Appendix C. Site Condition Report

AtkinsRéalis

Site Condition Report

SGN Gas to Grid ProjectCo1 Limited

May 2024

5223650-Knostrop_v3

KNOSTROP BIOMETHANE TO GRID PLANT

AtkinsRéalis - Baseline / Référence

Notice

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Document history

Document title: Site Condition Report

Document reference: 5223650-Knostrop

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft for client review	C Hidson	M Boobyer	C.Hughes	S.White	March 2024
2.0	Appendix C updated upon receipt of final factual report	C Hidson	M Boobyer	C.Hughes	S.White	April 2024
3.0	Final following client comment	C Hidson	M Boobyer	C.Hughes	S.White	May 2024

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1. Site Details

Name of the applicant	SGN Gas to Grid ProjectCo1 Limited Gas to Grid ProjectCo1 Limited
Activity address	Knostrop BtG Plant, Knostrop Sludge Treatment and Tankered Waste Facility, Knowsthorpe Lane, Leeds, LS9 0PJ
National Grid Reference	SE 33852 31762
Document reference and dates for Site Condition Report at permit application and surrender	Site Condition Report (reference 522360_Knostrop_v3), April 2024 (to support permit application).
Document references for site plans (including location and boundaries)	The following drawings are provided within Appendix D: site location, installation boundary, drainage, emission points and materials storage/use/production. An exploratory hole location plan is included within the ground investigation factual report, which is provided in Appendix B of this Site Condition Report.

2. Condition of the Land at Permit Issue

Environmental setting

Location and current land use

The proposed Biomethane to Grid (BtG) plant, herein referred to as 'the site', is located within Knostrop Sludge Treatment Facility (STF). The STF is operated under an IED Permit and is located within the grounds of the wider area Knostrop WwTW, which is owned and operated by Yorkshire Water Services (YWS). The WwTW is located off Knowsthorpe Lane, Leeds and the nearest postcode is LS9 0PJ.

The site comprises a roughly rectangular plot of land, with adjoining smaller plot to the north, which is located within the eastern section of the WwTW and is approximately 0.38 hectares in area. The approximate Ordnance Survey National Grid Reference (NGR) for the site is SE 33852 31762.

The site comprises two grassed areas, separated by a concrete access road. No plant is currently located within the site.

Surrounding land use

The land use in the area surrounding the site is summarised below:

- North east: adjacent wider Knostrop WwTW with Wyke Beck located approximately 40 m north east and Pontefract Lane (A63) beyond (approximately 100 m north east).
- South east: adjacent wider Knostrop WwTW then recently constructed Amazon site (approximately 70 m from site).
- South west: adjacent wider Knostrop WwTW; and
- North west: adjacent wider Knostrop WwTW.

The closest residential properties are located almost 900 m to the north of the site while the nearest commercial buildings are 260 m to the north, beyond the A63.

Topography

The site lies at an approximate elevation of 25 m Above Ordnance Survey (mAOD) [1].

Geology

Made Ground: The British Geological Survey (BGS) 1;10,000 published geology maps, included within the Groundsure report for the site [2], do not record Made Ground to be present underlying the site. However, Made Ground is anticipated to be present on the site associated with the construction and use of the site as a WwTW.

A ground investigation was conducted by Solmek Ltd [3] in December 2023 / January 2024 (see Baseline soil and groundwater reference data section below for further details). This encountered Made Ground in 13 of 14 exploratory holes (all other than RBH02). Made Ground was recorded as generally granular in nature, with a mixture of slightly clayey gravelly sand and sandy gravel. The gravel comprised sandstone, concrete, brick, ceramic tiles, metal, wood, plastic, cloth and occasional rebar. The thickness of Made Ground ranged from 0.13 m to a maximum of 6.30 m bgl. Made Ground with a thickness of 6.30 m bgl was encountered in one exploratory hole location (RBH03) only. Generally the thickness of Made Ground encountered within the exploratory holes was less than 1 m.

Superficial deposits: The BGS GeoIndex [1] and Groundsure report [2] records that the superficial geology underlying the site comprises Alluvium of clay, silt, sand and gravel.

The Solmek Ltd [3] ground investigation encountered natural deposits in two (RBH01 and RBH02) of 14 exploratory holes, comprising medium dense sand & gravel, slightly clayey sandy gravel and slightly clayey gravelly sand slightly clayey to sandy gravel deposits, to a maximum depth of 6.50 m bgl. At RBH01 the deposits where encountered beneath the Made Ground and at RBH02 they were encountered from surface. Although geological mapping [1] [2] suggests the presence of Alluvium at surface, River Terrace Deposits of sand and gravel are recorded in close proximity to the south of the site. The exploratory hole logs suggest the natural deposits comprise predominantly sand and gravel, which would suggest the site is underlain by River Terrace Deposits, rather than Alluvium.

In RBH02, between the depths of 6.50 to 8.90 m bgl, bands of cohesive material were recorded. The factual report considers these to be associated with the weathered zone of the Pennine Lower Coal Measures Formation. However, it is noted that from 6.50 to 7.50m bgl the slightly sandy gravelly clay was recorded as having an organic smell, and is therefore this material is considered more likely to be River Terrace Deposits.

Bedrock geology: The BGS GeoIndex [1] and Groundsure report [2] records that the bedrock geology underlying the site comprises mudstone, siltstone and sandstone of the Pennine Lower Coal Measures Formation.

The Pennine Lower Coal Measures Formation recorded as either siltstone or mudstone was encountered at depths of between 6.87 m bgl (RBH03) and 8.90 m bgl (RBH02) in the Solmek Ltd [3] ground investigation. The Pennine Lower Coal

Measures Formation was encountered to a depth of 30.0 m bgl (base not proven) and was recorded as alternating sequences of mudstone, sandstone, siltstone and coal.

Hydrogeology

Groundwater levels: The Solmek Ltd [3] ground investigation recorded a groundwater strike in the Made Ground of RBH03 at a depth of 4.70 m bgl. Within the River Terrace Deposits (gravel) groundwater strikes were recorded at 4.50 m bgl (RBH01) and 5.80 m bgl (RBH02).

Three groundwater monitoring visits were completed by Solmek Ltd [3] on 26th January 2024, 1st February 2024 and 6th February 2024. The following groundwater levels were recorded: RBH01 2.85 to 3.35m bgl; RBH02 2.72 to 3.08m bgl; and RBH03 2.70 to 3.07m bgl.

Aquifer designation: Environment Agency data, summarised in the Groundsure report, [2] classifies the River Terrace Deposits and Pennine Lower Coal Measures as secondary A aquifers which are defined as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers'.

Groundwater Source Protection Zones: The Groundsure report [2] records that the site is not located within a groundwater Source Protection Zone (SPZ) or within 250 m of a SPZ.

Abstraction licenses: The Groundsure report [2] records that there are no licensed active groundwater abstractions located within 250 m of the site.

Hydrology

Hydrological features: The nearest surface water feature is the Wyke Beck which is located approximately 35 m north east of the site. The Wyke Beck is classified as a Water Framework (WFD) watercourse. The 'Wyke Beck from source to River Aire' stretch was listed as having a good chemical rating and a moderate ecological rating with an overall moderate rating in 2016 [2].

A pond is located approximately 170 m north-east of the site (outside the wider Knostrop WwTW site).

Discharge Consents: The Groundsure Report [2] records that there are no discharge consents registered on the site. There are three active discharge consents located within the wider Knostrop WwTW site located between approximately 50 m and 180 m from the site. A summary of the discharge consents is presented in Table 2-1.

Table 2-1 - Summary of discharge consents to controlled waters

Distance / Direction	Site Name / Address	Effluent Type	Permit Number	Receiving Water	Effective Date
Within wider WwTW site (50 m to 180 m north-west of the site*)	Colton Sewage Pumping Station, Knostrop Storm Treatment Works	Sewage discharges: pumping station.	WRA7786	Wyke Beck	26/02/2002
Within wider WwTW site (50 m to 180 m north-west of the site*)	Knostrop CSO, Knowsthorpe Lane	Sewage discharges: sewer storm overflow.	WRA8145	Wyke Beck	31/03/2004
Within wider WwTW site (50 m to 180 m north-west of the site*)	Knostrop high level works, storm overflow / Knostrop WwTW	Sewage discharges: sewage treatment works storm overflow.	WRA6924	Wyke Beck / River Aire	31/03/2020

***** Unable to determine exact distance from Groundsure map.

YWS advised the following effluent types in relation to each of the records above: WRA7786: Sewage discharge in emergency; WRA8145: Storm sewage; WRA6924: Treated sewage, settled storm sewage, storm sewage, sewage discharge in emergency.

Abstraction licenses: The Groundsure Report [2] records that there are no licensed active surface water abstractions located within 250 m of the site.

Flood risk: The Environment Agency Flood Map for Planning [4] records that the site is located within a flood zone 1. Land within a flood zone 1 has a low probability of flooding with the land having a less than 0.1% chance of flooding from rivers or the sea annually.

Sensitive land uses

There are no statutory ecologically sensitive land uses within 250 m of the site [2].

Pollution history

Site history

Table 2-2 - Summary of historical land use

Date and Scale	On-site Development	Off-site Development (within 250m)
1852, 1:10,560	The White Wike Beck is present on-site, flowing in a southerly direction. The Middleton Main Coal seam is shown to run in an east to west direction through the northern area of the site. A track (Pontefract Lane) is shown on-site running in an east to west direction. The remaining site area comprises undeveloped land.	The surrounding area predominantly comprises undeveloped land. A tram line and open coal works are both located approximately 100 m north-west of the site.
1891, 1:10,560 (partial map view) 1893, 1:2,500	No significant changes (site not included within the mapped area)	A mineral railway running in a north-west to south-east direction is located approximately 80 m east of the site.
1905-1906, 1:10,560 1908, 1:2,500	The track on-site is labelled as Pontefract Lane.	The tram line and the open coal works, located approximately 100 m north-west of the site are no longer shown. The mineral railway, located approximately 80 m east of the site, is labelled as the Waterloo Main Colliery Railway.
1929, 1:2,500	Pontefract Lane is no longer shown on-site. The White Wike Beck is no longer shown on-site and has been realigned and channelised off-site.	The White Wike Beck, formerly on-site, has been realigned and channelised and is shown approximately 40 m north-east of the site. A weir is located approximately 60 m west of the site. Pontefract Lane is located approximately 100 m north-east of the site.
1932-1933, 1:10,560 1932-1933, 1:2,500	The site is now shown to be part of the Leeds Corporation Sewage Works with filter beds located across the site.	Leeds Corporation Sewage Works is shown adjacent to the site in all directions. The White Wike Beck located approximately 40 m north-east, is labelled as the Wyke Beck.

1938, 1:10,560	No significant changes.	No significant changes.
1948, 1:10,560		
1951, 1:2,500		
1956, 1:10,560	No significant changes.	Within the Leeds Corporation Sewage Works, adjacent to the north of the site, storm tanks, settling tanks and detritus tanks are shown.
1964, 1:2,500 (partial map view) 1965-1969, 1:10,560	No significant changes.	No significant changes.
1978, 1:10,000	No significant changes.	The railway located approximately 80 m east of the site is labelled as dismantled.
1991, 1:10,000	No significant changes.	A sludge lagoon is labelled adjacent to the north of the site.

