



PHASE I

DESK TOP STUDY & SITE WALKOVER

AGBRIGG LANDFILL SITE

JR/1321/MAS

At

REAR OF BRIARY CLOSE
AGBRIGG
WAKEFIELD

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1 Introduction

Wakefield Metropolitan District Council adopted the Contaminated Land Strategy in January 2003. This strategy was produced in line with the councils statutory duty to produce and publish a strategic approach to the investigation, and where necessary the remediation, of contaminated land under Part IIA of the Environmental Protection Act (EPA) 1990.

The Contaminated Land Strategy (2003) detailed the order in which areas will be inspected and how the information gathered would be prioritised and reported. The Contaminated Land Strategy Review was adopted in May 2008 as it was identified that the initial Strategy and its implementation needed updating to coincide with the next phase of the strategy i.e. the inspection of potentially contaminated sites.

This report details current site conditions, review of historic site uses, contaminants associated with these activities and recommendations for further action if required. The study has been compiled and carried out in accordance with BS 10175:2001.

1.1 Precursory Work Check

Have the checks/assessments below being carried out prior to this desktop study:

Confirmation of site boundary? Yes

Refer to Section 6, Procedural Document Contaminated Land 3 – Site Inspections

Decision made on prioritisation status of the site? Yes

Refer to Section 7, Procedural Document Contaminated Land 3 – Site Inspections

1.2 Assessment Objectives

The former use of this site as a landfill has the potential to have caused contamination. This report considers the potential for this contamination to impact any of the receptors identified in the statutory guidance¹ and hence, will consider the presence of possible significant pollutant linkages.

The aims of this desk study are as follows:

- Assess the risk of ground contamination by current and historic site activities and if possible identify the types of contaminants that may be present;
- Analyse the risk from migration of contaminants on to site from surrounding areas;

¹ DEFRA Circular 01/2006 – Contaminated Land “Statutory Guidance”, Table A, Annex 3

- Assess the findings in terms of risks to sensitive receptors;
- Provide recommendations for future site work, if deemed necessary.

1.3 Work Programme

The scope of work for the desk study was as follows:

- Review of planning records, waste management records, building control records, anecdotal evidence and environmental protection files;
- Review of historical maps held within the GIS, records from the library and council archives;
- Review of geological and hydro-geological records from the BGS datasets within GIS
- Correspondence with, and review of, site specific information provided by the Environment Agency and where appropriate English Nature amongst other consultees;
- Review of site-specific information provided by internal sources.
- Undertake a site walkover including excavation of hand dug trial pits, visual inspection of the venting trench and location of existing boreholes.

2 Documentary Research

2.1 Site Location & History

2.1.1 Site Description

National Grid Ref	434665,418625
Site Location	The site lies south east of Wakefield City Centre in Agbrigg. Oakenshaw Beck bounds the site to the north and a railway line to the south. Refer to Appendix 1 & 2
Site Area	12.8 ha
Site Description	The site is a former clay pit that was filled between 1969 and 1981 with various wastes including household and industrial. The site was restored in 1983/4 after the site closed in 1981. The site is now used as private agricultural land, specifically hay fields. Various drains surround the site that tie into Oakenshaw Beck which lies to the immediate north of the site. Part of the site is leased from the owner of the land to caravan owners to store their touring caravans.
Potential Contamination Sources	Hazardous and/or toxic waste materials that may have been tipped over the years, particularly prior to the site being licensed in 1974. Migration of landfill gas offsite towards nearby residents Leachate affecting the local aquifer and water courses, specifically Oakenshaw Beck.
Adjacent Land Uses	Residential properties of Station Street, Newland Street, Church View and Briary Close lie to the west of the site. Wakefield Thomas a Beckett Catholic School lies to the south of the site beyond the railway line that bounds the southern part of the site. Open fields lie to the east. The north of the site is bound by Oakenshaw Beck and further north lie allotments and the disused Barnsley Canal.

2.1.2 Review of Site History from Historic Maps/Aerial Photographs

OS Map Edition		On Site Features	Off Site Features
Date	Scale		
1851-1855	1:10560	Site appears to be open land/fields. An access road is evident off Agbrigg Road.	The Great Northern Railway Line runs adjacent to the southern boundary of the site. Sandal

		A spring exists in the east of the site.	railway station is evident to the south west.
1891-1894	1:2500	Spring no longer evident No other significant change	A 'Brickworks (disused)' now exists immediately adjacent to the western boundary of the site. 'Clay pit' also evident. Church Fields Terrace has been built to the west.
1906-1908	1:2500	The brickworks has now extended into the west of the site which includes a clay pit.	Newland Street and Station Street have now been developed. The clay pit is still evident between the two streets.
1907-1919	1:10560	The brickworks is still evident. Clay pit to the north and south of main buildings is now referred to as an 'old clay pit'. A new clay pit exists to the north of Church View Lane.	The clay pit between Newland Street and Station Street appears to have been infilled.
1930-1939	1:2500	Clay pit in the north extended. Allotment gardens now evident	No significant change
1951-1962	1:2500	The buildings associated with the brickworks in the western side of the site have extended with new building being evident. Electrical sub station is evident in the northwest. Various conveyors on site linked to the numerous clay pits now present which have extended over the majority of the site. Ponded water evident in the base of the clay pits.	No significant change
1967-1979	1:1250	The clay pit to the south of the brickworks buildings appears to have been infilled.	A farm (poultry) exists to the north west of the site.
1972-	1:10000	No significant change	Newland Court has now been built between Newland Street and

1984			Station Street.
1982-1996	1:10000	The brickworks has now been demolished and all the clay pits appear to have been infilled leaving a flat open space. Drains exist to the north south and west which tie in to Oakenshaw Beck to the north.	No significant change
2008	1:1250	No significant change	The poultry farm has been redeveloped into residential housing (Briary Close).
Aerial Photos			
2006		Caravan park lies in the north west corner of the site adjacent to Newland Street The northern part of the site is an agricultural field. The southern part is disused open land.	Nothing of note
2002		As 2006 although land doesn't appear to be farmed and is fairly green.	Briary Close now built.
1999		Open land/field. Land not as green as 2002.	Poultry farm has been demolished to make way for the residential dwellings of Briary Close
1980		The brickworks has been demolished and the clay pits appear to have been infilled forming the flat open land as exists today	Nothing of note
1971		The land has been heavily excavated with various clay pits and evidence of ponded water. Brickworks appear to still be operational. The clay pit south of the brickworks appears to have been infilled.	

Refer to Appendix 4 for the maps/photographs.

2.1.3 Potential Receptors

- Site workers
- Trespasser's
- Surface waters
- Groundwater
- Water abstractions within 1 km

- Nearby Property

2.1.4 Mining Activity

The site has been shallow mined for clay and mudstones for the production of bricks at Sandal brickworks.

2.1.5 Review of Sites Planning History

The Council hold records on all previous planning decisions from around 1974. Records of sites that were developed prior to this date may either be missing or incomplete. However, all available records and decision notices have been reviewed for relevant data and conditions relating to contaminated land. This has been summarised below.

Application	Summary of planning record / contaminated land conditions on decision notice.
96/99/56821	<u>Residential Development (Approved)</u> Note 8 – Landfill gas cautionary note on decision notice. Planning officer comment that the Sandal Brickworks Landfill Site closed in 1981. Household waste site
98/99/56821/A	<u>Residential Development (Approved)</u> Above note removed from decision notice. Building Design: ■ Strip foundations ■ DPC (min 2000g visqueen) ■ Airbricks ■ Ground floor – sand/cement screed over 100mm concrete slab over 1200g DPM over 150mm hardcore. ■ DPM to link with DPC to form a 'continuous barrier'.
99/99/56821/C	<u>Residential Development (Approved)</u> File missing

2.2 **Review of Previous Reports**

2.2.1 Environmental Health Landfill File (L7)

<i>Appraisal of the Potential Methane Hazard Around Sandal Brick, Agbrigg (J P Cork, November 1987)</i>
■ Landfill completely restored ■ Healthy vegetation cover ■ Gas spikes – up to 66% GIA methane on site ■ Elevated gas recordings along the south west boundary of the site and “in some areas the gas was coming out under its own pressure and spurting water from the pin holes”.

- Results from the playing fields and railway embankment suggest that the site is very effectively containing the gas as there appears to be no lateral migration of gas.
- Conclusion that gas venting naturally and not migrating
- Recommendation for periodic monitoring

Appraisal of the Potential Methane Hazard Around a Landfill Site (West Yorkshire Waste Management, No date but post 1985)

- 60% household waste/40% other waste including some sludge disposal of a "special" nature.
- Land filling commenced 1969 and ceased in June 1981.
- Pre 1974 site operated by Wakefield District Council.
- Geology is alluvium deposits originally. MCM bisected by a fault (NW/SE) which downthrows to the south. This faulting brings the Oak Rock (SW corner of the site) against shales and mudstones. The dip is about 3 degrees NE.
- The substantial landfill cover was ripped in summer of 1985 to facilitate the pressure venting of methane.
- Notes that properties on Church View and Newland Street have cellars
- Concludes that landfill gas generation is probably past its maximum and decreasing.
- Notes restoration commenced in summer of 1983.

Wakefield MDC Landfill Site Owner Form

Mr Robert & Janine Youde of 31 Church View, Agbrigg Road, Wakefield, WF1 5AL

Disposal Licence Application Form (West Yorkshire Waste Management)

- 260,000 m3 capacity
- Pumping station connected to public sewer.
- Waste stream mentions domestic/commercial waste; medical surgical and veterinary wastes; non hazardous industrial wastes, sewage sludge; mine and quarry waste and construction waste.

Landfill Gas Assessment, MDJA (Report No.2147, Sept 2001)

- Commissioned by WMDC in relation to damage of venting trench which was attributed to Yorkshire Water when they were installing a new drainage culver for Briary Close (refer to Appendix 5.1 for internal file notes)
- Due to high methane levels being recorded in plots 15,17,29,31,33,41,45,47 and 49 (spiking by WMDC)
- Venting trench is 190m long, 500mm wide and varies in depth from 1.6-6m. 2000g gas impermeable membrane laid on farm side of granular fill.
- Top of venting trench cleared of debris from YW works which reduced levels of methane within the gardens to zero by 29/06/2001.
- Carbon dioxide levels still elevated. (see remarks on analysis of gas which determined that this gas didn't originate from the landfill in Appendix 5.2).

- Recommends repairs to trench and continued monitoring by WMDC.
- According to Mr Mark Watson (officer monitoring LFG at the time of the incident) no gas was ever detected within the air bricks of the properties.

Leachate File

- Volume of leachate being pumped to the sewer has been calculated. The volumes appear to be higher during the winter months presumably due to the increased precipitation and corresponding infiltration of water into the landfill mass.
- Chemical Oxygen Demand (COD) remains around 100 mg/l between 1998 and 2006

2.2.2 Minerals Planning File (W87)

Letter from WYMCC to resident on Church View (27th October 1975)

- South western part of the quarry has been used for tipping for some time.
- Advises tipping for other half of the quarry.

Existing Waste Disposal Site Questionnaire (Dec 1979)

- Types of materials received – All types including liquids
- Leachate pumped to sewer

Memo from West Yorkshire Metropolitan County Council (WYMCC) to Mr M Rathmell (29th July 1982)

- Restoration of the site with 225mm of subsoil and 100mm topsoil.

Letter from Mineral Planning to Cllr Hirst (31st Jan 1996)

- Brickworks closed in 1973
- Restoration completed in 1984/1985.

2.2.3 Residential Planning Application at Briary Close

MDJA Report (April 1998, Report No.1821)

- LFG/geotechnical assessment for the proposed residential development.
- 25/30mm standpipes used (S4, S5 & S6 on boundary with landfill site)
- Notes that 7 venting boreholes installed some time ago to help dissipate gas.
- Advises that site is still producing gas but should now have reached peak production and may possibly be diminishing.
- All methane results zero except one insignificant result in S3
- Carbon dioxide varied and was elevated above 1.5% v/v which was identified as a risk.
- Recommends the use of a cut off venting trench between landfill and proposed dwellings which should be tied into the MCM bedrock. 2000g gas impermeable membrane laid on farm side of granular fill.
- Also advised on gas protection measures within dwellings dependant on

construction i.e. air bricks in sub floor void and gas impermeable membrane.
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2.2.4 Historic Complaints

The Environmental Health Department's electronic filing system was interrogated for complaints relating to odour/fumes at Briary Close, Station Street, Newland Court, Newland Street and Church View. Only one record existed as follows:

<i>M3 (14th November 2000, WK/000002803)</i>

- | |
|--|
| <ul style="list-style-type: none">■ Complaint about a chemical odour in the vicinity of 48 Newland Street■ No actions relating to this job. |
|--|

2.3 **Discussions with Land Owners, Developers**

Mr Robert Youde (Owner) and Mr Steve Shearman (Egg Business Owner), 18th December 2008.

Mr Youde advised that the paddock area had been infilled approximately 60-70 years ago prior to the main clay pit being tipped in the 1970's. Mr Youde was informed that this clay pit was infilled with predominantly ash.

Mr Steve Shearman advised that the leachate collection system was connected to the foul sewer outside 31 Church View by an underground pipe extrapolated on the plan in Appendix 2.

2.4 **Site Usage & Contamination**

Details of the past and current usages of the site together with information on spills etc should be collated.

2.4.1 Current Site Usage Potential Contamination

Most of the site is currently used as an agricultural hay field and it is therefore considered that there is a very low risk of contamination. A section of the site off Station Street is used for the storage of mobile caravans which may pose a risk of fuel/oils spills. The south western corner of the site is used as a paddock for horses.

Refer to photographs 1 & 2 in Section 4 taken during a recent site walkover.

2.4.2 Previous Site Usage Potential Contamination

Landfill

The main clay pits on site have been infilled with household and other waste from 1969 to 1981. Typical waste streams from this time would have been:

- Increased tipping of industrial and chemical waste
- Ash content down to about 10%
- Higher volume of degradable waste such as paper and food
- Vast increase in disposable packaging and products.
- Increase in disposal of fridges, cooker and televisions etc.

This waste stream increased the propensity for the production of landfill gases and for the presence of toxic and/or hazardous substances.

The clay pit in the south western corner of the site which is now a horse paddock was filled sometime between 1951 and 1975. Typical waste streams from this time would have been:

- High ash content
- Presence of thrown away packaging including paper
- Plastics started to enter the waste stream.

Brickworks

Common contaminants of concern associated with brickworks are:

- Heavy metals
- Asbestos
- Oil/fuel hydrocarbons
- PAH's
- PCB's

2.4.3 Other Causes of Potential Contamination

- importation of contaminated fill material for the landfill cover/cap

2.4.4 Hazards and Toxicity of Suspected Contaminants

Acidity

A particularly low pH may cause mild to considerable tissue damage when in contact with humans and other forms of animal and plant life. Acidity also exacerbates the effects of other types of contaminants, examples of which are as follows;

- Enhancement of heavy metal mobilisation making some metals more available to plant uptake through capillary action; and
- Further aggravation of sulphate reaction with concrete (in buildings)

Asbestos

Asbestos is a very stable and persistent naturally occurring fibrous silicate with four basic sub-groups;

- Crocidolite (blue asbestos)
- Amosite (brown asbestos)
- Chrysotile (white asbestos)
- Anthrophyllite

Primary routes to humans are through direct inhalation of asbestos dust and fibres that can lead to a number of terminal respiratory diseases such as bronchial cancer and mesothelioma. There is no safe exposure limit to asbestos. Primary sources include asbestos roofs in a poor state of repair collapsing to ground level creating fibre liberation at break, asbestos lagged pipes and boilers. All asbestos material to be disposed of is classed as special waste in the Special Waste Regulations 1996.

