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Crowther Turnbull Booth

On behalf of
U and I Group Plc

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STAIRFOOT BUSINESS PARK, BARNSLEY

PHASE I ENVIRONMENTAL ASSESSMENT

RAMBOLL ENVIRON

STAIRFOOT BUSINESS PARK, BARNSLEY
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EXECUTIVE SUMMARY

Ramboll Environ was instructed by Crowther Turnbull Booth on behalf of U and I Group Plc (the "Client"), to undertake a Phase I Environmental Assessment of Stairfoot Business Park, Barnsley (the "site"). It is understood that the Client is considering the purchase of the freehold interest of the site.

The review was undertaken by desk-based research, a site inspection, review of previous reports and regulatory enquiries. The site is located within the south-eastern outskirts of Barnsley approximately 2.9km south-east of the centre of Barnsley, and occupies an area of approximately 12.2 hectares. The site is occupied by four (4) wholesale/distribution units in the north of the site (GA Kelly, BFS, Wilsons Carpets, and AF Blakemore), and undeveloped land in the south of the site.

The findings of the Phase I Environmental Review may be summarised as follows:-

- The potential for significant ground contamination to exist at the site due to current and historic uses is considered to be ***low to moderate***.
- The potential for significant ground contamination to exist at the site as a result of off-site activities is considered to be ***moderate***.
- The hydrogeological sensitivity of the site is considered to be ***moderate*** (due to the underlying Secondary A Aquifer, which includes a thickness of Sandstone). The vulnerability of groundwater resources is considered to be ***moderate*** (due to the limited hardstanding coverage of the site, however it is present in operational areas).
- The hydrological sensitivity of the site is considered to be ***moderate*** (as the nearest assessed surface watercourse has been classified as having 'Moderate' Ecological Potential, and 'Good' Chemical Quality by the EA under the WFD). The vulnerability is considered to be ***moderate to high*** (since the nearest surface watercourse is located on-site).
- The site is situated outside a currently designated floodplain. In general terms this means that the annual risk of the site flooding from rivers or seas is less than 1 in 1000 (<0.1%).
- The sensitivity of the site in relation to land use is considered to be ***moderate to high***, since the site shows evidence of potential ecological receptors, is located in an area of green belt, and residential properties are located adjacent to the north-west.

In the UK, a risk-based approach is used to assess the potential impact associated with ground contamination. The current and former uses of the site indicate a ***low to moderate*** potential for significant or widespread soil and groundwater contamination.

It is considered that there is a ***low to moderate*** risk of the site currently attracting attention of the Regulatory Authorities, or being identified as representing a significant risk to site users, or other environmental receptors, whilst in its current use. It is noted that the railway land in the west of the site has been identified by the Council for further inspection under its Part 2A obligations; however the Council regards this as a very low risk whilst in current use, and the site has not been assigned a priority.

If the site were to be redeveloped, further investigation (such as intrusive site investigations, gas risk assessment, and/or remediation) will likely be required as part of the normal planning process.

1. INTRODUCTION

1.1 Background

Ramboll Environ was instructed by Crowther Turnbull Booth on behalf of U and I Group Plc (the "Client"), to undertake a Phase I Environmental Assessment of Stairfoot Business Park, Barnsley (the "site"). The report is required in connection with the proposed purchase of the site by the Client. It is understood that the northern parts of the site will remain in their current use, and the possibility of development of the southern part of the site is under consideration.

This report has been prepared for the exclusive use of the Client and may not be relied upon by any other person or entity without Ramboll Environ's prior express written permission.

1.2 Objectives

The objectives of the Phase I Environmental Assessment are to assess the potential for ground contamination and its likely implications. Specifically the assessment considers the potential for soil and groundwater contamination, from current and historical uses on and off-site in order to assess potential risks to sensitive receptors such as:-

- occupants;
- controlled waters;
- building fabric and underground infrastructure (e.g. water supply pipeline);

and on the basis of the above, to provide an opinion on the following:-

- whether the site would be classified as Contaminated Land under Part 2A of the Environmental Protection Act 1990;
- the likelihood of action by regulatory authorities with the site in its current use;
- the likelihood of third-party claims with the site in its current use; and
- the implications in the event of a change of use.

A secondary objective is to provide information on the risk of surface water flooding at the site, and to highlight other potential environmental risks associated with the site's current use.

The assessment does not constitute an environmental compliance assessment of tenant activities at the site.

It is understood that the northern parts of the site will continue in their current use, and that development of the southern part of the site is under consideration.

1.3 Scope and Limitation

The scope of the Phase I Environmental Assessment has included the following:-

- examination of historic, recent and current Ordnance Survey plans to identify activities which might have led to contamination of soil or groundwater (for example, from manufacturing processes, from storage activities or waste disposal practices) both on the subject site and on adjacent sites;
- examination of published records and plans on the shallow and deep geology and hydrogeology of the site to assess the vulnerability and sensitivity of groundwater and surface water resources to contamination, if present, and the possible direction of movement off site, if mobile;
- search of a proprietary database of environmental permits, records and incidents at the site and surrounding area;

- enquiries to the Environmental Health and Planning Departments of the Local Authority, the Petroleum Licensing Authority;
- a walkover inspection to observe the site and the exterior and interior of any structures located on the site. In addition, Ramboll Environ observed the adjoining properties from the site or adjacent public thoroughfares; and
- a review of existing environmental reports for the site made available by the Client and Local Authority (detailed in Section 5).

Ramboll Environ's scope of work for this assignment did not include collecting samples of any environmental media (soils, waters or other materials). As such, this review cannot rule out the existence of latent conditions including contamination not identified and defined by the data and information available for Ramboll Environ's review; however, this report is intended, consistent with normal standards of practice and care, to assist the Client in identifying the risks of such latent conditions.

The conclusions presented in this report represent Ramboll Environ's best professional judgment based upon the information available and conditions existing as of the date of this report. In performing its assignment, Ramboll Environ must rely upon publicly available information, information provided by the Client and information provided by third-parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll Environ was accurate and complete.

This review is not intended as legal advice, nor is it an exhaustive review of site conditions or facility compliance. Ramboll Environ makes no representations or warranties, expressed or implied, about the conditions of the site.

2. SITE INSPECTION

The following information was derived from a site inspection undertaken by Mark Douglas and Paul Andrews of Ramboll Environ on 20th November 2015. Interviews were conducted with James Zakeri (Owner of BFS Ltd), Anne Bowkett (Part owner of GA Kelly (Fruit Sales) Ltd), Mark Hoyland (Sales Personnel of Wilsons Carpets), and David Halfield (Manager of A.F. Blakemore & Son Ltd), who have been present on-site for between two (2) and twenty (20) years.

Figures showing the location of the site, site boundary and key features on-site are presented in Appendix 1. Photographs taken during the site inspection are in Appendix 2.

2.1 Site Setting

The site is located in the south-eastern outskirts of Barnsley, approximately 2.9km south-east of the centre of Barnsley, at National Grid Reference 437270, 405070. Access to the site is from Bleachcroft Way on the northern site boundary (see Figure 1).

The full address of site is:-

Stairfoot Business Park
Barnsley
S70 3PA

The site has an area of approximately 12.2 hectares and is located at an elevation of 54m to 74m above Ordnance Datum (AOD). The site slopes generally down to the east, with some embanked areas throughout the site (generally adjacent to roads); there are a couple of areas of lower ground (a former canal in the east, and a former railway cutting in the south of the site). Land off-site also slopes generally downwards towards the east.

The site is located within an area of mixed land use, comprising predominantly commercial and residential properties, in addition to some light industrial sites. The surrounding land uses are detailed in Table 2.1 below.

Table 2.1: Adjacent and Surrounding Land Uses

Direction	Occupant	Activities	Distance
North	Vacant commercial (formerly B&Q, vacated approximately one (1) month ago).	DIY retail, noted to potentially include a small amount of fuel storage for powering sprinkler system.	Adjacent
	The Keel	Public House	40m
South	Undeveloped land	Agricultural activities	Adjacent
East	Stairfoot MOT centre	Vehicle maintenance	Adjacent
	GR Systems	Conservatory roof manufacture	Adjacent
	Trade Window Supplies	Wholesale retail	Adjacent
	Floors 2 Go Showroom	Wholesale retail	Adjacent
	Tesco supermarket	Retail, parking	Adjacent
	Expert Valeting	Vehicle washing	30m
	Tesco Petrol Filling Station	Vehicle refuelling	190m
West	STMC	Office Activities	Adjacent

Direction	Occupant	Activities	Distance
	Residential Buildings	Residential activities	Adjacent
	Allotment Gardens	Allotment Gardens	Adjacent
	Railway	N/A	Adjacent
	Hunningley Primary School, Hunni-Bee Children's Centre	School activities	30m
	Graveyard	Graveyard	30m

2.2 Site Description

The site is irregular in shape; the northern portion of the site is occupied by two (2) wholesale/warehouse buildings, each split into two (2) Units. These are known as Unit 4 (located in the north-east of the site) and Units 1, 2, and 3 (located in the west of the site). The buildings on site occupy less than approximately 10% of the site area. Two (2) Electricity Sub-Stations are present, located in the centre and northern corner of the site.

Hardstanding occupies approximately 15% of the site area. This comprises car parking/storage yard areas to the north and west of Unit 4, and to the south of Units 1, 2, and 3 (concrete, asphalt, and block paving), as well as the access Roads (Bleachroft Way, and Stairfoot Way) which pass through the north, and centre of the site (asphalt surfaced). These access roads also provide access to the office buildings off-site adjacent to the west.

Areas of soft cover on-site comprise a former canal (located along the eastern boundary of the site) which is overgrown with vegetation. The majority of the southern portion of the site is undeveloped and occupied by vegetated areas comprising a mosaic of grassland, scrub, marshy grassland, ephemeral vegetation and tall ruderal vegetation, with small areas of woodland present along the eastern site boundary. Areas of soft cover occupy approximately 75% of the total site area. The Dob Sike (a small watercourse) flows along the south-eastern site boundary.

A layout of the site is included as Figure 2 (Appendix 1).

2.3 Site Operations

The Units on-site are currently occupied by four (4) tenants as detailed below:-

- GA Kelly (Fruit Sales) Ltd (Unit 1) - forming the eastern part of the building in the west of the site. Utilised for storage/wholesale of greengrocery products. Some light food preparation activities are carried out, along with light maintenance of the two (2) forklifts, and three (3) distribution vehicles. The Unit temporarily stores vehicle parts, and paints for a friend of the company.
- BFS Ltd (Barnsley Food Supplies) (Units 2 and 3) - forming the western part of the building located in the west of the site, who utilise the site for the storage and wholesale of food catering supplies, including foodstuffs (such as fish food), as well as catering products such as bleach and degreasers.
- Wilsons Carpets (part of Unit 4) - forming the north-western corner of the building in the north of the site. The unit is utilised for storage and wholesale of flooring products (predominantly vinyl flooring, carpets and adhesives); no installation activities operate from the unit on-site.
- A.F. Blakemore & Son Ltd (part of Unit 4) - forming the southern and eastern part of the building in the north of the site. The unit is utilised for storage/wholesale, generally of

foods/drinks, chilled foods, licensed products such as tobacco, pharmaceuticals, and catering supplies (including commercial cleaning products, and bleaches).

2.4 Building Construction and Asbestos Containing Materials

Unit 4 comprises a steel frame with brick and partial profiled metal sheet elevations and pitched profiled cement sheet roof. The cement sheet roof has the potential to contain asbestos. The building is indicated by historical maps to have been built by the 1970s and extended by the 1980s. The site contact for Wilsons Carpets stated that he understood sampling and testing had been carried out on the roof 6-7 months ago, in order to replace the roof (the roof had not been replaced at the time of the site inspection). The site contact had no knowledge of the findings of the survey, and did not hold a copy of the report or any further asbestos reports for the site. The site contact for Blakemore (who occupy the majority of unit 4), had no knowledge of asbestos containing materials (ACMs) within the building, or whether any asbestos surveys had been carried out.

Units 1-3 were constructed in the mid-2000s, and are of steel frame construction with brick and profiled metal sheet elevations, and a pitched profiled metal sheet roof. The site contacts had no knowledge of any asbestos surveys carried out for the buildings. Due to the age of these new units, the potential of them containing ACMs is considered to be low.

Ramboll Environ noted discarded cement sheeting on unsurfaced ground in the centre of the site, adjacent to the south of Stairfoot Way (marked as containing asbestos), which appeared to have been fly-tipped. (i.e. not associated with the site activities).

No further labelled ACMs were noted during the inspection, although an asbestos survey was not undertaken by Ramboll Environ.

The Control of Asbestos Regulations 2012 require those parties ("Duty Holders") who have control over maintenance of buildings to "ensure that a suitable and sufficient assessment is carried out as to whether asbestos is or is liable to be present in the premises." The definition of Duty Holder may include freehold landowners and/or leasehold tenants, including sub-let tenants and landlords. Under these regulations, the Duty Holder shall ensure that: 1) account is taken of buildings plans or other relevant information and of the age of the premises; 2) an inspection is made of those parts of the premises which are reasonably accessible; and 3) where asbestos is identified, an asbestos management plan must be implemented and regularly reviewed.

2.5 Storage of Chemicals and Hazardous Substances

Site personnel had no knowledge of any current or former underground storage tanks (USTs) present on-site, and no evidence of USTs (such as unexplained manhole covers or vent pipes) was noted by Ramboll Environ during the site inspection.

There are two (2) above ground storage tanks (ASTs) present on-site; these are both located adjacent to the north-east of Unit 4, within a single brick bund. The ASTs are of metal construction. One (1) is currently in use, is of approximately 10,000 litres capacity, and contains fuel oil. The second tank is of approximately 8,000 litre capacity (not in use), and is reported to be empty (former contents unconfirmed), with a large hole in the top. Both date from at least the 1980s according to historical maps; the not in use AST has reportedly not been in service for at least this time period.

The brick bund is not lined, and rain water was noted to be seeping out through the brickwork and cracks at the base. The tanks are located in an area of newly laid aggregate/hard-core, presumed to be above unsurfaced ground.

The active tank supplies five (5) air heaters within Unit 4 which operate only during the winter period; three (3) of these heaters do not currently work. The fill points for both tanks are located

approximately 10m north-west, on the northern elevation of Unit 4. The fill points had no secondary containment and are within approximately 10m of a surface water drain. Minor staining was noted on the wall in the vicinity of the fill points (of less than $1m^2$). The tanks are connected to the fill points via aboveground pipework, and the active tank is connected to the main building by aboveground pipework (to a pump located just inside the building). No evidence of staining was noted in the vicinity of the aboveground pipework. Internally the air heaters are connected via a network of high level aboveground pipes, with no evidence of staining noted.

