



March 2022
Ref: 1714-TDA

Technical Description and Assessment for Milton Landfill



Contents

1. Introduction	2
1.1. General	2
1.2. Pre-application Discussions	3
2. Technical Description of Changes	3
2.1. General	3
2.2. Waste Tonnages	4
2.3. Partial Surrender	4
2.4. New Monitoring Boreholes	5
3. Relevant Technical Guidance	6
4. Hydrogeological Risk Assessment	6
5. Stability Risk Assessment	7
6. Landfill Gas Risk Assessment	8
6.1. Gasim Modelling	8
6.2. Landfill Gas Infrastructure Review	8
6.2.1. Data Review	8
6.2.2. Discussion	9
6.2.3. Summary	10
7. Surface Water Management	11
8. Habitats and Receptors	11
9. Supporting Documents	12

DRAWINGS 653M282T Environmental Monitoring Plan
WR7544/01/01 Surface Water Drainage

APPENDIX 1 Correspondence

APPENDIX 2 CQA Documents for Replacement Boreholes

APPENDIX 3 Table of Gas Wells

Disclaimer

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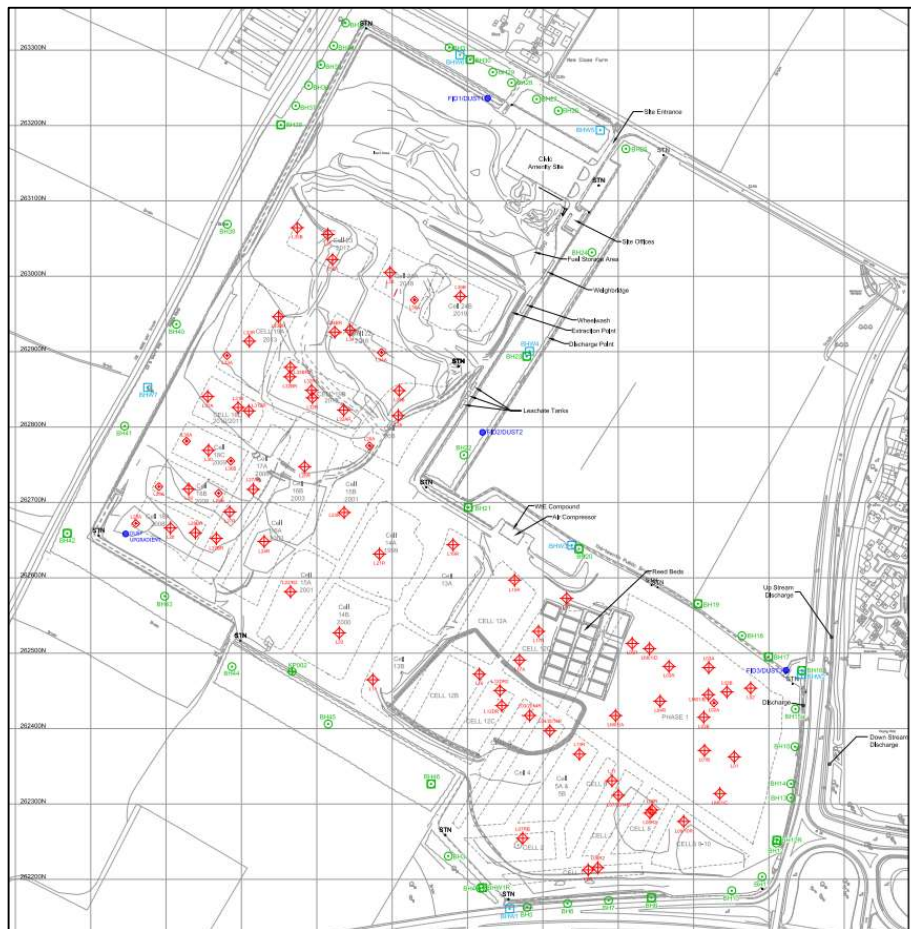
1. Introduction

1.1. General

Milton Landfill is a non-hazardous landfill, which is located on, Butt Lane, Milton, Cambridgeshire, CB24 6DQ, approximately 4km north of Cambridge city centre. It can be located by National Grid Reference TL 465 632.

The site is operated by FCC Environment, under permit number BV4584IU, originally issued in 2005 and most recently varied in 2016. Landfilling has been undertaken at the site since the 1980s. Earlier phases of landfilling included some hazardous wastes. Landfilling in Phases I and II is complete and the site is progressing towards the remaining few cells in Phase III, towards the north of the site, as shown in Figure 1.

Figure 1: Site Layout (taken from Environmental Monitoring Plan)



A permit variation application is being made to address a number of issues as listed below:

- To revise the leachate compliance levels;
- To increase the annual tonnages of waste and restoration materials;
- To surrender small areas of land, which have not been landfilled;
- To include new groundwater monitoring boreholes and associated compliance limits;
- To reduce the number of leachate wells used for regular monitoring;
- A revised surface water management scheme.

1.2. Pre-application Discussions

A pre-application meeting was held with the Environment Agency on 28/9/2020. The written response following the meeting was provided on 6/10/20, reference ENVPAP/BV4584IU/V010, refer to Appendix 1. Revisions to the Hydrogeological Risk Assessment have been made to address the issues raised during the meeting. In addition to this a revised Landfill Gas Risk Assessment has been provided, a revised Stability Risk Assessment and a Revised Environmental Risk Assessment. An updated Restoration Plan is provided to address the remaining tonnages required to complete and restore the site.

Email correspondence with Andy Wright of The Agency on 30/10/20 confirmed that the permit variation would amount to a substantial variation on account of increases to waste tonnages being more than 25,000 tonnes per annum.

This document represents the Technical Description and Assessment and also addresses each of the additional documents requested in turn. Supporting documents to this application are fully referenced.

2. Technical Description of Changes

2.1. General

This permit variation application is being made to address the following issues:

- To revise the leachate compliance levels;
- To increase the annual tonnages of waste and restoration materials;
- To surrender two small areas of land, which have not been landfilled;
- To include new groundwater monitoring boreholes and associated compliance limits;
- To reduce the number of leachate wells used for regular monitoring;
- A revised surface water management scheme.

The hydrogeological risk assessment (HRA) for Milton Landfill has been reviewed in order to re-evaluate leachate compliance levels, commonly referred to as leachate trigger levels, as these are written in to the environmental permit. The HRA review is supplied in support of this permit variation.

The review concludes that leachate compliance levels can be raised in all phases. The proposal is a compliance level of 8m AOD in Phase I and II; 8.5m AOD in specific eastern cells of Phase III and 9m AOD in the rest of Phase III.

2.2. Increased Tonnages

The current permitted annual tonnage for non-hazardous waste is 150,000 tonnes per year. There has been historical demand to exceed this amount. The site is nearing completion. Phase I, II and parts of Phase III have been permanently capped with site derived clay. Capping of Phase III continued in line with the progress of cell completion. Cell 24A was constructed in 2018 and Cell 24B, the final cell, was constructed in 2019. These cells are partially complete. The site closed in April 2020 due to the coronavirus pandemic. Cells 22, 23 and 24 are temporarily capped. It is planned to re-open the site in 2022 to bring the site to final levels.

It is estimated based on a conversion factor of 0.8 tonnes/m³, that there are approximately 200,000 tonnes required to complete the final cells of the site. FCC wish to complete all landfilling within the space of one year and therefore, request an increase to an annual tonnage of 200,000 for non-hazardous waste. This exceeds an increase of 25,000 tonnes per annum which would constitute a Part A (1) activity in its own right and therefore, a substantial variation is required.

The increase in annual waste tonnages would take place for just one year. However, the Agency have requested that this change is supported by a revised Landfill Gas Risk Assessment.

A revised Restoration Plan is submitted with this application. Final quantities required for restoration have been assessed by recent surveys. This includes identification of areas where surface depressions resulting from uneven settlement require levelling. The annual limit on wastes for restoration is to be agreed in line with Improvement Condition IC3. Based on the recent assessment it is estimated that approximately 220,000 m³ of soil will be required to complete restoration of the site. With a conversion rate of approximately 2 tonne/m³, this is approximately 440,000 tonnes.

2.3. Partial Surrender

Partial surrender of two areas of land within the currently permitted landfill boundary is required. The first area is in the southeast of the site. Infrastructure associated with improvements to the adjacent A10 and A14 has required an additional strip of land adjacent to the southeastern corner of the site. The scope of the works has been discussed with and approved by The Agency. The area of land has been demonstrated to have not received waste. It has, therefore, been agreed at the pre-application stage, that the surrender would be low risk and would amount to a non-commencement of an activity.

The second area for surrender is north of the engineered landfill cells and directly adjacent to the existing household waste site. This area has never been landfilled. A concrete pad has been laid above natural ground and the land has been used for storage of restoration materials. It is anticipated that the household waste site will expand into this area in the future. This will be the subject of a separate permit application. A photographic record indicate the concrete surface is in good condition. Materials have been removed from the area.

Further details of the two areas for surrender are presented in McDonnell Cole report reference 1714-LRS: Supporting Document for Low Risk Surrender, Milton Landfill.

2.4. New Monitoring Boreholes

Two of the existing groundwater and gas monitoring boreholes are affected by the realignment of the A14 eastbound off-slip and the A10 Milton Junction roadworks. Boreholes W01 and BH12 are the affected boreholes and their replacements are W01R and BH12R respectively. The replacement boreholes are installed as close to their original positions as possible. The original BH12 has modified headworks to allow gas monitoring to continue.

A CQA Plan was prepared by Highways England, reference HA528983-ACJV-HGT-S5_CQA-RP-C-0004 and this is presented as Appendix 2. The EA originally queried the location for replacement BH12 and the material encountered in TP7. Changes were made and a CAR form dated 1/9/20 confirmed acceptance of the updated CQA Plan. This is presented in Appendix 1. The final CQA validation report for the borehole construction is included in Appendix 2.

The water quality in the new boreholes has been sampled and analysed since January 2021. This data is used to derive control and compliance limits for the boreholes. The data is discussed in section 3.1.2 of the HRA and compliance limits are presented in Table 21 of the HRA, which is reproduced below.

Table 1: (HRA Table 21): Proposed Compliance Levels for New Boreholes

Borehole	Determinand	Average (mg/l)	Standard deviation	Compliance level (mg/l unless noted)
W01R	Ammoniacal nitrogen	0.49	0.14	0.91
W01R	Zinc	0.0038	0.0038	0.015
W01R	Mecoprop			0.1 (ug/l)
BH12R	Ammoniacal nitrogen	2.43	0.69	4.5
BH12R	Zinc	0.0063	0.0039	0.018
BH21R	Mecoprop			0.15 (ug/l)
W01R + BH12R	Cadmium			1 (ug/l)
W01R + BH12R	Chromium			0.05
W01R + BH12R	Xylene			3 (ug/l)

3. Relevant Technical Guidance

Current guidance for landfill sector is provided in the following web page:

<https://www.gov.uk/guidance/landfill-operators-environmental-permits>

This replaces “How to Comply with your Environmental Permit, Additional Guidance for Landfill, EPR 5.02, 2009. In terms of landfill engineering, particularly in relation to control of rain water, surface water and groundwater management, the guidance states that it should be determined through risk assessment what constitutes acceptable risk to satisfy the requirements of the Environmental Permitting Regulations 2016. This includes the efficacy of the leachate extraction system.

Guidance states that leachate management systems should have compliance limits set for the maximum leachate level. These levels must be based on a groundwater risk assessment. Monitoring of leachate and groundwater should be in line with EA guidance LFTGN02: Monitoring of Landfill Leachate, Groundwater and Surface Water, 2003.

In setting emission benchmarks for groundwater, reference should be made to EA guidance on hydrogeological risk assessment for landfill. Guidance on hydrogeological risk assessments is provided at the following webpage:

<https://www.gov.uk/guidance/landfill-operators-environmental-permits/what-to-include-in-your-hydrogeological-risk-assessment>

4. Hydrogeological Risk Assessment

A Hydrogeological Risk Assessment (HRA) has been undertaken, reference McDonnell Cole Ltd, 1714-HRA-R2.1 Milton Landfill, which follows the EA’s guidance on hydrogeological risk assessment for landfill. The site’s conceptual model is reviewed, including a detailed assessment of the shallow geological conditions. Leachate and groundwater monitoring has been undertaken and continues to be undertaken in accordance with LFTGN02. A review of the groundwater monitoring data is undertaken and concludes that the site is currently in compliance with all groundwater quality compliance limits.

FCC has a Leachate Management Plan which is updated annually, the most recent update being February 2022. This presents details of leachate infrastructure, leachate extraction rates and legacy. It presents an action plan for non-compliance events. Four new wells were installed in Phase I in 2018. These give a better understanding of leachate levels in the oldest part of the site. Several new wells were installed in other parts of the site in December 2020, to replace faulty wells identified as part of the routine surveillance procedures.

Leachate levels are maintained at 6.5m AOD in most cells, with higher levels in some cells as agreed in Table S3.1 of the environmental permit. This level is based on maintaining a 0.2m difference between the maximum leachate level and the minimum base level of the River Terrace Deposits, which hold water at most times of the year on the east of the site. On the west some boreholes show these deposits to be regularly dewatered. A detailed review of geological logs around the site perimeter indicates the base of the River Terrace Deposits is much higher in other places, meaning leachate levels could rise above 6.5m AOD, but still maintain 0.2m of hydraulic containment, or more. In most parts of the site leachate levels could rise to between 8 and 9m AOD and still be below the base of the River Terrace Deposits.

A quantitative risk assessment has been undertaken to assess the proposal for a rise to leachate levels of 9m AOD in Phase III on the west and 8m AOD in Phases I and II on the east. This would give a short section of the site perimeter where the proposed leachate level exceeds the base level of the River Terrace Deposits. Seepage calculations have been undertaken to demonstrate that the site could still comply with the requirements of the Environmental Permitting Regulations. The Landsim model for the Greensand aquifer at depth below the Gault Clay has also been updated to fit the revised conceptual model.

The conclusions of the HRA are for the following leachate compliance levels:

- Phase I and II - 8m AOD;
- Phase III cells 12A, 12C, 13A, 14A, 15B and 20B - 8.5m AOD;
- Phase III remaining cells - 9m AOD.

5. Stability Risk Assessment

Guidance from the following webpage has been reviewed in terms of requirements for a revised stability risk assessment:

<https://www.gov.uk/guidance/landfill-operators-environmental-permits/manage-leachate>

It states that where leachate levels will be above the level of the surrounding ground surface (for example, at land raise sites), you must consider the impact on slope stability.

The current proposal does not involve raising the leachate level above the surrounding ground level. However, a revised stability risk assessment was requested following the pre-application meeting. The report has been completed by Sirius: June 2021: reference WR7788 Rev 2, Stability Risk Assessment for Proposed leachate Level Increase at Milton Landfill Site. This reviews the revised leachate compliance levels and updates the details of the engineering in later parts of the site, which had not been constructed at the time of the 2003 permit application.

The report concludes that the proposed leachate level rise does not present a risk to slope stability.

6. Landfill Gas Risk Assessment

6.1. Gasim Modelling

As a result of the proposed increase to the annual waste input rate, the EA have requested that the Landfill Gas Risk Assessment is updated. This has been undertaken by Byrne Looby in 2022, report reference 5375-R001.

The report concludes that using atmospheric dispersion modelling, there were no exceedances at any discrete receptors. The proposed increase in waste tonnages is not considered to result in a risk to the environment, or human health and gas generation is expected to continue to decline. The proposed raising of leachate levels is not considered to have any significant impacts in terms of gas production and collection.

6.2. Landfill Gas Infrastructure Review

6.2.1. Data Review

The potential impact of the proposed increase in leachate levels above the base of the landfill on the existing gas management system has been reviewed. The gas infrastructure at Milton Landfill is reviewed regularly by Infinis. The latest report is dated June 2021, reference Well Condition Survey Report, Milton, January to June 2021. The data reported has been collated against ground elevation data provided by UTEC Starnet, dated May 21. The collated data is presented as Table 1, Appendix 3.

The data in Table 1 is used to assess the potential effect of raising the leachate compliance level in cells across the site. The proposed raise in leachate level is generally 8m AOD in Phase I and II and 9m AOD in Phase III. A few cells in Phase III have a proposed compliance level of 8.5m AOD, as indicated in Table 1. The relevant compliance levels are also given in Table 1. Gas generation is inhibited in saturated waste and gas collection is inhibited in wells where the slotted section is below the leachate level.

The average waste thickness is around 18m in Phases III and II, with an average of around 22m in Phase I, where the base of the site is lower. The proposed changes will give a leachate rise of:

- 1.5m in Phase I, which equate to 7% of the waste thickness;
- Upto 1.5m in Phase II, as three cells are already at or above 8m AOD for compliance, equivalent to 8% of the waste thickness;
- Upto 2.5m in Phase III (Cell 12C being already above the proposed rise and 12A being 1m below the proposed rise.), equivalent to 14% of waste thickness.

Table 1 indicates the following:

- The site has at least 154 wells, as listed in Table 1, with some additional pin wells, which are not listed in the Infinis survey as they are shallow (typically only 6m in depth) and considered sacrificial well infrastructure so not subject to the same well condition surveys .
- A total of 21 wells have bases above the proposed rise in leachate level and therefore, will not be affected by the proposed change.
- Only 35 wells have the existing leachate level lower than the proposed leachate level ie only 23% of wells will be affected by the change.

6.2.2. Discussion

Milton Landfill began operation in the 1980s. The waste in Phases I and II is over 25 years old and as such has passed peak gas generation potential.

Many wells have leachate levels higher than the existing leachate compliance level. The reasons for this include the fact that

- They are retro drilled so will have a minimum standoff from the base of 3m to avoid puncturing the basal liner. Therefore, they don't intersect the basal leachate drainage.
- The wells are not pumped for leachate.
- Wells may silt over time
- Perched leachate cannot drain freely from the well.

However, there is a large coverage of gas wells and the incidence of non-compliance for gas concentrations in perimeter monitoring boreholes is low. Perimeter boreholes around Phase III are reported to all be compliant. There have been occasional slight exceedances of the 1% methane compliance level in perimeter wells BH17 in the northeast corner of Phase I; BH12 towards the southeast corner of Phase I and BH11 east of Cells 9&10 in Phase II.

Borehole BH17 - the closest gas wells to this borehole are

- WB001 - no information is available from the survey
- WB15L - leachate level = 9.4m AOD
- WB14L - leachate level - almost dry

The proposed leachate compliance level of 8m AOD has already been exceeded in WB15L, so there should be no observed change as a result of these proposals. Leachate does not appear to be able to reach WB14L. If the surrounding wastes are of such low permeability to inhibit leachate flow, they are likely to be of limited gas generation potential.

There are additional leachate wells close to BH17, for example L02, which are not compliance points and are of similar construction to a gas well. So additional gas control can be provided from these wells.

Borehole BH12 – the closest gas wells to this borehole are

- P1202 – pinwell with no survey information
- P1201 – pinwell with no survey information
- RB010 – leachate level is 10m AOD

As RB010 already has a leachate level of 10m, a leachate compliance level of 8m AOD would not worsen conditions in RB010.

Borehole BH11 - the closest gas wells to this borehole are

- RD002 – Leachate level is less than 6.5m AOD
- WD26L - Leachate level is less than 6.5m AOD
- RD003 - Leachate level is less than 6.5m AOD
- WD007 – leachate level is 11.5 m AOD

There are a lot of gas wells in Cells 9 & 10 adjacent to BH11. A high proportion have a liquid level below that of the existing leachate compliance limit. The majority of the gas wells in close proximity to BH11 are pumped to remove perched leachate as part of a long term gas migration action plan. This situation will not change with a higher leachate compliance level. The action taken close to BH11 has been seen to noticeably reduce gas concentrations since October 2010.

Byrne Looby, 2022, Landfill Gas Risk Assessment includes a sensitivity analysis of the proposed rise in leachate levels on the Gassim model. The change had no discernible impact on the modelled gas generation rates and the report concludes that it is considered that the change will not interfere with gas collection and gas management.

6.2.3. Summary

Milton Landfill began operation in the 1980s. The waste in Phases I and II is over 25 years old and as such has passed peak gas generation potential.

Gas wells are not designed for leachate level monitoring and therefore, leachate levels in gas wells should not be considered representative of the cell in which it is located. High leachate levels in a particular well will, however, inhibit gas extraction. A review of existing leachate levels in gas wells indicates that leachate levels are high and only 23% of wells would be affected by the proposed change.

High leachate levels in gas wells are still allowing gas extraction to continue at Milton. This has been quantitatively assessed by Byrne Looby, 2022. There is limited evidence of perimeter migration. Where occasional perimeter exceedances have occurred, there is already evidence of high leachate levels and therefore, the proposals should not increase this occurrence.

With the proposed rise in leachate compliance level in place FCC will remain responsive to any perimeter exceedances of gas compliance concentrations. Should it be necessary,

localised reductions in leachate level will be put in place, using a combination of gas and leachate extraction points, until conditions are brought under control.

7. Surface Water Management

Details of the surface water management scheme to be implemented as the site reaches completion are presented with this variation application. The new design is presented in Sirius report 2020: Specification for Construction of Surface Water Management Scheme at Milton Landfill. Reference WR7544/01. The design drawing, reference WR7544/01/01, showing the general arrangement for the final surface water design is appended to this report.

Clean surface water will discharge to an attenuation lagoon in the northeast of the site. The outfall will discharge to the Thirteenth Public Drain. Monitoring of the discharge will continue in line with Table S3.3 of the Environmental Permit.

To accommodate the attenuation lagoon there is a need to extend the permit boundary slightly to the east. The updated permit boundary is presented in McDonnell Cole report 1714-LRS, where the boundary has been modified to accommodate both the eastern adjustment and the two areas for surrender.

8. Habitats and Receptors

As part of the pre-application advice, a Nature and Heritage Screening Report is provided by the EA. An assessment is required of the potential impacts of the variation application proposals on habitats and sensitive receptors within a set radius of the site. A Habitats Assessment is submitted as document reference 1714-HA Milton Habitats Assessment. This presents a qualitative assessment of those habitats and receptors identified by the EA's pre-application screening process. The document concludes that there are no perceived linkages between the leachate source and the identified habitats. Therefore, the potential for impacts is negligible.