Mineral oils

Mineral oils can generally be classed as oil and grease and are distillates produced from crude oil which are insoluble in water. Additives in mineral oils include phenols, compounds of chlorine and organo-metallic compounds.

Mineral oils cause both acute and chronic effects following ingestion. Short term effects can generally be classed as irritation to the digestive tract. Prolonged and repeated exposure can lead to the defatting of skin, irritation and severe dermatitis.

Diesel fuel/oil

The primary exposure route to diesel is through inhalation of vapours which can cause headache and stupor. Ingestion causes irritation of the stomach and intestines with associated nausea and vomiting.

Gasoline

Gasoline is one of the lighter fractions of petroleum with a carbon number between 6 and 11. It is highly volatile and is readily absorbed through the skin. Spillages will evaporate rapidly.

Polyaromatic Hydrocarbons (PAH's)

Often associated with the storage of hydrocarbons, many PAH's are carcinogenic in conjunction with the skin, lip, larynx and lungs. Higher concentrations of PAH's may render the ground aggressive which becomes especially significant if plastic service pipes (highest risk to potable water supply) are in the area of contamination.

Semi volatile organic compounds (SVOC's)/Volatile organic compounds (VOC's)

The groups contain various compounds. Examples of SVOC's are phenol, organofluorines, benzo-a-pyrene; VOC's include benzene, chloroform and toluene. As the names indicate substances included within the group VOC's are highly volatile, much more so than those included within the SVOC's section. Both groups of chemicals are readily absorbed through skin and some, such as benzene, are believed to be linked to tumour growth.

Polychlorinated Biphenyls (PCB's)

Used in pre-1974 transformers in dielectric fluids, PCB's are of increasing toxicity relative to the degree of chlorination. Acute symptoms of PCB poisoning are irritation of the respiratory tract leading to coughing and shortness of breath. Ingestion of PCB's can cause nausea, vomiting and abdominal pain.

Methane/carbon dioxide

Both gases are associated with organic fill. Carbon dioxide is toxic and may cause asphyxiation on inhalation, often occurring with little warning of its presence even at high concentrations.

Methane is also an asphyxiant due to oxygen displacement in its presence. In confined spaces methane is explosive, with flammable limits of 5 – 15% in air.

Hydrogen Sulphide

A colourless gas with a strong smell of rotten eggs. The explosive limits are between 4.3% and 46%. Highly toxic - may be fatal if inhaled. Inhalation of a single breath at a concentration of 1000 ppm (0.1%) may cause coma. Corrosive when moist. Skin contact may cause burns. There is a rapid loss of sense of smell on exposure to gas concentrations above 150 ppm, and this means that the extent of exposure may be underestimated. Perception threshold ranges from 0.5 ppt to 0.1 ppm. Irritant. Asphyxiant

Creosote

Creosote is a liquid mixture of phenols obtained by distilling tar. Although PAH's constitute a large percentage of creosote its mobility is often hindered. Phenolic, nitrogen, sulphur and oxygen compounds present in smaller concentrations in creosote pose the highest threat of contamination in groundwater.

Metals

Metals that may be present on site include;

Arsenic: Toxic to humans when inhaled and ingested in sufficient quantities. A skin irritant in dust form, causing inflammation and ulceration. Arsenic and its compounds are carcinogenic and can cause chronic and acute poisoning which affects the central nervous system.

Cadmium: A poison by ingestion or inhalation and in sufficient concentrations can cause rapid death. Toxic to humans and accumulation and retention can lead to metabolic disturbances, kidney damage and the development of prostate cancer.

Chromium: Chromate's are known to be carcinogenic and frequent exposure to the skin can cause ulceration. Irritation of the respiratory tract has also been recorded following inhalation of contaminated dust.

Nickel: Inhalation of nickel can result in chronic bronchitis, emphysema, asthma and lung cancer. By ingestion, nickel has been associated with reduced body weight and reproductive and foetotoxic effects and dermal exposure can lead to allergic contact dermatitis.

Lead: Toxic to humans and can lead to anaemia, digestive disorders and considerable damage to the central nervous system. A cumulative poison by inhalation and ingestion.

Mercury: Another metal, which, by ingestion or inhalation, affects the central nervous system. No evidence has been found that it can be absorbed through the plant chain.

Copper, zinc and boron: Of no particular hazard to humans but are known to significantly affect plant growth, particularly in acid soils.

Explosive residues

Contaminants associated with ordnance demolition or testing will include traces of residual energetic material and ash which may contain organic and heavy metal residues. These are likely to migrate into the soil and the more soluble have the potential to contaminate groundwater. Any demolition processes will also have the potential to release toxic gas mixtures.

2.4.5 Risk Based Classification of Land Uses

Contaminative land uses have been divided into four categories A - D, which provide advice on investigation techniques. Class A suggests that an intrusive investigation is highly recommended, and Class D suggests that an intrusive investigation is optional. Table 1 highlights how the land uses on and around the site under investigation have been categorised.

Table 1: Land uses and their proposed risk category.

Class	Hazard Rank	Land Use Classification	Index of Perceived Risk	Perceived Risk Category
A	5	Waste Disposal Site	0.85	HIGH
C	20	Concrete, Ceramics, Cement and Plaster Works	0.65	MEDIUM

Source: (Syms, 1998, Extract in Appendix 3)

The index of perceived risk is intended to represent the potential for contaminative substances to be present at a concentration, which will require remedial action, with 1 representing certainty.

The perceived risk category is intended to indicate the likelihood of contaminative substances being present at concentrations that will result in significant harm being caused. The ranking and index weighting accorded to each land use classification are based on perceived risk, it does not necessarily mean that all sites used for the purpose indicated will suffer from that degree of contamination.

Class A: Intrusive investigation strongly recommended

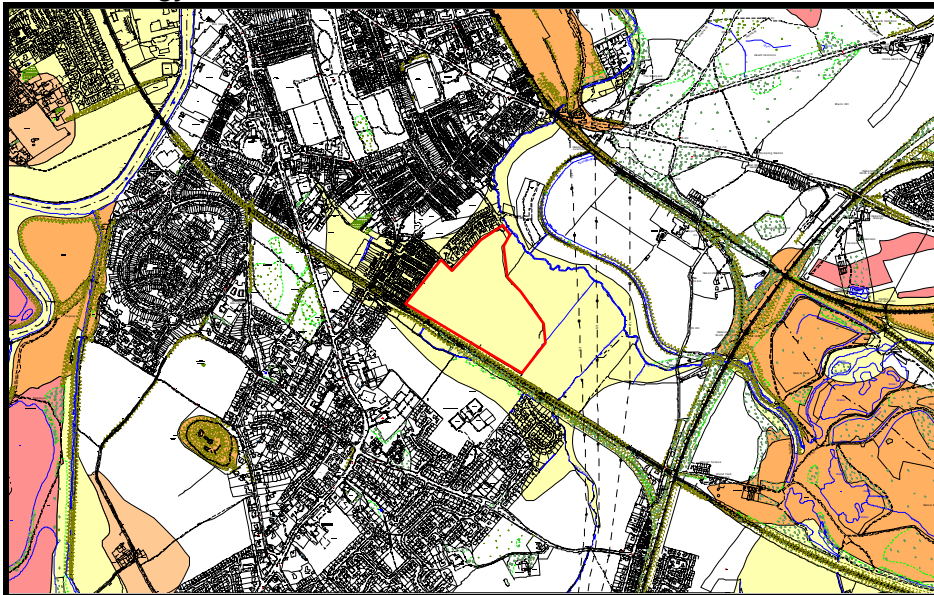
2.5 Geology, Hydrogeology & Hydrology

2.5.1 Geology

The British Geological Society 1:50000 Solid and Drift dataset within GIS shows the site to be underlain by alluvium deposits of clay, silt, sand and gravel. Investigations at the Briary Close development encountered up to 6m of firm clay with bands of sand. It is also considered that there are artificial deposits of infilled ground associated with the land filling operation.

Underlying the alluvium is the Oaks Rock (Sandstone) of the Middle Coal Measures which was identified as mudstone in the Briary Close Investigation.

Drift Geology



Bedrock Geology



2.5.2 Hydrogeology

The BGS Groundwater Vulnerability Map dataset within GIS, identified the geology below the area to be a minor aquifer of high vulnerability.

2.5.3 Hydrology

Oakenshaw Beck runs immediately north of the site and beyond this (100m) runs the Barnsley Canal (disused). A drain exists to the south of the railway line that bounds the southern extent of the site.

2.6 **Ecology & Archaeology**

2.6.1 Ecology

The site has not been officially designated by Natural England as a site of ecological importance.

2.6.2 Areas of Archaeological Importance

West Yorkshire Archaeological Services should be consulted if any physical works are being undertaken in the vicinity of the historic brickworks in the west of the site.

2.7 **Land Ownership**

The land is owned by:

Mr Robert & Janine Youde
31 Church View
Agbrigg Road
Wakefield
WF1 5AL

2.8 Site Chronology

Date	Event
1906	Brickworks and associated clay pits evident on site Newland Street & Station Street properties now built
1950's	Clay pits now at there maximum extent Clay pit in the south western part of the site will have been or would be in the process of being filled.
1969	Filling commenced by Wakefield District Council of the main (central) clay pit area
1972/3	Newland Court built
1981	Land filling ceased
1983-85	Restoration of the site (inc installation of leachate collection system)
1985	Cover ripped to facilitate pressure venting of methane (inc. installation of vent stacks)
June 1999	Vent trench installed as part of the Briary Close development
2000	Briary Close development completed
May 2000	Yorkshire Water breached the venting trench whilst installing flood alleviation pipe work for the above development.
Nov 2000	Significant levels of methane and carbon dioxide monitored within property curtilages at Briary Close and on site. Complaint regarding chemical odour in vicinity of 48 Newland Street also taken on the 11.11.2000 (could this have been landfill gas?)
Oct 2001	Venting trench repaired by Yorkshire Water

2.9 Landfill Gas Venting & Leachate Collection System

2.9.1 Landfill Gas Venting System

The landfill gas venting system was installed retrospectively in 1985 to reduce the risk of migration of LFG. The system consists of eight stacks (with cowls) within the centre of the site (see Appendix 2 for locations).

2.9.2 Leachate Collection System

The leachate collection system was presumably installed between the cessation of land filling and the restoration of the site in 1983-85. The installation of the system was agreed in a legal contract between West Yorkshire Metropolitan County Council and Yorkshire Water Authority on the 4th March 1981. This was due to the leachate being discharged to the public foul sewer at a levied charge.

David Sharples in Property Services advised that the system is of a rudimentary design which operates by the collection of leachate at the

greatest depth within the fill through a layer of brick rubble ("sump") and actively pumped to the connection with the foul sewer (refer to Appendix 2 for locations).

The maintenance of the pumping system is administered by Property Services.

Leachate volumes are dependant on the amount of infiltration of water into the waste mass and due to the lack of impermeable cap estimating the amount of leachate derived from the waste mass is impossible. Due to the infiltration of rain water and age of the fill it is anticipated that the leachate is now significantly diluted and hence will be relatively uncontaminated.

3 Consultations

3.1 Environment Agency

As part of the consultation process the Environment Agency were contacted to provide us with any site-specific information or data they may hold. This was via the standard application for exchange of information between the EA and local authorities – IDENT 01. A summary of the reply from the EA is provided below.

- Sampling point @ 434762,418928 – General Quality Assessment (water quality) has improved from F (2003) to C (2007).
- EA landfill reference is EAHLD05838
- There are no recorded pollution incidents relating to the site.
- There is one nearby water abstraction at Oakenshaw Lane, Walton (435460, 418410) for the topping up of surface water fishing ponds .
- Oakenshaw Beck is receiving water from drains on site.

3.2 Petroleum Officer

Where there is a likelihood that fuel storage tanks exist or existed at a site the local Petroleum Officer will be consulted to request any information on the specific site. A summary of the response is provided below.

No consultation was undertaken as the presence of any fuel storage tanks is unlikely unless they were actually tipped at the site.

3.3 Coal Authority

For larger sites such as landfills a report will be obtained from the coal authority in regards to coal mining activity associated with the immediate area. The pertinent features of the report are described below.

No report has been obtained at this stage of the investigation

3.4 Property Services

Property Services are legally responsible for closed landfills that are owned by Wakefield MDC.

David Sharples (Welbeck Project Manager) was contacted on the 12th December 2008 to discuss the site. He provided information on the leachate management system (refer to section 2.9.2). He also advised that, during maintenance works at the site, only 300mm inert cover overlaid the fill material. This inert cover was considered to be permeable. Although the pumping of leachate is still managed the monitoring and analysis of the leachate is not currently being undertaken.

4 Site Walkover

A preliminary site inspection of the site was undertaken on the 4th July 2008 with a further inspection on the 12th December 2008 by Environmental Health. The following photographs were taken during the site walkover which confirmed that the land is used for private agricultural hay fields (Photograph 1) and caravan storage (Photograph 2).

Photograph 1



Photograph 2



The pertinent points of the site inspection are as follows:

- The site is generally flat (Photograph 1)
- There are four monitoring standpipes at the boundary fence of Briary Close (Photograph 3 and Appendix 2 for locations)
- A 0.5m venting trench is visible between the track and landfill site with a black membrane evident. There didn't appear to be any sand blinding next to the membrane to protect it from puncture by the aggregate. Various punctures were noted in the membrane. (Photograph 4 & 5 and Appendix 2 for the location)
- There are eight venting stacks with cowls distributed within the landfill mass (Photograph 7 and Appendix 2 for locations).
- There is a leachate collection system that is connected to the main foul sewer (photograph 11). The leachate chamber and meter cabinet can be seen in Photographs 8, 9 & 10 and Appendix 2 for the location).
- A four foot diameter flood alleviation pipe installed by Yorkshire Water runs underneath the length of the track. There are three access chambers found in the middle of the track.
- The site tends to be waterlogged during the winter months.
- Two trail pits (refer to Plan in Appendix 2 and Photographs 12, 13, 14 and 15) were dug to confirm the depth and nature of the on-site cap. The pits revealed a loose layer of topsoil of about 300mm depth overlying made ground of ash, clay, bricks and red shale. Groundwater was encountered at trail pit 1 at 300mm.

Photograph 3 - Gas Monitoring
Standpipe at Briary Close



Photograph 4 - Venting Trench



Photograph 5 – Showing
Membrane and Excavated
Aggregate Demonstrating
No Visible Sand Blinding
Next to Membrane

Photograph 6 - Briary Close



Photograph 7 - On Site Vent Stacks



Photographs 8 – Leachate Chamber and Pumps



Photographs 9 & 10 – Leachate Pumping Control Cabinet



Photograph 11 – Foul Sewer Connection Manhole



Photographs 12 & 13 - Trail Pit 1



Photographs 14 & 15 - Trail Pit 2



5 Initial Conceptual Site Model (CSM)

Land cannot be determined as 'contaminated land' unless there is at least one complete pollutant linkage on site. This section will identify all possible pollutant linkages for the site and highlight those, which are considered to be potentially significant. The information gathered and reported to date can then be used to form a conceptual model for the site.

Risk Assessment Matrix

		Consequence			
		Severe	Substantial	Marginal	Negligible
Category of Probability	Probable	Very high risk	High risk	Moderate risk	Moderate/low risk
	Fairly Probable	High risk	Moderate risk	Moderate/low risk	Low risk
	Somewhat Likely	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk
	Very Unlikely	Low risk	Very low risk	Very low risk	Negligible risk
	Extremely Unlikely	Very low risk	Very low risk	Negligible risk	Negligible risk

Source: CIEH: *The Local Authority Guide to Ground Gas*, Table 6.3 (Wilson, Card & Haines), September 2008.

Notes:

Very high risk – There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or there is evidence that severe harm to a designated receptor is currently happening. This risk if realised is likely to result in substantial liability.

High risk – Harm is likely to arise to a designated receptor from an identified hazard. The risk if realised is likely to result in substantial liability.

Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However it is either relatively unlikely that any such harm would occur or if any harm were to occur it is likely that the harm would be mild.

Low risk – It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that if realised it would at worst be mild.

Very low risk - There is a low possibility that harm could arise to a receptor and in the event of harm being realised it is not likely to be severe.

Negligible risk – It is beyond the realms of credibility that harm could occur to a receptor and if it is realised the effects will be marginal.

5.1 Textual CSM

Source	Pathway	Receptor	Probability	Consequence	Risk
Metals/ Metalloids in the soil	Direct Ingestion Dermal Adsorption Inhalation of dust	Workers (16-59 yrs old)	VERY UNLIKELY (Landfill capped with soil/grass and in private ownership. Landfill surrounded by fencing)	SUBSTANTIAL	VERY LOW
Organic Compounds in the soil	Direct Ingestion Inhalation of vapours Dermal Adsorption	Workers (16-59 yrs old)	VERY UNLIKELY (As above)	SUBSTANTIAL	VERY LOW
Leachate	Horizontal/Vertical migration through fissures in MCM and pore space in alluvium (permeable) strata	Minor Aquifer	UNLIKELY (No tipping in last 27 years. Leachate collection system in place, Leachate diluted by infiltration of rain water)	MARGINAL	VERY LOW
		Oakenshaw Beck	UNLIKELY (No reports/evidence of impact on local surface waters, most of site surrounded by impermeable strata Leachate collection system in place)	SUBSTANTIAL	LOW
Landfill Gas (inc VOC's)	Vertical migration through sub surface fissures in MCM and pore spaces within the alluvium (permeable) strata's via services & building substructures.	Residential Properties (Briary Close)	UNLIKELY (Minor exceedance of CO2/CH4 recorded off-site. Most dwellings have air bricks/sub floor voids in addition to venting trench)	MARGINAL (Financial likely to be covered by insurance)	VERY LOW
		Residents (Briary Close)	UNLIKELY (High exceedance of CO2/CH4 recorded off-site. Most dwellings have air bricks/sub floor voids in	SEVERE (Explosion/Asphyxiation likely to cause death)	MODERATE/ LOW

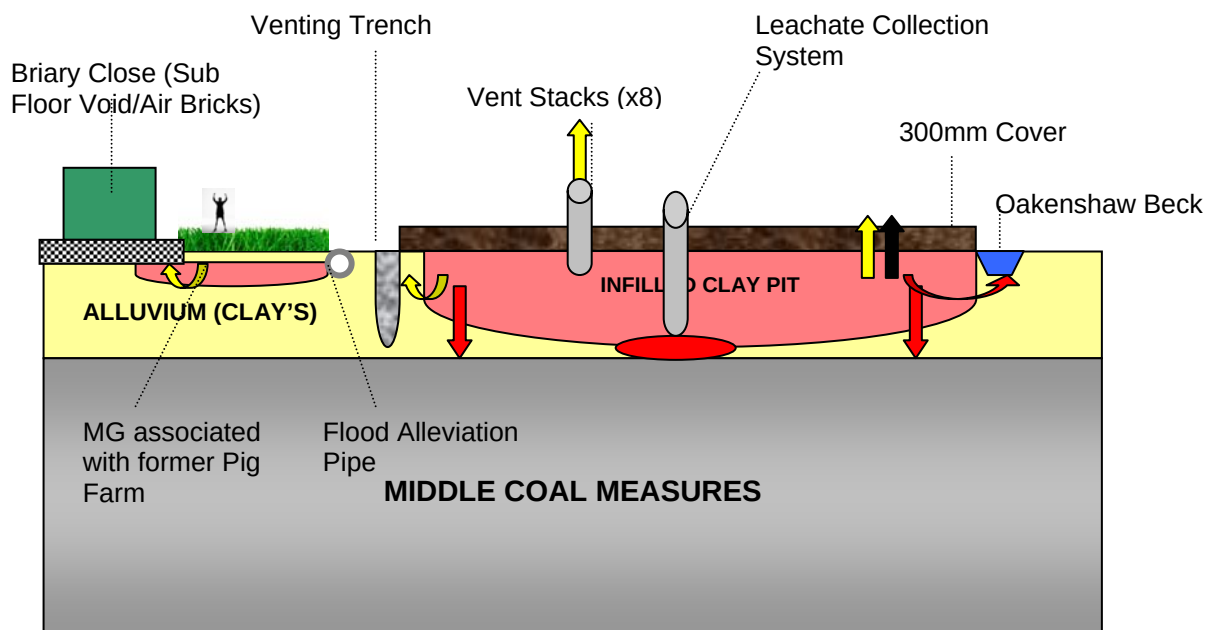
			addition to venting trench)		
		Residential Properties (ST,NC,NS,CV*)	UNLIKELY to FAIRLY PROBABLE (Dwellings have cellars, No monitoring undertaken off-site, Low levels of gas found at on-site boundary)	MARGINAL (Financial likely to be covered by insurance)	MODERATE/ LOW
		Residents (ST,NC,NS,CV*)	UNLIKELY to FAIRLY PROBABLE (As above)	SEVERE (Explosion/Asphyxiation likely to cause death)	HIGH
Radon	Sub-surface soil strata via services & building substructures	Residents	UNLIKELY (1-3% homes above action levels, naturally occurring)	SUBSTANTIAL (Potential carcinogenic)	LOW
Asbestos	Inhalation of fibres	Residents/Users of POS	VERY UNLIKELY (Landfill capped with soil/grass. Likely to have been tipped)	SEVERE	LOW

Notes: LOW/MODERATE/HIGH – Risk level is a qualitative designation based on perceived characterisation of the site prior to a comprehensive intrusive investigation. This matrix should be revised after the site investigation for the purpose of determining any requirements for action.

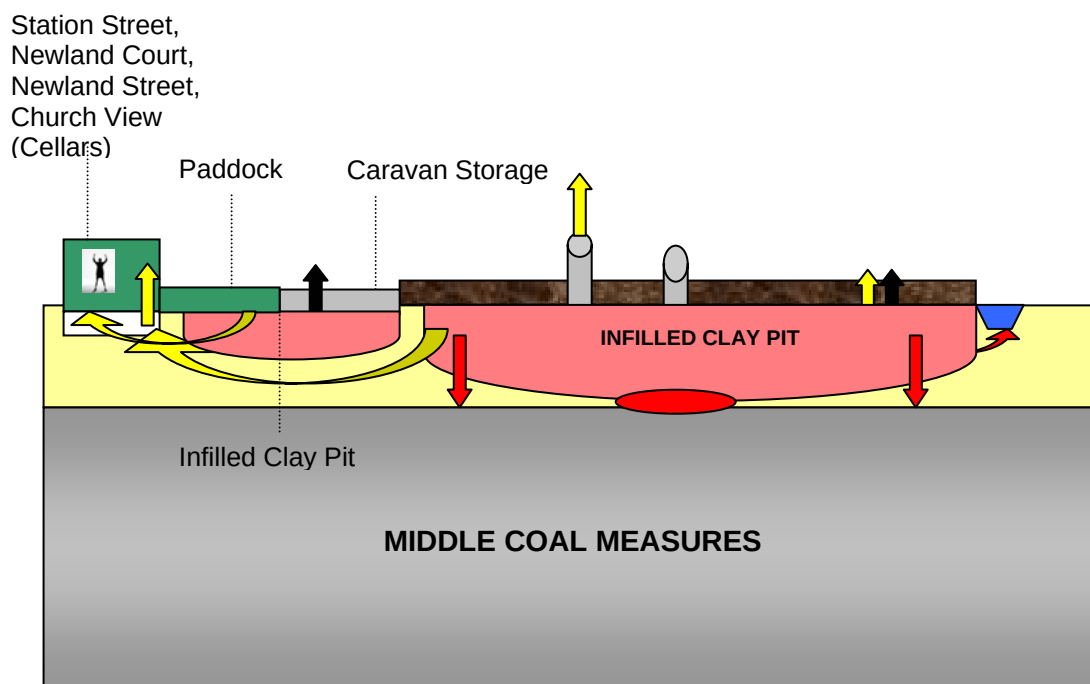
* Station Street, Newland Court, Newland Street, Church View

5.2 Graphical CSM

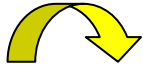
Northern Section (East to West)



Southern Section (East to West)



Human Health Linkages



Ingestion of soil
Dermal adsorption
Direct ingestion of indoor dust (off-site)
Direct ingestion of outdoor dust (on-site/off-site)
Inhalation of dust (on-site/off-site)

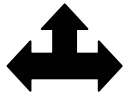


Migration of LFG causing:
Inhalation of vapours outdoors (on-site/off-site)
Inhalation of vapours indoors (off-site)



Inhalation of VOC's outdoors (on-site)

Property Linkages



Horizontal migration of LFG through ground affecting nearby properties
Vertical migration of LFG through the ground affecting any on-site livestock

Controlled Waters Linkages



Horizontal migration of leachate through the ground



Vertical migration of leachate through the ground

6 Conclusions & Recommendations

Site Summary

- The site is a former brickworks and clay pits that were landfilled by Wakefield District Council (pre-1974) and subsequently WYMCC after the Local Authority restructure. Land filling of the main (central) clay pit occurred between 1969 and 1981 with industrial, commercial and household wastes being tipped. The clay pit to the south west of the brickworks was landfilled c1950's.
- Capacity 260,000 m³
- Site now used as a hay field, paddock and caravan storage
- Landfill is unlined

Remedial Measures Summary

- Site restored with simple cap and grassed over between 1983 and 1985.
- Leachate management system installed which is connected to the foul sewer at Church View.
- Eight venting stacks installed within the waste mass to passively vent LFG.
- Air bricks/sub floor voids present within dwellings on Briary Close.
- Venting trench constructed between landfill and Briary Close

Monitoring Summary

- Significantly elevated levels of methane and carbon dioxide recorded on site which is expected for an active non-inert landfill.
- Significantly elevated levels of methane and carbon dioxide recorded in boreholes/spiking holes at Briary Close (refer to plan Appendix 7 for locations of these exceedances).
- No methane or carbon dioxide has ever been recorded within the air bricks of dwellings on Briary Close.

Key Risk Drivers

- Migration of LFG through permeable alluvium strata towards residential properties on Station Street, Newland Street, Newland Court and Church View which are believed to have cellars. Chemical odour reported to Environmental Health on the 11th November 2000 in this vicinity.
- The condition and effectiveness of the venting trench is unknown as no maintenance regime has been adhered to.

Conclusions

That the key risk drivers identified above need further investigation to establish if there are any risks to the properties and residents.

It is not considered that there are any other significant pollutant linkages

(SPL's). This is due to the following reasons:

1. No evidence of pollution of Oakenshaw Beck has occurred over the years and the water quality has improved from classification F in 2003 to classification C in 2007.
2. Land filling at the site has not occurred for twenty seven years and it is highly probable that the landfill is past its maximum gas generation potential with levels of landfill gas declining (this is reflected in the on-site monitoring data in Appendix 6). There has been no landfill gases found within the air bricks of the properties that lie adjacent to the site.
3. The provision of air bricks and sub floor voids in the Briary Close properties adjacent to the site.

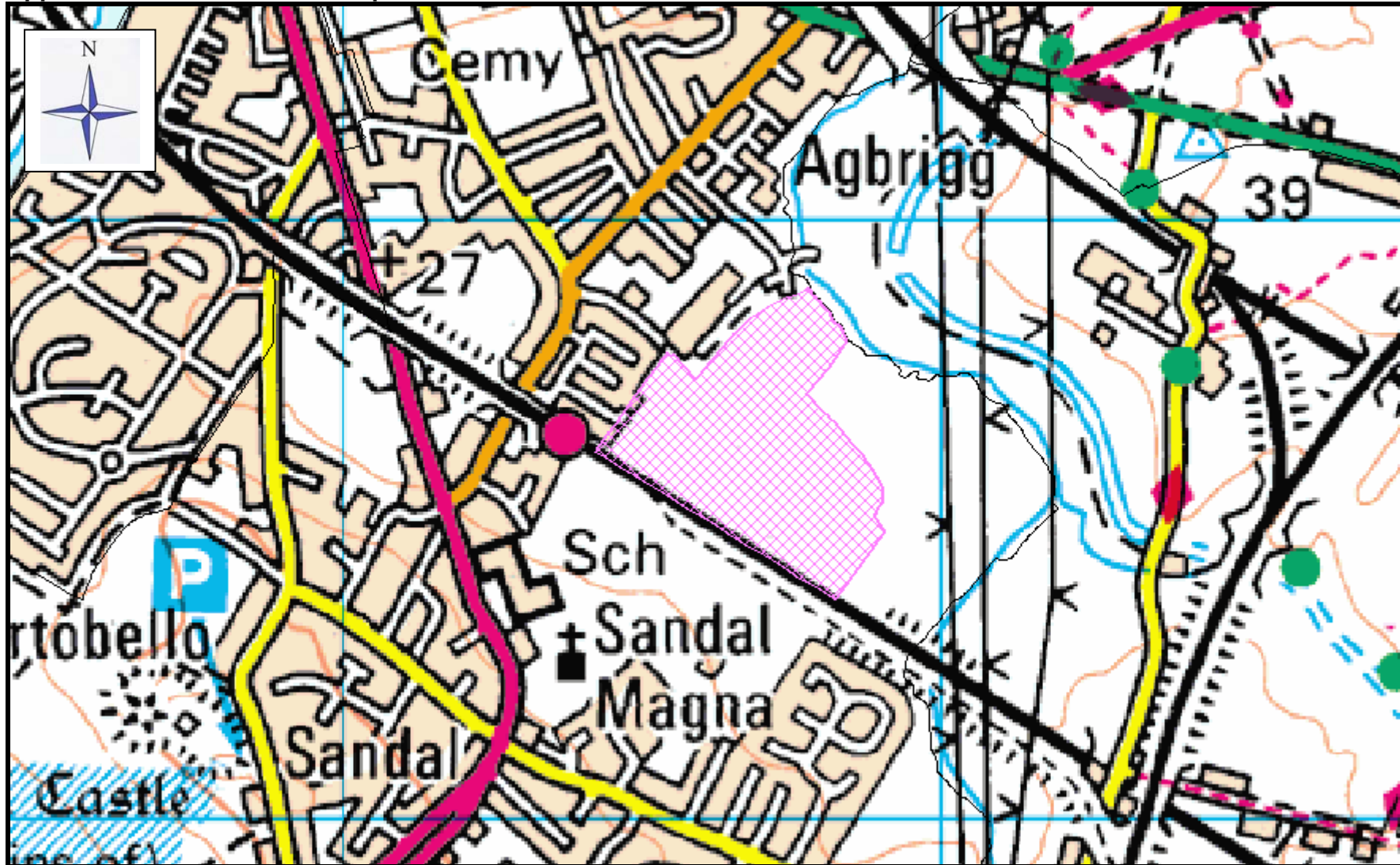
Uncertainties

- One of the key weaknesses of the monitoring by the Local Authority is that no gas flow readings were recorded. Flow is the key risk driver in LFG assessments according to current guidance.
- There has been very little monitoring undertaken in the vicinity of the landfill boundary towards the terraced properties with cellars in the south of the site.
- There is no design or specification evidence of the leachate management system or venting stacks.
- There is no information on the repair of the venting trench or any maintenance of the trench.
- The reason(s) behind the sudden highly elevated levels of landfill gas monitored both on site and off site between November 1999 and June 2001 has not been established. There is therefore a potential for this to happen again.

