



Phase I Desk Study

at

Orchard Business Park, North End Road, Yapton, BN18 0GA

for

Crayfern Homes

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.



Commission

Soils Limited was commissioned by Crayfern Homes to undertake a Phase I Desk Study on Orchard Business Park, North End Road, Yapton, BN18 0GA. The scope of the investigation was outlined in the Soils Limited quotation reference Q19478 dated 1st January 2018.

Caveat

Whilst reasonable skill and care has been taken to determine the site history and the environmental setting within the time constraints applied by the project, it should be appreciated that uncertainties may occur owing to the natural variability of soil material within a defined area or as a result of unknowns that are associated with contaminated land assessment in general. The site conditions may be different from that indicated by this desk study, particularly on a site with a history of past development. No responsibility can be accepted should such conditions alter the recommendations made in this report.

This Desk Study does not include a detailed UXO risk assessment. In preparing a Phase I Desk Study reference is made to web based sources to assess the risk of the site potentially having been impacted by bombing during the World Wars. The data readily available is not necessarily definitive. Certain areas were bombed heavily such as centres of industrial manufacture, airfields, shipyards, docklands, railways sidings and junctions. The assessment is based on the likely area risk, bomb patterns (i.e. lines of recorded bomb impacts with gaps where an impact would be anticipated) and the age of structures on and in close proximity to the site.

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Section I Introduction

1.1 Objective

The Phase I Desk Study was undertaken to advise the client on the risk pertaining to the site, with special reference to historic and current potential contaminative activities and processes. This also included the assessment of their impact on current and future sensitive receptors such as human health, controlled waters, ecological features, building structures and services.

1.2 Site Location

The site was located at Orchard Business Park, North End Road, Yapton, BN18 0GA and had an O.S Land Ranger Grid Reference of SU 979 037.

The site location map is presented in Figure 1 and the full Site Walkover is discussed in Section 2.1 of this report.

1.3 Proposed Development

At the time of reporting, January 2018, the proposed development of the site was to comprise 2No. two-bed, 7No. three-bed and 1No. 4-bed terraced two-storey houses with garages and car parking spaces. The development included hard landscaping such as access roads driveways and pavements and soft landscaping such as private gardens and amenity areas.

In compiling this report reliance was placed on drawing 2.10 rev.P2 prepared by Crossley Design Architecture, dated May 2017. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

The proposed development plans have been provided in Appendix A.

1.4 Legislation and Liability

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. The legislation provides powers in relation to the identification, remediation and apportionment of liability for contaminated land. Part 2A applies where there is unacceptable risk, assessed on the basis of the current use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

Under Part IIA of the Environment Act 1995, Local Authorities are required to identify contaminated land and serve on every person who is an appropriate person a

remediation notice setting out what is to be done by way of remediation and the period within which it must be done.

If the person who caused, or knowingly permitted, the contaminating substance cannot be found, the owner and/or, occupier for the time being, of the property can be the appropriate person.

Under the legislation, Contaminated Land is defined as: -

"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused."

Where the Act defines harm as:

"harm to the health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes harm to his property."

and pollution of controlled waters is defined as: -

"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter."

In addition, The Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 2006 introduced the supplementary definition of harm to include: lasting exposure to any person resulting from the after-effects of a radiological emergency, past practice or past work activity.

With regard to contaminated waters, the Environment Act 1995 amends the Water Resources Act 1991 and provides the Environment Agency with the power to force clean-up of historical contamination by issuing a Works Notice, with remediation paid for by the responsible parties.

The Groundwater Regulations (1998) stated that entry of List 1 substances into groundwater must be prevented, and List II substances must be controlled.

1.5 Limitations and Disclaimers

This Phase I Desk Study Report relates to the site located at Orchard Business Park, North End Road, Yapton, BN18 0GA and was prepared for the sole benefit of Crayfern Homes (The "Client") for the brief described in the Commission of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and

diligence within the terms of the contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

There may be other sources of information not included in those listed that hold data relevant to the Phase I Desk Study undertaken at the site that could materially affect the conclusions made in this report.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995.

Where a contaminative use is identified in the Phase I Desk Study this does not determine whether contamination has actually occurred, or if it has the degree to which it may have taken place. An intrusive investigation(s) and analysis is required to establish the nature and degree of any contamination present.

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Section 2 Site Conditions

2.1 Site Walkover

A site walkover was undertaken in January 2018, the notes are presented in Table 2.1 and Table 2.2.

Table 2.1 Site Walkover Record (On-site)

On-site	Use of site	Open grass field within industrial estate
	Structures	Storage units adjacent to the eastern site boundary/small shed located to the south-west corner
	Site topography	Gently sloping down to the south-east
	Site covering	Predominantly grass covered/gravel rubble was noted to the south and to the east
	Vegetation	No vegetation was noted within the site. Mature trees were noted on the northern and north-eastern site boundary. Hedgerows were noted on the eastern and western site boundary.
	Potential Contamination Sources	A pit full of Made Ground (waste material) was noted to the north-east corner of the site. Electric boxes were located to the south-west corner of the site next to the shed. Potential leakages of plastic barrels with cooking oil located against the eastern site boundary.
	Odour	None noted
	Drainage	No drainage was noted on site which was considered to be self-drained.
Notes:		

Table 2.2 Site Walkover Record (Off-site)

Off-site	Use of Land	N: Residential SE: Commercial/Industrial estate S: Residential & Commercial W & NE: Open fields
	Area topography	Gently sloping down to the south-east
	Vegetation	Mature trees and hedges from neighbouring gardens to the north and to the south
	Potential Contamination Sources	Garden machinery and cars repairs/sales were noted adjacent to the east and south-east of the site.
Notes:		

2.2 Site Drainage

No drainage was noted on site which was considered to be self-drained.

2.3 Site Photographs

The site photographs have been included within Appendix F.

Section 3 Geology, Hydrogeology, Hydrology and Radon

3.1 Anticipated Geology

The 1:50,000 BGS Geology map showed the site to be underlain by the Lewes Nodular Chalk Formation bedrock, with overlying superficial deposits of River Terrace Deposits.

3.1.1 River Terrace Deposits

River Terrace Deposits are superficial deposits of Quaternary age that lie along the margins of rivers and are predominantly found in the southern part of West Sussex, along the coastal plain and are typically less than 10m thick. The composition of the River Terrace Gravel varies greatly, depending on the source material available in the river's catchment. Deposits generally consist of sands and gravels of roughly bedded flint or chert gravels commonly in a matrix of silts and clays. In West Sussex the rivers flow mainly south over the Weald Clay, which contains some sandstones and limestone that could be incorporated into the river gravel.

3.1.2 Lewes Nodular Chalk Formation

The Lewes Nodular Chalk Formation is composed of hard to very hard nodular chalks and hardgrounds with interbedded soft to medium hard chalks (some grainy) and marls; some griotte chalks. The softer chalks become more abundant towards the top. Nodular chalks are typically lumpy and iron-stained. Brash is rough and flaggy or rubbly, and tends to be dirty. First regular seams of nodular flint, some large, commence near the base and continue throughout. Chalk formations are susceptible to ground dissolution, typically caused by water passing through soluble rocks producing underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Occasional erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits, are found in the chalk. The features sometimes manifest themselves at the surface as shallow circular depressions. Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse.

3.2 Hydrogeology

To assess the vulnerability of groundwater to contamination, consideration must be given to the leaching characteristics of the overlying soils and the characteristics of the strata in the unsaturated zone. Information on the geological strata such as lithological type and permeability characteristics has been combined with the physical properties of the soil to produce varying degrees of vulnerability.

Table 3.1 presents the hydrological data that is relevant to the site.

Table 3.1 Hydrogeological Assessment

Hydrogeological Data		Comment
On-site	Superficial	Secondary A Aquifer ¹
Aquifers	Bedrock	Principal Aquifer ²
Groundwater Vulnerability		Major Aquifer, Soils of Intermediate Leaching Potential (I1) ³
Source Protection Zones (SPZ)		None noted
Abstraction	Potable	None noted
	Non-potable	Agriculture - 35m/NW
Sensitive land uses		None noted
Surface Water Features		231m/S
Flood Risk from Rivers or Seas		None noted
Flood Risk from Surface Water		None noted
Flood Risk from Groundwater		Potential for Groundwater Flooding of Property Situated Below Ground Level – On site/SW Limited Potential for Groundwater Flooding to Occur – On site/NE

Notes: ✓ = Likely. ¹Secondary A are 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.

²Principal Aquifers - These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

³Soils of Intermediate Leaching Potential (I1) - Soils which can possibly transmit a wide range of pollutants.

Any works or development which has the potential to have an impact on surface water, aquifer or groundwater quality must be approved by the Environment Agency prior to implementation.

3.3 Hydrology

The approximate elevation of the site was ~7m Above Ordnance Datum (AOD). The anticipated groundwater flow direction is given in Table 3.2.

Table 3.2 Hydrogeological Assessment

Type	Direction	Notes
Surface water	-	Due to the permeable superficial River Terrace Deposits and the permeable bedrock of Lewes Nodular Chalk Formation no surface water is expected
Groundwater	South-east	In line with the wider topography – in low velocity due to the permeable bedrock of Lewes Nodular Chalk Formation

3.4 Radon Gas

The site was not situated within an area where protection or risk assessment against the ingress of radon was required. Radon protection measures will not be required within the proposed new development. It is not possible in the course of a survey or inspection to determine whether radon gas is present as the gas is colourless and odourless. Tests can be undertaken to assess the concentration of radon in existing structures.

Section 4 Site History

4.1 Historic Map Study

The object of this study was to report on the evidence of site history and redevelopment of the site and its environs from available County Series and Ordnance Survey Maps dating from the mid to late 19th Century to the present day as downloaded from Landmark Environmental.

The published maps only represent a “snap shot” of the site and its environs at the date of the survey. The detail of the information recorded can vary between epochs, map scale and county areas. It should be noted that changes in land uses, processes or activities may have occurred outside of published epochs and these may not have been recorded on subsequent epochs.

Any distances quoted for features remote from the site have been scaled from the maps and are only approximate. Where dates have been noted in brackets, these are the actual dates applicable to the map editions.

The information reported might not represent all pertinent information that could be obtained. The interpretation of the maps and/or other data commented on in this report is subjective.

In the following sections, dealing with individual maps, only features considered to have a potential contaminative impact on the site and usually within a notional 250m radius are discussed. The north point and approximate extent of the site are indicated on each figure. The historic maps referred to are appended to this report (Appendix B).