9. Supporting Documents

Table 2: List of Supporting Documents supplied with this application

No	Question reference	Document Title	Document Reference
Part C2			
1	Q2b Tab 1	Technical Description and Assessment	1714-TDA-R1.1 Milton
2	Q3b	Competence Management System certificate	1714 Milton C2 Q3b
3	Q3d	ISO 14001	1714 Milton C2 Q3d
3a	Q3d	ISO 9001	1414 Milton C2 Q3d ISO 9001
4	Q5a	EMP Plan	1714 Milton C2 Q5a
5	Q5a	Site Boundary Plan	1714 Milton C2 Q5a
6	Q5c	Non-Technical Summary	1714-NTS Milton
7	Q6	Environmental Risk Assessment	1714-ERA Milton
8	Q6	Hydrogeological Risk Assessment	1714-HRA-R2.1 Milton
Part C3			
9	App 4 Q5	Stability Risk Assessment	1714 Milton C3 App 4 Q5 SRA R2
10	App 4 Q6	Landfill Gas Risk Assessment	1714 Milton C3 App4 Q6 LFGRA
Part E2			
11	Q2a	Low Risk Surrender Report	1714-LRS Milton
Additional Documents			
12		Leachate Management Plan	1714 Milton LMP
13		Habitats Assessment	1714-HA Milton Habitats Assessment
14		Surface Water Management Plan	1714 Milton SWMP
15		Restoration Plan	1714 Milton Restoration Plan

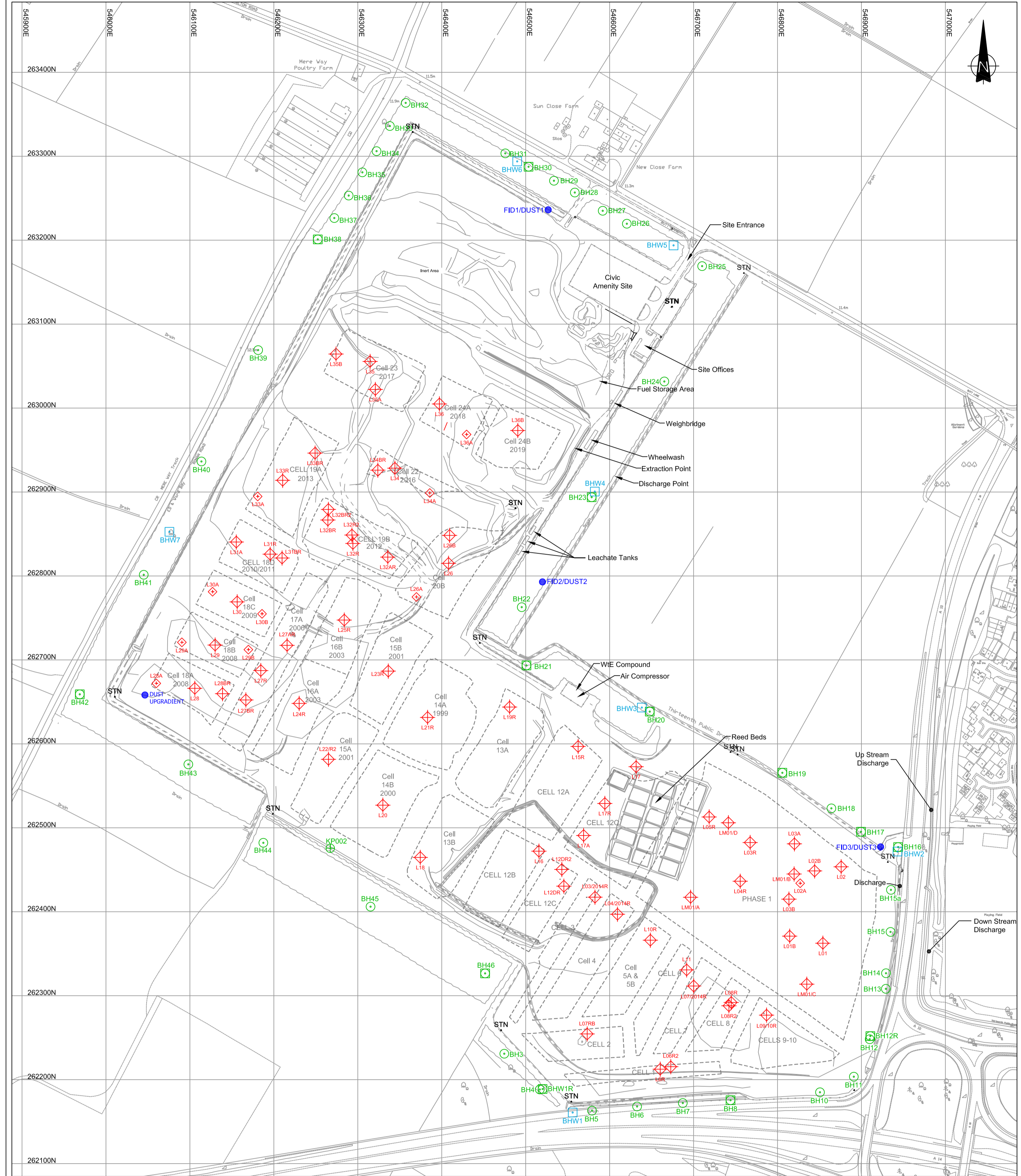
REFERENCES

1. Causeway Geotech: 2020: A14 Section 5 – Milton Landfill, Groundwater Wells Replacement. Factual Ground Investigation Report. Ref: 20-0525.
2. FCC: 2022: Restoration Plan, for the use of wastes for restoration at Milton Landfill Site, Butt Lane, CB24 6DQ.
3. Highways England (A14 Integrated Delivery Team): 2019: A14 Cambridge to Huntingdon Improvement Scheme, Milton Landfill -CQA Plan 3- Groundwater Well Replacement. Ref: HA528983-ACJV-HGT-S5_CQA-RP-C-0004 C04.
4. McDonnell Cole Ltd: 2021: Hydrogeological Risk Assessment, Milton Landfill, reference 1714-HRA-R2.0;
5. McDonnell Cole Ltd: 2021: Habitats Assessment, Milton Landfill, reference 1714-HA.
6. McDonnell Cole Ltd: 2021: Supporting Document for Low Risk Surrender , Milton Landfill, reference 1714-LRS.
7. Sirius Environmental: 2020: Specification for Construction of Surface Water Management Scheme at Milton Landfill. Reference WR7544/01
8. Sirius: 2021: Stability Risk Assessment for Proposed Leachate Level Increase at Milton Landfill Site, Report reference WR7788/SRA Rev 2.
9. Byrne Looby: 2021 – Landfill Gas Risk Assessment, reference 5375-R001.



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

DRAWINGS



NOTES:

- 1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.
- 2. DO NOT SCALE FROM THIS DRAWING.
- 3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF FCC ENVIRONMENT (UK) LIMITED PRIOR TO CONSTRUCTION WORKS COMMENCING.

LEGEND:

-  Landfill Gas Monitoring Borehole
-  Landfill Gas Surface Monitoring Point
-  Combined Gas/ Groundwater Monitoring Point
-  Gas Flare Stack
-  Landfill Gas Extraction Point
-  Landfill Gas Extraction/ Leachate Monitoring Point
-  Condensate Unit (Knock-out Pot)
-  Gas Manifold
-  Groundwater Monitoring Borehole
-  Groundwater Pumping Point
-  Surface Water Monitoring Point
-  Leachate Collection Point
-  Leachate Monitoring Point
-  Leachate Recirculation Point
-  Leachate Collection Sump
-  Leachate Discharge Sampling Point
-  Leachate Detection Point
-  Underdrainage Monitoring Point
-  Settlement Monitoring Point
-  Drain/ Dewatering Tank
-  Valve
-  As-built Cell Footprint
-  Dust Points
-  Proposed Well

Reference files:
 Information taken from plans:
 Site Survey: 653W2247A
 Monitoring Plans: 6373 - Milton - Leachate System - April 2013
 Cell Footprint: 653B2190

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Site: **MILTON LANDFILL SITE**

Drawing Title: **Environmental Monitoring Plan**

Drawn By: BS | Checked By: RB | Date: 11.02.22 | Scale: 1:3000 | Paper Size: A2
 Status: FINAL | Revision: T | Drawing No: **653M282** | Plan Number: **Plan 04A**

Revision:	Date:	Description:	By:	CHK:
T	11.02.22	Site survey updated & WIE compound label removed	BS	RB
S	20/02/21	Site survey updated & WIE compound label removed	BS	RB
R	06/11/20	Site survey updated & WIE compound label removed	BS	RB
O	14/05/20	Site survey updated & WIE compound label removed	BS	RB
P	13/11/19	Site survey updated	BS	RB
O	06/10/19	Site survey updated, Extraction & discharge labels added, Cell 24B detail added.	BS	RB
N	20/05/19	L12DR2, L32R2 & L32BR2 installed	BS	RB
M	02/04/19	Site survey updated, Proposed wells L12DR2, L32R2 & L32BR2 added	BS	RH
L	11/03/19	L32BR REDRAW, L32R REDRAW & L12DR REDRAW added	BS	RH

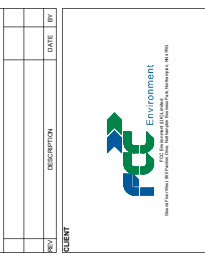
Date: 11-Feb-22 By: BS Date: 11-Feb-22
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THIS INFORMATION IS FOR INFORMATIONAL PURPOSES ONLY. THE ACCURACY OF THE INFORMATION SHALL BE DISCLOSED TO ANY THIRD PARTY OR CONSULTANT IN WRITING OF RECORD.

- NOTES**
1. ALL SURFACES SHALL BE FINISHED TO THE LEVELS SHOWN ABOVE OR AS NOTED OTHERWISE.
 2. DO NOT SCALE FROM THIS DRAWING.
 3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHALL BE REPORTED TO THE CLIENT IMMEDIATELY PRIOR TO THE COMMENCEMENT OF CONSTRUCTION WORKS COMMENCING.
 4. ALL INVERT LEVELS ARE TO BE CONFIRMED BY SIRIUS PRIOR TO CONSTRUCTION ONCE A FALL-UP HAS BEEN INSTALLED AND RECEIVED.
 5. GATE PORTIONS TO BE CONFIRMED ON SITE WITH FCC DURING CONSTRUCTION WORKS.

- KEY**
- SITE SURVEY
 - PROPOSED LAGOON CONTOURS
 - FINAL RESTORATION CONTOURS
 - OWNERSHIP BOUNDARY
 - PROPOSED SURFACE WATER DITCH (500mm WIDE X 500mm DEEP)
 - PROPOSED PIPEWORK
 - PROPOSED ROAD CROSSING / CULVERT
 - CAP DEFLECTION BUND
 - FLOW DIRECTION
 - EXISTING DITCHES
 - PROPOSED MANHOLE CHAMBER
 - PROPOSED PRECAST CONCRETE HEADWALL
 - PROPOSED CONCRETE SANDRAG HEADWALL

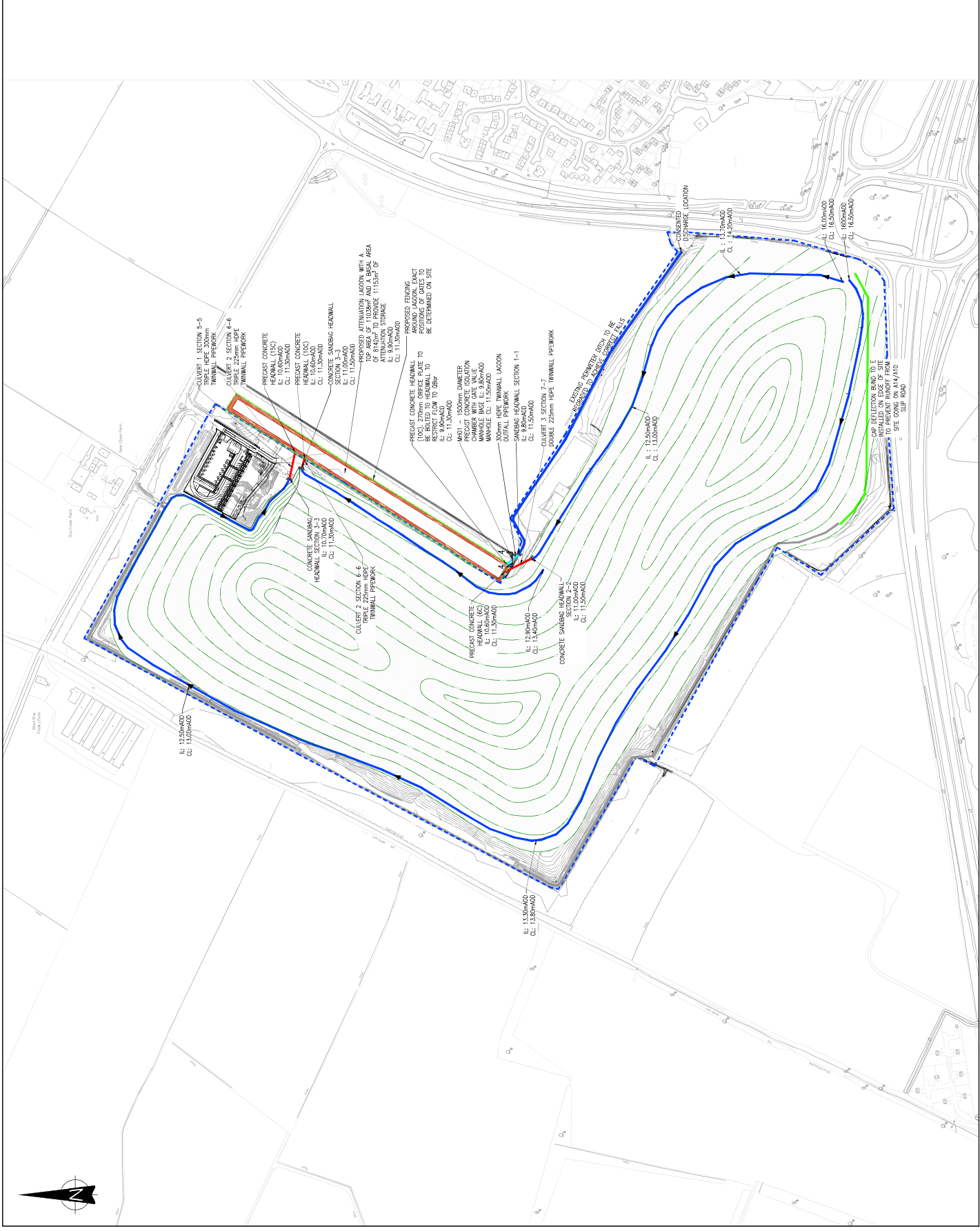
REV	DESCRIPTION	DATE	BY



FOR TITLE
 MILTON LANDFILL SITE
 Surface Water Management

DRAWING TITLE
 General Arrangement

DATE 03/02/2020
DESIGNED BY J.D.
CHECKED BY J.D.
DATE 03/02/2020
SCALE 1:2500
PROJECT A1L
WORK NO. WR7544/01/01
REV 0



APPENDIX 1

Correspondence

GEOSCIENCE OPERATIONS TEAM (GOT) PRE-APPLICATION FORM EPR WASTE & INSTALLATIONS

This form provides the GOT consultation response following pre-application discussions.

Part A: Site details

Site Name	Milton Landfill (East Waste Ltd)		
Applicant Name	FCC		
Consultant	Other		
Application Reference	EPR/BV4584IU/V010	ENVPAP/BV4584IU/V010	WML
Grid Reference	TL 465 632		
Regime	Installations		
Activity Type	Non-hazardous Landfill		
Specialism	Leachate Management		
Pre-Application Officer	Nnaemeka O Iloani		
Area Contact	Sarah Kent		
Assessment Required	Document Review		
Supporting Documents	HRA		
Agenda Items			
Meeting Attendees	<p><u>Environment Agency (EA)</u> Nnaemeka O Iloani (NOI) Sarah Hartley Kent (SK)</p> <p><u>McDonnell Cole - Consultant</u> Helen McDonnell (HM)</p> <p><u>FCC</u> Mat Nicholson (MN) Roisin Bennett (RB) Martin Greaves (MG) Hannah Beckett (HB)</p>		

Part B: GOT response

Estimated Hours	35 Hours	Date Provided	06/08/2020 should be 6/10/20
Final Chargeable Time	35 Hours		
Discussion Guides	<p>Agenda Items:</p> <ol style="list-style-type: none"> 1. The principle of raising leachate compliance limits as described in the revised HRA submitted at the pre-application stage. 2. Revised waste tonnages and what information will be required in support of making this change. 3. Revised restoration proposals. 4. Confirm what documents are needed to complete the application process. 5. New boreholes replacing permitted boreholes lost to highway extension. 		

Background
Milton Landfill Site is operated by FCC Environment (FCC), under environmental permit number

BV4584IU, issued in 2005. A Hydrogeological Risk Assessment (HRA) of the site was carried out during 2015. FCC has requested an early review of the HRA to further conceptualise the site and assess the potential for raising leachate level limits above the base of the landfill.

The site was initially operated by Cambridgeshire County Council and accepted hazardous waste until 2005. Filling in Phase I is understood to have begun in 1980. The site is divided into three phases. Phase II is divided into Phase IIa: Cells 1 to 5 and Phase IIb: Cells 6 – 11. Wardell Armstrong report that Phases I, II and Phase III cells 12 to 15B accepted both hazardous and non-hazardous waste. It is understood the remaining cells have only accepted non-hazardous waste. Cell 16A and Cell 16B are recorded as having been built in 2003, but are understood to only have received non-hazardous waste once filling began in those cells.

The site has been progressively capped. Cells 19 and subsequent cells do not yet have final capping in place. Cell 24b was constructed during 2019.

The previous hydrogeological risk assessments of the site describe the principles of site leachate management in relation to the groundwater confined within the Greensand at depth, but also in relation to the River Terrace deposits (RTDs), which are understood to be present across the whole site, in contrast to the published information available from the BGS.

Pre-Application Discussions / Review

Introduction and Site Summary: Helen McDonnell introduced all the attendees and provided a brief description of the site. She explained that the site has existed for over 40 year. The earlier cells were not engineered to same standard as the news cells. Phase 1 has not got basal containment engineering. Cell 24 was almost completed until coronavirus kicked in. It was found there are compliance issues with leachate levels especially in Phase 1. Some of the older wells have been replaced with retro-drilled wells and often found initial spike in levels with huge difference in levels between wells which are quite close together and has resulted in non-compliance scores.

Leachate Level Change Discussion

The aim is to simplify things by looking at more blanket leachate level controls which will allow a margin of flexibility while new wells are put in rather than getting non-compliance scores while investigate and try to maintain level in each phase particularly Phase1.

The proposal in general is raising leachate levels to 8 mAOD in Phase 1 and 9 mAOD elsewhere. While looking at the levels a review of geological log data has been undertaken which has been used in the past on a worst case of the lowest level of River Terrace Deposits (RTDs) that was found on the east of the site. Compliance Level were worked backwards from there.

A review of geological log indicates the base of River Terrace Deposits were obtained at greater elevation on the west and there was less risk of leachate migration into the deposits. This means slightly higher compliance level on the west and lower compliance level on east.

NOI (EA) asked whether it is right to assume that Phase 1 and early part of Phase 2 were designed on the principle of dilute and disperse.

HM confirmed that the base of the site is in Gault Clay and was not entirely on the basis of dilute and disperse. Phase 1 has no basal engineering but 3 m thick retro installed sidewall liner was put in place as the level of waste rose and management changed. Phase 1 wasn't originally engineered to any standard but it does have sidewall containment at the moment and substantial thickness of Gault Clay at the base.

HM presented the description of the generalised site Conceptual model through Phase 2 and 3 which illustrated the thin layer of River Terrace Deposits east and west of the site. On the west the proposed leachate level (9 mAOD) will be below the base (10 mAOD) of River Terrace deposits. It is acknowledged that some time during the course of the year the 8 mAOD leachate level on the east

will be slightly above the base of the River Terrace Deposits but not always. There is 16m of Gault clay below the base as well as 3m retro installed sidewall.

HM: FCC has put in new leachate wells at the site to try and deal with the variable level in phase 1. RB indicated the wells were drilled down to the base. A review of the 4 new leachate level graphs indicate the levels in the new wells are managed much better with recent data showing the levels are well below the 8 mAOD. The aim is to keep it as it is managed now.

NOI (EA) ask whether the site will remain hydraulically contained base on the proposed leachate levels.

HM: With respect to the migration into the river terrace deposits there is no reliance on average groundwater level. The intention is not for the site to maintain inward hydraulic gradient at all times as the report discussed the period where the leachate level will be above groundwater level in the River Terrace Deposits which calculated the seepage rate across the sidewall containment.

NOI (EA): We will expect that Phase 2 and 3 will remain hydraulically contained at all times. The proposed leachate level needs to be compared against the groundwater levels by superimposing the leachate level limit over the groundwater series graph to demonstrate containment. A review of the groundwater level time series graph (Figure 8) presented in the draft HRA report would indicate the site will not be compliant at all times if the 9 mAOD line is drawn across the graph.

HM acknowledged it is true but that was the reason for the geological sections which show the River Terrace Deposits at higher elevation than the groundwater levels especial for the BH38 in which groundwater drops very low below the base of the RTDs in Gault Clay. This borehole measures groundwater in borehole installation in Gault Clay which is very easily dewatered by the current landfilling activities.

HM explained that it is useful to look at the leachate level in relation to the groundwater level with an understanding of what the boreholes are monitoring which sometimes show the groundwater is sitting in the Gault Clay.

NOI (EA): It is expected the groundwater level will eventually rebound in future when the groundwater management stops.

HM: There is no data to show what will happen when the groundwater management stops.

MN (FCC): The boreholes in question are not in the area of interest but the area of interest is the base of the RTDs which is at 10 mAOD at the western boundary with leachate level at 9 mAOD which is a meter below the interface meaning that groundwater there is not relevant.

HM confirmed that's how it has been approached historically.

NOI (EA): Table A7.4 of the 2015 HRA report showed that the interface of River Terrace Gravels and Gault Clay is at 8.29 mAOD at W05.

Mat (FCC): The level proposed around the area of W05 is 8 mAOD but landfilling hasn't progressed towards the area.

HM: The site will be hydraulically contained on the west but not on the east. In addition the level will be below the interface of River Terrace Gravels and Gault Clay on the west.

NOI (EA) With reference to the minimum groundwater level on the west what amount of headroom will be available base on the proposed leachate level.

HM: The minimum groundwater level is not helpful as the recorded minimum levels (table 5) are below the base of RTDs.

NOI (EA): Is it ok to assume that where the minimum groundwater level drops below the interface the leachate level will remain below the interface?

HM: Base on the borehole section that was provided the level will remain in the Gault Clay except at BH32 which is in the North West corner not affected by the waste deposits. The boreholes are slotted from top to the bottom and are not always specific to the horizon to be provided data on.

NOI (EA): It is our understanding that the proposed leachate level will be above the piezometric level in Lower Greensand but below the groundwater level in the RTDs except around the seepage area shown by orange line in the southern boundary where the minimum interface level was recorded.

HM: That is correct

NOI (EA): It needs to be made clear in the application which area of the site is hydraulically contained and which area that are not. As a minimum 5 percentile low groundwater level should be used to define the hydraulically contained area where applicable.

Leachate Level Summary

- The proposal is to raise leachate levels to 8 mAOD in Phase 1 and 9 mAOD elsewhere. During the discussion it emerged that the leachate level of 9 mAOD is applicable to the western boundary and 8 mAOD for the eastern boundary.
- On the west the proposed leachate level (9 mAOD) will be below the base (10 mAOD) of River Terrace deposits. This means that the level will remain in the Gault Clay except at BH32 which is in the North West corner not affected by the waste deposits.
- The proposed leachate level will be above the piezometric level in Lower Greensand but below the groundwater level in the RTDs except around the seepage area shown by orange line in the southern boundary where the minimum interface level was recorded.
- Other areas of the site where leachate level may be above the interface between Gault Clay and RTD 5 percentile low groundwater level should be used to demonstrate hydraulic containment.
- In addition to the issues discussed and due to the alignment of the site it is recommended that eastern and western boundaries of the site are clearly defined to help us understand the Cells and Phases that are subject to each proposed level.

Leachate Management Infrastructure

NOI (EA): The Leachate Management Infrastructure at the site especially in phase 1 will need looking at given the problem encountered in the past maintaining level below the permitted limit. You need to demonstrate your ability to maintain leachate level and be compliant at all times. The key principle considered by Agency is that all cells and leachate catchment areas affected by higher leachate levels must have adequate engineered containment and leachate drainage and extraction systems to maintain the revised level. We will only accept applications to increase leachate levels where we are satisfied that the leachate extraction and monitoring infrastructure is fit for purpose. Evidence that all the leachate monitoring and extraction infrastructure are fit for purpose should be provided.

HM: The new leachate wells have been put in to the best drilling techniques and are designed with 3m slotted section at the base and are monitoring head of leachate accurately rather than picking up perched leachate. The data from the new monitoring wells shows the leachate level will be below the proposed level.

NOI (EA): The application need to be supported by flow calculations which must demonstrate that the leachate collection system in all affected cells can transport leachate to the extraction sumps.

HM: There is an issue with an old site which was not designed like the rest of the site.

Mat (FCC): The evidence from the 4 new wells show the levels has been consistent.

Roisin (FCC): Levels from old wells have been inconsistent due to unsuitable wells compared to the 4 new wells which have allowed for proper control. Leachate have been controlled at this level since 2018.

NOI (EA): Was any form of flow testing been carried out when the new wells were installed?

HB (FCC): Pumps were immediately installed for leachate extraction. There was pulse counter readings which were not accurate in measuring flow.

NOI (EA): Has the site got a separate monitoring and extraction wells.

HB (FCC): Leachate is extracted from all the 4 new wells and levels are taken after 48 hours. In addition leachate is extracted from all the old wells along with the 4 new wells. All the wells are dipped after 48 hours pump suspension.

NOI (EA): The monitoring methodology needs to be made clear in the application.

HM: Revised Leachate Management Plan will be submitted as part of the application.

HB (FCC): Pump suspension trial was done in 2015 but has not been undertaken since then.

MG (FCC): The 48 hour suspension was the result of the trial in 2015.

Summary of Leachate Management Infrastructure

- Leachate level from old well are inconsistent.
- Leachate level from 4 new well are consistent and time series graphs have shown the levels have been below the proposed level since November 2018.
- The 48 hour pump suspension is based on pump suspension test that was undertaken in 2015.
- There is no separate leachate monitoring and extraction points. Leachate is extracted and monitoring at all wells.

Recommendations

- Provide updated monitoring plan that shows all the locations of monitoring infrastructure. It is noted the 4 new leachate wells are not on the monitoring plan.
- There is reliance on 4 new wells to demonstrate the leachate management infrastructure in Phase 1 are working. Though data has shown the levels are consistent the 4 wells may not be sufficient in maintaining levels across the old phases. It is recommended the application include proposal for additional wells which would be installed along the site perimeter. It is important sufficient and effective leachate monitoring points are installed close to the site perimeter especially around the older phases/cells without basal drainage blanket to ensure any differential rise in levels above the set limits are identified as early as possible.
- The detail of pump suspension test undertaken in 2015 which demonstrated the 48 hour pump suspension prior to level reading is adequate should be provided. If not available FCC should consider undertaking further suspension tests to demonstrate the 48 hour pump suspension is still appropriate.