YWS has advised that between 2011 and 2018, i.e. before the presence of an Environmental Permit for the WwTW, the site was used for storage of raw sludge, green waste and wood waste (with conditioning), as well as lime stabilisation [5].

The site forms part of an area for which YWS obtained a waste permit for a small concrete pad for sludge conditioning operations in 2011. This allowed YWS to condition (similar process to composting) sewage sludge with green waste or wood waste. The lime stabilisation did not require a permit.

In June 2018, YWS applied for a waste operations permit for the new STF (issued in 2019). In parallel, YWS submitted a low risk surrender for the waste permit as the conditioning pad area was required for the STF. An application for an IED permit for the Anaerobic Digestion process was submitted in 2021, with the permit issued in 2023.

Inspection of Google Earth Pro [6] historical aerial photos indicates that the site has been in its current form since at least April 2020. Construction of the grassed areas and haulage / access road was underway in March and May 2019. In April 2018, June 2016 and June 2015, mounds of material can be seen at the site (and the wider area), stored on what appears to be unsurfaced ground. In September 2011, site activity, assumed to be lime stabilisation, is visible at the site (and the wider area); it cannot be confirmed from the photographs if this was on hardstanding or unsurfaced land. From

December 2002 to June 2009 the site (and wider area) was occupied by sludge beds [5].

Pollution incidents

The Groundsure Report [2] records that there are two pollution incidents within 250 m of the site. The pollution incidents are summarised in Table 2-3.

Table 2-3 - Summary of pollution incidents

Pollutant	Distance / Direction	Impact	Date of Incident
General biodegradable materials and waste	140 m north-west	Water impact: Category 2 (significant) Land impact: Category 4 (no impact) Air impact: Category 4 (no impact)	26/02/2015
Crude sewage	140 m north	Water impact: Category 2 (significant) Land impact: Category 4 (no impact) Air impact: Category 4 (no impact)	31/10/2005

Control of Major Hazards (COMAH)

The Groundsure report [2] records that there are no COMAH sites within 250 m of the site.

Licensed industrial activities (Part A(1))

The Groundsure report [2] records that there is no known surrendered licensed industrial activity (Part A(1)) within 250 m of the site.

Licensed pollutant release (Part A(2)/B)

The Groundsure report [2] records that there is one licensed pollutant release (Part A(2)/B) permit within 250 m of the site.

Radioactive substance authorisations

The Groundsure Report [2] records that there are no radioactive substance authorisations within 250 m of the site.

List 1 dangerous substances

The Groundsure report [2] records that there is one list 1 dangerous substance record within 250 m of the site which is summarised in Table 2-4.

Table 2-4 - Summary of list 1 dangerous substances

Distance / Direction	Description	Receiving water	Authorised Substances	Status
50 m north-west	Knostrop Low (activated sludge) sludge treatment works.	River Aire	Not provided	Not active

List 2 dangerous substances

The Groundsure report [2] records that there is one list 2 dangerous substance within 250 m of the site which is summarised in Table 2-5.

Table 2-5 - Summary of list 2 dangerous substances

Location	Description	Receiving water	Authorised Substances	Status
50 m north-west	Knostrop (activated sludge) sludge treatment works.	River Aire	Copper	Active

Landfill sites

The Groundsure Report [2] records that there are no known historical landfill sites within 250 m of the site.

Licensed waste sites

The Groundsure Report [2] records that there is one licensed waste site located within 250 m of the site. A summary of the waste licensed sites is provided below in Table 2-6.

Table 2-6 - Summary of licensed waste sites

Distance / Direction	Site Name / Address	Type of Site	Licence Issue Date	Licence Status
16 m west	Knostrop Wastewater Treatment Works, Knowsthorpe Lane.	Composting in open windrows.	11/02/2011	Issued

YWS has provided the following waste permit records relating to the site:

Table 2-7 - Summary of YWS waste permit records

Site Name	Activity	Permit Type	Dates	Status
Knostrop	Sewage Sludge Conditioning	Installation	Issued 11/02/2011	Surrendered June 2018
Knostrop	Sludge Treatment Facility and Tankered Waste Facility	Installation (IED)	Issued 26/09/2018. IED and Tankered Waste Facility variation issued 08/09/23	Operational

It is anticipated that the composting in open windrows licence detailed in the Groundsure report is the same as the sewage sludge conditioning permit.

Mineral extraction and mining

The Coal Authority website [7] records that the site is located within a Coal Mining Reporting Area and within a Development High Risk Area. The site is not located within a Past Shallow Coal Mine Workings area; however, a Past Shallow Coal Mine Workings area is located adjacent to the west of the site.

The Groundsure report [2] records that there is one British Pit records located within 250 m of the site. Osmondthorpe Coal Workings pit, a ceased surface coal working is located approximately 160 m north-west.

Radon

The Groundsure report [2] records that the very southern tip of the site is located in an area where between 1% and 3% of properties exceed the radon action level. The Groundsure report suggests that no radon protection measures are required.

Unexploded Ordnance (UXO) risk

The Zetica online Unexploded Ordnance (UXO) map [8] indicates that there is a low UXO risk on the site associated with a bombing density of 15 bombs per 1000 acres or less.

A pre-desk study assessment undertaken by Zetica [9] in November 2021 identified no pre- or World War I military activities or bombing and no interwar or World War II or post-war military activities on or affecting the site. There were also no bombing decoy sites within 5 km of the site.

A total of 272 high explosive bombs were recorded in the County Borough of Leeds during World War II, with a bombing density of 17.1 bombs per 405 hectares (ha). However, no readily available records were found to indicate the site was bombed.

Zetica's recommendation was that a detailed desk study undertaken by a UXO specialist whilst always prudent, is not considered essential in this instance.

	Recent industrial land uses The Groundsure report [2] records that recent industrial land uses within 250 m of the site include the following land uses: outfalls, tanks, wind turbine and chimneys. **Petrol stations** The Groundsure report [2] records that there are no current petrol stations located within 250 m of the site. **Summary of pollution potential** It is considered that there is a potential for contamination to be present on-site associated with the construction and operation of the existing WwTW and associated with surrounding former and existing potentially contaminative land uses (detailed above) which may have impacted on the site.
Evidence of historical contamination	One previous ground investigation is known to be available and is located within the wider Knostrop WwTW, approximately 200 m south-west of the site [10]. The ground investigation was undertaken by Environmental Scientific Group (ESG) on behalf of Amey Black & Veatch in 2015. The scope of the ESG 2015 site investigation [10] comprised six combined cable percussion / rotary cored boreholes, nine trial pits, in-situ testing and laboratory testing. The maximum depths of the boreholes ranged between 9.2 m and 31.0 m bgl. All locations recorded Made Ground up to a depth of 2.4 m bgl. The Pennine Lower Coal Measures Formation was recorded underlying the Made Ground up to a depth of 31.0 m bgl; the base of the stratum was not proven. Made Ground recorded as filter bed material was generally described as grey slightly sandy to slightly silty gravel with low to high cobble content. Gravel was sub-angular to rounded fine to coarse of limestone, sandstone, brick and tile. Cobbles were subrounded of limestone and sandstone. Visual evidence of potential contamination was recorded in the form of possible clinker in the Made Ground (filter bed medium) at TPA09. No olfactory evidence of contamination was recorded. Six soil samples were collected from the Made Ground and Pennine Lower Coal Measures Formation between the depths of 2.10 m and 3.10 m bgl. Soil samples were analysed for a range of metals, asbestos screen, inorganics, total petroleum hydrocarbons (TPH) by gas chromatography (GC) flame ionization detection (FID), polycyclic aromatic hydrocarbons (PAHs) 16 by gas chromatography mass spec (GCMC), gasoline range organics (benzene, toluene, ethylbenzene and xylene (BTEX) and aliphatic carbon ranges), aliphatic and aromatic fraction by GC FID. It is noted that not all samples were tested for all of the laboratory analysis listed above. No asbestos was identified within any of the soil samples analysed. AtkinsRéalis has not been provided with a report detailing the interpretation of the test results.
Baseline soil and groundwater reference data	A ground investigation was undertaken at the site by Solmek Ltd [3] in December 2023 / January 2024. The objective of the ground investigation was to collect ground condition data to support design of the BtG scheme and collect baseline information to support the permit application. It should be noted that, based on the site-specific assessment of substances to be used, stored and handled in relation to permitted activities at the site (see Section 3 below), no substances have been identified which

represent a significant potential pollution risk. Therefore, the collection of baseline data is considered to be a precautionary approach.

The ground investigation works completed within the installation boundary comprised the following:

- drilling of three rotary boreholes to a maximum depth of 30.0 m bgl (RBH01 to RBH03) targeting proposed equipment;
- excavation of nine machine excavated trial pits (TP01 to TP09) to a maximum depth of 1.20 m bgl for plate load testing;
- excavation of two hand dug excavated trial pits to a maximum depth of 0.60 m bgl (TP01A and TP02A) targeting proposed equipment;
- installation of three gas/groundwater monitoring wells within one well (RBH03) screened within the Made Ground and two (RBH01 and RBH02) screened within the River Terrace Deposits and / or Pennine Lower Coal Measures Formation;
- collection of soil samples for laboratory analysis; and
- completion of three groundwater monitoring / sampling visits on 26/01/24, 01/02/24 & 06/02/24.

The ground conditions and groundwater levels encountered are reported in the Environmental Setting section above.

No visual and olfactory evidence of potential contamination was recorded within any of the exploratory hole logs.

Head-space screening for volatile organic compounds (VOCs) using a photoionization detector (PID) during the site investigation detected concentrations ranging between 6 parts per million (ppm) and 25 ppm. A maximum concentration of 25 ppm was identified in the Made Ground at TP04 between the depths of 0.12 and 0.40 m bgl.

Five soil samples were collected from the Made Ground (TP01A at 0.1-0.3m bgl, TP01A at 0.5-0.6m bgl, TP02A at 0.1-0.2m bgl, RBH01 at 0.1m bgl & RBH03 at 0.5m bgl) and one soil sample was collected from natural material (RBH02 at 0.1m bgl). Soil testing was undertaken on these samples for the following determinants. These were based on the substances identified to pose a potential pollutant risk from the proposed permitted activities:

- ethylene glycol;
- unsaponificated oil and grease;
- pH;
- soil organic matter (SOM);
- speciated total petroleum hydrocarbons (TPH CWG);
- copper. chromium, nickel, lead, zinc, tin, arsenic, iron, cadmium, mercury, selenium, vanadium, molybdenum and aluminium; and
- nitrite and ammoniacal nitrogen.

Two of the samples, TP01A at 0.50-0.60 m bgl and TP02A at 0.10 – 0.20 m bgl were tested twice by the laboratory in error. Both sets of results have been included for completeness.

A number of other samples were also tested for the above suite of determinants by the laboratory in error – RBH01 at 0.5m bgl, RBH01 at 2.0m bgl, RBH02 at 3m bgl and RBH03 at 4.6m bgl. The results of these have also been included for completeness.

Screening for asbestos identified asbestos containing material (ACM) within four soil samples. Asbestos was identified in TP01A at 0.50-0.60 m bgl (<0.001% chrysotile present as bitumen debris), TP02A at 0.10 – 0.20 m bgl (<0.001% amosite present in microscopic board identified during the first test and 0.006% amosite present in microscopic board identified during the second test) and RBH02 at 0.1m bgl (0.092% amosite present in microscopic board).