Table 4.1 Historic Development of the Site

Site History	Date Range	
	From	To
Open field. A hedge was noted crossing the site from the north-west to the south-east.	1875	1974
North End Road was bounding the site to the east going from the south to the north		
As mentioned before with the hedge being removed from the site	1974	2017

Table 4.2 Historic Off-site Development

Off-site Development	Date Range	
	From	To
Open fields – W, S & E, Commercial developments and small woodland – N & NW.	1875	1974
Commercial and residential developments further to the south		
As mentioned with a complex of large nursery units built adjacent to the south-east of the site	1974	2009
As described with the nursery units being replaced by car dealers company	2009	2017
As before. Clays Farm was noted further to the north-west	2017	

Table 4.3 Potential Sources of Pollution Indicated from Historic Maps

Source	Direction	Distance (m)	Date Range	
			From	To
Nursery	SE	3	1974	2009
Nursery	E	5	1974	2009
Nursery	NW	57	1974	2009
Nursery	SE	65	1974	2009
Tank ¹	SE	78	1974	1992
Tank ²	SE	87	1974	1992
Clays Farm	NW	105	2017	Today

Notes: ^{1,2} Possibly oil-fired tanks potentially associated with the heating of the nurseries located to the east and south-east of the site

4.2 Bomb damage and the potential for Unexploded Ordnance

It's not likely that the site has been/or in an area that has been subject to bombing, or shelling.

Section 5 Environmental Records and Consultation

5.1 Dataset Information

The Landmark Envirocheck Report was obtained by Soils Limited and includes site specific information. The extent of the search has initially been limited to a radius of 250m as it is considered that sources of contamination beyond 250m are unlikely to impact on the site. This search radius may however, be increased if a significant source of contamination or sensitive receptor is identified within 1000m of the site. A copy of the report is appended to this report in Appendix summarised in Table 5.1, table 5.2 and Table 5.3.

Table 5.1 Environmental Significance of Data

Source	Direction	Distance (m)
Contaminated Land Register Entries and Notices	None	None
Discharge Consents	None	None
Integrated Pollution Prevention and Control	None	None
Local Authority Pollution Prevention and Controls	None	None
Local Authority Pollution Prevention and Control Enforcements	None	None
Nearest Surface Water Feature	S	231
Pollution Incidents to Controlled Waters (Significant Incidents only)	None	None
Prosecutions Relating to Authorized Processes	None	None
Registered Radioactive Substances	None	None
Substantiated Pollution Incident Register	None	None
Nearest Potable Abstraction Point	None	None
Nearest Non-Potable Abstraction Point	NW	35
Water Industry Act Referrals	None	None
Source Protection Zones	None	None
Extreme Flooding from Rivers or Sea Without Defences	None	None
Flooding from Rivers or Sea Without Defences	None	None
Areas Benefiting from Flood Defences	None	None
Flood Water Storage Areas	None	None
Flood Defences	None	None
BGS Recorded Landfill Sites	None	None
Historical Landfill Sites	None	None
Licensed Waste Management Facilities	None	None
Local Authority Recorded Landfill Sites	None	None
Potentially Infilled Land (Non-Water)	None	None
Potentially Infilled Land (Water)	None	None
Registered Landfill Sites	None	None
Registered Waste Transfer Sites	None	None
Registered Waste Treatment or Disposal Sites	None	None
Control of Major Accident Hazards Sites (COMAH)	None	None
Notification of Installations Handling Hazardous Substances	None	None
Planning Hazardous Substance Consents	None	None

Table 5.2 Contemporary Trade Directory

Contemporary Trade Directory within 250m	Direction	Distance (m)	Status
Car Dealers	SE	29	Inactive
Classic Car Specialists	SE	29	Active
Seal & Joint Manufacturers	E	36	Inactive
Waste Disposal Services	E	36	Inactive
Car Body Repairs	E	36	Inactive
Meat - Wholesale	NW	51	Inactive
Commercial Cleaning Services	SE	54	Inactive
Printers	SE	54	Active
Classic Car Specialists	SE	54	Active
Car Dealers	SE	60	Inactive
Engineering Machine Services	E	66	Active
Scaffolding & Work Platforms	SE	74	Active
Pet Foods & Animal Feeds	E	80	Active
Lawnmowers & Garden Machinery – Sales & Service	E	81	Active
Electrical Goods, Sales, Manufacturers & Wholesalers	SE	87	Inactive
Pet Foods & Animal Feeds	SW	117	Inactive
Vehicle repair, Testing and Servicing	SE	30	-
Vehicle repair, Testing and Servicing	E	36	-
Vehicle repair, Testing and Servicing	SE	54	-

Table 5.3 Geological Hazards

Source	Nearest Distance from Site/Type
Coal Mining Affected Areas	In an area that might not be affected by coal mining
Mining Instability	Unknown
Natural and Mining Cavities	Unknown
Potential for Collapsible Ground Stability Hazards	On site/Low
Potential for Compressible Ground Stability Hazards	On site/No Hazard
Potential for Ground Dissolution Stability Hazards	On site/Very Low
Potential for Landslide Ground Stability Hazards	On site/Very Low
Potential for Running Sand Ground Stability Hazards	On site/Low
Potential for Shrinking or Swelling Ground Stability Hazards	On site/Low

5.2 Site Sensitivity Maps

No other significant potential sources of contamination were shown on the Landmark Envirocheck Site Sensitivity Maps, which have not been listed in Table 5.1, table 5.2 and Table 5.3, and copies of which are appended to this report (Appendix B).

5.3 Regulatory Enquires

As part of the Phase I Desk Study the local authority was contacted and asked to provide any information on potential risks pertaining the site. The information provided by the local authority, sent via e-mail to Soils Limited, has been presented in Appendix E. The

council held very limited information on the site. A summary of pertinent information is outlined below:

- Aerial imagery shows previously the site to have been the entrance/trackway to a nursery used for storage of unknown objects.
- The local authorities were not aware of any petroleum licences associated with the site.
- No landfill sites were noted within 500m.

5.4 Soil Geochemistry

The BGS soil chemistry for environmental assessments dataset coverage, has been developed from BGS G-BASE and Imperial College Wolfson Atlas data. It contains estimated ambient As, Cd, Cr, Ni and Pb background concentrations for rural topsoil across Great Britain. It also contains the locations and measured concentrations (mg kg⁻¹) of As, Cd, Cr, Cu, Ni, Pb, Sn and Zn in urban topsoil samples, collected from geochemical surveys in 23 major urban centres.

The results of this survey are contoured on the Landmark Environmental check report (Appendix C).

The results of the survey have been assessed against current guidance values for the proposed '**Residential with plant uptake**' scenario, as presented in SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014 (C4SL), derived for the protection of human health. Where there are no published screening values for determinants within SP1010, screening values have been adopted from the following published guidance; DEFRA Soil Guideline Values (SGV) and LQM/CIEH/Suitable 4 Use Level (S4UL). The results are indicated in Table 5.4.

Table 5.4 Soil Geochemistry

Determinant	Proposed Land Use	Indicated Soil Geochemistry (mg kg ⁻¹)	Guideline for Residential with plant uptake (mg kg ⁻¹)	Potential Risk
Arsenic	Residential with plant uptake	<15	37	
Cadmium		<1.8	11	
Chromium		60-90	910	
Lead		<100	200	
Nickel		15-30	130	

Note: ✓ = Likely. ¹ Soil guideline value for 1% and 6% SOM respectively. Other soils guidelines presented in the table are based on soils with 6% SOM.

The results show no significant risk to identified receptors for contaminants presented based on the proposed end use. Should the proposed development change, then the recommendations given in the report would be likely to change.

Please note that there are only a limited number of land uses for which data on determinants have been published or can be readily determined.

Section 6 Data Collection Summary

6.1 General

The findings of the Phase I Desk Study are summarised below:

Table 6.1 summaries the site Environs, which include geology, hydrogeology, the risk from radon and potential risk from flooding.

Table 6.1 Site Environs

Environs	Summary
Geology	Superficial deposits of the River Terrace Deposits overlying the Lewes Nodular Chalk Formation bedrock.
Hydrogeology	Superficial River Terrace Deposits classed as a Secondary A aquifer. The Lewes Nodular Chalk Formation bedrock was a Principal Aquifer. Surface water would infiltrate into the permeable bedrock of Lewes Nodular Chalk Formation.
Surface water Flow	Anticipated to be vertically down into the granular superficial deposits.
Radon	No radon risk was present on site.
Flooding	The site did not benefit from flood defences and had a limited risk from groundwater flooding and a potential risk from groundwater flooding of property situated below ground level. No risk from surface flooding was present on site.
Geological Hazard	There was a low potential risk of collapsible, running sand and shrinking or swelling ground stability hazard on site and a very low potential risk for ground dissolution and landslide ground stability hazards. There was no hazard of compressible ground stability and an unknown risk for mining instability and natural and mining cavities on site. The site was located in an area that might not be affected by coal mining.
Local Authority Response	The council holds very limited information on the site. Aerial imagery shows previously the site to have been the entrance/trackway to a nursery used for storage of unknown objects. The local authorities were not aware of any petroleum licenses associated with the site. No landfill sites were noted within 500m.
Soil Chemistry	No significant risk to identified receptors for contaminants presented based on the proposed end use was present on site.

Table 6.2 provides a summary of potential on-site and off-site contamination sources identified during the study of the historic maps, the Landmark Envirocheck Dataset Report and the Site Walkover.

Table 6.2 Summary of Potential Contamination Sources

Contaminative Sources/Environmental Impact	Direction ⁱ	Distance (m)	Date Range		Data Source
			From	To	
On-Site					
Pit full of Made Ground (waste material)	NE	Onsite	-	2017	SW
Electric boxes	SW	Onsite	-	2017	SW

Contaminative Sources/Environmental Impact	Direction ¹	Distance (m)	Date Range		Data Source
			From	To	
Plastic barrels with cooking oil (potential spills/leakages)	E	Onsite	-	2017	SW
Off-Site					
Garden machinery and cars repairs/sales	E	Adjacent	-	2017	SW
Nursery	SE	3	1974	2009	HM
Nursery	E	5	1974	2009	HM
Nursery	NW	57	1974	2009	HM
Nursery	SE	65	1974	2009	HM
Tank ¹	SE	78	1974	1992	HM
Tank ²	SE	87	1974	1992	HM
Clays Farm	NW	105	2017	Today	HM
Car Dealers	SE	29	-	-	DS
Classic Car Specialists	SE	29	-	-	DS
Seal & Joint Manufacturers	E	36	-	-	DS
Waste Disposal Services	E	36	-	-	DS
Car Body Repairs	E	36	-	-	DS
Meat - Wholesale	NW	51	-	-	DS
Commercial Cleaning Services	SE	54	-	-	DS
Printers	SE	54	-	-	DS
Classic Car Specialists	SE	54	-	-	DS
Car Dealers	SE	60	-	-	DS
Engineering Machine Services	E	66	-	-	DS
Scaffolding & Work Platforms	SE	74	-	-	DS
Pet Foods & Animal Feeds	E	80	-	-	DS
Lawnmowers & Garden Machinery – Sales & Service	E	81	-	-	DS
Electrical Goods, Sales, Manufacturers & Wholesalers	SE	87	-	-	DS
Pet Foods & Animal Feeds	SW	117	-	-	DS
Vehicle repair, Testing and Servicing	SE	30	-	-	DS
Vehicle repair, Testing and Servicing	E	36	-	-	DS
Vehicle repair, Testing and Servicing	SE	54	-	-	DS

Notes: SW – Site walkover, HM – Historic Maps, DS – Datasheet, GC – Geochemistry, LA – Local Authority, GE Google Earth

¹² Tanks possibly oil-fired associated with the heating of the nurseries located to the east and south-east of the site

Section 7 Preliminary Conceptual Site Model

7.1 General

Environment Agency guidance provided in CLR11 indicates that the Conceptual Site Model should identify those contaminants, pathways and receptors which are 'likely' to represent an 'unacceptable' risk either to human health or the surrounding environment. The following sections present potential contaminants, pathways and receptors based on the information collected during the desktop study. Pathways have been established based on scientific knowledge of the behaviour of the contaminants in the ground.