Ditch Feature Clarification

NOI (EA): Can FCC clarify the function of the ditch feature around the area of Cells 3, 4, 12B and 12C as the report appear to suggest it has potential to compromise cap integrity and the operator's ability to efficiently manage leachate levels given the higher head and bleaches of leachate limits around the area.

HM showed the location of the feature on the site plan and explained the ditch is related to leachate treatment and irrigation that used to go on at the site.

Mat (FCC) confirmed it is no longer in use and will be taken out along with the reed bed prior to restoration.

Sara (EA) asked if the engineering design for it available.

Mat (FCC) confirmed there is but that was long time ago.

Sara (EA): Is any remediation required before restoration occurs.

Mat explained the features will be taken out before restoration soils are put on.

NOI (EA) asked if the feature is affecting leachate management around the area.

Mat (FCC) suggested the data from leachate wells around the area needs to be checked.

HM: It was mentioned in the HRA as something to be aware because it is an unknown design.

Sara (EA) advised that it was raised as a potential preferential route for leachate and work needs to be done in that area to remediate it. This was acknowledged by Helen.

Summary

- Review the leachate wells around the ditch feature to understand its effect on landfill infrastructure and its potential as preferential migration route for leachate.

Seepage Face

NOI (EA) advised the limit and prevent requirement of Water Framework Directive and Groundwater Directive should be demonstrated along the seepage face to show there will be no direct discharge.

HM indicated that is the standard referenced and the confirmed thickness of the barrier is 3m.

NOI (EA) asked if the geotechnical properties of the material used for the retro-installed sidewall barrier was confirmed.

HM: The calculation was based on the minimum it was expected to achieve but detail construction report is not available as the bund is quite old.

NOI (EA) advised that if the construction detail is not available the risk assessment should be based on worst case scenario and parameters used should be as conservative as possible.

HM: The assessment was based on permeability of 1×10^{-9} m/s which is the minimum it would have been required to achieve and could often be lower than that.

NOI (EA): 1×10^{-9} m/s assumes the structure was engineered to CQA standard but if not worst case assumption needs to be made.

Mat (FCC): Before it was accepted by EA it must have met the standard required by the permit which is 1×10^{-9} m/s. The permit would not have been issued if EA thinks it did not meet the landfill directive requirement and this was demonstrated before permit was issued. The seepage assessment relied on the minimum requirement of Landfill Directive.

NOI (EA) asked whether the 3m that was used in the assessment was a figure we have accepted as there was no document to cross-check with. It will be helpful to point us to previous assessment or report where we have considered and accepted the 3m sidewall liner.

Summary

- As part of the application provide a reference document where we have considered and accepted the 3m sidewall liner.

Leachate Migration between Phases/Cells – Intercell Bunds

NOI (EA) asked whether the proposal will mean that leachate will migrate from one Phase to another.

HM: There are 2m dividing walls when the site was designed and the position is that leachate level will overtop the dividing walls.

NOI (EA): The Environment Agency position is that the maximum leachate level must include a justified stand-off to prevent any inter-cell bund overtopping into cells where there would be an impact on groundwater or off-site. For example, if bunds to an adjacent unlined or lesser standard cell or off-site are 3 metres high, the Environment Agency may only accept levels up to 2 metres.

The application needs to include as built drawings showing the elevations of cell base, dividing walls and engineered sidewall to enable us understand the proposed leachate levels in relation to the intercell bunds.

Mat (FCC): The current permitted leachate head is already above the intercell bund and the proposal is on this basis.

NOI (EA) advised that if the level is already above the intercell bund it should be explained properly in the application and the potential impact should be properly considered in the application including any impact on leachate management infrastructure.

Summary

- There are 2m intercell bunds which are already overtopped by the current leachate level.
- The application needs to include as built drawings showing the elevations of cell base, dividing walls and engineered sidewall to enable us understand the proposed leachate levels in relation to the intercell bunds.
- The potential impact of leachate mixing between the new cells and older phases should be considered in the application. As the site accepted hazardous waste until 2005 the implication on leachate mixing should be considered. A review and comparison of leachate quality between the new and older phases is recommended.

Other reports and assessments to be included in the application

Revised Landfill Gas Risk Assessment – You need to provide a review of the LFGRA in support of the application to increase the leachate level limits at the site. In the event that leachate head compliance limits are increased at the site the operator must ensure that gas may continue to be abstracted from all areas of the site in order to maximise collection efficiency and prevent fugitive gas emissions through the site surface or via lateral migration.

An assessment of the depth of unsaturated waste from which landfill gas may be abstracted by the existing landfill gas system must be submitted. This must include a survey of all abstraction wells and identify the length of slotted pipework above the proposed leachate compliance limit(s) available for abstraction at each well location.

The survey data must be presented on an abstraction system layout drawing and in tabular form. The assessment must calculate the new zones of influence for each well and identify any locations where increasing leachate heads to the proposed compliance limit(s) could prevent gas from being effectively abstracted due to saturation of a well's slotted response zone.

Where necessary proposals to prevent a reduction in the abstraction efficiency of a gas well shall be presented, e.g. a reduction in the proposed leachate head compliance limit, or installing new gas wells with a longer unsaturated response zone.

Revised Stability Risk Assessment - Your proposed leachate levels must not have a negative impact on the stability of the basal liner, cap, waste, or leachate and landfill gas infrastructure. You must confirm this with stability and settlement risk assessments.

Leachate Well Description - A table clarifying which wells are original or retro-drilled wells, or which wells are single purpose, dual purpose, extraction or solely leachate level monitoring should be provided.

FCC confirmed the re-drilled wells are denoted by an 'R' and the details will be included in the Revised Leachate Management Plan.

NOI (EA): The key to agreeing to any proposal to increase leachate is the demonstration that leachate can be effectively managed to the proposed level across the whole site and there is adequate infrastructure in place to do that. The landfill must not be having impact on groundwater. Where this is not demonstrated to our satisfaction we may refuse or impose improvement condition requiring further work to be undertaken.

HM: Recent wells at the site were installed using the best technique and were drilled to the base level unlike the older technique that stopped above the base level. A table of levels which demonstrated this can be provided.

Revisions to the designated leachate monitoring wells

FCC indicated there is huge amount of monitoring points including retro drilled wells (over 60 wells) at the site and part of the proposal is to see if the amount of leachate quality monitoring at the site can be reduced in some wells. Level monitoring will continue across all wells.

NOI (EA): This may not be a problem as long as it is demonstrated representative leachate quality can continue to be taken across the site in line with our guidance LFTGNO2.

5th Percentile Minimum leachate level – In terms of hydraulic containment EA confirmed this is the level we may be comfortable with if it is demonstrated there is at least 1m factor of safety.

Revised Model Input Parameters – The application should include a table that compares the input parameters in this HRA with those in 2015 HRA with justification and explanation for any change.

HM: The models are different and may not be comparable but a summary of what has changed will be provided.

Raw data in excel format, models and results – Excel copies of all the monitoring should be provided as part of the application as well models and results. The application should also include the PDF copies of the model results.

Waste Tonnages

FCC want to increase the annual waste input into the landfill from 150,000 to 250,000 tonnes per annum. The increase in tonnage is in relation to disposal activity.

HM: What does EA need to see before the request could be approved?

EA recommendations:

- Updated Gas Risk Assessment & Management Plan - An increase in annual tonnages at a non-hazardous site would have the effect of increasing the peak gas production rate. An increased peak gas flow would need to be reconsidered in the gas management plan as it could require an increase in engine/flare capacity in the short term as such this would also trigger a review of the air dispersion model. In addition zonal gas well coverage to ensure there are no gaps in the gas extraction system need to be addressed. In summary we will expect an update the gas risk assessment and management plan to assess the impact of increasing the annual waste input into the landfill from 150,000 to 250,000 tonnes per annum on gas production.

Mat (FCC): The site operation is in the final cell and the peak gas production occurred 10 years ago.

NOI (EA): Supporting evidence needs to be provided as part of the application to explain the gas situation at the site and show the tonnage increase will not have impact on gas management infrastructure.

FCC thinks the remaining void space is 204,000 tonnes but will need to be confirmed.

- **Revised Environmental Risk Assessment** – EA indicated the increase could potentially increase the emission of odour and given the expected increase in vehicle movement could also increase the noise and dust emissions from the site. The initial recommendation is for revised Environmental Risk Assessment to be included in the application.

Action: EA will get a permitting officer to confirm what other documentary evidence needs to be supplied in support of the increase waste tonnages.

EA Response: Revised Environment Risk Assessment will be required in support of the application to address potential increase in emissions of odour, noise and dust from the site.

Restoration

HM asked to know if the proposed increase in annual tonnage will also include restoration material.

SK (EA) confirmed that restoration waste tonnage and non-hazardous waste tonnage are separate in permit table S1.5.

HM asked whether the change to the table will require amending the restoration plan.

SK (EA) thinks the restoration plan may need changing but will need to confirm with a Permitting Officer.

Action: EA to confirm whether changing the restoration waste tonnage will need to be done as part of the variation or separately.

EA Response: Yes, because the original RvD assessment will have been carried out based on the minimal amount of material required for the recovery activity (if no RvD assessment carried out previously then we will require one as part of this application). So any change to the tonnage will require a new RvD assessment in accordance with a variation application.

New Perimeter Boreholes in relation to A14 Road Expansion.

Due to changes in the adjacent road structure (A10 & A14) and ongoing discussions between EA, Highways and FCC, a number of perimeter wells both GW and Gas will need to be changed for the replacement boreholes. This has been subject to ongoing discussion and investigation over the last 4 years and replacement boreholes have been agreed as part of these discussions (a number of old boreholes will be within the road so there is no choice but to remove them).

Actions for EA:

- If FCC supply the records of agreement from the EA will this be sufficient (no additional technical assessment needs to be made)

EA Response: In addition to record of agreement FCC will need to provide updated site plan showing the proposed locations of the new boreholes. The installations will be in accordance with the Landfill Engineering conditions in the permit.

- With regards to applying trigger limits, would this be through the inclusion of a IC to include the requirement for 12 months of data before setting triggers?

EA Response: If baseline data is not available at the time of the application EA will impose improvement condition requiring baseline data to be collected in order to derive emission limit values.

Perimeter boundary

As a result of the above road works, the permit boundary will need altering to surrender an aspect which will fall outside of FCC's control. In order to undertake the installation of new infrastructure and allow the road works, FCC/Highways were required to undertake some investigation works including trial pitting to confirm edge of waste. This has all been assessed by Area GWCL and therefore this should be a simple surrender of unfilled land.

Actions for EA:

- If FCC supply the reports and agreements, is there anything further that is required for submission?
- Can this partial surrender be completed under this variation or does it need to be completed separately?

EA Response: The operator will need to complete application form, part E2 (2a - tick that this is a low risk surrender and provide evidence to confirm that operations have not commenced) and submit with the application along with the additional fee (£770) - and then it can be done at the same time.

Boreholes BH17 & BH19

The data from these boreholes are not included in the revised HRA. This needs to be addressed in the application.

Surface Water Discharge

Following the meeting the Operator also raised that they are just about to build their surface water scheme and requested:

Actions for EA:

- Confirmation as to whether the installation of this scheme requires a variation.

EA Response: The SWMP will need to be submitted to the Agency for assessment as part of the variation application.

- Whether they need to apply for discharge consent within the permit.

EA Response: Discharge consent is required if the discharge is from a point source/s. We would need to know what the emission contained (and if more than one source - e.g. surface water and groundwater – which would need to be separated) and whether it is contaminated or uncontaminated. If it is likely to be contaminated, then we will require a risk assessment to determine whether any limits are required in the permit. We would also need to know about how it is intended to discharge the run-off and what monitoring is proposed.

Variation Fee

Mat (FCC) asked to know what level of fee that will be required.

NOI (EA) base on the latest charging guidance it will depend on the number of changes, risk assessments involved and hours of work involved. The minimum will be normal variation but will likely go up to substantial when we know the detail of the changes.

Mat (FCC) pointed out that based on discussions there will be:

- Revised HRA
- Revised GRA
- Revised Environmental Risk Assessment
- Revisions to perimeter boreholes and
- Partial surrender.

Action: EA to confirm the variation fee and produce summary of discussions as well as confirmation of required supporting documents.

EA Response: The normal variation fee is £11,388; Partial surrender fee is £770; Habitat assessment £779.

Total fee = £11,388 + £770 + £779 = £12,937.00

Note: There are additional assessment charges if the variation means that 'Odour management plan' and 'Noise and vibration management plan' would be required.

Odour management plan assessment: £1,246

Noise and vibration management plan assessment: £1,246.

AOB

HM asked if there is chance of the proposed changes being accepted in view of the discussions we've had.

NOI (EA): As long as all our concerns are addressed in the application we will expect the proposed changes to be accepted. The key is demonstrating your ability to manage leachate across the whole

site to the proposed level. You need to expand on the reason for increasing the leachate and not just focus on avoiding non-compliance. This gives the impression the operator is struggling to manage leachate head and may not be able to manage at higher level.

Draft HRA Review

Conceptual Hydrogeological Site Model -

Groundwater Level – The development of the Conceptual Hydrogeological Model relied so much on average groundwater level which is not considered very conservative. The use of average level will distort the result because it ignores the impact of the inevitable variations and uncertainties. To account for these variation we will recommend the assessment be based on minimum groundwater level or 5th percentile minimum level for each monitoring point. This level should be indicated on the cross section presented in Figures 2 to 5.

Borehole Logs (Thickness of River Terrace Deposit) – It was stated under section 1.2.2 of the draft HRA that *“It has been stated in previous reports that the thickness of River Terrace deposits reached 6.7m. This appears to be based on the borehole log for BH14, where the base of the River Terrace is 6.7m below ground level (bgl), however, the borehole encounters a 5.3m thickness of fill and the ground level recorded for the borehole is elevated more than 3m above surrounding ground level.”*

This statement appear to differ from the 2015 HRA review report. It was stated under Section 6 of the 2015 HRA review that *“Based on the geological interpretation from available borehole logs for the groundwater monitoring boreholes (Table A7.2) the depth of the interface between the River Terrace Gravels and Gault Clay has been reviewed. As summarised in Table A7.4 below the elevation of the interface is variable across the site with a minimum elevation of 6.76mAOD recorded in groundwater borehole BH08. The other groundwater monitoring boreholes all record an elevation of 8.29mAOD or greater.”* This report contain no reference to BH14.

If available the copy of BH14 log should be provided as part of the application.

Table A7.4: Interface of River Terrace Gravels and Gault Clay (HRA 2015)

Phase	Monitoring Point	Interface between River Terrace Gravels and Gault Clay (mAOD)
Phase III	W03	9.57
Phase III	W04	9.69
Phase III	W05	8.29
Phase III	W06	9.80
Phase III	W07	10.92
Phase II	BH08	6.76
Phase I	BH12	12.89
Phase III	BH21	8.98
Phase III	BH38	12.39
Phase III	BH42	10.45
Phase II / III	BH46	10.13

Reference reports – some reports referenced in the draft HRA review should be provided. For example it stated in section 1.2.4 that *“Phase I had no original sidewall liner. It is reported that in 1996 a retrospective side wall liner / cut off wall was installed along the northern, eastern and southern boundaries. The wall was engineered to a maximum permeability of 1 x 10-9 m/s and a thickness of 1m against the Gault Clay and 3m against the River Terrace / Drift deposits.”* The report reference for this construction or evidence of construction should be provided.

Receptors (Section 1.2.6) – This section of the report made reference to surface water discharge point shown on the plan 653M282. The surface water discharge point is not clearly labelled on the site monitoring plan. There are discharge points but it is not clear what is discharged at the points.

Groundwater Quality (Section 1.2.7, Tables 8 & 9) – The excel copy of groundwater quality data summarised in these tables should be provided. The analysis made several references to UKDWS. We will expect the monitoring data to be reviewed against the baseline groundwater quality.

Review of Technical Precautions – It was stated in section 2.4.2 that the details of basal lining in Phase I and earlier cells of Phase II are unknown. This statement represents a huge uncertainty. It should be explained how the risk assessment has addressed this uncertainty as further increase in leachate level within these Phases may not be appropriate.

It was further stated the Phase I was initially unlined, however, an engineered cut-off wall/side wall liner was retrospectively put in place during 1996 along the northern, eastern and southern perimeter. It is however unclear whether the cut-off wall was engineered to CQA standard. We expect conservative assumptions to be made about the hydraulic properties of the cut-off wall.

Leachate drainage (Section 2.4.3) – It was stated that Phase I and the earlier cells of Phase II to Cell5a, are understood not to have a basal leachate drainage system, as reported in the 2015 HRA. However, all Phases have a large number of leachate wells retrospectively fitted and kept under constant review for effectiveness. During 2018 an additional number of wells were installed within Phase I. Evidence need to be provided to shown that leachate levels can be effectively managed across these Phases and Cells.

Leachate Levels Proposal (2.4.5.) – It was suggested in section 2.4.5 that the main reason for the leachate level review is to avoid non-compliance scoring during periods of maintenance and in instances in Phase I where new wells are being brought in to use. It will be helpful to expatiate on why the leachate level needs to be increased in order to avoid non-compliance. If leachate level cannot be effectively managed at the current level there is no guarantee it will be managed efficiently at higher level.

It was further stated in the majority of Phase III the base of the River Terrace/Drift deposits is around 9m AOD, or higher to the west. It is then proposed to raise leachate levels in Phase III to 9mAOD.

Table A7.4 in 2015 HRA Review report the minimum depth to interface between River Terrace Gravels and Gault Clay is 8.29 mAOD north east of the site at W05.

The report further stated there will be very low or negative hydraulic gradient acting across the sidewall liner from the leachate source if raised to 9 mAOD.

The average groundwater level in BH38 north west of the site is 7.73 mAOD as shown in Table 5 of the HRA. We note your comment that BH38 and BH42 are discounted from the calculation as they appear to be influenced by landfill construction activities: the River Terrace/Drift is dewatered in BH38 and also some of the time in BH42 and therefore, the measured groundwater levels sit within the Gault Clay. The application need to include some actions that will be taken in future when waste deposit reaches this area of the site.

It is noted the groundwater levels from BH17 and BH19 are not included in all the considerations. We consider that groundwater level data from these points should be included given their use as compliance points.

FCC further noted that in the east of the site the average groundwater levels in the River Terrace Deposits are around 8m AOD which could mean an average head of 1m acting outwards across the sidewall liner, which is 3m thick around Phase I and 1m thick around Phase II, if leachate was raised to a similar level. FCC however proposed to raise leachate levels to 8m AOD in Phase I and II and indicated that there will be no change to cells with higher bases where higher cell-specific leachate compliance limits have previously been agreed.

Our view remains setting leachate level limit using average groundwater level and without headroom will not guarantee hydraulic containment within the site.

Table 5: Groundwater levels BH series boreholes

	BH08	BH12	BH16	BH20	BH21	BH23	BH30	BH38	BH42
Min	6.02	5.81	5.63	6.23	3.06	1.26	4.2	0.91	2.95
Max	10.92	11.87	10.21	11.49	11.16	10.67	10.75	11.31	12.26
Average	8.55	7.89	8.22	9.90	9.83	9.51	9.67	7.73	9.23
GWL 5/3/2008	8.66	8.08	8.41	10.7	10.25	10.25	10.05	7.72	8.31

Table 10: Groundwater Level Review: eastern River Terrace Deposits

Borehole Log	Location	Nearest monitoring BH	Low groundwater level (5th percentile)	High groundwater level (95th percentile)	Average groundwater level
W05	NE	BH30	9.2	10.27	9.69
BH25	NE	BH30	9.2	10.27	9.69
BH21	Central	BH21	8.5 bRTD	10.83	9.86
BH12 /	E	BH12	7.43	9.01	7.91
BH4,5,6,8	S	BH8	8.18	9.11	8.55

bRTD – measured groundwater level is below base of River Terrace Deposits

Leachate Quality - For the assessment to be conservative you need to use the maximum leachate concentration and not the average.

Contaminant Concentrations in River Terrace Deposits – Where there is no emission limit set for a determinand we recommend that comparison be made against baseline groundwater quality to ensure the proposed limit will not lead to rising upward trend in concentration of mecoprop in groundwater.

2.5. Quantitative Assessment

Leachate Head vs Piezometric Surface - To ensure the assessment is conservative minimum piezometric surface should be used. We do not agree with the conclusion that an assessment of a leachate head of 3m in Phases III represents a conservative assessment. Leachate level is not static during wetter period. The assessment is neither based on minimum piezometric level nor minimum groundwater level. Hence the assessment is not conservative.

2.5.2. Leachate Quality - It was recommended that the number of leachate quality sampling points is reduced. It needs be made clear that the affected points will continue to be monitored for level.

2.5.3. Revised Model Input Parameters - provide a table that compares the input parameters in this HRA with those 2015 HRA with justification and explanation for the change.

The application to increase leachate head need to contain suitable site specific drawings, as-built drawing(s) and cross-sections which show:

- i. landfill cells affected/relevant to the application and their spatial setting of the site relative to the environment(s) which surround the site.
- ii. as built and scaled diagrammatic representation of the conceptual hydrogeological site model identifying the potential emissions to groundwater/surface water (SOURCE), routes for leachate to enter these (PATHWAY(S)), what could be affected by leachate leaking to groundwater/surface water (RECEPTOR).
- iii. basal and sidewall engineering elevations of the landfill cells subject to the proposal.
- iv. top and bottom elevations of the landfill engineering infrastructure, landfill cell(s) basal and sidewall elevation heights including monitoring infrastructure for leachate; landfill gas; and groundwater, as relevant.
- v. Groundwater elevations.

- vi. Monitoring and leachate management infrastructure, as relevant.
- vii. The level of the top of the waste for disposal and the top of the restoration layer, clearly differentiated.

Revised Leachate Management Plan (LMP) – You will need to provide updated Leachate management plan in support of the application. This should include clear presentation of:

- a) proposed leachate compliance levels;
- b) proposed site-specific action levels below the proposed compliance limits;
- c) review of the suitability of leachate collection, extraction and monitoring infrastructure;
- d) detail of how leachate will be managed at the proposed higher levels;
- e) detail of how leachate elevations management reflects:
 - a. leachate pumping or extraction rates and volumes;
 - b. water balance calculations, or equivalent;
 - c. relationship with leachate recirculation where this takes place at a site.
- f) proposed actions as a result of:
 - a. operational problems/failure;
 - b. abnormal/unexpected changes in leachate level;
 - c. extreme weather events;
 - d. leakage/spillage of leachate; and
 - e. Impacts to controlled waters

Other Issues to be addressed

- All cells and leachate catchment areas affected by higher leachate levels must have adequate engineered containment and leachate drainage and extraction systems to maintain the revised level. We will only accept applications to increase leachate levels where we are satisfied that the leachate extraction and monitoring infrastructure is fit for purpose. Evidence that leachate monitoring infrastructure is fit for purpose should be provided.

Application should include proposal for overcoming the difficulty in maintaining leachate level in the earlier part of the site. The following comment in section 2.4.5 of the HRAR suggests higher leachate levels within the earlier Phases may not be appropriate because of lack of infrastructure to maintain levels “*There has been difficulty in maintaining leachate levels constantly below the compliance level in earlier parts of the site. This is most likely due to a lack of basal drainage in this part of the site.*”

- Your proposal must be supported by flow calculations. These must demonstrate that the:
 - leachate collection system in all affected cells can transport leachate to the extraction sumps
 - an increase in leachate head will not result in the failure of the leachate management system
 - an increase in leachate head will not result in the failure of the leachate management system
- You must show that your ability to manage landfill gas will not be compromised.
- You must design leachate extraction, monitoring and treatment infrastructure to manage landfill gas emissions.
- Provide programme of monitoring to confirm that the leachate extraction infrastructure can maintain the proposed leachate level across the whole leachate catchment area.

Assessments to be included in the application:

- Leachate levels (current and proposed) vs. minimum groundwater heads vs rainfall – across the same time series. – Where required this must demonstrate that the site will be compliant with the proposed leachate level all year round. This assessment should include consideration of rebound levels of groundwater around the area of the site affected by dewatering activities.

- Base on table 'Table 10 – Groundwater Level Review' of the HRA it was concluded that 'the leachate level of 8 mAOD in the northeast of the site would be hydraulically contained' (pdf page 34/50). This conclusion is not based on the proposed leachate level of 9 mAOD proposed for the northern boundary of the site. The northern boundary should be assessed against the proposed leachate level of 9 mAOD.
- Show that the site will be hydraulically contained in all phases and Cells – The area of lateral seepage defined at BH12 & BH 14 south east of the site gives the impression the proposed level will cause Phase 1 to be out of containment. This may be contrary to the requirements of the Environmental Permitting Regulation (England and Wales) Regulations 2016 (EPR), Water Framework Directive (WFD) and the Groundwater Directive (GD):
 - to prevent the input of any hazardous substances to groundwater, and
 - to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.
 It needs to be clearly and unambiguously demonstrated how this proposal will achieve the above requirements of the EPR, WFD and GD.
- Leachate head elevation levels vs groundwater quality trends vs groundwater levels – Include the comparison of leachate levels against groundwater quality trend.
- Leachate head elevation levels relative to landfill site engineering should be included.
- The HRA must show there is no evidence of groundwater pollution.

