by virtue of their very low solubility and volatility. On this basis, plausible pathways by which these potential contaminants could pose a significant risk to the underlying groundwater or nearby surface watercourses are not considered to be active.

- A number of commercial and industrial sites are located in the surrounding area, however these are all located down hydrological gradient of the site (focused towards the 'Southern Cross Industrial Estate') and therefore risks are not considered to be present associated with the on-site migration of organic compounds in groundwater.
- Contaminants of concern may be associated with the local railway line, located to the east of the site. However, given the distance of this feature from the site, and as no goods / storage yards or sidings have been present close to the site, a plausible contaminant linkage has not been identified associated with this source.
- Given the likely shallow nature of impacts to surface soils, no site derived contaminants of concern have been identified at the site which could pose a significant risk to the foundations of any on-site or adjacent buildings / infrastructure.
- Whilst a number of small ponds have been historically in-filled within the surrounding area, given the size, age, (and therefore likely nature of fill material) and distance >200m of these features from the site, a plausible contaminant linkage is not recognised from the on-site migration of ground gas.

The following diagram provides an illustration of the plausible contaminant linkages that may be active at the site and which may need further investigation or control to ensure safe development:

Saltbox, Bognor Regis – Illustrative Conceptual Site Model



4 GEOTECHNICAL GROUND MODEL

Geological records indicate the ground conditions to comprise River Terrace Deposits overlying Lewes Nodular Chalk Formation. A conceptual geotechnical ground model is provided in the table below which assesses design elements, anticipated strata and ground conditions:

Element	Anticipated Strata	Parameter(s)	Anticipated Conditions
Foundations	River Terrace Deposits	Allowable Bearing Pressure	75kN/m ² to 150kN/ m ²
		Settlement	Low sensitivity
		Volume Change	Low/No volume change potential
	Lewes Nodular Chalk Formation	Allowable Bearing Pressure	100kN/m ² to 150kN/m ²
		Settlement	Low risk
		Volume Change	Low/No volume change potential
Drainage	River Terrace Deposits	Permeability	May be suitable depending on depth to groundwater
	Lewes Nodular Chalk Formation		
Concrete Grade	River Terrace Deposits	Grade	Low risk of high sulphate levels
	Lewes Nodular Chalk Formation		



5 CONCLUSIONS & RECOMMENDATIONS

This Phase I Desk Study has identified that a limited number of plausible contaminant linkages have the potential to become active as a result of presence of a former barn towards the centre of the southern boundary, which was demolished in the late 1950s.

Therefore, the contaminant linkages which carry the greatest potential risks at this site comprise the following:

- Human health risks associated with interaction between future site users and potentially contaminated shallow soils, particularly in the location of the former building.
- Potential exposure of site workers to contaminated soils during the proposed redevelopment.

In accordance with the Model Procedures for Management of Land Contamination (*Contaminated Land Report 11*) the risks identified by this work will not require further assessment providing adequate control measures can be implemented. A summary of the approach outlined in CLR11, marking the work already completed under the risk assessment phase, is presented as a flow diagram in Figure 4 of this report.

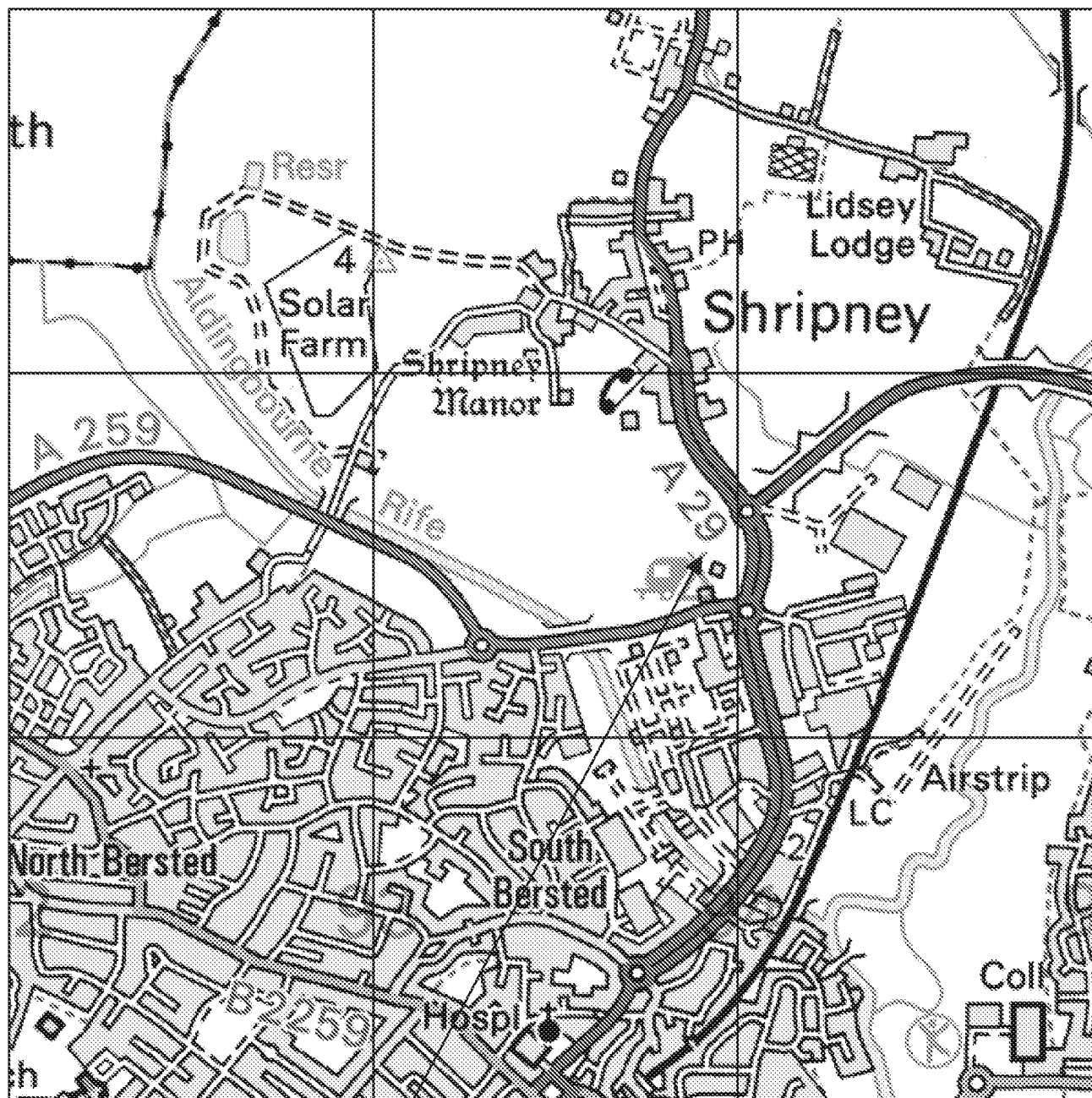
Given that the primary source being identified is demolition materials associated with a former barn which was removed more than 50 years ago, it is considered that any Made Ground (infilled materials) which remained post demolition works are likely to be extremely limited. Therefore, given the context of the site, and the proposed development, EPS would make the following recommendations:

- Should any areas of Made Ground be identified within the areas of landscaping formed across the site (likely to be limited to the vicinity of the former barn if encountered), these materials should be removed until only natural soils remain. Any excavated materials should be segregated for subsequent independent assessment of either appropriate disposal method or suitability for reuse. It should be noted that if ACM are encountered, this may need to be treated as hazardous waste and disposed of in an appropriate manner.
- All construction workers operating at the site should be advised of the potential exposure to Made Ground in the subsurface at the site. Appropriate health and safety precautions should also be adopted during any excavation works to avoid exposure to soils such as adequate PPE and the provision / use of welfare and washing facilities.
- Any palpable evidence of contamination encountered during exposure of shallow soils beneath the site during redevelopment work should be reported to EPS so that an inspection can be made and appropriate sampling and assessment work carried out.

It is recommended that a copy of this report be forwarded to the Environmental Health Department of Arun District Council for inclusion into their land quality records.