Recommendations

1. Funding should be sought for the following:
 - Installation of landfill gas monitoring boreholes in the southern part of the site i.e. paddock and caravan storage area where dwellings with cellars exist.
 - Monitoring of landfill gas within the boreholes in line with current guidance.
 - Inspection of the landfill gas venting trench to the east of Briary Close to determine its condition and recommend any need for maintenance as deemed necessary.
 - Sampling of the leachate within the leachate chamber
 - Completion of a landfill gas & leachate risk assessment utilising these monitoring results with any recommendations for remedial action.
2. The site should be reassessed after the above works have been completed.

Appendix 1 – Site Location Map

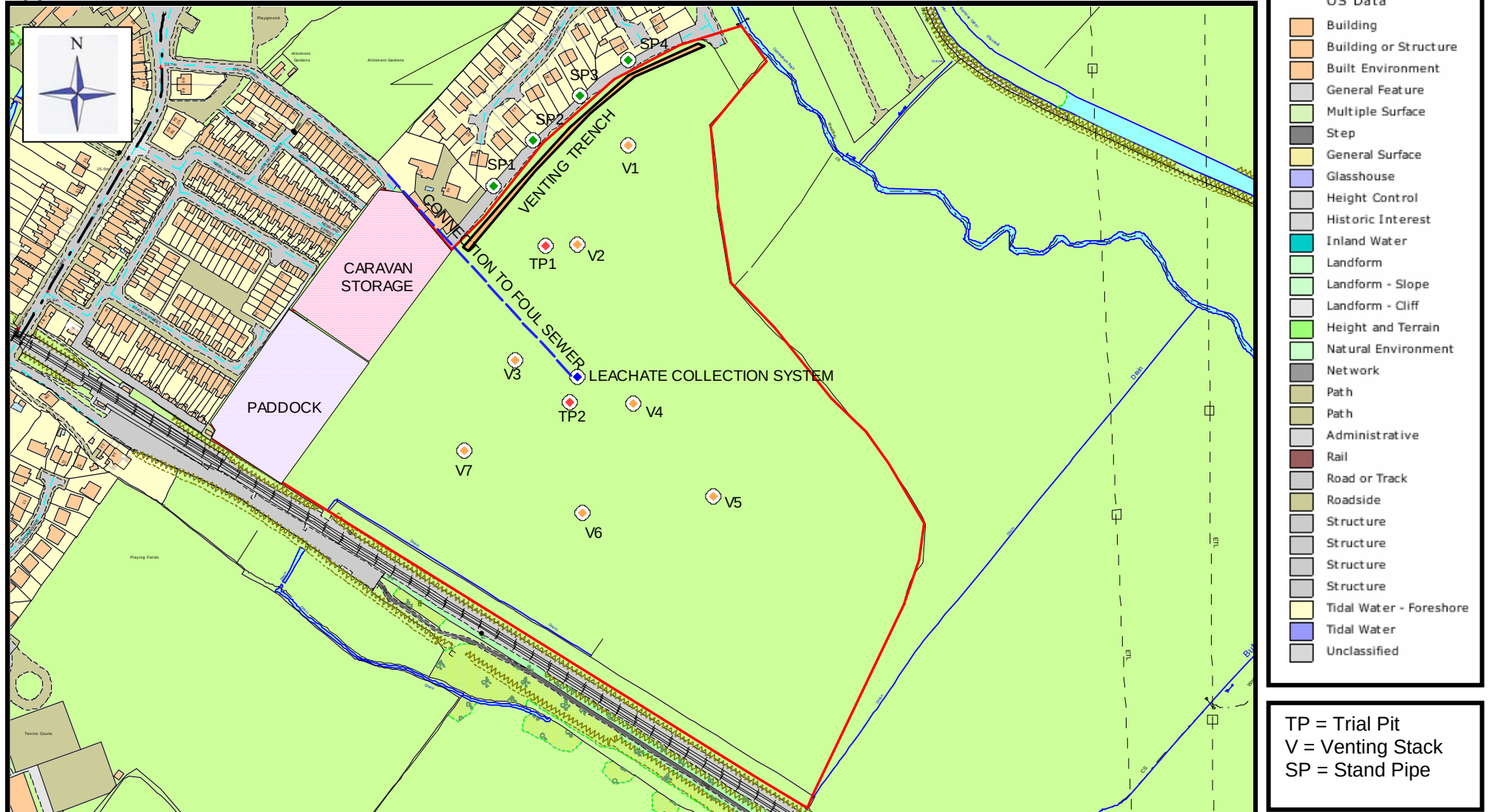


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Source 1:50000
(OS)

Scale 1:10000

Appendix 2 – Site Walkover Points of Interest



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Source 1:1250
(OS Mastermap)

Scale: Not to Scale

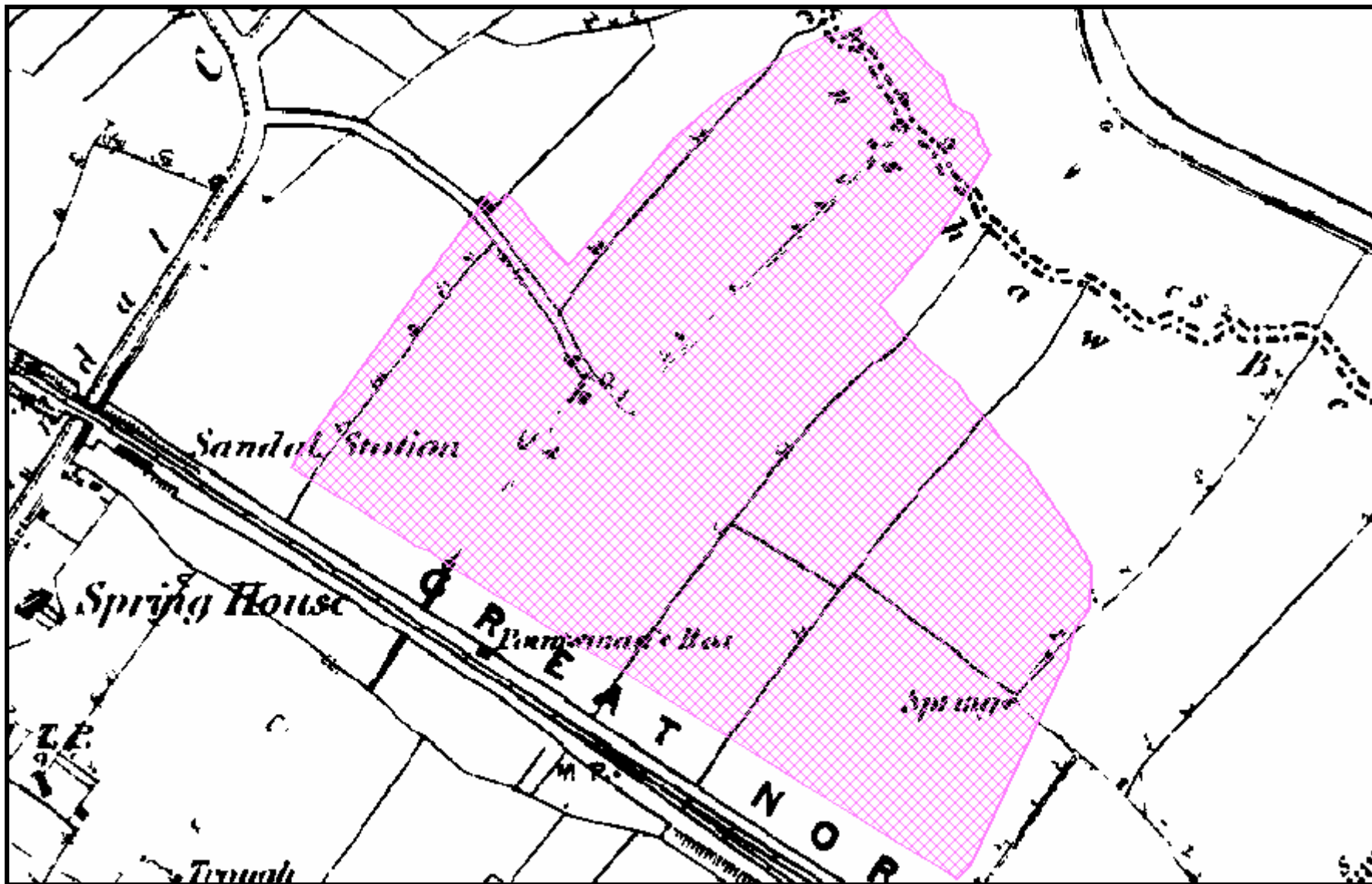
Appendix 3 – Extract From ‘Symms Desk Reference Guide to Potentially Contaminative Land Uses’

Table 2 RISK BASED CLASSIFICATION OF LAND USES
(existing or most recent uses)

	HAZARD RANK	LAND USE CLASSIFICATION	INDEX OF PERCEIVED RISK	PERCEIVED RISK CATEGORY
CLASS A	1	Asbestos manufacture and use	1.00	HIGH
	2	Organic and inorganic chemicals production not included elsewhere	0.93	HIGH
	3	Radioactive materials processing and disposal	0.88	HIGH
	4	Gasworks, coke works, coal carbonisation and similar sites	0.85	HIGH
	5	Waste disposal sites, including hazardous wastes, landfills, incinerators, sanitary depots, drum and tank cleaning, solvent recovery	0.85	HIGH
	6	Oil refining, petrochemicals production and storage	0.84	HIGH
	7	Manufacture of pesticides	0.83	HIGH
	8	Pharmaceutical industries, including cosmetics and toiletries	0.82	HIGH
	9	Fine chemicals, dyestuffs and pigments manufacturing	0.82	HIGH
CLASS B	10	Paint, varnishes and ink manufacture	0.79	HIGH
	11	Animal slaughtering and by-products, including soap, candle and bone works, detergent manufacture	0.78	HIGH
	12	Tanning and leatherworks	0.77	HIGH
	13	Metal smelting and refining, including furnaces and forges, electro-plating, galvanising and anodising	0.74	HIGH
	14	Explosives industry, including fireworks manufacture	0.73	HIGH
	15	Iron and steelworks	0.72	HIGH
	16	Scrap yards	0.68	HIGH
	17	Engineering (Heavy and general)	0.66	MEDIUM
CLASS C	18	Rubber products and processing	0.65	MEDIUM
	19	Tar, bitumen, linoleum, vinyl and asphalt works	0.65	MEDIUM
	20	Concrete, ceramics, cement and plaster works	0.65	MEDIUM
	21	Mining and extractive industries	0.65	MEDIUM
	22	Electricity generating (excluding nuclear power stations)	0.64	MEDIUM
	23	Film and photographic processing	0.63	MEDIUM
	24	Manufacture of disinfectants	0.62	MEDIUM
	25	Paper and printing works, including newsprint (usually excludes 'high street' printers)	0.60	MEDIUM
	26	Glass manufacture	0.58	MEDIUM
	27	Fertiliser manufacture	0.58	MEDIUM
	28	Timber treatment works	0.58	MEDIUM
	29	Sewage treatment works	0.54	MEDIUM
	30	Garages, inc. sale of automotive fuel, repair of cars and bikes	0.53	MEDIUM
	31	Transport depots, road haulage, commercial vehicle fuelling, local authority yards and depots	0.53	MEDIUM
	32	Railway land, including yards and tracks	0.53	MEDIUM
	33	Electrical and electronics manufacture, inc. semi-conductor manufacturing plants	0.48	MEDIUM
	34	Textiles manufacture and dyeing	0.48	MEDIUM
	35	Laundries and dry-cleaning (larger scale, not usually 'high street')	0.48	MEDIUM
CLASS D	36	Plastic products manufacture, moulding and extrusion; building materials; fibre glass, fibre glass resins and products	0.48	MEDIUM
	37	Dockyards and wharves	0.48	MEDIUM
	38	Food processing, including brewing and malting, distilling of spirits	0.45	LOW
	39	Airports and similar	0.45	LOW

Class A: Intrusive investigation **strongly recommended**;
Class B: Intrusive investigation **recommended**;
Class C: Intrusive investigation **desirable**; and
Class D: Intrusive investigation **optional**

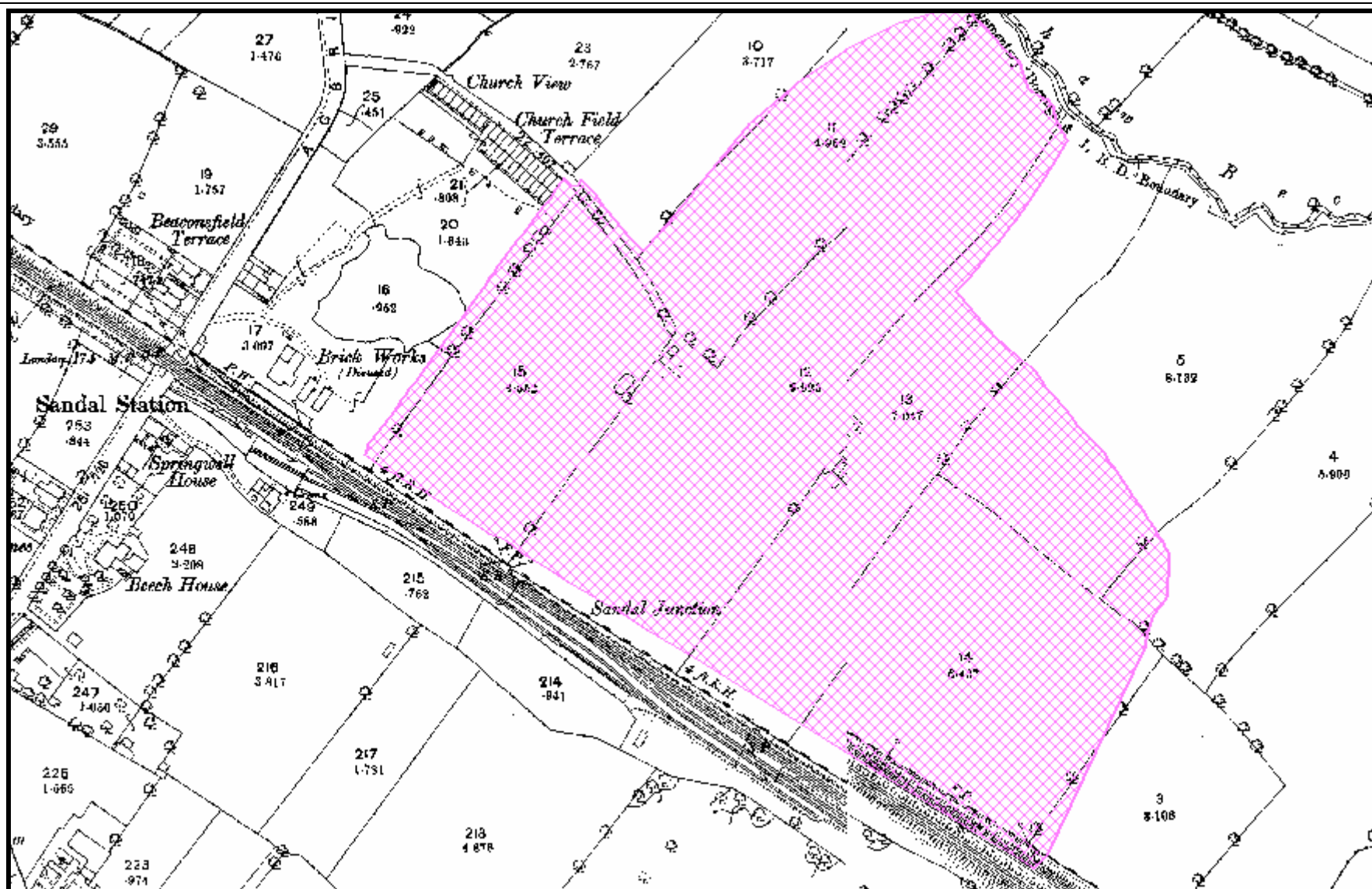
Appendix 4 – Historical Maps/Aerial Photographs



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Source 1: 10560
(1851-1855 Historical Map)