Useful reference documents and guides:

1. [Landfill Developments: Groundwater Risk Assessment for Leachate](#)
2. [Groundwater risk assessment for your environmental permit](#)
3. [LFTGN02 Monitoring Guidance](#)
4. [Landfill operators: environmental permits - How the Environment Agency makes decisions on landfill engineering](#)
5. [Landfill operators: environmental permits - Design and build your landfill site](#)
6. [How to comply with your environmental permit Additional guidance for: Landfill \(EPR 5.02\)](#)
7. [Environmental permitting: landfill sector technical guidance](#)
8. [Contaminant fluxes from hydraulic containment landfills: a review](#)
9. [How to surrender your environmental permit](#)
10. [Variation Application forms – Parts A, C2, C3 and F1](#)
11. [Surrender Application Forms – Parts A, E2 and F1](#)
12. [Environmental permitting: H5 Site condition report](#)

Completed by:	Nnaemeka O Iloani	Date:	06/10/2020
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Part C: Follow-up Discussions / Assessment

<Complete if further pre-app has been requested and reviewed>

Assessment Required	
Supporting Documents	
<Insert details of discussions and advice given>	
Completed by:	Date:

Annex <Insert emails / additional correspondence>



This form will report compliance with your permit as determined by an Environment Agency officer

Site	Milton Landfill EPR/BV4584IU		Permit Ref	BV4584IU	
Operator/ Permit holder	East Waste Limited				
Date	01/09/2020		Time in		Out
What parts of the permit were assessed	CQA Plan for Borehole Replacement Works				
Assessment	Report/data review	EPR Activity:	Installation X	Waste Op	Water Discharge
Recipient's name/position	Roisin Bennett				
Officer's name	Sarah Hartley Kent		Date issued	01/09/2020	

Section 1 - Compliance Assessment Summary

This is based on the requirements of the permit under the Environmental Permitting Regulations (EPR). A detailed explanation and any action you may need to take are given in the "Detailed Assessment of Compliance" (section 3). This summary details where we believe any non-compliance with the permit has occurred, the relevant condition and how the non-compliance has been categorised using our [Compliance Classification Scheme](#) (CCS). CCS scores can be consolidated or suspended, where appropriate, to reflect the impact of some non-compliances more accurately. For more details of our CCS scheme, contact your [local office](#).

Permit Conditions and Compliance Summary			Condition(s) breached
a) Permitted activities	1. Specified by permit	A	
b) Infrastructure	1. Engineering for prevention & control of pollution	A	
	2. Closure & decommissioning	N	
	3. Site drainage engineering (clean & foul)	N	
	4. Containment of stored materials	N	
	5. Plant and equipment	N	
c) General management	1. Staff competency/ training	N	
	2. Management system & operating procedures	A	
	3. Materials acceptance	N	
	4. Storage handling, labelling, segregation	N	
d) Incident management	1. Site security	N	
	2. Accident, emergency & incident planning	N	
e) Emissions	1. Air	N	
	2. Land & Groundwater	N	
	3. Surface water	N	
	4. Sewer	N	
	5. Waste	N	
f) Amenity	1. Odour	N	
	2. Noise	N	
	3. Dust/fibres/particulates & litter	N	
	4. Pests, birds & scavengers	N	
	5. Deposits on road	N	
g) Monitoring and records, maintenance and reporting	1. Monitoring of emissions & environment	N	
	2. Records of activity, site diary, journal & events	N	
	3. Maintenance records	N	
	4. Reporting & notification	A	
h) Resource efficiency	1. Efficient use of raw materials	N	
	2. Energy	N	

KEY: C1, C2, C3, C4 = CCS breach category (*suspended scores are marked with an asterisk),
A = Assessed (no evidence of non-compliance), N = Not assessed, NA = Not Applicable, O = Ongoing non-compliance – not scored
MSA, MSB, TCM = Management System condition A, Management System Condition B and Technically Competent Manager condition which are environmental permit conditions from Part 3 of schedule9 EPR (see notes in Section 5/6).

Number of breaches recorded	0	Total compliance score (see section 5 for scoring scheme)	0
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If the Total No Breaches is greater than zero, then please see Section 3 for details of our proposed enforcement response

Section 2 – Compliance Assessment Report Detail

This section contains a report of our findings and will usually include information on:

- the part(s) of the permit that were assessed (e.g. maintenance, training, combustion plant, etc)
- where the type of assessment was 'Data Review' details of the report/results triggering the assessment
- any non-compliances identified
- any non-compliances with directly applicable legislation
- details of any multiple non-compliances
- information on the compliance score accrued inc. details of suspended or consolidated scores.
- details of advice given
- any other areas of concern
- all actions requested
- any examples of good practice.
- a reference to photos taken

This report should be clear, comprehensive, unambiguous and normally completed within 14 days of an assessment.

Updated CQA Plan 3, revision C05, for Groundwater Well Replacement submitted on 17 August 2020.

The CQA Plan addresses issues raised and is approved. Please ensure CVs of CQA Inspectors are provided for approval a week in advance of any works commencing.

Section 3- Enforcement Response

Only one of the boxes below should be ticked

You must take immediate action to rectify any non-compliance and prevent repetition.

Non-compliance with your permit conditions constitutes an offence* and can result in criminal prosecutions and/or suspension or revocation of a permit. Please read the detailed assessment in Section 2 and the steps you need to take in Section 4 below.

**Non-compliance with MSA, MSB & TCM do not constitute an offence but can result in the service of a compliance, suspension and/or revocation notice.*

Other than the provision of advice and guidance, at present we do not intend to take further enforcement action in respect of the non-compliance identified above. This does not preclude us from taking enforcement action if further relevant information comes to light or advice isn't followed.

In respect of the above non-compliance you have been issued with a warning. At present we do not intend to take further enforcement action. This does not preclude us from taking additional enforcement action if further relevant information comes to light or offences continue.

We will now consider what enforcement action is appropriate and notify you, referencing this form.

Section 4- Action(s)

Where non-compliance has been detected and an enforcement response has been selected above, this section summarises the steps you need to take to return to compliance and also provides timescales for this to be done.

Criteria Ref.	CCS Category	Action Required / Advised	Due Date
See Section 1 above			

Section 5 - Compliance notes for the Operator

To ensure you correct actual or potential non-compliance we may

- advise on corrective actions verbally or in writing
- require you to take specific actions in writing
- issue a notice
- require you to review your procedures or management system
- change some of the conditions of your permit
- decide to undertake a full review of your permit

Any breach of a permit condition is an offence* and we may take legal action against you.

- We will normally provide advice and guidance to assist you to come back into compliance either after an offence is committed or where we consider that an offence is likely to be committed. This is without prejudice to any other enforcement response that we consider may be required.
- Enforcement action can include the issue of a formal caution, prosecution, the service of a notice and or suspension or revocation of the permit.
- A civil sanction Enforcement Undertaking (EU) offer may also be available to you as an alternative enforcement response for this/these offence(s).

See our Enforcement and Civil Sanctions guidance for further information

**A breach of permit condition MSA, MSB & TCM is not an offence but may result in the service of a notice requiring compliance and/or suspension or revocation of the permit.*

This report does not relieve the site operator of the responsibility to

- ensure you comply with the conditions of the permit at all times and prevent pollution of the environment
- ensure you comply with other legislative provisions which may apply.

Non-compliance scores and categories

CCS category	Description	Score
C1	A non-compliance which could have a major environmental effect	60
C2	A non-compliance which could have a significant environmental effect	31
C3	A non-compliance which could have a minor environmental effect	4
C4	A non-compliance which has no potential environmental effect	0.1

Operational Risk Appraisal (Opra) - Compliance assessment findings may affect your Opra score and/or your charges. This score influences the resource we use to assess permit compliance.

MSA, MSB & TCM are conditions inserted into certain permits by Schedule 9 Part 3 EPR

MSA requires operators to manage and operate in accordance with a written management system that identifies and minimises risks of pollution.

MSB requires that the management system must be reviewed, kept up-to-date and a written record kept of this.

TCM requires the submission of technical competence information.

Section 6 – General Information

Data protection notice

The information on this form will be processed by the Environment Agency to fulfill its regulatory and monitoring functions and to maintain the relevant public register(s). The Environment Agency may also use and/or disclose it in connection with:

- offering/providing you with its literature/services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, local authorities) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving its service
- Freedom of Information Act/Environmental Information Regulations request.

The Environment Agency may pass it on to its agents/representatives to do these things on its behalf. You should ensure that any persons named on this form are informed of the contents of this data protection notice.

Disclosure of information

The Environment Agency will provide a copy of this report to the public register(s). However, if you consider that any information contained in this report should not be released to the public register(s) on the grounds of commercial confidentiality, you must write to your local area office within 28 days of receipt of this form indicating which information it concerns and why it should not be released, giving your reasons in full.

Customer charter

What can I do if I disagree with this compliance assessment report?

You must notify your local officer within 28 days of receipt if, you wish to challenge any part of this compliance assessment report. If you are unable to resolve the issue with your site officer, you should firstly discuss the matter with the officer's line managers. If you wish to raise your dispute further through our official [complaints](#) and Commendations procedure, phone our general enquiry number 03708 506 506 (Mon to Fri 08.00–18.00) and ask for the [customer contact](#) team or send an email to enquiries@environment-agency.gov.uk. If you are still dissatisfied, you can make a complaint to the Ombudsman. For advice on how to complain to the [Parliamentary and Health Service Ombudsman](#), phone their helpline on 0345 015 4033.

APPENDIX 2
CQA Documents for Replacement Boreholes

A14 Cambridge to Huntingdon Improvement Scheme

Milton Landfill – CQA Plan 3- Groundwater Well Replacement

Status: Issued For Construction

13 August 2020

much more than a road

Working on behalf of

Notice

This report was produced by IDT for Highways England for the specific purpose of the A14 Cambridge to Huntingdon Improvements Scheme.

This report may not be used by any person other than Highways England without Highways England's express permission. In any event, IDT accepts no liability for any costs, liabilities or losses arising as a result of the use of or reliance upon the contents of this report by any person other than Highways England.

Document History

PROJECT NUMBER: HA528983			DOCUMENT REF: HA528983-ACJV-HGT-S5_CQA-RP-C-0004			
C05	Updated with comments from EA/FCC	NC	DM	DM	DM	13/8/2020
C04	Appendix 26/7 and drawing HA528983-ACJV-HGN-S5_ML-SK-C-0017 updated	NC	DM	DM	DM	29/6/2020
C03	Borehole reference numbers updated as requested by FCC. Referencing to Spec Appendix 26/6 and Appendix 26/7 updated.	NC	DM	DM	DM	01/05/2020
C02	Details for borehole ID755 updated	NC	DM	DM	DM	20/04/2020
C01	For Construction	TB	NC	DM	GJ	13/02/2020
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

Table of contents

Chapter	Pages
1. Introduction	6
2. Overview of Milton Landfill (History)	6
3. Limitations	7
4. Summary of the A14 IDT ground truthing (trial pitting)	8
5. Proposed Works	10
6. Purpose of this CQA Plan 3	11
7. CQA inspected operations	11
7.1. Introduction	11
7.2. Roles of Construction Quality Assurance Engineer	11
7.3. Competency	12
7.4. Methodology - determination and checking of well locations and installation depths	12
7.5. Protocol (General)	12
7.6. Documentation and CQA report	14
Appendix A. Construction Drawings	15
Appendix B. J2A logs and BH12	16
Appendix C. CQA Verification Report	17
Appendix D. RAMS Document HE528983-IDT-HSE-S5-GEN-MST-W-00160	18
Appendix E. Appendix 26/6 Groundwater Monitoring Well Replacement, Milton Landfill	19
Appendix F. Appendix 26/7 Well Modification Works, Milton Landfill	20

Client signoff

Client	Highways England
Project	A14 Cambridge to Huntingdon Improvement Scheme
Document title	Milton Landfill – CQA Plan 3 - Groundwater Well Replacement
Project No.	HA528983
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PCF Stage	

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1. Introduction

The existing A14 eastbound off-slip at Milton Junction bounds the south-east corner of the Milton Landfill Site. The Milton Landfill Site operator is East Waste Limited which is a wholly owned subsidiary of FCC Environment (UK) Limited. The site has nine wells (references BH-W01, BH05, BH06, BH07, BH08, BH10, BH11, BH12 and BH13) used for monitoring purposes along that boundary and which are in the vicinity of the A14 Cambridge to Huntingdon improvement scheme (A14 scheme) works. Some of those wells are affected by the proposed re-alignment of the A14 eastbound off-slip and the A10 at Milton Junction. Wells BH-W01 and BH12 require replacement at new locations; the replacement wells will be referred to as BH-W01R and BH12R respectively. Wells BH10, 11 and 12 require modification to their headworks.

The monitoring of the wells for gas and groundwater quality is a condition of FCC's permit for the operation of the landfill site. The availability of wells for gas and groundwater monitoring has, therefore, to be maintained. The existing junction layout, the existing well locations and relevant landfill site boundaries are shown on Drawing No. HA528983-ACJV-HGN-S5_XX-DR-C-0001 – Section Location Plan, Section 5, Milton Junction Location (Appendix A refers).

In October 2019 prior to commencement of A14 scheme construction a ground truthing trial pit investigation was undertaken to confirm the absence or otherwise of landfill, capping or other infrastructure associated with the landfill site in the services corridors and below the proposed A14 scheme permanent works, described in Section 4. That investigation was undertaken under a Construction Quality Assurance (CQA) Plan (referenced HA528983-ACJV-HGT-S5_CQA-RP-C-0001).

This CQA Plan 3 describes the processes and operations required for the construction of the two groundwater replacement wells, which are also referenced in CQA Plan 2 for the modifications to several of the existing wells. Specification Appendix 26/6 (Groundwater Monitoring Well Replacement, Milton Landfill) refers to the installation of the two replacement wells and Specification Appendix 26/7 (Well Modification Works, Milton Landfill) refers to the modification of the existing wells, copies included in Appendix E and Appendix F respectively.

This document has been produced by the A14 Integrated Delivery Team (IDT) which is a collaboration between the designers Atkins – CH2M Joint Venture (ACJV) and the Contractors Joint Venture (CJV) undertaking scheme construction.

2. Overview of Milton Landfill (History)

As part of the scheme handover to the IDT at detail design stage, the IDT was provided the following documents by Highways England and J2A (Jacobs, Aecom and Arup Joint Venture, that took the scheme through its design development stage), which were reviewed to inform the development of this CQA Plan:

- Waste Recycling Group (2003). Milton Landfill PPC Application Volumes 1 to 3 PPC Application, Ref 03523331
- FCC Environment (2013). Milton Landfill Leachate Management Plan Permit BV4584IU, variation WP3237LF version 4 December 2013.
- J2A (November 2014). Construction Quality Assurance Plan, Additional ground investigation at Milton landfill A14-JAC-ZZ-XX-RP-V-00088.
- J2A (March 2015) Construction Quality Assurance Validation Report A14-JAC-ZZ-XX-RP-V-00142.

Milton Landfill Site was developed from a number of disused clay pits excavated during the 1970s. It has accepted waste since the 1980s, including hazardous waste which was received until 2004. It has been developed in three Phases to date.

Phase 1 was developed as a single large cell. Phase 2 comprised several smaller cells (Cells 1 to 10, refer to Figure 1). Phase 3 lies to the north of Phase 2 and is not affected by the A14 scheme works.

Both Phases 1 and 2 are underlain by Gault Clay. Boreholes sunk in the surrounding area were reported to encounter River Terrace Deposits overlying the Gault Clay. The cells of these phases are naturally contained by a basal geological barrier comprised of in situ Gault Clay. Both Phase 1 and 2 were restored with a 1m thickness of engineered, low-permeability clay cap, overlain by restorations soils comprising, anecdotally, 800mm of subsoil overlain by 300mm of topsoil.

Previous investigations completed around the perimeter of the landfill site proved the presence of River Terrace Deposits around the site, thickening in the west (ref exploratory hole records dated 1990 and 1992 prepared by Peter Scott Consultant Engineering Geologist within the Waste Recycling Group, PPC Application Ref 03523331, 2003 (Ref 1)).

Both Phase 1 and Phase 2 were permitted to accept hazardous, special, liquid, putrescible, inert, commercial and industrial wastes. The Phase 1 Cell and Phase 2 Cells 1 to 5a inclusive are naturally contained by a basal geological barrier which comprises in situ Gault Clay without use of any engineered basal lining system.

Since 1991 cell construction has been subject to CQA procedures and engineered basal lining system(s) have been installed. In Phase 2, Cell 6 and subsequent cells, a 1m thick low permeability engineered clay liner has been placed to the base. Where a cell wall lies against Gault Clay deposits, the engineered lining is reported to be 1m thick and where it lies against River Terrace Deposits, it is reported to be 3m thick.

In 1996 a clay sidewall liner was retrospectively installed in part within Phase 1 and was keyed into the perimeter clay bunds of Phase 2 and Phase 3 to assist with leachate management.

The nine monitoring wells around the boundary of the landfill site were drilled and installed in 1990 and 1992. Some of the exploratory hole logs were available for review within the Permit application (Waste Recycling Group, 2003). Details of the wells, including those well for which exploratory hole log are not available, are provided within the J2A document "Construction Quality Assurance Plan, Additional ground investigation at Milton landfill A14-JAC-ZZ-XX-RP-V-00088". That document reports that the wells are 100mm diameter, typically screened from around 1.0m below ground surface to the base of the well.

As part of the 2015 Ground Investigation, undertaken at A14 scheme design development stage, J2A completed a CQA plan detailing its proposal to replace the monitoring wells that would be affected by the A14 scheme works. While it was originally intended to install wells to provide direct replacements for those which would be destroyed, the installations were undertaken by the use of window sampler rigs which limited the wells to typically only 6 to 8m depth. As such they were not suitable replacement installations. The locations of the holes are shown on Drawing No. HA528983-ACJV-HGN-S5_ML-SK-C-0017 – Milton Landfill Site Well Modification Works Plan With Milton Landfill Layout (ref **Appendix A**), and their logs (ref **Appendix B**). Where available, the exploratory hole records for the existing monitoring wells are also provided in Appendix B.

It is noted that the logs show that Made Ground was frequently encountered in the window sampler holes. That Made Ground was interpreted as comprising "general fill" to provide landscaping between the capped landfill and the existing adjacent A14.

3. Limitations

The extent of the landfill cells, particularly the earlier cells, is not clearly known. FCC has provided the information which it has available, which includes a limited number of photographs, and has provided a survey drawing. However, the information pre-dates FCC's involvement of the site, and the information provided is therefore considered to be of unknown the reliability, which will need to be verified by ground-truthing. Consequently, a series of trial pits were scheduled by the A14 IDT which is summarised in Section 4.

4. Summary of the A14 IDT ground truthing (trial pitting)

Prior to commencement of the A14 scheme construction in the vicinity off Milton landfill, ground truthing trial pitting was undertaken as documented within the CQA Plan referenced in Section 1, in October 2019. The purpose of the trial pitting was to confirm the absence or otherwise of landfill, capping (believed to comprise 1m of compacted clay overlain by about 1m of restoration soil) or other infrastructure associated with the landfill site in the services corridors and below other A14 scheme permanent works, including vehicle restraint systems (VRS), signage, lighting and boundary fences.

Between 07 October 2019 and 11 October 2019, eight trial pits (referenced TPML1 to TPML8) were excavated under the CQA regime, supervised by a CQA Engineer appointed by the CJV, and overseen by an independent CQA Observer, acting on behalf of the landfill site operator, FCC. Each trial pit was undertaken in accordance with the CQA Plan.

A validation report for the trial pit investigation was produced by the CQA Engineer and submitted to FCC for review on 18 October 2019. The report was later issued to the EA for review and approval on 04 November 2019. The report is included within Appendix C and has been referenced in preparing this CQA Plan 2. A summary of the ground conditions recorded by the CQA Engineer (as reported within the verification report) is provided in Table 1.

Table 1 Summary of Observed Ground Conditions

Trial Pit Reference	Scheduled Depth (m bgl)	Excavated Depth (m bgl)	Observed / A14 IDT Interpreted Ground Conditions (refer to Appendix C for CQA Plan Validation Report)	
TPML 1	1.5	1.5	0m – 0.3m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.3m – 0.7m	Dark brown mottled reddish brown slightly clayey gravelly sand. Sand is predominantly fine to medium. Gravel is angular to subangular. [MADE GROUND – GRANULAR]
			0.7m – 1.5m	Firm to stiff dark grey, slightly sandy slightly gravelly silty clay. [GAULT CLAY] No groundwater ingress recorded.
TPML 2	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.1m – 0.5m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. Gravel is angular to sub angular. [MADE GROUND - GRANULAR]
			0.5m – 1.5m	Dark bluish grey firm to stiff slightly gravelly silty clay. Rare pockets of orangish brown gravelly sand present. [GAULT CLAY] No groundwater ingress recorded.
TPML 3	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]

Trial Pit Reference	Scheduled Depth (m bgl)	Excavated Depth (m bgl)	Observed / A14 IDT Interpreted Ground Conditions (refer to Appendix C for CQA Plan Validation Report)	
			0.1m – 0.2m	Orangish brown slightly gravelly sand. Sand is fine to coarse. [MADE GROUND - GRANULAR]
			0.2m – 1.5m	Dark bluish grey firm to stiff slightly gravelly silty clay. Rare pockets of orangish brown gravelly sand present. [GAULT CLAY] No groundwater ingress recorded.
TPML 4	1.8	1.8	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.1m - 0.2m	Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. [MADE GROUND]
			0.2m – 1.8m	Dark bluish grey stiff slightly gravelly silty clay. [GAULT CLAY] No groundwater ingress recorded.
TPML 5	1.0	1.0	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL].
			0.1m – 1.8m	Dark grey stiff slightly gravelly silty clay. Rare pockets of brick cobbles recorded up to 1.0m. [MADE GROUND - COHESIVE]. No groundwater ingress recorded.
TPML 6	1.5	1.8	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL].
			0.1m – 0.2m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND]
			0.2m – 1.45m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND COHESIVE]. Occasional pockets of orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is angular to subangular with occasional cobbles of brick and concrete aggregate. Possible waste material from former roadworks. [MADE GROUND - GRANULAR].
			1.45m – 1.8m	Dark bluish grey stiff slightly gravelly silty clay. [GAULT CLAY] No groundwater ingress recorded.
TPML 7	1.5	1.8	0m – 0.2m	Dark blackish grey slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]. Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. [MADE GROUND - GRANULAR]

Trial Pit Reference	Scheduled Depth (m bgl)	Excavated Depth (m bgl)	Observed / A14 IDT Interpreted Ground Conditions (refer to Appendix C for CQA Plan Validation Report)	
			0.2m – 0.4m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND - COHESIVE]. Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND - GRANULAR]
			0.4m – 0.9m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND - COHESIVE].
TPML 7 (continued)			0.9m – 1.8m	Dark orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is angular to subangular with occasional brick cobbles, concrete aggregate and wood deposits. Possible waste material from former roadworks. [MADE GROUND GRANULAR]. No groundwater ingress encountered.
TPML 8	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL].
			0.1m – 0.2m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND GRANULAR]
			0.2m – 1.5m	Greyish blue stiff slightly gravelly silty clay. [GAULT CLAY] No groundwater ingress recorded.

Based on the findings of the A14 ground investigation detailed above, it is not envisaged that installation of the two replacement groundwater wells will be affected by landfill waste, landfill capping or the restoration material associated with Milton landfill.

5. Proposed Works

The main works associated with the A14 scheme are described within CQA Plan 2 (HA528983-ACJV-HGT-S5_CQA-RP-C-0003).

The existing boreholes BH-W01 and BH12 are located within or close to the permanent works associated with the proposed A14 road alignment and consequently, will require replacement to allow for future groundwater and gas monitoring and groundwater sampling to continue. This is a requirement for the landfill operator, FCC.

BH-W01 is an existing well which is currently used for groundwater and gas monitoring. The location of the well clashes with the proposed A14 improvement works (refer to drawing HA528983-ACJV-HGN-S5_ML-SK-C-0017) and therefore, it is intended to be replaced with a like for like replacement to be referred to as BH-W01R (A14 reference ID754). However in the short-term, the existing BH-W01 is to remain in place, in order that it can be monitored in parallel with its replacement well.

BH12 is currently used for both groundwater and gas monitoring and shall be modified during the A14 improvement works to be retained for gas monitoring only. The headworks of the existing well shall be modified in accordance with the construction drawings referenced in **Appendix A** and in accordance with *Specification Appendix 26/7 Well Modification Works, Milton Landfill*. In parallel, a replacement well, BH12R (A14 reference ID755), shall be a like for like replacement allowing for future groundwater monitoring to be undertaken.