Nine groundwater samples were collected from RBH01, RBH02 and RBH03; one sample from each on three occasions. Groundwater testing was undertaken on these samples for the following determinants. These were based on the substances identified to pose a potential pollutant risk from the proposed permitted activities:

- ethylene glycol;
- unsaponificated oil and grease;
- pH;
- electrical conductivity;
- speciated total petroleum hydrocarbons (TPH CWG);
- copper. chromium, nickel, lead, zinc, tin, arsenic, iron, cadmium, mercury, selenium, vanadium, molybdenum and aluminium; and
- nitrite and ammoniacal nitrogen.

Laboratory reports are provided within the Solmek Ltd Factual Ground Investigation Report [3] provided within Appendix B.

Minimum and maximum concentrations of each contaminant / parameter recorded within the soil and groundwater are provided in Appendix C.

The data will form the baseline against which soil and groundwater concentrations at the point of permit surrender will be compared, to demonstrate that there has been no pollution of the ground / groundwater underlying the site as a result of the permitted operations and that the site is in a satisfactory state at permit surrender.

Supporting information

The following references were used in the production of this Site Condition Report:

[1] British Geological Survey (BGS), “Onshore GeoIndex,” 2023. [Online]. Available: https://mapapps2.bgs.ac.uk/geoindex.

[2] Groundsure, “Enviro+GeoInsight Knostrop WwTw, SGIP-2021-12294-8120,” 2021.

[3] Solmek Ltd, “Yorkshire Water Knostop Energy & Recycling Facility, Leeds. Factual Site Investigation. Ref: M23-045,” 2024.

[4] Environment Agency, “Flood Map for Planning,” 2021. [Online]. Available: https://flood-map-for-planning.service.gov.uk/. [Accessed 2023].

[5] AtkinsRéalis , “Knostrop Biomethane to Grid Plant Technical Note,” November 2023.

[6] Google, “Google Earth Pro,” 2023. [Online]. Available: https://earth.google.com/web/. [Accessed 2023].

[7] The Coal Authority, “Interactive Map,” 2023. [Online]. Available: https://mapapps2.bgs.ac.uk/coalauthority/home.html. [Accessed 2024].

[8] Zetica, “Zetica Unexploded Ordnance Risk Maps,” 2024. [Online]. Available: https://zeticauxo.com/downloads-and-resources/risk-maps/.

[9] Zetica UXO, “Knostrop Wastewater Treatment Works, West Yorkshire, Pre-Desk Study Assessment,” 2021.

[10] ESG , “Knostrop Wastewater Treatment Works - Alternative GI, Factual Report on Ground Investigation, Report No A5070-15. October 2015.”.

[11] UK Health Security Agency, “UKradon, UK maps of radon,” 2024. [Online]. Available: https://www.ukradon.org/information/ukmaps.

[12] Health and Safety Executive, “The Dangerous Substances and Explosive Atmospheres Regulations 2002,” [Online]. Available: https://www.hse.gov.uk/fireandexplosion/dsear.htm.

3. Permitted Activities

Permitted activities

Proposed activities

Biogas is produced at the YWS STF by anaerobic digestion and is currently used as a fuel by YWS. Once the BtG plant is operational, the raw biogas will instead be routed to the BtG plant and cleaned (upgraded) to produce biomethane. Compliant biomethane gas will be sent for final conditioning prior to entry to the local gas transmission network. Any non-compliant biomethane will be routed to the new biomethane flare for disposal.

The Site Condition Report will address operations in relation to the following proposed equipment at the site:

- pre-treatment blowers and heat exchangers;
- pre-treatment filter vessels;
- two biogas compressors;
- pre-treatment chillers;
- membrane separation unit (MSU) and control room
- grid entry unit (GEU);
- below ground propane tank;
- gas bottle store;
- Low Voltage (LV) switchroom;
- biomethane flare;
- stores container; and
- COSHH stores container.

Identification of the substances used at the installation

As part of the proposed operations the following raw substances are to be handled within the site:

- biogas;
- ethylene glycol;
- activated carbon;
- mineral oil;
- cleaning solvents (WD40);
- liquified propane gas; and
- nitrogen, hydrogen / helium and inert calibration gases.

The locations of use and storage are shown on the Substances Location Plan, provided as Figure D-7 in Appendix D. Further details are provided in Table A-1 in Appendix A of this document.

Small quantities of nitrogen, hydrogen / helium and inert calibration gases will be stored in a locked bottle store and used for calibration of plant. These substances have not been considered further in Table A-1, as given their small volume and gaseous nature, they are not considered to present a potential ground / groundwater pollution risk at the installation.

The biogas upgrading plant will not require the storage or handling of fuel (other than the handling of biogas/ biomethane).

The following wastes will be generated at the site:

- condensate;
- spent activated carbon;
- waste oil; and
- waste ethylene glycol.

Carbon dioxide that is separated from biogas during upgrading will be vented via the biogas upgrader stack at the MSU. Non-compliant biomethane will be disposed of at the biomethane flare. Spent membranes will be removed from the MSU (as an indicative estimate these would be replaced every 5-10 years). These substances have not been included in Table A-1, as they are not considered to present a potential ground / groundwater pollution risk at the installation.

The process will produce biomethane, which will be injected into the local gas transmission grid.

The emission and discharge points are shown on the Location of Emission and Transfer Points drawing provided as Figure D-5 in Appendix D.

There are no anticipated emissions to ground, surface water or groundwater during normal operation. In abnormal operation (for example, an accident or incident) measures will be in place to prevent such emissions.

Identification of those substances which are relevant hazardous substances or which represent a theoretical pollution risk and assessment of site-specific pollution risk

The substances listed above have been further considered to determine whether each substance is considered to be a relevant hazardous substance and / or whether it represents a theoretical pollution risk. Those substances that were identified as relevant hazardous substances and / or a theoretical pollution risk have been further considered to determine whether circumstances will exist on-site which may result in the release of the substance in sufficient quantities to represent a pollution risk. Details of this assessment, including details of storage, use and quantities of the substances, as well as any relevant containment measures, practices or procedures, for each substance are provided in Table A-1 in Appendix A.

In addition to the details regarding relevant containment measures, practices or procedures, for each substance provided in Appendix A, the following general practices, procedures and measures will be implemented. In accordance with Best Available Techniques (BAT), procedures will be adopted in relation to the storage,

handling and use of chemicals, waste, oil, and potentially hazardous substances at the site.

Further details are provided in the main permit application documentation.

Subsurface structures

Subsurface structures will comprise the following:

- propane storage tank;
- potable water connection to YWS ring main; and
- condensate and surface water transfer to the wider YWS WwTW drainage system.

Biogas condensate will be generated from the BtG plant and collected via a separate sealed drainage system and transferred into the YWS drainage system to be returned to the YWS WwTW inlet for treatment. An isolation valve and non-return valve will be in place at / near to the transfer point. The condensate collection pots are subsurface and are therefore unlikely to be damaged during operation of the plant, minimising the potential for accidental release of condensate. The condition of pipework and condensate collection pots will be monitored through periodic inspection. The system will be designed and installed using approved materials and installed in locations suitable for the lifecycle of the installation.

Further detail regarding the surface water drainage system is provided in the Drainage section below.

Surfacing

The site will comprise a mix of hardstanding, gravel and soft landscaping. The proposed above ground plant at the site will be located on impermeable hardstanding bases.

Storage

The ethylene glycol, mineral oil, waste oil and cleaning solvent (WD 40) will be stored in suitable containers with bunding, such as a spill pallet (of appropriate capacity) within the locked COSHH stores container.

Granular activated carbon will be stored at the point of use in the carbon filters (2 x 8200kg activated carbon vessels) and siloxane unit (4 x 8200kg activated carbon vessels). When the medium is saturated, the spent GAC will be removed by vacuum extraction and replaced with new carbon (noting there is one pair of activated carbon filters for siloxane removal and two pairs of activated carbon filters for hydrogen sulphide removal, each pair operating in lead / lag formation) and the spent carbon will be removed from site for off-site regeneration / disposal.

The biogas compressors and MSU will be located in dedicated enclosures which should contain any accidental minor spills / leaks.

The inherent design of the plant will be such that the opportunity for fugitive emissions will be virtually eliminated. The likelihood for occurrence of leaks will be minimised by the plant management and maintenance regime that will be in place.

Plant will be regularly inspected (working week operational visual inspections and monthly intrusive checks) and procedures to cover spills, leaks or damaged plant will be incorporated into the site Environmental Management System.

Transport and handling of materials

Biogas will be supplied directly from the existing YWS biogas system to the new BtG plant via dedicated pipework.

Propane will be managed under a 'tank, equipment and commodity supply' agreement with a specialist leading propane supplier. All bulk deliveries of propane will be arranged with the prior agreement of the Site Manager and pre-booked. Such deliveries will be carried out under supervision. Propane is an extremely flammable gas at ambient temperatures and containment systems for liquid spillages are not appropriate because any losses during offloading will lead to immediate generation of a propane gas cloud. Control measures are therefore tailored to address the key risk which is explosion and / or fire.

Other raw materials will be delivered to the site by road, using authorised carriers. Material unloading, storage, handling and use of raw materials will be undertaken in accordance with local site procedures. Offloading activities will be supervised at all times (in accordance with site procedures).

Spill kits will be provided in close proximity to relevant plant and drip trays will be used when topping up / removing substances within plant. Staff will be appropriately trained in the use of these pollution prevention measures.

Drainage

Site runoff water will be collected in a segregated sealed SGN drainage system, which will pass through an oil interceptor before entering an attenuation tank. The oil interceptor will be regularly inspected / maintained. The water will then be transferred into the YWS drainage system to be returned to the YWS WwTW inlet for treatment. An isolation valve and non-return valve will be in place at / close to the transfer point. If an accidental spill were to enter the drainage system, the system would be isolated and the contents pumped into waste IBCs for disposal via the waste management contactor. The non-return valve will prevent back feeding from the YWS drainage system to the BtG plant. The condition of pipework will be monitored through periodic inspection. The system will be designed and installed using approved materials and installed in locations suitable for the lifecycle of the installation.

Clean water from roof drainage will be collected via a separate system and discharged to ground via soakaways within areas of soft landscaping in the SGN compound.

Spill kits will be in place on the site, and operatives will receive regular training in their use.

The drainage system will meet the requirements of CIRIA 736 (or equivalent approved standard) with sealed construction joints.

	The site drainage is shown on the Indicative Drainage Plan provided as Figure D-6 in Appendix D. **Environmental and Management Controls** The installation will be attended daily throughout the working week for frequent operational checks by SGN technicians – operational checks will consist of visual inspection of plant and equipment and any sampling or analysis required as part of the day-to-day operation of the site. Monthly visits will also be carried out of a more intrusive nature, including detailed visual inspection of plant and equipment, sampling and changing of calibration gas bottles when required. A level of remote monitoring of the plant can be carried out via monitoring system pressures/temperatures. Methods will be in place to ensure spill risks are appropriately managed during the receipt, transfer, use and disposal of potentially polluting substances. Furthermore, the site will operate with emergency plans in place and the risks to land/water during the operation of the site will be minimised. Site management procedures include procedures to minimise environmental impact during accidents and include preventative and control measures to prevent accidents. Relevant staff will be trained to mitigate the environmental impact of emergencies as well as to prevent accidents occurring. **Summary** Based on the relatively small quantities of liquids to be used / stored / generated and the proposed pollution prevention measures, there is considered to be limited potential for leaks / spills to impact underlying ground / groundwater. Therefore, none of the substances to be used or handled at the site as part of the permitted activities are considered to represent a significant site-specific potential pollution risk.
Non-permitted activities undertaken	N/A
Document references	Drawings showing substances to be used / stored / produced, emissions / discharge points and site drainage are provided in Appendix D.