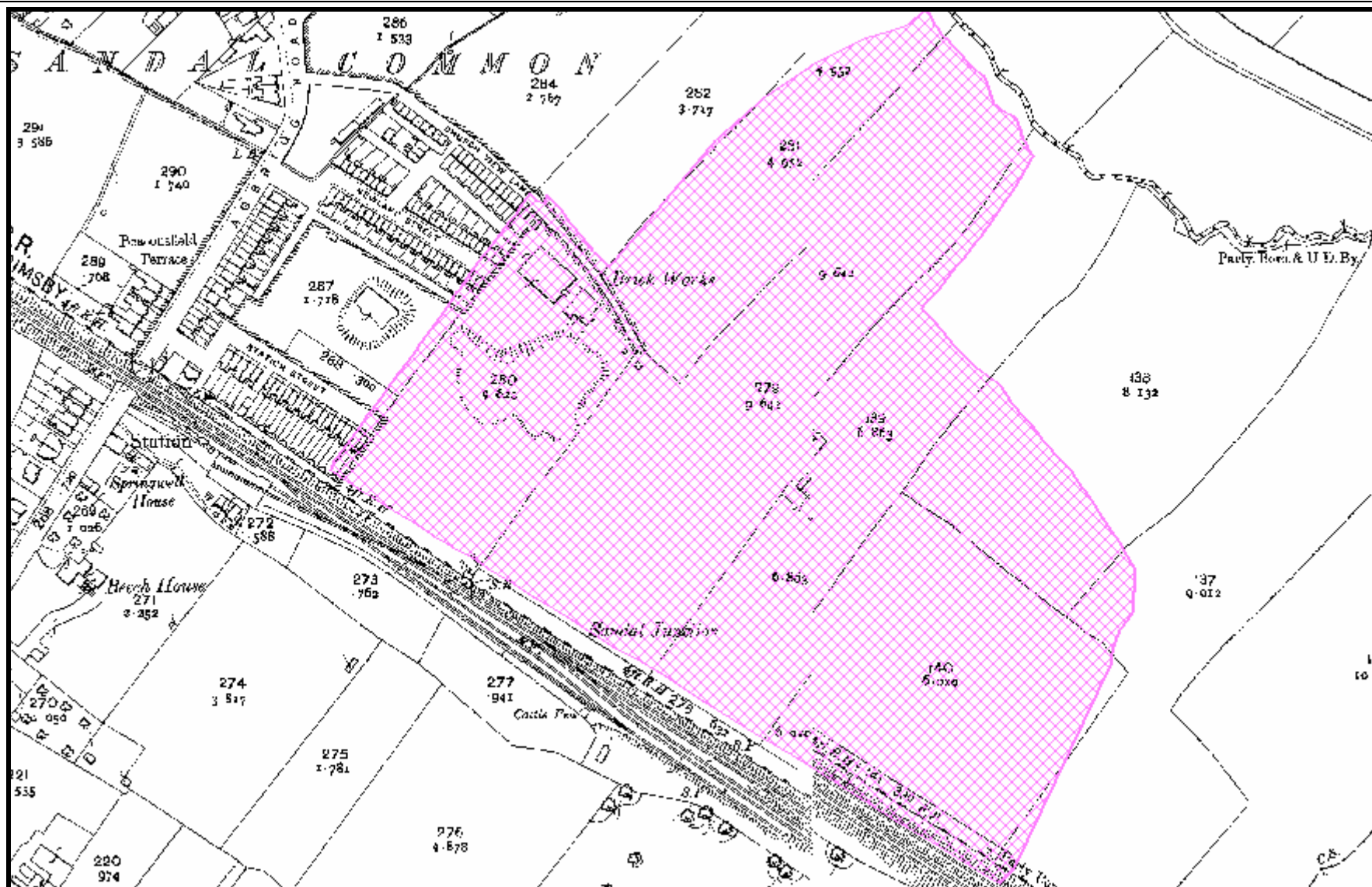
Scale 1: 3500



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Source 1: 2500
(1891-1894 Historical Map)

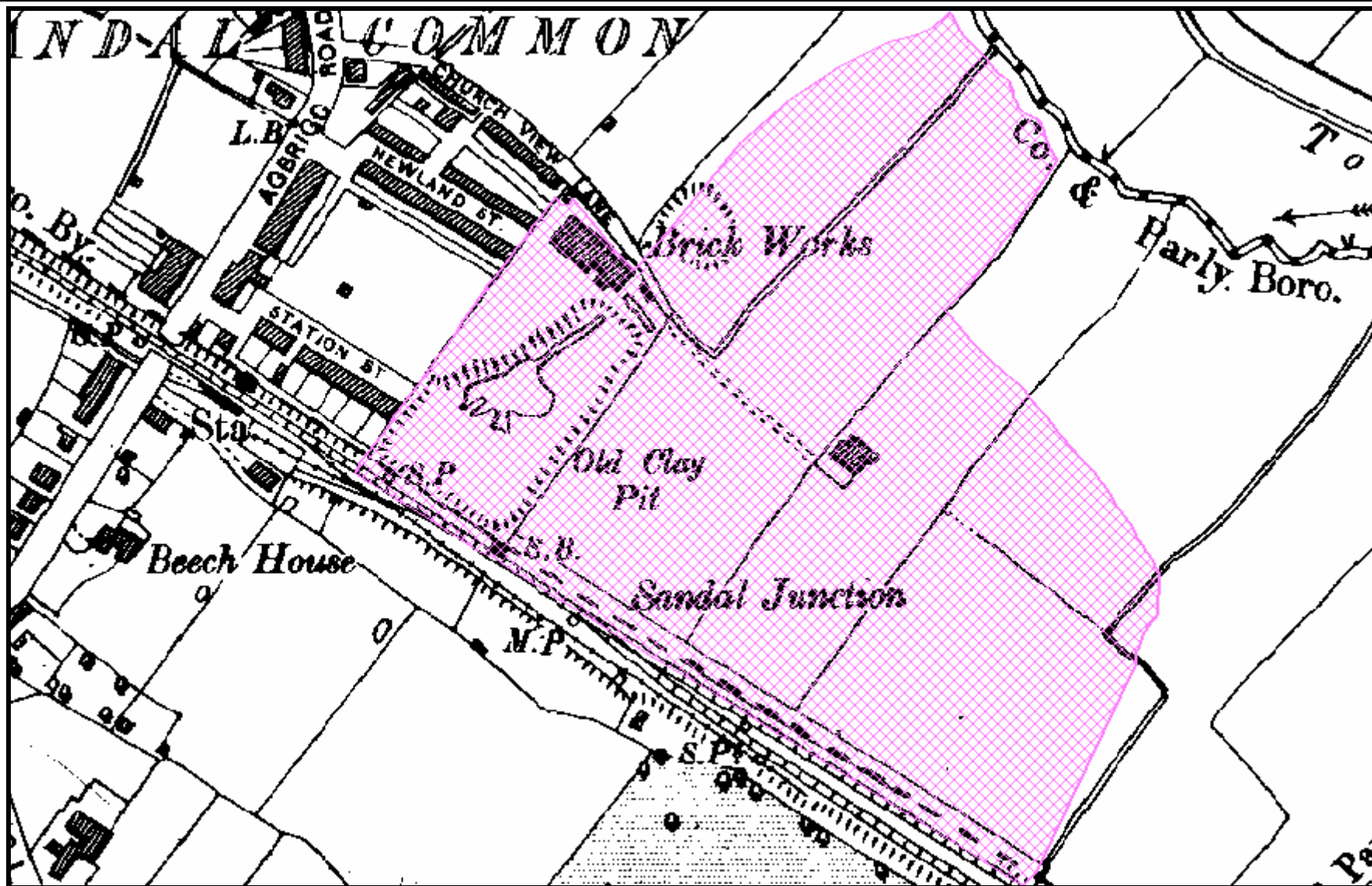
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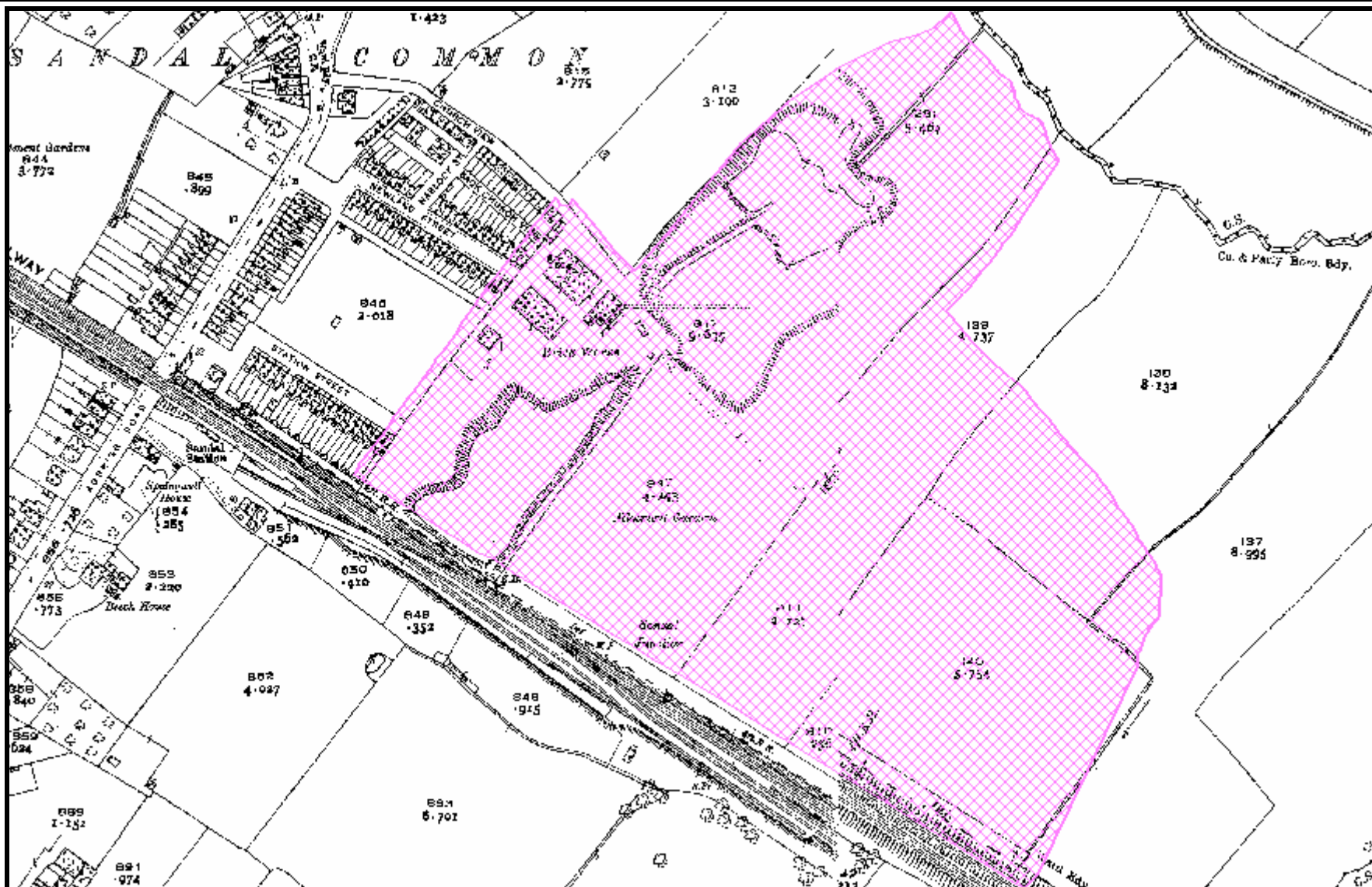


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Source 1: 2500
(1906-1908 Historical Map)

Scale 1: 3500

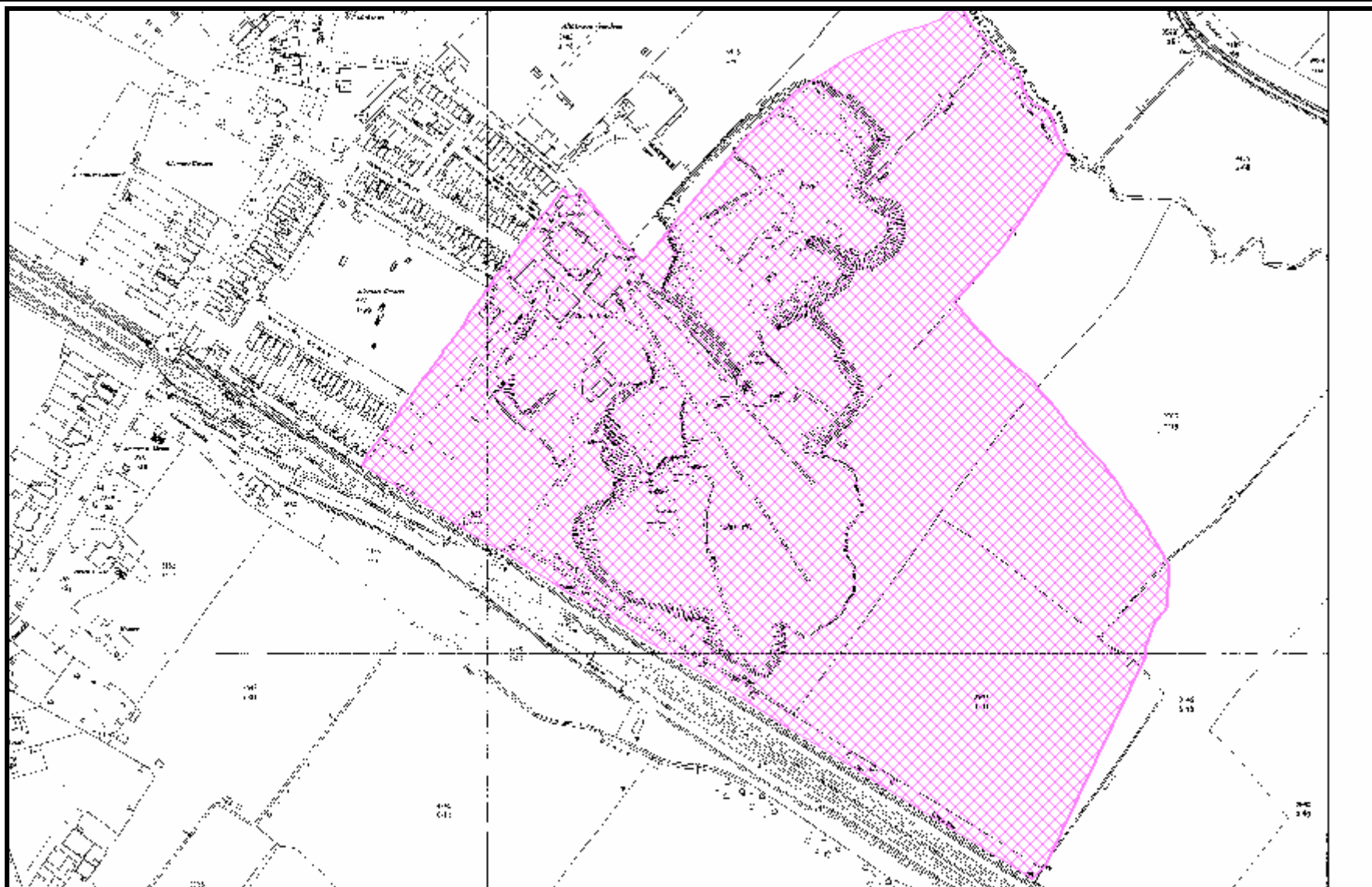




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Source 1: 10560
(1930-1939 Historical Map)

Scale 1: 3500



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Source 1: 2500
(1951-1962 Historical Map)