The proposed replacement wells are summarised in **Table 2**.

Table 2 Proposed Replacement Wells

Borehole Reference	Type	Proposed Depth (m bgl)	National Grid Reference		Remarks
			Eastings	Northings	
BH-W01R (A14 reference ID 754) (Replacement for BHW-01)	Dynamic Sampling (to 30m depth) followed by Rotary Core (DS + RC)	42m	546528.20	262186.62	BH-W01 replacement well to be installed to allow groundwater and gas monitoring. A 100mm HDPE standpipe piezometer with raised cover to be installed within the groundwater response zone located within the Woodburn Sand Formation (Lower Greensand Group). Installation details to be confirmed by the GI Contractor.
BH12R (A14 reference ID 755) (Replacement for BH12)	Dynamic Sampling until refusal followed by Rotary Core (DS + RC)	20m	546913.25	262251.12	BH12 replacement well, 100mm diameter well that shall be installed for groundwater and gas monitoring.

6. Purpose of this CQA Plan 3

The purpose of this CQA Plan 3 is to outline the works associated with the installation of the two new groundwater replacement wells as described in Section 5. The works shall be undertaken under this CQA regime and shall conform to the requirements set out in *Specification Appendix 26/6 Groundwater Monitoring Well Replacement, Milton Landfill* attached within **Appendix E**.

7. CQA inspected operations

7.1. Introduction

The installation of the replacement wells will be undertaken by the CJV and overseen by an independent CQA Engineer, who shall be approved by both FCC (the Landfill Operator) and by the Environment Agency in its role as Regulator. In addition, a CQA Observer is to be appointed by the Landfill Operator to provide oversight of the works from the Landfill Operator's perspective.

The locations and alignments of features associated with the A14 scheme (service corridors, lighting columns, vehicle restraints and permanent fence lines), will be marked on the ground prior to the works commencing.

7.2. Roles of Construction Quality Assurance Engineer

The CQA Engineer shall have proven competency in the supervision of installation and investigation works with specific experience to meet the quality standards under Landfill Directive 1999.

It is envisaged that a CQA supervision shall be required on a full-time basis during the borehole drilling and associated works.

In addition, a CQA Observer is to be appointed by the Landfill Site Operator to provide oversight of the works from the Landfill Site Operator's perspective.

7.3. Competency

The CQA Engineer shall have proven competency in the supervision of installation and investigation works with specific experience to meet the quality standards under Landfill Directive 1999.

7.4. Methodology - determination and checking of well locations and installation depths

Prior to commencement of any drilling / auguring activities, the CQA Engineer will be informed by the CJV and will identify the existing monitoring wells and other pertinent existing and proposed features at the site, from the drawings provided in **Appendix A**.

The location of the proposed replacement wells shall be set out by the CJV and checked by the CQA Engineer. The CQA Engineer shall ensure that the CJV is aware of the proposed depth of installation as specified in Appendix 26/6.

During the installation works, the CQA Engineer will liaise with the CJV to ensure that all works comply with the Specification.

7.5. Protocol (General)

Prior to any work on site, the CJV will follow its own 'Permit to Dig' procedure. Any services identified in the vicinity of the proposed works will be marked out with small flags on site. No mechanical excavations will be undertaken within 1m of known services. A 'Cat and Genny' will be used at pre-set intervals during the excavation process to continually check for unknown buried services.

Vegetation clearance will be undertaken followed by an initial topsoil scrape. Topsoil will be removed in layers not exceeding 100mm.

Excavations will be undertaken using a suitably-specified tracked excavator. The choice of plant to be used shall be determined by the contractor, with cognisance to mitigating the risk of causing damage to the existing landfill capping. It is anticipated that trafficking across the site will be limited, since there will be only limited export of material from the site, hence limited requirement for earth-moving plant.

Excavated spoil will be temporarily stored adjacent to the excavation but at a safe distance to maintain the integrity of the excavation.

The CJV has produced its own detailed RAMS documentation, as required by the A14 procedures. These contain the detail of machinery, locations, methods of working, safety and environmental management. A CDM 'lite' plan has been prepared which describes the steps and safe systems of work that the subcontractor, John Henry Group, will adhere to during construction of the new A10 telecommunications corridor. The A14 document reference is HE528983-IDT-S5-GEN-MST-W-00174 and CDM Lite Plan (F-JHG-SA001-L-A1) are included in Appendix E.

Existing well locations will be protected as follows:

- Wells BH-W01, BH5, BH6, BH7 and BH8 with pedestrian barrier erected around the well location;
- Wells BH10, BH11, BH12 and BH13 with protection barrier around the well location;
- All other relevant FCC monitoring points with pedestrian barrier.

7.5.1. Services clearance

The A14 contractor shall have identified and marked-out the locations of existing services. The excavations shall specifically be commenced such that they will not encounter the known marked services.

7.5.2. Method of Installation

It is anticipated that the boreholes will extend to the depths stated in **Table 2**, subject to confirmation of the conditions encountered in the boreholes. The target strata, Woburn Sand Formation, is anticipated to be encountered at approximately 35m bgl for BH-W01A. Open-hole drilling to a depth of 30m bgl is acceptable, thereafter coring technique shall be used to provide an accurate depth and thickness for the Woburn Sand. Once the underlying Kimmeridge Clay has been encountered and proven at least 3m, the borehole can be terminated. The cored section of the borehole shall then be over-reamed by open-hole techniques to increase the diameter of the borehole to the minimum 200mm required for well installation.

Core runs shall not exceed 1.5m length. All operations entailed in recovering the cores from the ground after completion of drilling shall be carried out in a manner such as to minimise disturbance to the cores. Immediately after removing the liner, the top and bottom shall be marked in indelible ink. The ends of liners shall be capped and sealed using adhesive tape.

The Contractor shall achieve no less than 90% core recovery. If recovery falls below 90% the Contractor shall take immediate steps to rectify the problem. If in the Investigation Supervisor's opinion the Contractor fails to take appropriate steps, the Contractor may be required to re-drill all or parts of the borehole at his own expense.

Heras fencing will be required around each borehole location in areas accessible to the public or livestock during site operations.

Groundwater readings shall be taken at the start and end of each shift.

The CJV will inform the CQA Engineer prior to commencement of works.

7.5.3. Protocol if waste / clay capping is encountered during drilling

If, at any time, discoloured subsoils, engineered clay fill (possibly clay capping) or waste is encountered, or personal gas monitor alarms are activated or suspicious odours are noted from the recovered cores, then works will cease immediately. The CQA engineer and site supervisor will be informed, whereupon a combined assessment of the recovered cores will be made. If it is deemed that the existing clay cap has been encountered, then the cap shall be reinstated by placing hydrated bentonite granules or bentonite slurry.

7.5.4. Logging of Cores

Whilst on site, the CQA Engineer shall be required to examine and report materials that are encountered during the works. A site diary shall be kept by the CQA Engineer and shall be made available for A14 IDT review.

Should any doubt arise with the nature of excavated materials encountered during the works, the CJV will inform and request for the CQA Engineer to be present for the works. The CQA Engineer will be required to inspect, examine and report the spoil material in accordance with BS EN ISO 14688-1, EN ISO 14688-2, EN ISO 14689-1 BS5930 by the CQA Engineer.

7.5.5. Photographs

The CQA Engineer shall photograph all excavations whilst present on site which will be documented within a site diary.

Where the CQA Engineer has been requested by the CJV to supervise a specific construction activity (e.g. installation of fence post foundations), the excavations shall be photographed in accordance with the Clauses 3.25 and 6.12 of the ICE Specification for Ground Investigation (2nd edition).

The CQA Engineer shall be present at all stages of drilling and installation works and observed by FCC's CQA observer.

7.6. Documentation and CQA report

The CQA Engineer shall complete a daily diary of the construction works. The diary shall include all information relevant to the works including start/finish times, progress of works, notes, communications, incidents, deviations from specification. Each entry shall have a corresponding time entered.

Daily progress reports of the works shall be made available by the CQA Engineer to the CJV and FCC. Should an incident occur, the CQA Engineer shall complete an Incident Report accordingly.

The CQA Engineer shall complete all documentation fully and legibly and obtain signatures from FCC where necessary.

The CQA Engineer shall collect and collate copies of CJV's documentation and photographic records.

The CQA Engineer shall compile the above information into a CQA Report, confirming that the works have been carried out in accordance with this CQA Plan 2, for submission to the Environment Agency following approval from the CJV and FCC.

The CJV shall provide a surveyor to provide the coordinates of the replacement wells.

Appendix A. Construction Drawings

Drawing Number	Drawing Title
HA528983-ACJV-HGN-S5_ML-SK-C-0017	MILTON LANDFILL SITE WELL MODIFICATION WORKS PLAN WITH MILTON LANDFILL LAYOUT
HA528983 - ACJV - HGT - S5_BH-W01A - SK - C - 0001	MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH-W01R (ID 754)
HA528983 - ACJV - HGT - S5_ML_BH12 - SK - C - 0001	MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH12R (ID 755)

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks.

Construction

428. Whilst proposed works are outside the reported location of buried landfill cells, there is a risk of encountering waste and contaminated soils or both.

429. Risk of leachate entering aquifer via new well.

430. Risk of encountering existing underground services and potential clash with proposed underground services. Designer to liaise with Utilities Team where potential clash is identified.

431. Potentially contaminated dust emissions to air.

432. Risk of working in potentially explosive atmosphere, particularly wells WS8535, WS8538 and WS7512.

433. Working adjacent to live traffic.

434. Works in within an active landfill site. Contractor shall comply with the Site Operator FCC's SHE requirements.

Maintenance / Cleaning

SHE information for Maintenance/Cleaning to be assessed by the Milton Landfill Site operator (FCC).

Use

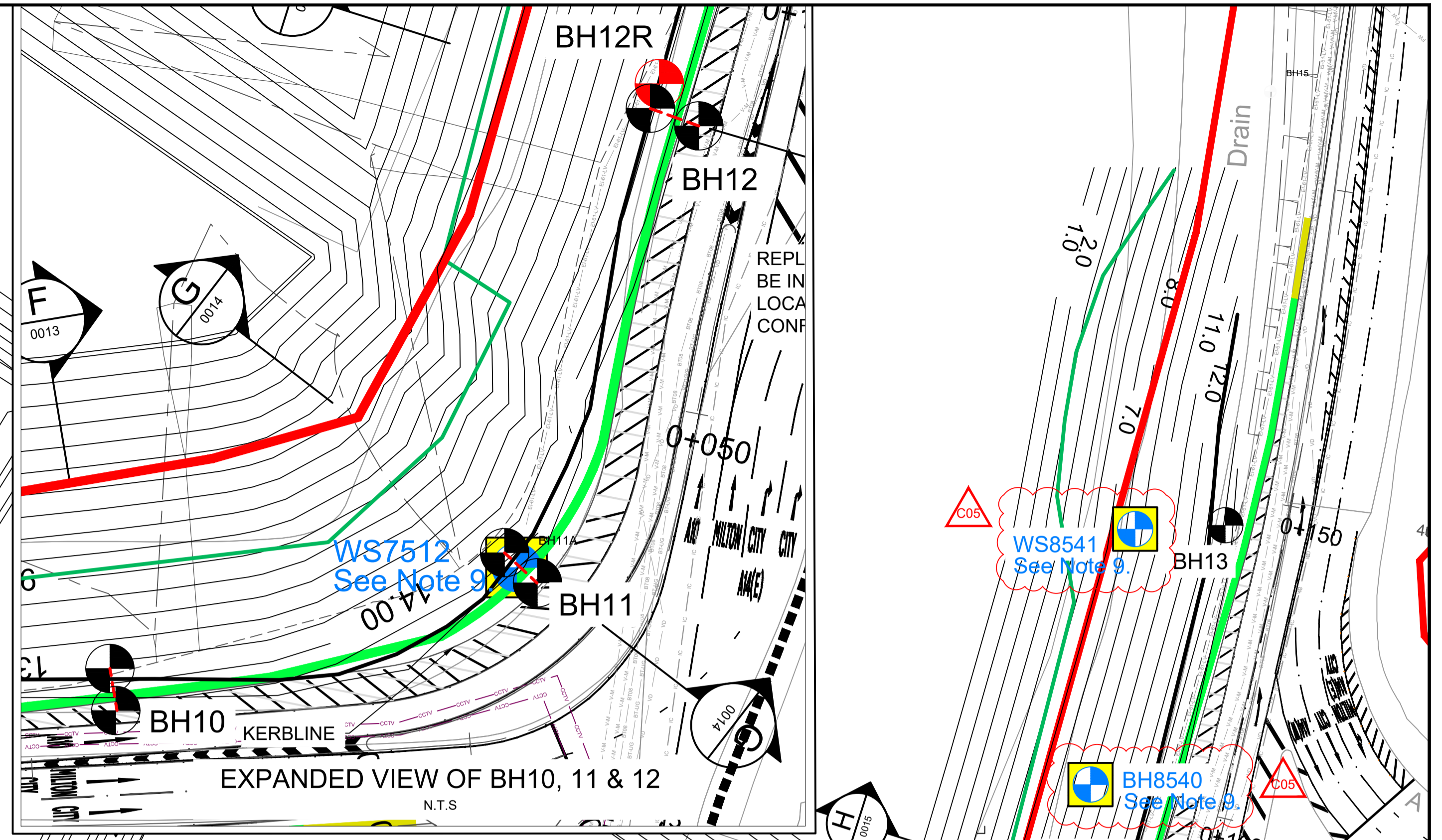
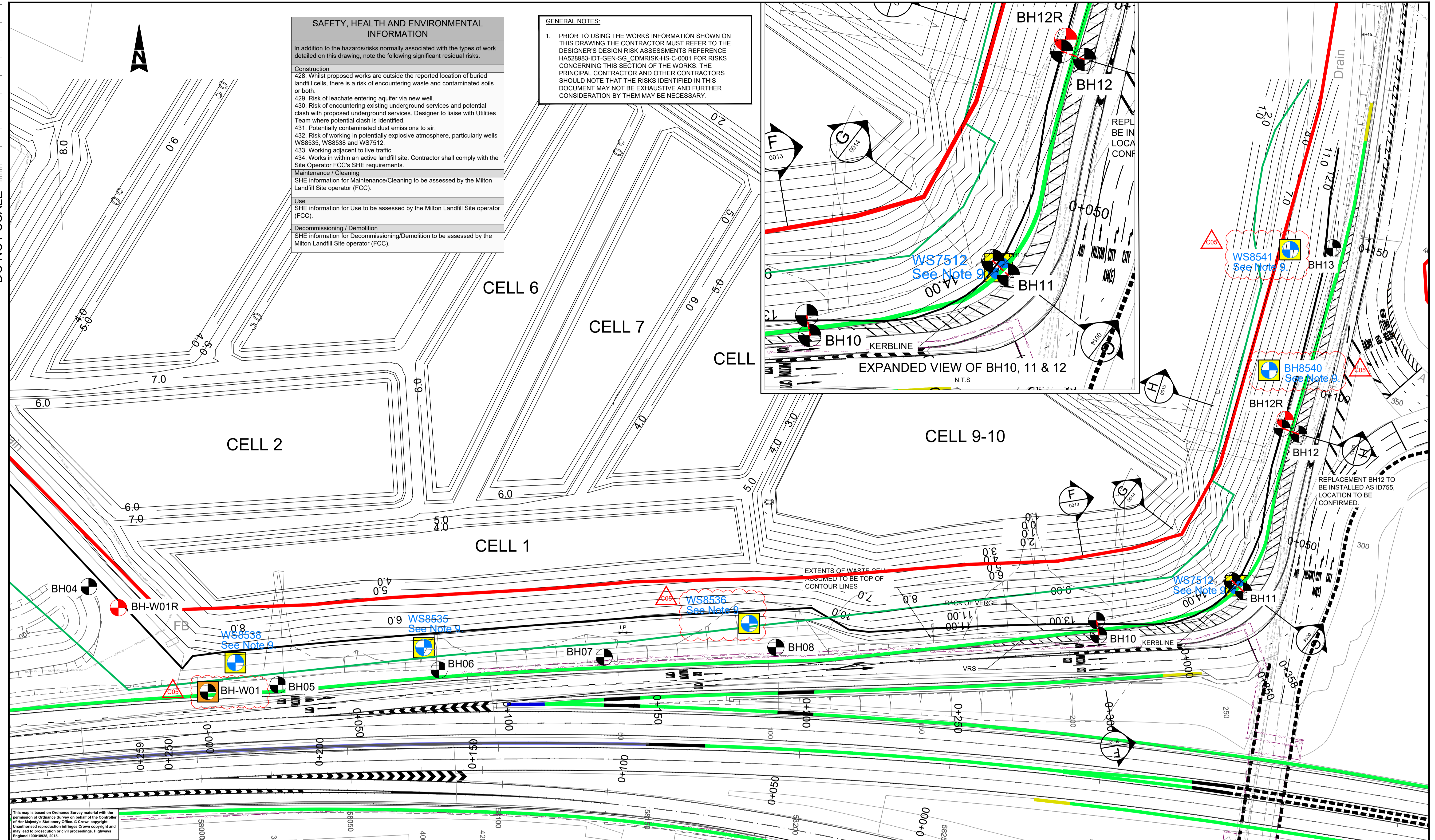
SHE information for Use to be assessed by the Milton Landfill Site operator (FCC).

Decommissioning / Demolition

SHE information for Decommissioning/Demolition to be assessed by the Milton Landfill Site operator (FCC).

GENERAL NOTES:

1. PRIOR TO USING THE WORKS INFORMATION SHOWN ON THIS DRAWING THE CONTRACTOR MUST REFER TO THE DESIGNER'S DESIGN RISK ASSESSMENTS REFERENCE HA528983-IDT-GEN-SG_CDMRISK-HS-C-0001 FOR RISKS CONCERNING THIS SECTION OF THE WORKS. THE PRINCIPAL CONTRACTOR AND OTHER CONTRACTORS SHOULD NOTE THAT THE RISKS IDENTIFIED IN THIS DOCUMENT MAY NOT BE EXHAUSTIVE AND FURTHER CONSIDERATION BY THEM MAY BE NECESSARY.



NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWINGS HA528983-ACJV-HGN-S5_XX-SK-C-0008, 0009, 0010 AND 0011 SERIES.
- THIS DRAWING IS NOT TO SCALE.
- THIS DRAWING REFLECTS HIGHWAYS DESIGN FIX F.
- DRAWING TO BE READ IN CONJUNCTION WITH THE EARTHWORKS DETAILS DRAWINGS HA528983-ACJV-HDG-S5_XX-M2-C-0007, THE DRAINAGE DRAWING HA528983-ACJV-HFE-SG_XX-M2-C-0001 AND 1001, THE FENCING DRAWING HA528983-ACJV-HGT-SG_DECOM-M2-C-0001 AND 0002, THE GEOTECHNICAL DRAWING HA528983-ACJV-HMK-S5_XX-M2-C-0001, THE ROAD MARKINGS DRAWING HA528983-ACJV-HML-S5_XX-M2-C-0002, THE HIGHWAYS DRAWING HA528983-ACJV-HRR-S5_XX-M2-C-0001, THE ROAD RESTRAINTS DRAWING HA528983-ACJV-HSC-S5_XX-M2-C-0001, THE STR. CULVERTS DRAWING HA528983-ACJV-VOS-S5_XX-M2-C-0001, THE ORDINANCE SURVEY DRAWING.
- REFER TO UTILITY KEY PLAN HA528983-ACJV-HUT-SG_XX-SK-C-0001
- MILTON LANDFILL LAYOUT PROVIDED BY FCC ON 28/04/19.
- 2015 BOREHOLES, WELLS WERE INSTALLED IN BOREHOLE WS7512, WS8535, WS8538, WS8536, WS8541 AND BH8540

	- EXISTING MONITORING WELL (SURVEYED LOCATION (24-04-18))		- FCC OWNERSHIP BOUNDARY } DETAILS PROVIDED BY FCC ON 23-04-19
	- RE-INSTALLED MONITORING WELLS		- FCC PPC BOUNDARY
	- SWAN NECK		- PROPOSED BOUNDARY PROVIDED 31-03-20
	- VRS		- ROAD MARKING SEPARATION ISLAND
	- HEADWALL		
	- 2015 BOREHOLE		
	- WELL TO BE DECOMMISSIONED		
	- WELL TO BE DECOMMISSIONED FOLLOWING A PERIOD OF CONFIRMATION MONITORING		
	- LANDFILL CELL		
	- LANDFILL CONTOUR		

Rev.	Date	Description	By	Chk'd	App'd
C01	14/02/20	AMENDED HIGHWAY DETAILS	EC	DM	DM
C02	18/02/20	AMENDED HIGHWAY DETAILS	EC	NC	AP
C03	20/04/20	BH'S 10, 11, 12 MOVED TO 3.0M BEHIND VR	ME	ME	NC
C04	01/05/20	HOLE IDS & LEGEND UPDATED, NOTE 9 ADDED.	AS	NC	DM
C05	29/06/20	WELLS TO BE DECOMMISSIONED UPDATED	LZ	NC	DM

FOR CONSTRUCTION

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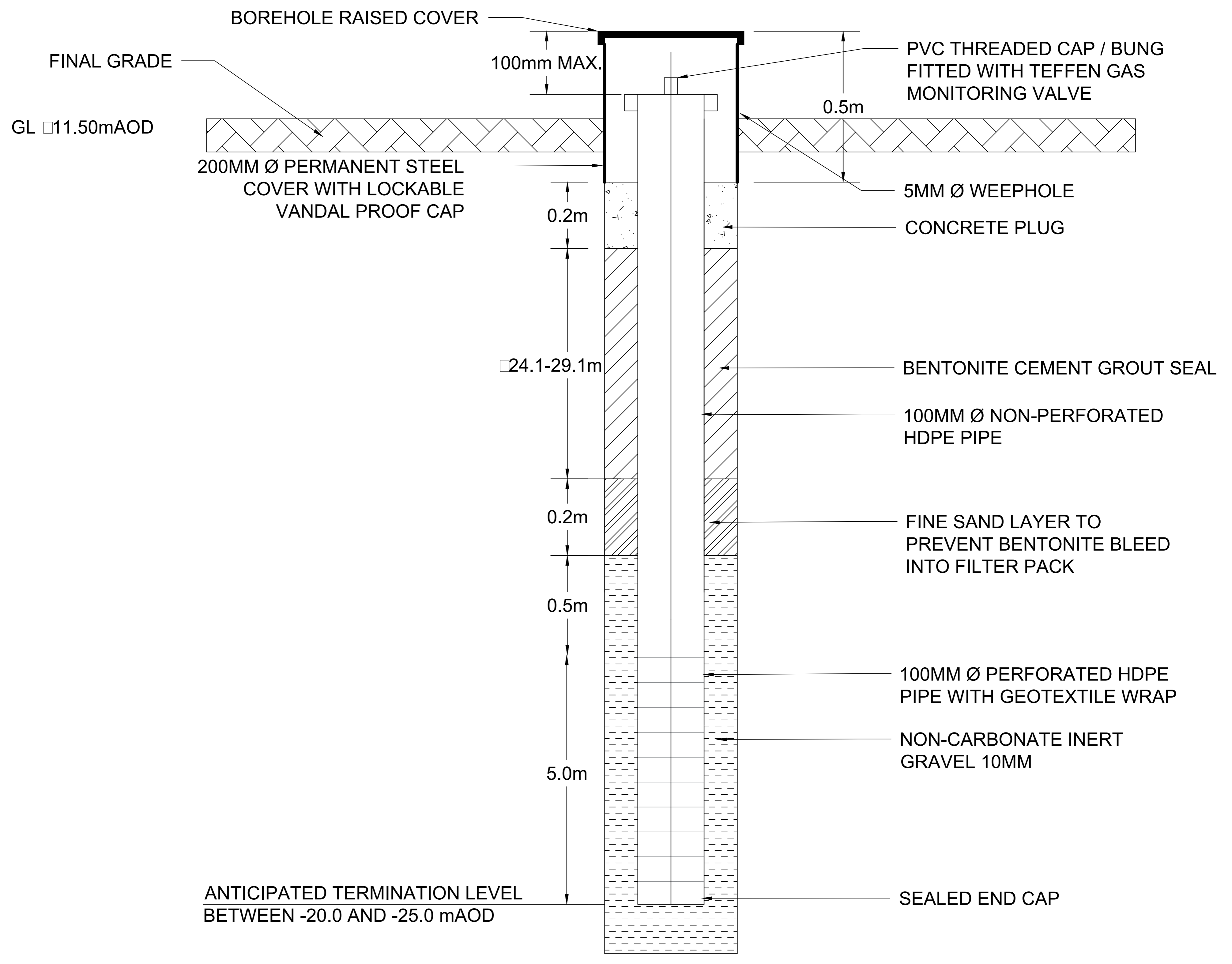
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Working on behalf of **highways england**