7.2 Sources and Pathways of Contamination

The Landmark Site Specific Envirocheck Report and Site Walkover have been used to identify potential contaminative sources. These sources have been presented in Table 6.2. An assessment of the likely pathways and the likelihood of each contaminative source that was considered a risk has been presented in Sections 7.2.1 to 7.2.3.

7.2.1 Potential Pathways

A review of the potential pathways on and off the site has been undertaken based on the site, ground conditions, hydrology and scientific knowledge of the behaviour of the contaminants in the ground. The pathways applicable to the site and the proposed development have been marked in Table 7.1.

Table 7.1 Applicable Pathways

Pathway	Present	Comment
Inhalation of dust	Yes	Residential gardens within the proposed development
Inhalation of vapour/gases	Yes	Potential sources have been identified
Ingestion and absorption via direct contact	Yes	Residential gardens within the proposed development
Migration via surface runoff	No	No surface water is expected on site
Migration in solution via groundwater	Yes	Due to the permeable bedrock of Lewes Nodular Chalk Formation and the Groundwater Vulnerability of being a Major Aquifer
Migration of gases via permeable soils	Yes	Due to the permeable superficial River Terrace Deposits and the permeable bedrock of Lewes Nodular Chalk Formation
Direct contact with construction material	Yes	Due to the permeable superficial River Terrace Deposits and the permeable bedrock of Lewes Nodular Chalk Formation
Notes:		

7.2.2 Potential Sources of On-site Contamination.

A study of Landmark Envirocheck Report and Site Walkover has identified a number of potential on-site sources of contamination which may present a risk to

future uses of the proposed development. The sources have been presented in Table 7.2.

Table 7.2 On-site Potential Contamination Sources

Source	Likely	Reasoning
Pit full of Made Ground (waste material)	✓	On site source
Electric boxes	✓	
Plastic barrels with cooking oil (potential spills/leakages)		Small-scale source /not within the hydraulic gradient, adjacent to the site boundary

Notes:

7.2.3 Potential Off-site Sources of Contamination

A study of Landmark Envirocheck Report and Site Walkover has shown a number of potential off-site sources of contamination which may present a risk to future uses of the proposed development. These sources have been presented in given in Table 7.3.

Table 7.3 Off-site Potential Contamination Sources

Source	Direction	Distance (m)	Likely	Reasoning
Garden machinery and cars repairs/sales	E	Adjacent to site		
Nursery	SE	3		Not within the hydraulic gradient of the site
Nursery	E	5		
Nursery	NW	57	✓	Within the hydraulic gradient of the site
Nursery	SE	65		Not within the hydraulic gradient of the site
Tank ¹	SE	78		
Tank ²	SE	87		
Clays Farm	NW	105	✓	Within the hydraulic gradient of the site
Car Dealers	SE	29		Not within the hydraulic gradient of the site
Classic Car Specialists	SE	29		
Seal & Joint Manufacturers	E	36		
Waste Disposal Services	E	36		
Car Body Repairs	E	36		
Meat - Wholesale	NW	51		Not a potential contamination source
Commercial Cleaning Services	SE	54		
Printers	SE	54		Not within the hydraulic gradient of the site
Classic Car Specialists	SE	54		
Car Dealers	SE	60		
Engineering Machine Services	E	66		
Scaffolding & Work Platforms	SE	74		
Pet Foods & Animal Feeds	E	80		

Source	Direction	Distance (m)	Likely Reasoning
Lawnmowers & Garden Machinery – Sales & Service	E	81	
Electrical Goods, Sales, Manufacturers & Wholesalers	SE	87	
Pet Foods & Animal Feeds	SW	117	
Vehicle repair, Testing and Servicing	SE	30	
Vehicle repair, Testing and Servicing	E	36	
Vehicle repair, Testing and Servicing	SE	54	Not within the hydraulic gradient of the site

7.3 Potential Contaminants

Table 7.4 presents the range of possible contaminants associated with the onsite and off-site sources of potential contamination which are identified in Table 7.2 and Table 7.3.

Chemical data has been taken from the Department of the Environment Industry Profiles or from referenced sources detailing the processes involved in the activity carried out on-site.

Table 7.4 Potential Contaminants

Potential Contaminative Sources	Contaminants/Chemical Properties
Nursery	Ammonia, Pesticides, ¹ Metals and semi-metals (ex. Arsenic, chromium), ² Organic Compounds (ex. PAHs and TPHs), ³ Asbestos
Clays Farm	Pesticides, Organic Compounds (ex. PAHs and TPHs)

Notes: ¹ Possible oil-fired heating boiler/ Potential heavy metals from lead paint. ² Possible asbestos external lagging around heating pipes in former greenhouse

7.4 Potential Exposure Receptors

The presence of potential receptors has been evaluated from our understanding of the current and planned land use of the site, an assessment of surrounding land uses and currently available information pertaining to the site. The assessment for potential receptors is presented in Table 7.5.

Table 7.5 Potential Receptors

Potential Receptor	Present
Human Health	
Future users of the site	Yes
Construction workers on-site	Yes
Service and maintenance workers	Yes
Site neighbours and wider public	Yes
Groundwater/Future Potable Water Supply	Yes

Potential Receptor		Present
Groundwater/Controlled Waters	Surface Water	
	Construction materials	Yes
Buildings & Materials	Buildings and confined spaces	Yes
	Flora and fauna in surface water	
Ecosystems	Flora and fauna in surface water	

Notes:

7.5 Preliminary Conceptual Site Model and Risk Assessment

A preliminary risk assessment has been undertaken based on the proposed development. The assessment has been based on the likelihood of the presence of a pollutant linkage.

A pollutant linkage is the relationship between a contaminant source, a pathway and a receptor. Unless all three elements of a pollutant linkage are present, a risk is not considered to exist. Each of the three elements has been considered within Table 7.1 to Table 7.5. The preliminary conceptual site model and risk assessment is presented in Table 7.6. The classification tables on which the level of risk has been determined have been modified from 'Contaminated land risk assessment: A guide to good practice, 2001, CIRIA C552' and are presented in Appendix G.

Table 7.6 Preliminary Conceptual Site Model and Risk Assessment Methodology

Source (See Table 7.2 and Table 7.3)	Potential Contaminant (See Table 7.4)	Exposure Pathway (See Table 7.1)	Receptor (See Table 7.5)	Risk Score
Nursery Off-site sources from which potential contamination would have migrated onto the site.	Ammonia, Pesticides, Metals, Semi- metals and non-metals, PAHs	Inhalation of dust	Site Workers/Site Maintenance	Me
			End Users	Me
			Off-site Users	Me
	PAHs, TPHs	Inhalation of Vapour/gases	Site Workers/Site Maintenance	Min
			End Users	Me
			Off-site Users	Min
	Ammonia, Pesticides, Metals, Semi- metals and non-metals, PAHs, TPHs	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Me
			End Users	Me
	Ammonia, Pesticides, Metals, Semi- metals and non-metals, PAHs, TPHs	Migration via surface runoff	Surface Water	-
		Migration in solution via groundwater	Surface Water	-
			Shallow Aquifer	-
			Deep Aquifer	Me
		Direct contact with construction material	Buried structures	M
			Buried Services	M
	PAHs, TPHs	Migration of gases via permeable soils	Site Workers/Site Maintenance	Min
			End Users	
			Off-site Users	Min
			Building and confined spaces	
Clays Farm On-site sources of potential contamination	Pesticides, PAHs, TPHs	Inhalation of dust	Site Workers/Site Maintenance	Me
			End Users	Me
			Off-site Users	Me
	PAHs, TPHs	Inhalation of Vapour/gases	Site Workers/Site Maintenance	Min
			End Users	Me
			Off-site Users	Min
	Pesticides, PAHs, TPHs	Migration via surface runoff	Surface Water	-
		Migration in solution via groundwater	Surface Water	-
			Shallow Aquifer	-
			Deep Aquifer	Me
	Pesticides, PAHs, TPHs	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Me
			End Users	Me
	PAHs, TPHs	Direct contact with construction material	Buried structures	M
			Site Workers	
			Site Workers/Site Maintenance	M
			End Users	M
			Off-site Users	M
Electric boxes On-site sources of potential contamination	PCB's	Inhalation of dust	Building and confined spaces	M
			Site Workers/Site Maintenance	Me
			End Users	Me
			Off-site Users	Me
		Inhalation of Vapour/gases	Site Workers/Site Maintenance	Min
			End Users	Me
			Off-site Users	Min
		Migration via surface runoff	Surface Water	-
		Migration in solution via groundwater	Surface Water	-
			Shallow Aquifer	-
			Deep Aquifer	Min
		Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Min
			End Users	Min
		Direct contact with construction material	Buried structures	M
			Site Workers	
		Migration of gases via permeable soils	Site Workers/Site Maintenance	M
			End Users	M
			Off-site Users	M
			Building and confined spaces	M

Source (See Table 7.2 and Table 7.3)	Potential Contaminant (See Table 7.4)	Exposure Pathway (See Table 7.1)	Receptor (See Table 7.5)	Init Info Sen
Pit full of waste material (Made Ground) On-site sources of potential contamination	PAHs, TPHs, Metals, Semi-metals and non-metals, Sulphate, Asbestos	Inhalation of dust	Site Workers/Site Maintenance	Mei
			End Users	Mei
			Off-site Users	Mei
	PAHs, TPHs, Metals, Semi-metals and non-metals, Sulphate	Inhalation of Vapour/gases	Site Workers/Site Maintenance	Mik
			End Users	Mei
			Off-site Users	Mik
	PAHs, TPHs, Metals, Semi-metals and non-metals, Sulphate	Migration via surface runoff	Surface Water	-
		Migration in solution via groundwater	Surface Water	-
			Shallow Aquifer	-
			Deep Aquifer	Mei
	PAHs, TPHs, Metals, Semi-metals and non-metals, Sulphate, Asbestos	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Mei
			End Users	Mei
		Direct contact with construction material	Buried structures	M
	PAHs, TPHs, Metals, Semi-metals and non-metals, Sulphate	Migration of gases via permeable soils	Site Workers	
			Site Workers/Site Maintenance	M
			End Users	M
			Off-site Users	M
			Building and confined spaces	M

Section 8 Recommendations

8.1 General

Based on the information obtained during the compilation of this Phase I Desk Study and the preliminary conceptual site model which has indicated a **VERY LOW, LOW or MODERATE** risk of contamination, an intrusive investigation will be required to quantify the risks. The intrusive investigation may reveal additional on-site sources of contamination that were not identified in the Phase I Desk Study and Site Walkover. Any additional sources of contamination or unexpected ground conditions that may promote the migration of contamination will be included within the Conceptual Site Model.

