REPORT

Sandsfield Gravel Company Ltd

Leachate Management and Monitoring Plan - Milegate Eastern Extension Landfill

Submitted to:

Sandsfield Gravel Company Ltd
Sandsfield
Brandesburton
Driffield
East Yorkshire
YO25 8SA

Submitted by:

Golder WSP UK Ltd
Attenborough House, Browns Lane Business Park, Stanton-on-the-Wolds,
Nottingham, NG12 5BL, UK

+44 [0] 115 937 1111

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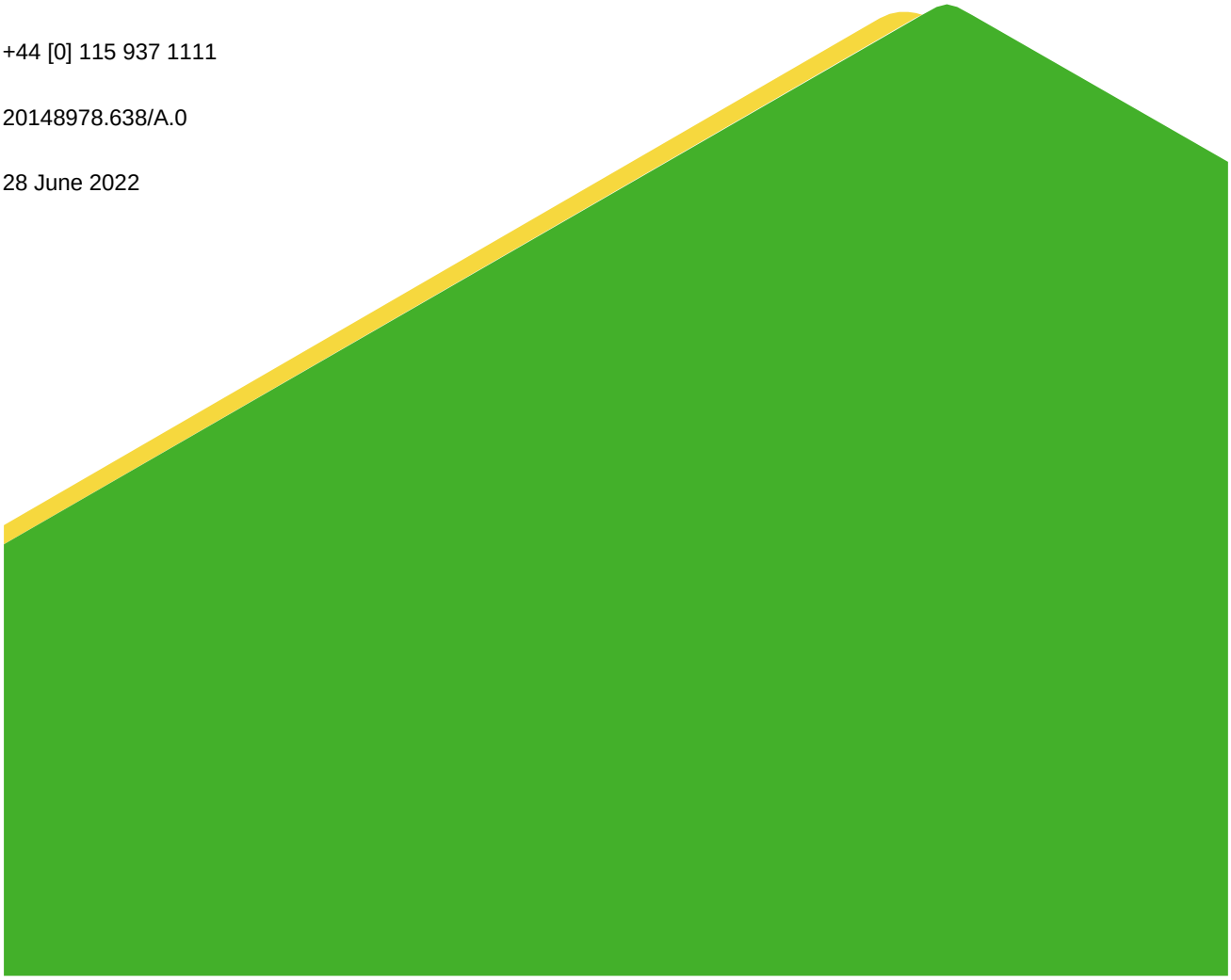

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1.0 REPORT CONTEXT

This report details the Leachate Management and Monitoring Plan implemented at Milegate Extension Landfill Site ('Milegate Extension Landfill') and its planned extension to the east ('Eastern Extension') collectively referred to as the 'Site'. A location plan for the Site is provided in **Drawing ESID1 - Site Location Plan**. The Site has been designed to operate under the joint principles of engineered and hydraulic containment and as such, under normal operational conditions, will pose negligible risk to the surrounding groundwater quality. The Milegate Extension Landfill is operated by the Sandsfield Gravel Company Ltd. under Environmental Permit BX1942IX issued on 3 March 2006 which was subsequently varied several times with the most recent variation notice EPR/BX1942IX/V003 dated 17 February 2020 (the 'Permit').

This Plan has been produced by Golder Associates (UK) Ltd. ('Golder') on behalf of the Sandsfield Gravel Company Ltd ('Sandsfield') in order to meet the Permit requirements.

This Plan should be read in conjunction with the Permit Application, in particular Environmental Setting and Installation Design (ESID; ref. 20148978.632), and Hydrogeological Risk Assessment (HRA; ref. 20148978.633). This plan has been revised to incorporate the Eastern Extension and it fully supersedes earlier versions.

The assistance of Sandsfield in the provision of data for this work is gratefully acknowledged. Golder has not attempted to independently verify any of the information supplied.

2.0 LEACHATE MANAGEMENT

2.1 Leachate Drainage System

The basal and sidewall drainage systems include either gravel or whole used tyres, as follows:

2.1.1 Gravel Drainage Blanket

Where a gravel drainage blanket is installed, the design and specification are in accordance with Environment Agency (EA) online Guidance '*Design and build your landfill site'* (EA, 2021a), or as otherwise agreed with the EA.

If required by relevant EA guidance, geo-composite or equivalent side slope leachate drainage systems are incorporated on externally facing side slopes.

2.1.2 Drainage System Incorporating Whole Used Tyres

Where a drainage blanket incorporating used tyres is installed, the design and specification are in accordance with EA Guidance (EA, 2021a), or as otherwise agreed with the EA.

Sandsfield may propose recycled aggregate or other materials as a sustainable alternative to gravel or used tyres for approval by the EA. The design, specification, and construction quality assurance that apply to the placement of the drainage blanket will be submitted for agreement to the EA.

A pipe system is placed within the drainage blanket that comprises a central HDPE slotted pipe with connected secondary drains comprising HDPE slotted pipe at regular intervals in a herringbone pattern. The central pipe is connected to a leachate collection point, which is constructed from the base of the cell to the ground surface to enable the extraction of the collected leachate.

The base of each cell is profiled to provide an appropriate fall towards a leachate collection point located as shown in the **Drawing ESID7A - Leachate Management Infrastructure**.

A non-woven needle-punched geotextile is placed on the base and side slopes of each cell beneath the drainage blanket to help prevent punching of the drainage media down into the clay. All geotextile overlaps are a minimum of 150 mm between adjacent panels and all such joints will be sewn or heat bonded. The geotextile is secured in accordance with EA Guidance (EA, 2021a).

The final design and properties of the leachate drainage system will be submitted to the EA within a Construction Quality Assurance (CQA) plan prior to placement of any drainage material. Following agreement by the EA, the works will be completed in accordance with the CQA plan, and a CQA report detailing the results of compliance testing will be produced.

2.2 Leachate Removal

In accordance with EA guidance LFGTN 02 (2003), one leachate collection sump per hydraulically isolated cell is required. The collection point is located at the lowest point along the boundary of each of the cells, as shown in the **Drawing ESID7A**, or as otherwise agreed with the EA as part of the Site-specific design, specification, and construction quality assurance plan.

Leachate is removed from the leachate collection points by means of vertical leachate extraction wells or upslope risers extending to the surface of the landfill. The wells are able to accommodate automatic pumping equipment (eductors or submersible pumps) to extract leachate (**Drawing ESID7B - Leachate Management Details).** In the event of failure of the leachate extraction point, actions will be taken to install a suitable replacement as close to the existing leachate extraction point as practicable. In order to manage leachate heads across the cell, leachate may also be abstracted from monitoring points if necessary.

Leachate will be extracted from the cells to maintain the level of leachate within each cell below control levels.

2.3 Leachate Re-Circulation

During the early stages of waste infilling, and when required, leachate collected in the extraction wells will be re-circulated onto the waste mass in the active cell to ensure that the absorptive capacity of the waste is fully utilised. In addition to providing a means of leachate level control, leachate re-circulation within unsaturated wastes promotes the accelerated stabilisation of the wastes by assisting in the flushing out of contaminants and maintaining moisture levels in the waste body as a whole. This process aids landfill gas production which will further promote accelerated stabilisation and will increase the potential for landfill gas extraction and utilisation over flaring.

Re-circulation will be achieved using a combination of the following methods, as appropriate:

- By pumping below the working face using temporary pipework or a vacuum tanker;
- Through pipework which will be introduced into shallow trenches excavated into recently placed wastes and filled with selected hardcore. The leachate will be reintroduced back into the waste slowly such that no overflow at the injection point occurs; and/or
- By spraying onto the surface of the waste. Weather conditions will be considered before this method of leachate recirculation is employed.