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Drawing Title		MILTON LANDFILL SITE WELL MODIFICATION WORKS PLAN WITH MILTON LANDFILL LAYOUT			
Scale	NTS	Drawn	LZ	Checked	NC
Original Size	A1	Date	29/06/20	Date	29/06/20
Approved	DM	Date	29/06/20	Authorised	DM
Date	29/06/20	Date	29/06/20	Date	29/06/20
Drawing Number	Project	Originator	I Volume	Project Ref. No.	
HA528983 - ACJV - HGN - S5_ML - SK - C - 0017				C05	
Location	Type	Role	Number	Revision	

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**BH-W01R (ID 754)
 BOREHOLE DETAIL**

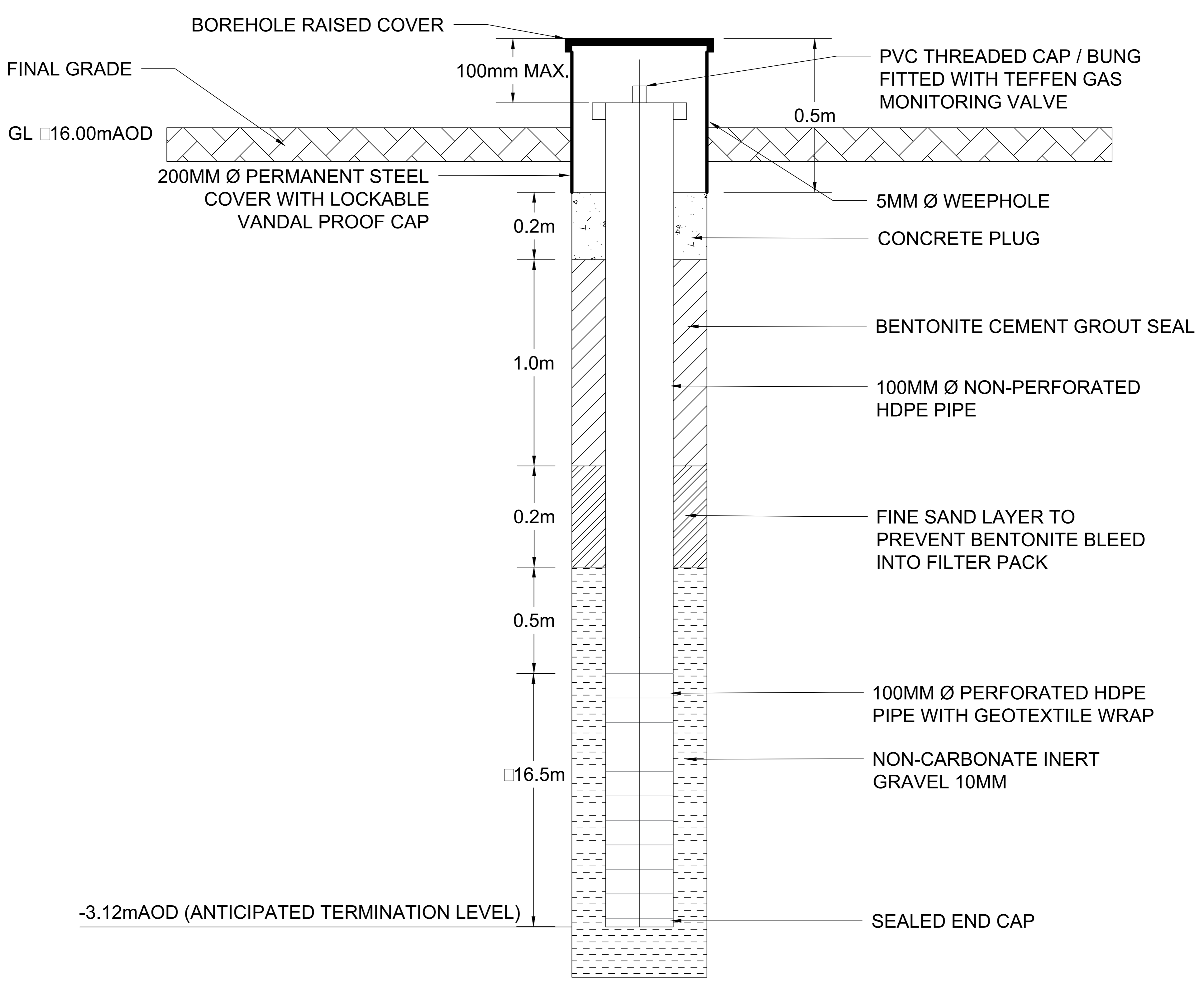
SCALE N.T.S.

- NOTES:**
- DRAWING TO BE READ IN CONJUNCTION WITH THE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN, HA528983-ACJV-HGT-S5_CQA-RP-C-0004.
 - DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION APPENDIX 26/6, GROUNDWATER MONITORING WELL REPLACEMENT, MILTON LANDFILL, HA528983-ACJV-HGT-S5_26_6-SP-C-0001.
 - THE DEPTHS SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED DURING DRILLING, BASED ON THE GROUND CONDITIONS ENCOUNTERED.

Drawing Status						FOR CONSTRUCTION		Suitability		A		Project Title						A14 CAMBRIDGE TO HUNTINGDON																																			
												Drawing Title												MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH-W01R (ID 754)																													
Copyright © ACJV - Atkins Limited and Ch2m (2015)						Scale		NTS		Drawn		KR		Checked		NC		Approved		DM		Authorised		DM																													
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**BH12R (ID 755)
 BOREHOLE DETAIL**
 SCALE N.T.S.

- NOTES:**
 1. DRAWING TO BE READ IN CONJUNCTION WITH THE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN, HA528983-ACJV-HGT-S5_CQA-RP-C-0004.
 2. DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION APPENDIX 26/6, GROUNDWATER MONITORING WELL REPLACEMENT, MILTON LANDFILL, HA528983-ACJV-HGT-S5_26_6-SP-C-0001.
 3. THE DEPTHS SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED DURING DRILLING, BASED ON THE GROUND CONDITIONS ENCOUNTERED.

Drawing Status FOR CONSTRUCTION						Suitability A		Project Title A14 CAMBRIDGE TO HUNTINGDON																							
 						Drawing Title MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH12R (ID 755)																									
Copyright © ACJV - Atkins Limited and Ch2m (2015)						Scale NTS		Drawn KR		Checked NC		Approved DM		Authorised DM																	
Client 						Original Size A4		Date 01/05/2020		Date ---		Date ---		Date ---																	
<table border="1"> <thead> <tr> <th>Rev.</th> <th>Date</th> <th>Description</th> <th>By</th> <th>Chk'd</th> <th>App'd</th> </tr> </thead> <tbody> <tr> <td>C01</td> <td>01/05/2020</td> <td>ISSUED FOR CONSTRUCTION</td> <td>KR</td> <td>NC</td> <td>DM</td> </tr> <tr> <td>P01.1</td> <td>---</td> <td>FIRST ISSUE</td> <td>LZ</td> <td>LZ</td> <td>LZ</td> </tr> </tbody> </table>						Rev.	Date	Description	By	Chk'd	App'd	C01	01/05/2020	ISSUED FOR CONSTRUCTION	KR	NC	DM	P01.1	---	FIRST ISSUE	LZ	LZ	LZ	Drawing Number HA528983 - ACJV - HGT - S5_ML_BH12 - SK - C - 0001						Project Ref. No. C01	
Rev.	Date	Description	By	Chk'd	App'd																										
C01	01/05/2020	ISSUED FOR CONSTRUCTION	KR	NC	DM																										
P01.1	---	FIRST ISSUE	LZ	LZ	LZ																										
						Location		Type		Role		Number																			


Appendix B. J2A logs and BH12

Drilling Method Window Sampler		Borehole Diameter 101mm to 3.00m 87mm to 6.00m	Casing Diameter 101mm to 3.00m	BOREHOLE No. WS7512	
Equipment Terrier		Logged by CAG 28/01/2015		Coordinates (National Grid) 546897.0 E 262196.0 N	Ground Level 15.60 m OD
Crew/Vessel Dates Drilled RU Start 28/01/2015 End 28/01/2015		Compiled by ec 04/02/2015		Approved by REC Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details			Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.				
28/01	0.00					TOPSOIL. Brown slightly gravelly silty clay with occasional rootlets (<1mm) and abundant root fibres. Gravel is angular and subangular fine to coarse of flint. [Topsoil]	(0.10) 0.10	15.50	
		(PIT)	0.30	ES	1	MADE GROUND. Grey slightly gravelly silty clay with occasional rootlets (<2mm). Gravel is angular and subangular fine to coarse of flint. [Made Ground]	(1.10)		
			0.80	ES	2	Between 1.00m and 1.20m; firm and stiff.			
	1.20	(100)	1.20-1.50	ES	3	MADE GROUND. Grey slightly gravelly silty clay with rare rootlets (<1mm). Gravel is very angular to rounded fine and medium of flint. [Made Ground]	1.20	14.40	
	1.50	(100)				Between 1.50m and 1.80m; grey and greyish brown locally mottled orangish brown.	(0.95)		
	1.80	(100)							
	2.30	(100)	2.30-2.80	ES	4	Dark brown mottled reddish brown slightly clayey gravelly SAND. Sand is predominantly fine and medium. Gravel is very angular to subrounded fine to coarse of flint. [Made Ground]	2.15 (0.10) 2.25	13.45 13.35	
	2.80	(100)				Orangish brown very gravelly SAND with rare pockets (<20mm) of stiff grey silty clay and light greenish grey clayey silt. Sand is predominantly fine and medium. Gravel is very angular to subrounded predominantly fine and medium of chalk and flint. [Made Ground]	(0.55)		
	3.00	(100)				Firm and stiff grey slightly sandy slightly gravelly silty CLAY. Sand is medium and coarse. Gravel is very angular to rounded fine to coarse of chalk and flint. [Made Ground]	2.80	12.80	
	4.00	(100)	3.50	ES	5	At 3.70m; with parting of orangish brown gravelly sand. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of chalk and flint.	(3.05)		

Remarks (See notes & keysheets)

- 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
- 2 In-situ testing and geotechnical sampling not required.
- 3 Position located within Milton Landfill - J2A suspect possible made ground to at least 6.00m.
- 4 See separate sheet for installation.
- 5 Groundwater not encountered during boring.


	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS7512 (1 of 3)

Drilling Method Window Sampler		Borehole Diameter 101mm to 3.00m 87mm to 6.00m	Casing Diameter 101mm to 3.00m	BOREHOLE No. WS7512	
Equipment Terrier				Coordinates (National Grid) 546897.0 E 262196.0 N	Ground Level 15.60 m OD
Crew/Vessel Dates Drilled	RU Start 28/01/2015 End 28/01/2015	Logged by CAG 28/01/2015	Compiled by ec 04/02/2015	Approved by <i>REL</i>	
				Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From	To	Type	No.				
	5.00	(100)								
28/01	3.00	Dry	5.90		ES	6	<p>CLAY. See previous sheet.</p> <p>Stiff greenish grey sandy slightly gravelly CLAY with rare wood fragments (<5mm x 30mm). Sand is fine and medium. Gravel is very angular to subrounded fine to coarse of flint with occasional siltstone. [Made Ground]</p> <p>End of Borehole</p>	5.85 (0.15) 6.00	9.75 9.60	

Remarks
(See notes & keysheets)

Scale 1:25

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS7512 (2 of 3)

Drilling Method Window Sampler		Borehole Diameter		Casing Diameter		BOREHOLE No. WS7512	
Equipment Terrier		101mm to 3.00m		87mm to 6.00m		Coordinates (National Grid) 546897.0 E 262196.0 N Ground Level 15.60 m OD	
Crew/Vessel RU		Logged by CAG		Compiled by ac		Checked by REC	
Dates Drilled Start 28/01/2015 End 28/01/2015		28/01/2015		04/02/2015		Location Milton Landfill	
Installation Details			Installation Depth (m)	Level m OD	Water Strikes	Strata Depth (m)	Strata Details
Instrumentation: 50mm slotted section (SL) from 2.50 to 6.00m	Concrete					0.10	TOPSOIL
	Bentonite Pellets		0.40	15.20			MADE GROUND
	Gravel Filter		2.20	13.40		2.15	Gravelly SAND
	SL=2.50-6.00m					2.80	Silty CLAY
				6.00	9.60		5.85
						6.00	Base of Hole
Remarks (See notes & keysheets) <input checked="" type="checkbox"/> Water Strike <input checked="" type="checkbox"/> Water Rise Not to Scale Upstanding cover with gas tap. Pipe diameter 50mm to 6.00m, installed on 28/01/2015.							
			Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A			Contract No. G140036U	
						Figure No. WS7512 (3 of 3)	

Drilling Method Window Sampler		Borehole Diameter 101mm to 4.00m 87mm to 6.00m		Casing Diameter		BOREHOLE No. WS8535	
Equipment Terrier		Crew/Vessel RU		Logged by CAG		Coordinates (National Grid) 546627.5 E 262175.5 N Ground Level 11.50 m OD	
Dates Drilled Start 03/02/2015 End 03/02/2015		Compiled by es		Approved by <i>REL</i>		Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
03/02	0.00	(PIT)	0.40	ES	1	TOPSOIL. Grass and leaf litter over friable greyish brown sandy slightly gravelly silty clay with frequent rootlets (<2mm), root fibres and tree roots (<100mm). Sand is fine to coarse. Gravel is angular and subangular fine to coarse of flint and concrete. [Topsoil]	(0.60)			
			0.80	ES	2	MADE GROUND. Orangish brown slightly clayey very gravelly sand. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of flint. [Made Ground]	0.60 (0.15) 0.75	10.90 10.75		
	1.20	(100)	1.30	ES	3	MADE GROUND. Grey slightly gravelly silty clay with occasional rootlets (<1mm). Gravel is very angular and angular predominantly fine and medium of flint and subangular to rounded fine and medium of chalk. [Made Ground]	(0.45) 1.20 (0.30)	10.30 10.00		
	1.50	(100)				Firm and stiff friable greyish brown sandy slightly gravelly silty CLAY with occasional rootlets (<1mm) and root fibres. Sand is fine to coarse. Gravel is very angular to subrounded predominantly fine and medium of flint with rare clinker. Possible made ground. [Made Ground]	1.50 (0.30) 1.80	9.70		
	2.00	(100)				Firm and stiff brown mottled greyish brown sandy, becoming slightly sandy, slightly gravelly silty CLAY with occasional rootlets (<1mm). Sand is fine to coarse. Gravel is very angular to subrounded predominantly fine and medium of flint. Possible made ground. [Made Ground]	(0.50) 2.30 (0.10) 2.40	9.20 9.10		
	3.00	(100)	2.80	ES	4	Stiff greyish brown mottled yellowish brown slightly sandy silty CLAY with occasional pockets (<30mm) of white nodules (<10mm) and occasional rootlets (<2mm). Sand is fine to coarse. Possible made ground. [Made Ground] Between 2.00m and 2.30m; with pockets (<100mm) of orangish brown clayey sand, frequent nodules and flint gravel. Between 2.10m and 2.30m; with frequent rootlets (<2mm). Orangish brown mottled grey locally slightly clayey SAND. Sand is predominantly fine. Possible made ground. [Made Ground]				
	4.00	(100)				Stiff grey slightly mottled yellowish brown silty CLAY with occasional rootlets (<1mm). [Gault Clay] Between 2.40m and 3.00m; with occasional white nodules (<10mm) and rare pinkish brown nodules (<10mm), locally occurring in pockets (<20mm). Between 3.00m and 6.00m; with occasional pseudofibrous plant remains (<5mm) and possible fossil/shell (<10mm).	(3.60)			

Remarks (See notes & keysheets)

- 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
- 2 In-situ testing and geotechnical sampling not required.
- 3 See separate sheet for installation.
- 4 Groundwater not encountered during boring.

Scale 1:25




Project
A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME
HIGHWAYS AGENCY
J2A

Contract No. G140036U
Figure No. WS8535 (1 of 3)

Drilling Method Window Sampler		Borehole Diameter 101mm to 4.00m 87mm to 6.00m	Casing Diameter	BOREHOLE No. WS8535	
Equipment Terrier		Coordinates (National Grid) 262175.5 E 262175.5 N Ground Level 11.50 m OD		Location Milton Landfill	
Crew/Vessel	RU	Logged by	Compiled by	Approved by	
Dates Drilled	Start 03/02/2015 End 03/02/2015	CAG 04/02/2015	es 12/02/2015	<i>REC</i>	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recov- ery %)	Sample/Test Details				Description of Strata	Depth (Thick- ness) (m)	Level	Legend
			Depth (m) From	To	Type	No.				
03/02	5.00	(100)					CLAY. See previous sheet. Between 5.00m and 6.00m; stiff and very stiff.			x x x x x x x x x x x
							End of Borehole	6.00	5.50	x

Remarks
(See notes
& keysheets)

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS8535 (2 of 3)


Drilling Method Window Sampler		Borehole Diameter 101mm to 5.00m 87mm to 6.00m		Casing Diameter		BOREHOLE No. WS8536	
Equipment Terrier		Logged by CAG 29/01/2015		Compiled by es 12/02/2015		Coordinates (National Grid) Ground Level Location Milton Landfill	
Crew/Vessel Dates Drilled		RU Start 29/01/2015 End 29/01/2015		Approved by <i>RLC</i>		546735.5 E 262183.5 N 11.90 m OD	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
29/01	0.00									
		(PIT)	0.30	ES	1	TOPSOIL. Grass over brown sandy slightly gravelly silty clay with frequent roots (<10mm) and rootlets (<2mm). Sand is fine to coarse. Gravel is very angular to subangular fine to coarse of flint. [Topsoil]	(0.15) 0.15	11.75		
			0.90	ES	2	MADE GROUND. Orangish brown sandy and very sandy slightly gravelly silty clay with occasional roots and rootlets (<5mm). Sand is predominantly fine and medium. Gravel is angular and subangular fine and medium of flint. [Made Ground]	(0.60) 0.75	11.15		
	1.20	(100)				MADE GROUND. Grey silty clay with occasional rootlets (<2mm) and root fibres. [Made Ground]	(0.45) 1.20	10.70		
	1.50	(100)				MADE GROUND. Grey mottled brownish grey silty clay with frequent root fibres. [Made Ground]	(0.30) 1.50	10.40		
	1.80	(100)				MADE GROUND. Fissured grey mottled brownish grey silty clay. Fissures are extremely closely and very closely spaced, randomly orientated, planar, with brownish yellow staining. [Made Ground]	(0.30) 1.80	10.10		
	2.30	(100)	2.40	ES	3	MADE GROUND. Grey mottled brownish grey silty clay with occasional rootlets (<1mm) and root fibres and rare pinkish brown nodules (<6mm). [Made Ground]	(0.50) 2.30	9.60		
			2.80	ES	4	MADE GROUND. Dark brown and orangish brown slightly clayey slightly gravelly sand. Sand is predominantly fine and medium. Gravel is very angular to subrounded predominantly fine and medium of flint with occasional chalk, brick and charcoal. [Made Ground]	(0.40) 2.70	9.20		
	3.00	(100)				Very stiff orangish brown very sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is angular and subangular predominantly fine and medium of flint. [Made Ground]	(0.65) 3.35	8.55		
			3.60	ES	5	Between 2.85m and 2.95m; stiff, sandy, with black speckles. Between 2.95m and 3.15m; firm and stiff sandy gravelly clay. Between 3.15m and 3.35m; orangish brown mottled greenish grey.				
	4.00	(100)	4.30	ES	6	Orangish brown and orange, locally mottled greenish grey, locally slightly clayey, SAND with occasional very thin beds of firm light grey and greenish grey sandy gravelly clay and rare blackened rootlets and black speckles (<5mm). Sand is fine to coarse. Gravel is subangular fine and medium of flint. [3rd Terrace River Gravels] Between 4.00m and 4.10m; thin bed of light grey clayey sandy gravel. Sand is fine to coarse. Gravel is angular to rounded predominantly fine and medium of flint and chalk. Between 4.10m and 4.40m; very soft light grey sandy, locally gravelly, clay with occasional thin bed of abundant shell fragments (<5mm). Sand is fine. Gravel is angular to subrounded fine and medium of flint and chalk.	(1.65) 5.00	6.90		

Remarks (See notes & keysheets)

- Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
- In-situ testing and geotechnical sampling not required.
- Water at 6.00m run and rose to 3.40m. Hole collapsed to 5.30m.
- See separate sheet for installation.
- Groundwater was encountered at 4.85m during boring and rose to 4.79m after 5 mins, 4.79m after 10 mins, 4.79m after 15 mins, 4.79m after 20 mins.

Scale 1:25

	Project	Contract No.
	A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	G140036U
	Figure No.	WS8536 (1 of 3)

Drilling Method Window Sampler		Borehole Diameter 101mm to 5.00m 87mm to 6.00m		Casing Diameter		BOREHOLE No. WS8536	
Equipment Terrier		Crew/Vessel RU		Logged by CAG		Coordinates (National Grid) 546735.5 E 262183.5 N	
Dates Drilled Start 29/01/2015 End 29/01/2015		Compiled by as		Approved by <i>RLC</i>		Ground Level 11.90 m OD	
		29/01/2015		12/02/2015		Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
29/01	5.00	(100) 3.40	5.80	ES	7		Orangish brown slightly clayey very sandy GRAVEL with occasional pockets (<50mm) of soft light grey sandy gravelly clay. Sand is fine to coarse. Gravel is very angular to rounded fine to coarse of flint. [3rd Terrace River Gravels]	5.00 (0.50)	6.90	
							Firm and stiff grey silty CLAY. [Gault Clay]	5.50 (0.50)	6.40	
							End of Borehole	6.00	5.90	

Remarks (See notes & keysheets)

Scale 1:25

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS8536 (2 of 3)

Drilling Method Window Sampler		Borehole Diameter		Casing Diameter		BOREHOLE No.	
Equipment Terrier		101mm to 5.00m		87mm to 6.00m		Coordinates (National Grid) 546735.5 E 262183.5 N	
Crew/Vessel RU		Logged by CAG		Compiled by es		Ground Level 11.90 m OD	
Dates Drilled Start 29/01/2015 End 29/01/2015		29/01/2015		12/02/2015		Checked by <i>RM</i> Location Milton Landfill	
Installation Details			Installation Depth (m)	Level m OD	Water Strikes	Strata Depth (m)	Strata Details
Instrumentation: 50mm slotted section (SL) from 3.50 to 5.00m	Concrete					0.15	TOPSOIL
	Bentonite Pellets		0.40	11.50			MADE GROUND
						2.70	
	Gravel Filter		3.30	8.60		3.35	Sandy CLAY
	SL=3.50-5.00m					5.00	SAND
	Arisings		5.30	6.60		5.50	Sandy GRAVEL
			6.00	5.90		6.00	Silty CLAY
Remarks (See notes & keysheets)						Base of Hole	
<input checked="" type="checkbox"/> Water Strike <input checked="" type="checkbox"/> Water Rise Not to Scale		Upstanding cover with gas tap. Pipe diameter 50mm to 5.00m, installed on 29/01/2015.					
		Project				Contract No.	
		A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A				G140036U	
						Figure No.	
						WS8536 (3 of 3)	

Drilling Method Window Sampler		Borehole Diameter	Casing Diameter	BOREHOLE No. WS8538	
Equipment Terrier		101mm to 5.00m 87mm to 6.00m		Coordinates (National Grid)	546565.0 E 262170.5 N
Crew/Vessel RU		Logged by CAG	Compiled by es	Approved by <i>RLC</i>	Ground Level 11.65 m OD
Dates Drilled		Start 04/02/2015	End 04/02/2015	Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
04/02	0.00									
		(PIT)	0.30	ES	1	Rough grass and leaf litter over TOPSOIL. [Topsoil] MADE GROUND. Friable orangish brown very sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of flint. [Made Ground]	(0.30) 0.30	11.35		
			0.90	ES	2	MADE GROUND. Gravelly clay. (Driller's description). [Made Ground] MADE GROUND. Grey silty clay with occasional rootlets (<1mm). [Made Ground]	(0.40) 0.70 (0.15) 0.85	10.95		
	1.20	(100)	1.40	ES	3	Stiff friable brown very sandy slightly gravelly silty CLAY with occasional rootlets (<1mm). Sand is predominantly fine and medium. Gravel is very angular to rounded predominantly fine and medium of flint and chalk. Possible made ground. [Made Ground]	1.20 (0.40)	10.45		
	1.50	(100)				Between 1.50m and 1.60m; firm and stiff, with occasional fragments (<6mm) of possible red brick.	1.60 (0.20)	10.05		
	2.00		2.30	ES	4	Firm mottled orangish brown, grey and brown sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to rounded predominantly fine and medium of flint and chalk. Possible made ground. [Made Ground] Stiff light grey slightly mottled yellowish brown slightly gravelly CLAY with occasional calcareous nodules (<10mm), locally occurring in pockets (<40mm). Gravel is angular to rounded predominantly fine and medium of flint and chalk. [Made Ground]	2.00 (0.55)	9.85		
		(100)				Firm light grey and bluish grey, locally slightly sandy and sandy, slightly gravelly CLAY with frequent pockets (<80mm) of orangish brown mottled black slightly clayey and clayey sand. Sand is predominantly fine. Gravel is very angular to subrounded predominantly fine and medium of flint with occasional chalk. Possible made ground. [Made Ground]	2.55 (0.45)	9.10		
	3.00					Stiff light bluish grey mottled yellowish brown CLAY with occasional root fibres and pseudofibrous rootlets (<1mm). Possible made ground. [Made Ground]	3.00 (0.40)	8.65		
		(100)				Orangish brown gravelly SAND. Sand is predominantly fine and medium. Gravel is very angular to rounded predominantly fine and medium of flint with occasional chalk. Possible made ground. [Made Ground]	3.40 (0.60)	8.25		
	4.00					Stiff and very stiff grey slightly mottled yellowish brown CLAY. [Gault Clay]	4.00	7.65		
		(100)				Firm and stiff fissured grey slightly mottled yellowish brown CLAY with occasional pinkish brown nodules (<25mm) and rare pseudofibrous rootlets (<1mm). Fissures are poorly developed, very closely spaced, randomly orientated, planar, smooth, occasionally polished. [Gault Clay]	(2.00)			

Remarks 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
2 In-situ testing and geotechnical sampling not required.
3 See separate sheet for installation.
4 Groundwater was encountered at 2.63m during boring and rose to 2.53m after 5 mins, 2.43m after 10 mins, 2.41m after 15 mins, 2.41m after 20 mins.