8.2 UXO

It's not likely that the site has been/or in an area that has been subject to bombing, or shelling. No UXO Risk Assessment is needed for the site.

8.3 Proposed Further Site Works

An intrusive investigation was required to quantify the risks that have been identified within the preliminary CSM. The preliminary CSM identifies the test parameters relevant to the sources that have a pathway to a receptor. Dependant on the findings of an intrusive investigation the test parameters may be modified. The intrusive investigation will investigate and assess pollutant linkages identified in the preliminary Conceptual Site Model.

The required further environmental investigation has been presented in Table 8.1.

Table 8.1 Required Further Environmental Investigation

Potential Further works	General Purpose	Required
Investigatory Holes	To collect sufficient samples for a robust assessment	Yes
Laboratory Testing	To quantify the risks identified in the Conceptual Site Model	Yes
Risk Assessment	Assess pollutant linkages based on current contaminated land guidance and screening criteria's	Yes
Borehole well installation	To allow for continued groundwater and/or gas monitoring	Yes
Remediation	If the site-specific risk assessment reveals that the site was contaminated	Yes
Validation & Verification	To validate and verify the remedial objectives based on the site-specific risk assessment	Yes

Notes:

8.4 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

Care should be taken during excavation works especially to investigate any soils which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded, and the Local Authority and a competent and appropriate third-party Engineer/Environmental consultant notified immediately. An approval from the Local Authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on-site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

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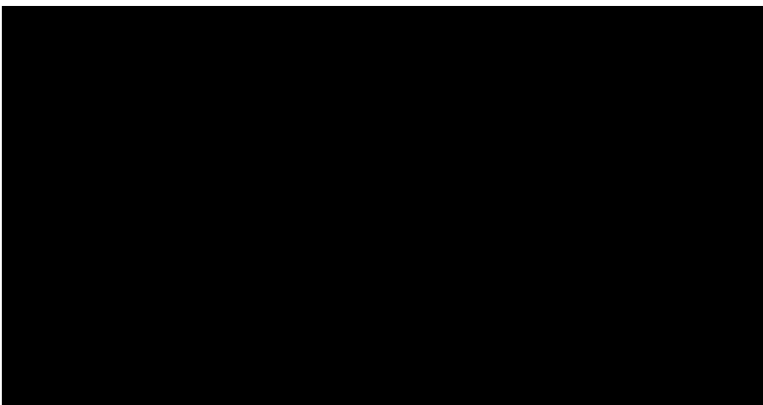


Table A.4. Risk Classifications

Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
None	No potential risk if no pollution linkage has been established.

Appendix G Risk Assessment Criteria

The classification presented in Tables A1-A4 below are modified from, 'contaminated land risk assessment: A guide to good practice, 2001, CIRIA C552'.

Table A.1. Classification of Consequence

Classification	Definition
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIA. Short term risk of pollution (note: Water Recourses 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 (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000.)
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water recourse (note: Water Recourses Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000.)
Mild	Pollution of non-sensitive water recourses. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000.)
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.)

Table A.2. Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptors 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 probable 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 short term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the long term.

Table A.3. Comparison of Consequence Against Probability

Probability	Consequence			
	Severe	Medium	Mild	Minor
High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
Likely	High risk	Moderate risk	Moderate/low risk	Low risk
Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
Unlikely	Moderate risk	Low risk	Very low risk	Very low risk

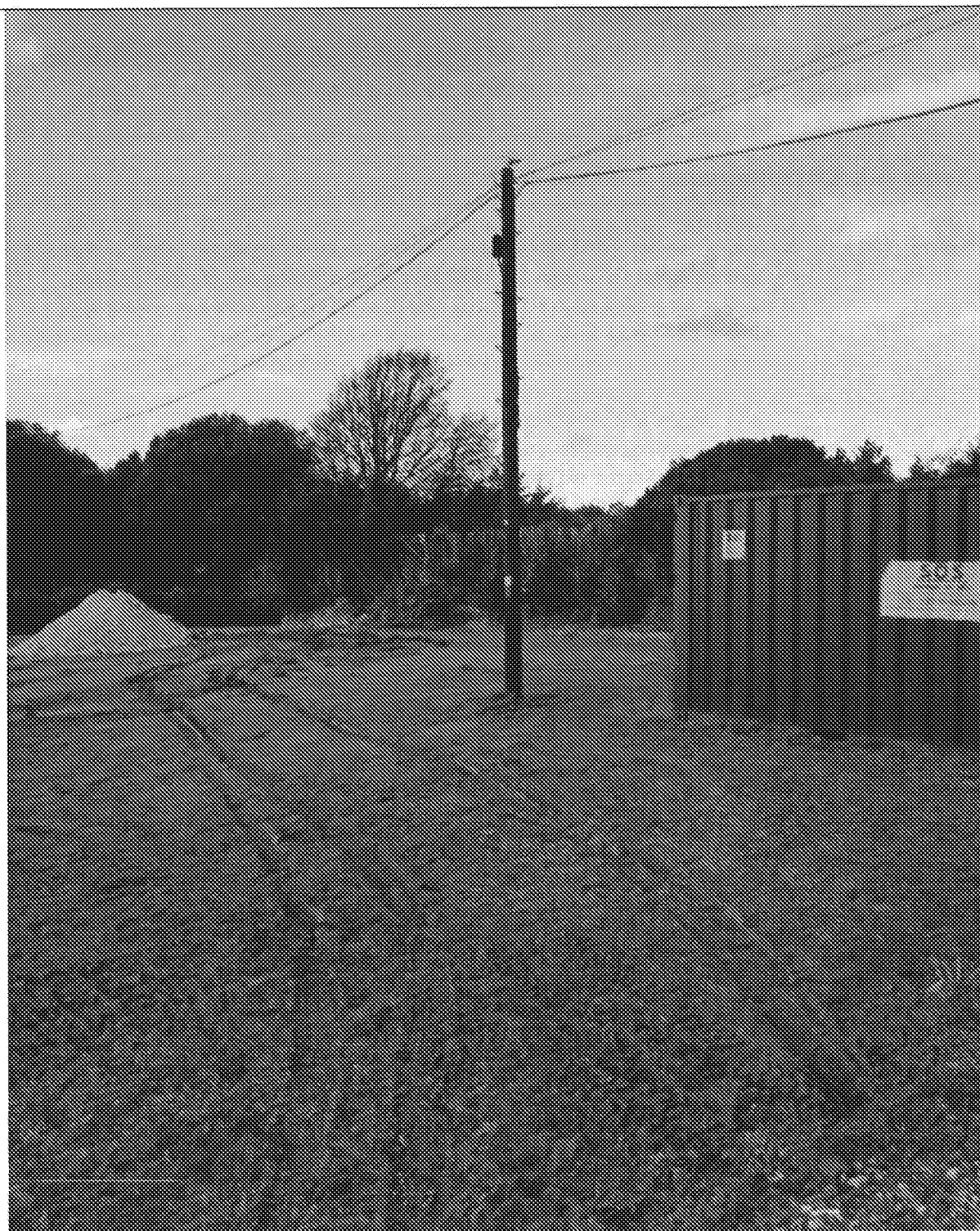


Photo 3:

Looking towards the north-west of the site



Photo 4: Two-storey warehouse units adjacent to the eastern site boundary



Photo 3:

Shed located to the south-west corner of the site



Photo 2:	Pit with Made Ground (waste material) to the north-east corner of the site
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Appendix F Site Photographs