The use of the ASTs prior to 1996 (when the current air heaters were installed) is unconfirmed. However it likely included fuel supply to an old standby power generator, which was noted to remain present externally on the northern elevation of Unit 4. In addition further concrete plinths were noted adjacent to the east of Unit 4; these appeared to form floor slabs for former extensions, though the potential for them to have been bases for former ASTs cannot be discounted.

Four (4) 205 litre plastic drums containing sodium bisulphate solution are stored internally within Unit 1 on a wood surfaced mezzanine level. These were not located within secondary containment, though no staining was noted in the vicinity. Sodium bisulphate solution is utilised as a potato preservative. It was reported that these are no longer used on-site (although they are full) and are awaiting disposal.

Sodium bisulphate powder (alternative dry format of the potato preservative) is still used on-site, and is stored internally within a locked metal cabinet in Unit 1.

Engine oils, antifreeze, brake and clutch cleaners, and transmission fluids are stored within Unit 1 (GA Kelly) in plastic containers of no more than 20 litres, as are vehicle batteries. These reportedly result from light maintenance activities carried out on the three (3) distribution vehicles that operate out of the unit, and (two (2) forklift trucks (one (1) of which is on permanent loan to Units 2-3). The chemicals and batteries are stored internally on laminate/concrete floor) with no evidence of significant staining.

A number of paints (including oil/solvent based paints), are stored on the mezzanine level in Unit 1 in metal tins of no more than 10 litres.

Commercial cleaning chemicals (such as bleach, and detergents are stored in a number of instances across the site including within the staff room of Unit 1, within the toilets of Wilsons Carpets (part of Unit 4). No evidence of staining was noted in the vicinity.

Stock of catering supplies (which include bleaches, degreasers, detergents, and other commercial cleaning products in 5 litre plastic containers) are stored within both Units 4 (AF Blakemore), and Units 2 and 3 (BFS). Adhesive stock (in plastic containers of no more than 25 litres, and metal cans of less than 5 litres) is also present within Wilsons Carpets (part of Unit 4).

2.6 Emissions to Air

Five (5) fuel-oil fuelled air heaters are present within Unit 4 (Blakemore): two (2) situated at ground level and three (3) overhead; three (3) of these do not currently work. These were all installed in 1996, and have a heat output of 146.5kW. The heaters are run only during the winter months. All other heating on-site (where present) is electric.

It is considered unlikely that activities observed on-site would be of sufficient capacity to require authorisation from the Regulatory Authorities.

2.7 Water, Wastewater and Drainage

Drainage plans were not made available to Ramboll Environ at the time of the site visit. Details of the route of discharge of all drainage and wastewater on-site are not confirmed. The site is supplied by mains water.

A potential interceptor was noted adjacent to the west of Unit 4. This was characterised by three (3) adjacent manhole covers, and a feature which is likely to be an associated ventilation pipe. The potential interceptor was located within a rectangular concrete surfaced area which sloped downwards to a drain located in the centre. This may be indicative of a former vehicle washing facility. No site contacts were aware of the presence of interceptors on-site.

The site contacts present during the site inspection within Unit 1 (GA Kelly) were unable to confirm whether a trade effluent consent was held or required for the discharge of process wastewater from potato preparation activities. It was reported that Yorkshire Water undertakes regular testing of wastewater discharges from a point external to the unit. No further information or documentation was available in relation to this during the site visit. The need for such consents is usually at the discretion of the Local Authority and/or the Environment Agency. Given the sites activities (preservation of potatoes with sodium bisulphate) it is considered likely that the Authorities would require a consent to be in place. Compliance with requirements of water undertakers in relation to discharge consents is considered to be a tenant issue.

A large depression was observed to the south of Unit 4 which has been identified by planning records as a surface water collection lagoon; surface water discharges from at least part of the site are indicated to drain through this.

2.8 Waste Disposal

Waste storage areas on-site comprise three (3) main areas; these are located on

- hardstanding within the yard area adjacent to the north of Unit 4 (utilised by Blakemore);
- hardstanding within the car park adjacent to the north-west of Unit 4 (utilised by Wilsons Carpets); and
- hardstanding and partially on unsurfaced ground adjacent to the south and east of Units 1, 2, and 3 (utilised by BFS and GA Kelly).

Wastes generated on-site comprise general wastes (generated by all units) such as food wastes, plastic packaging, and in some instances cardboard and other plastics. These are stored within metals skips (for Blakemore, and BFS/GA Kelly), and a wheelie bin (for Wilsons Carpets) and collected by the contractors Biffa, Veolia and Betterpack. Cardboard wastes generated on-site (generated by BFS/GA Kelly, and Blakemore) are stored within a shipping container for BFS/GA Kelly), and bailed and stored internally on pallets (by Blakemore), before being returned to head office. Waste electrical equipment is also reported to be generated by Blakemore, which is stored internally and returned to head office as needed. No other hazardous wastes were reported to be generated on-site.

No significant evidence of staining was noted in the vicinity of any of the waste storage areas, however housekeeping was poor in some instances with wastes were piled up adjacent to the waste storage containers associated with GA Kelly and BFS.

Fly tipping was evident in multiple areas across the site. This was noted to include asbestos cement sheeting (marked as such). There was also evidence of burning of wastes on an area of unsurfaced ground in the centre/west of the site (south of Stairfoot Road).

2.9 PCBs

There are two (2) electricity sub-stations present on-site. These are located in the northern corner of the site, and in the centre of the site. Both are operated by Northern Powergrid (Yorkshire) Plc. The age of the sub-station in the centre of the site is indicated by planning records to be mid-2000s, the Sub-Station in the north of the site is evident on historical mapping from the 1970s), and as such it is possible that polychlorinated biphenyl's (PCBs) could be present within transformer coolant oils. Northern Powergrid (Yorkshire) Plc would have primary responsibility for assessing and maintaining the equipment, including the coolant oils.

No further equipment was present on-site that has the potential to contain PCBs (such as old hydraulic lifts).

2.10 Ozone Depleting Substances

There are a total of six (6) large 'walk-in' fridges/freezers present on-site. One (1) is located within Blakemore (Unit 4), and five (5) are located within Unit 2, and 3 (BFS). Also present are three (3) chilled rooms. Two (2) are located within Unit 1 (GA Kelly), and one (1) is within Unit 4 (Blakemore); each of these rooms is supplied by one (1) or two (2) air conditioning units.

The refrigerants utilised for the majority of these units were unconfirmed, and no F-Gas registers were held by any of the units. However the three (3) walk in fridges (BFS - Units 1-2), were marked as utilising R22. In addition a maintenance report for the chilled room in Unit 4 (Blakemore) listed the refrigerant as 22 (likely R22). The unit for one (1) of the chilled rooms in Unit 1 (GA Kelly) was marked as R404A. No further documentation was available for view, and the remaining refrigerants were unconfirmed.

R404A is a non-ozone depleting substance, however R22 is an ozone depleting substance. The use of ozone depleting substances can continue to the useful life of equipment, however like for like replacement of such substances has now been banned. The use of HCFC and HFC blends requires compliance with the Fluorinated Greenhouse Gases Regulations 2009. Compliance with the Regulations is the responsibility of the operator.

Refrigerant gases are not generally considered to pose a ground contamination risk.

2.11 Other Issues

No significant flooding issues were reported on-site. Pooling of water was noted in an area of car parking/hardstanding to the south of Unit 4 (in the north of the site) during the site inspection. A further incident of pooling of water externally on hardstanding was reported in the car parking area adjacent to the south of Unit 1. In addition Wilsons Carpets (part of Unit 4) experience leakage from the roof. This has not damaged stock, however has marked carpeted areas, and requires the occupants place/empty plastic containers during times of heavy rainfall.

An area of Himalayan Balsam (*Impatiens glandulifera*), a non-native invasive species, was identified along the bank of Dob Sike in the south-east of the site. It is an offence to allow Himalayan Balsam to spread or to plant it in the wild.

3. HISTORICAL & REGULATORY INFORMATION

3.1 Map History

Ramboll Environ has undertaken a review of historical mapping and aerial imagery (where available) obtained from a proprietary environmental database which is summarised below. Selected historical maps are presented in Appendix 3.

The historical development of the site and surrounding area is detailed in Table 3.1 below.

Table 3.1: Site History

Date & Scale	Features On-Site	Features Off-Site
1855 1:10,560	The site is undeveloped and likely in agricultural use, a road extends on-site from the west, which terminates in the centre of the site. An Old Quarry (Sandstone) is located in the south-west of the site. A small feature surrounded by embankments (later annotated as a Reservoir), and a further circular feature (later annotated as a pond) are present in the south of the site. Dob Sike flows along the south-eastern site boundary (in a general east/north-easterly direction), and Dearne and Dove Canal (later also annotated as the Sheffield & South Yorkshire Navigation) is present in the east of the site along the site boundary (with a north/south orientation). The two (2) meet at the eastern corner of the site where the Dob Sike is culverted beneath the Canal.	The surrounds are predominantly undeveloped and likely in agricultural use, with a small number of industrial buildings present in the area. In the vicinity of the site this comprises Stairfoot Brickworks (located adjacent to the north-east) and Stairfoot Bleach and Dye Works (100m north). A railway is located 70m north-east with a north-west/south-east orientation (later annotated as the London and North-Eastern Railway, Mexborough and Barnsley Branch. Darne and Dove Canal extends off-site to the north and south, and Dob Sike extends off-site to the east and west (flowing in a general easterly direction). A raised Reservoir is located 40m north.
1892-94 1:2,500 1:10,560	A small Well is annotated in the south-eastern corner of the site (on this map edition only). The Old Quarry (Sandstone) in the south-west of the site is no longer shown (potentially having been infilled).	Ardsley Cemetery is 25m south-west, a Station has been annotated 170m north, Hope Glass Works has been constructed 280m north-west (including a Kiln), and New Oaks Colliery has been constructed 100m north-east. Development has occurred to the north-west and north (from 50m), predominantly comprising residential buildings, with churches and some commercial/industrial buildings also present. Stairfoot Brickworks (adjacent to the north-east) is no longer annotated, though some associated structures remain. Stairfoot Bleach and Dye Works (100m north) is no longer annotated, though the buildings remain.

Date & Scale	Features On-Site	Features Off-Site
1906-07 1:2,500 1:10,560	Manor Flint Glass Works has been constructed to the north-east, with part of the main building and a further small structure extending slightly onto the north-eastern corner of the site. The Midlands Railway, Stairfoot and Cudworth Branch has been constructed through the west of the site with a north/south orientation. The railway is located partially on an embankment (the central / northern part of the site), and partially in a cutting (the south of the site and extending off-site. The cutting is illustrated partially as a quarry, indicating that excavations may have removed portions of the sandstone bedrock. The on-site road now passes through a bridge under the railway (in the north-western corner of the site).	Manor Flint Glass Works is located adjacent to the north-east (extending marginally on-site). The railway on-site extends off-site to the north and south, and an additional railway is located adjacent to the south-western site boundary (located partially in a cutting and partially on an embankment). The features associated with Stairfoot Brickworks (small structures and features, potentially ponds adjacent to the north), are no longer present. A heap (potentially associated with railway cutting excavations) is present 80m south.
1931-32 1:2,500 1:10,560	A small structure and an unconfirmed feature (potentially a fenced off area or hardstanding), are located adjacent to the east of the railway in the north of the western part of the site.	Allotment Gardens are located adjacent to the east/north-east of the site and 10m west. Manor Flint Glass Works (adjacent to the north-east) has undergone slight expansion to the north with further small structures present. New Oaks Colliery (100m north-east) is now annotated as Oaks Chemical Plant, has Tanks annotated, and a small potentially associated Refuse/Slag Heap 220m north-east. Hope Glass Works (280m north-west) appears to have been demolished.
1938 1:10,560	No significant changes noted on-site.	No significant changes in the vicinity noted.
1948 1:10,560	No significant changes noted on-site.	No significant changes in the vicinity noted.
1955-56 1:10,000	No significant changes noted on-site.	A large Clay Pit was annotated 260m east with a tramway connecting to a Brickworks (400m east).
1960-62 1:1,250 (Partial Coverage) 1:2,500	The small structure in the north of the western part of the site is annotated as 'Fairholme', and is connected to the road via a track. This is reported as private residence with a fuel storage	Unidentified mounds/uneven ground is shown adjacent to the north-east of the site. Hunningly County Primary School is located 30m east.

Date & Scale	Features On-Site	Features Off-Site
	tank according to previous reports (see Section 5). Four (4) small structures are present adjacent. Manor Flint Glass Works (extending marginally onto the north-east of the site) has been demolished. A small drain issues in the centre/north of the site, and flows in a south-easterly direction before joining the Canal. The Sheffield & South Yorkshire Navigation Darne & Dove Canal is depicted partially as marshland in the south-east of the site (indicated to have been partially infilled/silted up).	A Factory is under construction 280m north-west (later annotated as a Clothing Factory). The building formerly annotated as Stairfoot Bleach and Dye Works (100m north) is now annotated as Bleachcroft Farm, and further structures have been constructed 60m north (annotated as Bleachcroft). The majority of Manor Flint Glass Works (extending marginally onto the north-east of the site) has been demolished.
1966 1:10,000	No significant changes noted on-site.	Oak Chemical Plant (100m north-east) is now annotated only as a Works, and the potentially associated Refuse/Slag Heap (220m north-east) is no longer shown.
1967 1:1,250 (Partial Coverage)	No site coverage.	An unidentified heap is shown 200m north-east.
1972-74 1:1,250 (Partial Coverage) 1:10,000 (Partial Coverage)	A Warehouse has been constructed in the north of the site and an Electricity Sub-Station constructed in the northern corner. The entirety of the Canal in the east of the site is now depicted as marshland (however still includes an annotation of Water). The railway is now annotated as dismantled.	Two (2) Garages have been constructed adjacent and 35m north-east, a Glass Fibre Works is adjacent to the north, a large Warehouse is 10m north (replacing the Reservoir), a small Engineering Works is 180m north-west, and a small Foundry 220m north-west. The Allotment Gardens (adjacent to the north-east) are no longer annotated, and the majority of the buildings associated with the Works 100m north (formerly referred to as a Chemical Plant) have been demolished. The railway extending off-site to the north and south is annotated as dismantled, and the Station (170 north) is no longer annotated. Bleachcroft and Bleachcroft Farm (60m and 100m north respectively have been demolished.
1980-84 1:1,250 (Partial Coverage) 1:10,000	The Warehouse building in the north of the site has undergone extension to the south and east (shown from 1982), and a further small structure is shown	A small Works has been constructed 120m north, and a collection of small Depots, Warehouses, and Works is present 280m north-west.