Scale 1:25



Project
A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME
HIGHWAYS AGENCY
J2A

Contract No. G140036U

Figure No. WS8538 (1 of 3)

Drilling Method Window Sampler		Borehole Diameter 101mm to 5.00m 87mm to 6.00m	Casing Diameter	BOREHOLE No. WS8538	
Equipment Terrier		Coordinates (National Grid) 262170.5 E 262170.5 N Ground Level 11.65 m OD		Location Milton Landfill	
Crew/Vessel Dates Drilled	RU Start 04/02/2015 End 04/02/2015	Logged by CAG 05/02/2015	Compiled by as 12/02/2015	Approved by <i>RL</i>	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
04/02	5.00	(100)					CLAY. See previous sheet.			
							End of Borehole	6.00	5.65	

Remarks (See notes & keysheets)

Scale 1:25



Project
A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT
SCHEME
HIGHWAYS AGENCY
J2A

Contract No. G140036U

Figure No. WS8538 (2 of 3)

Drilling Method Window Sampler	Borehole Diameter 101mm to 5.00m 87mm to 6.00m	Casing Diameter	BOREHOLE No. WS8538
Equipment Terrier			Coordinates (National Grid) 546565.0 E 262170.5 N
Crew/Vessel RU	Logged by CAG	Compiled by es	Ground Level 11.65 m OD
Dates Drilled Start 04/02/2015 End 04/02/2015	05/02/2015	12/02/2015	Checked by <i>RL</i> Location Milton Landfill

Installation Details			Installation Depth (m)	Level m OD	Water Strikes	Strata Depth (m)	Strata Details	
Instrumentation: 50mm slotted section (SL) from 0.50 to 5.50m	Concrete		0.10	11.55		6.00	TOPSOIL	
	Bentonite Pellets						0.30	MADE GROUND
	Sand Filter		0.40	11.25			1.20	Silty sandy CLAY
	Gravel Filter		0.50	11.15			1.60	Sandy gravelly CLAY
							1.80	CLAY
							3.00	Gravelly SAND
							3.40	CLAY
				6.00			5.65	

Remarks
(See notes & keysheets)

Water Strike
 Water Rise

Upstanding cover with gas tap.
Pipe diameter 50mm to 5.50m, installed on 06/02/2015.

Not to Scale

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS8538 (3 of 3)

Drilling Method Cable Percussion		Borehole Diameter 250mm to 8.50m	Casing Diameter 250mm to 7.68m	BOREHOLE No. BH8540	
Equipment Dando 2000				Coordinates (National Grid) 546908.0 E 262267.5 N Ground Level 16.05 m OD	
Crew/Vessel SF		Logged by CAG	Compiled by es	Approved by <i>RL</i>	
Dates Drilled Start 20/01/2015 End 20/01/2015		20/01/2015 29/01/2015			

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details			SPT Blows/N Drive mm	U100 Blows/ Recovery mm	Description of Strata	Depth (Thickness) (m)	Level	Legend
			Depth (m) From	To	Type						
20/01							<p>TOPSOIL. Grass over brown silty clay with frequent rootlets (<1mm) and root fibres. [Topsoil]</p> <p>MADE GROUND. Orangish brown sandy gravelly clay with frequent pockets (<50mm) of grey clay. Sand is fine to coarse. Gravel is very angular to rounded fine to coarse of flint and chalk. [Made Ground]</p> <p>MADE GROUND. Grey silty clay with occasional rootlets (<2mm) and with rare pieces of plastic sheeting. [Made Ground]</p> <p>MADE GROUND. Grey silty clay with occasional rootlets (<2mm) [Made Ground]</p> <p>MADE GROUND. Mottled grey, brownish grey, brown and black sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is very angular to subangular fine to coarse of flint, aggregate stone, brick and concrete. Cobbles are angular of brick (<100mm) and subangular of concrete (<150mm). [Made Ground]</p> <p>At 5.00m; with occasional plastic bag fragments. Hydrogen sulphate odour (no reading on meter). Between 5.50m and 6.00m; with frequent pockets (<250mm) of light greenish grey sandy gravelly silty clay. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of flint, chalk and siltstone. Between 6.30m and 7.10m; driller noted concrete. At 6.50m; obstruction. Brick rubble and powdered grey concrete. At 7.00m; with frequent concrete cobbles (<150mm).</p> <p>MADE GROUND. Brown silty sandy gravel with occasional pockets of greyish brown sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of flint and concrete. Gravel in pockets is very angular to rounded fine to coarse of flint and chalk. Cement odour. [Made Ground] Between 7.10m and 8.10m; driller noted clay and brick fill. Between 8.10m and 8.50m; driller noted clay. Approximate boundary.</p> <p>Grey slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is very angular to subangular fine and medium of flint. Possible made ground. [Made Ground]</p> <p>End of Borehole</p>	(0.20) 0.20 (0.40)	15.85		
								0.60 (0.60)	15.45		
								1.20 (0.80)	14.85		
								2.00 (5.10)	14.05		
								7.10 (1.30)	8.95		
20/01	7.68	Dry						8.40 (0.10)	7.65		
								8.50	7.55		

Remarks (See notes & keysheets)

- 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
- 2 Sampling and in-situ testing not required.
- 3 Chiselled from 6.40m to 6.70m (60 mins); chiselled from 6.70m to 7.10m (60 mins).
- 4 See separate sheet for installation.
- 5 Groundwater not encountered during boring.

Scale 1:50



Project
A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT
SCHEME
HIGHWAYS AGENCY
J2A

Contract No. G140036U

Figure No. BH8540 (1 of 2)

Drilling Method Cable Percussion Equipment Dando 2000		Borehole Diameter 250mm to 8.50m Casing Diameter		BOREHOLE No. BH8540	
Crew/Vessel SF Dates Drilled Start 20/01/2015 End 20/01/2015		Logged by CAG 20/01/2015		Compiled by es 29/01/2015	
				Checked by PCC	
				Coordinates (National Grid) 546908.0 E 262267.5 N Ground Level 16.05 m OD	
Installation Details			Installation Depth (m)	Level m OD	Water Strikes
Instrumentation: 50mm slotted section (SL) from 2.00 to 8.50m	Concrete				
	Bentonite Pellets		0.50	15.55	
	Gravel Filter		1.50	14.55	
	SL=2.00-8.50m				
			8.50	7.55	
					8.40
					Strata Details TOPSOIL MADE GROUND Sandy GRAVEL Base of Hole
Remarks (See notes & keysheets)					
<input checked="" type="checkbox"/> Water Strike <input checked="" type="checkbox"/> Water Rise					
Upstanding cover with gas tap. Pipe diameter 50mm to 8.50m, installed on 22/01/2015.					
Not to Scale					
		Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A		Contract No. G140036U	
				Figure No. BH8540 (2 of 2)	

Drilling Method Window Sampler		Borehole Diameter 101mm to 6.00m 87mm to 8.00m		Casing Diameter 113mm to 5.00m		BOREHOLE No. WS8541	
Equipment Terrier		Crew/Vessel RU		Logged by CAG		Coordinates (National Grid) 546915.0 E 262307.5 N Ground Level 15.25 m OD	
Dates Drilled		Start 26/01/2015 End 27/01/2015		Compiled by es 02/02/2015		Approved by <i>REL</i>	
						Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recovery %)	Sample/Test Details				Description of Strata	Depth (Thick- ness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
26/01	0.00									
		(PIT)	0.30	ES	1	TOPSOIL. Grass over brown silty clay with abundant rootlets (<1mm) and root fibres. [Topsoil]	(0.20) 0.20	15.05		
			0.80	ES	2	MADE GROUND. Yellowish brown sandy gravelly silty clay. Sand is fine to coarse. Gravel is very angular to rounded fine to coarse of flint and chalk. [Made Ground]	(0.40)			
26/01						MADE GROUND. Grey silty clay with occasional rootlets (<1mm). [Made Ground]	0.60	14.65		
27/01	1.20	(100)	1.20-1.50	ES	3					
	1.50	(100)								
	2.00	(100)								
						Between 2.80m and 3.00m; slightly gravelly, locally with pockets (<30mm) of fine to coarse sand. Gravel is angular to subrounded predominantly fine and medium of flint and chalk.				
	3.00	(100)				MADE GROUND. Grey slightly mottled yellowish brown slightly gravelly silty clay with occasional pockets (<60mm) of slightly gravelly fine sand. Gravel is very angular to rounded predominantly fine and medium of flint and chalk. [Made Ground]	3.00	12.25		
	4.00	(100)								
			5.00-5.20	ES	4					

Remarks (See notes & keysheets)

- 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
- 2 In-situ testing and geotechnical sampling not required.
- 3 See separate sheet for installation.
- 4 Groundwater not encountered during boring.

Scale 1:25



Project
A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT
SCHEME
HIGHWAYS AGENCY
J2A

Contract No. G140036U


Figure No. WS8541 (1 of 3)

Drilling Method Window Sampler		Borehole Diameter 101mm to 6.00m 87mm to 8.00m	Casing Diameter 113mm to 5.00m	BOREHOLE No. WS8541	
Equipment Terrier				Coordinates (National Grid) 546915.0 E 262307.5 N	Ground Level 15.25 m OD
Crew/Vessel	RU	Logged by	Compiled by	Approved by	
Dates Drilled	Start 26/01/2015 End 27/01/2015	CAG 27/01/2015	es 02/02/2015	REC	
				Location Milton Landfill	

Date (Run Interval secs)	Run / Casing Depth (m)	Water (m) (Recov- ery %)	Sample/Test Details				Description of Strata	Depth (Thick- ness) (m)	Level	Legend
			Depth (m) From To	Type	No.	Results				
	5.00									
		(80)	5.50-5.80	ES	5	MADE GROUND. See previous sheet.				
						MADE GROUND. Brown and grey sandy gravelly clay. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse of flint, chalk, brick and charcoal/coal. [Made Ground] Between 5.80m and 6.00m; assumed zone of core loss.	5.40 (0.60)	9.85		
	6.00					MADE GROUND. Grey and brown sandy slightly gravelly silty clay. Sand is fine to coarse. Gravel is very angular to subrounded predominantly fine and medium of flint and chalk. [Made Ground]	6.00 (0.60)	9.25		
		(100)				Grey and brownish grey sandy and very sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is very angular to subangular fine to coarse of flint. Possible made ground. [Made Ground]	6.60 (0.50)	8.65		
	7.00					Firm, locally soft or stiff, greenish grey very sandy slightly gravelly silty CLAY. Sand is fine and medium. Gravel is very angular to subrounded fine to coarse of flint. Possible made ground. [Made Ground] Below 7.40m; light greenish grey to light grey, mottled orange.	7.10 (0.90)	8.15		
27/01		(100)	7.50-7.80	ES	6	Below 7.80m; firm and stiff.				
						End of Borehole	8.00	7.25		

Remarks
(See notes
& keysheets)

Scale 1:25

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS8541 (2 of 3)

Drilling Method Window Sampler	Borehole Diameter 101mm to 6.00m 87mm to 8.00m	Casing Diameter	BOREHOLE No. WS8541
Equipment Terrier			Coordinates (National Grid) 546915.0 E 262307.5 N Ground Level 15.25 m OD
Crew/Vessel RU	Logged by CAG	Compiled by as	Location Milton Landfill
Dates Drilled Start 26/01/2015 End 27/01/2015	27/01/2015	02/02/2015	


Installation Details		Installation Depth (m)	Level m OD	Water Strikes	Strata Depth (m)	Strata Details
Instrumentation: 50mm slotted section (SL) from 2.00 to 8.00m	Concrete				0.20	TOPSOIL
	Bentonite Pellets	0.40	14.85			MADE GROUND
	Gravel Filter	1.75	13.50			
	SL=2.00-8.00m				6.60	Silty sandy CLAY
		8.00	7.25		8.00	Base of Hole

Remarks
(See notes & key sheets)

Water Strike
 Water Rise

Upstanding cover with gas tap.
Pipe diameter 50mm to 8.00m, installed on 27/01/2015.

Not to Scale

	Project A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME HIGHWAYS AGENCY J2A	Contract No. G140036U
		Figure No. WS8541 (3 of 3)

RECORD OF BOREHOLE No. 12

Client Cambridge CC

Contractor Tony Bedford Site Milton

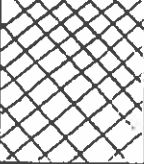
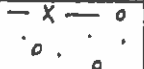

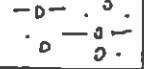

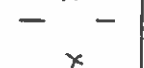
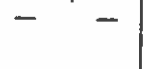
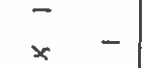



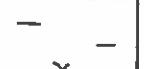





Sheet 1 of 1

Ground Level 9.7 metres AoD

Co-ordinates

E

N

Daily Progress	Depth m	Legend	Description of Strata	Reduced Level m AoD
11/2/92			Brown gravel FILL Firm grey clay FILL (Driller's descriptions) (MADE GROUND)	
	1.3			8.4
	1.5		Stiff grey brown mottled sandy silty CLAY with rootlets & trace of fine gravel	8.2
	2.2		Medium dense pale yellowish grey slightly clayey SAND & trace of fine gravel	8.5
	2.8		Medium dense orange brown clayey SAND with fine & medium gravel & stiff grey CLAY with much fine gravel incl. chalk (POCKETTY DRIFT)	6.9
	4.0		Fin to stiff grey silty MARL with brown streaks along laminae - moderately weathered (GAULT)	5.7
			Stiff blueish grey silty MARL etc. slightly weathered	
				
	6.0			
				
			Very stiff blueish grey fissured silty unweathered MARL to . . .	3.7
				
				
				
				
				
				
11/4/92		 base of borehole at 19.0m	-9.3

Remarks

- MARL = calcareous clay.
- Borehole dry throughout.

Appendix C. CQA Verification Report

A14 Cambridge to Huntingdon Improvement Scheme

Milton Landfill – Trial Pitting CQA Validation Report

28 October 2019

Status: Issued for Approval

much more than a road

Working on behalf of

Notice

This report was produced by IDT for Highways England for the specific purpose of the A14 Cambridge to Huntingdon Improvements Scheme.

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Table of Contents

1.0 Introduction.....	8
1.1 Scope.....	8
1.2 Relevant Site History	8
1.3 Report Usage	9
2.0 Milton Landfill	10
2.1 History	10
3.0 Purpose of Trial Pitting	12
4.0 Description of Ground Investigation Activities	12
4.1 Trial Pit Methodology	14
5.0 Results and Interpretation	15
6.0 Discussion	21
7.0 Conclusion.....	23
APPENDIX A. DAILY DIARY	25
APPENDIX B. PHOTOGRAPHIC RECORDS	37
APPENDIX C. TRIAL PIT LOGS.....	46
APPENDIX D. AS BUILT DRAWING	48
APPENDIX E. UTILITY DRAWING AT MILTON WESTBOUND DIVERGE	50

Tables

Table 1 – Proposed Ground Investigation.....	13
Table 2 – Trial Pit 1.....	16
Table 3 – Trial pit 2.....	16
Table 4 – Trial Pit 3.....	17
Table 5 – Trial pit 4.....	18
Table 6 – Trial Pit 5.....	18
Table 7 – Trial pit 6.....	19
Table 8 – Trial Pit 7.....	20
Table 9 – Trial Pit 8.....	21

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PCF Stage	5

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Preface

This document has been prepared by Nwabueze Uwandu, a qualified Geoenvironmental Engineer, employed on behalf of the A14 Integrated Delivery Team for the Milton trial pitting undertaken between 7th October and 10th October 2019.

1.0 Introduction

1.1 Scope

This report covers a supplementary ground investigation by means of trial pitting which was undertaken to determine whether the proposed infrastructure associated with the A14 improvement scheme will conflict or not, with the Milton landfill capping and lining system and to confirm the absence of engineered capping and/or lining within the footprint of the A14 improvement scheme.

This report only covers the area of investigation which comprises 8 (eight) trial pits within the southeast corner of the Milton Landfill site.

The trial pitting investigation was undertaken in accordance with *Milton Landfill – Trial Pitting CQA Plan* (document reference HA528983-ACJV-HGT-S5_CQA-RP-C-0002) revision P04 dated 03/09/19. Reference has been made to this document throughout this report.

1.2 Relevant Site History

As part of the handover process, the Integrated Design Team (IDT) was provided the following documents by Highways England and J2A, which were reviewed to inform the following sections of this report:

- Waste Recycling Group (2003). Milton Landfill PPC Application Volumes 1 to 3 Ref 03523331
- FCC Environment (2013). Milton Landfill Leachate Management Plan Permit BV4584IU, variation WP3237LF version 4 December 2013.

- J2A (November 2014). Construction Quality Assurance Plan, Additional ground investigation at Milton landfill A14-JAC-ZZ-XX-RP-V-00088.
- J2A (March 2015) Construction Quality Assurance Validation Report A14-JAC-ZZ-XX-RP-V00142.

The documents above are comparative sources of information used in the preparation of this intrusive investigation report. These documents should be read in conjunction with this report.

1.3 Report Usage

The output of this geo-environmental investigation work will inform the following A14 / A10 construction operations:

- Site clearance and stumping removal.
- Modifications to, and protection of, existing monitoring installations
- A10 telecommunications corridor
- Topsoil and subsoil strip (to formation, beneath alignment of pavement and A14 infrastructure)
- Placement of GIL (ground improvement layer)
- Placement of capping
- Drainage
- Comms & technology ducting
- Installation of street lighting columns
- Installation of traffic signals

- Power supply
- Placement of pavement sub-base
- Installation of new kerbs
- Placement of tarmacadam / white lines
- Topsoil to new verge
- Installation of VRS
- Installation of timber boundary fence
- Planting

As previously confirmed with FCC and the Environment Agency:

- Installation of new boreholes to replace boreholes BH12 and BH-W01
- Installation of 'swan neck' modification on BH's 10, 11 and 12 for ongoing and future monitoring.

2.0 Milton Landfill

2.1 History

The existing A14 Eastbound off-slip improvement scheme at Milton junction bounds the southeast corner of the Milton landfill site. The physical works extends close to the boundary of Milton landfill, operated by FCC Environment (UK)Ltd. Milton landfill is situated approximately 1km west of the village of Milton and 3km north of the centre of Cambridge. The landfill comprises an L-shaped plot of land approximately 48.5 hectares in area which is divided into three phases of development.

Milton landfill site was developed by adopting disused clay pits excavated during the 1970's, and has accepted waste since the 1980's. Phase III however, was developed within arable land. The site is located on Gault Clay, which is overlain by River Terrace Deposits although these have been extracted over much of the landfill. The capping system emplaced/proposed across the site comprises 1m thick site derived clay overlain by subsoil. Geological data suggests that locally, the thickness of the Gault Clay ranges from 10.2 – 18.7m and is underlain by the Cretaceous age Woburn Sand Formation (a principal aquifer). Both hazardous and non-hazardous waste was accepted at Milton, up to 15 July 2004, and only non-hazardous thereafter.

Phase I received waste from 1980 to 1990, and Phase II is recorded as having received waste from 1991. Since 1991 the cell construction has been subject to CQA procedures. Phase I and Phase II, Cells 1 – 5A were not constructed based on engineered containment but were reported to be hydraulically contained. The cells of these phases are purported to be naturally contained by a basal geological barrier comprised of in-situ Gault Clay. In 1996, a clay sidewall liner was installed retrospectively along the northern, eastern and southern perimeter of Phase I and was keyed into the perimeter clay bunds of Phase II and Phase III. The thickness of the clay sidewall is 1m where it is adjacent to the Gault Clay and is 3m where it lies against the River Terrace Gravel deposits. This remedial action was necessary due to the need to control leachate levels in Phase I.

Construction Quality Assurance (CQA) information provided by FCC Environment Ltd. indicates that to the east of the engineered clay liner, inert fill overlies the Gault Clay. This is likely to represent general engineered fill to regulate the topography between the landfill and the adjacent A14/A10. Anecdotally, an earlier access to the landfill was in this area.

3.0 Purpose of Trial Pitting

Given the age of the landfill site and the changes of operator, there is a lack of confidence in the survey data, location and extent of waste mass within the capping system associated with Milton Landfill; however, Phase 1 and Phase 2 are believed to comprise a metre of compacted clay, overlain by a metre of restoration soil.

The purpose of the investigation is to demonstrate that the service corridors and other areas of proposed works associated with the A14 improvements including Vehicle Restraint Systems (VRS), signage, lighting and boundary fences, are not underlain by materials associated with the landfill, notably landfill capping, restoration material.

4.0 Description of Ground Investigation Activities

A total of eight trial pits were undertaken in accordance with the details outlined in *Milton Landfill – Trial Pitting CQA plan*. For ease of reference, this is presented below in Table 1. The trial pits were located and oriented as shown on drawing HA528983-ACJV-HGN-S5_XX-DR-C-0001.

Table 1 – *Proposed Ground Investigation*

Excavation identification	Anticipated depth (m)	Details and rationale for proposed depth	Purpose of excavation
TPML 1	1.5	TPML1 to be extended to 500mm below base of traffic sign foundation	To confirm absence of materials associated with landfill capping.
TPML 2	1.5	TPML2 to be extended to 500mm below base of nearby services. Trial pit to be excavated parallel to A10 off-slip	To confirm whether the proposed scheme will be encountered materials associated with the performance of the landfill. Note TPML2 is offset approximately 40m from indicated line of section
TPML 3	1.5	TPML3 excavated to 500mm below base of nearby services	To confirm whether the proposed scheme will be encountered materials associated with the performance of the landfill.
TPML 4	1.8	TPML4 excavated to 300mm below modifications to BH10	To confirm whether the proposed scheme will be encountered materials associated with the performance of the landfill.
TPML 5	1.0	TPML5 to be excavated to approximately to 1.0m, to assess the presence of capping material	To confirm or not the proposed scheme will be encountered materials associated with the performance of the landfill.
TPML 6	1.5	TPML6 excavated to 500mm below	To confirm whether the proposed scheme will be encountered materials

		base of nearby services	associated with the performance of the landfill.
TPML 7	1.5	TPML7 excavated to 500mm below base of nearby services	To confirm whether the proposed scheme will be encountered materials associated with the performance of the landfill.
TPML 8	1.5	TPML8 excavated to 500mm below base of nearby services	To confirm the ground conditions in the vicinity of BH13, which has been identified as a possible location for the construction of a monitoring well to replace BH12

4.1 Trial Pit Methodology

Existing grassland/ vegetation was cut and removed in the form of turves.

Topsoil was removed in layers not exceeding 100mm and kept separate from other samples.

Excavated samples were stored adjacent to the excavation but at a safe distance to maintain the integrity of the excavation from collapse.

Soil samples were examined at each trial pit. Upon completion of the excavation and inspection, the excavation was photographed, backfilled and compacted using a padfoot roller. The materials were placed and compacted in the reverse order to which they were removed, with topsoil replaced last.

5.0 Results and Interpretation

The trial pitting commenced from 7th October to 10th October 2019. The weather conditions were dry, clear sky throughout the duration of the works.