Re-circulation points will be retained after capping and in the aftercare period such that the absorptive capacity of the waste is fully utilised. Once waste reaches final levels, a sub-cap irrigation system will be installed if required, and will comprise pipework to a similar specification as the basal drainage system, placed in 0.5 m wide by 0.5 m deep trenches excavated into the waste at the surface of the landfill. Trenches will be backfilled with selected hardcore and aggregate which is free draining.

To minimise odour from re-circulation operations, leachate will only be spray irrigated onto areas of the Site if weather conditions are appropriate. Once backfilled with hardcore, shallow re-circulation trenches will be covered over with suitable material to suppress odour. Pipework will be introduced into trenches before leachate is pumped in, and the discharge will be monitored to ensure that it does not give rise to unacceptable odour.

Should unacceptable odour arise, or should the trench become saturated, the discharge will be discontinued and moved to an alternative discharge point. Where trenches become a source of odour, these will be abandoned and the entry covered over to prevent further odour. The use of trenches will be rotated to obtain a uniform distribution of wetting and prevent saturation at individual locations.

The volume of leachate re-circulation between cells will be measured and recorded to ensure that the maximum volumes set out in Table LMP1 are not exceeded where there are temporary waste slopes. The limits were set out in order to prevent waste instability and were calculated (**Appendix B**) following the methodology outlined in "Response to Request For Further Information Dated October 2005", ref. 03523539.500, December 2005. 20% of the waste thickness was considered maximum allowable extent of the waste leachate saturation and free leachate volume was calculated in **Appendix ESID1** of ESID (ref. 20148978.632).

Table LMP1: Maximum Re-Circulation Volumes where there are Temporary Waste Slopes

Cell	Volume of Leachate that can be Allowed to be Re-circulated to Each Cell Whilst There are Temporary Waste Slopes (m^3)
Cell 1	2,894
Cell 2	2,768
Cell 3	2,236
Cell 4	3,022
Cell 5	2,983
Cell 6	3,548
Cell 7	2,369
Cell 8	2,681
Cell 9	5,012
Cell 10	5,671
Cell 11	1,805
Cell 12	5,946
Cell 13	5,159
Cell 14	2,660

To prevent loss of anaerobic decomposition due to air ingress, capping will be installed as soon as practicable following completion of waste placement in any cell, and gas and leachate monitoring and extraction wells will be sealed at the surface when not in use or connected to extraction systems.

It is not anticipated that pH adjustment of re-circulated leachate will be required prior to re-introduction to the Site; inert materials accepted at the Site are expected to maintain buffering capacity such that acid souring will not prevent the establishment or maintenance of methanogenic conditions. If this situation should occur, then

pre-treatment may be required and discussions would be held with the EA regarding the siting, design, and use of a holding or pre-treatment tank.

It is not anticipated that heat pre-treatment of leachate will be required prior to re-circulation. The placement of an engineered cap and the thickness of restoration materials will reduce heat losses through the surface and aid heat retention. This additional insulation will assist the onset of thermophilic conditions within the wastes and assist in accelerated anaerobic decomposition and waste stabilisation.

It is not anticipated that waste will be pre-treated on-site to produce a smaller particle size to assist in biodegradation. However, some waste materials likely to be incorporated within the deposited wastes will contribute nutrients that will assist in the biodegradation process.

It is not considered that the use of leachate re-circulation in conjunction with gas extraction and the above supplementary methods to achieve accelerated stabilisation will impact on the designed capping and control systems.

The above scheme for accelerated stabilisation substantially embodies the principles given in Waste Management Paper 26B, Appendix D.

2.4 Leachate Disposal

Long-term leachate management is required at the Site to ensure leachate heads are maintained below compliance limits established by the Permit.

In 2016, Sandsfield secured a Trade Effluent Discharge Consent from Yorkshire Water (**Appendix A**) to dispose of excess leachate generated at the Site to sewer for treatment at the Brandesburton Sewage Treatment Works. To facilitate this, Sandsfield installed two above-ground leachate holding tanks on the western side of the Site and a discharge pipeline to the sewer discharge point, as described below and shown on **Drawing ESID7C - Leachate Holding Tanks and Discharge Pipeline**.

- The western tank is 2.75 m diameter, and the eastern tank is 3.1 m diameter. Both tanks are approx. 5.2 m high, and are about 3.5 m apart;
- Each tank is black, double-skinned and constructed from HDPE, founded on a compacted clay base;
- The pipeline is 750 m long, fully fusion welded, 90 mm OD, 10 bar rated, solid wall, polyethylene pipe;
- The pipeline is buried, installed at less than 1 m depth in an approx. 150 mm wide trench;
- There are flow meter valve chambers at each end of the pipeline. Each chamber comprises approx. 1.0 m diameter, 1.0 m deep, HDPE chamber, with 0.6 m x 0.6 m hinged lockable cover. Each chamber provides access to a gate valve and flow meter on the pipeline; and
- The pipeline is connected to the leachate storage tanks at the eastern end and the sewer main at the western end.

A CQA Report was provided by the installer, Earth Direct Ltd, and submitted to the EA.

Yorkshire Water has provided the following details of the treatment process that takes place at the Brandesburton Sewage Treatment Works. It is a filter-type works and receives pumped flow to the inlet, which is screened. Flow then passes to two settlement tanks and then to two siphon driven percolating filters. Filtered effluent passes to two humus tanks, after which a portion of the flow is diverted for polishing to tertiary wetlands and is then recombined with effluent from the humus tanks prior to leaving site. The works has consent to nitrify. The excellent performance of the works is considered to be a result of the reed beds that polish the effluent.

There is no requirement on Yorkshire Water by the EA to remove either phosphates or nitrates from the effluent that is treated at Brandesburton Sewage Treatment Works; however, some will be taken up through the reed bed system. Given the predicted low concentrations of phosphates and nitrates in the leachate from the Site, this is not considered to be an issue. BOD and ammonia are treated via the biological processing in the humus tanks, and are reduced to levels acceptable for discharge in line with EA consents.

3.0 LEACHATE MONITORING

Leachate monitoring is cognisant of EA guidance (EA, 2021b).

3.1 Leachate Monitoring Infrastructure

Two leachate monitoring points per cell have been, and will be, installed to allow monitoring of leachate levels remote to the leachate abstraction point. The locations of existing and proposed leachate monitoring wells are shown on **Drawing ESID7A**.

3.2 Leachate Monitoring Programme

The landfill is effectively managed on the basis of hydraulic containment. In accordance with the findings of the original HRA, and confirmed in the subsequent HRA reviews, the leachate level within each cell has been, and will be, maintained at or below 1.0 m above the base of the cell (control level). Leachate is monitored from one leachate collection point and two remote monitoring points located within each cell.

The leachate monitoring regime for the Site is set out in Environmental Permit EPR/BX1942IX/V003 Table S3.1. The proposed monitoring regime in the aftercare period following Site closure is included in the Application. The leachate monitoring regime for the Site is reproduced in Table LMP2.

Table LMP2: Proposed Leachate Level Limits and Monitoring Requirements (proposed varied Permit Table S3.1)

<table>
<tr><th>Monitoring Point Reference / Description</th><th>Limit</th><th>Monitoring Frequency</th><th>Monitoring Standard and Method</th></tr>
<tr><td colspan="4">As shown on Plan ESID7A dated 14/10/2021</td></tr>
<tr><td>LCP1</td><td>-0.76 m OD</td><td rowspan="5">Quarterly</td><td rowspan="11">As specified in EA Guidance TGN02 (February 2003) or such other subsequent guidance as may be agreed in writing with the EA. Or as otherwise agreed with the EA as part of a leachate monitoring plan.</td></tr>
<tr><td>LCP3</td><td>-2.80 m OD</td></tr>
<tr><td>LCP5</td><td>-2.70 m OD</td></tr>
<tr><td>LCP7</td><td>-2.30 m OD</td></tr>
<tr><td>LCP8</td><td>-2.40 m OD</td></tr>
<tr><td>LCP6</td><td>-1.65 m OD</td><td rowspan="6">Monthly while operational or without final engineered cap agreed in accordance with condition 2.5.

Quarterly once final engineered cap in place.</td></tr>
<tr><td>LCP4A</td><td>-1.23 m OD</td></tr>
<tr><td>LCP2A/B</td><td rowspan="3">1 m above base of cell unless otherwise agreed as part of pre-operational conditions</td></tr>
<tr><td>LCP4B</td></tr>
<tr><td>Eastern Extension boreholes</td></tr>
</table>

Leachate level (measured to the top level of the pipework) and leachate head above base are determined to an accuracy of 0.01 m. The leachate level is measured using an electronic dip tape, which is lowered down the borehole until the electronic beeper sounds. The graduation on the tape is read to give the depth at which the beeper starts to sound. A report, reviewing the results of the monitoring completed over the previous 12-month period, is produced and submitted to the EA by 31 January each year (or other date agreed in writing by the EA).

The suggested analysis suites for leachate quality are based on a combination of EA guidance (2003) and the risks posed to groundwater as described in the HRA of the Permit variation Application.

4.0 LEACHATE COMPLIANCE LEVELS

4.1 Leachate Level

Under normal operating conditions at the Site, i.e., when leachate elevations are maintained below the groundwater elevation in the Lower Sand and the piezometric elevation of groundwater in the Chalk, an inward hydraulic gradient exists that will not support the advective movement of leachate out of the Site. However, contaminants may diffuse through the sidewall lining system into groundwater.