Date & Scale	Features On-Site	Features Off-Site
	to its north-east (likely the Tanks noted during the site inspection). Bleachcroft Way is present extending on-site from the north (and along a north-western boundary). A large circular Tank is partially on the north of the western part of the site (associated with the off-site Warehouse). The reservoir in the south of the site is shown to no longer contain water (though embankments remain), and the pond was no longer shown on a 1984 map segment.	The Clay Pit 260m north-east appears to have undergone expansion (approximately 150m north-east). The Warehouse building 10m north has undergone expansion to the south and a large circular Tank is present adjacent to its south (extending on-site). The unidentified mounds/uneven ground adjacent to the north-east are no longer shown. The off-site portions of the Canal (to the north and south) are no longer shown (having potentially been infilled).
1989 1:10,000 (Partial Coverage)	No significant changes noted on-site.	No significant changes noted in the vicinity.
1990 1:1,250	No significant changes noted on-site.	A Superstore and associated parking have been constructed adjacent to the east of the site, including a feature with the layout of a petrol filling station (190m east).
1993 1:1,250 1:10,000 (Partial Coverage)	No significant changes noted on-site.	A canopied area is shown 30m north-east (adjacent to one (1) of the Garages) in a format potentially indicative of refuelling activities. The railway 70m north-east is annotated as dismantled.
2000 1:10,000	The canal in the east of the site is represented as a water body.	A Refuse/Slag Heap is depicted approximately 100m north-east, replacing the Clay Pit.
2002 Google Earth Aerial Photography	Approximately 50% of the central portion of the site appears to be undergoing ground working (movement of soil creating a heaps and pits). The works are considered to likely comprise site levelling, and include the removal of the railway embankment (in the west of the site and construction of a storm water detention basin (in the east of the site, referenced by planning records). Adjacent to the north of the storm water detention basin is a line of apparently newly lain material which potentially comprises a surface water pipe line).	A large building is under construction adjacent to the north. The Warehouse building adjacent to the north has been demolished (including the circular tank extending on-site), as has the Glass Fibre Works (adjacent to the north, recently annotated only as a Works). The on-site groundworks extend off-site to the north and west.

Date & Scale	Features On-Site	Features Off-Site
	Unidentified materials (potentially ground materials/soil may have been deposited in the railway cutting in the south of the site which is identifiable by an un-vegetated area surrounded by a vegetated land, and with what appears to be a vehicle track connecting it to the main area of groundworking to the north. A small portion of the former railway cutting at its northern end appears to contain further unidentified materials in addition to soil. A collection of structures are present in the centre of the site (likely temporary). The small structures in the north of the western part of the site have been demolished (including Fairholme), as has the tank extending onto the north of the western part of the site. No water can be seen in the canal in the east of the site.	
2006 1:10,000	The building in the north of the site is annotated as Stairfoot Business Park, and the railway cutting in the south of the site remains depicted as a pit.	The building under construction adjacent to the north/west appears complete and appears to include a circular feature adjacent to its south (potentially a sprinkler water storage tank, indicative of fuel storage to power the sprinkler system).
2008 Google Earth Aerial Photography	A further building has been constructed in the north of the western part of the site, and a small structure in the centre of the site. The groundworkings are no longer shown, and the entirety of the southern part of the site is vegetated.	Two (2) building of commercial appearance have been constructed adjacent to the west of the site.
2009 Google Earth Aerial Photography, and Google Street View	No significant changes noted on-site.	The carparking associated with the Superstore adjacent to the east has undergone extension, and the canopied area (30m north-east) at the Garage is noted to comprises a car wash at this time (not refuelling).
2015 1:10,000	No significant changes noted on-site.	The Refuse/Slag Heap 100m north-east is no longer depicted (annotated as a Clay Pit and Disused Workings).

3.2 Environmental Database Records

The following information has been obtained from a search of a publicly available third-party environmental database (dated 27th November 2015):-

- There are no contaminated land register entries/notices within a 1km radius of the site.
- There are three (3) former landfill sites recorded within a 250m radius of the site (i.e. the "planning consultation zone"). The nearest is positioned in the east of the site and extends off-site to the north (occupying the area of the Canal); this is referred to as a Disused Canal, and no further information is available on this landfill. The second nearest landfill is positioned 90m north-east of the site and is variously known as Stairfoot Brickworks, Stairfoot North Quarry Phase 2, Stairfoot Landfill Site, and other names. The landfill is indicated to have undergone a number of phases of infilling over differing but overlapping and/or adjoining areas. The near portions (within 250m) are recoded as having being infilled between 1979 and 1992, with industrial, commercial, household, and special waste and liquid sludge (including asbestos, paint waste, used filter materials, old vehicles, food and animal processing wastes, scrap metals, scrap rubber, treated timber, and slag/boiler flue cleanings). A far portion of this landfill (referred to as Stairfoot Landfill from 270m north-east) remains active. The third landfill within 250m relates to an off-site portion of the disused canal. This is positioned 210m north; however it potentially extends nearer/onto the site. No further information is supplied on this landfill.
- There are a further seven (7) former landfill sites between 250m and 1km radius of the site.
- There are five (5) current Environmental Permits for waste management activities within 1km of the site. The nearest is held by Armitage Kathleen (20m north-east), for a Metal Recycling Site (Vehicle Dismantlers).
- There is one (1) Environmental Permit to operate a Pollution Prevention and Control (PPC) Part A(1) Installation (formerly referred to as Integrated Pollution Prevention and Control (IPPC) Authorisations) within 1km of the site. This is held by C Soar & Sons (UK) Limited (840m north) for the temporary storage of hazardous waste.
- There is one (1) Environmental Permit to operate PPC Part A(2) Installation (formerly referred to as Local Authority IPPC Authorisations), within 1km of the site. This is held by Beatson Clark Plc (910m north-west) for a glass manufacturing process.
- There are thirteen (13) Environmental Permits to operate PPC Part B processes (formerly referred to as Local Authority Pollution Prevention and Control Authorisations) within 1km of the site. The nearest is licensed to Stairfoot MOT Centre Ltd (50m north-east) for operation of waste oil burners (less than 0.4mW net thermal output).
- There are no Radioactive Consents registered within 1km of the site. *NB Due to public security restrictions, certain information on closed or mobile radioactive substance authorisations has been removed from the public register and is not available to Ramboll Environ.*
- There are no Control of Major Accident Hazard (COMAH) sites, explosive sites, or Planning Hazardous Substance consents within 1km of the site.
- There have been no prosecutions relating to authorised processes within 1km of the site.
- There are no Environment Agency Discharge Permits (formerly referred to as Discharge Consents) associated with the site; however there are five (5) within a 500m radius of the site. The nearest is held by Marshalls Brick Products (approximately 350m east of the site), authorised for trade discharges - site drainage (contaminated surface water, not waste sites).
- There are two (2) pollution incidents recorded on-site, both of which are positioned in the north-east of the site (adjacent to the north-east of Unit 4), and were classified by the EA as Category 3 - Minor Incidents. The first occurred in November 1995 and related to 'other

chemicals' impacting a freshwater stream/river at a road. No fish were killed. The second occurred in May 1997 and related to the release of gas oil into a freshwater stream/river (referred to as headwaters of Dob Sike). The 1997 incident, although positioned in the north of the site, is indicated to have been off-site to the north-west (as detailed in Section 5).

- There have been a further thirteen (13) pollution incidents to controlled waters (from 390m south-east), and three (3) substantiated pollution incidents (from 350m north) recorded within 1km of the site.
- The site is located in an area where between 1% and 3% of residential properties are above the action level for Radon (200 becquerels per cubic meter (Bq/m^3) averaged over a year) set by the Health Protection Agency (formerly the National Radiological Protection Board). According to the BGS no radon protection measures are considered necessary during the construction of new buildings or extensions.
- There are two (2) fuel station entries within a 500m radius. The nearest of these is the current Tesco Barnsley Extra Filling Station (positioned 230m east). This is the same filling station noted by Ramboll Environ from historical mapping (190m east). The difference in distance quoted from the site is due to the representation of the filling station by a single point located at the centre of the filling station site by the database. There is the potential for a further former petrol filling station to have been present 30m north-east of the site from the 1990s (no longer in use by the 2000s).
- There are is one (1) ecologically sensitive site within a 1km radius of the subject site. This is referred to as Stairfoot Brickworks (650m east) a Site of Special Scientific Interest (SSSI). The site is also located within an Area of Adopted Green Belt.

The LinesearchbeforeUdig database lists pipelines and transmission assets owned and/or operated by a number of major operators. According to the database there are records of CLH Pipeline System Ltd assets within approximately 200m and 300m south of the site to the south. CLH Pipeline System Ltd is an oil products logistics company with depots at Rawcliffe, and Bramhall connected via a pipeline[1]. It is likely this pipeline which passes approximately 200m-300m south of the subject site (likely with an approximate north-east/south-west orientation based on the location of the oil depots).

According to the database there are also Zayo ducts (fibre optic lines) operated by Zayo Group UK Ltd approximately 50m north.

3.3 Regulatory Authority Enquiries

3.3.1 Local Authority Environmental Health Department

An enquiry was submitted to the Contaminated Land Team at Barnsley Metropolitan Borough Council, the response (received 1st December 2015), is summarised below:-

- Two (2) areas of the site are currently on the Council's 'prioritised site list' with respect to Part 2A of the Environmental Protection Act:-
  - The canal in the east of the site has been assessed by the Council in 2006, and was determined suitable for its current (undeveloped) use. The Council has no plans to carry out further inspection of the canal site.
  - The disused railway in the west of the site has been identified, however has not yet been inspected by the Council. The Council states that this has not been assigned a ranking within its prioritised list. The Council states it could be assumed that in general such sites

[1] CLH Pipeline System Ltd website, Accessed 27th November 2015, Available at: http://www.clh.es/section.cfm?id=1&side=206&lang=en

are regarded as very low risk and will not be assessed for some time, unless via the planning system.

- The Council has no records of any known contamination issues or events associated with the site.
- The Council has records of the 2009 ARCADIS Phase I report for the site (as reviewed in Section 5); the Council has no further records of any intrusive investigations carried out at the site.
- The Council has records of one (1) former landfill site located within a 250m radius of the site. This is the Stairfoot Brickworks landfill, reported as being 150m north-east of the subject-site, and operated by Yorkshire Brick Co., and Barnsley MBC. The landfill is recorded as having undergone infilling with domestic, commercial, and industrial material between 1978 and 1996, and is currently in use as car parking, woodland, pasture, and agriculture. The Council states that the landfill has been classified as Category 3 meaning gas control systems have been installed. These were at least initially in part to extract methane for use in brick ovens. The Council states that the gas control measures were removed in 2013, but continuous monitoring of the site boundary is being carried out. This is considered to relate to the former landfill site recorded by the environmental database 90m north-east of the site (see Section 3.2).
- The Canal and railway cutting noted by Ramboll Environ are not listed on the Councils landfill register.
- The Council holds no records indicating that elevated levels of radon gas have been detected in any properties in this area, and are not aware of any radon protection measures being installed in properties in the area.
- The Council has no records of any nuisance issues, prosecutions or enforcement action relating to complaints such as dust, odour or noise issues associated with this site.
- The Contaminated Land Team at Barnsley Metropolitan Borough Council has no records of any private water supplies within a 2km radius of the site.
- The Council has no records of any Environmental Permits associated with the site. The Council has one (1) record relating to adjacent sites. This is held by Stairfoot MOT Centre positioned 40m east for operation of waste oil burners with less than 0.4mW net thermal output. This information is consistent with that detailed in the environmental database (see Section 3.2) however distances vary.

3.3.2 Local Authority Planning Department

Recent planning history information is provided on Barnsley Metropolitan Borough Council planning portal website, accessed 27th November 2015, further information was requested from Barnsley Metropolitan Borough Council. A summary of relevant applications is provided in Table 3.2 below.

Table 3.2: Summary of Relevant Planning Applications at the Site

Applicant	Application ref.	Details of Application	Status
Not stated	B/97/1456/BA	Erection of Industrial Unit. Land off Bleachcroft Way, Stairfoot.	Granted on 9th January 1998. No Conditions in relation to land contamination.
Not stated	B/02/0141/BA	Installation of storm water detention basin to serve proposed retail/industrial development.	Dated 23rd April 2002. No further information available.

Applicant	Application ref.	Details of Application	Status
		Bleachcroft Way.	
West Coach Properties Ltd.	B/03/1842/BA	Erection of one (1) block of industrial units including use classes B1, B2 and B8. Bleachcroft Way.	Approved with Conditions on 22nd December 2003, no Conditions in relation to land contamination
Stainsby Grange (Wombwell) Ltd	B/04/1141/BA	Refurbishment of industrial unit. Unit 4.	Approved with Conditions 19th July 2004. No further information available.
Stainsby Grange Ltd.	B/04/0189/BA	Erection of an electrical sub-station. Bleachcroft Way.	Approved with Conditions 10th March 2004. No further information available.
Sentium Pension Scheme	B/05/0549/BA	Erection of two (2) two-storey office buildings. Land off Bleachcroft Way (area in the centre/south of the site).	Approved with Conditions 16th May 2005. No further information available. Application considered to have not gone ahead.
Mr David Williams	2009/0779	Erection of 272 dwellings with ancillary services and facilities (Outline). Land off Bleachcroft Way (southern portion of site).	Refused on 21st October 2009 due to unsuitability of site for residential usage (such as secluded from amenities, surrounded by commercial uses, no requirement for additional housing, and against Barnsley Unitary Development Plan). Appeal Dismissed on 31st March 2010.
Stainsby Grange (Wombwell) Ltd	2013/0902	Use of unit as a Retail Warehouse Club (Certificate of Lawfulness). Blakemore Cash & Carry (Unit 4).	Lawful Development Certificate - Granted on 23 October 2013.
Stainsby Grange Wombwell LTD	2013/1331	Erection of two (2) 'drive thru' restaurant/cafe units with access and parking, extension of curtilage for relocated service yard and subdivision of existing 'Blakemores' retail warehouse into four (4) separate retail warehouse club units including installation of four (4) separate shop fronts. Located in the north-east of the site.	Approved with Conditions on 25th March 2014, no Conditions in relation to land contamination, however reference to surface water drainage arrangements.

Application 2009/0779 included a Desk Study Report for part the site carried out by ARCADIS Terence E Dudley & Associates in 2009 (Ref SC/08363). This has been obtained and reviewed by Ramboll Environ (see Section 5).

3.3.3 Petroleum Licensing Authority

An enquiry was submitted to the Petroleum Officer at South Yorkshire Fire & Rescue in order to establish if the site is currently or has previously been licensed for the bulk storage of petroleum products. The response (received 4th December 2015), confirmed that the Authority has no records of any petroleum spirit storage at the site.