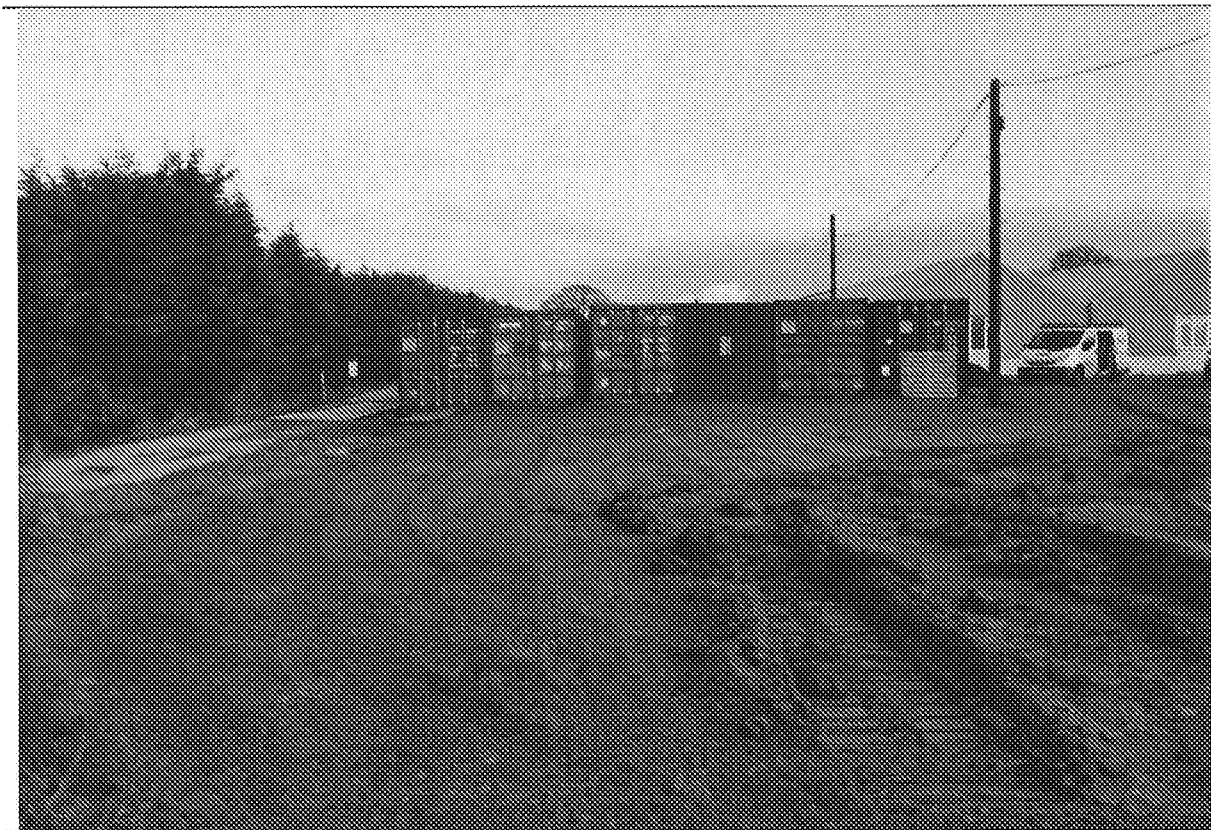
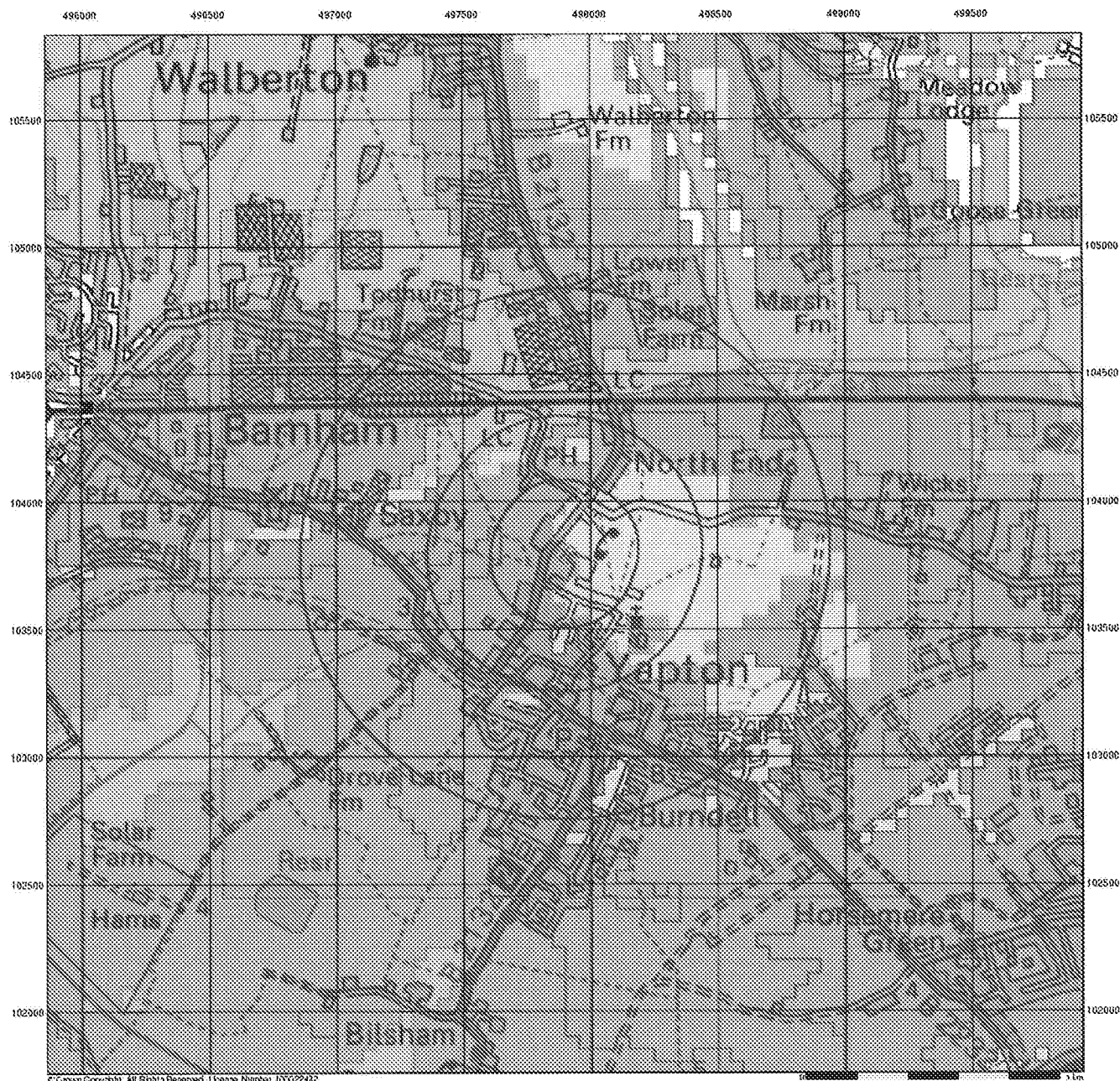
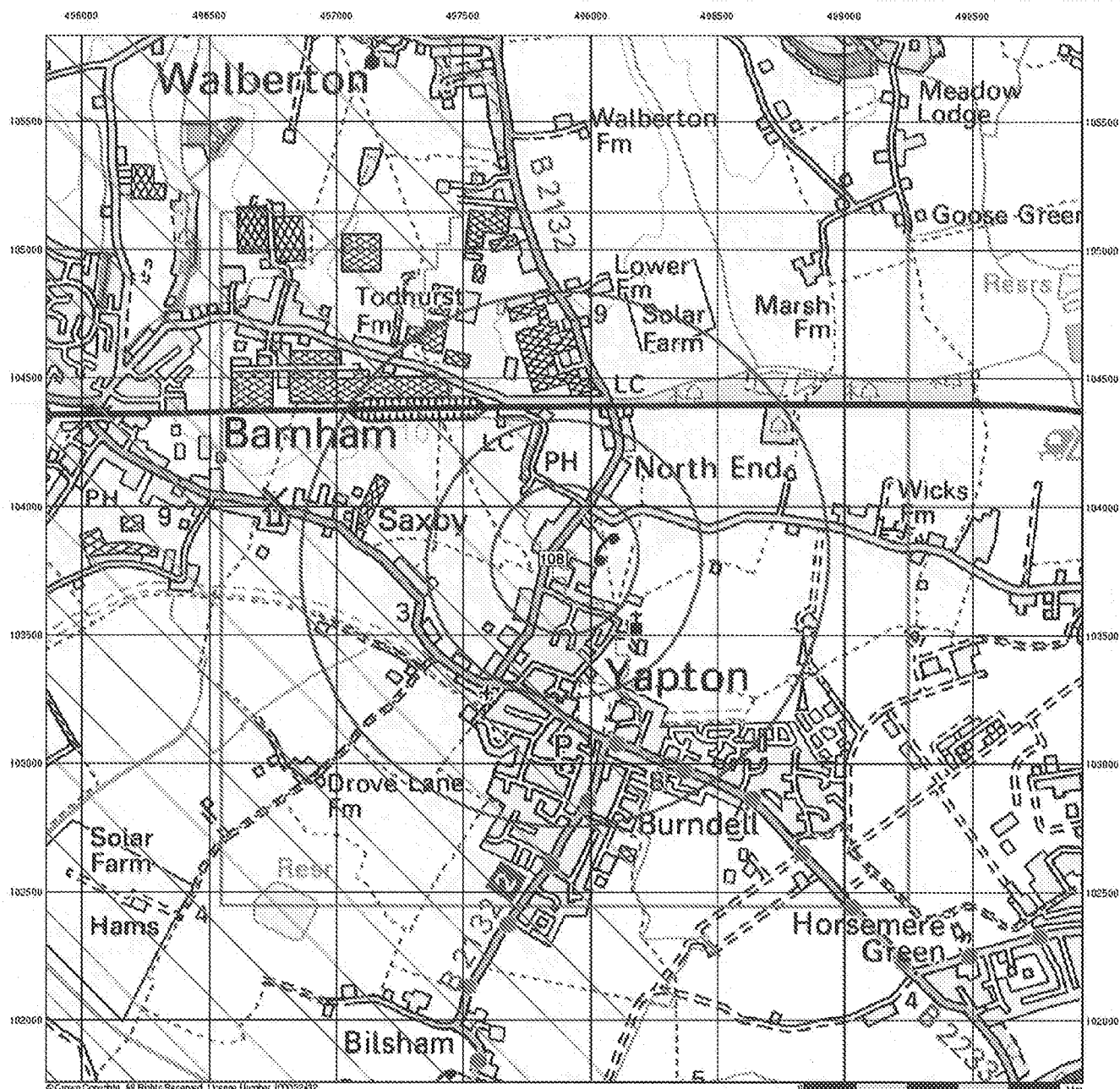
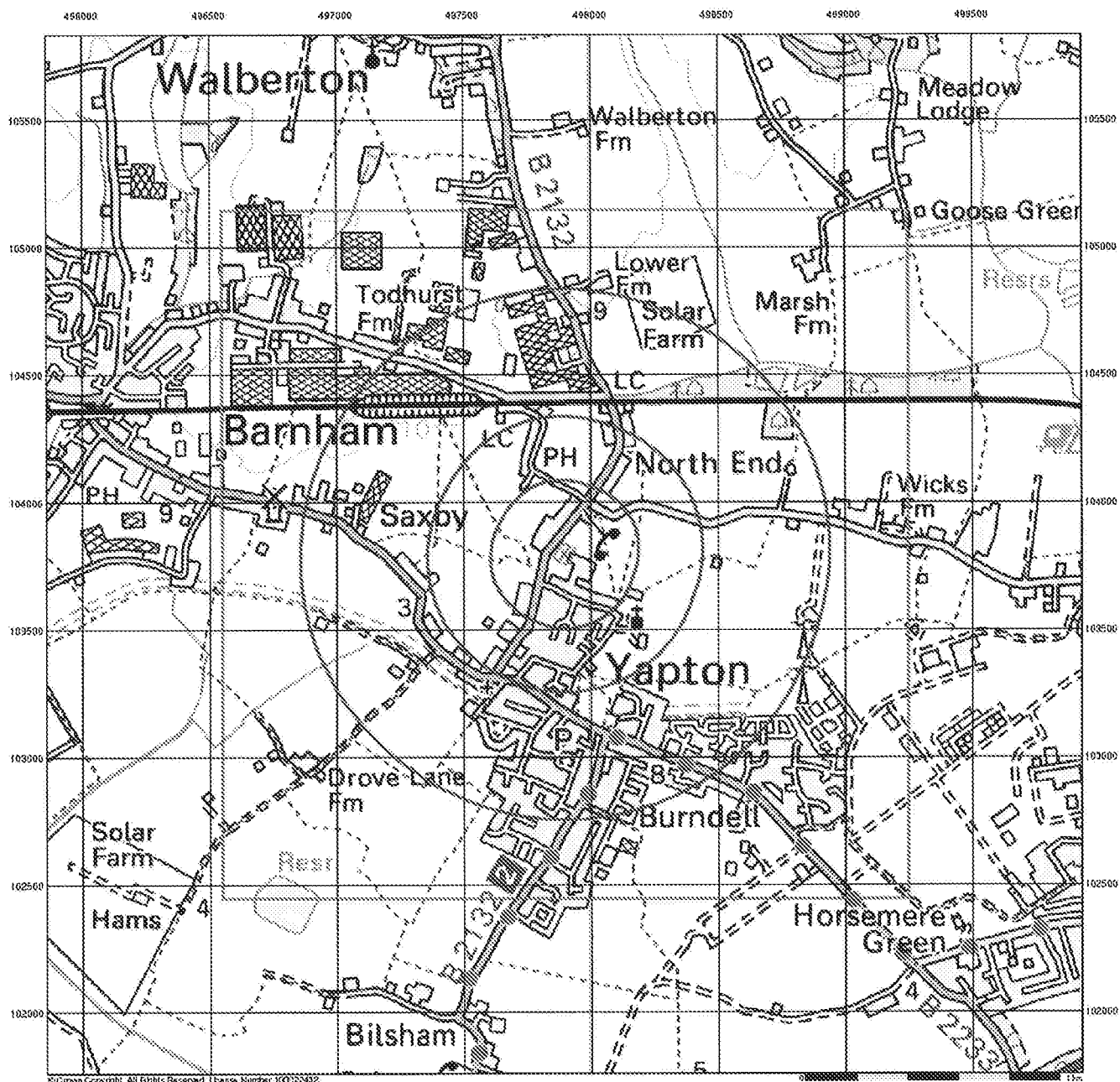