Leachate level control and compliance limits were most recently updated in the 'Response to Second Schedule 5 Notice' (ref. 1671322.700) and 2021 HRA Review (ref. 0751420324.508).

Table LMP3 summarises the leachate elevation control and compliance levels.

Drawing HRA1 - Monitoring and Extraction Point Plan which shows the proposed and as-built positions of groundwater monitoring points at the Site, is reproduced in this report. Groundwater elevations in boreholes screened in the Lower Sand and in the Chalk during the period January 2015 to October 2021 are provided in the latest HRA Review (ref. 0751420324.508).

The HRA (ref. 20148978.633) supporting this application indicated an unretarded travel time in excess of 600 years for the advective movement of contaminants through the sidewall liner to the Sands (Failure Scenario 2, Section 3.3.2). Short term seasonal losses of hydraulic containment followed by a rise in groundwater levels do not, therefore, pose a risk to groundwater quality in the Sands. In addition, groundwater in the Sands currently flows into the quarry void, from where it is discharged to surface water under conditions of the Permit. In the longer term, following waste placement and filling of the quarry void, groundwater elevations in the Sands will rebound and hydraulic containment will be achieved.

Table LMP3: Leachate Elevation Control and Compliance Levels

Monitoring Location	Adjacent Groundwater Monitoring Boreholes	Groundwater Elevation in Adjacent Boreholes (m OD)		Compliance Limit (m OD)	Control Limit (m OD)
		0.4 m below 5th Percentile	Lowest 5th Percentile		
LCP1	GWS01, GWS02, GWC01, GWS10	-0.315	0.085	-0.76	-1.26
LCP3	GWS09, GWS10, GWC05	-2.48	-2.08	-2.80	-3.00
LCP5	GWS09, GWC03, GWC05, MB04/03	-2.48	-2.08	-2.70	-2.90
LCP7	GWS07, GWS08, GWC03	-2.16	-1.76	-2.30	-2.50
LCP8	GWS06, GWS07, GWC04	-2.16	-1.76	-2.40	-2.60

Monitoring Location	Adjacent Groundwater Monitoring Boreholes	Groundwater Elevation in Adjacent Boreholes (m OD)		Compliance Limit (m OD)	Control Limit (m OD)
		0.4 m below 5th Percentile	Lowest 5th Percentile		
LCP6	GWS04, GWS05, GWS06, GWC02, GWC04	-1.23	-0.83	-1.65	-2.15
LCP4A	GWS04, GWC02	-1.23	-0.83	-1.23*	-1.43
Future LCPs in Cells 4B, 2A/B, and Eastern Extension	1 m above base of cell unless otherwise agreed as part of pre-operational conditions				

** Pending approval from the EA.*

In order to maintain liner stability, a back drain will be installed at an elevation of approximately 0 m OD (i.e., within the Lower Sand and Gravel) in each cell and operated at least until waste is in place in the cell. The requirement to block each section of the back drain as waste placement progresses will be discussed within the CQA Plan submitted for each Cell.

4.1.1 Variation in Groundwater Elevation

Future abstraction of groundwater from the Chalk in the vicinity of the Site may lead to a reduction in the potentiometric elevation of groundwater within the Chalk. This scenario has been considered within the PPC Application (Section B *Hydrogeological Risk Assessment*, Failure Scenario 2, Section 2.5.3) (ref. 03523539.502) and in Golder Associates (UK) Ltd, 2005, *Response to Request For Further Information Dated October 2005*, Report Number 03523539.500, December 2005, in which it was assumed that leachate levels were 2 m above external groundwater elevations. An updated model of this scenario including the Eastern Extension is provided in the HRA (ref. 20148978.633).

Cessation of any currently ongoing abstraction of groundwater from the Chalk is likely to lead to an increase in the potentiometric elevation of groundwater within the Chalk. In this event, the degree of hydraulic containment at the Site will increase.

Travel times of leachate through the engineered clay barrier following loss of hydraulic containment were estimated in the HRA to be in excess of 600 years (at the 5th percentile). This gives an indication of the time available to undertake remedial action and reverse the advective movement of leachate, thus preventing impact on the surrounding groundwater. A temporary reduction in the elevation of groundwater below the 5th percentile minimum in response to a drought is therefore unlikely to result in an impact on groundwater.

If occurring, a longer-term decline in the elevation of groundwater will be reflected in a reduction in the 5th percentile minimum groundwater elevation recalculated as part of the regular review of monitoring data. Control and compliance levels will be adjusted accordingly.

It should be noted that a comparison of measured groundwater elevations surrounding the landfill with groundwater elevations reported on the 1978 Hydrogeological Map for East Yorkshire does not indicate any significant changes in groundwater elevation within the Chalk in the past forty years.

4.1.2 Proposed Action Plan in the Event of Breach of Control or Compliance Level

In the event that a leachate head control or compliance level is breached, the measures identified in Table LMP4 will be implemented.

Table LMP4: Action Plan to be Implemented in the Event of Breach of Leachate Head Control or Compliance Level

Contingency Action	Control Level	Compliance Level
Advise site management, and environmental manager of landfill operating company.	✔	✔
Notify EA.		✔
The leachate well should be dipped within two weeks of the breach to confirm the measurement. If repeat measurement confirms breach, then review existing monitoring information and pumping records. Data will be reviewed by use of statistics and graphical presentation to establish the presence of any trends or patterns. If review of existing monitoring data indicates an increasing trend, review site management and operations, and implement actions such as pumping to reduce level to prevent a future breach. Continue monitoring monthly until level reduces to the control level.	✔	
The leachate well should be dipped within one week of the breach to confirm the measurement. If repeat measurement confirms breach, begin pumping within one month to reduce leachate levels below the compliance level. Continue monitoring monthly until level reduces to below the control level.		✔
In the event that the compliance level is exceeded for more than six months, derive groundwater and surface water quality control and compliance levels, agree with the EA, and implement at subsequent monitoring rounds. Monitor leachate and groundwater level monthly and increase monitoring of groundwater quality to monthly until leachate level is reduced below control level.		✔

4.2 Leachate Quality

The Site is classified as a non-hazardous landfill. It is expected that it will receive the same range of wastes in the future as it has to date. Table LMP5 summarises the leachate quality from across the Site from the last HRA review period, for priority contaminants defined in the HRAR (Golder, 2021).

Table LMP5: Summary of Leachate Concentrations August 2015 to April 2021 (mg/l)

Determinand	Minimum	Median	Maximum	Count
Chloride	22	1620	3700	64
Ammoniacal Nitrogen	20	1095	2400	64
Nickel	0.011	0.137	0.5	64
Lead	0.00022	0.010	0.5	57
Benzene	<0.001	0.002	0.0078	32
Fluoranthene	0.00004	0.000285	0.00066	22
Mecoprop	<0.00002	<0.00002	0.0993	25

4.2.1 Priority Contaminants

Both hazardous substances and non-hazardous pollutants are anticipated to be present within the leachate.

In accordance with the recently updated list for the existing Site (Golder, 2021), the priority contaminants to be assessed for the Site are:

- Chloride: mobile inorganic anion, non-hazardous pollutant;
- Ammoniacal nitrogen: mobile inorganic cation, non-hazardous pollutant;
- Nickel: highly mobile metallic cation, non-hazardous pollutant;
- Lead: less mobile metallic ion, hazardous substance;
- Benzene: soluble, organic chemical, hazardous substance;
- Fluoranthene: less soluble, hydrophobic organic chemical, hazardous substance; and
- Mecoprop: acid herbicide, formerly a hazardous substance.

5.0 QUALITY ASSURANCE OF LEACHATE MONITORING AND SAMPLING

Leachate is sampled using a pump, according to the following procedure:

- Leachate wells are pumped until three times the cased well volume of water has been drawn out or the pH and conductivity of discharge has attained a stable value, as determined using suitable hand-held portable equipment, or flow through cell. Where recharge rates to the well are low, purging three well volumes may be impractical.
- The required volume to be pumped is calculated having first measured the leachate level inside the well and having dipped the bottom of the well, or taken the corresponding value obtained from the construction logs. Periodically, the bottom level of the wells obtained from dipping is compared with the corresponding value obtained from the construction logs. This will be used to determine whether the wells have silted up and to decide on the need for any maintenance.
- The pumped sample is taken for analysis.
- If the well is dewatered, a sample is collected once leachate levels have recovered sufficiently to provide an adequate sample volume.

Alternatively, samples are collected using a dedicated leachate sampling bailer. The bailer is cleaned or rinsed with the first sampling between successive wells.

Appropriate protective equipment is worn when handling leachate. Sampling is undertaken by staff appropriately trained in environmental monitoring procedures and familiar with the equipment and its limitations. Sandsfield ensures that the personnel engaged in monitoring activities are trained to undertake the task. Personnel may include Sandsfield's own technical personnel, the Landfill Manager or nominated deputy following appropriate training by technical personnel. All monitoring staff undergo a period of job training and in addition external courses are used to supplement internal training. The sampling personnel detailed above will validate results.

Samples are, where possible, despatched to the laboratory on the same day, and in any event no later than the following day. Samples that are stored overnight are either stored in a refrigerator or cool box. All samples are analysed at a laboratory under UKAS accreditation which operates externally verified quality control procedures and checks on analytical work. These include spiked samples, blanks etc. Because of the large batches of samples that are processed by such laboratories, the QA/QC checks implemented are efficient in identifying any quality control failures. Accordingly, it is not proposed to submit additional QC samples (sampling duplicates, field standards or field blanks) from the Site, as this only duplicates the controls already being implemented by the laboratory.