4. Changes to the Activity

Not applicable for permit application.

5. Measures Taken To Protect Land

Not applicable for permit application.

6. Pollution Incidents That May Have Had an Impact on Land, And Their Remediation

Not applicable for permit application.

7. Soil Gas and Water Quality Monitoring (Where Undertaken)

Not applicable for permit application.

8. Decommissioning and Removal of Pollution Risk

Not applicable for permit application

9. Reference Data and Remediation (Where Relevant)

Not applicable for permit application.

10. Statement of Site Condition

Not applicable for permit application.

APPENDICES

Appendix A. Pollution Risk Evaluation

Table A-1 – Determining relevant hazardous substances / substances which may represent a pollution risk

Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
Raw Materials							
Biogas	G	To be upgraded to biomethane.	Non-compliant biomethane released in flare. Compliant biomethane injected into local gas grid.	Pressurised gas (may explode if heated) H280, asphyxiant H330.	Approx. 14,673,000 Nm^3/yr (based on average biogas inlet flow rate)	Not stored on site. Present in equipment and transported through pipework. Condition of pipework monitored via gas flow readings and periodic inspection. All pipework design approved and appraised to relevant standards, using approved materials, with suitable protection as part of design.	Not likely to impact soil or groundwater on site as gaseous in nature.
Propane	L/G	To boost the calorific value of the biomethane if does not meet required energy content standard to be injected into local grid.	Added to biomethane.	Extremely flammable gas (H220), contains gas under pressure, may explode if heated (H280). Liquid can cause burns similar to frostbite. Acts as a simple asphyxiant. At very high concentrations, can displace the normal	600 t/yr (based on average biogas flow rate)	16 tonnes below ground storage tank. Remote monitoring in place. High and low level alarms. Overfilling safety cut out.	Would evaporate if leaked from tank so not likely to impact soil or groundwater.

Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
				air and cause suffocation from lack of oxygen.			
Ethylene glycol (coolant)	L	In pre-treatment heat exchanger, biogas compressors, chillers and MSU.	Waste disposed of via authorised waste contractor.	Harmful if swallowed (H302), may cause damage to organs through prolonged or repeated exposure (H373).	<500 litres	Stored in 200 l bunded container in locked COSHH store. Drip trays used when topping up use in plant. Spill kits near locations of use.	Not stored on site, only collected and removed following maintenance. No practical alternatives available. Not likely to significantly impact soil or groundwater as used in relatively small quantities and used / stored / handled with appropriate pollution prevention measures in place.
Mineral oil	L	Lubricating moving parts in pre-treatment blowers & heat exchanger and biogas compressors.	Removed during oil changes for disposal. Waste disposed of via authorised waste contractor.	Health hazard (H300–H399) (harmful if swallowed, harmful in contact with skin, causes serious eye damage, causes skin irritation and may cause respiratory irritation) Hazardous to the environment (H400–H499) (very toxic to aquatic life;	<1000 litres	Stored in locked COSHH store in a 400 l bunded container. Drip trays used when topping up use in plant. Spill kits near locations of use.	No practical alternatives available. Not likely to significantly impact soil or groundwater as used in relatively small quantities and used / stored / handled with appropriate pollution

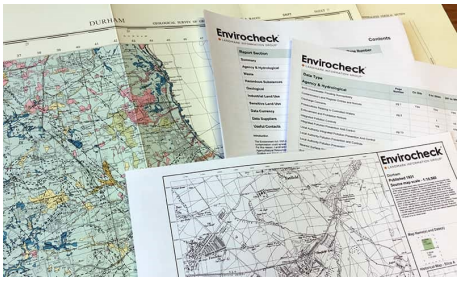
Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
				toxic to aquatic life with long lasting effects)			prevention measures in place.
Cleaning materials (WD 40)	L	Maintenance.	Waste disposed of via authorised waste contractor.	Flammable liquid and vapour (H226), may be fatal if swallowed and enters airways (H304), may cause drowsiness or dizziness (H336).	Minimal	Stored in small bunded containers in COSHH store. Drip trays used when topping up use in plant. Spill kits near locations of use.	No practical alternatives available. Not likely to significantly impact soil or groundwater as used in small quantities and used / stored / handled with appropriate pollution prevention measures in place.
Activated carbon	S	Removal of hydrogen sulphide and non-methane VOCs from biogas in pre-treatment filter vessels.	Waste disposed of via authorised waste contractor.	No hazardous properties.	49,200 kg on site at any one time.	In 6 x 8 tonne vessels, each containing 8,200kg of activated carbon, 2 for H_2S removal and 4 for siloxane removal. Carbon delivered to site and then removed from filter units when in need of replacement.	Not likely to impact soil or groundwater as contained within sealed vessels so no opportunity for exposure to ground / groundwater.
Waste Substances							

Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
Waste oil	L	Mostly from compressors	Disposed of via authorised waste contractor.	Health hazard (H300–H399) (harmful if swallowed, harmful in contact with skin, causes serious eye damage, causes skin irritation and may cause respiratory irritation) Hazardous to the environment (H400–H499) (very toxic to aquatic life; toxic to aquatic life with long lasting effects)	800 litres	Stored in COSHH store in a 1000 l bunded container. Drip trays used when removing from plant. Spill kits near locations of use.	No practical alternatives available. Not likely to significantly impact soil or groundwater as used in relatively small quantities and used / stored / handled with appropriate pollution prevention measures in place.
Spent activated carbon	S	From pre-treatment filter vessels	Transported off-site to be regenerated / disposed of by authorised waste contractor.	Siloxanes, NMVOC and hydrogen sulphide adsorbed by the granular activated carbon contain hazardous properties: Health hazard (H330) acute toxicity, fatal if inhaled. Toxic to aquatic organisms, acute toxicity (H400). Toxic to aquatic organisms, may cause long-term adverse effects	49,200 kg (waste generated per 230 days)	4 x 8,200 kg activated carbon vessels for siloxane removal. 2 x 8,200 kg activated carbon vessels for H_2S removal. Removed by specialists with appropriate procedures in place to prevent spillages.	Regular monitoring will be undertaken with the activated carbon filters replacement scheduled as required. Not likely to impact soil or groundwater as contained within sealed vessels so no opportunity for exposure to ground / groundwater.

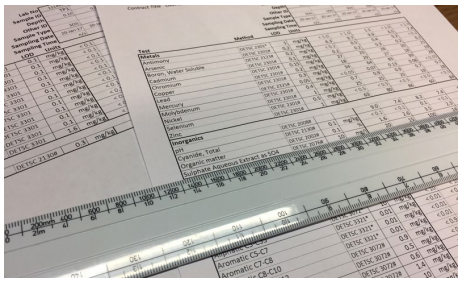
Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
				in the aquatic environment (H411)			
Biogas condensate	L	Generated at pre-treatment heat exchangers and biogas compressors.	Transferred to existing YWS drainage system and then to WwTW inlet for treatment.	MSDS not available. Health hazard (H300–H399) (harmful if swallowed, harmful in contact with skin, causes serious eye damage, causes skin irritation and may cause respiratory irritation). Hazardous to the environment (H400–H499) (very toxic to aquatic life; toxic to aquatic life with long lasting effects)	1,680 m^3 (based on 192 l/hr, 24 hours/day, 365 days/year)	Collected via dedicated sealed drainage system before transfer to YWS drainage system. Isolation valve and non-return valve at / close to transfer point. Condensate collection pots subsurface so unlikely to be damaged. Condition of pipework and condensate collection pots monitored through periodic inspection. System designed and installed using approved materials and installed in locations suitable for lifecycle of the installation.	Not likely to significantly impact soil or groundwater as used / stored / handled with appropriate pollution prevention measures in place.
Waste ethylene glycol	L	From pre-treatment heat	Disposed of via authorised	Harmful if swallowed (H302), may cause	400 litres	Intention not to store on site as removed	Not likely to significantly impact

Substance	State S – Solid L – Liquid G – Gas	Use	Fate	Hazardous Properties (CLP risk phrases)	Annual Quantity	Storage and Transport Arrangements	Comments
		exchanger, biogas compressors, chillers and MSU.	waste contractor.	damage to organs through prolonged or repeated exposure (H373).		following maintenance. Drip trays used when removing from plant. Spill kits near locations of use.	soil or groundwater as used in relatively small quantities and used / stored / handled with appropriate pollution prevention measures in place.
Products							
Biomethane	G	Product of process.	Injected to local gas transmission grid, non-compliant biomethane gas is flared	Extremely flammable gas (H220), gases under pressure which may explode if heated (H280), may form explosive mixtures with air, may displace oxygen and cause rapid suffocation.	395 to 1,933 Nm^3/hr, depending on the input biogas flow rate (max. 2,110 Nm^3/h following the addition of propane)	Transported through pipework.	Not likely to impact soil or groundwater on site as gaseous in nature.

Appendix B. Factual Ground Investigation Report







Factual Site Investigation

Yorkshire Water Knostrop Energy & Recycling Facility, Leeds

SGN

M23-045

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FACTUAL SITE INVESTIGATION REPORT

YORKSHIRE WATER KNOSTROP ENERGY & RECYCLING FACILITY, LEEDS

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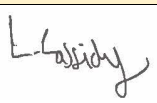
APPENDICES

Revision	Date	Prepared By	Signed
Final - Rev03	March 2024	L Richards *Regional Manager*	
		Checked By	
		L Cassidy *Principal Environmental Engineer*	
		Approved By	
		R Woods *Managing Director*	

1 INTRODUCTION

1.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of SGN taking into account Technical Notes authored by AtkinsRealis, on land located at Yorkshire Water Knostrop Energy & Recycling Facility, Leeds, LS9 0PJ. A site location plan is presented as Figure 1 in Appendix A.

1.2 Scope of Works

These ground investigation works are to facilitate SGN's Biomethane Gas to Grid Knostrop scheme.

A geotechnical and environmental investigation was requested. This report details the environmental portion of the works only. The type and position of exploratory positions and the scope and nature of testing were all determined by SGN and carried out in accordance with AtkinsRealis GI Technical Note 5223650 where applicable.

The fieldwork and testing was generally carried out according to the recommendations of BS5930:2015+A1:2020 "Code of Practice for Ground Investigations" and where applicable BS EN 1997-2:2007 with soil descriptions to BS EN 14688-1:2013 where applicable. The information provided in this report is based on the investigation fieldwork and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

2 SITE DESCRIPTION AND FIELDWORK

The site is located within a sewage treatment facility and consists of two smaller plots located southwest of Pontefract Lane and northwest of Sewage Works Road. The site is bound on its north-eastern side by Wyke Beck and surrounded in all other directions by sewage works. Given the site's current use there is potential for superficial contamination.