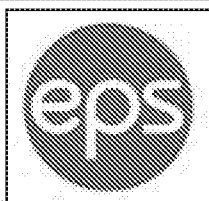


FIGURES



Approximate Site Location

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Title: Site Location Plan

Project: Saltbox, Shripney Road,
Bognor Regis, PO22 9NW

Fig No: 1

Scale: NTS

Drawn By: BV **Approved By:** SB

Job No: UK17.2707

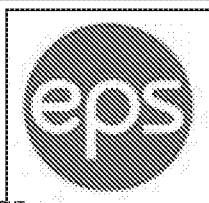
Dwg No: Saltbox/ 0617/ 01

Date: June 2017



Approximate Site Boundary -----

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Title: Current Site Layout

Project: Saltbox, Shripney Road,
Bognor Regis, PO22 9NW

Fig No: 2

Scale: NTS

Drawn By: BV **Approved By:** SB

Job No: UK17.2707

Dwg No: Saltbox/ 0617/ 02

Date: June 2017



Approximate Site Boundary -----

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Title: Aerial Photograph

Project: Saltbox, Shripney Road,
Bognor Regis, PO22 9NW

Fig No: 3

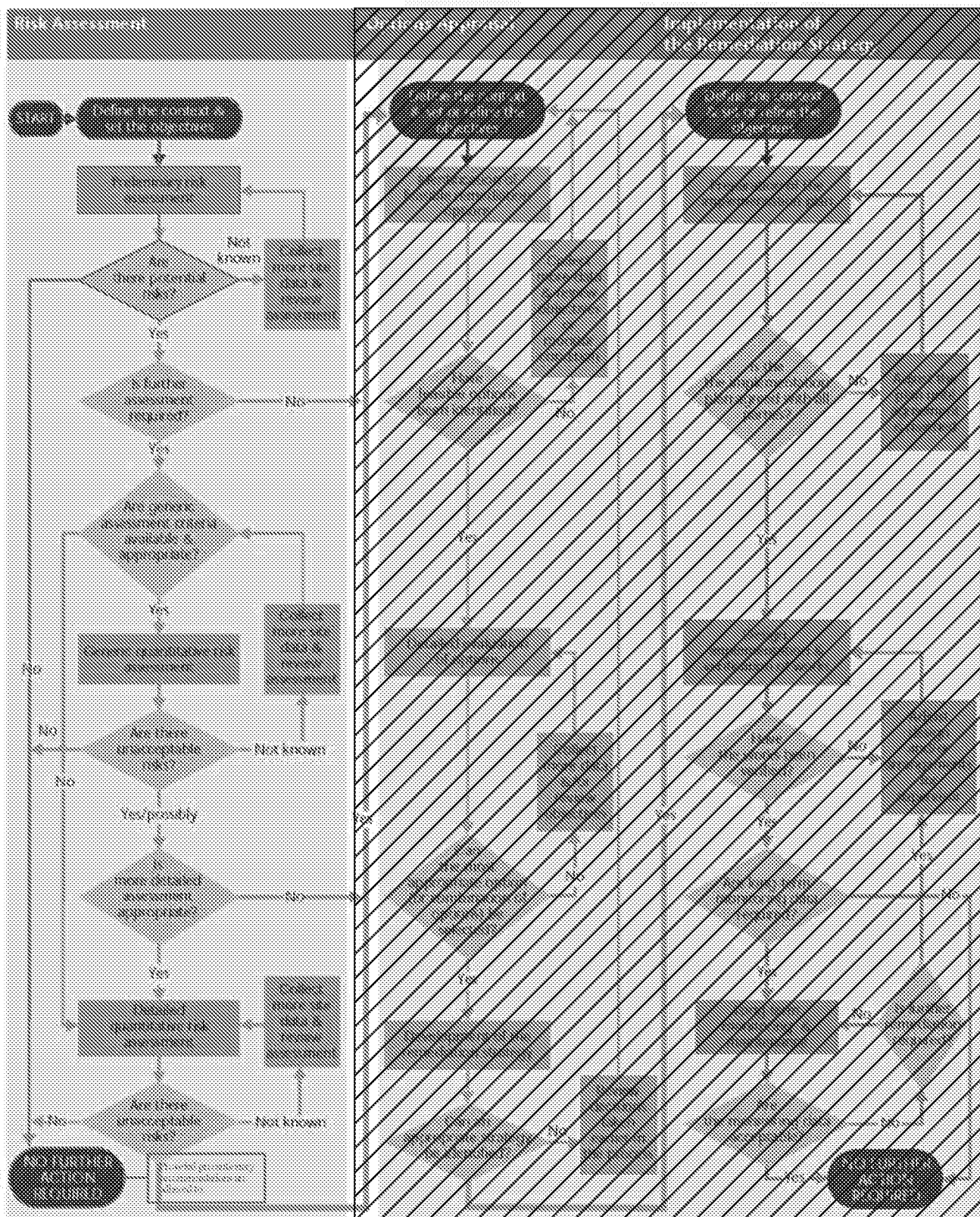
Scale: NTS

Drawn By: BV **Approved By:** SB

Job No: UK17.2707

Dwg No: Saltbox/ 0617/ 03

Date: June 2017



Assessment Pathway for Site



Title: Site Context - CLR11

Project: Saltbox, Shripney Road,
Bognor Regis, PO22 9NW

Fig No: 4

Scale: n/a

Drawn By: BV

Approved By: SB

Job No: UK17.2707

Dwg No: Saltbox/ 0617/ 04

Date: June 2017



APPENDICES



APPENDIX A

Proposed Development Plan

REVISIONS	DATE	BY	REV
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REF: 190402GRBPP/Zoning/Cover/604;

 ZONE W1

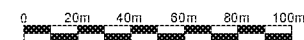
 ZONE W2 - GATEWAY ZONE

 ZONE W3 - VILLAGE BUFFER

 ZONE W4 - LOCAL NATURE RESERVE BUFFER

1:2000 A3 25.09.15

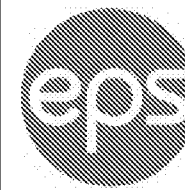
SALTBOX SITE - BOGNOR REGIS





APPENDIX B

Surrounding Land Use



General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Local Authority Recorded Landfill Site
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral
- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

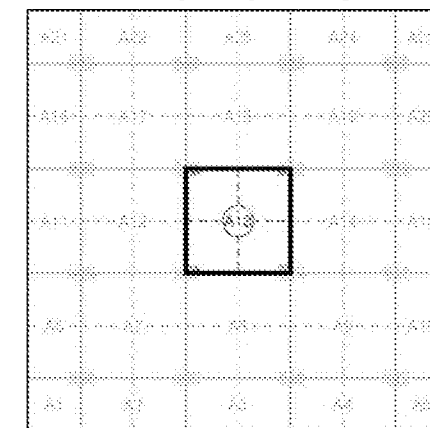
Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Geological

- BGS Recorded Mineral Site

Site Sensitivity Map - Segment A13



Order Details

Order Number: 126607648_1_1
Customer Ref: UK17.2707
National Grid Reference: 493810, 101630
Slice: A
Site Area (Ha): 0.01
Plot Buffer (m): 100

Site Details

Saltbox, Bognor Regis, PO22 9PA

Landmark
INFORMATION GROUP

Tel: 0844 844 9852
Fax: 0844 844 9851
Web: www.onwrocheck.co.uk





General

△ Specified Site ○ Specified Buffer(s) X Bearing Reference Point 8 Map ID

□ Several of Type at Location

Agency and Hydrological

○ Contaminated Land Register Entry or Notice (Location)
○ Contaminated Land Register Entry or Notice
◆ Discharge Consent
▲ Enforcement or Prohibition Notice
▲ Integrated Pollution Control
■ Integrated Pollution Prevention Control
■ Local Authority Integrated Pollution Prevention and Control
▲ Local Authority Pollution Prevention and Control
▲ Local Authority Pollution Prevention and Control Enforcement
● Pollution Incident to Controlled Waters
▼ Prosecution Relating to Authorised Processes
◆ Prosecution Relating to Controlled Waters
▲ Registered Radioactive Substance
— River Network or Water Feature
+ River Quality Sampling Point
◆ Substantiated Pollution Incident Register
◆ Water Abstraction
◆ Water Industry Act Referral