The range of determinands detailed above includes an ionic balance for all samples taken for the full range of determinands at annual intervals. Leachate samples that attain an ionic balance within ±20% are deemed satisfactory. Where the ionic balance falls outside this range, the laboratory is requested to repeat the analysis or to investigate the provided results for errors.

6.0 MAKING AND SUBMISSION OF RECORDS

Records are kept on-Site of determinands analysed, date of sampling, sampler, results, units and any repeat analysis or laboratory comment or internal assessment on the validity of the results.

A copy of the results of sampling and analysis will be forwarded to the EA within 28 days of the end of the reporting period in accordance with Environmental Permit BX1942IX Condition 4.2.3.

An annual report will be provided to the EA by 31st January (or other date agreed in writing by the EA) each year in accordance with Environmental Permit BX1942IX Condition 4.2.2, detailing a review of the environmental monitoring results obtained from the Site during the previous year. This review will include an interpretation of the accuracy and validity of results of leachate monitoring along with an interpretation of the trend of the results against compliance levels.

7.0 REFERENCES

1) EA, 2003. Guidance on monitoring of landfill leachate, groundwater and surface water. LFTGN02. February 2003.

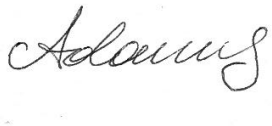
2) EA, 2021a. Design and build your landfill site. https://www.gov.uk/guidance/landfill-operators-environmental-permits/design-and-build-your-landfill-siteV.UK (www.gov.uk). Accessed 20 January 2022.

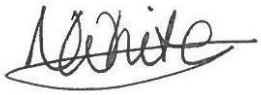
3) EA, 2021b. Landfill operators: environmental permits. Monitor and report your performance - Landfill operators: environmental permits - Guidance - GOV.UK (www.gov.uk). Accessed 20 January 2022.

4) Golder Associates (UK) Limited, 2021. Sandsfield Gravel Company Ltd. Hydrogeological Risk Assessment Review – Milegate Extension Landfill. 07514290324.508/A.0. August 2021.

Signature Page

Golder WSP





Aniela Adamus
Hydrogeologist

Nicola White
Project Manager

Date: 28 June 2022

AA/DD/ab

Company Registered in England No. 01383511
At WSP House, 70 Chancery Lane, London, WC2A 1AF
VAT No. 905054942

DRAWINGS

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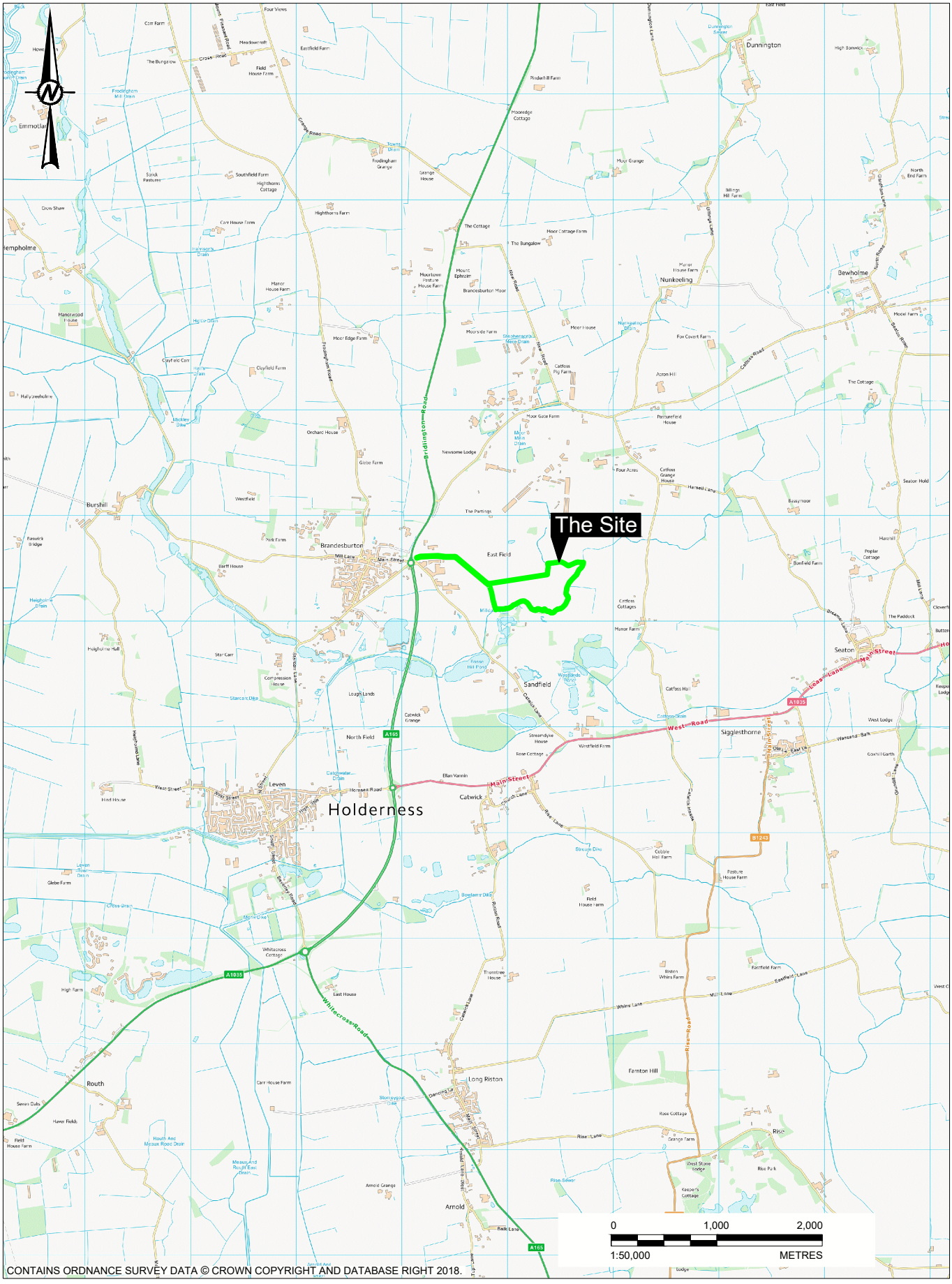
Drawing ESID7A - Leachate Management Infrastructure