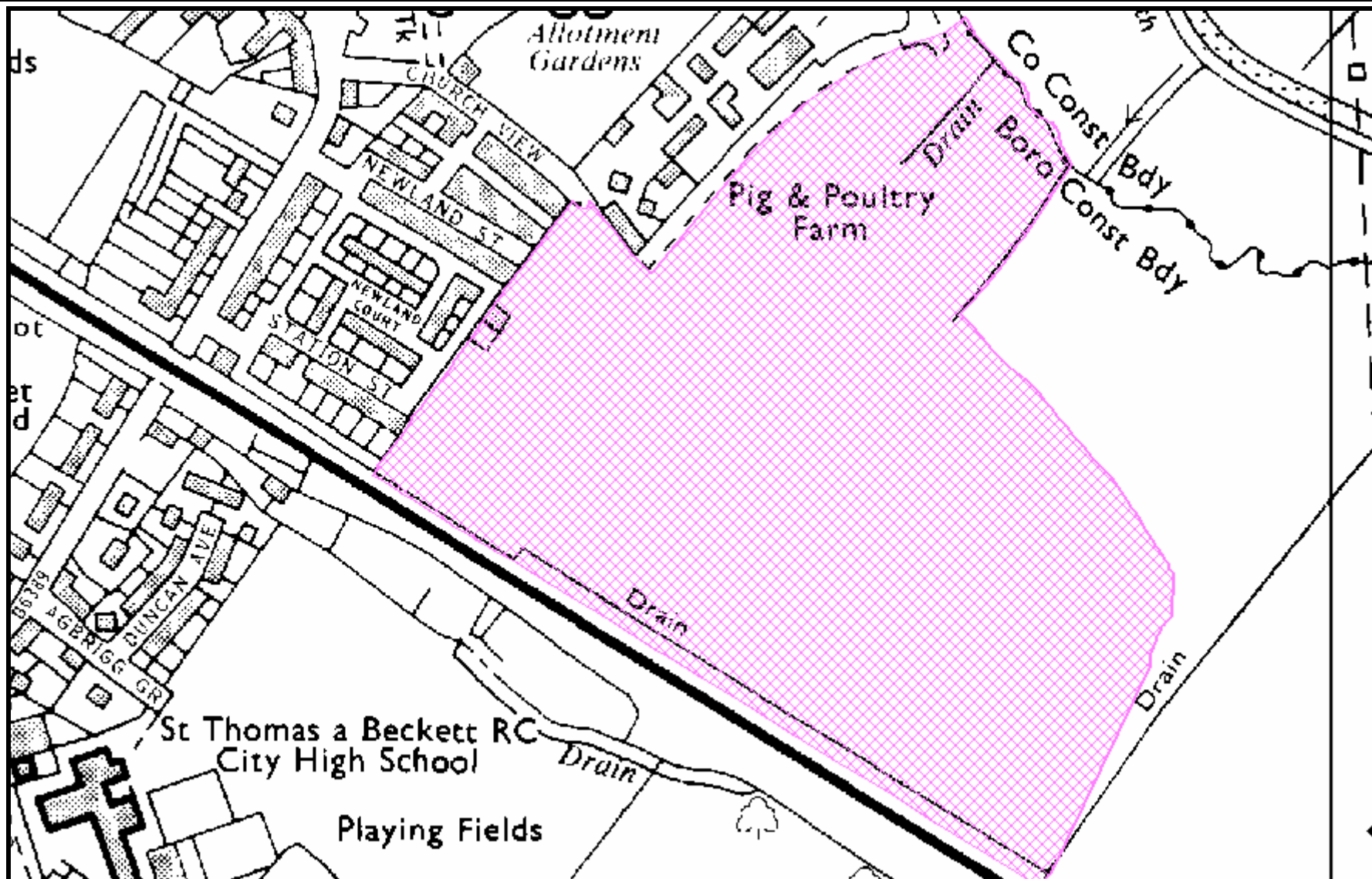
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Source 1: 1250
(1967-1979 Historical Map)

Scale 1: 2200





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2006 Aerial Photograph

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Centre = 434703 E 418622 N



Detail added from
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2002 Aerial Photograph

Scale 1: 3500



Appendix 5 – Historic Correspondence

Appendix 5.1

Agbrigg Landfill Gas Investigation File Notes

- 01.12.2000 The conclusion was drawn that landfill gas has breached the trench and protective membrane. The following action was taken:
- Permission was obtained from Mr Youde to allow access to contractors on to his property for the removal of the earth from the trench
 - Contacted John Parkin, Earthtec, requested that soil be moved over weekend
 - Contacted building control to determine if properties built with preventative measures against gas migration. It could not be established that this was the case, no file note to this effect.
 - Contacted James Brennan, Weaver Homes, re design he confirmed that visqueen membranes installed.
 - Decided in view of above that situation would be acceptable over the weekend and further monitoring to determine any improvement on Monday.
 - Briefed Phil.
- 04.12.2000 Further monitoring some improvement.
I contacted Tom Reid re design no record of membrane for landfill gas purposes.
Spoke to John Parkin soil removed from trench
- 05.12.2000 I contacted Jim Brennan he confirmed that membrane was there for weed control and moisture control not the prevent gas ingress. They still have several houses to sell on site. He said typical Council overreacting and that could probably tomes our figures by seven and still be OK. I advised him that this wasn't the case and it is a matter of informing without scaremongering. I advised him that we were looking to leaflet. Discussed leaflet with Phil he was anxious to clear up building control/planning position - we don't want to say anything that may embarrass another part of department drop properties he wasn't happy with this. He asked to see any leaflet before posting.
- 06.12.2000 I rang James Martin re planning conditions. Nothing apart from an informative re landfill gas. So no breach of planning permission that membranes not installed.
Last thing message left for me 4.30pm Eric & Mark want to discuss today's reading first thing 07.12.2000.
- 07.12.2000 Discussed concern about two properties in particular Nos. 17 and 49 Briary Close.
Gas levels higher nearer house than at boundary with landfill site. It was suggested that a second trench be constructed at rear of boundary fence of these properties just to vent the ground that bit

more and levels to drop. Also need to get information out to residents as we need to go back with longer. I contacted Mr Youde advised him what needed doing and also contacted John Parkin and asked if he was prepared to help (suggested that he contact his line manager re getting deeper into the job and appearing to accept responsibility). Arranged for these two parties to meet Eric and Mark on site 2.30pm this pm to sort out the digging asap. At this meeting Mr Youde gave OK for John Parkin's contractors to start on new trenches tomorrow first thing. Briefed Phil re need for more work also for need for more monitoring with 1m probe (rather than 0.5m probe) hence need for letter now as folks really will wonder what's going on. I contacted Ian Morse for legal view. Meeting arranged 1.30pm this pm attended by Alan Pye, Tom Reid, Ian Morse, Phil and me. Before meeting Tom Reid rang to discuss and looked as if Building Control were in the clear so to speak. At our meeting this position was reinforced. Alan Pye mentioned some of properties may be Northern Counties Housing Association – me to chase. Agreed letter could be drafted and no problem for Building Control. Possibility of this falling under contaminated land regime was discussed. Ian to look at this but the preferred way is stat. Nuisance and Youde would be liable. On return to office I drafted letter ran it past Phil emailed to Ian and Brenda Haywood in Press Office. I rang Jim Brennan at Weaver. Ian made couple of minor comments. Brenda spoke to Phil she doesn't like it. Jim Brennan thinks it reads as if they are at fault and their Chairman won't like it. I redrafted and sent back to Ian & Brenda.

- 08.12.2000 Trenches dug first thing. Lads out monitoring again. I had YAHPAC meeting and when I discussed letter with Phil he said leave it to Monday rather than rushing around. Lads had promised occupiers of 17 though so asked Eric to explain to them. Eric still concerned re No 17 agreed for monitoring Sat & Sun am just this property. Phil briefed Glenn, as on leave until today, also briefed Mike Ashworth. I connected local councillors, N Hazell & Hopkins – ansa phone for B Hazell- in case they had enquiries at weekend surgery. Rang Malcolm Wilcock re emergency planning arrangements should there be a need to evacuate homes. Occupiers can be moved into local B&B and Council will pay if necessary.
- 09.12.2000 Saturday Eric went out & rang me afterwards. A couple of hot spots in garden of No 17 Eric removed top soil around areas monitored.
- 11.12.2000 Sunday things went OK. Eric & Mark to do full survey again today. I started chasing feedback form letter. Ian was off Friday last. Brenda not happy but didn't like being put under pressure to say what she did want. Her & Ian got together. Wording agreed. Letter to No 17 at least I dropped if off on way home. I contacted Housing Association. Their properties are even Nos. so not affected. Eric enquired re purchase of fixed methane monitor/alarm for No 17. Ady Ok'd petty cash for £50. Alarm to be obtained Wednesday. I rang Mr Youde but

na until tomorrow. Alan Wheeler of Earthtec rang. Enquiring re position as concerned that it may appear that they are responsible by co-operating. If more work required of them then they would look to engaging consultants to look at trench. They are happy to put right anything they have done wrong but not that for which there is no proof. Mr Youde's agent had been onto him last Friday. I explained that still not clear whether the gas in the ground is residual from that driven across when gravel trench covered or whether it's being replenished due to the membrane being compromised. Said situation continues to be monitored and hopefully by end of week the situation will be clearer.

Action Plan - Agreed with Eric & Mark full survey today and Friday with No 17 in addition on Wednesday. Me to sort out file & type up file notes to date pull position together so that if it looks like need to go down formal route everything is in one place. Would need to go down formal route if we continue to feel that membrane comprised based on monitoring results over next few weeks. Discussed with Phil if serve Notice then would need to state that Notice NOT suspended in event of appeal so we need to be right. Strong likelihood of need to engage consultants to survey and advise before any Notice is served. Ideally Phil would like to monitor situation until New Year and not start the formal route until then. He sees that formal resolution needed even if it is a "friendly notice served." Of course if things take a turn for the worse this timescale will have to be brought forward.

- 12.12.2000 Spoke to Mr Youde advised him of above though legal aspect not discussed other than this is to be decided. He wants to be sure that it's decided asap as he doesn't want us to live with the situation and come back in a couple of years to him by which time YWA/Earthtec could say it's not us. Results from yesterday showed continued reduction with a couple of hot spots but all on boundary bar one exception but gas is moving around still.
- 13.12.2000 Eric & Mark came to see me as they were unhappy re the way forward and what was going to be done.
- 14.12.2000 Meeting with Eric & Mark and I explained the action plan as above. I thought that I had done this but clearly I hadn't got my message across. Briefed Phil. Spoke to Mrs Horne of 39 Briary Close and reassured her about the situation.
- 18.12.2000 Update with Eric & Mark.
- 19.12.2000 Update Mrs Youde on current situation.
- 28.12.2000 Update with Eric on monitoring to date.

- 02.01.2001 Meeting on site with Mr Spiesberger of Micheal D Joyce Assoc. Eric Mark and me. Mr Youde joined us part way through. Explained to Mr Spiesberger events to date and our possible explanations. He is well aware of the situation re the building of the trench. He was still on site doing gas measurements as part of the planning requirements. He was familiar with kinds of gas levels etc at the time. He was very surprised at the levels we were finding. As asked re possibility of acting as consultant to the Council, costs etc.
Action me to write to Spiesberger.
- 08.01.2001 Contacted all parties to arrange meeting for 22.01.200. Update with Mark & Eric
- 15.01.2001 Letter sent to Spiesberger. Discussed with Mark & Eric.
- 22.01.2001 Meeting at 49 King Street.
Present Mr Youde, John Hoyle (Yorkshire Water), Alan Wheeler (Earthtec), Mark, Eric and me.
The client – YWA- the project manager for YWA at the time of the works has moved on and John Hoyle now manager. His task was to take project on from the reinstatement of land disturbed and write the project off.
The contractor – Earthtec – Alan Wheeler, his job is consulting engineers i.e. design and supervision of the project.
Sub-contractors – McLoughlin Pipes PLC – they actually did the physical work. They did the earthworks but went into liquidation before reinstatement was completed.

I gave a chronological account of the events to date right from the beginning as John particularly wasn't aware of the history.

Eric then explained the two scenarios which may explain the reason for the migration of gas on to the housing development.

Alan Wheeler did most of the talking. He was adamant that the membrane wasn't damaged. He couldn't accept the theory that, due to the raising of the land/filling of the venting trench, the gas may have got across the top foot or so of soil. He suggested that the gas may have migrated from the top of the site beyond the start of the venting trench then found an easy route along the new pipework. The gradient of the pipe is 1:300 from Agbrigg Road end to Montague Street (i.e. house nos. 49 to 17). Wheeler confirmed that the ground over the trench on the road had been lifted up to 200mm in places to maintain the necessary cover over the pipe.

Mr Youde is very unhappy re the reinstatement of the land and has a claim in against YWA. He stated that the soil taken out of the trench for its construction was tipped on his land as well as on the venting trench. He states that the height of the land at the boundary of the

landfill site is now 1-1.5m higher than previously. According to him Darrington quarries brought in 60-70 lorry loads of aggregates to fill the trench but only a handful of lorries actually came to take away the soil dug out the remaining soil was just tipped on the land.

Mr Youde also stated that the final level of aggregate in the venting trench was never realised. They run short of a couple of loads of gravel and Weavers were to sort this. Then the pipework construction started so it was delayed and never finished.

Agreed: Alan Wheeler would get land profiles done again to substantiate the claims made by Mr Youde. If this is confirmed then it may put a different slant on the situation.

I am to consider getting the desk top study done.

- 29.01.2001 Rang Alan Wheeler they haven't managed to get out yet to check final profile levels. Plan to do it this week if the chap returns from sick leave. He said they had turned out some pre works photos of the site which showed that Weaver Homes were running a muck down there before they were on site. The site was very muddy and deep tracks – Weaver would have been installing boundary fences at the time. The photos didn't show a prominent venting trench then. I said I would contact him next week – he said he doesn't expect the work to be too revealing.
I rang a couple of consultants for prices – Environ UK and WSP Environmental.
- 01.02.2001 Quote obtained from WSP - £820 ex VAT
- 02.02.2001 Drafted report for Phil to consider to put to Divisional Mngt Team
- 05.02.2001 Alan Wheeler rang they've checked the profiles on the final road level after re instatement of the road. By and large it is as it should be – there was a need to have a length 200-250mm higher than it was previously and this is the case but not quite where it was intended on the length of road! They didn't take profiles of the height of the landfill boundary though believe it was about 400mm higher (not sure if they have photos of it). He did say though that having looked at it again they are even more convinced that the state the builders left the road in after they had finished constructing the boundary fences leaves a lot to be desired. He said there was no sign of the trench (I think they do have photos on this). He confirmed the top of the trench is now clear and they have obtained a price for topping the aggregate up. I reported that only a handful of readings are in the explosive range now and we are monitoring once a week.
- 12.02.2001 Rang Environ UK re quote left message

- 21.02.2001 Spoke to Jane Botham of Environ UK nearly getting there re quote. This is holding job up need three prices before can proceed. (Diane Bondi also involved).
- 23.02.2001 Quote received £3900!!!!
- 07.03.2001 Letter drafted to Spiesberger re success in getting job for desk top study!! Letters also drafted to residents on update of investigation
- 16.03.2001 Spoke to Alan Wheeler to update him on position. Desk top study being done. Monitoring continuing on a weekly basis.
- 26.03.2001 Spoke to Mr Spiesberger draft report to be sent for comment.
- 29.03.2001 Spoke to Mr Youde updated him on position.
- 05.04.2001 Report received
- 06.04.2001 Read report discussed with Eric. Spiesberger seems to be suggesting that the problem is more than land locked gas that will come out in the drier summer months. He is suggesting excavation to determine if membrane damaged or alternatively construct a second trench with membrane at the chainages where adjacent properties are still experiencing gas levels in excess of Waste Mngt Paper 27. Who's going to pay and in order to make someone other than Council pay will need to serve Notice. Do we have evidence to serve Notice?
- 09.04.2001 Rang Mr Spiesberger, Ian and Mr Youde. Update latter and organise meeting with others. Letters sent. Briefed Phil. Left him report to read. To organise meeting Phil, Eric, Mark and I but Bank Hols. Phil on leave 'til first week in May
- 16.05.2001 Meeting with Ian Morse re legal position on this. Stat. Nuisance? Discussed at great length. A number of queries to be raised with Spiesberger. To write with queries and ask for a meeting at which Ian can be present. Drafted letter.
- 13.06.2001 Meeting present – Mr Spiesberger, Ian Morse, trainee legal bod, Eric, Mark and me.
The technical/monitoring aspects of the job were discussed first. Last weeks results were the first in 6 months that are anywhere near approaching acceptability in terms of Paper 27. Hence Spiesbergers conclusion and recommendations and he still sticks by them. Moved on to legal position. Is there nuisance? Who is suffering? What's the damage? Is it prejudicial to health? Is Waste Mngt Paper 27 the yard stick to be used?
It was agreed that to undertake further intrusive works would not provide additional evidence and may cause additional

damage/introduce further uncertainties re responsibilities. To replace certain chainages would be difficult due the instability of the land. A new trench with membrane along the entire length would be needed. The evidence and law is unclear. Ian to research any precedent particularly with regard to Paper 27. To continue to monitor situation and if present low levels are maintained and even continue to drop then our evidence is dwindling away. Spiesberger to be updated on results since production of draft report and finalise his report. Situation to be reviewed on return from my hols. 1 August and decision to be made then.