Hazardous Substances

■ COMAH Site ■ Explosive Site
■ NIHS Site
■ Planning Hazardous Substance Consent
■ Planning Hazardous Substance Enforcement

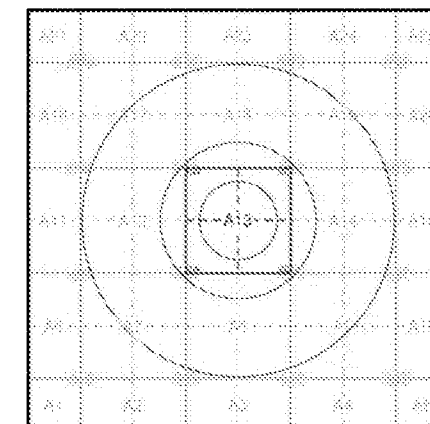
Geological

▼ BGS Recorded Mineral Site

Waste

▼ BGS Recorded Landfill Site (Location)
■ BGS Recorded Landfill Site
■ EA Historic Landfill (Buffered Point)
■ EA Historic Landfill (Polygon)
▲ Integrated Pollution Control Registered Waste Site
■ Licensed Waste Management Facility (Landfill Boundary)
■ Licensed Waste Management Facility (Location)
■ Local Authority Recorded Landfill Site (Location)
■ Local Authority Recorded Landfill Site
○ Potentially Infilled Land (Non-water)
○ Potentially Infilled Land (Non-water)
○ Potentially Infilled Land (Non-water)
▶ Potentially Infilled Land (Water)
○ Potentially Infilled Land (Water)
○ Potentially Infilled Land (Water)
■ Registered Landfill Site
■ Registered Landfill Site (Point Buffered to 100m)
■ Registered Landfill Site (Point Buffered to 250m)
■ Registered Waste Transfer Site (Location)
■ Registered Waste Transfer Site
■ Registered Waste Treatment or Disposal Site (Location)
■ Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Slice A



Order Details

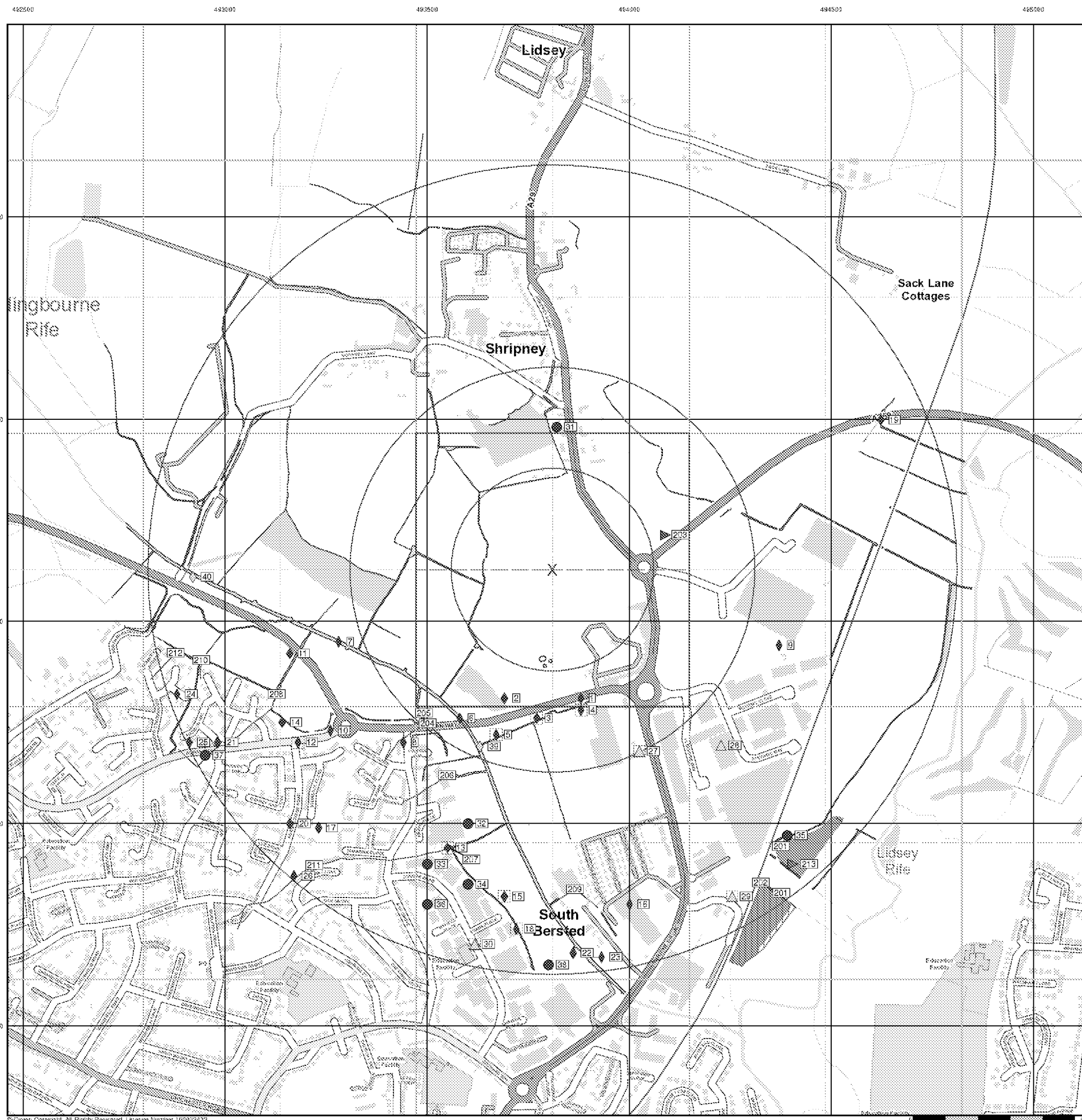
Order Number: 126607648_1_1
Customer Ref: UK17.2707
National Grid Reference: 493810, 101630
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Saltbox, Bognor Regis, PO22 9PA

Landmark
INFORMATION GROUP

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





APPENDIX C

Geological Context

Geology 1:50,000 Maps Legends

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	RTDU	River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	Quaternary - Quaternary
	RMD	Raised Marine Deposits	Clay, Silt, Sand and Gravel	Quaternary - Quaternary
	RBD1	Raised Beach Deposits, 1	Sand and Gravel	Quaternary - Quaternary
	ALF	Alluvial Fan Deposits	Gravel, Sand, Silt and Clay	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay, Silt and Sand	Eocene - Eocene
	LMBE	Lambeth Group	Clay, Silt and Sand	Paleocene - Paleocene
	LPCK	Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (Undifferentiated)	Chalk	Campanian - Turonian



Geology 1:50,000 Maps

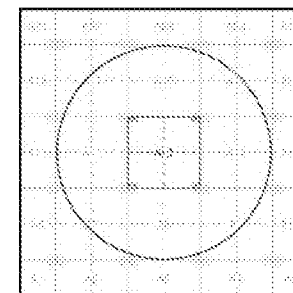
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1
Map Sheet No:	332
Map Name:	Chichester and I
Map Date:	1996
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