Drawing ESID7B - Leachate Management Details

Drawing ESID7C - Leachate Holding Tanks and Discharge Pipeline

Drawing HRA1 - Monitoring and Extraction Point Plan



CLIENT
SANDSFIELD GRAVEL COMPANY LTD

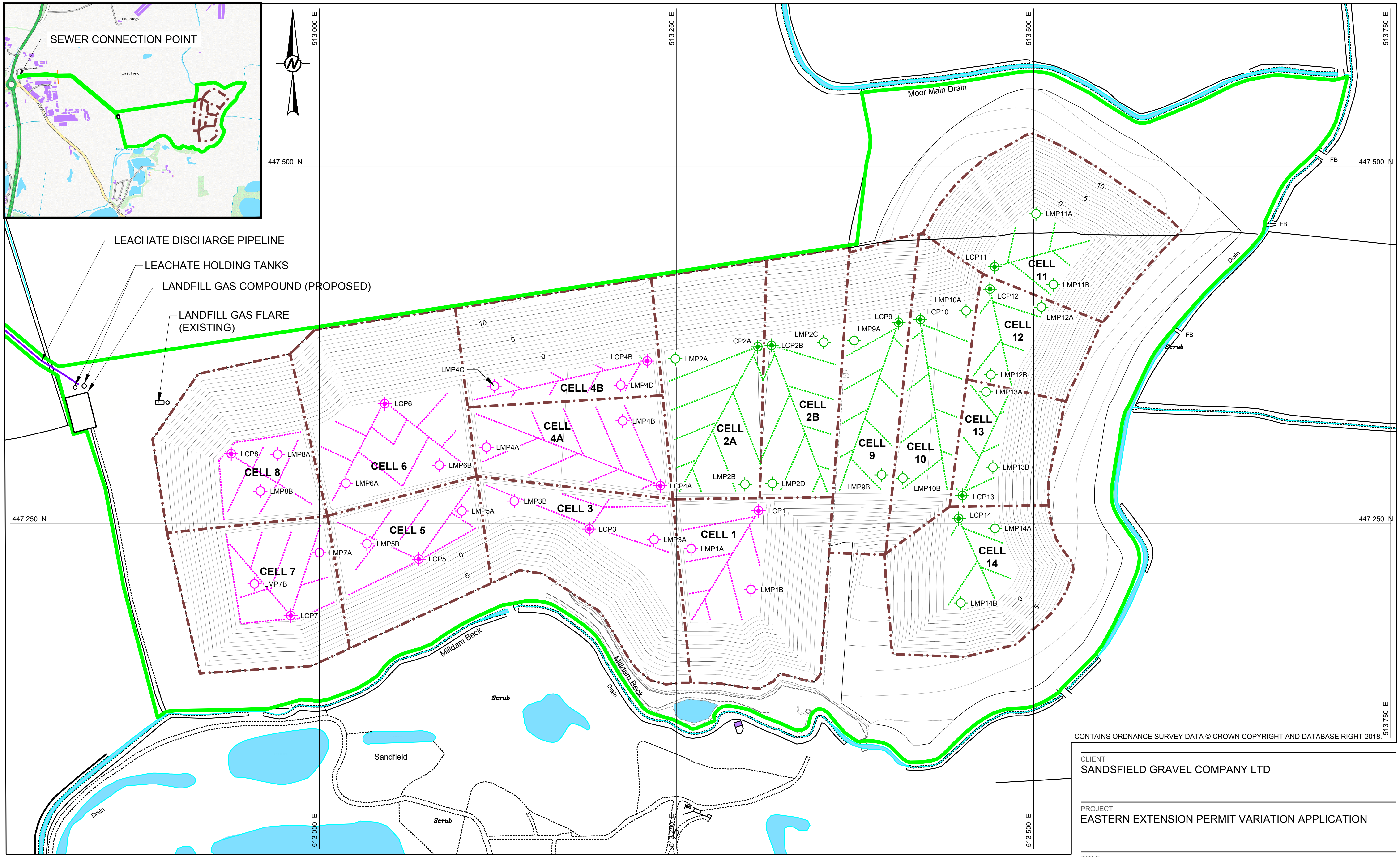
PROJECT
EASTERN EXTENSION PERMIT VARIATION APPLICATION

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-10-14
DESIGNED	AA
PREPARED	ECS
REVIEWED	DD
APPROVED	DD

TITLE
SITE LOCATION PLAN

PROJECT NO.	CONTROL	REV.	DRAWING
20148978	1002-PA-0001	A	ESID1



SEWER CONNECTION POINT
East Field
LEACHATE DISCHARGE PIPELINE
LEACHATE HOLDING TANKS
LANDFILL GAS COMPOUND (PROPOSED)
LANDFILL GAS FLARE (EXISTING)
513 000 E
513 250 E
513 500 E
513 750 E
447 500 N
447 250 N
Moor Main Drain
FB
Drain
Scrub
Milldam Beck
Sandfield
CELL 1
CELL 2A
CELL 2B
CELL 3
CELL 4A
CELL 4B
CELL 5
CELL 6
CELL 7
CELL 8
CELL 9
CELL 10
CELL 11
CELL 12
CELL 13
CELL 14
LCP1
LCP2A
LCP2B
LCP3
LCP4A
LCP4B
LCP5
LCP6
LCP7
LCP8
LCP9
LCP10
LCP11
LCP12
LCP13
LCP14
LMP1A
LMP1B
LMP2A
LMP2B
LMP2C
LMP2D
LMP3A
LMP3B
LMP4A
LMP4B
LMP4C
LMP4D
LMP5A
LMP5B
LMP6A
LMP6B
LMP7A
LMP7B
LMP8A
LMP8B
LMP9A
LMP9B
LMP10A
LMP10B
LMP11A
LMP11B
LMP12A
LMP12B
LMP13A
LMP13B
LMP14A
LMP14B
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LEGEND

- PERMIT BOUNDARY
- CELL BOUNDARY
- CLAY LINER CONTOUR
- LEACHATE EXTRACTION WELL - EXISTING
- LEACHATE MONITORING WELL - EXISTING
- LEACHATE DRAINAGE PIPE - EXISTING
- LEACHATE EXTRACTION WELL - PROPOSED
- LEACHATE MONITORING WELL - PROPOSED
- LEACHATE DRAINAGE PIPE - PROPOSED

NOTES

1. ALL LEVELS RELATIVE TO NEWLYN ORDNANCE DATUM.
2. GENERALISED LAYOUT OF EXISTING INFRASTRUCTURE SHOWN.

REFERENCE(S)

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0 50 100
1:2,500 METRES

CLIENT
SANDSFIELD GRAVEL COMPANY LTD

PROJECT
EASTERN EXTENSION PERMIT VARIATION APPLICATION

TITLE
LEACHATE MANAGEMENT INFRASTRUCTURE

CONSULTANT
WSP GOLDER

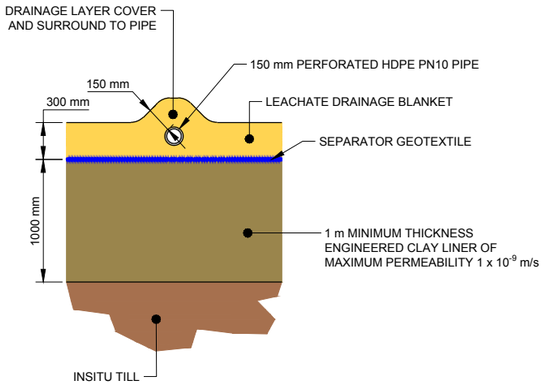
YYYY-MM-DD	2022-06-14
DESIGNED	AA
PREPARED	ECS
REVIEWED	DD
APPROVED	DD

PROJECT NO.	CONTROL	REV.	DRAWING
20148978	1002-PA-0008	B	ESID7A

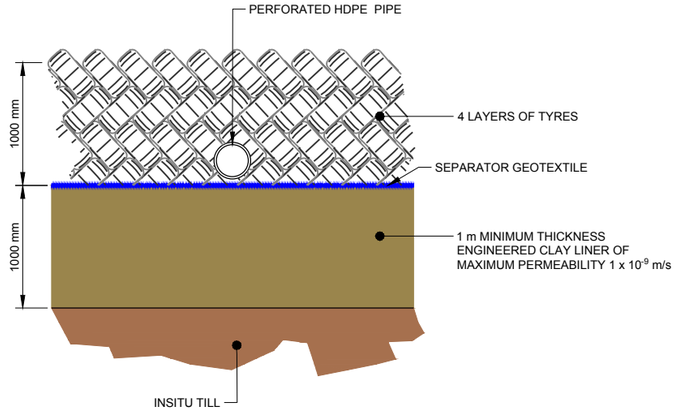
25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

NOTE(S)

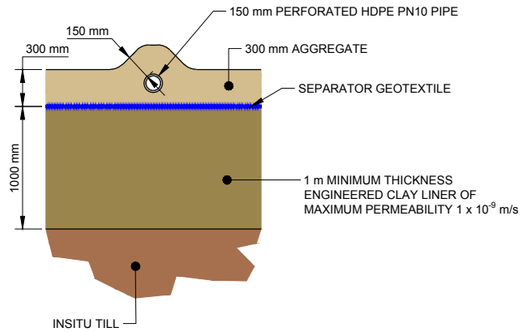
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.



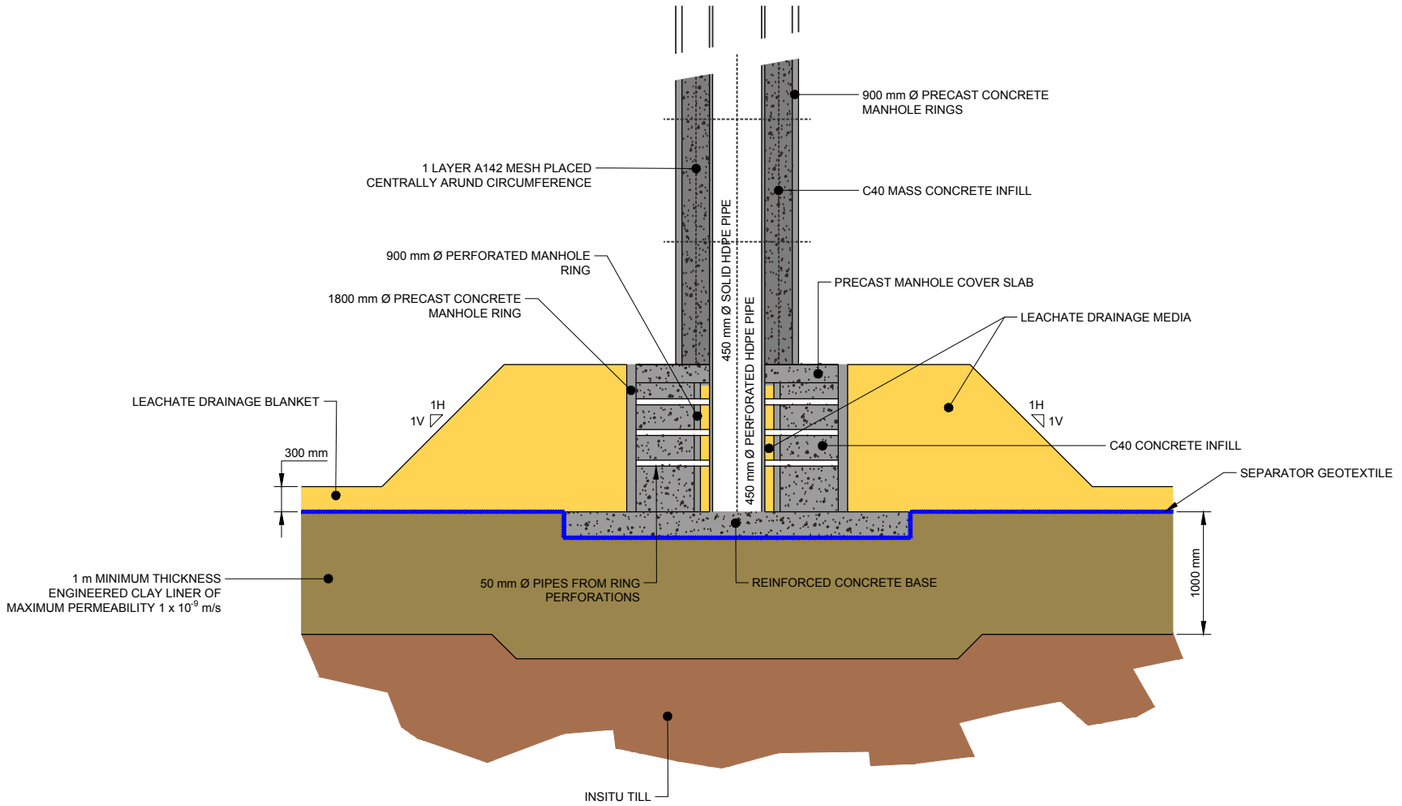
LEACHATE CARRIER PIPE (GRAVEL)
SCALE 1:50