2.1 Fieldwork

The fieldwork commenced on 18th December 2023. The extent of the investigation was:

- 3no. rotary boreholes to 30.00mbgl (RBH01-03 inclusive).
  - The boreholes were initially progressed via dynamic sampling methods to bedrock.
  - The uppermost portion of bedrock was cored to facilitate pile design.
  - The boreholes were then progressed to 30mbgl via water flush open-hole drilling methods to investigate potential historic coal workings.
- Gas/Groundwater monitoring wells were installed in WS01, RBH01, 02 & 03.
  - The monitoring wells were designed by AtkinsRealis.
- 2no. windowless sampling boreholes (WS01 and WS01A) to a maximum depth of 1.30mbgl.
- 11no. machine excavated trial pits (TP01-TP11 inclusive) to a maximum depth of 1.20mbgl.
  - These locations were set out for the purpose of undertaking Plate Load Bearing Testing, the results of which will be presented in a separate report.
- 2no. hand excavated trial pits (TP01A and TP02A) to a maximum depth of 0.60mbgl.
  - These exploratory holes were positioned to recover shallow samples of made ground material.
- In-situ testing in the exploratory boreholes as Standard Penetration Tests (SPTs).
- Retrieval of samples for geotechnical and contamination testing.

The boreholes were backfilled with gas/groundwater monitoring installations/bentonite grout, and trial pits were backfilled with clean arisings upon completion.

Descriptions of the strata encountered in the exploratory positions together with details of sampling and groundwater are presented in Appendix B of this report. A plan showing the location of all positions can be found in Appendix A (Figure 2).

3 GROUND CONDITIONS

A brief summary of the ground conditions encountered is given below.

3.1 Made Ground & Topsoil

Topsoil was encountered within TP01A to TP11 inclusive, ranging in thickness from 0.10m – 0.19m.

Made ground was recorded within all exploratory positions with the exception of RBH02, however it should be noted that made ground was recorded within exploratory positions immediately surrounding RBH02, however no anthropogenic material was noted within this borehole by the supervising engineer.

Where proven, the made ground ranged in thickness from 0.70mbgl (WS01A) to 6.30mbgl (RBH03) and was generally noted to be granular in nature, comprising a mixture of slightly clayey gravelly sand, and sandy gravel. The gravel constituents were noted to comprise sandstone, concrete, brick, ceramic tiles, metal, wood, plastic and cloth.

3.2 Natural Drift Deposits

Proven to underlie the made ground deposits across the site, natural deposits generally consisted of medium dense sandy gravel deposits, which was variably recorded to be slightly clayey recorded to a depth of 6.50mbgl within RBH01 and RBH02.

Locally, bands of cohesive material were encountered within RBH02 from 6.50-8.90mbgl, which are likely to be associated with the uppermost weathered zone of the Pennine Lower Coal Measures Formation.

3.3 Solid Geology

Rockhead, generally comprising siltstone or mudstone, was encountered within each of the rotary boreholes at depths of between 6.87mbgl (RBH03) and 8.90mbgl (RBH02).

The boreholes were progressed to 30.00mbgl via rotary methods, and bedrock was noted to comprise sedimentary cyclothems of mudstone, sandstone, siltstone and coal, which is consistent with the geology of the Pennine Lower Coal Measures Formation.

3.4 Groundwater

Groundwater strikes, where encountered, are presented on the exploratory logs (Appendix B) and are summarised below in Table 1:

TABLE 1: SUMMARY OF GROUNDWATER STRIKES

Exploratory Position	Depth Encountered (mbgl)	Depth after 20 minutes (mbgl)	Strata
RBH01	4.50	4.12	GRAVEL
RBH02	5.80	4.30	GRAVEL
RBH03	4.70	4.37	MADE GROUND: Gravel

It should be noted the rapid rate of advancement of the exploratory holes, coupled with the water flushing medium employed may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

4 CONTAMINATION TESTING RESULTS

The proposed development is outlined to be commercial, comprising a new Biomethane Gas to Grid Knostrop scheme. The chemical samples were generally retrieved in line with BS ISO 18400-105:2017 “Soil Quality. Sampling”. The chemical results are presented in Appendix C.

4.1 Contamination Testing

4.1.1 Soil Contamination Testing

To provide information upon the possibility of ground contamination, 6no samples of made ground and 1no sample of natural sand were selected for contamination testing. The number and type of samples chosen were specified by AtkinsRealis, and are detailed below:

- TP01A – 0.10-0.30m (Made Ground – Topsoil)
- TP01A – 0.50-0.60m (Made Ground – Granular)
- TP02A – 0.10-0.20m (Made Ground – Granular)
- WS01 – 0.50-0.80m (Made Ground – Granular)
- RBH01 – 0.50m (Made Ground – Granular)
- RBH02 – 0.10m (Natural Sand)
- RBH03 – 0.50m (Made Ground – Granular)

The samples selected are considered to provide coverage of both the made ground and shallow natural strata from across the site that would be most likely to be exposed during future site works. The samples were tested for the following contaminant suites:

TABLE 2: SUMMARY OF SOILS TESTING CHEMICAL DETERMINANDS

Suite B.1 – Soils Suite (Baseline)	Suite B.3 – Soils Suite (Contaminated Land Liabilities)
Ethylene Glycol	pH
Unsaponificated Oil & Grease	Soil Organic Matter
Methyl mercaptan	Sulphate (as SO4) - Total
pH	Phenols – Total (monohydric)
Soil Organic Matter	Total Cyanides
Speciated TPH (CWG)	Free Cyanide
Copper	Complex Cyanide
Chromium	Boron
Nickel	Arsenic
Lead	Chromium
Zinc	Chromium - Hexavalent
Tin	Copper
Arsenic	Lead
Iron	Iron
Cadmium	Selenium
Mercury	Zinc
Selenium	Cadmium
Vanadium	Mercury
Molybdenum	Nickel
Aluminium	Vanadium
Nitrite	Asbestos identification
Ammonical Nitrogen	Asbestos quantification
	Speciated polycyclic aromatic hydrocarbons (16 PAHs)
	Speciated TPH (CWG)
	Benzene, toluene, ethylbenzene and xylene (BTEX) and MTBE
	Volatile Organic Compounds (VOC)
	Semi Volatile Organic Compounds (SVOC)
	Total Speciated PCBs – WHO 12

- 7no Suite B1 – Soils Suite (Baseline)
- 7no Suite B3 – Soils Suite (Contaminated Land Liabilities)

4.1.2 Leachate Contamination Testing

The following samples were also sent for leachate analysis, at the request of AtkinsRealis:

- TP01A – 0.10-0.30m (Made Ground – Topsoil)
- TP01A – 0.50-0.60m (Made Ground – Granular)
- TP02A – 0.10-0.20m (Made Ground – Granular)
- WS01 – 0.50-0.80m (Made Ground – Granular)
- RBH01 – 0.50m (Made Ground – Granular)
- RBH02 – 0.10m (Natural Sand)
- RBH03 – 0.50m (Made Ground – Granular)

The suite of determinands tested is outlined in Table 3., below.

TABLE 3: SUMMARY OF LEACHATE TESTING CHEMICAL DETERMINANDS

Suite B.4 – Soil Leachate Suite (Contaminated Land Liabilities)
pH
Boron (water soluble)
Arsenic
Chromium (total)
Chromium - Hexavalent
Copper
Lead
Iron
Selenium
Zinc
Cadmium
Mercury
Nickel
Vanadium
Cyanide (free)
Cyanide (total)

4.1.3 Water Contamination Testing

During the monitoring fieldwork, three samples of groundwater were retrieved. Samples were retrieved once the wells were purged 3x the well volume and then allowed to recharge. The following samples were sent for water analysis, at the request of AtkinsRealis:

Visit 1 (26/01/24):

- RBH01 – 3.35m
- RBH02 – 3.08m
- RBH03 – 3.07m

Visit 2 (01/02/24):

- RBH01 – 2.93m
- RBH02 – 2.72m
- RBH03 – 2.70m

Visit 3 (06/02/24):

- RBH01 – 2.85m
- RBH02 – 2.72m
- RBH03 – 2.70m

The water samples were tested for the following determinands outlined in Table 4 below:

TABLE 4: SUMMARY OF GROUNDWATER TESTING CHEMICAL DETERMINANDS

Suite B.2 – Groundwater Suite (Baseline)	Suite B.5 – Groundwater Suite (Contaminated Land Liabilities)
Ethylene Glycol	Arsenic
Unsaponificated Oil & Grease	Boron
Methyl mercaptan	Cadmium
pH	Chromium (total)
Electrical Conductivity	Chromium (hexavalent)
Speciated TPH (CWG)	Copper
Copper	Lead
Chromium	Mercury
Nickel	Nickel
Lead	Selenium
Zinc	Zinc
Tin	Vanadium
Arsenic	Iron
Iron	Chemical Oxygen Demand
Cadmium	Biological Oxygen Demand
Mercury	pH
Selenium	Electrical Conductivity
Vanadium	Redox
Molybdenum	Water soluble sulphate (as SO4)
Aluminium	Sulphide
Nitrite	HCO3
Ammonical Nitrogen	Ammoniacal Nitrogen as N
	Ammonium as NH4
	Ammonia as NH3
	Nitrate
	Nitrite
	Nitrogen
	Calcium
	Magnesium
	Sodium
	Potassium
	Chloride
	Cyanide (total)
	Cyanide (free)
	Cyanide (complex) Speciated
	Polycyclic aromatic hydrocarbons (16 PAHs)
	Phenol
	Total organic carbon
	Total coliforms
	Fecal coliforms

4.2 Test Results

The contamination test results are presented in Appendix C.

5 WATER MONITORING

For this report, groundwater monitoring was undertaken from four standpipes (WS01 and all three rotary boreholes) that were installed during the sitework. The groundwater monitoring/sampling consisted of three visits, with the depths reported in Table 5, below.