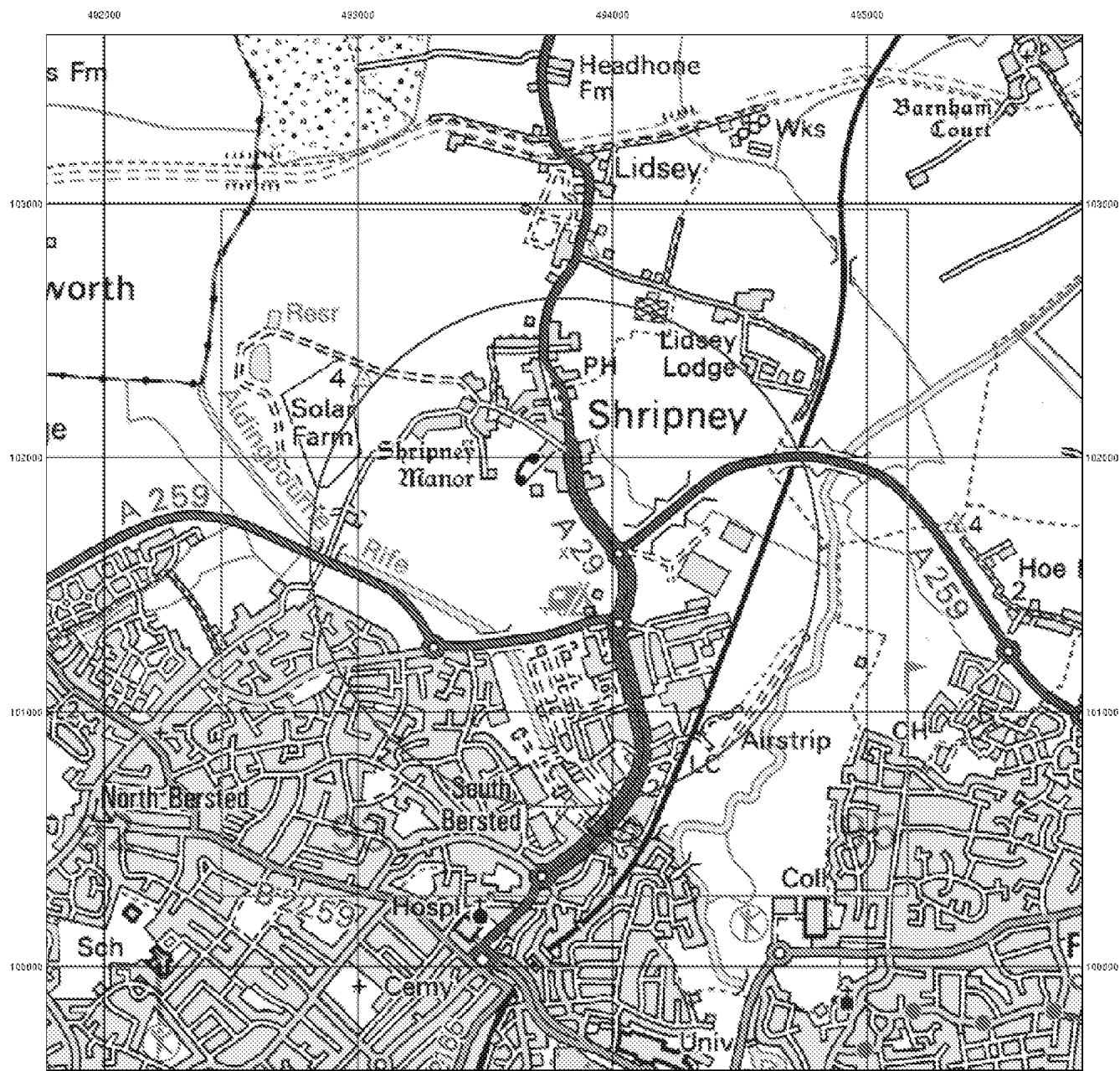
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Customer Reference:	UK17.2707
National Grid Reference:	493810, 101630
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

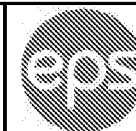
Saltbox, Bognor Regis, PO22 9PA

Landmark
www.landmark.co.uk

Tel: 0544 244 0052
Fax: 0244 544 5551
Web: www.epsv.co.uk



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Artificial Ground and Landslip

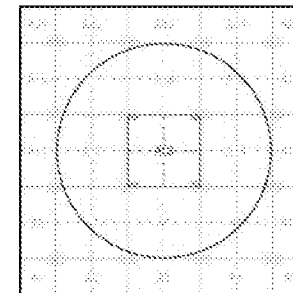
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A

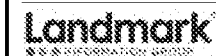


Order Details:

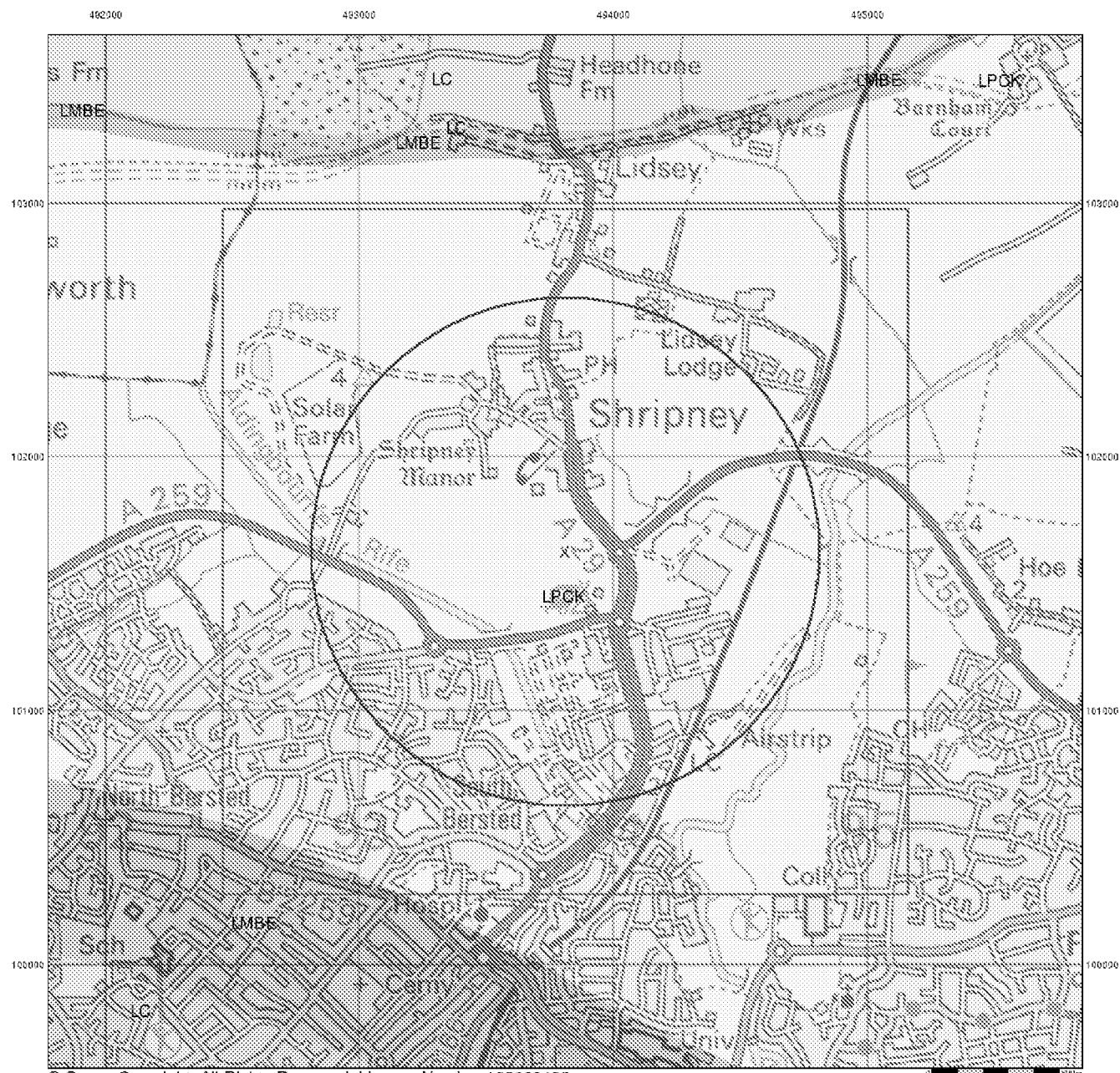
Order Number: 126607648_1_1
 Customer Reference: UK17 2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details:

Saltbox, Bognor Regis, PO22 9PA



Tel: 0544 244 0353
 Fax: 0544 544 5551
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Bedrock and Faults