LEACHATE CARRIER PIPE (TYRES)
SCALE 1:50



LEACHATE CARRIER PIPE (AGGREGATE)
SCALE 1:50



TYPICAL LEACHATE COLLECTION AND MONITORING POINT CONSTRUCTION
SCALE 1:50

0 1 2
1:50 METRES

SANDSFIELD GRAVEL COMPANY LTD

EASTERN EXTENSION PERMIT VARIATION APPLICATION

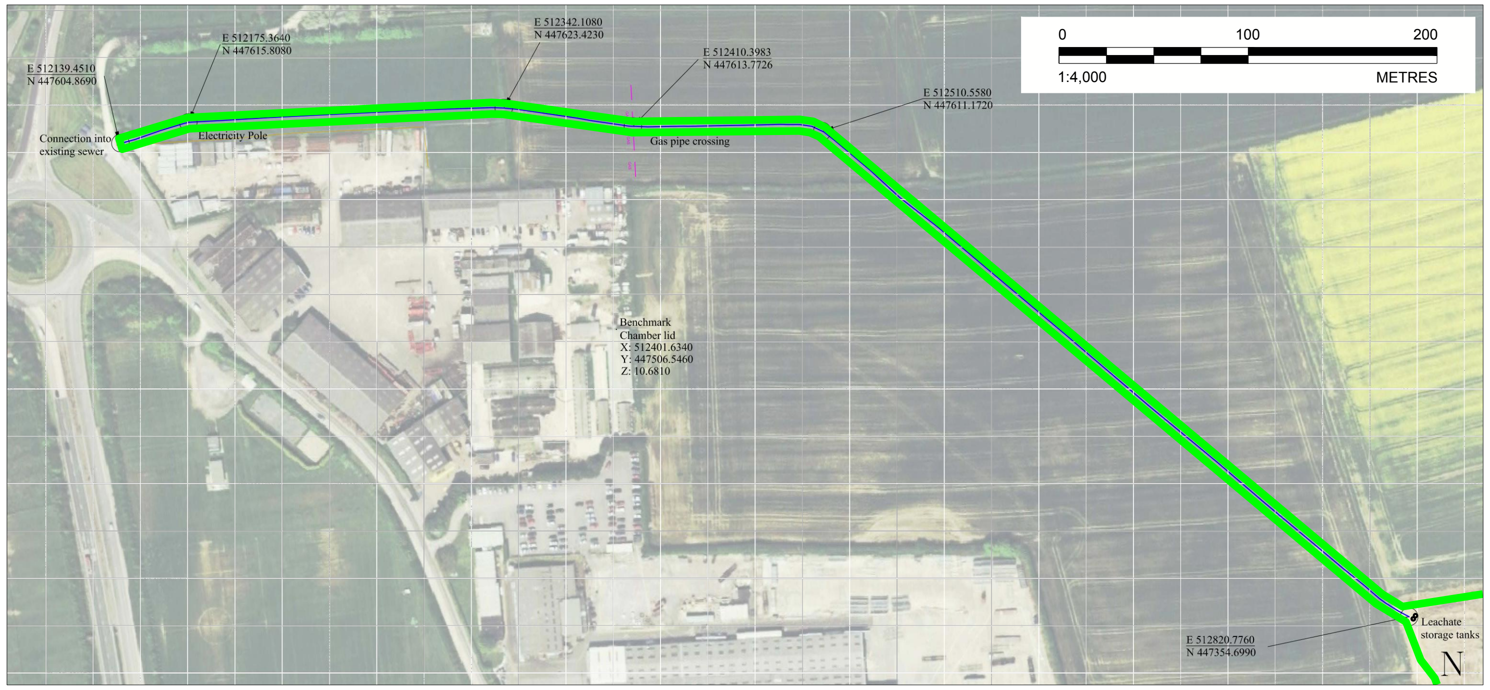
LEACHATE MANAGEMENT DETAILS

2021-10-14	
AA	
ECS	
DD	
DD	

GOLDER
MEMBER OF WSP

CONTROL			DRAWING
20148978	1002-PA-0009	A	ESID7B

25 mm
0



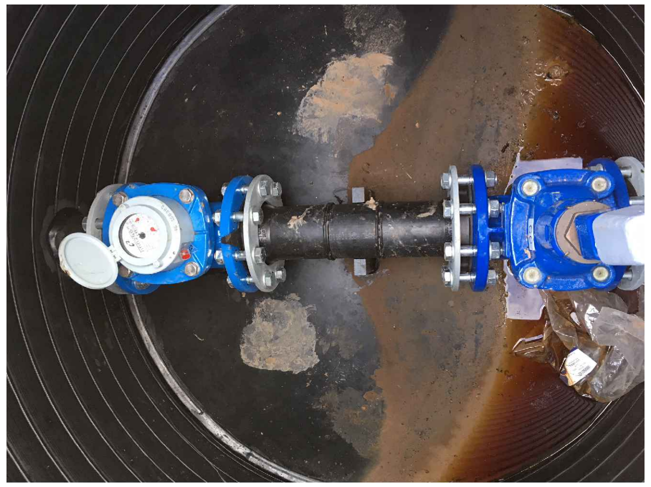
LOCATION OF DISCHARGE PIPELINE (FROM LAND DRAINAGE CONSULTANCY LTD), USING GPS, 31ST OCTOBER 2016

LEGEND

PERMIT BOUNDARY

LEACHATE HOLDING TANKS (FRONT ELEVATION)

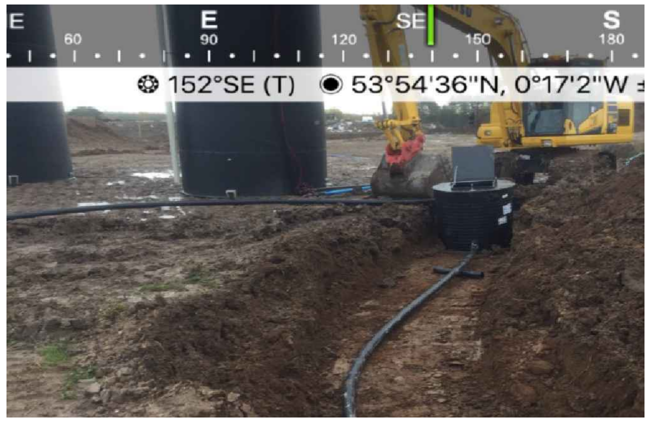
FIRST LEACHATE CHAMBER (EAST), ADJACENT TO LEACHATE HOLDING TANKS



FLOW METER AND VALVE IN FIRST LEACHATE CHAMBER

FINAL (WEST) LEACHATE CHAMBER AND ENTRY TO EXISTING SEWER

CONNECTION FROM TANKS TO FIRST CHAMBER



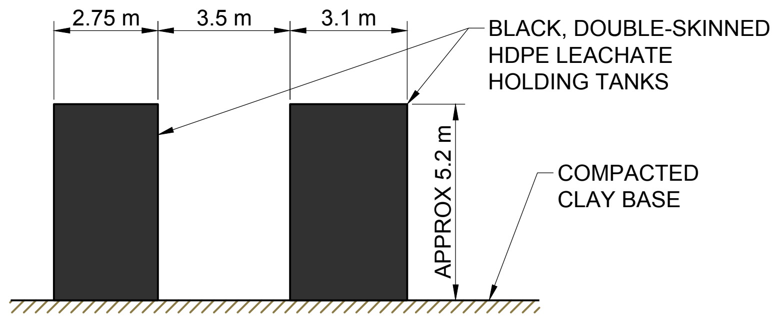
PIPELINE DURING INSTALLATION

EXCAVATION OF TRENCH DURING INSTALLATION

INSTALLATION OF PIPELINE

TRENCH PRIOR TO BACKFILL

DISCHARGE POINT TO SEWER (DURING INSTALLATION)