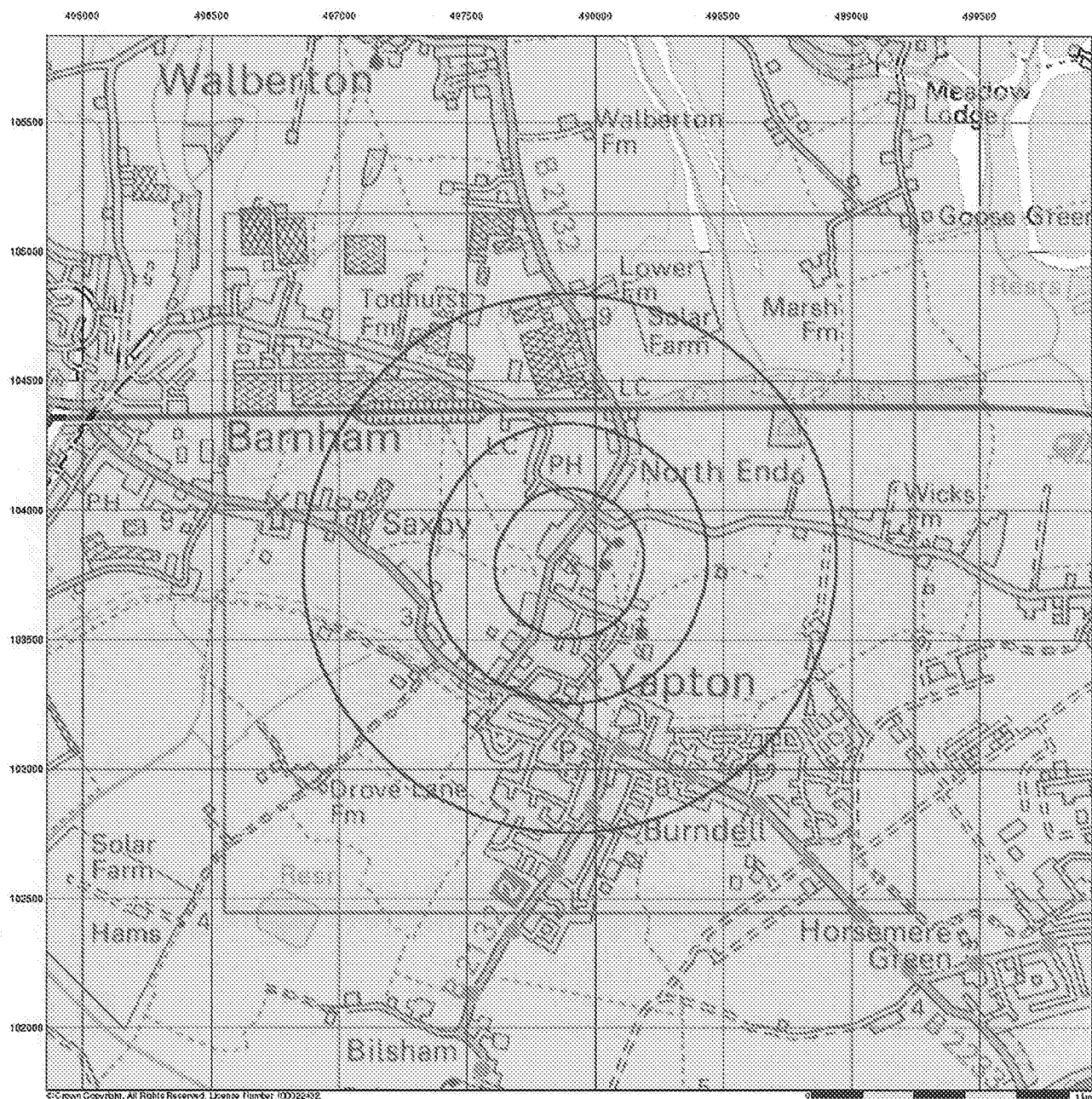
Photo 1:	Storage units against the eastern site boundary
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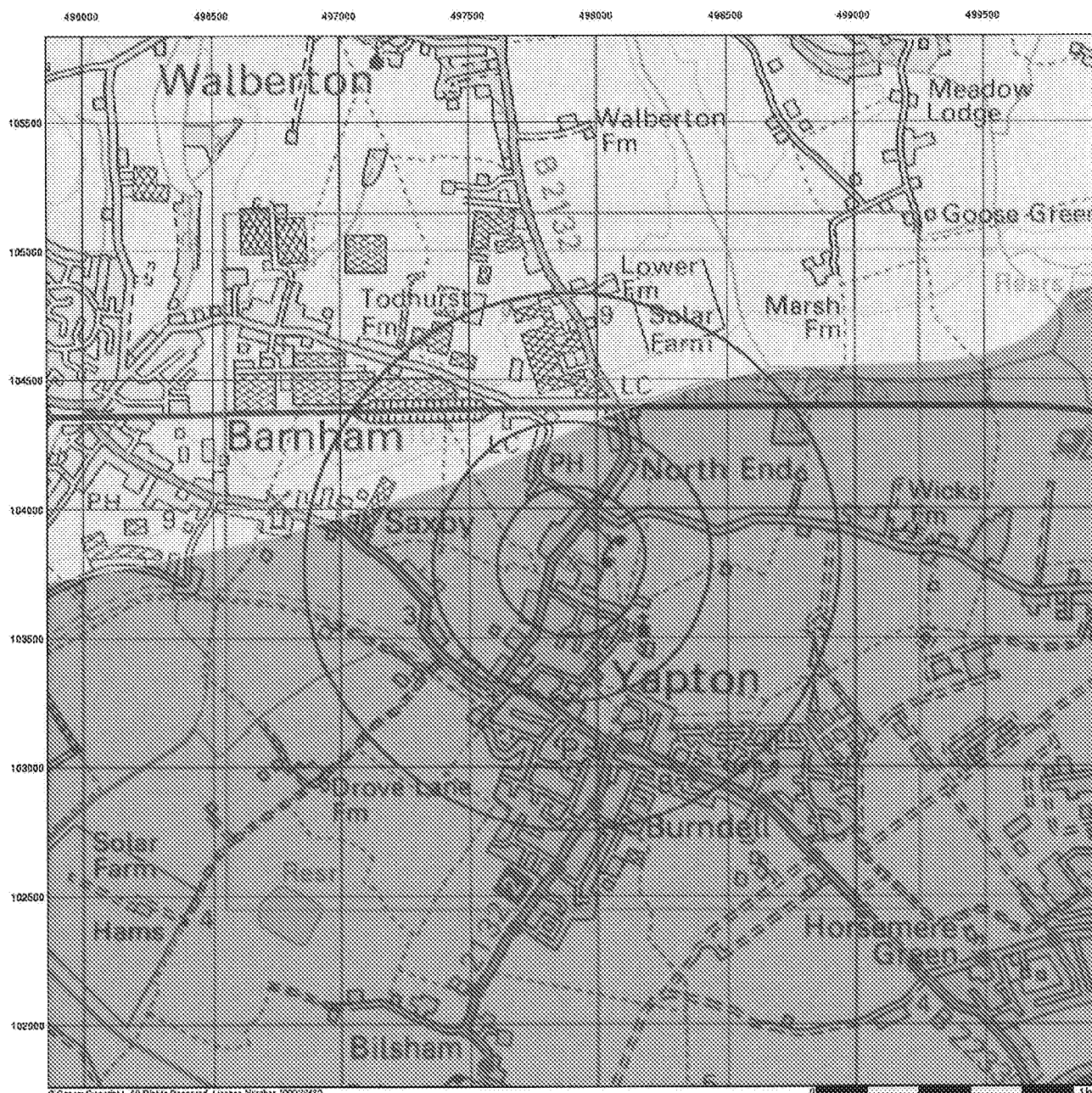
Appendix E Local Authority Search Data