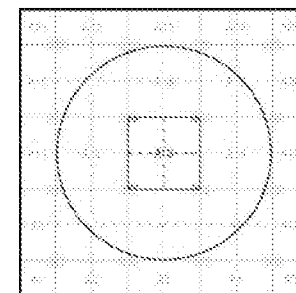
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A

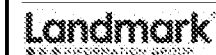


Order Details:

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Customer Reference: UK17.2707
National Grid Reference: 493810, 101630
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details:

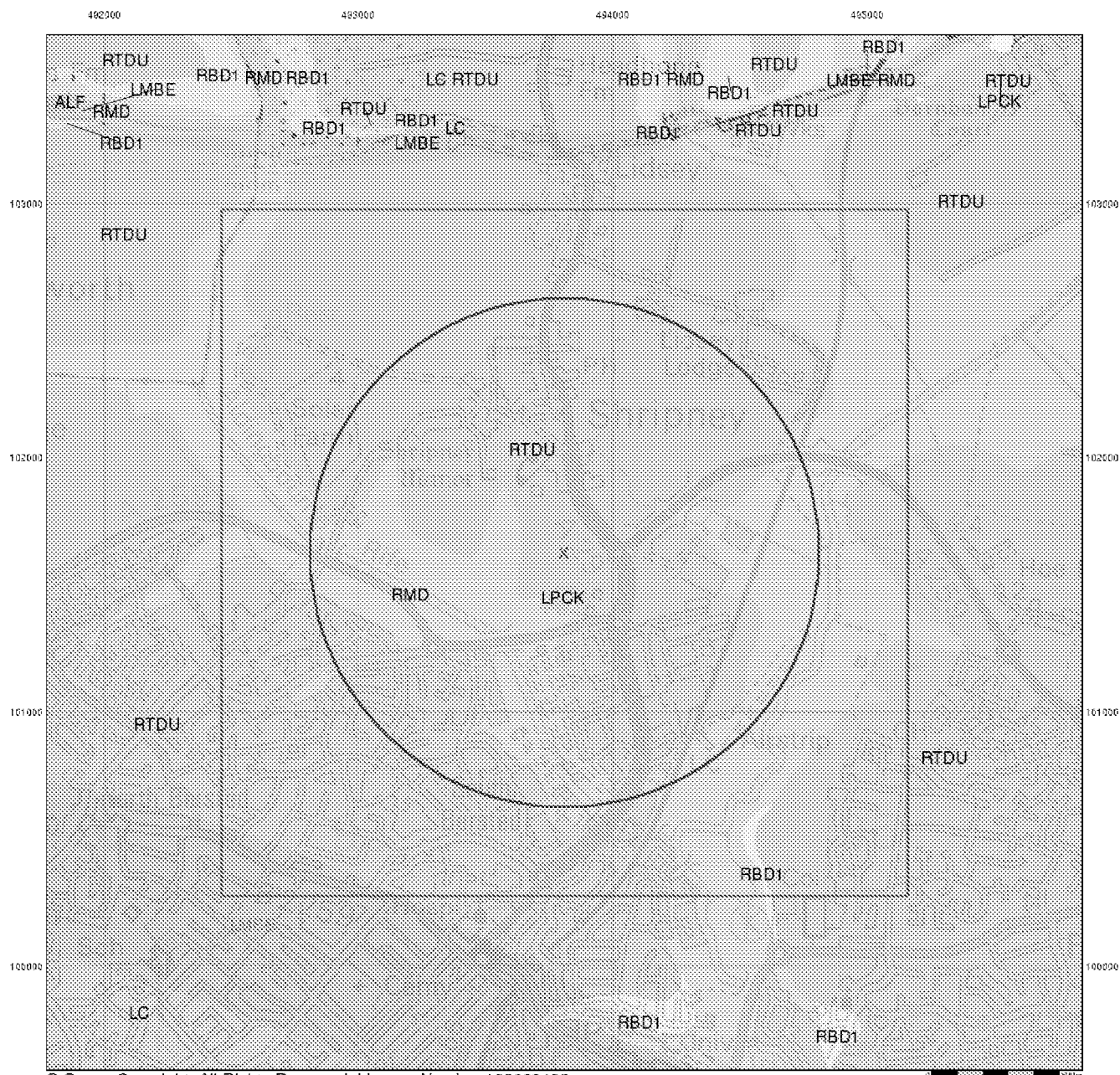
Saltbox, Bognor Regis, PO22 9PA



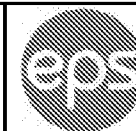
Tel: 0544 244 0053
Fax: 0544 544 5551
Web: www.envirocheck.co.uk

v15.0 31-May-2017

Page 4 of 5



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

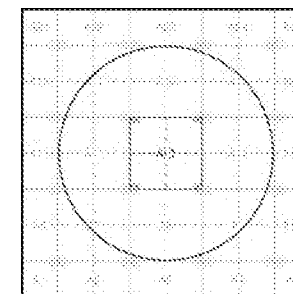
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A

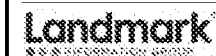


Order Details:

Order Number: 126607648_1_1
Customer Reference: UK17 2707
National Grid Reference: 493810, 101630
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details:

Saltbox, Bognor Regis, PO22 9PA



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Fax: 0544 544 5551
Web: www.oxfordcheck.co.uk

v15.0 31-May-2017

Page 5 of 5

SU 90 SW 54

9428 0141

Oldlands Farm

Block

Surface level +3.2 m
Water not struck
September 1981

Waste 2.
Bedrock 1.

LOG

Geological classification	Lithology	Thickness m	Depth m
British Geological Survey	Soil	0.4	0
Brickearth	Clay, brown, silty near top, sandier near base	1.5	1
Raised Beach Deposits (younger)	'Very clayey' pebbly sand Gravel: coarse and fine; flint with chalk Sand: fine with traces of medium and coarse Fines: silt	0.9	2
Upper Chalk	Chalk, rubbly, silty near top	1.2+	4

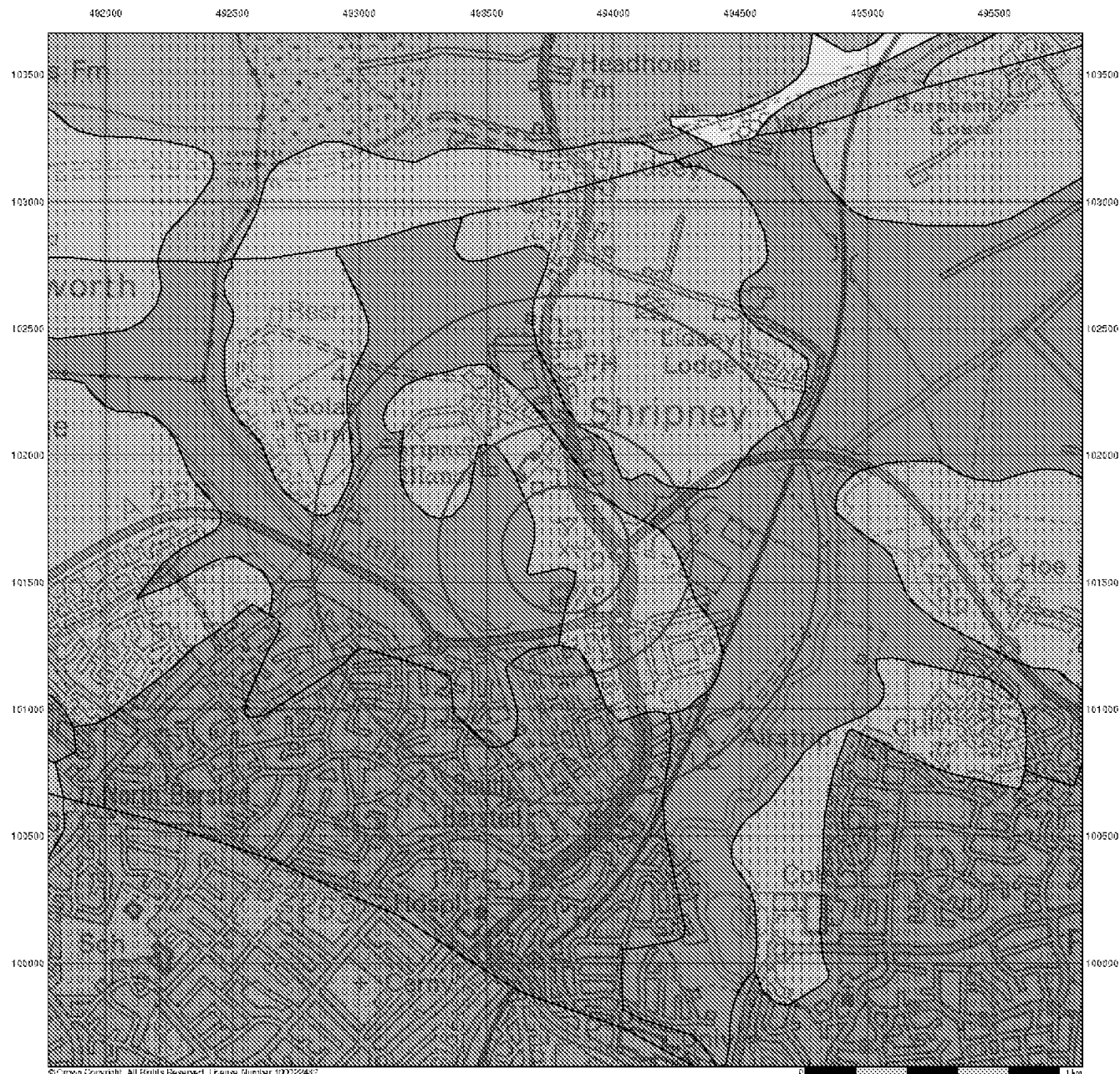
GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-4	+4 -4	+4 -1	+1 -4	+4 -16	+16 -64	+64 mm
39	48	13	1.5-2.8	39	42	3	3	6	7	0