CROSS SECTION OF LEACHATE TANKS
SCALE 1:200

CLIENT
SANDSFIELD GRAVEL COMPANY LTD

PROJECT
EASTERN EXTENSION PERMIT VARIATION APPLICATION

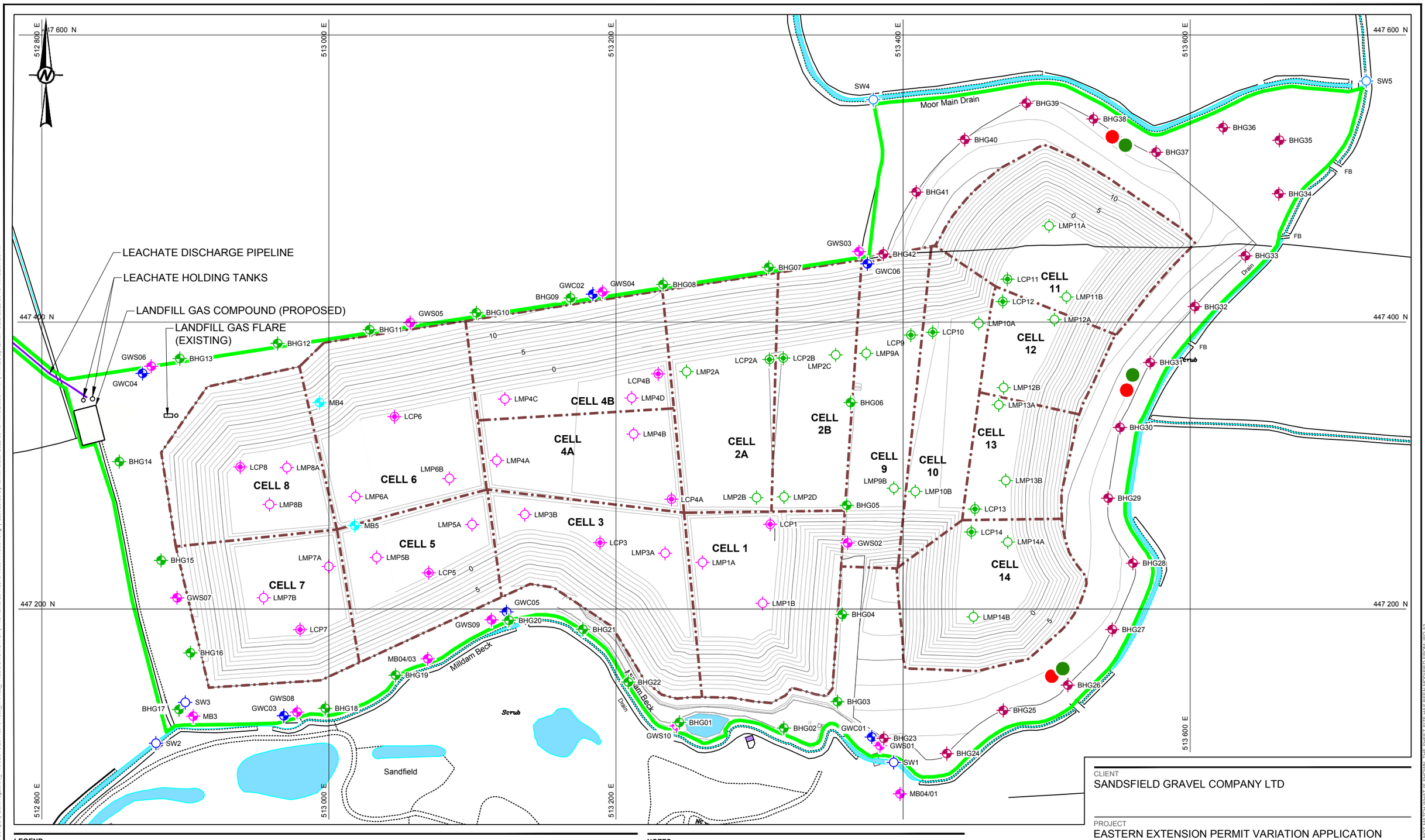
TITLE
LEACHATE HOLDING TANKS AND DISCHARGE PIPELINE

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-10-14
DESIGNED	AA
PREPARED	ECS
REVIEWED	DD
APPROVED	DD

PROJECT NO.	CONTROL	REV.	DRAWING
20148978	1002-PA-0010	A	ESID7C



LEGEND

- PERMIT BOUNDARY
- CELL BOUNDARY
- CLAY LINER CONTOUR
- EXISTING SURFACE WATER MONITORING BOREHOLE - DEEP
- EXISTING SURFACE WATER MONITORING BOREHOLE - SHALLOW
- EXISTING GROUNDWATER MONITORING BOREHOLE
- EXISTING SURFACE WATER MONITORING POINT
- PROPOSED SURFACE WATER MONITORING POINT
- PROPOSED SAND AND GRAVEL MONITORING BOREHOLE
- PROPOSED CHALK MONITORING BOREHOLE
- EXISTING PERIMETER GAS MONITORING WELL
- PROPOSED PERIMETER GAS MONITORING WELL
- EXISTING LEACHATE EXTRACTION WELL
- EXISTING LEACHATE MONITORING WELL
- PROPOSED LEACHATE EXTRACTION WELL
- PROPOSED LEACHATE MONITORING WELL

NOTES

1. ALL LEVELS RELATIVE TO NEWLYN ORDNANCE DATUM.
2. GENERALISED LAYOUT OF EXISTING INFRASTRUCTURE SHOWN.

REFERENCE(S)

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0 50 100
1:2,500 METRES

CLIENT
SANDSFIELD GRAVEL COMPANY LTD

PROJECT
EASTERN EXTENSION PERMIT VARIATION APPLICATION

TITLE
MONITORING AND EXTRACTION POINT PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-15
DESIGNED	AA
PREPARED	ECS
REVIEWED	AA
APPROVED	CM

PROJECT NO.	CONTROL	REV.	DRAWING
20148978	1005-HR-0001	B	HRA1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3

25 mm 0

APPENDIX A

Trade Effluent Discharge Consent from Yorkshire Water

YorkshireWater

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834
For telephone enquiries ring:

Jane Phillips on 0345 120 8482

2nd June 2016

Sandsfield Gravel Co. Ltd
Sandsfield Farm, Catwick Lane
Brandesburton
Driffield
YO25 8SA

Your Ref:
Our Ref: S008516

Dear Sir/Madam,

Land adj to Village Hall, Eastfield Road, Brandesburton, YO25 8RW - S106 Sewerage Connection on R182333

PERMISSION TO MAKE 1 No. SEWER CONNECTIONS
& NOTICE OF INTENTION TO ADOPT AS LATERAL
UNDER SECTION 106 & 102 OF THE WATER INDUSTRY ACT 1991

Your connection to the public sewer at the above address has now been granted permission, subject to the details specified on the 'Permission Certificate', attached for your attention.

Subject to the details on the attached certificate, the sewer connection may be undertaken by persons competent and qualified for sewer works. You must ensure that you have permission to install the connection from all landowners beforehand.

If I can be of further assistance, please contact me at the above address.

For inspections, please contact 0345 1 20 84 82, quoting the reference number on the attached 'Permission Certificate'.

Yours faithfully

Developer Services

YorkshireWater

SEWER CONNECTION

UNDER SECTION 106 AND SECTION 102 OF THE WATER INDUSTRY ACT 1991

PERMISSION GRANTED

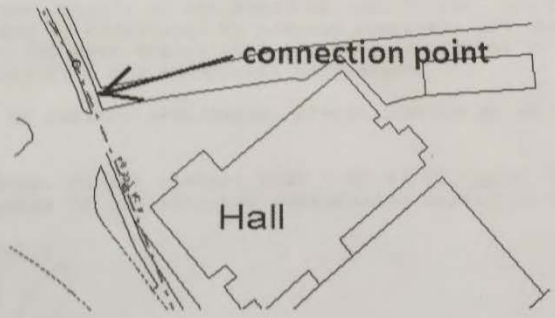
AT Land adj to Village Hall, Eastfield Road, Brandesburton, YO25 8RW

100mm private foul drain connection by junction onto 225mm foul sewer located adjacent to Eastfield Road

FOR A SITE INSPECTION PLEASE CONTACT DEVELOPER SERVICES AT LEAST TWO DAYS PRIOR TO START OF DRAINAGE WORKS

0345 1 20 84 82

QUOTING REFERENCE NUMBER: R182333



Registration Number: Y/4482/16C

YORKSHIRE WATER SERVICES LTD

The Water Industry Act 1991

CONSENT

to discharge trade effluent into a public sewer

To: Sandsfield Gravel Company Ltd
Catwick Lane
Brandesburton
YO25 8SA

On the 19th June 2013 a Notice containing an application for a Trade Effluent Consent was served by you on Yorkshire Water Services Ltd (here called "YWS") in respect of the discharge of trade effluent (here called "the effluent") from the premises (here called "the premises") known as

Sandsfield Gravel Company Ltd
Catwick Lane
Brandesburton
YO25 8SA

YWS now CONSENTS to the discharge of the effluent from the premises into a public sewer subject to the following Conditions:

1. Communication with the Sewer

(1) The public sewer into which the effluent may be discharged is marked 'Z' on the attached plan.

(2) The effluent shall be discharged to enter only into the public sewer shown on the attached plan, at the point so shown marked 'X'. No connection for the discharge of effluent shall be made to the connecting pipe between such point and any measurement facilities referred to in the following Condition without the prior approval in writing of YWS.

2. Inspection and Measurement

(1) There shall be provided and maintained at all times at your expense at the point shown or otherwise indicated and marked as 'Y' on the said plan an inspection chamber or manhole or sample tap such as will enable a person readily and safely to take at any time samples of what is passing into the said sewer from the premises, and that chamber or manhole shall be a minimum size of 1,200 millimetres internal diameter for pre-cast concrete sections or 1,200 millimetres x 800 millimetres for engineering brickwork construction or such other suitable sampling facility to be constructed and maintained to the satisfaction of YWS,

(2) There shall be provided, operated and maintained in good accurate working order and in a manner consistent with good operating practice, at all times, at your expense, a meter in such a position and of such specification as shall be approved by YWS such as will measure and provide a continuous record of the quantity and rate of discharge of any trade effluent being discharged from the premises into the said sewer and following the written request of YWS to have the accuracy of the meter independently tested by an agreed body,

(3) You shall allow YWS a right of access without notice for the purpose of inspecting, testing and reading such meter and any other equipment required under Condition 5(3) below and for obtaining any sample of the effluent.