3.4 Historical Potential for Ground Contamination

3.4.1 The Site

The following potentially contaminative activities have been identified as having taken place on site:-

- Warehouse present in the north of the site from the 1970s, indicated to have included fuel storage tanks from at least the 1980s. Two (2) EA recorded Category 2 - Minor Pollution Incidents to Controlled Waters are recorded in the late 1990s at the approximate locations of the fuel storage tanks. Potential contaminants from these activities include fuels and oils, and asbestos (though depend on the specific nature of the Warehousing).
- Manor Flint Glass Works extended very marginally onto the north-east of the site from the 1910s to the 1960s. Potential contaminants associated with these activities include fuels and oils, solvents, acids, and metals.
- Midlands Railway, Stairfoot and Cudworth Branch, present in the west of the site from the 1910s to the 1970s. Potential contaminants associated with these activities include fuels and oils, metals, asbestos (from brake linings), and herbicides. This area of the site has been identified by the Local Authority for further inspection under its Part 2A obligations; however it is considered to have a very low risk (whilst in current use).
- Potential infilling activities in relation to the Old Quarry (Sandstone) in the south of the site (no longer present by the 1890s), construction of embankments for the Railway (in the 1910s), potential infilling of a Pond in the south of the site (no longer evident by the 1980s), potential partial infilling of the canal in the east of the site (a BGS recorded landfill site), and railway cutting in the south of the site (potentially in the 2000s). Potential contaminants would depend on the nature of the fill materials however there is the potential for production of leachate and ground gases (such as carbon dioxide and methane) resulting from the decomposition of putrescible materials.
- Electricity Sub-Station noted on historical mapping in the north of the site from the 1970s. Potential contaminants from these activities include PCBs.
- A residential property with an associated heating oil storage tank. The site is noted to be present on historic maps from the 1930s to the 2000s (further discussion in Section 5).

3.4.2 The Surrounding Area

The following potentially contaminative activities have been identified as having taken place in the surrounding area:-

- Glass Works adjacent to the north-east/extending on-site from the 1910s to the 1960s and a Glass Fibre Works adjacent to the north from the 1970s to the 2000s. Potential contaminants associated with these activities include fuels and oils, solvents, acids, and metals.

- A number of Garages in the area, the nearest adjacent to the north-east (from the 1970s), and Petrol Filling Stations (nearest confirmed 190m east from the 1990s to present, a further petrol filling station indicated to be 30m north-east from the 1990s to 2000s). Potential contaminants from these activities include fuels and oils, solvents, acids/alkalis, metals, and PCBs.
- Large Warehouse adjacent to the north (1970s to 2000s) with large circular tank (extending on-site). Potential contaminants would depend on the specific nature of activities, however may include fuels an oils.
- A number of instances of potential infilling activities in the area including infilling of off-site portions of the Canal (this is a recorded landfill site; Ramboll Environ notes that the canal is no longer present by the 1980s); a recorded landfill 90m north-east infilled between 1979 and 1992 with industrial, commercial, household, and special wastes, and liquid sludge. This landfill is reported by the Local Authority to be undergoing monitoring in relation to ground gas. Associated heaps were noted on historical mapping from the 1960s (from 200m north-east), depicted as a Refuse/Slag Heap from the 2000s (from 100m). Further instances of potential infilling relate to the potential infilling of a Reservoir 40m north (in 2000s), and unidentified mounds/uneven ground adjacent to the north-east from the 1960s to the 1980s. Potential contaminants would depend on the nature of the fill materials however there is the potential for production of leachate and ground gases (such as carbon dioxide and methane).
- Stairfoot Brickworks which is located adjacent to the north-east from at least the 1850s to 1910s. Potential contaminants from these activities predominantly relate to use and storage of fuels, such as liquid hydrocarbon fuels (for powering conveyors, and site vehicles), and coal (with the production of ash), used in kilns for drying and firing activities. Potential contaminants include hydrocarbons, metals, and inorganic compounds.
- Railways and associated Station in the area from at least the 1850s to present, the nearest adjacent/on-site. Potential contaminants associated with these activities include fuels and oils, metals, asbestos (from brake linings), and herbicides.
- Cemetery 25m south-west from the 1890s to present. Potential contaminants include pesticides, herbicides, and varnishes.
- Chemical Plant 100m north-east (from the 1930s to the 1970s), including a number of Tanks and a small Refuse Heap. Potential contaminants from these activities would likely include fuels and oils, as well as further contaminants dependent on the specific nature of the Chemical Plant.
- Bleach and Dye Works 100m north (from the 1850s to an unconfirmed date). The buildings were no longer annotated by 1890s (though remained present), were annotated as Bleachcroft and Bleachcroft Farm from the 1960s, and then demolished by the 1970s. Potential contaminants from these activities include acids, solvents, fuels and oils, bleaches and dyes.
- New Oaks Colliery 100m north-east (present from the 1890s to 1930s). Potential contaminants from these activities include fuels and oils.
- Further small Works in the area, from 120m north (from the 1980s), potential contaminants from these activities include fuels and oils, solvents.

The above activities represent potential off-site sources of contamination that (if present) could potentially migrate beneath the site.

The potential for off-site contamination (if present) to migrate beneath the site would be dependent on the underlying geological conditions, which are discussed in Section 4.

4. ENVIRONMENTAL SETTING

Desk-based research of the local geology, hydrogeology and hydrology was carried out in order to establish the potential for migration of contamination onto or away from the site, and to assess the sensitivity and vulnerability of the site's setting with respect to surface water, groundwater and ecological resources.

Information was obtained from a number of sources, including:-

- examination of published geological maps produced by the British Geological Survey (BGS Sheet 87, Barnsley);
- a proprietary environmental database procured by Ramboll Environ; and
- Regulatory Authority websites, including the Environment Agency (EA).

4.1 Geology and Hydrogeology

According to BGS online mapping (accessed 27th November 2015), superficial deposits are only present across approximately 15% of the site (at the eastern edge) and comprise Alluvium (silty clay, potentially with layers of sand, peat, and gravel). The solid geology at the site comprises the Pennine Middle Coal Measures Formation (underlying the entirety of the site), with Oaks Rock (a Sandstone unit within the Middle Coals Measures) at the surface beneath approximately 50% of the site to the south-west. The Oaks Rock is indicated to dip to the north-east in the area. The BGS map of the area also indicates a fault extends onto the north of the site (with a north-west/south-east orientation.

Site works undertaken by ARCADIS in 2000 identified Made Ground of between 0.3m and 1.8m thickness (comprising topsoil, sandy gravel, clays, and ash), underlain by sandy clays, graded to weathered Mudstone/Siltstone (likely the weathered upper surface of the Pennine Middle Coal Measures).

According to the BGS website (accessed 27th November 2015) the nearest available-to-view borehole log is located approximately 140m north-east. This indicates the Oaks Rock is approximately 28m thick in the area, and the Middle Coal Measures extend to at least 308m below ground level (bgl).

A summary of the geological and hydrogeological setting of the site is provided in Table 4.1.

Table 4.1: Summary of Geology and Hydrogeology

Formation	Description	Thickness	EA Aquifer Designation	Hydrogeological Significance
Made Ground	Topsoil, sandy gravel, clays, and ash	0.3m to 1.3m (likely deeper in areas of infilling)	N/A	N/A
Alluvium	Silty clay	Likely limited thickness, present only in east of site	Secondary A	Permeable formations with potential to support localised abstractions.
Pennine Middle Coal Measures (including Oaks Rock)	Upper surface comprising sandy clays, graded to weathered Mudstone/Siltstone. Beneath which	Greater than ~300m	Secondary A	Permeable formations with potential to support localised abstractions.

Formation	Description	Thickness	EA Aquifer Designation	Hydrogeological Significance
	comprising interbedded mudstone, siltstone, and sandstone, with approximately 28m thickness of sandstone, potentially at the surface (south-west) and near the surface (north-east).			

According to an independent third-party environmental database, there is one (1) former mineral extraction site located within the site area. This is positioned in the south of the site from which sandstone was extracted from the Oaks Rock via opencast methods. Ramboll Environ considers this to likely relate to the small Quarry depicted on historical mapping in the 1850s. There are a further fourteen (14) mineral extraction sites within a 1km radius of the site. The nearest is positioned 130m north-east and relates to the extraction of coal from the Barnsley Coal Seam via underground methods.

According to the EA website, the underlying groundwater was classified, using the Water Framework Directive (WFD), as currently having 'Good' Quantitative Quality and 'Poor' Chemical Quality. This is consistent with the targets for 2015 (set in 2009). Targets for 2021 are in the process of being defined by the EA.

According to EA information presented in the Landmark Envirocheck database, there are three (3) licensed groundwater abstractions within a 2km radius of the site, as detailed in Table 4.2.

Table 4.2: Licensed Groundwater Abstractions within 2km of the Site

Licence Holder	Distance from Site	Abstraction source	Purpose of Abstraction
C Soar & Sons	800m N	Superficial deposits	Other industrial/commercial/public services and metal: general washing/process washing
Low Laithes Dairy Farm Ltd	1.49km E	Spring	General farming and domestic
	1.64km E	Spring	General farming and domestic

The Contaminated Land Team at Barnsley Metropolitan Borough Council has no records of any private unlicensed) abstractions (that are generally of smaller scale) within a 2km radius of the site.

The site is not situated within an EA designated groundwater Source Protection Zone.

4.1.1 Coal Authority Report

The following information was derived from a report from The Coal Authority for the site (dated 20th November 2015):-

- The property is in the likely zone of influence from workings in eleven (11) seams of coal at 120m to 620m depth, and last worked in 1987. Any ground movement from these coal workings should have stopped by now.
- The site is not in the likely zone of influence from any present underground coal workings, and is not within an area that the Coal Authority is determining whether to grant a licence to

remove coal using underground methods. However, reserves of coal exist in the local area which could be worked at some time in the future.

- There are no known coal mine entries on-site or within 20m of the site.
- The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that may have been affected by coal mining.
- The site does not lie within the boundary of an opencast site from which coal has been removed by opencast methods in the past, within 200m of the site presently and within 800m of an opencast site that the Coal Authority is determining to grant a licence to remove coal by opencast methods.
- The Coal Authority has not received a damage notice or claim for the site or any property within 50m since 31st October 1994, and there is no current Stop Notice delaying the start of remedial works or repairs to the property.
- There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the site.
- The site has been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out Procedures.

4.2 Hydrology

The nearest identified surface water bodies are located on-site, and comprise Dob Sike (a secondary river that flows in a north-easterly direction along the southern site boundary), and a disused canal (located in the east of the site with a north/south orientation - previously the Sheffield & South Yorkshire Navigation Dearne and Dove Canal). The Canal appeared to be vegetated with marshy grassland during the site visit (and also on aerial imagery from 2002). Dob Sike flows into the River Dove (located 1km south).

According to the EA website, the River Dove was classified, using the Water Framework Directive (WFD), as currently having a 'Poor' Ecological Potential and 'Good' Chemical Quality. This is consistent with the targets for 2015 (set in 2009). Targets for 2021 are in the process of being defined by the EA.

According to an independent, third-party environmental database, there is one (1) licensed surface water abstraction within a 2km radius of the site, as detailed in Table 4.3 below.

Table 4.3: Licensed Surface Water Abstractions within 2km of the Site

Licence Holder	Distance from Site	Abstraction source	Purpose of Abstraction
Mr & Mrs D & J Nuttall	1.47km SW	River Dove	Private Non-Industrial Amenity: Make-Up Or Top Up Water

According to the EA, the site is located in Flood Risk Zone 1 (Low Probability). This zone comprises land assessed as having a less than 1 in 1000 (<0.1%) annual probability of river or sea flooding. The closest area of land recorded as having an elevated risk of flooding is located approximately 1km south-east of the site.

In relation to surface water flooding (i.e. flooding caused by rainwater exceeding capacity of drainage systems), according to the EA website the majority of the site (approximately 80%) is located within an area considered at very low risk of flooding from surface water. This means the annual probability of flooding is this less than 1 in 1000 (0.1%). Approximately 15% of the site is located within an area considered at low and medium risk of flooding (annual probability of between 1 in 1000 and 1 in 30 (0.1%-3.3%)). These areas are dispersed across the site but are generally in the north, and comprise areas of hardstanding (around Unit 4, and to the south of

Units 1, 2, and 3), as well as in the south of the site (along the edge of Dob Sike). Very small portions of the site (less than 5% of the site area) are depicted as being at high risk of flooding from surface water (greater than 1 in 30 annual probability (>3.3%)). Of most significance are two (2) locations adjacent to the north and south of Unit 4 (areas of hardstanding).

Surface water drainage networks are typically designed to accommodate only a 1 in 30 (3.3%) annual probability rainfall event. Older drainage networks may have a lower capacity, especially if they have not been maintained adequately. Although not true of every situation, surface water flooding is typically relatively shallow and would be expected to subside following the storm event assuming drainage assets are maintained in an appropriate condition.

Regulatory flood maps have been developed to be used in strategic planning and are not intended to provide site-specific information. However, the mapping can provide a useful indication of whether further consideration or assessment of flood risks to a site may be required.

4.3 Ecology

According to the Landmark Envirocheck Database there is one (1) potentially significant ecological receptor, i.e. those that are statutorily designated, e.g. SSSIs, SPAs, SACs, RAMSAR sites within a 1km radius of the site. This is referred to as Stairfoot Brickworks (650m east) a Site of Special Scientific Interest (SSSI). The site is also located within an Area of Adopted Green Belt.

Although the site visit did not include scope for an ecological survey it was noted that the undeveloped area of the site has ecological potential which may require additional survey. The southern area of the site is undeveloped with a mosaic of habitats comprising grassland, scrub, marshy grassland, ephemeral vegetation, tall ruderal vegetation and woodland on the site boundary. The habitats would be considered to have the potential to support breeding birds, small mammals and a variety of invertebrate populations as well as a varied flora.

Additionally, during the site visit indicators of potential badger activity were noted on-site in the south-eastern part of the site. These included potential badger prints sighted, badger feeding hole/snuffle holes, and potentially a badger dung pit/latrine. No badger setts were observed during the site visit.

4.4 Environmental Sensitivity and Vulnerability

The site is considered to be situated in an area of ***moderate*** sensitivity with respect to groundwater resources due to the underlying Secondary A Aquifer (comprising the Pennine Middle Coals Measures with a significant Sandstone thickness). There are three (3) licensed groundwater abstractions within 2km of the site (from 800m north); the EA classified the groundwater quantitative quality as 'Good' under the Water Framework Directive but the chemical status was 'Poor'.