APPENDIX D

Groundwater Vulnerability and Flood Risk Maps



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Groundwater Vulnerability

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

**Major Aquifer
(Highly Permeable)**

**Minor Aquifer
(Variably Permeable)**

**Non Aquifer
(Negligibly Permeable)**

Water or Sea

Drift Deposit

Soil Classes

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

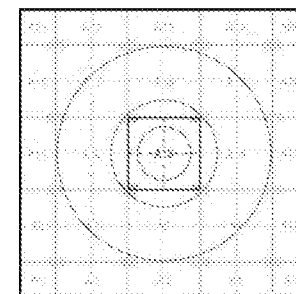
Low

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

Low

Site Sensitivity Context Map - Slice A



Order Details

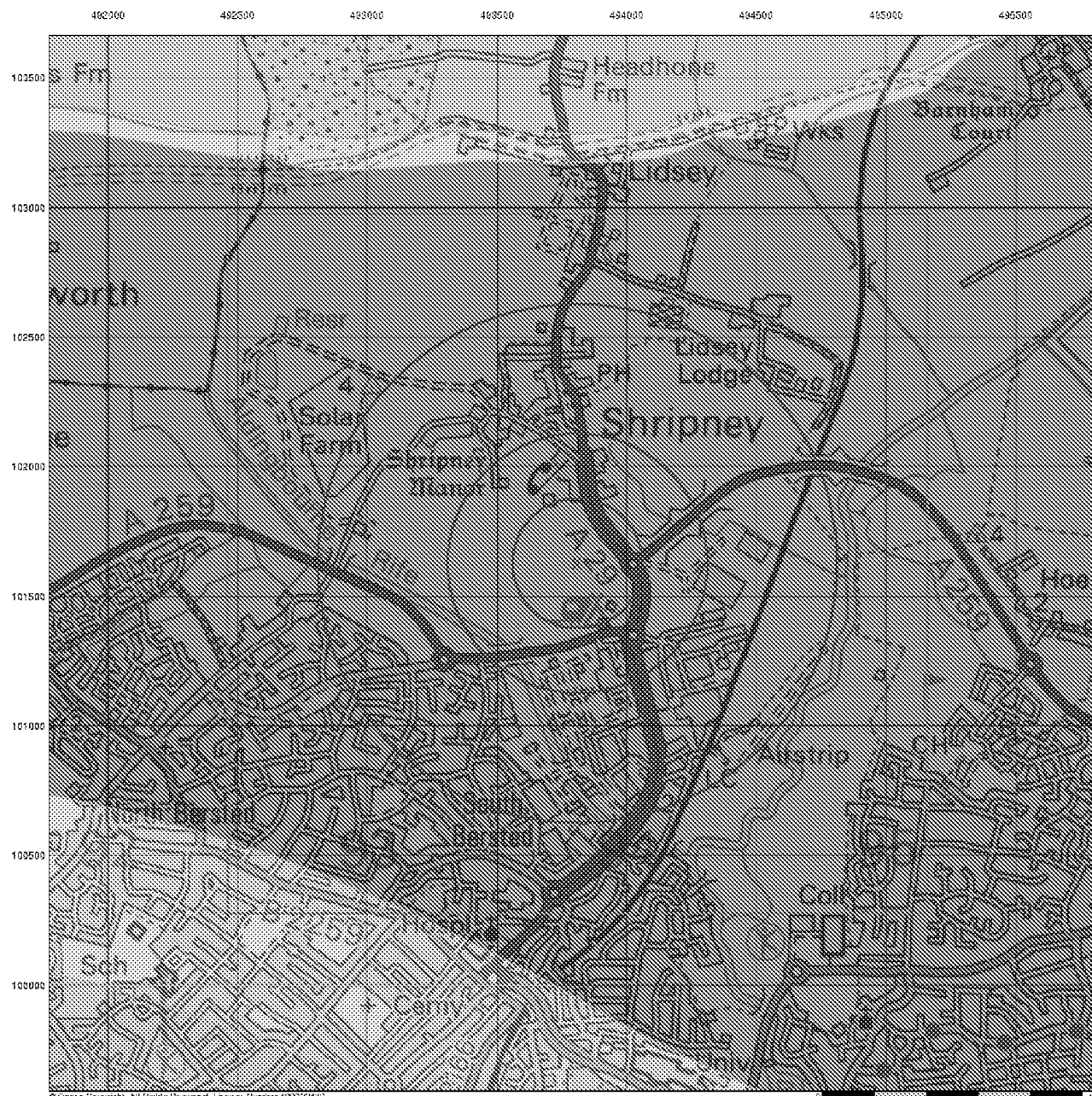
Order Number: 126607648_1_1
 Customer Ref: UK17 2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

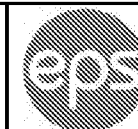
Saltbox, Bognor Regis, PO22 9PA

Landmark
 Environmental Services

Tel: 0544 244 0053
 Fax: 0544 544 5551
 Web: www.envirocheck.co.uk



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Bedrock Aquifer Designation

General

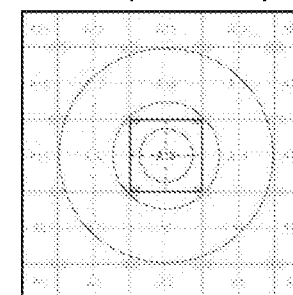
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