TABLE 5: SUMMARY OF GROUNDWATER MONITORING VISITS

Borehole	Visit 1 (26/01/24)	Visit 2 (01/02/24)	Visit 3 (06/02/24)
RBH01	3.35	2.93	2.85
RBH02	3.08	2.72	2.72
RBH03	3.07	2.70	2.70

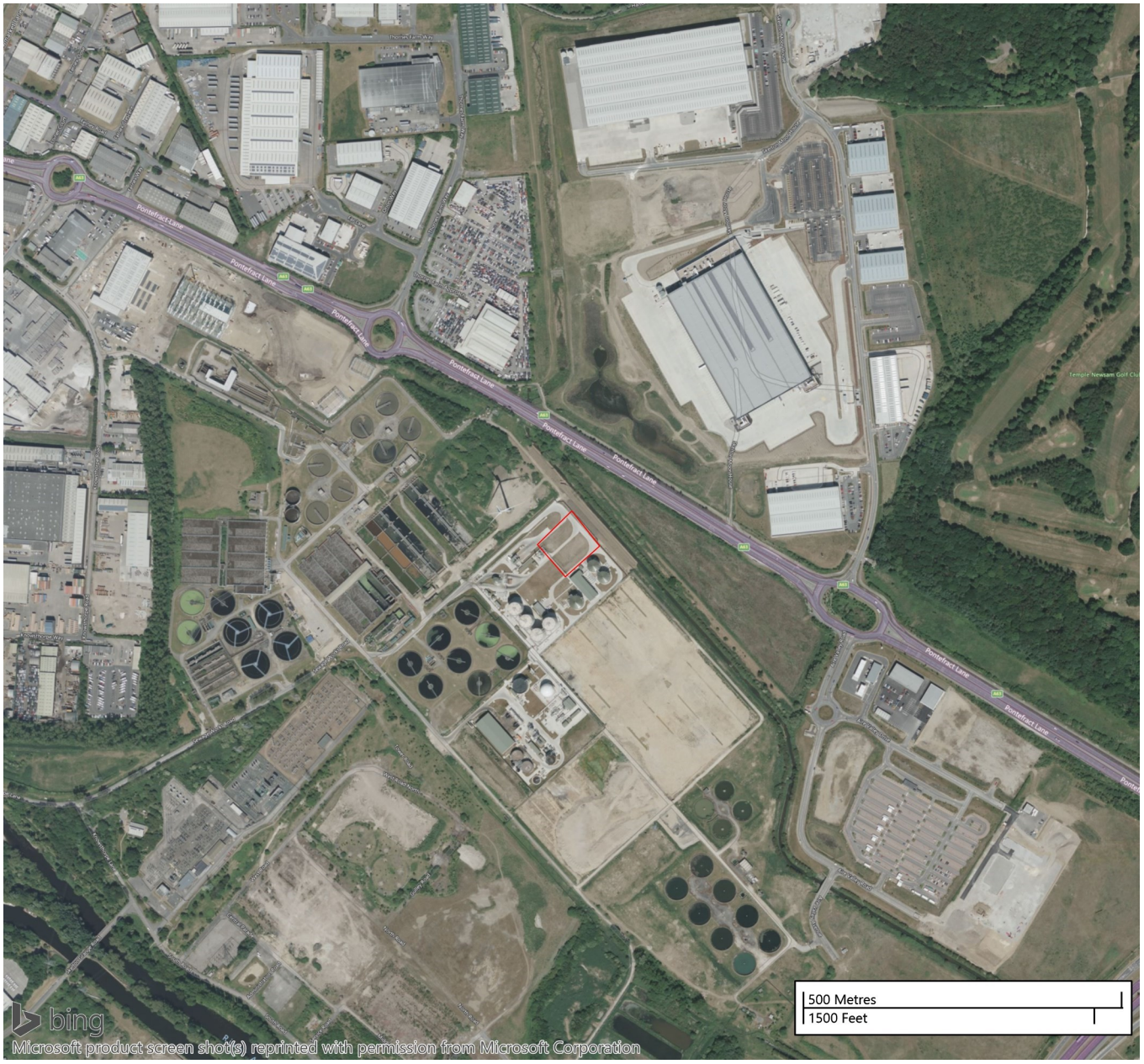
5.1 Monitoring Wells and Response Zones

During the site investigation works, monitoring wells were installed within four boreholes. The response zones were specified by AtkinsRealis and are briefly summarised below in Table 6.

TABLE 6: SUMMARY OF MONITORING WELL RESPONSE ZONES

Borehole	Pipework	Installation Depth (mbgl)	Response zone of slotted pipework (mbgl)	Response Zone Stratum
RBH01	50mm HDPE pipe	9.00	4.00-9.00	GRAVEL
RBH02	50mm HDPE pipe	6.00	4.00-6.00	SAND & GRAVEL
RBH03	50mm HDPE pipe	5.50	4.00-5.50	MADE GROUND
WS01	50mm HDPE pipe	0.80	0.40-0.80	MADE GROUND

Appendix A



SOLMEK

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Figure Title

Site Location Plan

Project Number

M23-045

Project Name

Yorkshire Water Knostrop Faciliity, Leeds

Client

SGN

Date

January 2024

DRG Number

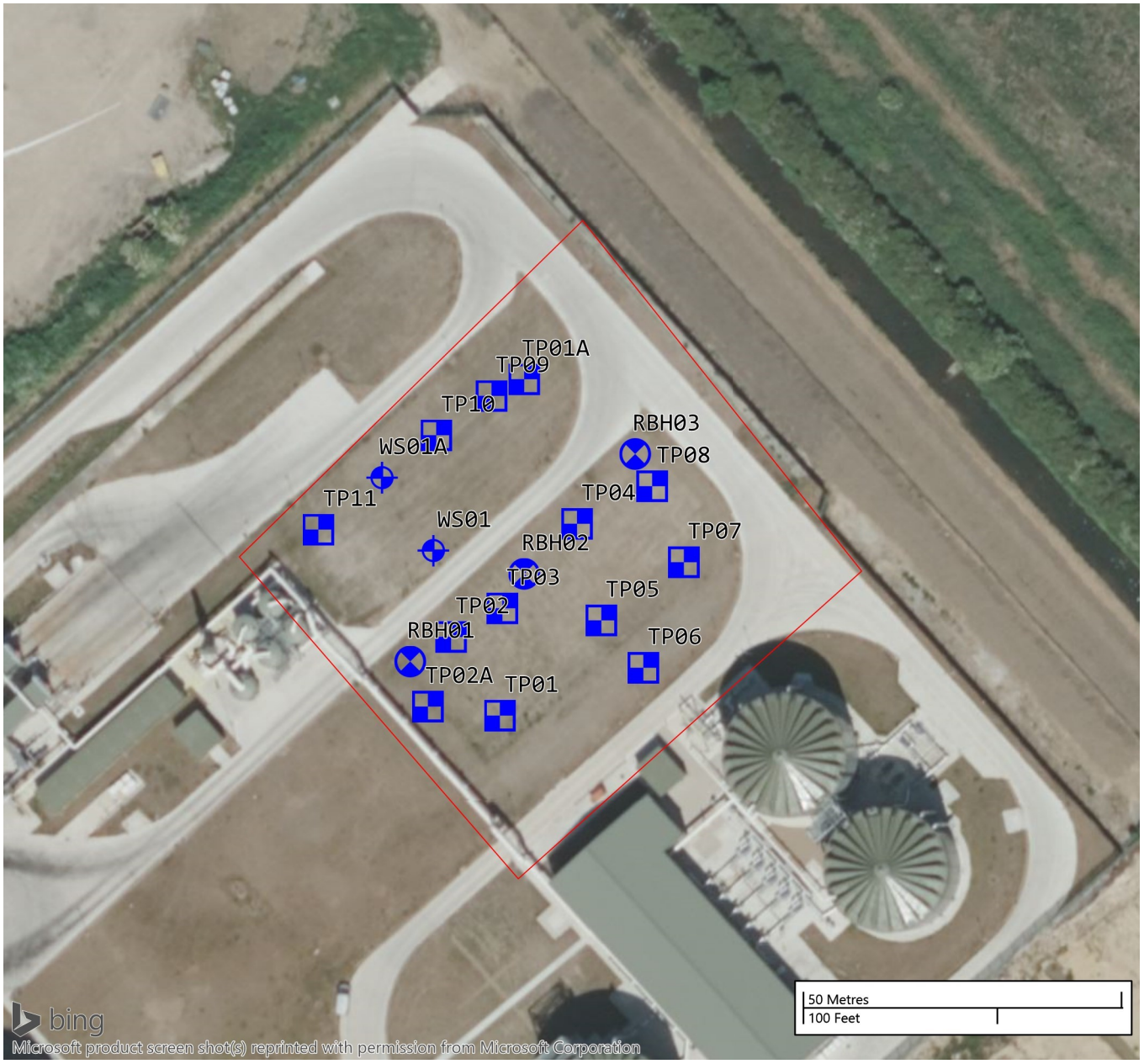
Figure 1

Scale

1:10000 @ A4 [DO NOT SCALE]

Legend Key

Project Bounds - Project Bounds



SOLMEK

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Figure Title

Exploratory Hole Location Plan

Project Number

M23-045

Project Name

Yorkshire Water Knostrop Faciliity, Leeds

Client

SGN

Date

February 2024

DRG Number

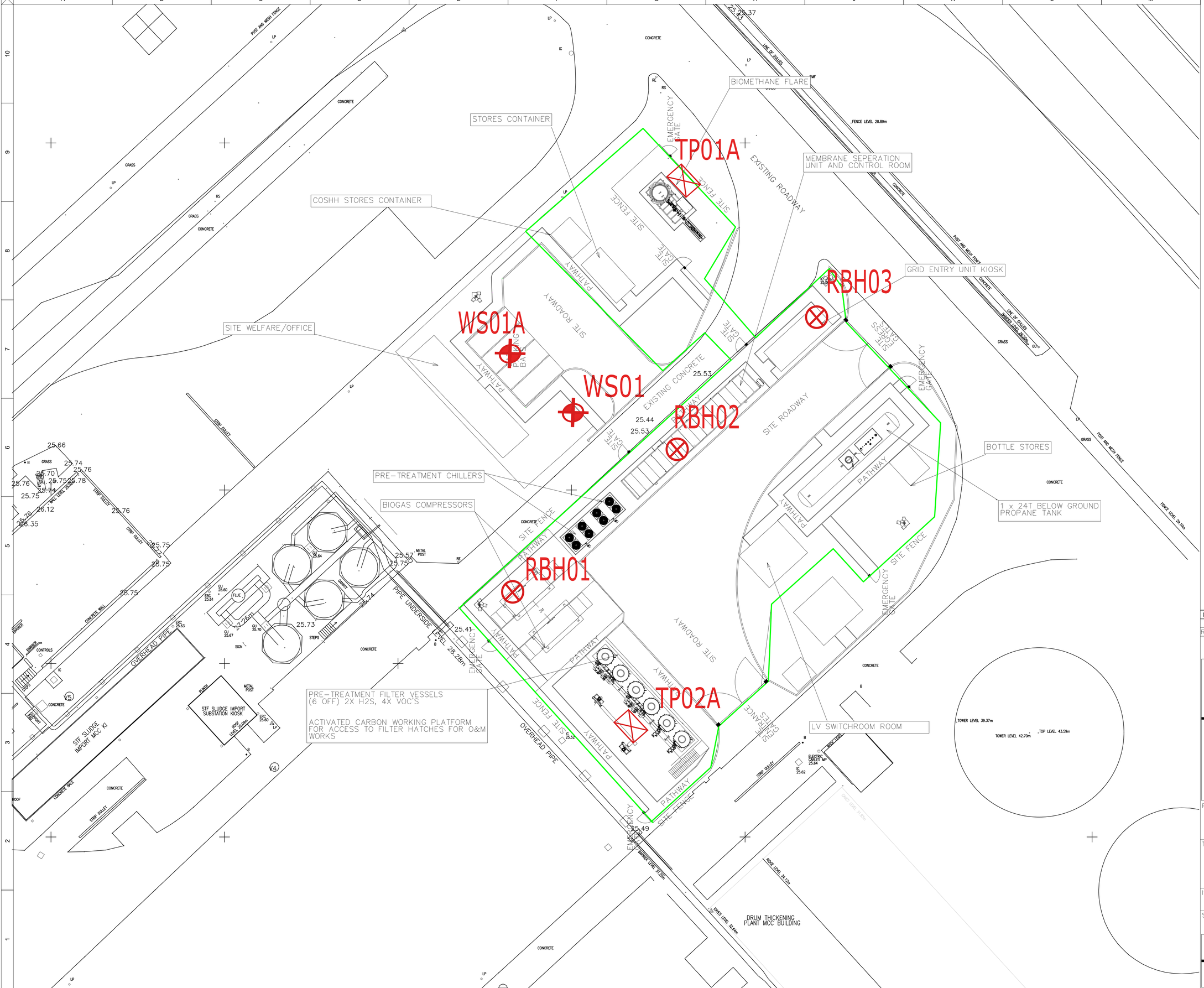
Figure 2

Scale

1:1000 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- Locations By Type - BH
- Locations By Type - RC
- Locations By Type - TP
- Project Bounds - Project Bounds



KEY –

– SGN PERMIT APPLICATION BOUNDARY

North

1:200

4m 0 4m 8m 12m 16m 20m

REV	DESCRIPTION	DRN	CHK	APP	DATE
01	FOR PERMIT APPLICATION	TG	MG	AM	21/2/24
A	FOR PERMIT APPLICATION	TG	MG	AM	24/1/24

SGN Commercial Services

CLIENT

Yorkshire Water

PROJECT

SGN GAS TO GRID
KNOSTROP

TITLE

SGN PROPOSED SITE PLAN
ENVIRONMENTAL PERMIT BOUNDARY

ISSUE

FOR PERMIT APPLICATION

SCALE	SIZE	ORIGINATOR	DATE CREATED
1: 200	A1	TG	31.1.24

EXTERNAL DRAWING NO.