The vulnerability of the groundwater receptor in the vicinity of the site is considered to be ***moderate*** as while hardstanding is present in the vicinity of operational areas, large portions of the site comprise unsurfaced land, and surface water drainage from the site may discharge into a surface water collection lagoon/into the former canal.

The sensitivity of the hydrological receptor can be considered as ***moderate*** as the nearest assessed surface watercourse has been classified as having 'Poor' Ecological Potential, and 'Good' Chemical quality. There is one (1) licensed surface water abstractions within 2km of the site located 1.47km south-west.

The site is considered to be in an area of ***moderate to high*** vulnerability with respect to surface water resources as the nearest surface watercourse/waterbodies are located on-site.

The site is situated outside a currently designated floodplain, in general terms this means that the annual risk of the site flooding from rivers or seas is less than 1 in 1000 (<0.1%).

The nearest sensitive land use are residential properties located adjacent to the north-west of the site.

5. REVIEW OF PREVIOUS REPORTS

The following reports have been provided to Ramboll Environ for review:

- ARCADIS Geraghty & Miller International Inc, January 2000: Geo-Environmental Site Investigation Interpretative Report (Ref 91091); and
- ARCADIS Terence E Dudley & Associates, April 2009: Desk Study Report (Ref SC/08363).

5.1 2000 Geo-Environmental Report

ARCADIS Geraghty & Miller International Inc (AGMI) was instructed by Terence E. Dudley & Associates on behalf of Stainsby Grange Ltd to carry out a ground investigation at the subject site. The investigation was produced in support of a proposed redevelopment into a B&Q Retail Warehouse and several small industrial/retail units.

It should be noted that the site area associated with this investigation was not the same as the current subject site area assessed in this report, as it extended further to the north-west, and included the area that comprises the retail warehouse to the north-west (until recently occupied by a B&Q Warehouse). In addition the area to the west (within the current subject site boundary) was not included in the AGMI investigation. For completeness the report review has been undertaken on the area investigated by AGMI, but any points of note that fall outside the current subject site area have been highlighted.

At the time of the AGMI works 50% of the site was undeveloped (southern half belonging to Barnsley Metropolitan Borough Council), with the remainder occupied by a warehouse used for the storage and distribution of glass containers (*note: this is outside the current subject site area*), a small industrial unit (split between a clothing warehouse and a former car scrapyard) and a private house. The land along the western boundary (*note: now included in the subject site area*) belonged to an adjacent land owner, who operated an off-site scrap metal yard.

The site walkover conducted prior to the commencement of the intrusive works observed disused above ground tanks (a gas fuel oil tank associated with the warehouse, an oil storage tank associated with the private house, and a diesel storage tank in the scrap metal merchants to the west), as well as fly tipping and oil residues across the site area. It was detailed that a fuel spillage occurred in 1997 from the former tank located adjacent to the warehouse, and that contaminated soils were removed and replaced with clean materials (*note: this incident occurred outside what is now the subject site area*).

The site works comprised the excavation of nineteen (19) trial pits to a maximum depth of 2.8m below ground level (bgl), and the drilling of five (5) exploratory boreholes to a maximum depth of 6.2m bgl using a rotary mini drill rig. The ground conditions encountered were split into four (4) separate areas:-

Area 1 – developed area to the north (*note: part of this area falls outside the subject site area*). Ground conditions comprised Made Ground to a maximum death of 1.8m bgl (dark brown/grey sandy gravel and ash underlain by white coarse construction fill gravel and pinkish brown sands and gravels), underlain by silty and sandy clays which graded to weathered Mudstone/Siltstone from 2.0m bgl.

Area 2 – low lying ground in the centre and east of the site. Ground conditions comprised a 300mm layer of topsoil Made Ground underlain by mottled silty clay, which graded to Mudstone or Siltstone below a depth of 2.2m bgl.

Area 3 – grassland on higher ground to the south and west. Ground conditions consisted of loose brown topsoil underlain by Made Ground to a depth of 1.5m bgl (comprising soil or sandy

clays), that was underlain by clays grading to weathered Mudstone/Siltstone below a depth of 2.5m bgl.

Area 4 – railway embankment on the western side of the site. Ground conditions comprised Made Ground of black ash gravel to a depth of 1.0m bgl, which was underlain by 0.5m of a coarse sandstone gravel. This was further underlain by weathered Mudstone/Siltstone.

Groundwater was limited to observations in TP2 at a depth of 2.1m bgl (groundwater was contaminated with oils and a hydrocarbon odour) and BH2 at a depth of 1.6m bgl (*note: both of these positions fall outside the subject site boundary*). No other groundwater was encountered.

A contamination assessment was undertaken on the twelve (12) collected soil samples. The samples which were analysed for both inorganic and organic compounds were evaluated using the Interdepartmental Committee on the Re-development of Contaminated Land (ICRCL) guidance values (*note: The ICRCL guidelines are no longer an accepted screen tool for contaminated land investigations)*. Total petroleum hydrocarbons (TPH) was only analysed for in a sample if the photo-ionisation detector (PID) readings when sampled on-site were considered elevated.

Concentrations of inorganic compounds copper, nickel and zinc exceeded the ICRCL threshold trigger levels in TP1 at a depth of 1.2m bgl, and total chromium exceeded the ICRCL threshold trigger level for parks, playing fields and open spaces in ash fill samples from TP1. pH values ranged from pH5.3 to pH10.8 and was considered by AGMI to be within the ICRCL threshold trigger limit for acidity. Sulphate in TP1 at a depth of 0.2m bgl (14,453mg/kg) exceeded the ICRCL threshold trigger limit of 2,000mg/kg, and concentrations of sulphur in the same sample (5,091mg/kg) also exceeded the relevant ICRCL trigger level (not stated in the report supplied).

Polycyclic aromatic hydrocarbons (PAHs) were considered to be elevated in two (2) samples. TP2 at a depth of 2.3m bgl and a sample of ash fill from TP1 (depth not stated) were elevated above the ICRCL threshold trigger value of 1,000mg/kg. TPH was considered to be elevated in the sample taken from TP2 at a depth of 2.3m bgl, where a concentration of 279mg/kg was recorded.

One (1) groundwater sample from TP2 was analysed for a similar suite of analysis as the soil samples and this was compared with UK Drinking Water Standards (DWS) screening criteria. Total PAH, phenols and TPH were elevated above the relevant DWS (*note – TP2 was located outside the subject site boundary*).

Gas monitoring (methane, carbon dioxide and oxygen concentrations) was completed during the investigations. No recorded concentrations were provided as part of the AGMI report, however it was stated that no abnormal levels were detected. The technique used to collect this data is unknown, but it can be interpreted from the text that as no permanent monitoring wells were installed, it is likely that the monitoring to have been conducted will have been undertaken during the drilling process only.

The environmental risk assessment section of the report concluded that a number of isolated hotspots of contamination were present, but that no widespread contamination had been identified. The elevated contaminants were mainly related to the ashy fill layer present within the Made Ground, apart from in TP2 where the deeper soils and groundwater below 2.0m bgl were contaminated with organic compounds. A 'moderate' classification was assigned to the risk between human targets and chromium and organic compounds in soil, and a 'low to moderate' classification was assigned to the risk between groundwater supplies and organic compounds in soil. All other risks were classified as low or negligible.

The recommendations for re-development around the report focussed on TP2 where the most significant contamination was encountered (*note – this location falls outside the current subject*

site boundary). The remediation of contamination hot-spots was to be considered in three (3) options:-

a) Excavation and disposal of materials to landfill;

b) Excavation of contaminated soils and mixing with crushed demolition rubble or granular fill; and

c) Capping of the contaminated ground with inert clay.

A geotechnical assessment of the soil samples was conducted through the following laboratory testing:-

- Moisture content
- Determination of Atterberg Limits
- Compaction Tests
- California Bearing Ratio (CBR) test
- Quick Undrained Triaxial Test
- One Dimensional Consolidation Test

Interpretation of geotechnical testing falls outside the scope of this assessment and will not be commented on further. It should be noted that any new development on the site in the future would likely require further geotechnical assessment to take place as part of the planning process.

5.2 2009 Desk Study Report

ARCADIS Terence E Dudley & Associates (ARCADIS) was instructed by Stainsby Grange (Wombwell) Ltd to undertake a desk-study of land at Stairfoot, Barnsley (comprising the undeveloped southern portion of the site under assessment by Ramboll Environ). The work was produced in support of a proposed development of the site into residential usage. The scope comprises review of historical records, environmental database, coal mining records, and incorporation of information from the 2000 ARCADIS investigation report (reviewed by Ramboll Environ). This is similar to that carried out by Ramboll Environ here, consistent information is therefore not repeated. ARCADIS also review a further investigation report (dated 2000), which related to an area off-site to the north.

The pit noted by Ramboll Environ in the east of the site was reported to comprise a surface water collection lagoon.

ARCADIS concludes that the risk of contamination from historical activities is remote, a detailed geo-environmental investigation was recommended, and that there are no problems that would prevent the proposed development into domestic use.

5.3 Ramboll Environ Comments

Ramboll Environ believes that the 2000 investigation scope conducted by AGMI provided a reasonable coverage across the site area given the proposed development. The analysed contamination suite was considered limited as the only organic contaminants tested within all samples were PAH compounds. Given the disused tanks identified prior to the commencement of the works, it would have been considered more prudent to have undertaken TPH and other organic contaminant analysis on a greater number of samples.

Where contamination was identified in the AGMI report, the primary location (TP2) was actually located outside the current subject site boundary. The ICRCL screening criteria used by AGMI is no longer considered to be applicable to the UK contaminated land industry in the UK. Ramboll Environ has developed its own generic assessment criteria (GAC) which takes account of the

latest contaminated land models currently in use when screening soil samples. A comparison of the analysed samples has been completed using the Ramboll Environ GAC for industrial/commercial properties. The screening found that no exceedances were present within the soil samples when compared with the GAC for industrial/commercial end use.

Whilst possible remediation techniques were discussed within the AGMI report, the screening of the results by Ramboll Environ has shown that there is no current risk for an industrial/commercial land use (which is in line with the current use of the site).

The one (1) groundwater sample analysed as part of the intrusive works was located outside of the current subject site boundary; as it was taken from a trial pit it would also not be regarded as representative of the ground conditions. No groundwater was encountered on the subject site and so the groundwater regime cannot be considered further.

Only a small amount of information was provided with regard to the ground gas regime on-site. Whilst the AGMI report concluded that no abnormal concentrations of gases were recorded, given that the history of potential infilling and landfills in the surrounding area, it is likely that any development in the future may require further monitoring to be conducted. Ramboll Environ considers the technique used by AGMI to collect the monitoring results as inadequate, as monitoring was only undertaken during the drilling process. In order to obtain accurate results, gas monitoring is typically undertaken post investigation within installed ground gas boreholes.

Overall the contamination noted in the site investigation report was recorded at concentrations that are not considered elevated when compared with screening values for its current site use (i.e. industrial/ commercial). It is noted that further investigation would likely be required should redevelopment of the site take place in the future. Any investigation would include a broader range of contaminant testing within any collected soil and groundwater samples.

6. QUALITATIVE RISK ASSESSMENT

The regime for contaminated land was set out in Part 2A of the Environmental Protection Act 1990 (EPA). Under Part 2A, contaminated land is defined as land which appears to be in such a condition, by reason of substances in, on or under the land, that:

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

b) Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused"[2].

Revised statutory guidance ('the Guidance') entered into force in England on 11th April 2012. "significant harm" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land. The presence of a contaminant linkage relies on the Contaminant-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist.

A "contaminant linkage" requires the following:

i) A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters;

ii) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters;

iii) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

Under the Guidance, a 'significant contaminant linkage' is one which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land.

The Guidance provides a four category test to help decide when land is and is not contaminated. Land in Category 1 and Category 2 would be capable of being determined as contaminated land under Part 2A on the grounds of significant possibility of significant harm to human health, or a significant possibility of significant pollution of controlled waters. Land in Category 3 and Category 4 comprises cases where there is not considered to be a significant possibility of significant harm, or the level of risk posed is low.

Based on the above factors, an initial assessment of the presence of a potential contaminant linkage can be made qualitatively. A conceptual model is an essential element of any site-specific environmental risk assessment, providing a simple representation of the hypothesised relationships between contaminants, pathways and receptors. For the purpose of this report, a basic conceptual model has been developed based on the presentation and interpretation of information regarding the site gathered during the Phase I Review process. This allows the identification of potential contaminant linkages and, therefore, an interpretation of the potential for significant harm and/or significant pollution of controlled waters in relation to a site. Based on this interpretation, the implications for potential liability associated with soil or water contamination at the site can be evaluated.

It is understood that the northern parts of the site will continue in their current use, and that development of the southern part of the site is under consideration.

[2] As Amended by the Water Act 2003 (commencement No. 11) Order 2012

Table 6.1: Conceptual Site Model

Source	Pathway[3]	Receptor[4]	Risk of Contaminant Linkage[5]
Current use of site as wholesale/distribution units, including presence of oil tank for heating purposes and storage of sodium bisulphate solution (associated with potato preservation activities), in addition to fly tipping activities (including ACMs), and burning activities.	Leaching to Groundwater & Groundwater Flow.	Groundwater in the Pennine Middle Coal Measures.	*Low to Moderate*. Potential contamination sources from current use, Secondary A Aquifer beneath the site.
	Surface water run-off.	Surface water as controlled water.	*Moderate*. Potential contamination from current use cannot be ruled out. Nearest receptor is located in the on-site.
Potential sources of contamination relating to historic use include; • Warehouse in N (1970s-present) (including fuel storage tanks); • Manor Flint Glass Works very marginally on NE (1910s-1960s); • Railway in W (1910s-1970s); • Potential infilling activities: Old Quarry in S (1890s); railway embankment building in W (1910s); Pond in the S (1980s); canal in E (dates unconfirmed); and railway cutting in S (2000s); • Electricity Sub-Station in N (1970s-present). Site investigation in 2000 did not identify soil contaminants above Ramboll Environ commercial/industrial GAC (though limited scope and no groundwater monitoring).	Leaching to Groundwater & Groundwater Flow.	Groundwater in the Pennine Middle Coal Measures.	*Low to Moderate*. Potential contamination from historical activities cannot be ruled out.
		Surface water as controlled water via connectivity with groundwater flow.	*Low to Moderate*. Potential for contamination to be present, nearest receptor located on-site.
	Dermal contact / ingestion.	Site buildings, users and neighbours.	*Low to Moderate*. Potential contamination present, however operational parts of site covered by hardstanding.
	Vapours / ground gases.		*Moderate*. Potential for vapours from historic use of parts of site; operational parts of site completely covered by hardstanding.