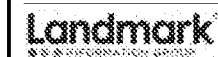


Order Details

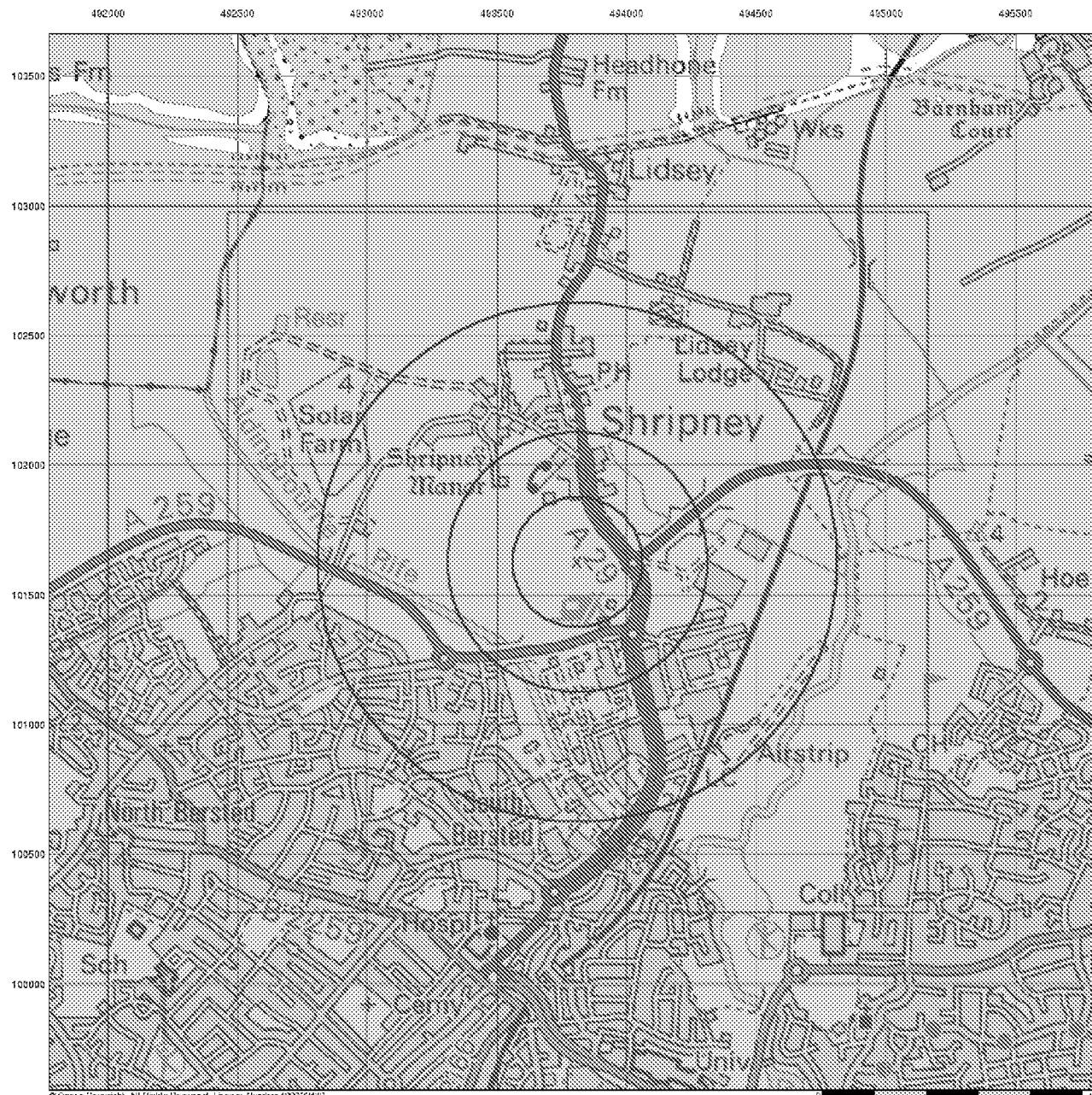
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 National Grid Reference: 493810, 101630
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 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

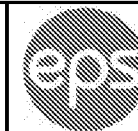
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Superficial Aquifer Designation

General

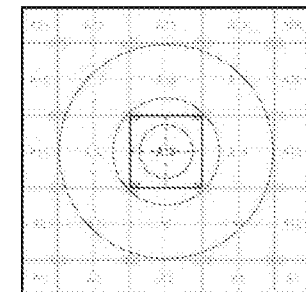
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

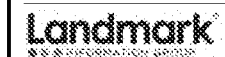


Order Details

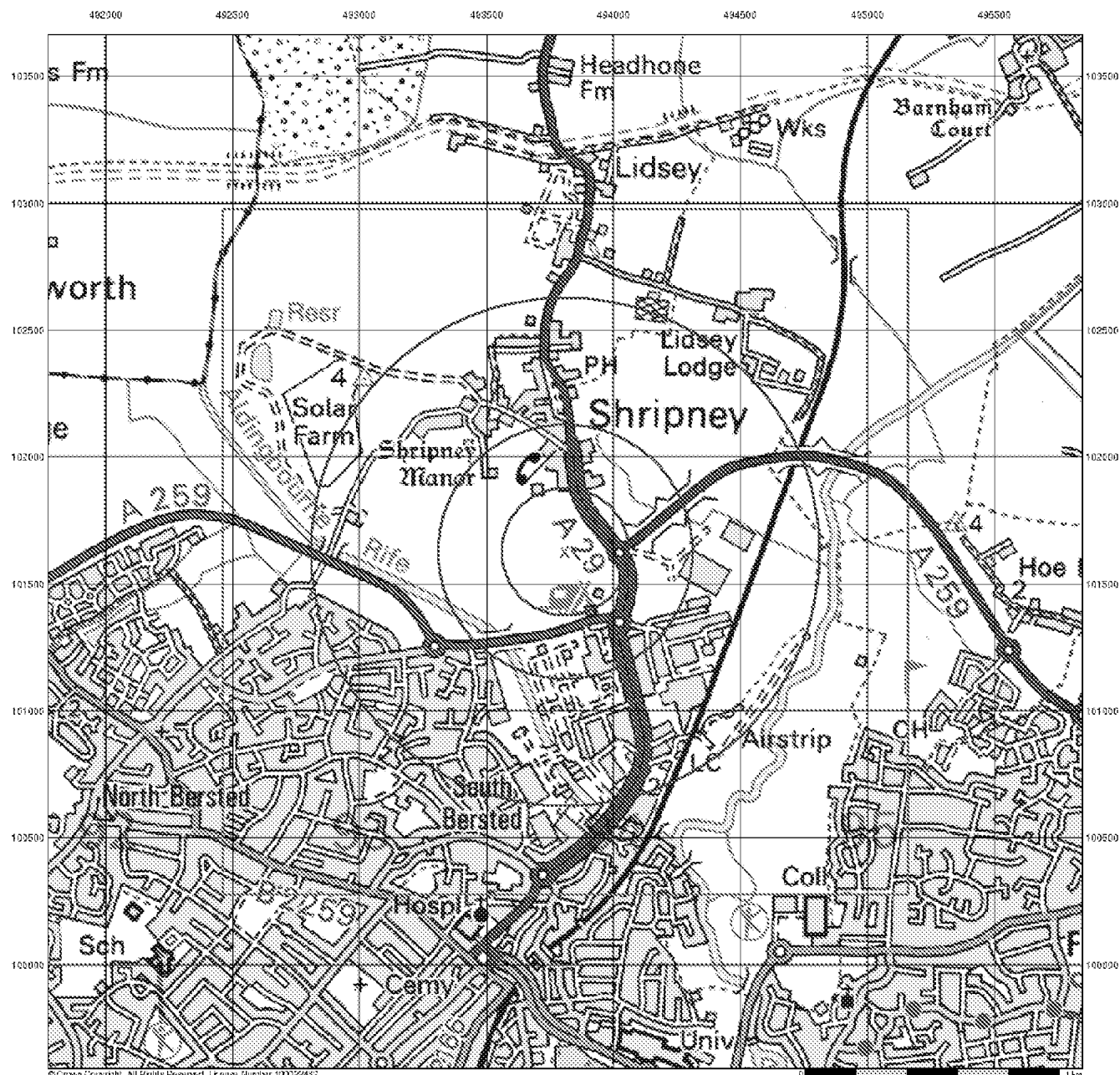
Order Number: 126607648_1_1
 Customer Ref: UK17 2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Saltbox, Bognor Regis, PO22 9PA



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Source Protection Zones

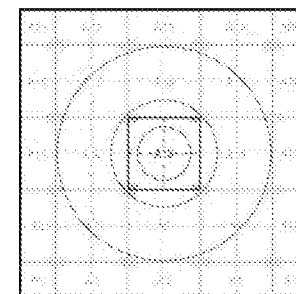
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A

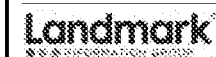


Order Details

Order Number: 126607648_1_1
 Customer Ref: UK17.2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