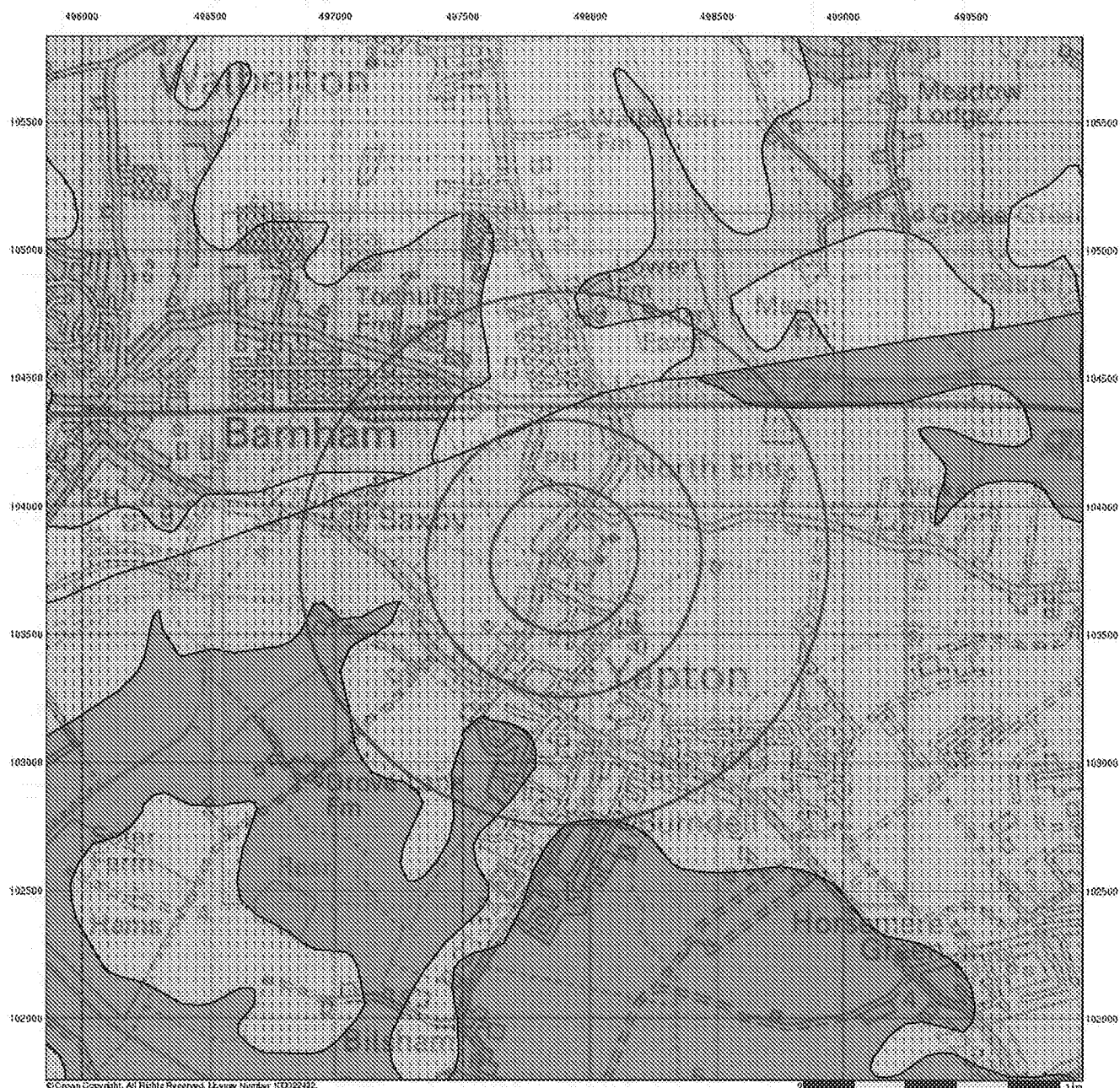


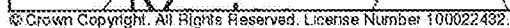








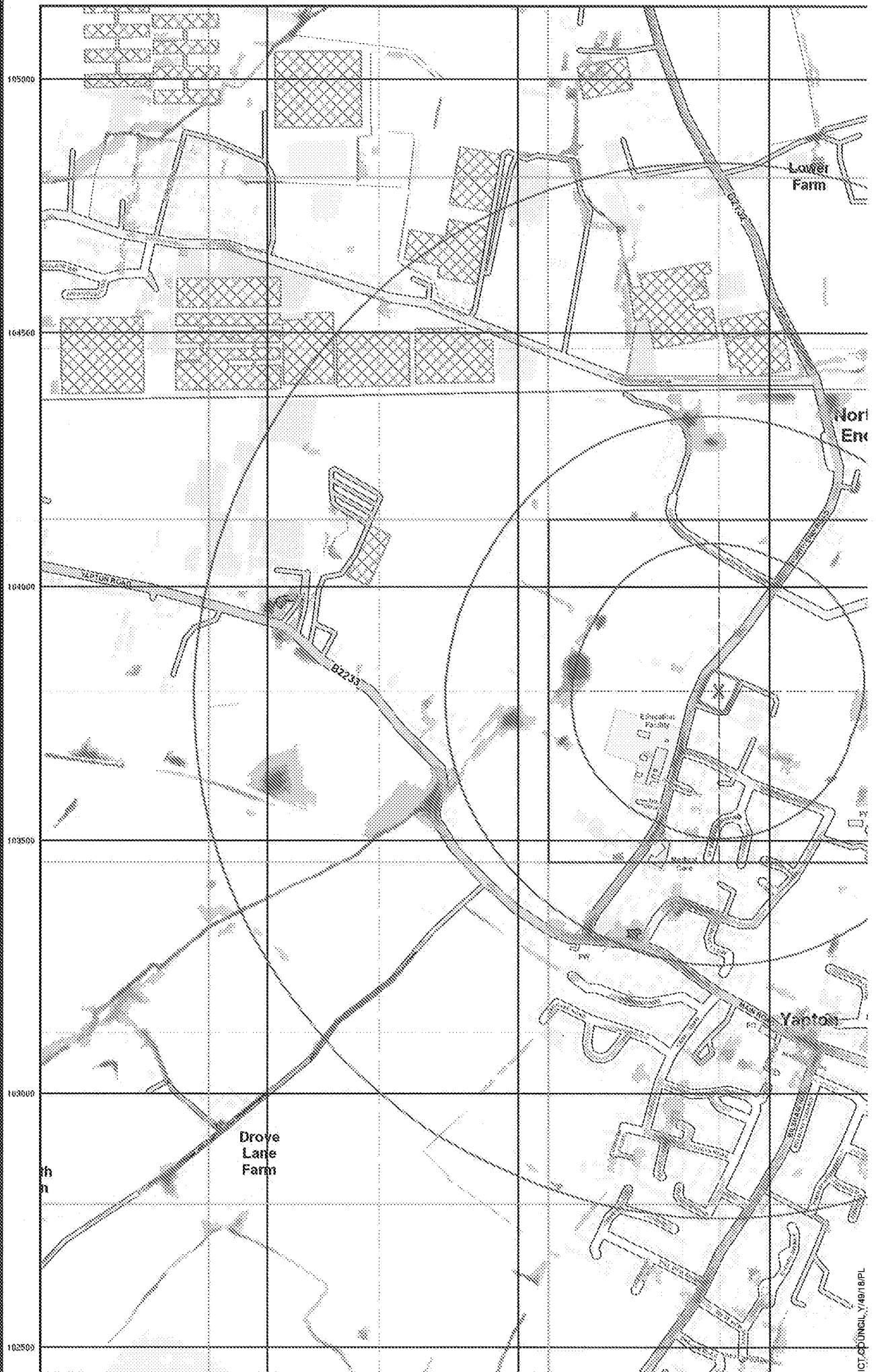


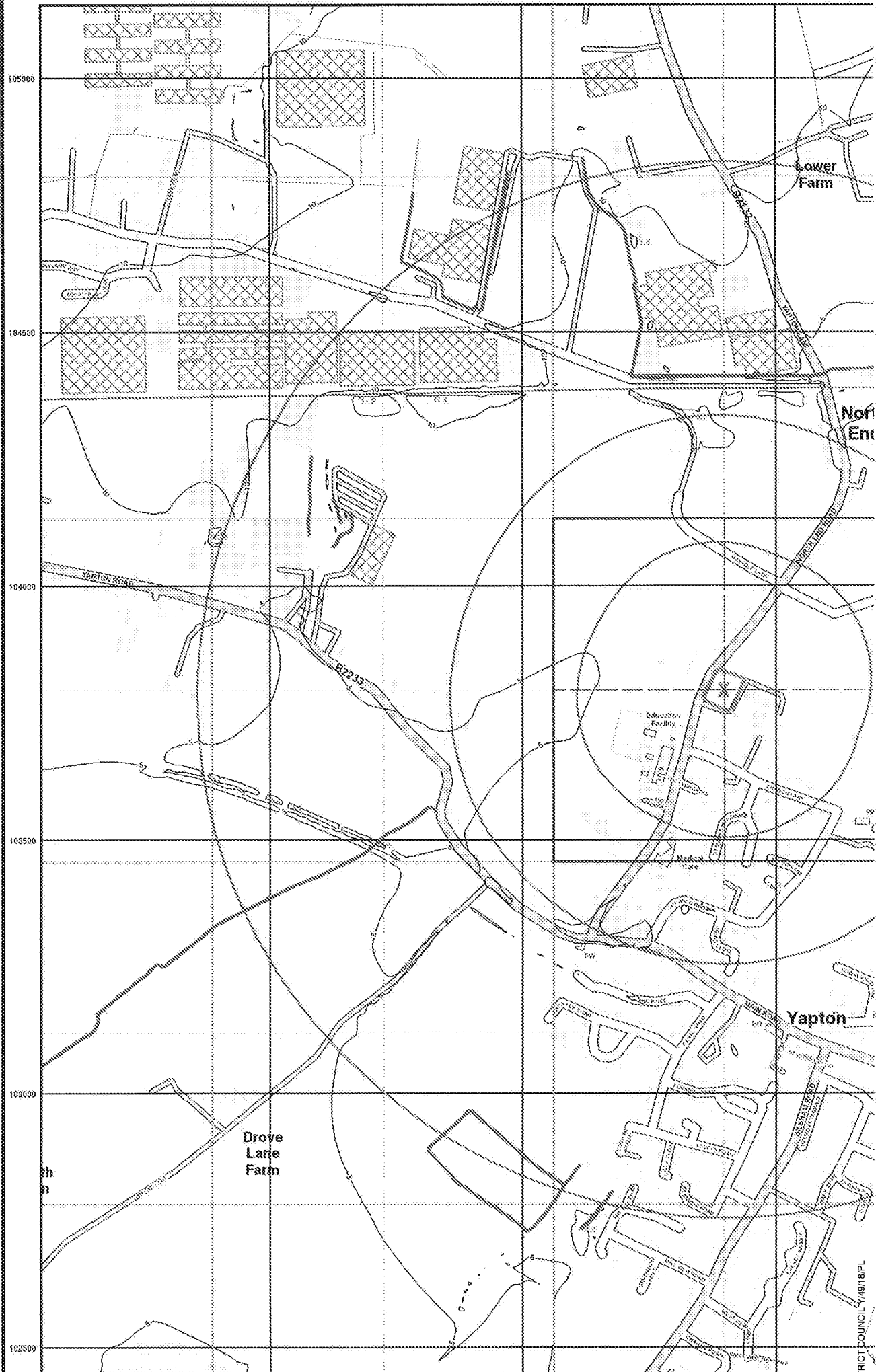


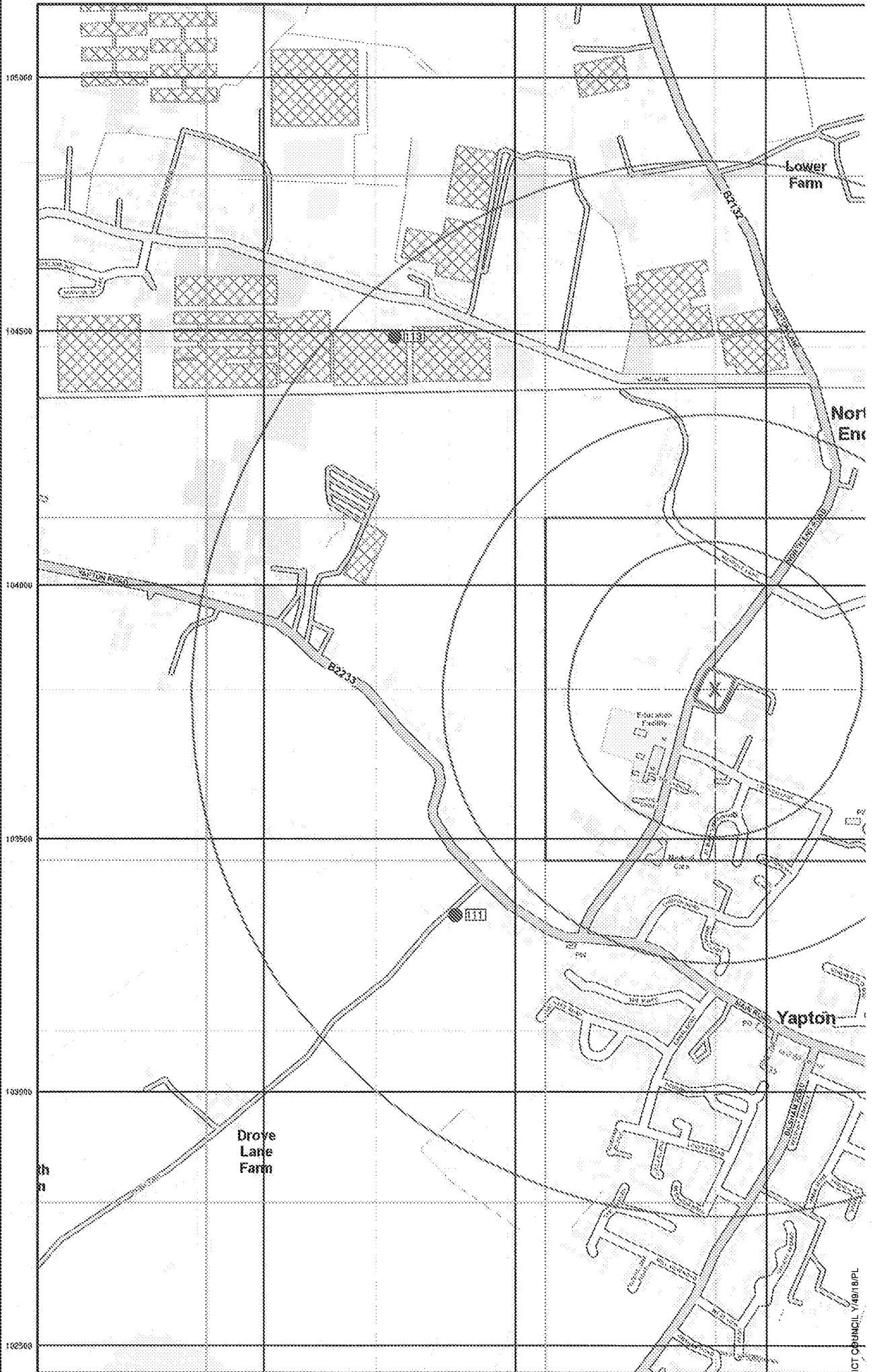