[3] Pathway: mechanism or route by which a contaminant comes into contact with, or otherwise effects, a receptor.
[4] Receptor: persons, living organisms, ecological systems and controlled waters that could be adversely affected by the contaminants.
[5] Risk: probability of the occurrence of, and magnitude or the consequences of, an unwanted adverse effect on a receptor.

Source	**Pathway[3]**	**Receptor[4]**	**Risk of Contaminant Linkage[5]**
Potential current and historical off-site contamination sources in the vicinity of the site include: • Glass Works extending onto NE (1910s-1960s), and adjacent N (1970s-2000s); • Garages from adjacent to N (from the 1970s), and Petrol Filling Station 190m E (1990s-present); • Large Warehouse adjacent to N (1970s-2000s); • Infilling activities including landfilled canal (extending off-site to N), and further landfill 90m NE; • Stairfoot Brickworks adjacent NE (1850s-1910s); • Railways adjacent (1850s-present); • Cemetery 25m SW (1890s-present); • Chemical Plant 100m NE (1930s-1970s); • Bleach and Dye Works 100m NW (1850s to an unconfirmed date); • New Oaks Colliery 100m NE (1890s-1930s).	Leaching onto site in Groundwater & Groundwater Flow.	Groundwater in the Pennine Middle Coal Measures.	*Moderate*. Potential presence of potential contamination sources from off-site activities.
	Vapours / ground gases.	Site buildings, users and neighbours.	*Moderate*. Potential for vapours from historic use of surroundings; however operational parts of site are covered with hardstanding.

7. CONCLUSIONS

The findings of the Phase I Environmental Review may be summarised as follows:-

- From at least the 1850s the site was predominantly undeveloped with a Sandstone Quarry, Reservoir, and Pond (in the south of the site), and the Canal (in the east). The Quarry was no longer evident by the 1890s (potentially having been infilled). By the 1910s Flint Manor Glass Works extended marginally onto the north of the site, and the Railway was constructed through the west of the site (with cutting and embankment). By the 1960s Flint Manor Glass Works had been demolished, and the Canal was depicted as Marshland. By the 1970s a Warehouse (and Electricity Sub-Station) had been constructed in the north of the site; the Warehouse underwent extension by the 1980s (including construction of a feature indicated to be two (2) Tanks). Two (2) historical pollution incidents are recorded as having occurred in the north of the site in the 1990s (one (1) of which is indicated by previous reports to have been located off-site to the north). The central parts of the site underwent development in the early 2000s with the current wholesale units in the west of the site, including what appeared to be ground works associated with the railway cuttings/embankments, and construction of a surface water detention basin. The site is currently occupied by four (4) wholesale/ distribution units, which includes the presence of an oil AST (for heating purposes) and storage of sodium bisulphate solution (associated with potato preservation activities). In addition Ramboll Environ noted evidence of fly tipping (including ACMs) on areas of unsurfaced ground, and evidence of waste burning activities.

  Intrusive investigation work carried out in 2000 at the site (and a wider area) by ARCADIS identified no contaminant concentrations that would exceed Ramboll Environs current GACs (screening values) for commercial/industrial end uses. The scope of the investigation is considered to be limited in relation to the limited range of contaminants analysed for in soil samples, the nature of the ground gas monitoring, and the absence of on-site groundwater monitoring. Based on current information available, the potential for significant ground contamination to exist at the site due to current and historic uses is considered to be ***low to moderate***.
- The site is currently surrounded by industrial / warehousing units, including potential re-fuelling activities. Historical potentially contaminative activities present in the vicinity include a Glass Works which extended marginally onto the north-east of the site (from the 1910s to the 1960s); a Glass Fibre Works located adjacent to the north (from the 1970s to the 2000s); Garages in the area from adjacent to the north (from the 1970s to present); Petrol Filling Station 190m east (from the 1990s to present); a Large Warehouse adjacent to the north (from the 1970s to the 2000s); infilling activities, which included a landfilled canal (extending off-site to the north, potentially infilled by the 1980s), a landfill 90m north-east (recorded as having undergone infilling from the 1970s to the 1990s with a range of materials (including putrescible and special wastes) and to be undergoing monitoring in relation to ground gas, and further potential infilling activities); Stairfoot Brickworks adjacent to the north-east (from the 1850s to the 1910s); a off-site and adjacent railways, and associated station (from the 1850s to the present); a Cemetery 25m south-west (from the 1890s to the present); a Chemical Plant 100m north-east (from the 1930s to the 1970s); a Bleach and Dye Works 100m north (from the 1850s to an unconfirmed date); and New Oaks Colliery 100m north-east (from the 1890s to the 1930s). The potential for significant ground contamination to exist at the site as a result of off-site activities is considered to be ***moderate***.
- The site is located on a Secondary A Aquifer (including thickness of Sandstone); there are three (3) groundwater abstractions within 2km (from 800m north), and the site is not within an EA designated Groundwater Source Protection Zone. Overall, the hydrogeological

sensitivity in the vicinity of the site is considered to be ***moderate***. The vulnerability of the groundwater resources is considered to be ***moderate*** due to the limited hardstanding coverage of the site, however it is present in operational areas.

- The hydrological sensitivity of the site is considered to be ***moderate*** (as the nearest assessed watercourse has been classified as having 'Poor' Ecological Potential and 'Good' Chemical Quality by the EA under the WFD). The vulnerability is considered to be ***moderate to high*** (since the nearest surface watercourse is located on-site).
- The site is situated outside a currently designated floodplain, in general terms this means that the annual risk of the site flooding from rivers or seas is less than 1 in 1000 (<0.1%).
- There is one (1) designated ecologically sensitive site within a 1km radius of the subject site. This is referred to as Stairfoot Brickworks (650m east) a Site of Special Scientific Interest (SSSI). The site is located within an area of Adopted Green Belt.
- The southern area of the site is occupied by undeveloped land with a variety of habitats which may require additional ecological survey I redeveloped. Indications of badger activity were noted on-site, potential badger prints, feeding/snuffle holes, and a potential badger dung pit/latrine were observed in the south-eastern area of the site. An area of Himalayan Balsam, a non-native invasive species, was identified adjacent to Dob Sike in the south-east of the site. It is an offence to allow Himalayan balsam to spread in the wild.

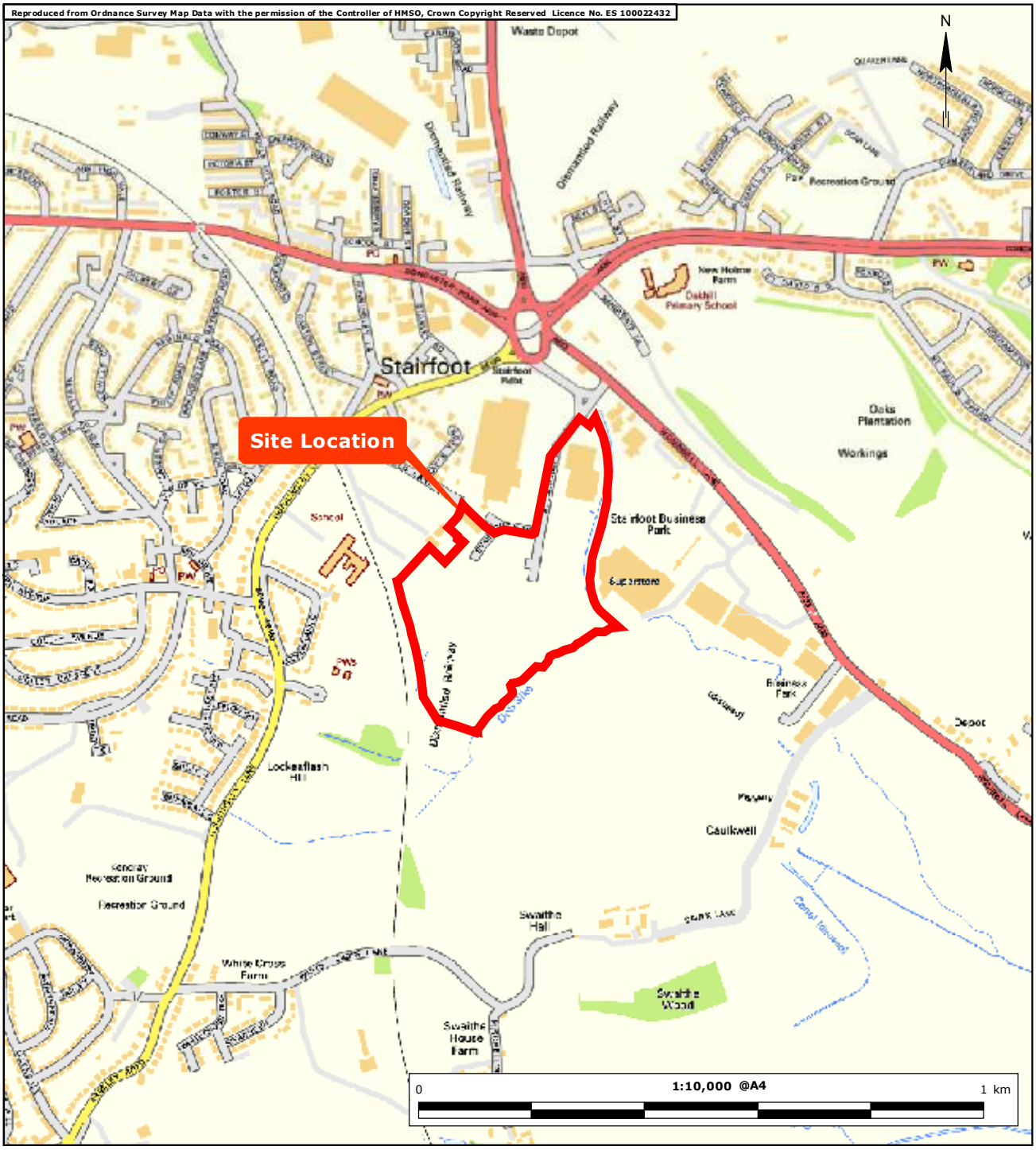
In the UK, a risk-based approach is used to assess the potential impact associated with ground contamination, as summarised in the CSM. The current and former uses of the site indicate a ***low to moderate*** potential for significant or widespread soil and groundwater contamination.

It is considered that there is a ***low to moderate*** risk of the site currently attracting attention of the Regulatory Authorities, or being identified as representing a significant risk to site users, or other environmental receptors, whilst in its current use. It is noted that the railway land in the west of the site has been identified by the Council for further inspection under its Part 2A obligations; however the Council regards this as a very low risk whilst in current use and the site has not been assigned a priority.

If the site were to be redeveloped, further investigation (such as intrusive site investigations, gas risk assessment and/or remediation) will likely be required as part of the normal planning process.

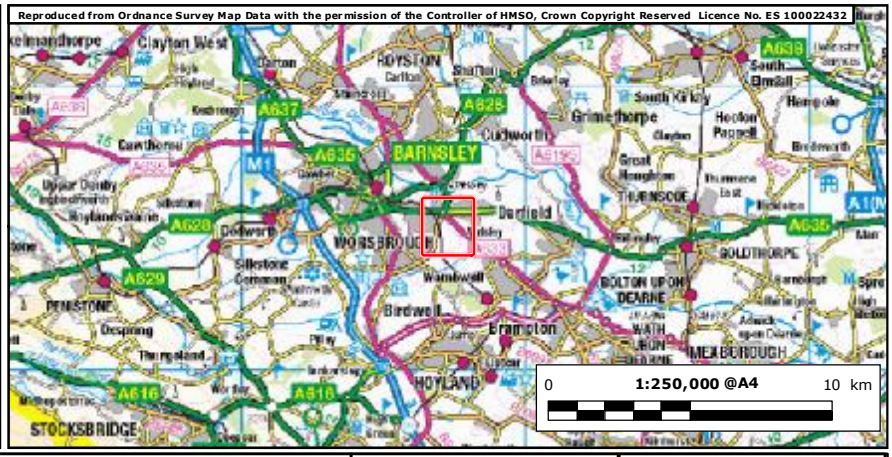
APPENDIX 1
FIGURES

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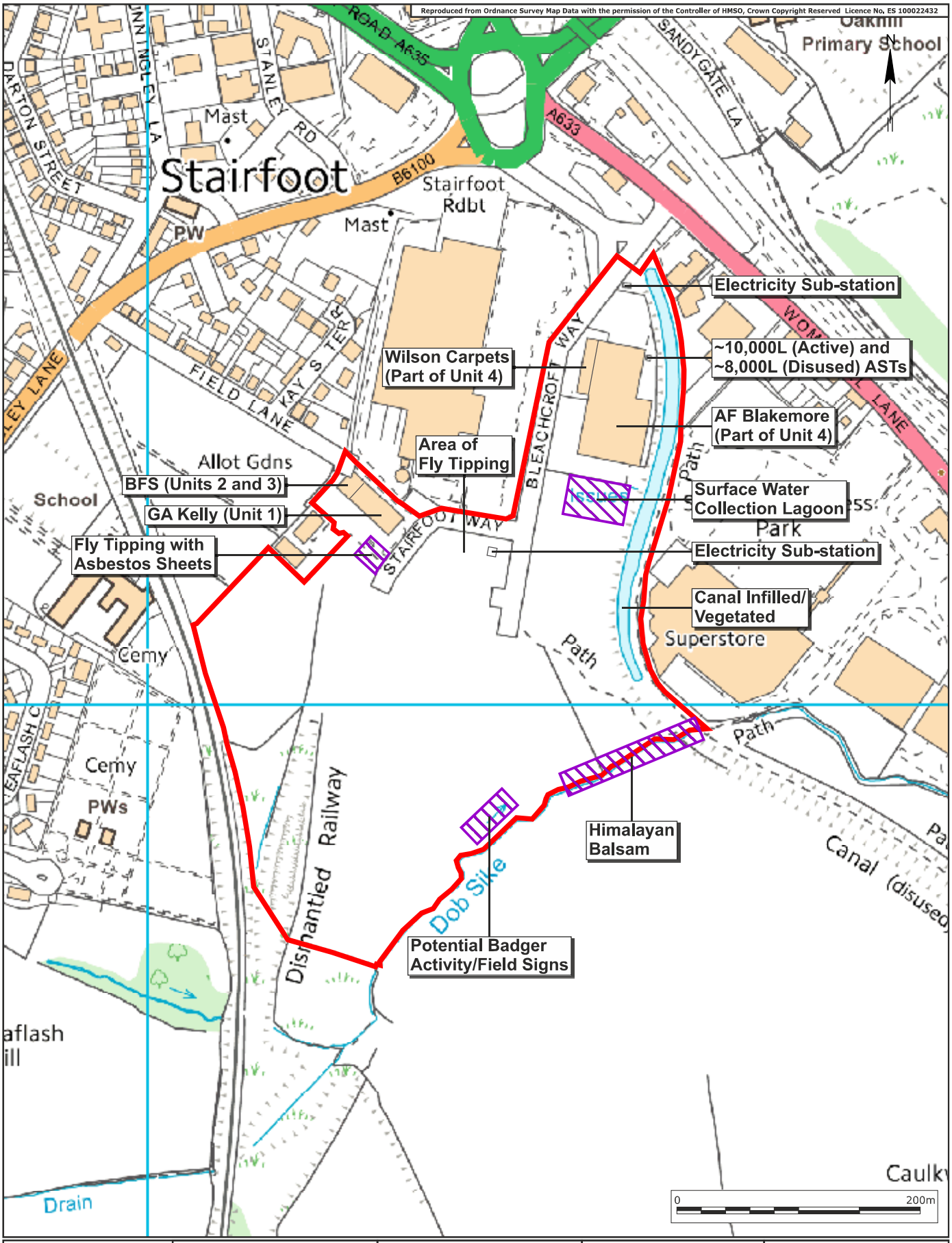