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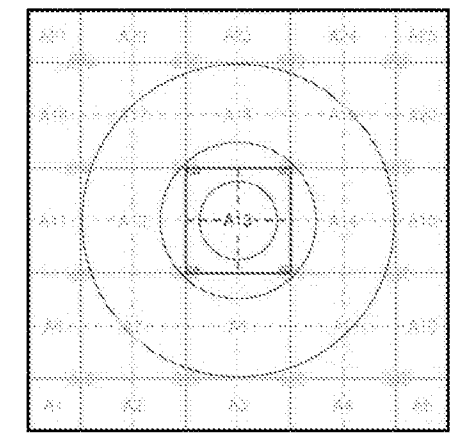
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

Order Number: 126607648_1_1
Customer Ref: UK17.2707
National Grid Reference: 493810, 101630
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

Saltbox, Bognor Regis, PO22 9PA



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Web: www.envirocheck.co.uk



APPENDIX E

A Selection of Historic Maps



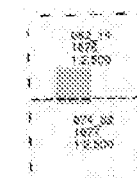
Sussex

Published 1876 - 1877

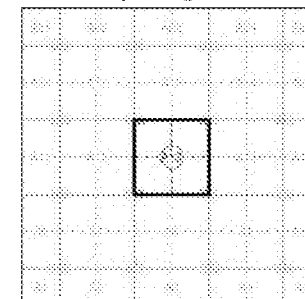
Source map scale - 1:2,500

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 A13



Order Details

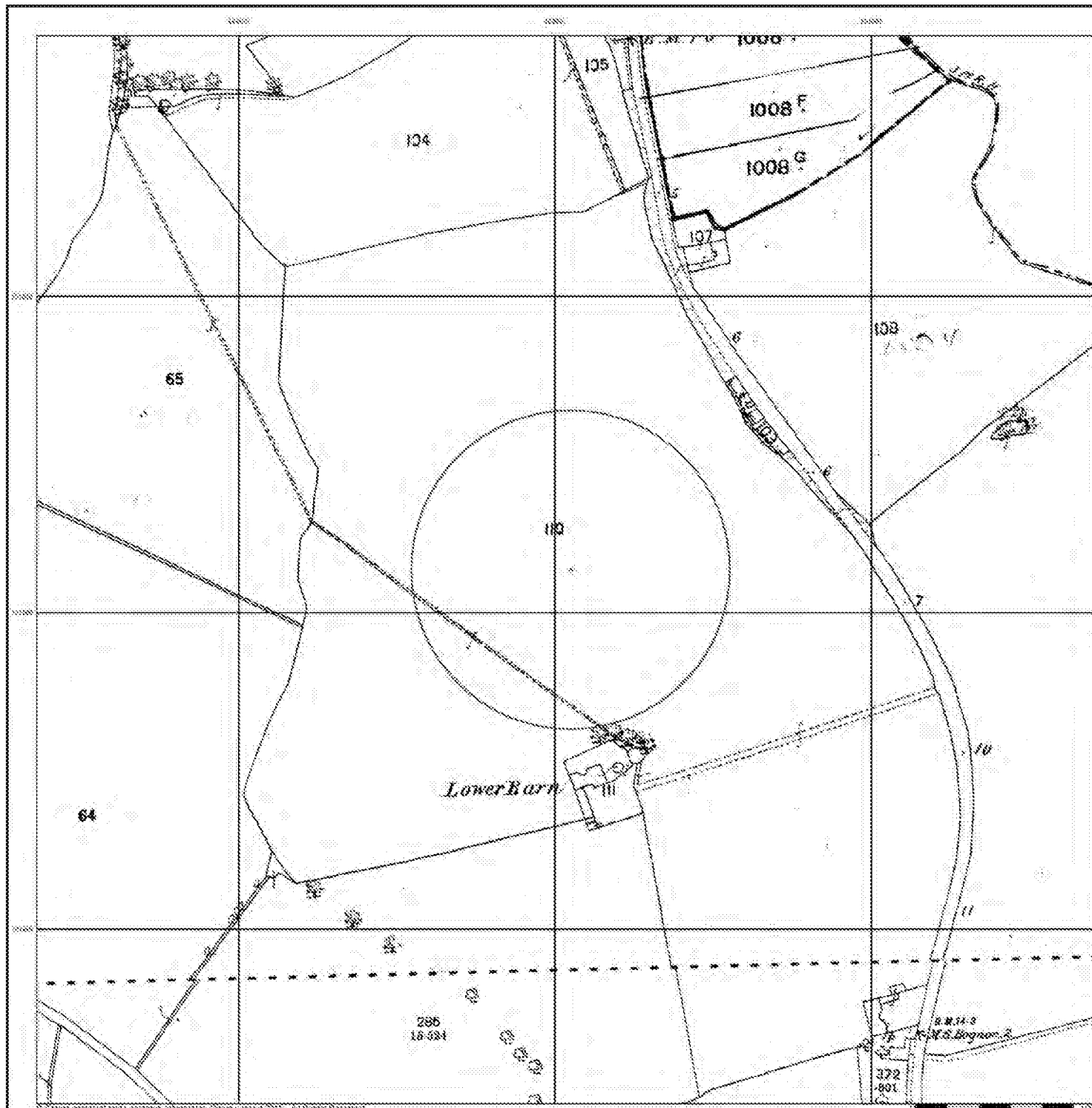
Order Number: 126607648_1_1
 Customer Ref: UK17.2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 100

Site Details

Saltbox, Bognor Regis, PO22 9PA

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0244 844 9951
 Web: www.landmark-ig.co.uk





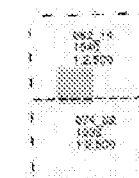
Sussex

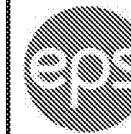
Published 1932 - 1940

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)





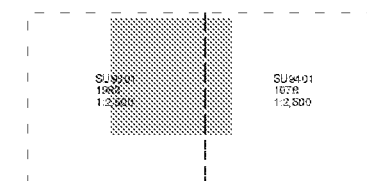
Ordnance Survey Plan

Published 1976 - 1983

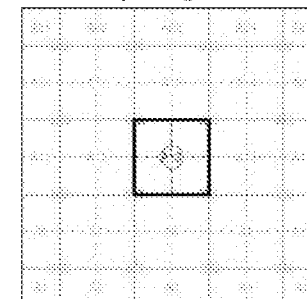
Source map scale - 1:2,500

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 A13



Order Details

Order Number: 126607648_1_1
 Customer Ref: UK17.2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 100

Site Details

Saltbox, Bognor Regis, PO22 9PA

Landmark
 INFORMATION GROUP

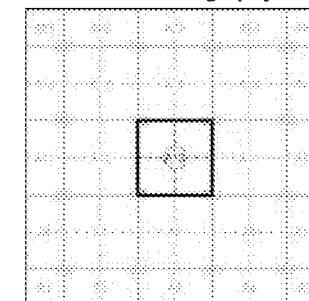
Tel: 0844 844 9952
 Fax: 0344 844 9951
 Web: www.unitedreck.co.uk



Historical Aerial Photography Published 1999

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

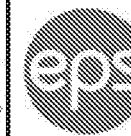
Order Number: 126607648_1_1
 Customer Ref: UK17.2707
 National Grid Reference: 493810, 101630
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 100

Site Details

Saltbox, Bognor Regis, PO22 9PA

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0344 844 9951
 Web: www.landmark-ig.co.uk



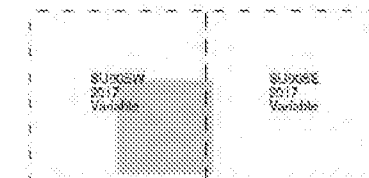
VectorMap Local

Published 2017

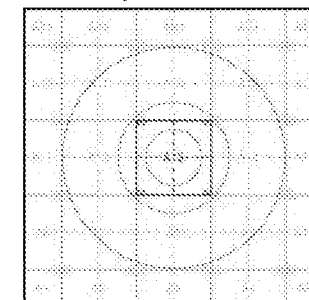
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10,000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 126607648_1_1
 Customer Ref: UK17.2707
 National Grid Reference: 493810, 101630
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