3. Information to be Given

(1) You shall supply to YWS all information reasonably requested for the control of the effluent and for the assessing of the charges in accordance with Condition 8.

(2) You shall keep a continuous record of the volume and rate of discharge of any effluent discharged from the premises into the said sewer and a record of the nature and quantity of any chemicals used to ensure compliance with the terms of this consent and copies of such records shall be submitted to YWS within fourteen days of a written demand from YWS. The originals of all such records shall be retained by you for a period of six years.

(3) You shall provide written documentation within 12 months from the date of this consent and every 12 months thereafter that the flow measurement and any other equipment have been independently tested and where appropriate calibrated to ensure that they are in good working order and operating to all relevant specifications.

4. Discharge Quantity and Rate

The quantity of the effluent discharged shall not exceed 50 cubic metres in any period of twenty-four hours.

The rate of discharge of the effluent shall not exceed 2 litres per second.

5. Nature of the Effluent

(1) Subject to the provisions of Conditions 5(2), 5(3) and 6 below, the effluent shall not contain any substance or be of a character other than as listed in the attached Schedule of Conditions and any such substance or character shall not be in a proportion greater than that there stated.

(2) No sample of the effluent taken from the point specified in 2.(1) shall contain prescribed substances in concentrations above background.

(3) There shall be provided, operated and maintained at all times at your expense, such equipment and/or systems including but not limited to chemical dosing as shall be approved by YWS, as will prevent the effluent, either alone or in combination with any matter in any sewer or receiving sewage treatment works vested in and/or under the control of YWS from giving rise to any obnoxious, poisonous or inflammable gases or otherwise a statutory nuisance as defined by the Environmental Protection Act 1990 in such sewer or sewage treatment works which would be deleterious to such sewer or to the processes in use at such sewage treatment works or to the disposal of sludges produced by such sewage treatment works.

6. Matter to be Excluded

Save as permitted by this Consent the effluent shall not contain:

(1) Any matter likely to injure any public sewer or any sewer or drain communicating with a public sewer, or to interfere with the free flow of its contents, or to affect prejudicially the treatment and disposal of its contents; or

(2) Any matter which, either alone or in combination with the contents of any public sewer or any sewer or drain communicating with a public sewer, is dangerous, or the cause of a nuisance, or prejudicial to health; or

(3) Any petroleum spirit. For this purpose 'petroleum spirit' means any such: -

(a) crude petroleum; or

(b) oil made from petroleum, or from coal, shale, peat or other bituminous substances; or

(c) product of petroleum or mixture containing petroleum,

as when tested in the manner prescribed by or under the Petroleum (Consolidation) Act 1928 gives off an inflammable vapour at a temperature of less than 22.7 degrees Celsius.

7. Notification of Changed Effluent

You shall give to YWS prior written notice of any change in the process or the process materials or any other circumstances likely to alter the constituents of the effluent as set out in Condition 5 and the Schedule of Conditions. In such circumstances, no substance of which YWS has not had previous notice of may be discharged unless and until YWS has agreed to accept the substance at a limit imposed by YWS which shall then deemed to be incorporated in the said Schedule by agreement and shall not prejudice the right of YWS to serve a Direction earlier than two years from the date of such incorporation.

Charges

(1) Payment for the treatment and disposal of the effluent and the costs of sampling and analysis of the same for control purposes shall be made to YWS by way of charges determined separately as stated below for the effluent discharged.

(2) The charge under (1) above shall be calculated in accordance with the Yorkshire Water Services Limited Charges Schemes as from time to time amended.

(3) The charge shall be payable by any person who is or was the occupier of the premises during the period of discharge of the effluent or at the date payment is due.

DATED this 20th day of January 2017

Signed: .....

YWS Authorised Signatory

I/We: .....

have received the Consent, of which this is a copy

Dated: 24/1/2017

Signed: .....

Print Name: S Hodges

SCHEDULE OF CONDITIONS

1 The temperature of the effluent shall not exceed 43.3 degrees Celsius at the time of discharge.

2 The pH value of the effluent shall not be less than 6 nor more than 10 at the approved measuring point.

3 Settled Chemical Oxygen Demand shall not exceed 2000 milligrammes per litre.

4 Settleable Solids shall not exceed 500 milligrammes per litre.

5 Total Ammonia (as N) shall not exceed 100 milligrammes per litre.

NOTES

1. Any person aggrieved by any condition contained in this Consent may appeal to the Water Services Regulatory Authority.

2. Compliance with these Conditions shall be ascertained by reference to the approved methods of analyses used, applied or adopted by YWS as from time to time amended.

3. For purposes of Condition 5 prescribed substances shall be taken as being those substances that are included in Schedule 1 of 'The Trade Effluents (Prescribed Processes and Substances) Regulations 1989' Statutory Instrument Number 1156 or any amendment or addition to the same.

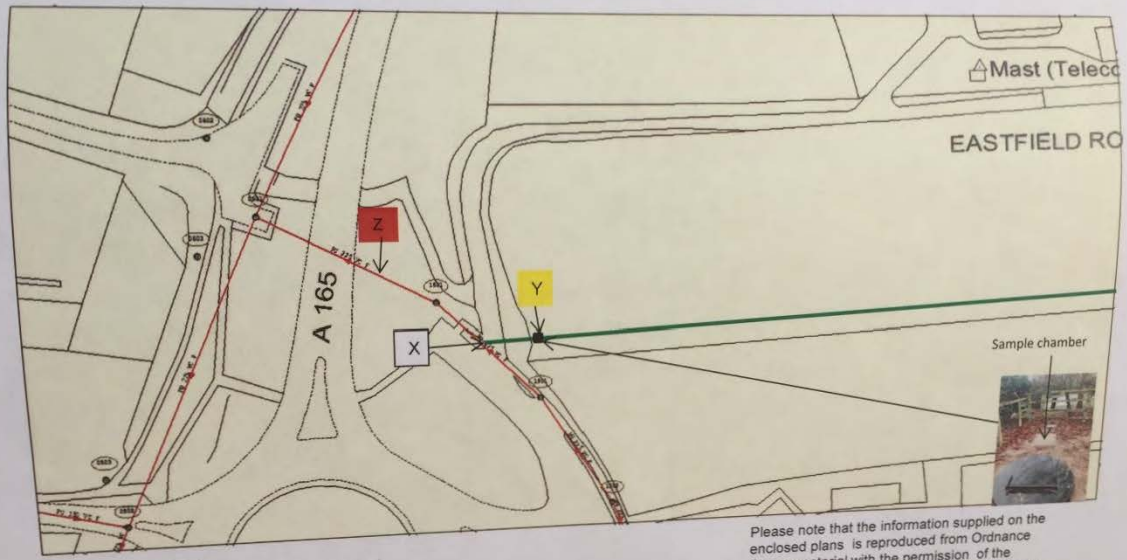
4. For purposes of Condition 5 background shall assume the same meaning as defined in 'The Trade Effluent (Prescribed Processes and Substances) Regulations 1989' Statutory Instrument Number 1156 or any amendment or addition to the same.

5. Occupiers are reminded of their duty under the Health and Safety at Work etc Act 1974 to ensure that inspection and sampling of the effluent can be undertaken without risk to health or safety.

6. Entry to the premises by Officers of YWS for the purpose of inspecting and sampling the effluent is authorised under the Water Industry Act 1991.

7. If any condition of the Consent is contravened the occupier of the premises may be guilty of an offence and liable to conviction by a Magistrates' Court to a fine not exceeding the statutory maximum or on conviction by a Crown Court to an unlimited fine.

Sandsfield Gravel
Brandesburton
URN 2390226



X Connection to sewer

Y Sample point

Z Public sewer

Trade effluent

APPENDIX B

Leachate Recirculation Assessment

Leachate Recirculation Assessment - Milegate Extension Landfill and Eastern Extension

Cell	Free leachate volume	Approximate waste thickness – calculated as the difference between the approximate base elevation and approximate elevation of the top of the waste	Total depth of leachate to ensure that greater than 20% of the waste thickness will not become saturated	Volume of leachate to saturated waste to 20% of the waste thickness	Volume of leachate that can be allowed to be recirculated to each cell whilst there are temporary waste slopes
	(m^3)	(m)	(m)	(m^3)	(m^3)
Cell 1	-708.9	12.5	0.375	2,186	2,894
Cell 2	-266	15.5	0.465	2,502	2,768
Cell 3	-892.8	11.5	0.345	1,343	2,236
Cell 4	-778.5	14.5	0.435	2,244	3,022
Cell 5	-1,542.50	10.5	0.315	1,440	2,983
Cell 6	-1,534.50	13.5	0.405	2,014	3,548
Cell 7	-1,076.40	10.5	0.315	1,293	2,369
Cell 8	-1,171.20	13.5	0.405	1,509	2,681
Cell 9	-2115	14.25	0.4275	2262	4377
Cell 10	-2481	14.5	0.435	2501	4982
Cell 11	-102	16	0.48	1362	1464
Cell 12	-4230	15.5	0.465	1364	5594
Cell 13	-3816	12.5	0.375	1017	4833
Cell 14	-1320	11	0.33	983	2303

golder.com