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Title: Figure 1: Site Location	Site: Stairfoot Business Park, Barnsley, S70 3PA	Date: December 2015	RAMBOLL ENVIRON
		Scale: As shown	
Project No.: UK16-22483	Client: U and I Group Plc	Issue: 1 Drawn by: DM	



Key	Title	Site	Date
Site Boundary	Figure 2: Site Layout	Stairfoot Business Park, Barnsley, S70 3PA	December 2015
			Scale 1:4,000 @ A4
	Project No. UK16-22483	Client U and I Group Plc	Issue 1 Drawn by DM

RAMBOLL ENVIRON

APPENDIX 2
PHOTODOCUMENT



Photo 1. North-east of site showing Wilsons Carpets and Blakemore (Unit 4)



Photo 2. Roof of Wilsons Carpets showing potential ACM cement sheeting

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015



Photo 3. Two (2) x ASTs to north-east of Unit 4 (Blakemore)



Photo 4. Fill points for ASTs on northern elevation of Unit 4 (Blakemore)

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015



Photo 5. Heating oil pump, located in north-east of Unit 4 (Blakemore), in north-east of site



Photo 6. Oil fuelled air heater in Unit 4 (Blakemore)

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015



Photo 7. Electricity sub-station in northern corner of site



Photo 8. Walk in fridges in Unit 2 and 3 (BFS), indicated to utilise R22

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015



Photo 9. General waste skip to east of Unit 1 (GA Kelly), in west of site



Photo 10. Fly tipped material along land east of Unit 4 (Blakemore)

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015



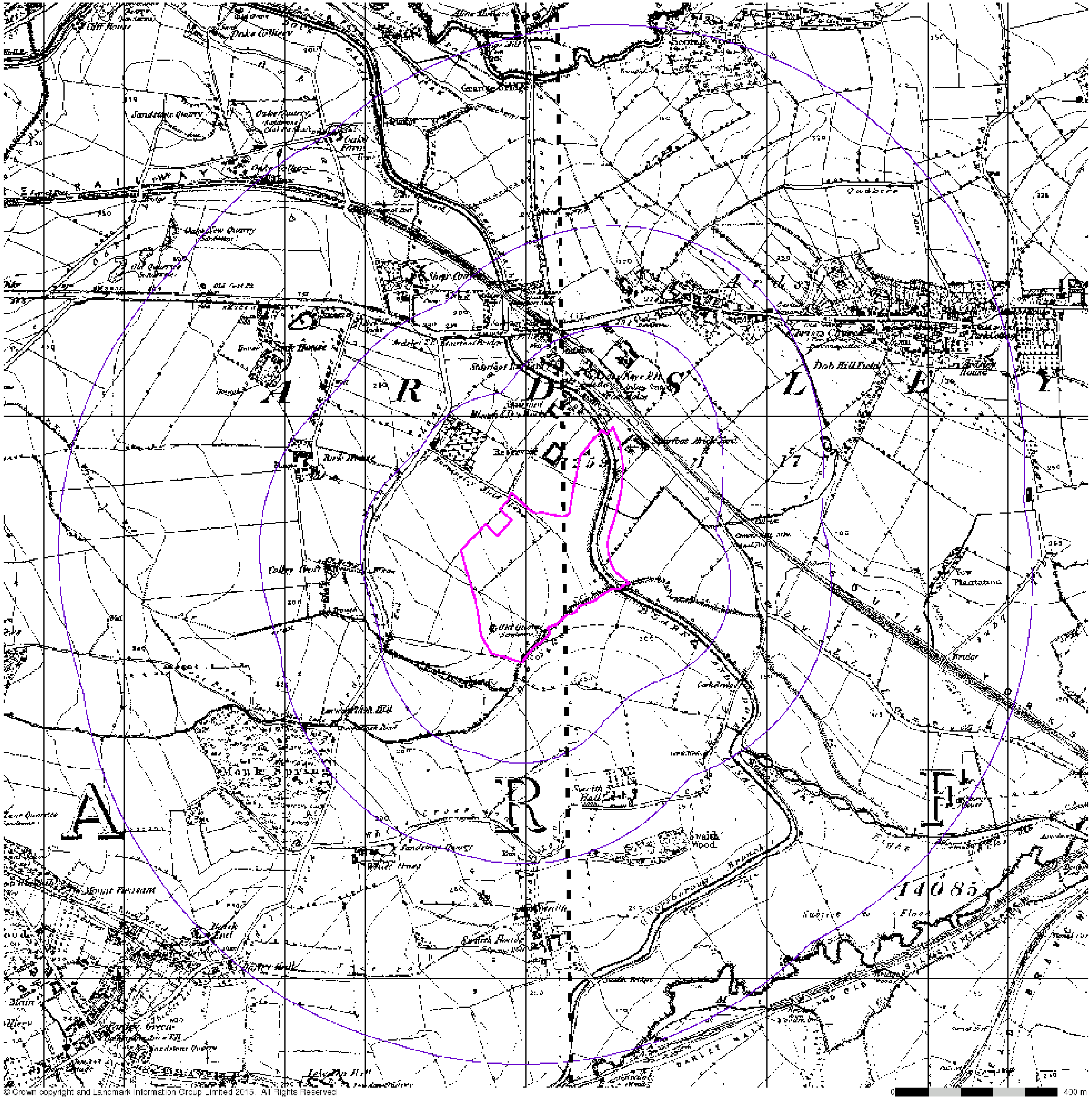
Photo 11. Fly tipping of asbestos cement sheeting south of Stairfoot Road (in west of site)



Photo 12. Fly tipping of asbestos cement sheeting south of Stairfoot Road (in west of site)

Title:	Photographic Log	**Client:**	U and I Group Pl
Site:	Stairfoot Business Park, Barnsley	**Date:**	November 2015

APPENDIX 3
HISTORICAL MAPS



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400 m

RAMBOLL ENVIRON

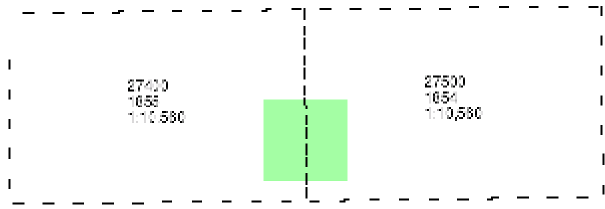
Yorkshire

Published 1854 - 1855

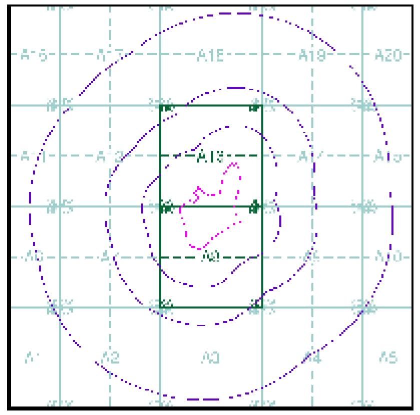
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



N

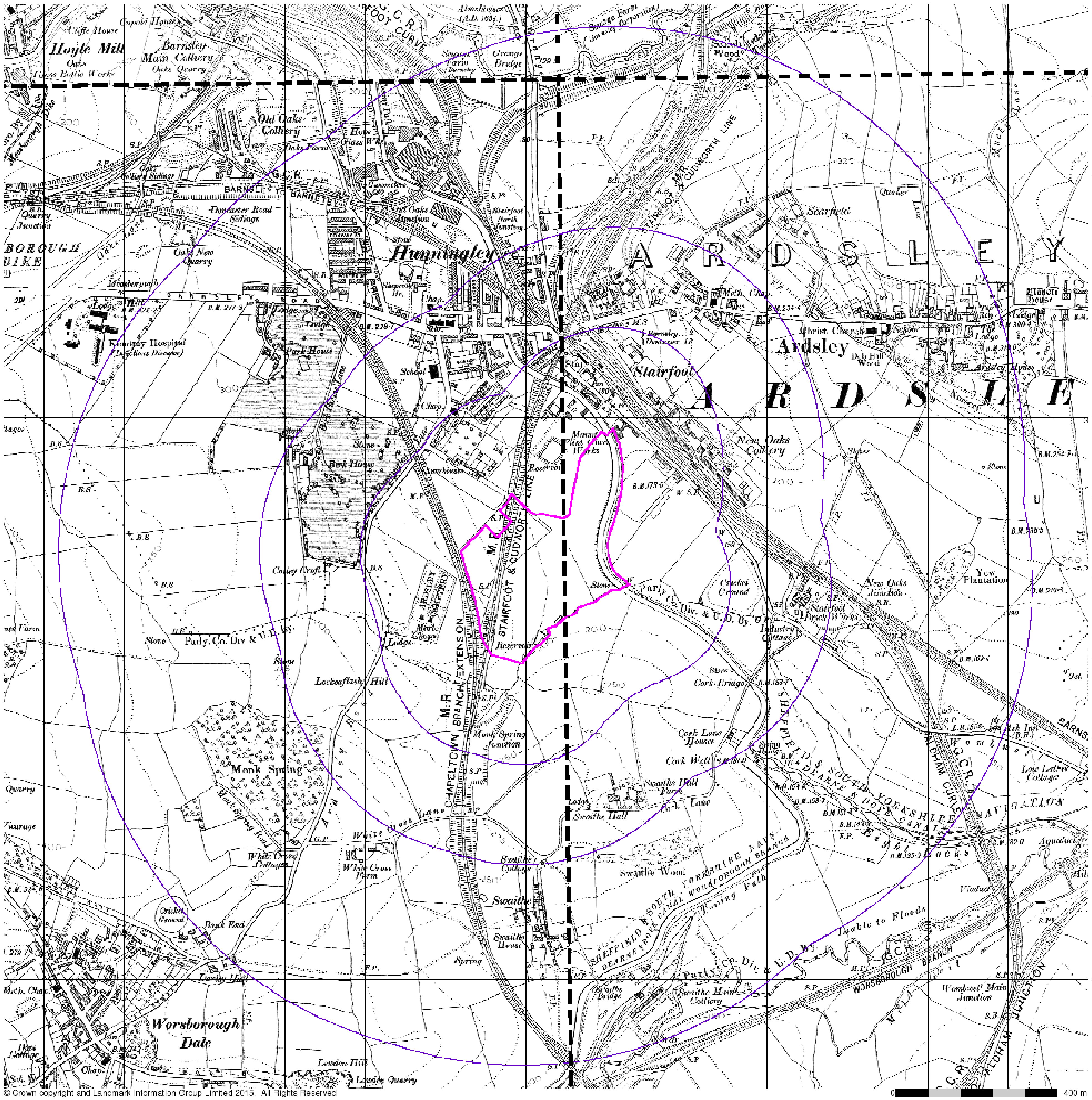
Order Details

Order Number: 75557607_1_1
Customer Ref: UK16-224xx_Stairfoot Business Park
National Grid Reference: 437270, 405070
Slice: A
Site Area (Ha): 12.2
Search Buffer (m): 1000