SGN/EAP/KNOSOP/B/001

INTERNAL DRAWING NO.	REVISION
SGN/EAP/KNOSOP/B/001	01

KEY –

– SGN PERMIT APPLICATION BOUNDARY

North

1:200

4m 0 4m 8m 12m 16m 20m

REV	DESCRIPTION	DRN	CHK	APP	DATE
01	FOR PERMIT APPLICATION	TG	MG	AM	21/2/24
A	FOR PERMIT APPLICATION	TG	MG	AM	24/1/24

SGN Commercial Services

CLIENT

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PROJECT

SGN GAS TO GRID
KNOSTROP

TITLE

SGN PROPOSED SITE PLAN
ENVIRONMENTAL PERMIT BOUNDARY

ISSUE

FOR PERMIT APPLICATION

SCALE	SIZE	ORIGINATOR	DATE CREATED
1: 200	A1	TG	31.1.24

EXTERNAL DRAWING NO.

SGN/EAP/KNOSOP/B/001

INTERNAL DRAWING NO.	REVISION
SGN/EAP/KNOSOP/B/001	01

Appendix B

SOLMEK

Rotary Coring Log

Scale 1:100 Sheet 1 of 2

RBH01

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	22/12/2023
Client:	SGN			**Ended:**	04/01/2024
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	04/01/2024

GL (AOD):	
Easting:	433832.48
Northing:	431748.79
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results	Coring / Fractures: TCR (m)	SCR (m)	RQD (m)	Fracture
				MADE GROUND: Brown yellow sand and gravel. Sand is fine to coarse. Gravel is rounded to angular of sandstone and brick.	0.10 - 0.30	ES	20.00				
					0.20	PID					
					0.50 - 0.80	B	23.00				
		1.20		Medium dense yellow brown SAND & GRAVEL. Sand is fine to coarse. Gravel is rounded to subangular of sandstone.	0.50 - 1.00	ES	17.00				
					0.65	PID	N=18				
					1.00 - 1.20	ES	(3,4/4,4,4,6)				
					1.10	PID	6.00				
					1.20	SPT	N=20				
					1.20 - 1.65	B+ES	(5,5/4,5,5,6)				
					1.40	PID	8.00				
		3.00		Medium dense brown to yellow slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is rounded to subangular of sandstone and chert.	2.00	SPT	N=23				
					2.00 - 2.45	B+ES	(4,3/4,5,7,7)				
					2.20	PID	8.00				
					3.00	SPT					
					3.00 - 3.45	B+ES	N=14				
					3.20	PID	(2,3/3,5,3,3)				
					4.50	SPT	10.00				
					4.50 - 4.95	B+ES					
					4.70	PID					
		6.00		Medium dense brown to black slightly sandy, clayey GRAVEL. Sand is fine to coarse. Gravel is fine to medium rounded to subangular of sandstone.	6.00	SPT	N=17				
					6.20 - 6.30	ES	(3,4/4,5,4,4)				
					6.20	PID	7.00				
		7.50		NO RECOVERY.							
		8.16		Very weak grey roughly laminated MUDSTONE.				73	30	0	0 0 70
		9.10		Recovered as light grey soft CLAY.							
		9.20		Very weak grey thinly laminated MUDSTONE.							
		9.69		COAL.							
		9.71		Very weak grey roughly laminated MUDSTONE.				97	59	16	0 0 72
		10.50		NO RECOVERY.							
		11.50		Very weak laminated grey SILTSTONE/MUDSTONE.				45	23	0	0 60 90
		11.70		No fractures, recovered as fine to coarse gravel angular of siltstone.							
		11.85		Recovered as fine to coarse gravel angular of siltstone.							
		12.70		Very weak grey roughly laminated MUDSTONE. Fractures from 180-90 degrees, 2mm spaced.				49	27	0	0 40 80
		13.27		Very weak laminated grey SILTSTONE with light grey inclusions. Very weak grey rough laminated MUDSTONE.							
											0 0 90

Continued on Next Sheet

Hole Diameter: Depth Base (m)	Hole Diameter: Diameter (mm)	Casing Depths: Depth Base (m)	Casing Depths: Diameter (mm)
		7.50	152

General Remarks

1.2m Hand excavated inspection pit dug.
Groundwater encountered at 4.50m.

Flush Returns: From (m)	To (m)	Flush Type	Flush (%)

Ground Water: Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
4.50	4.50		20	4.12

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Rotary Coring Log

Scale 1:100 Sheet 2 of 2

RBH01

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	22/12/2023
Client:	SGN			**Ended:**	04/01/2024
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	04/01/2024

GL (AOD):		
Easting:	433832.48	
Northing:	431748.79	
Logged:	ARC	
Status:	FINAL	

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing			Coring / Fractures			
					Depth (m)	Type	Results	TCR (m)	SCR (m)	RQD (m)	Fracture
		30.00		End of Borehole at 30.00m							

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1.2m Hand excavated inspection pit dug. Groundwater encountered at 4.50m.
		7.50	152	

Flush Returns				Ground Water				
From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				4.50	4.50		20	4.12

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Rotary Coring Log

Scale 1:100 Sheet 1 of 2

RBH02

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	22/12/2023
Client:	SGN			**Ended:**	22/12/2023
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	22/12/2023

GL (AOD):	
Easting:	433850.48
Northing:	431762.74
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results	Coring / Fractures: TCR (m)	SCR (m)	RQD (m)	Fracture
				Medium dense brown slightly clayey gravelly SAND. Sand is fine to coarse Gravel is fine to medium rounded to subrounded of sandstone.	0.10 - 0.30	ES	8.00				
					0.20	PID	7.00				
					0.50 - 0.80	ES					
					0.60	PID	9.00				
					1.00 - 1.20	ES	N=21				
					1.10	PID	(4,5/5,6,5,5)				
					1.20	SPT					
					1.20 - 1.65	B+ES					
					2.00 - 2.50	B					
		3.00		Medium dense orange SAND & GRAVEL. Sand is fine to coarse. Gravel is fine to medium subangular to rounded of sandstone and chert.	3.00	SPT	N=23				
					3.00 - 3.40	B+ES	(4,4/6,6,6,5)				
					3.30 - 3.50	ES	10.00				
					3.40	PID					
					4.50	SPT	N=23				
					4.50 - 4.95	B+ES	(5,6/5,5,6,7)				
G		6.00		Medium dense brown to grey clayey slightly sandy GRAVEL. Sand is fine to medium. Gravel is fine to coarse rounded to subangular of sandstone with an organic smell.	6.00	SPT	N=29				
		6.50			6.00 - 6.45	B+ES	(6,7/7,8,7,7)				
					6.10 - 6.20	ES	8.00				
					6.10	PID					
		7.50		Grey to brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse rounded to subrounded of sandstone with organic smell.	7.50 - 7.95	B+ES					
				NO RECOVERY.				27	27	0	
		8.68		Recover as very soft grey to brown slightly gravelly CLAY. Gravels is fine angular of mudstone.							0
		8.90		Very weak grey amorphous thickly bedded SILTSTONE. No fractures.							90
								73	53	28	200
		9.88		Very weak dark grey black thinly laminated MUDSTONE with widely spaced fractures at 180 degrees smooth.							
		10.00		Very weak grey amorphuses thickly bedded SILTSTONE. No fractures.							
		10.50		NO RECOVERY.				0	0	0	0
											0
											80
		11.90		Recovered as very soft light grey CLAY.							
		12.10		Weak grey thinly laminated SILTSTONE. Fractures from 45 to 180 degrees smooth undulating 5-2mm spacing.							
		12.30		NO RECOVERY.				87	24	0	0
		12.59		Weak grey thinly laminated SILTSTONE. Fractures from 45 to 180 degrees smooth undulating 5-2mm spacing.							0
		12.74									80
		13.31		Very weak grey thinly laminated MUDSTONE. Fractures at 180 degrees0 small spaced.							
		13.50		Recovered as grey clayey GRAVEL.				33	14	0	0
		14.50		NO RECOVERY.							0
				Weak grey amorphous thickly bedded SILTSTONE. Small spaced fractures from 180-90 degrees.							90
		15.83		Very weak grey amorphous thickly bedded SILTSTONE. No fractures.				97	45	0	
		15.93		COAL.							
		16.04		Very weak grey amorphous thickly bedded SILTSTONE with fractures small on 180-90 degrees.							

Continued on Next Sheet

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1.2m Hand excavated inspection pit dug. Groundwater encountered at 5.80m.
		7.50	152	

Flush Returns				Ground Water				
From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				5.80	5.80		20	4.30

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Rotary Coring Log

Scale 1:100 Sheet 2 of 2

RBH02

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	22/12/2023
Client:	SGN			**Ended:**	22/12/2023
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	22/12/2023

GL (AOD):	
Easting:	433850.48
Northing:	431762.74
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description
		23.50		COAL seam.
		25.00		MUDSTONE
		30.00		End of Borehole at 30.00m

Samples and Insitu Testing

Depth (m)	Type	Results

Coring / Fractures

TCR (m)	SCR (m)	RQD (m)	Fracture

Hole Diameter		Casing Depths	
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)
		7.50	152

General Remarks

1.2m Hand excavated inspection pit dug.
Groundwater encountered at 5.80m.