- 15.06.2001 Briefed Phil on the meeting, conclusion and plan forward.
- 21.06.2001 Monitor results provided and return of Spiesberger spreadsheets so we can see trends (though Andrew Fowler has produced some on his own initiative).
- 10.08.2001 Rang Mr Spiesberger advised him that low levels have been maintained and that I wanted to arrange further meeting to discuss next stage. He gave me the impression that he still didn't want to say that things were satisfactory and said that in the winter when water tables rises again the problem could recur. I explained our view point and need to address issue formally otherwise the Council may be criticised if a compliant was made to the ombudsman. I asked, if we were to serve notice there would undoubtedly be an appeal, as our expert in court did he think he could defend the position upon cross exam by YWA or who ever. He understood my point. I decided to meet with Legal on my own as I felt I knew what Spiesbergers technical position was but Spiesberger had little, if any, appreciation of what I need to do legally.
- 16.08.2001 Met with Ian Morse and Lia Musto case discuss. Legal to send memo. Update Eric and Mark. Some of residents down there are wondering what's happening. They would like me to do a mailing. Four permanent standpipes installed on landfill side of the boundary fences of the properties affected by the gas. These pipes giving readings consistent with the spikes in the gardens. The monitoring points and frequency to be reconsidered when this next stage of job complete. Samples taken of gas in garden and from landfill to try and trace origin. Eric suspects CO2 may not be from landfill site as previously observed by Spiesberger in his work.
- 29.08.2001 Contacted Lia has not received anything to be with me tomorrow.
- 30.08.2001 Drafted letter to Spiesberger. Rang Mr Youde to advise him of position as he is going away until 17/9. I was concerned that he would be unhappy that the matter is not to be resolved formally. However he has come to a financial settlement with YWA for damage done to his land re obstruction of trench etc. And the agreement

leaves the way open for him to go back to them at any time in the future.

03.09.2001 Memo received from Legal.

04.09.2001 Drafted letter to residents. Letter sent to Spiesberger. Monitoring to be undertaken monthly from the standpipes. Only very occasional readings from the gardens. Rang John Hoyle left message re poss site meeting 18/9.

05.09.2001 Letter sent to Spiesberger

18.09.2001 Site meeting John Hoyle, Alan Wheeler, Mr Youde, Eric, Mark and me to discuss restoration of trench and basically finish the job in terms of dialogue with interested parties although monitoring will continue. Although YW still denying any responsibility they were very amenable to restoring trench i.e. filling it up with aggregate and making good. I explained Councils position but that we would continue to monitor.

20.09.2001 Final Report received from Spiesberger.

05.10.2001 Some involvement as YW had turned up with limestone and Mr Youde wanted sandstone. I wasn't sure which it should be. Tried to contact Spiesberger but on leave. Spoke to contractors they had no problem in swapping it so all went ahead without confrontation.

25.10.2001 Result eventually back from analyst in writing giving his view that CO2 in garden not from landfill site.

09.11.2001 Letter sent to Spiesberger.

End of investigation as such in terms of legal position. Monitoring to continue.

Appendix 5.2

Letter from Di Widdowson to MDJA

Mr G A Spiesberger
Micheal D Joyce Associates
Charnock Court
6 South Parade
Wakefield
WF1 1LR

Dear Mr Spiesberger

LANDFILL GAS MONTAGUE STREET, AGRIGG

Thank you for your letters of 20 September and 19 October 2001. I have approved the payment of the slightly higher fee and you should receive a cheque for the revised figure in due course. If you have any difficulties in this regard please do not hesitate to contact me.

For your interest and information I have enclosed a copy of the public analyst's report concerning the samples of gas taken from the landfill site and from a borehole off site. The analysts view is quite conclusive that there was no evidence that the chemicals present in the gas samples taken from the landfill were also present in the samples from the garden. This has led me to the conclusion that the carbon dioxide gas in the gardens does not originate from the landfill site.

Monitoring of landfill gases is now undertaken on a weekly basis from standpipes erected immediately behind the boundary fences of the properties at 17, 33, 41 and 49 Briary Close Agbrigg. For several weeks monitoring was undertaken from the standpipes and by spiking. The results were consistent. No methane has been detected. Carbon dioxide levels are variable from NIL to 6% v/v, typically 1 – 2%. Monitoring will continue for the foreseeable future.

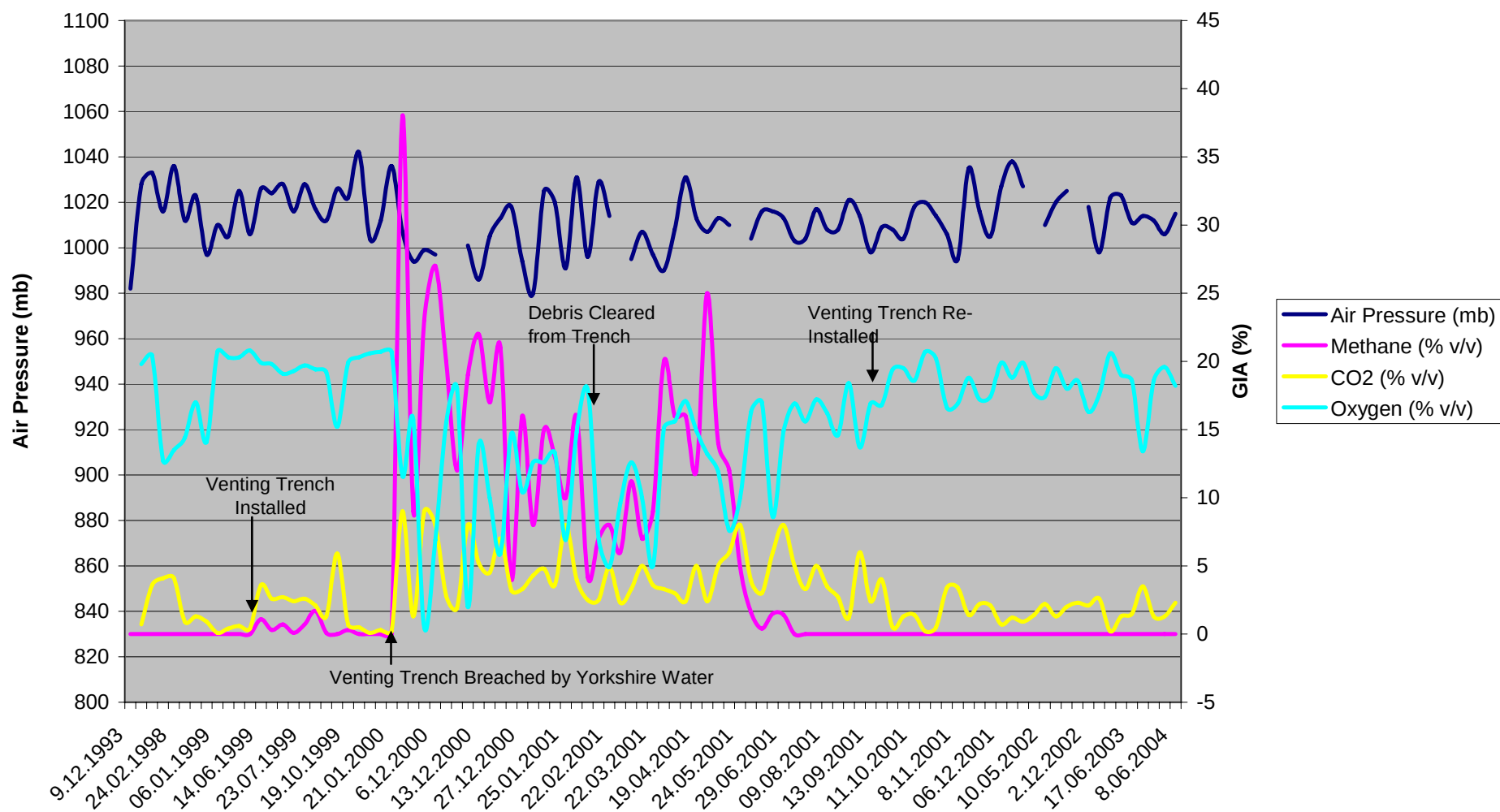
I trust this information is of interest to you. If I may I will contact your Company again in the event of the Council requiring further technical advice on this matter.

Thank you for all your assistance

Yours

Appendix 6 – Gas Monitoring Results

Off Site BH Monitoring (Briary Close, Agbrigg)



Wakefield MDC
Phase I Desktop Study
JR/1321/MAS
Agbrigg Landfill Site

Date of Survey	Pressure (mb)	Pressure Trend	Location	CH4% (v/v) (Worst Case)	Location	CO2% (v/v) (Worst Case)	O2% (v/v) (Worst Case)	Monitored By	Monitoring Method
9.12.1993	982	n/a		0	A/B - Church view			Local Authority	
20.01.1998	1028		Briary Close	0	Briary Close	0.7	19.8	MDJA	Standpipe
26.01.1998	1033		Briary Close	0	Briary Close	3.6	20.4	MDJA	Standpipe
11.02.1998	1016		Briary Close	0	Briary Close	4.1	12.7	MDJA	Standpipe
24.02.1998	1036		Briary Close	0	Briary Close	4.1	13.5	MDJA	Standpipe
11.03.1998	1012		Briary Close	0	Briary Close	0.9	14.4	MDJA	Standpipe
25.03.1998	1023		Briary Close	0	Briary Close	1.3	17	MDJA	Standpipe
16.04.1998	997		Briary Close	0	Briary Close	0.9	14.1	MDJA	Standpipe
06.01.1999	1010		Briary Close	0	Briary Close	0.1	20.7	MDJA	Standpipe
13.01.1999	1005		Briary Close	0	Briary Close	0.4	20.3	MDJA	Standpipe
22.01.1999	1025		Briary Close	0	Briary Close	0.6	20.3	MDJA	Standpipe
08.02.1999	1006		Briary Close	0	Briary Close	0.4	20.8	MDJA	Standpipe
14.06.1999	1026		Briary Close SW	1.1	Briary Close	3.6	19.9	MDJA	Standpipe
22.06.1999	1024		Briary Close SW	0.3	Briary Close	2.6	19.8	MDJA	Standpipe
7.07.1999	1028		Briary Close SW	0.7	Briary Close	2.7	19.1	MDJA	Standpipe
15.07.1999	1016		Briary Close SW	0.1	Briary Close	2.4	19.3	MDJA	Standpipe
23.07.1999	1028		Briary Close SW	0.7	Briary Close	2.6	19.7	MDJA	Standpipe
02.08.1999	1017		Briary Close SW	1.7	Briary Close	2.1	19.4	MDJA	Standpipe
26.08.1999	1012		Briary Close SW	0.1	Briary Close	1.3	19.2	MDJA	Standpipe
2.09.1999	1026		Briary Close	0	Briary Close	5.9	15.2	MDJA	Standpipe
19.10.1999	1022		Briary Close SW	0.3	Briary Close	0.7	19.9	MDJA	Standpipe
10.11.1999	1042		Briary Close	0	Briary Close	0.5	20.3	MDJA	Standpipe
10.12.1999	1004		Briary Close	0	Briary Close	0.1	20.6	MDJA	Standpipe
7.01.2000	1012		Briary Close	0	Briary Close	0.3	20.7	MDJA	Standpipe
21.01.2000	1036		Briary Close	0	Briary Close	0.2	20.7	MDJA	Standpipe
30.11.2000	1007	Rising	Briary Close	38	Briary Close	9	11.6	Local Authority	Spiking
1.12.2000	994	Falling	Briary Close	9	Briary Close	1.3	15.7	Local Authority	Spiking
4.12.2000	999	Falling	Briary Close	23	Briary Close	9	0.5	Local Authority	Spiking
6.12.2000	997	Rising	Briary Close	27	Briary Close	8	6.9	Local Authority	Spiking
9.12.2000			Briary Close	20	Briary Close	2.8	15.5	Local Authority	Spiking
10.12.2000			Briary Close	12	Briary Close	1.9	18	Local Authority	Spiking
11.12.2000	1001	Falling	Briary Close	19	Briary Close	8	2	Local Authority	Spiking
13.12.2000	986	Rising	Briary Close	22	Briary Close	5.2	13.9	Local Authority	Spiking
15.12.2000	1005	Rising	Briary Close	17	Briary Close	4.5	10	Local Authority	Spiking
18.12.2000	1013	Rising	Briary Close	21	Briary Close	7	5.9	Local Authority	Spiking