Site Details

Stairfoot Business Park, Barnsley, S70 3PA

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



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0 400 m

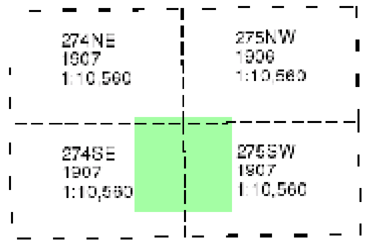
Yorkshire

Published 1906 - 1907

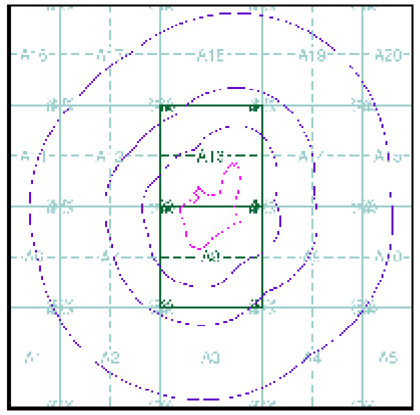
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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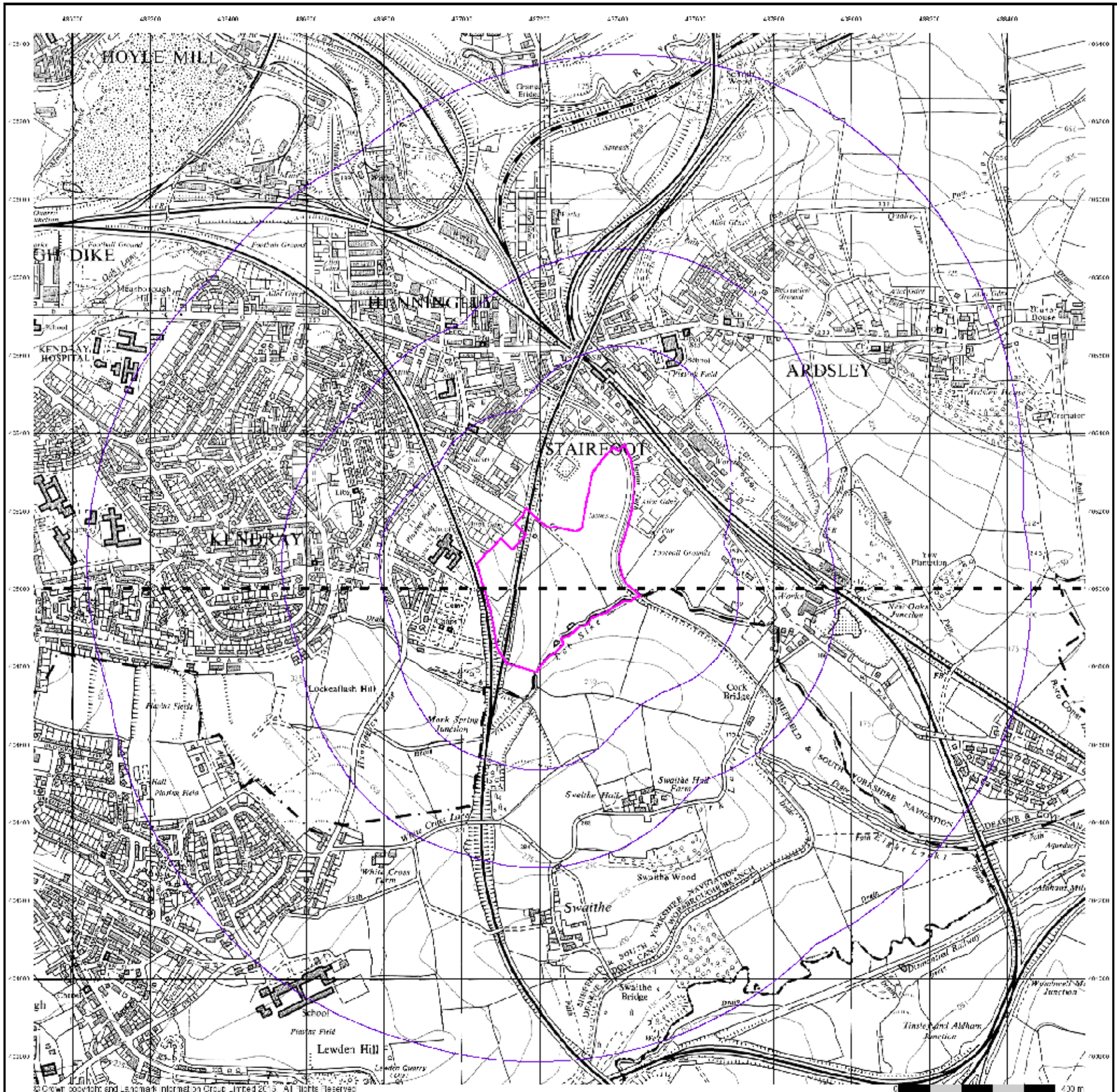
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Customer Ref:	UK16-224xx_Stairfoot Business Park
National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	1000

Site Details

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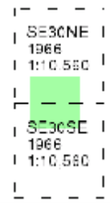
Ordnance Survey Plan

Published 1966

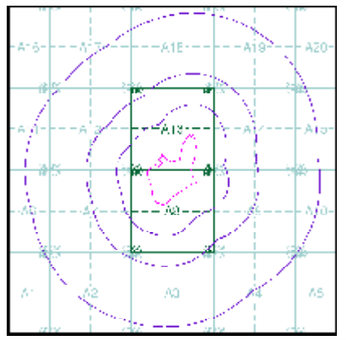
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

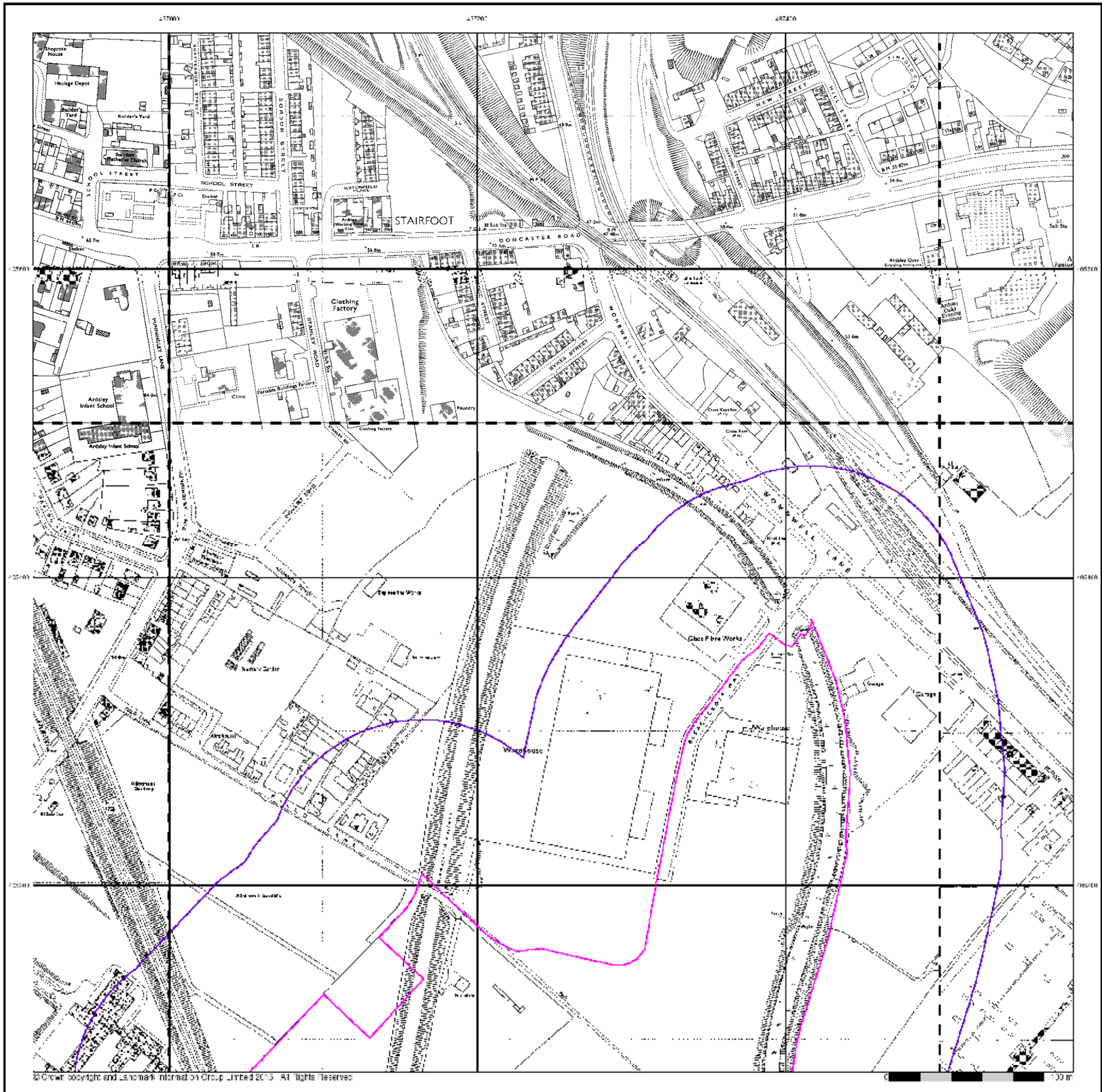
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National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	1000

Site Details

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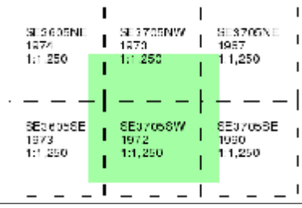
Ordnance Survey Plan

Published 1967 - 1990

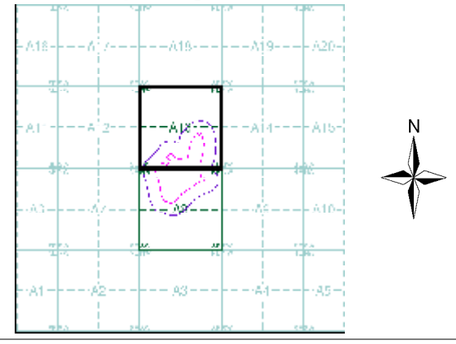
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	75557607_1_1
Customer Ref:	UK16-224xx_Stairfoot Business Park
National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	100

Site Details

Stairfoot Business Park, Barnsley, S70 3PA

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Ordnance Survey Plan

Published 1980 - 1984

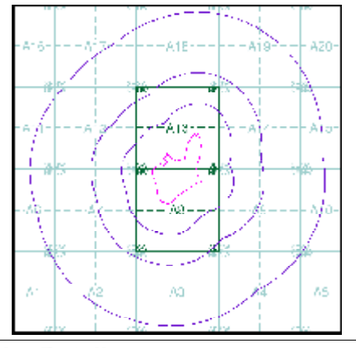
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

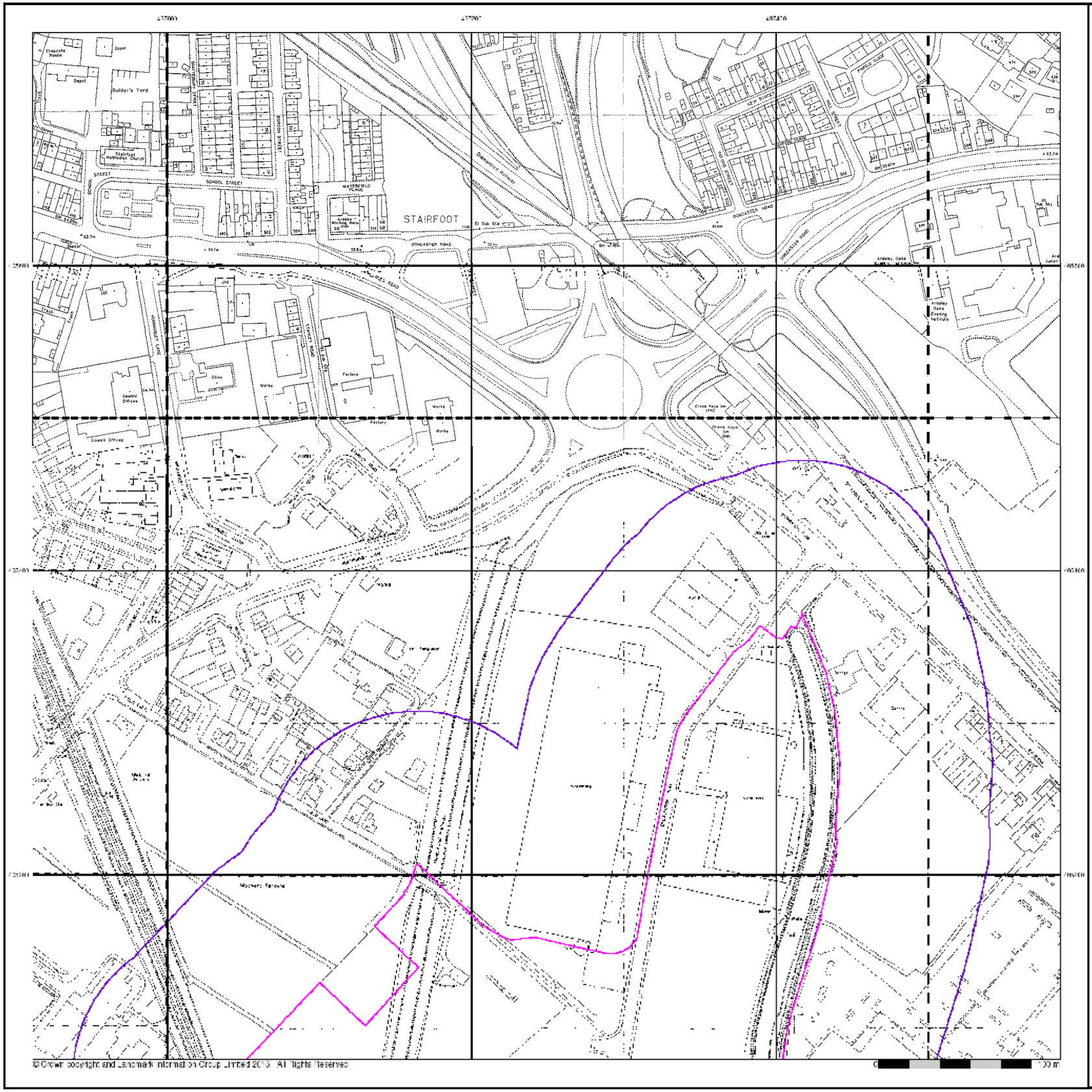
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Customer Ref:	UK16-224xx_Stairfoot Business Park
National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	1000

Site Details

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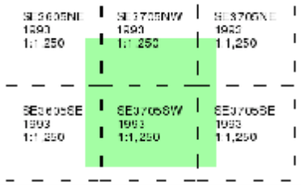
Large-Scale National Grid Data

Published 1993

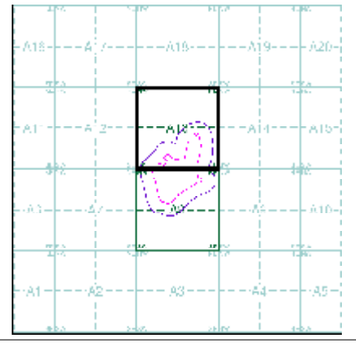
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	75557607_1_1
Customer Ref:	UK16-224xx_Stairfoot Business Park
National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	100

Site Details

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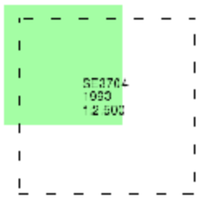
Large-Scale National Grid Data

Published 1993

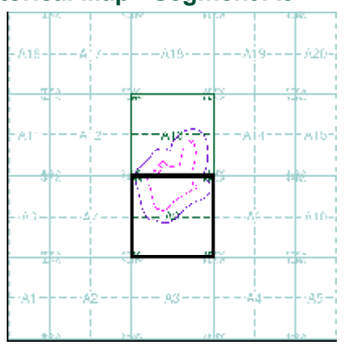
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	75557607_1_1
Customer Ref:	UK16-224xx_Stairfoot Business Park
National Grid Reference:	437270, 405070
Slice:	A
Site Area (Ha):	12.2
Search Buffer (m):	100

Site Details

Stairfoot Business Park, Barnsley, S70 3PA

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VectorMap Local

Published 2015

Source map scale - 1:10,000

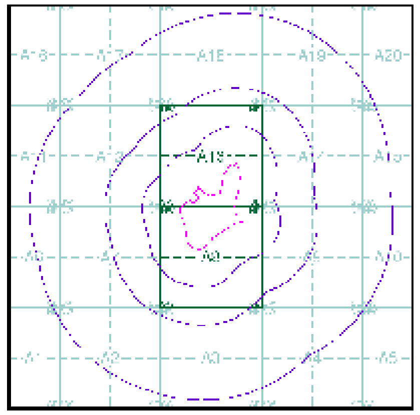
VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap 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)

SE30NE
2015
Variable

SE30SE
2015
Variable

Historical Map - Slice A



Order Details

Order Number: 75557607_1_1
Customer Ref: UK16-224xx_Stairfoot Business Park
National Grid Reference: 437270, 405070
Slice: A
Site Area (Ha): 12.2
Search Buffer (m): 1000

Site Details

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