Flush Returns			
From (m)	To (m)	Flush Type	Flush (%)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
5.80	5.80		20	4.30

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Rotary Coring Log

Scale 1:100 Sheet 1 of 2

RBH03

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	20/12/2023
Client:	SGN			**Ended:**	22/12/2023
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	22/12/2023

GL (AOD):	
Easting:	433867.88
Northing:	431781.77
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results	Coring / Fractures: TCR (m)	SCR (m)	RQD (m)	Fracture
				MADE GROUND: Brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse rounded to angular of concrete, sandstone and chert.	0.10 - 0.30	ES	20.00				
					0.20	PID	23.00				
					0.50 - 0.80	ES					
					0.60	PID	18.00				
		1.50		Inferred MADE GROUND: NO RECOVERY.	1.00 - 1.20	B+ES	N=46				
					1.00	PID	(4,6/9,9,12,16)				
					1.50	SPT					
					3.00	SPT	N=23 (5,5/4,6,6,7)				
		4.50		MADE GROUND: Dark brown gravel. Gravel is subrounded to angular of sandstone and concrete. Occasional wood and tile.	4.50	SPT	N=12				
					4.60 - 4.80	B+ES	(2,3/3,3,3,3)	21	0	0	0
					4.70	PID	17.00				0
		5.53		Inferred MADE GROUND: NO RECOVERY.							10
		6.00		MADE GROUND: Dark brown gravel. Gravel is subrounded to angular of sandstone and concrete. Occasional wood and tile.	6.00	SPT	N=17				
		6.30		Very soft grey CLAY.	6.10 - 6.20	B+ES	(3,4/4,5,4,4)	48	25	0	0
		6.87		Very weak light grey thinly bedded MUDSTONE with no fractures.	6.10	PID	15.00				0
		7.30		NO RECOVERY.							60
		7.50		MUDSTONE. Recovered as very soft grey CLAY.							
		7.81		Very weak light grey thinly bedded MUDSTONE with very small fractures.				92	69	23	0
		7.84									80
		8.24		Weak dark grey thinly laminated SILTSTONE. 2-5mm fractures from 90-45 degrees also brown sand inclusions.							150
		8.89		MUDSTONE - Recovered as fine to coarse angular gravel.							
				MUDSTONE with subordinate Siltstone bands frequently noted.							

Continued on Next Sheet

Hole Diameter		Casing Depths	
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)
		6.00	200
		13.50	150

General Remarks

1.2m Hand excavated inspection pit dug.
Groundwater encountered at 4.70m.

Flush Returns			
From (m)	To (m)	Flush Type	Flush (%)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
4.70	4.50		20	4.37

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Rotary Coring Log

Scale 1:100 Sheet 2 of 2

RBH03

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Bainbridge Brothers Ltd
				Plant used:	Beretta T41
				Started:	20/12/2023
Client:	SGN			**Ended:**	22/12/2023
Method:	Rotary Core & Rotary open Hole			**Backfilled:**	22/12/2023

GL (AOD):	
Easting:	433867.88
Northing:	431781.77
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results	Coring / Fractures: TCR (m)	SCR (m)	RQD (m)	Fracture
		30.00		End of Borehole at 30.00m							

Hole Diameter: Depth Base (m)	Hole Diameter: Diameter (mm)	Casing Depths: Depth Base (m)	Casing Depths: Diameter (mm)
		6.00	200
		13.50	150

General Remarks

1.2m Hand excavated inspection pit dug.
Groundwater encountered at 4.70m.

Flush Returns: From (m)	To (m)	Flush Type	Flush (%)

Ground Water: Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
4.70	4.50		20	4.37

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Trial Pit Log

TrialPit No
TP01A
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433833E - 431741N Level:
Plant Used:	Hand Tools	Dimensions (m): Depth 0.60	2.10 × 0.40
Client:	SGN		

Date: 18/12/2023
Scale: 1:26
Logged: ARC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30 0.10	B+ES PID	22.00	0.10			TOPSOIL with frequent rootlets.
							MADE GROUND: Brown slightly clayey gravely sand. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick and concrete.
	0.50 - 0.60 0.50	B+ES PID	20.00	0.46 0.60			MADE GROUND: Grey brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of sandstone and concrete.
							End of Pit at 0.600m

Remarks: No groundwater encountered.

Stability: Pit wall stable in clayey material.

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Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433839E - 431753N Level:
Plant Used:	JCB	Dimensions (m): Depth 1.00	2.10 × 0.90
Client:	SGN		Scale 1:26 Logged ARC

Date: 21/12/2023

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			TOPSOIL with frequent roots.
	0.20 - 0.30 0.20	B+ES PID	19.00	0.33			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
	0.40 - 0.50 0.40	B+ES PID	18.00	0.52			MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone.
				1.00			MADE GROUND: Grey sand and gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone and concrete. Occasional cobbles subangular to rounded of concrete and sandstone End of Pit at 1.000m

Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP02A
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433850E - 431794N Level:
Date	18/12/2023		
Plant Used:	Hand Tools	Dimensions (m): Depth 0.60	0.35 / 0.35
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.20 0.10	B+ES PID	16.00	0.10			TOPSOIL with frequent rootlets.
				0.26			MADE GROUND: Brown slightly clayey gravely sand. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick and concrete.
	0.50 - 0.60 0.50	B+ES PID	18.00	0.60			MADE GROUND: Yellow brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse rounded to subangular of sandstone and concrete.
							End of Pit at 0.600m

Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP03
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Facility, Leeds	Project No. M23-045	Co-ords: 433847E - 431757N Level:
Date	21/12/2023		
Plant Used:	JCB	Dimensions (m): Depth 1.00	1.15 × 0.90
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			TOPSOIL with frequent roots.
	0.20 - 0.30 0.20	B+ES PID	16.00	0.37			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
	0.50 - 0.60 0.50	B+ES PID	18.00	0.42			MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone.
							MADE GROUND: Light grey sand and gravel. Sand is fine to coarse. Gravel is fine to coarse of sandstone and concrete. Small to large cobbles rounded to angular of sandstone and core.
				1.00			End of Pit at 1.000m

1
2
3
4
5

Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP04
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433859E - 431771N Level:
Date	21/12/2023		
Plant Used:	JCB	Dimensions (m): Depth 1.20	1.30 × 0.90
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.12			TOPSOIL with frequent roots.
	0.20 - 0.40 0.20	B+ES PID	25.00	0.40			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
	0.50 - 0.80 0.50	B+ES PID	14.00	0.63			MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone.
	1.00 - 1.20	B+ES		1.20			MADE GROUND: Light grey sand and gravel. Sand is fine to coarse. Gravel is fine to coarse subrounded to subangular of sandstone, tile and brick. Frequent small to large cobbles subangular of brick and sandstone. End of Pit at 1.200m

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Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433863E - 431755N Level:
Date	21/12/2023		
Plant Used:	JCB	Dimensions (m):	2.16 × 0.90 Depth 0.43
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.15 - 0.25	B+ES		0.10			TOPSOIL with frequent roots.
	0.15	PID	9.00	0.28			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
	0.30 - 0.40	B+ES		0.43			MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone.
	0.30	PID	15.00				End of Pit at 0.430m

Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP06
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433869E - 431748N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m): Depth 0.10	2.90 / 0.90
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			TOPSOIL with frequent roots. End of Pit at 0.100m

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Remarks: No groundwater encountered.

Stability: Pit wall stable.

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Trial Pit Log

TrialPit No
TP07
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Facility, Leeds	Project No. M23-045	Co-ords: 433876E - 431765N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m):	1.04 / 0.90
Scale	1:26		
Client:	SGN	Depth 0.29	
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.15 - 0.20 0.15 0.24 - 0.29 0.24	B+ES PID B+ES PID	 21.00 18.00	0.13 0.24 0.29			TOPSOIL with frequent roots. MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth. MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone with small to medium frequent cobbles subangular of concrete. End of Pit at 0.290m

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Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP08
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433871E - 431777N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m):	1.88 / 0.90 / Depth 0.54
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.20 0.10	B+ES PID	17.00	0.10			TOPSOIL with frequent roots.
	0.30 - 0.34 0.30	B+ES PID	16.00	0.30			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
				0.54			MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of sandstone. End of Pit at 0.540m

Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP09
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433845E - 431791N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m):	1.73 / 0.90
Scale	1:26		
Client:	SGN	Depth 0.84	
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.30 0.20	B+ES PID	19.00	0.18			TOPSOIL with frequent roots.
	0.50 - 0.60 0.50	B+ES PID	19.00	0.46			MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth.
				0.84			MADE GROUND: Dark grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse angular to rounded of concrete and sandstone. Occasional small to medium cobbles subrounded of concrete and sandstone. Occasional metal and plastic.
							End of Pit at 0.840m

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Remarks: No groundwater encountered.

Stability: Pit wall stable in topsoil.

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Trial Pit Log

TrialPit No
TP10
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433836E - 431785N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m): Depth 0.37	2.10 × 0.90
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.30 0.20	B+ES PID	17.00	0.17 0.37			TOPSOIL with frequent roots. MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile, sandstone, occasional rebar, plastic and cloth. End of Pit at 0.370m

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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Trial Pit Log

TrialPit No
TP11
Sheet 1 of 1

Project Name:	Yorkshire Water Knostrop Faciliity, Leeds	Project No. M23-045	Co-ords: 433818E - 431769N Level:
Date	20/12/2023		
Plant Used:	JCB	Dimensions (m): Depth 0.34	1.10 × 0.34
Scale	1:26		
Client:	SGN		
Logged	ARC		

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.25 0.25 0.30 - 0.34	B+ES PID B+ES	9.00	0.19 0.30 0.34			TOPSOIL. MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of brick, tile and sandstone. MADE GROUND: Yellow to grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to angular of sandstone. End of Pit at 0.340m

Remarks: No groundwater encountered.

Stability: Pit wall stable made ground.

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Borehole Log

Scale 1:50 Sheet 1 of 1

WS01

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Regional Drilling Ltd
				Plant used:	Mini Rig
				Started:	18/12/2023
Client:	SGN			**Ended:**	18/12/2023
Method:	Small Percussive			**Backfilled:**	18/12/2023

GL (AOD):	
Easting:	433836
Northing:	431766
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
				MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of gravel and concrete. Occasional rootlets, small cobbles angular of concrete.	0.10 - 0.30	B+ES	
		0.50		MADE GROUND: Light brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse angular to rounded of concrete and core. Occasional small cobbles angular of concrete.	0.50	PID	17.00
G		0.80		Very dense yellow brown SAND & GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone. Occasional small cobbles angular of sandstone.	0.50 - 0.80	B+ES	
					1.00 - 1.20	ES	
		1.30		End of Borehole at 1.300m	1.20 - 1.65	SPT (S)	N=50+ (16,9/,50)
					1.20	PID	8.00

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				1.2m Hand excavated inspection pit dug. No groundwater encountered.								

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Borehole Log

Scale 1:50 Sheet 1 of 1

WS01A

Contract no:	M23-045	**Site:**	Yorkshire Water Knostrop Faciliity, Leeds	**Driller:**	Regional Drilling Ltd
				Plant used:	Mini Rig
				Started:	18/12/2023
Client:	SGN			**Ended:**	18/12/2023
Method:	Small Percussive			**Backfilled:**	18/12/2023

GL (AOD):	
Easting:	433828
Northing:	431778
Logged:	ARC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
				MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of gravel and concrete. Occasional rootlets, small cobbles angular of concrete.			
		0.40		MADE GROUND: Light brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse angular to rounded of concrete and core. Occasional small cobbles angular of concrete.			
		0.70		Very dense yellow brown SAND & GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone. Occasional small cobbles angular of sandstone.	0.80	PID	7.00
		1.00		End of Borehole at 1.000m	0.80 - 1.00	ES	
					1.20 - 1.65	SPT (S)	N=50+ (18,7/50)

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)