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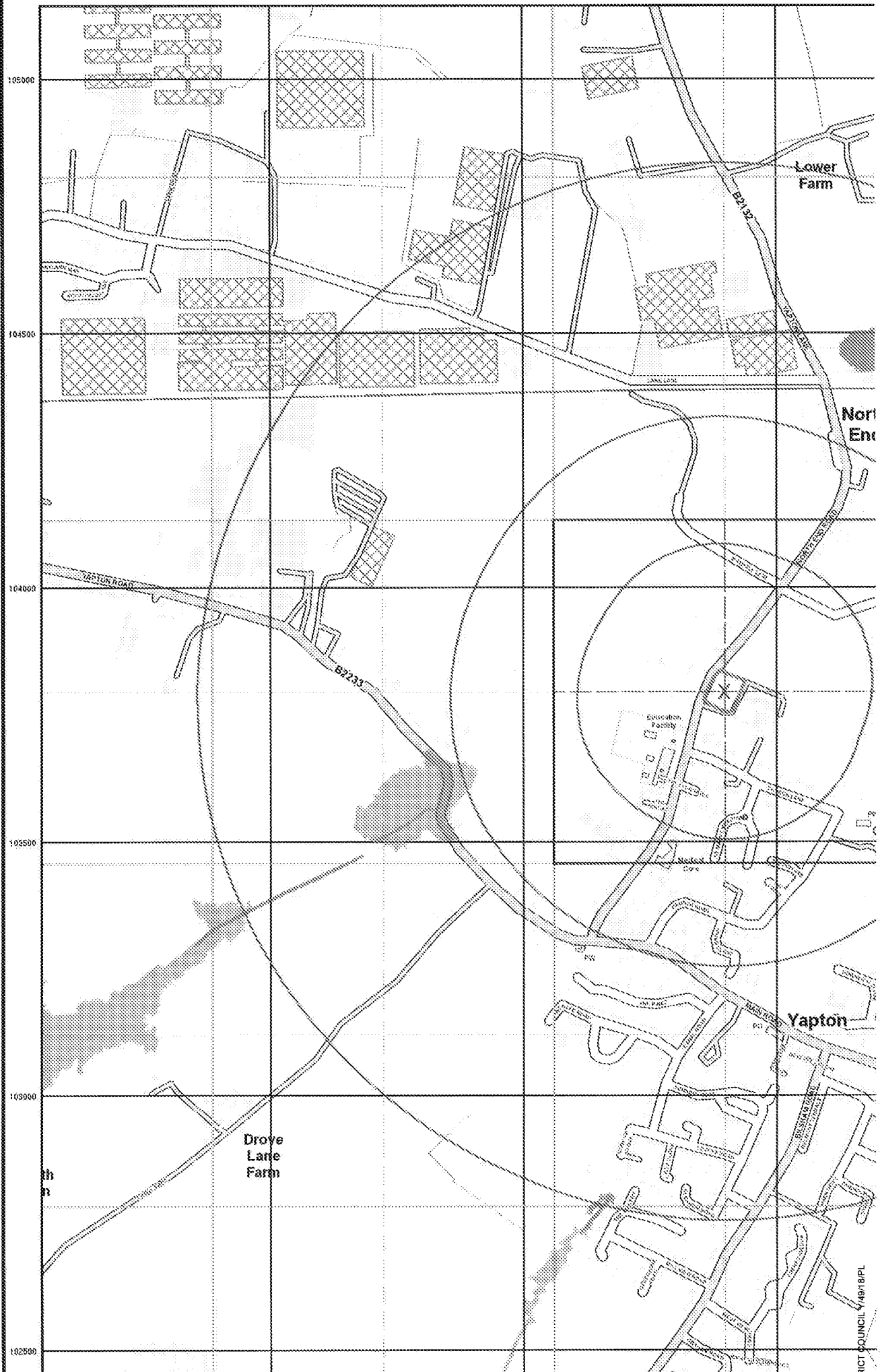
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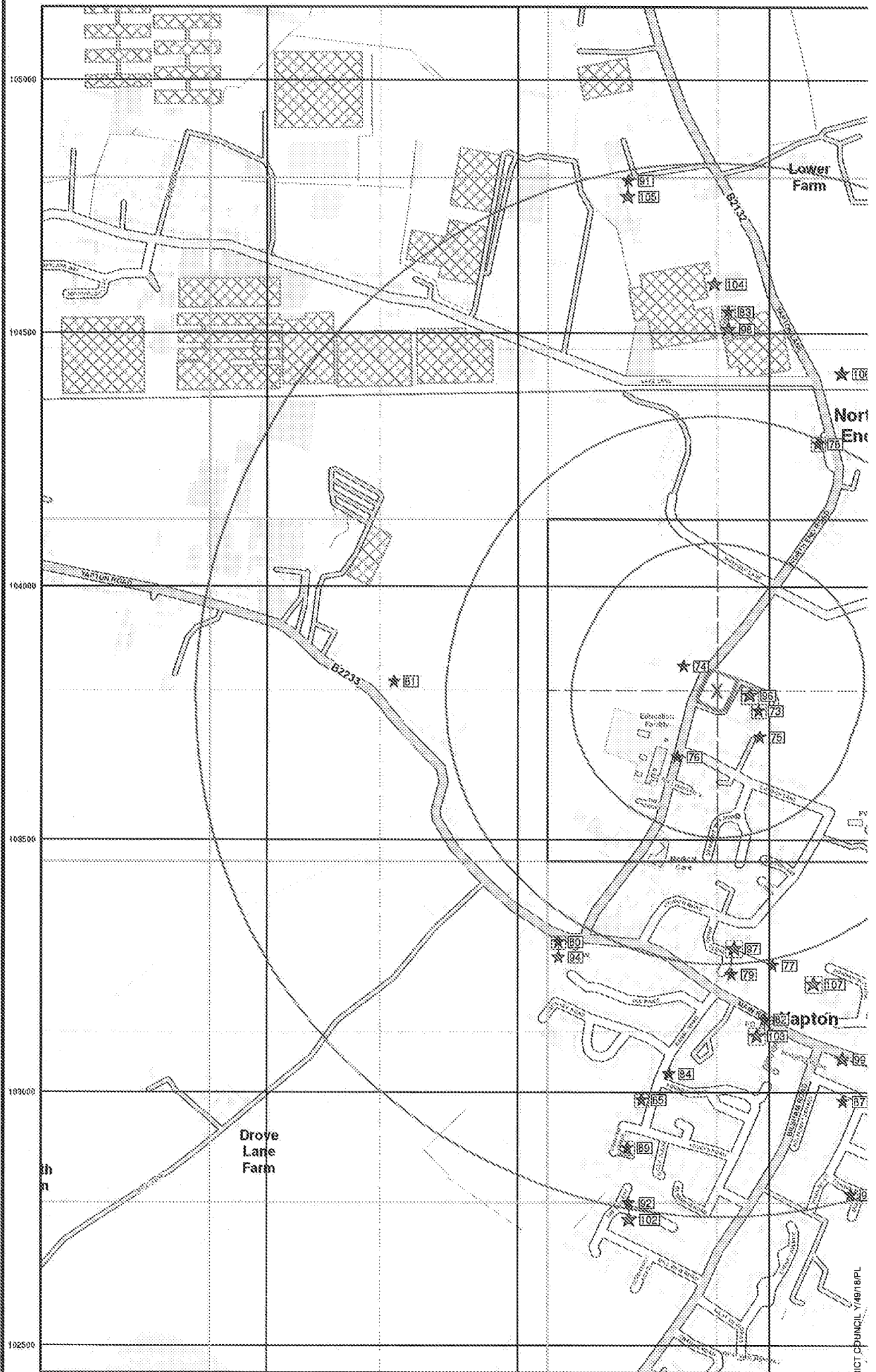
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