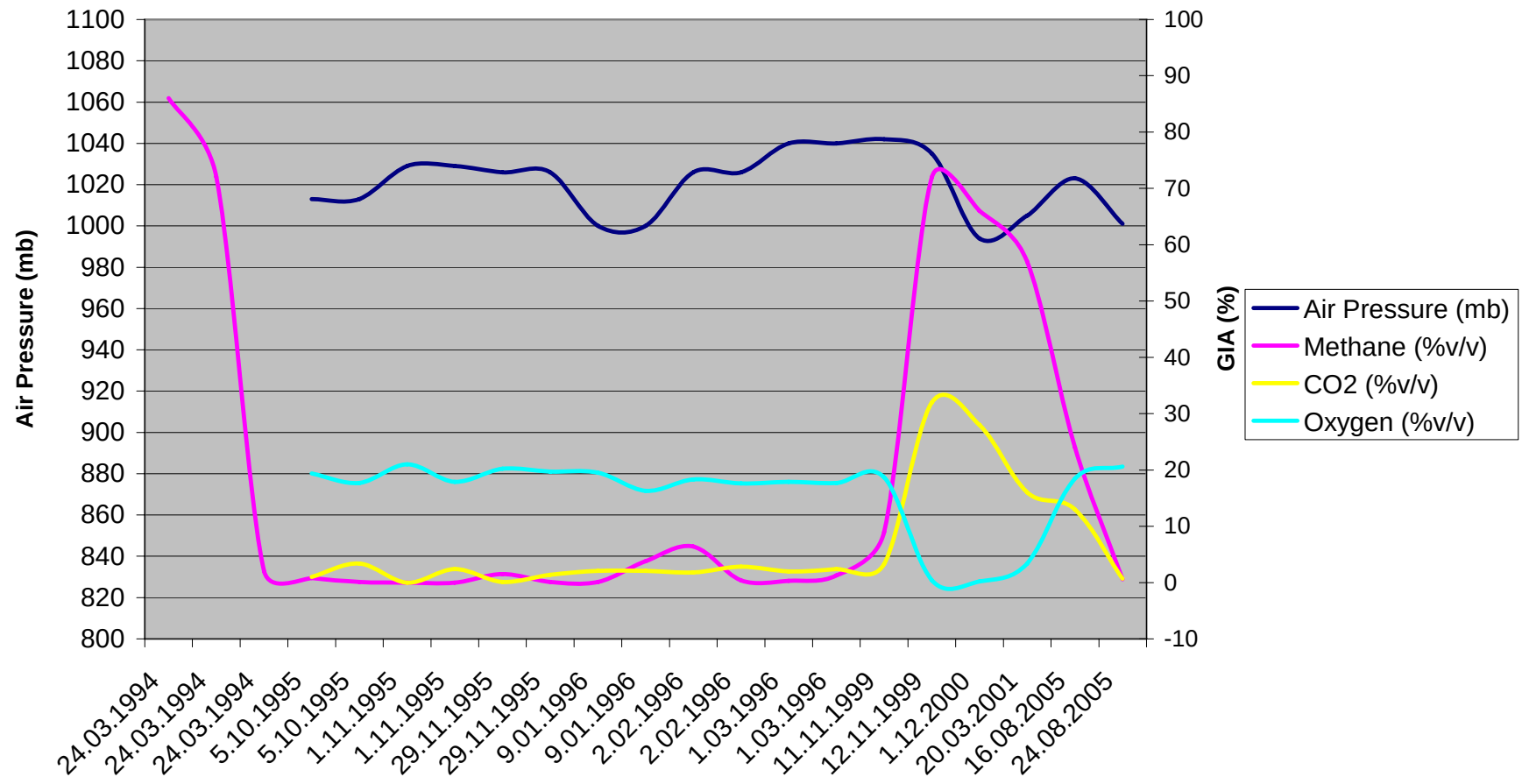
Wakefield MDC
Phase I Desktop Study
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22.12.2000	1018	Falling	Briary Close	4	Briary Close	3.2	14.7	Local Authority	Spiking
27.12.2000	994	Falling	Briary Close	16	Briary Close	3.3	10.4	Local Authority	Spiking
2.01.2001	980	Falling	Briary Close	8	Briary Close	4.3	12.6	Local Authority	Spiking
11.01.2001	1025	Rising	Briary Close	15	Briary Close	4.8	12.6	Local Authority	Spiking
18.01.2001	1020		Briary Close	13	Briary Close	3.6	13.3	Local Authority	Spiking
25.01.2001	991	Falling	Briary Close	10	Bungalow	8	6.9	Local Authority	Spiking
1.02.2001	1031	Falling	Briary Close	16	Briary Close	4	14.8	Local Authority	Spiking
8.02.2001	996	Steady	Briary Close	4.2	Briary Close	2.5	17.9	Local Authority	Spiking
15.02.2001	1029		Briary Close	7	Briary Close	2.5	7	Local Authority	Spiking
22.02.2001	1014	Falling	Briary Close	8	Briary Close	4.9	4.9	Local Authority	Spiking
1.03.2001			Briary Close	6	Briary Close	2.3	9.6	Local Authority	Spiking
8.03.2001	995	Falling	Briary Close	11.2	Bungalow	3.3	12.6	Local Authority	Spiking
15.03.2001	1007		Briary Close	7	Briary Close	5	10	Local Authority	Spiking
22.03.2001	997	Rising	Briary Close	9	Briary Close	3.6	5	Local Authority	Spiking
29.03.2001	990	Steady	Briary Close	20	Briary Close	3.3	15.1	Local Authority	Spiking
5.04.2001	1008	Rising	Briary Close	16	Briary Close	3	15.6	Local Authority	Spiking
12.04.2001	1031	Falling	Briary Close	16	Briary Close	2.4	17.1	Local Authority	Spiking
19.04.2001	1013		Briary Close	12	Briary Close	5	14.9	Local Authority	Spiking
26.04.2001	1007	Rising	Briary Close	25	Briary Close	2.4	13.2	Local Authority	Spiking
03.05.2001	1013	Falling	Briary Close	14	Briary Close	5	11.9	Local Authority	Spiking
18.05.2001	1010	Rising	Briary Close	12	Briary Close	6	7.6	Local Authority	Spiking
24.05.2001			Briary Close	4.9	Briary Close	8	10	Local Authority	Spiking
7.06.2001	1004	Rising	Briary Close	1.6	Briary Close	3.9	16.3	Local Authority	Spiking
14.06.2001	1016		Briary Close	0.4	Briary Close	3	17	Local Authority	Spiking
21.06.2001	1016		Briary Close	1.5	Briary Close	6	8.6	Local Authority	Spiking
29.06.2001	1013	Falling	Briary Close	1.4	Briary Close	8	14.9	Local Authority	Spiking
12.07.2001	1003	Steady	Briary Close	0	Briary Close	5	16.9	Local Authority	Spiking
18.07.2001	1004	Falling	Briary Close	0	Briary Close	3.3	15.6	Local Authority	Spiking
02.08.2001	1017	Falling	Briary Close	0	Briary Close	5	17.2	Local Authority	Spiking
09.08.2001	1008	Rising	Briary Close	0	Briary Close	3.5	16.2	Local Authority	Spiking
16.08.2001	1008	Steady	Briary Close	0	Briary Close	2.7	14.6	Local Authority	Standpipe
23.08.2001	1021	Falling	Briary Close	0	Briary Close	1.2	18.4	Local Authority	Standpipe
7.09.2001	1014	Falling	Briary Close	0	Briary Close	6	13.7	Local Authority	Standpipe
13.09.2001	998		Briary Close	0	Briary Close	2.4	16.9	Local Authority	Standpipe
20.09.2001	1009	Rising	Briary Close	0	Briary Close	4	16.8	Local Authority	Standpipe
28.09.2001	1008	Falling	Briary Close	0	Briary Close	0.5	19.4	Local Authority	Standpipe
05.10.2001	1004	Falling	Briary Close	0	Briary Close	1.3	19.5	Local Authority	Standpipe
11.10.2001	1018	Falling	Briary Close	0	Briary Close	1.4	18.6	Local Authority	Standpipe
17.10.2001	1020	Falling	Briary Close	0	Briary Close	0.2	20.7	Local Authority	Standpipe

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25.10.2001	1014	Rising	Briary Close	0	Briary Close	0.5	20.2	Local Authority	Standpipe
31.10.2001	1006	Rising	Briary Close	0	Briary Close	3.4	16.6	Local Authority	Standpipe
8.11.2001	995	Rising	Briary Close	0	Briary Close	3.4	16.9	Local Authority	Standpipe
15.11.2001	1035	Steady	Briary Close	0	Briary Close	1.4	18.8	Local Authority	Standpipe
22.11.2001	1016	Rising	Briary Close	0	Briary Close	2.2	17.2	Local Authority	Standpipe
29.11.2001	1005	Falling	Briary Close	0	Briary Close	2.1	17.4	Local Authority	Standpipe
06.12.2001	1027	Rising	Briary Close	0	Briary Close	0.7	19.9	Local Authority	Standpipe
13.12.2001	1038	Falling	Briary Close	0	Briary Close	1.2	18.8	Local Authority	Standpipe
3.01.2002	1027		Briary Close	0	Briary Close	0.9	19.9	Local Authority	Standpipe
18.02.2002			Briary Close	0	Briary Close	1.4	17.7	Local Authority	Standpipe
10.05.2002	1010	Falling	Briary Close	0	Briary Close	2.2	17.4	Local Authority	Standpipe
29.07.2002	1020	Falling	Briary Close	0	Briary Close	1.3	19.5	Local Authority	Standpipe
28.10.2002	1025		Briary Close	0	Briary Close	2	18	Local Authority	Standpipe
18.11.2002			Briary Close	0	Briary Close	2.3	18.6	Local Authority	Standpipe
2.12.2002	1018		Briary Close	0	Briary Close	2.1	16.3	Local Authority	Standpipe
3.02.2003	998	Falling	Briary Close	0	Briary Close	2.6	17.6	Local Authority	Standpipe
24.02.2003	1022	Falling	Briary Close	0	Briary Close	0.2	20.6	Local Authority	Standpipe
21.05.2003	1023		Briary Close	0	Briary Close	1.3	19	Local Authority	Standpipe
17.06.2003	1011	Falling	Briary Close	0	Briary Close	1.5	18.6	Local Authority	Standpipe
4.07.2003	1014	Rising	Briary Close	0	Briary Close	3.5	13.4	Local Authority	Standpipe
1.08.2003	1012	Rising	Briary Close	0	Briary Close	1.3	18.6	Local Authority	Standpipe
22.03.2004	1006		Briary Close	0	Briary Close	1.3	19.6	Local Authority	Standpipe
8.06.2004	1015		Briary Close	0	Briary Close	2.3	18.2	Local Authority	Standpipe

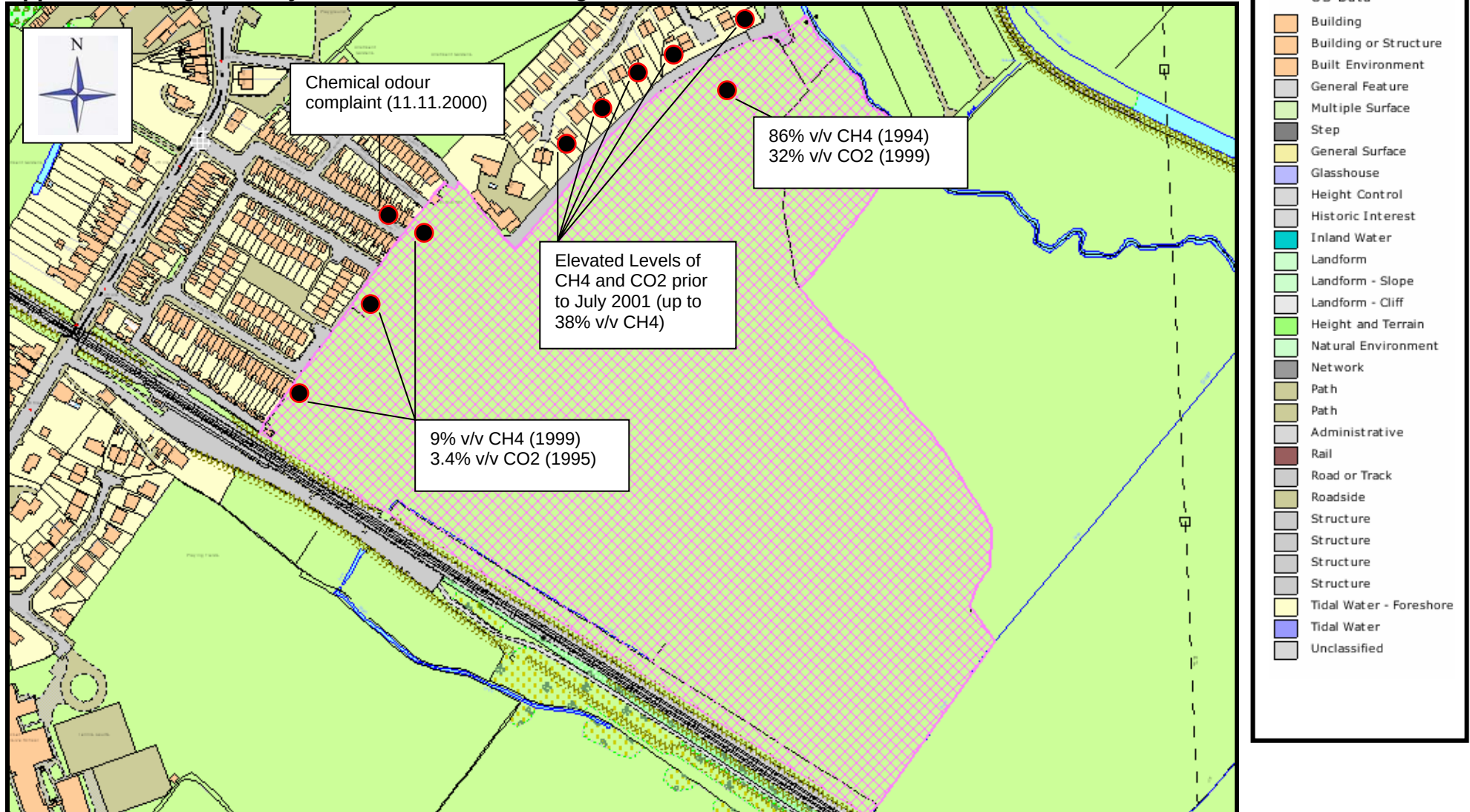
On Site Borehole Monitoring (Agbrigg)



Wakefield MDC
Phase I Desktop Study
JR/1321/MAS
Agbrigg Landfill Site

Date of Survey	Pressure (mb)	Pressure Trend	Location	CH4% (v/v) (Worst Case)	Location	CO2% (v/v) (Worst Case)	O2% (v/v) (Worst Case)	Monitored By	Monitoring Method
24.03.1994			Western Boundary	86				Unknown	Unknown
24.03.1994			Briary Close Boundary	72				Unknown	Unknown
24.03.1994			Newland St Boundary	2				Unknown	Unknown
5.10.1995	1013		Briary Close Boundary	0.8	Briary Close Boundary	1	19.4	Geotechnical Eng Ltd	Borehole
5.10.1995	1013		Newland St Boundary	0.1	Newland St Boundary	3.4	17.7	Geotechnical Eng Ltd	Borehole
1.11.1995	1029		Briary Close Boundary	0	Briary Close Boundary	0	21	Geotechnical Eng Ltd	Borehole
1.11.1995	1029		Newland St Boundary	0	Newland St Boundary	2.4	17.9	Geotechnical Eng Ltd	Borehole
29.11.1995	1026		Briary Close Boundary	1.5	Briary Close Boundary	0.1	20.2	Geotechnical Eng Ltd	Borehole
29.11.1995	1026		Newland St Boundary	0.1	Newland St Boundary	1.4	19.7	Geotechnical Eng Ltd	Borehole
9.01.1996	1000		Briary Close Boundary	0.1	Briary Close Boundary	2.1	19.5	Geotechnical Eng Ltd	Borehole
9.01.1996	1000		Newland St Boundary	3.8	Newland St Boundary	2.1	16.3	Geotechnical Eng Ltd	Borehole
2.02.1996	1026		Briary Close Boundary	6.4	Briary Close Boundary	1.8	18.3	Geotechnical Eng Ltd	Borehole
2.02.1996	1026		Newland St Boundary	0.4	Newland St Boundary	2.8	17.6	Geotechnical Eng Ltd	Borehole
1.03.1996	1040		Briary Close Boundary	0.3	Briary Close Boundary	2	17.9	Geotechnical Eng Ltd	Borehole
1.03.1996	1040		Newland St Boundary	1.3	Newland St Boundary	2.4	17.7	Geotechnical Eng Ltd	Borehole
11.11.1999	1042		Newland St Boundary	9	Newland St Boundary	3.3	18.7	Local Authority	Spiking
12.11.1999	1035		Briary Close Boundary	72	Briary Close Boundary	32	0.4	Local Authority	Spiking
1.12.2000	994	Falling	Briary Close Boundary	66	Briary Close Boundary	28	0.2	Local Authority	Spiking
20.03.2001	1005	Rising	Briary Close Boundary	57	Briary Close Boundary	16	3.4	Local Authority	Spiking
16.08.2005	1023	Falling	Briary Close Boundary	24	Briary Close Boundary	13	18.5	Local Authority	Spiking
24.08.2005	1001		Newland St Boundary	0.6	Newland St Boundary	0.7	20.6	Local Authority	Spiking

Appendix 7 – Significantly Elevated LFG Monitoring Locations



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Source 1:1250
(OS Mastermap)

Scale 1:3500