It must be noted that geotechnical samples were retrieved from the arising materials during the trial pitting and therefore, classification of the material descriptions may be subjective. In addition, no in-situ testing was carried out. The geological interpretation of the in-situ, founding materials (geological strata boundaries) encountered during the trial pitting has been made using a combination of available ground investigation data in the area, local knowledge for the ground conditions and a visual inspection of the trial pits. There is no clear differentiation between the Gault Clay Formation and Made Ground Cohesive (which may also be reworked/ engineered Gault Clay) from the existing J2A 2014 investigation and therefore, the current interpretation may be subjective given the limited material test data available.

A summary of the conditions encountered within each trial pit is provided in the followings section.

Table 2. Trial Pit 1

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 1	1.5	1.5	0m – 0.3m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.3m – 0.7m	Dark brown mottled reddish brown slightly clayey gravelly sand. Sand is predominantly fine to medium. Gravel is angular to subangular. [MADE GROUND – GRANULAR]
			0.7m – 1.5m	Firm to stiff dark grey, slightly sandy slightly gravelly silty clay. [GAULT CLAY]
				No groundwater ingress recorded.

Table 3. Trial Pit 2

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 2	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.1m – 0.5m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. Gravel is angular to sub angular. [MADE GROUND – GRANULAR]

			0.5m – 1.5m	Dark bluish grey firm to stiff slightly gravelly silty clay. Rare pockets of orangish brown gravelly sand present. [GAULT CLAY] No groundwater ingress recorded.
--	--	--	-------------	---

Table 4. Trial Pit 3

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 3	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]
			0.1m – 0.2m	Orangish brown slightly gravelly sand. Sand is fine to coarse. [MADE GROUND – GRANULAR]
			0.2m – 1.5m	Dark bluish grey firm to stiff slightly gravelly silty clay. Rare pockets of orangish brown gravelly sand present. [GAULT CLAY] No groundwater ingress recorded.

Table 5. Trial Pit 4

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 4	1.8	1.8	0m – 0.1m 0.1m – 0.2m 0.2m – 1.8m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]. Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. [MADE GROUND – GRANULAR] Dark bluish grey stiff slightly gravelly silty clay. [GAULT CLAY] No groundwater ingress recorded.

Table 6. Trial Pit 5

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 5	1.0	1.0	0m – 0.1m 0.1m – 1.0m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]. Then dark grey stiff slightly gravelly silty clay from 0.1m to 1m. (GAULT CLAY). No groundwater ingress recorded.

Table 7. Trial Pit 6

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 6	1.5	1.8	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL].
			0.1m – 0.2m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND]
			0.2m – 1.45m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND COHESIVE]. Occasional pockets of orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is angular to subangular with occasional cobbles of brick and concrete aggregate. Possible surplus material from former roadworks. [MADE GROUND – GRANULAR].
			1.45m – 1.8m	Dark bluish grey stiff slightly gravelly silty clay. [GAULT CLAY]
No groundwater ingress recorded.				

Table 8. Trial Pit 7

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 7	1.5	1.8	0m – 0.2m	Dark blackish grey slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL]. Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. [MADE GROUND – GRANULAR]
			0.2m – 0.4m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND – COHESIVE]. Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND – GRANULAR]
			0.4m – 0.9m	Dark grey stiff slightly gravelly silty clay. [MADE GROUND – COHESIVE].
			0.9m – 1.8m	Dark orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is angular to subangular with occasional brick cobbles, concrete aggregate and wood deposits. Possible surplus material from former roadworks. [MADE GROUND GRANULAR].
No groundwater ingress encountered.				

Table 9. Trial Pit 8

Trial Pit reference	Scheduled depth	Excavated depth	Strata depth	Description
TPML 8	1.5	1.5	0m – 0.1m	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots. Gravel is angular to subangular. [TOPSOIL].
			0.1m – 0.2m	Orangish brown slightly silty gravelly sand. Sand is fine to coarse. [MADE GROUND GRANULAR]
			0.2m – 1.5m	Greyish blue stiff slightly gravelly silty clay. [GAULT CLAY]
				No groundwater ingress recorded.

6.0 Discussion

The trial pitting investigation within the Milton Landfill site has been completed in accordance with ‘Milton Landfill – Trial Pitting CQA plan ‘revision P04 dated 03/09/19.

In TPML 1 to 5 and 8, following topsoil strip, the pits mostly showed between 0.1m to 0.5m of Made Ground (possibly restoration soil / subsoil) overlying a dark bluish grey, stiff slightly gravelly silty clay which is consistent with the over consolidated Gault Clay Formation seen elsewhere in

the Milton area. It was difficult to determine whether this was reworked Gault Clay (which would suggest this was engineered Made Ground) without material testing, however, its consistency with depth and absence of fissures, laminations or variability in fill could imply this was natural ground. The clay was described as relatively homogenous over the depth of these pits. In general, the trial pits were consistent with the historic borehole BH8535, BH8536 and BH8541, and historic window samples WS7511 and WS8536 respectively. The geological interpretation of the stiff cohesive subgrade material (whether that is natural Gault Clay Formation or engineered Made Ground) may be subjective and confirmed through material testing or otherwise. Based on the trial pitting, the landfill capping system nor any form of landfill waste was encountered.

Anthropogenic materials were not encountered within the trial pits, other than TPML 6 and 7 where, the Made Ground was seen to be quite variable with pockets of brick and concrete rubbles present. The nature of the material encountered was that commonly associated in road construction which could suggest this is reworked engineered fill from the construction of the existing Milton haul road / A10 road construction. The material is thought to have been used to re-grade the topography between the landfill site and the adjacent road embankment which is consistent with WS7512 and WS8541. There was no evidence to suggest landfill capping or any form of waste material associated with the landfill was encountered during the trial pitting.

No landfill leachate nor perched groundwater was recorded during the site investigation. This coincides with historic borehole logs where, groundwater is expected at some 2–4m below ground level.

Personal gas monitors were used by all site operatives during the ground investigation however, these did not monitor any landfill gases (e.g. hydrogen sulphide) present. Personal gas monitors (MSA Altair 4X) were used to measure carbon dioxide and oxygen levels in the vicinity of the trial pitting that may affect human health only, not specifically for monitoring landfill gas exposure. None of the personal gas monitors were triggered.

Also, no geotechnical samples were retrieved from the arising material during the trial pitting.

7.0 Conclusion

Based on the findings of the A14 IDT ground investigation, the exploratory trial pits did not encounter any materials associated with the functionality of the landfill within the footprint of the permanent works. The landfill is not considered to pose an impediment to the improvement scheme. The risk associated with encountering material associated with the landfill capping system, or waste material with the works associated with the A14 improvement scheme, is unlikely. The risk of encountering landfill gases such as hydrogen sulphide during construction work is also considered to be unlikely. The A14 IDT will however, implement precautionary measure during construction (such as the use of gas monitors etc).

The locations and alignment of features associated with the improvement works (service corridors, lighting columns, vehicle restraints and permanent fence lines), will be marked on the ground. Due to the number of required construction activities which are to be covered under a separate CQA plan and given that the risk of encountering landfill material is unlikely, it is envisaged that CQA Engineer (including FCC's appointed CQA Inspector) will have supervisory roles whilst on site for all activities that involve breaking of ground. The A14 IDT will notify the CQA Engineer of any construction activities that may require supervision.

Those activities that do not involve breaking of the ground, do not need CQA supervision.

APPENDIX A. DAILY DIARY

Date:	Monday 7 th October 2019	Site:	Milton Landfill Site
Weather:	Partially Cloudy and Clear Sky	CQA Plan Ref:	HA528983-ACJV-HGT-S5_CQA-RP-C-0002Revision P03 P04

Visitors to Site:	None
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Work inspected and Progress on Site

09:20hrs-09:50hrs	- Tool box talk by Jack Clarke.
10.20hrs-10.30hrs	- Site work over with Jack for confirmation of Trial Pit set out positions
10.35hrs-10.47hrs	- 5T excavator moving to position for TPML 1
	<u>TPML1</u>
12.41hrs-13.00hrs	- CAT scanned digging position for any services. And plant clear vegetation.
13.08hrs	- Commenced excavation of trial pit.
	- Total excavation width 1m x length 8m x depth 1.5m achieved.
	- Trial Pit log show dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.3m. Gravel is angular to subangular. (TOPSOIL)
	- Dark brown mottled reddish brown slightly clayey gravelly sand. Sand is predominantly fine to medium form 0.3m to 0.7m. Gravel is angular to subangular. (MADE GROUND - GRANULAR)
	- Firm to stiff dark grey, slightly sandy slightly gravelly silty clay from 0.7m to 1.5m. (GAULT CLAY)
	- No groundwater ingress recorded
	- Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised.

DAILY DIARY

16:16hrs	<p>- Completed excavation, however trial pit not backfilled because of discrepancy with set out length and Jade (Section 5 Project engineer) confirmation who had a day off work</p> <p style="text-align: right;">(Cont. overleaf if required)</p>
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List of Plant	Hours of Operation	Comments
Excavator (5T) CAT	08:00 -16:16	

Prepared by:	N A Uwandu	Signed:	
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Date:	Tuesday 8 th October 2019	Site:	Milton Landfill Site
Weather:	Partially Cloudy and Sunny	CQA Plan Ref:	HA528983-ACJV-HGT-S5_CQA-RP-C-0002Revision P03 P04

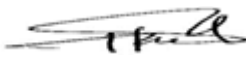
Visitors to Site:	None
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Work inspected and Progress on Site

07.10hrs-10.00hrs	<p><u>TPML 1</u></p> <ul style="list-style-type: none"> - Backfilled using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller.
10.08hrs	<p><u>TPML 2</u></p> <ul style="list-style-type: none"> - CAT scanned digging position for any buried services. And plant clears vegetation.
10.31hrs	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 0.6m x length 17m x depth 1.5m achieved. - Trial Pit log show Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular (TOPSOIL). - Orangish brown slightly silty gravelly sand from 0.1m to 0.5m. Sand is fine to coarse. Gravel is angular to sub angular. (MADE GROUND - GRANULAR) - Dark bluish grey firm to stiff slightly gravelly silty clay from 0.5m to 1.5m. Rare pockets of orangish brown gravelly sand present. (GAULT CLAY) - No groundwater ingress recorded. - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but in a safe distance to ensure that the integrity of the excavation is not compromised.
13:25hrs	<ul style="list-style-type: none"> -Completed Trial pit excavation.

	<ul style="list-style-type: none"> - Caution barrier and tape installed around holes as safety measures prior to complete backfilling.
13.56hrs	<p><u>TPML 3 Excavation</u></p> <ul style="list-style-type: none"> - CAT scanned set out position for any buried services. And plant clears vegetation.
14.12hrs	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 1m x length 5m x depth 1.5m achieved. - Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL). - Orangish brown slightly gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND - GRANULAR) - Dark bluish grey firm to stiff slightly gravelly silty clay from 0.2m to 1.5m. Rare pockets of orangish brown gravelly sand present. (GAULT CLAY) - No groundwater ingress recorded. - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored opposite to the excavation but in a safe distance to ensure that the integrity of the excavation is not compromised.
17.20hrs	<ul style="list-style-type: none"> - Completed Trial pit excavation for the day. Partially backfilled trial pit. - Caution barrier and tape installed around holes as safety measures prior to complete backfilling.

DAILY DIARY

List of Plant	Hours of Operation	Comments	
Excavator (5T) CAT Rammax	08:00 -17.41		
Prepared by:	N A Uwandu	Signed:	

Date:	Wednesday 9 th October 2019	Site:	Milton Landfill Site
Weather:	Partially Cloudy and Clear Sky	CQA Plan Ref:	HA528983-ACJV-HGT-S5_CQA-RP-C-0002Revision P03 P04

Visitors to Site:	None
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Work inspected and Progress on Site

07:08hrs-07:50hrs	<ul style="list-style-type: none"> - Excavator (9T) Plant operator inducted by FCC <p><u>TPML 3</u></p>
08.00hrs-09.20hrs	<ul style="list-style-type: none"> - Backfilled using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller. <p><u>TPML4</u></p>
09.25hrs	<ul style="list-style-type: none"> - Excavator (9T) moved to position for TPML 4
09.27hrs	<ul style="list-style-type: none"> - CAT scanned set out position for any buried services. And plant clears vegetation.
09.30hrs	<ul style="list-style-type: none"> -Commenced excavation of trial pit. - Total excavation width 1.7m x length 6m x depth 1.8m achieved. - Trial Pit log show Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL). - Rare pockets of orangish brown slightly gravelly sand present from 0.1 to 0.2m. Sand is fine to coarse. (MADE GROUND - GRANULAR) - Then Dark bluish grey stiff slightly gravelly silty clay from 0.2 to 1.8m. (GAULT CLAY). - No groundwater ingress recorded.

<p>09.50hrs</p>	<ul style="list-style-type: none"> - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised. - Backfilled using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller. <p><u>TPML 5</u></p>
<p>10:30hrs</p>	<ul style="list-style-type: none"> - Excavator (9T) moved to position for TPML 5 - CAT scanned set out position for any buried services. And plant clears vegetation.
<p>10:35hrs</p>	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 1.7m x length 4m x depth 1m achieved. - Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL). - Then dark grey stiff slightly gravelly silty clay from 0.1m to 1m. (GAULT CLAY). - No groundwater ingress recorded - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised.
<p>11.00hrs</p>	<ul style="list-style-type: none"> -Finish trial pit excavation <p><u>TPML 6</u></p>
<p>12.30hrs</p>	<ul style="list-style-type: none"> - Excavator (9T) moved to position for TPML 6
<p>12.30hrs</p>	<ul style="list-style-type: none"> - CAT scanned set out position for any buried services. And plant clears vegetation.
<p>12.36hrs</p>	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 1.7m x length 4m x depth 1.8m achieved.

<p>13.46hrs</p>	<ul style="list-style-type: none"> - Dark brown slightly gravelly silty clay with occasional root fibres and tree roots 0m to 0.1m. Gravel is angular to subangular (TOPSOIL) - Orangish brown slightly silty gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. [MADE GROUND- GRANULAR) <p>From 0.2m to 1.45m dark grey stiff slightly gravelly silty clay. (MADE GROUND COHESIVE). Occasional pockets of orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is angular to subangular with occasional cobbles of brick and concrete aggregate. Possible surplus material from former roadworks. (MADE GROUND - GRANULAR).</p> <ul style="list-style-type: none"> -Then Dark bluish grey stiff slightly gravelly silty clay from 1.45m to 1.8m. (GAULT CLAY). - No groundwater ingress recorded - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised. - Finish trial pit excavation
<p>13.50hrs</p>	<ul style="list-style-type: none"> - Backfilled using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller.
	<p><u>TPML 7</u></p>
<p>15.26hrs</p>	<ul style="list-style-type: none"> - Excavator (9T) moved to position for TPML 7
<p>15.26hrs</p>	<ul style="list-style-type: none"> - CAT scanned set out position for any buried services. And plant clears vegetation.
<p>15.30hrs</p>	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 1.7m x length 4m x depth 1.8m achieved. - Dark blackish grey slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.2m. Gravel is angular to subangular. (TOPSOIL). Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. (MADE GROUND - GRANULAR).

16.22hrs	<ul style="list-style-type: none"> - Dark grey stiff slightly gravelly silty clay 0.2m to 0.4m. (MADE GROUND - COHESIVE). Orangish brown slightly silty gravelly sand. Sand is fine to coarse. (MADE GROUND -GRANULAR) - Dark grey stiff slightly gravelly silty clay from 0.4 to 0.9m. (MADE GROUND - COHESIVE). - Dark orangish brown slightly gravelly sand from 0.9m to 1.8m. Sand is fine to coarse. Gravel is angular to subangular with occasional brick cobbles, concrete aggregate and wood deposits. Possible surplus material from former roadworks. (MADE GROUND GRANULAR). - No groundwater ingress recorded. - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised.
16.30hrs	<ul style="list-style-type: none"> - Completed trial pit excavation. - Backfilled TPML 6 and TPML 7 using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller. <p>Note</p> <ul style="list-style-type: none"> - TPML 5 and 6 excavations were extended to 1.8m by Jade (Section 5 Project Engineer) with the concept of FCC CQA engineer for further correlations/ investigation.

(Cont. overleaf if required)

List of Plant	Hours of Operation	Comments
Excavator (5T) CAT Rammax Deodorizer	08.00-18.00	

Prepared by:	N A Uwandu	Signed:	
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Date:	Thursday 10 th October 2019	Site:	Milton Landfill Site
Weather:	Partially Cloudy and Clear Sky	CQA Plan Ref:	HA528983-ACJV-HGT-S5_CQA-RP-C-0002Revision P03 P04

Visitors to Site:	None
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Work inspected and Progress on Site

08.10hrs	<p><u>TPML8</u></p> <ul style="list-style-type: none"> - CAT scanned digging position for any services. And plant clear vegetation.
08.21hrs	<ul style="list-style-type: none"> - Commenced excavation of trial pit. - Total excavation width 1.7m x length 6m x depth 1.5m achieved. - Trial Pit log show dark brown slightly gravelly silty clay with occasional root fibres and tree root from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL). - Orangish brown slightly silty gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND GRANULAR). - Greyish blue stiff slightly gravelly silty clay from 0.2m to 1.5m. (GAULT CLAY) - No groundwater ingress recorded - Top soil removed in layer not exceeding 100mm and others. Differential excavation spoils were stored adjacent to the excavation but at a safe distance to ensure that the integrity of the excavation is not compromised.
11:20hrs	<ul style="list-style-type: none"> -Finish trial pit excavation
13.20hrs	<ul style="list-style-type: none"> - Backfilled TPML 8 using bucket of the excavator, in the reverse order to which spoils were removed and compacted using Rammax roller.
14.38hrs	<ul style="list-style-type: none"> - Contractors tidied up all work environment and demobilise from site.

(Cont. overleaf if required)

DAILY DIARY

List of Plant	Hours of Operation	Comments
Excavator (5T) CAT Remmax Deodorizer	08:00 -14:30	

Prepared by:	N A Uwandu	Signed:	
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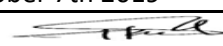
APPENDIX B. PHOTOGRAPHIC RECORDS

PHOTOGRAPHS



A14 Integrated Delivery Team

TMPL 1

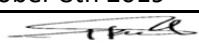
Site	Milton Landfill	Date	October 7th 2019
Prepared by:	NA Uwandu	Signed:	

PHOTOGRAPHS



A14 Integrated
Delivery Team

TMPL 2

Site	Milton Landfill	Date	October 8th 2019
Prepared by:	NA Uwandu	Signed:	

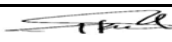
PHOTOGRAPHS



A14 Integrated
Delivery Team

TMPL 3

Site	Milton Landfill	Date	October 8th 2019
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Prepared by:	NA Uwandu	Signed:	
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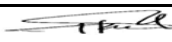
PHOTOGRAPHS



A14 Integrated
Delivery Team

TMPL 4

Site	Milton Landfill	Date	October 9th 2019
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Prepared by:	NA Uwandu	Signed:	
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PHOTOGRAPHS



A14 Integrated Delivery Team

TMPL 5

Site	Milton Landfill	Date	October 9th 2019
Prepared by:	NA Uwandu	Signed:	

PHOTOGRAPHS



A14 Integrated Delivery Team

TMPL 6

Site	Milton Landfill	Date	October 9th 2019
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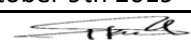
Prepared by:	NA Uwandu	Signed:	
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PHOTOGRAPHS



A14 Integrated Delivery Team

TMPL 7

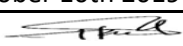
Site	Milton Landfill	Date	October 9th 2019
Prepared by:	NA Uwandu	Signed:	

PHOTOGRAPHS



A14 Integrated
Delivery Team

TMPL 8

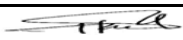
Site	Milton Landfill	Date	October 10th 2019
Prepared by:	NA Uwandu	Signed:	

PHOTOGRAPHS


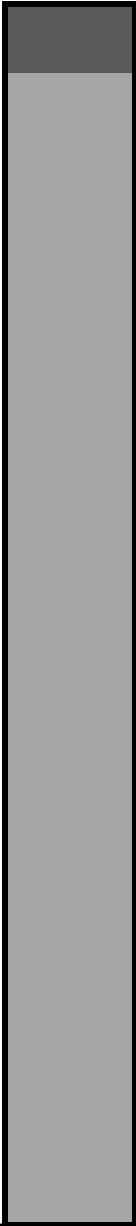




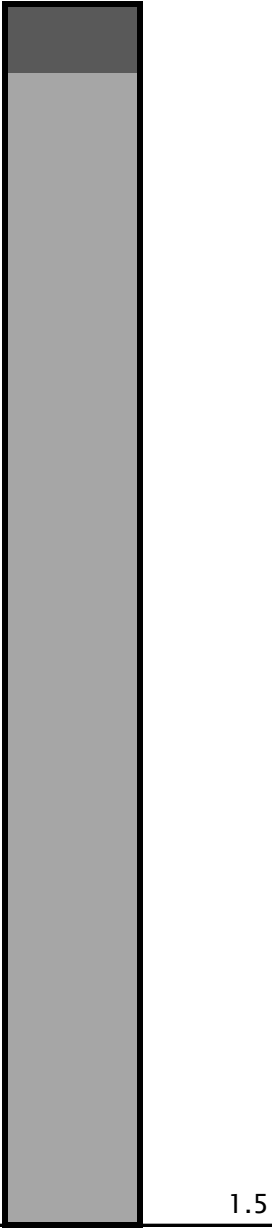

A14 Integrated Delivery Team


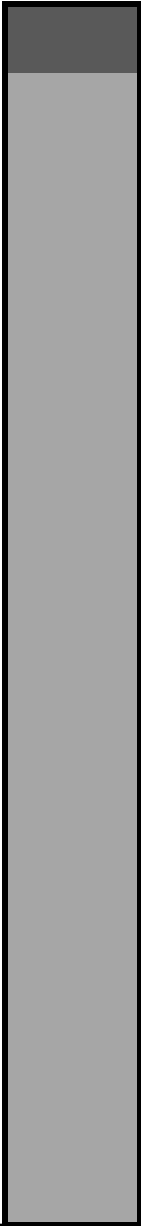
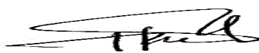
Clay liner compaction using remote padfoot roller


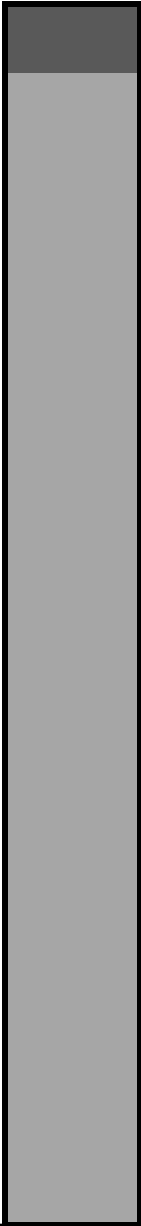
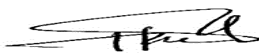
Site	Milton Landfill	Date	October 10th 2019
Prepared by:	NA Uwandu	Signed:	


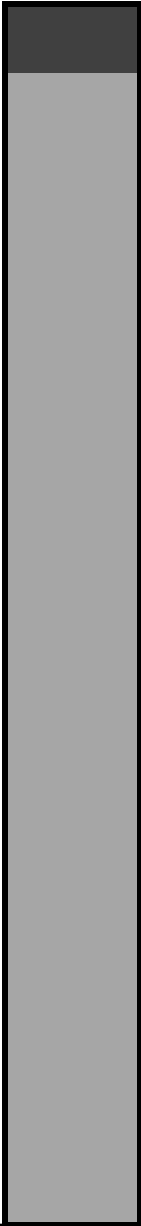

APPENDIX C. TRIAL PIT LOGS


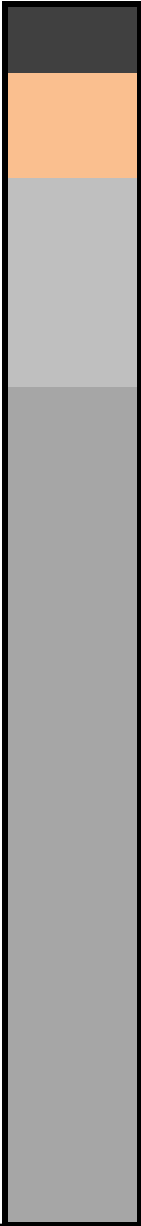
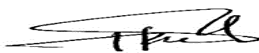
DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04
		Site: Milton Landfill
		CQA Engineer: A Uwandu
TP N°: TPML 1	Dates Drilled:	7th October 2019
Design Depth: 1.5m		Completed Depth: 1.5m
Well Schematic	Description of Strata	
Width : 1 m Length : 8 m 	Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.3m. Gravel is angular to subangular. (TOPSOIL)	
	Dark brown mottled reddish brown slightly clayey gravelly sand from 0.3m to 0.7m. Sand is predominantly fine to medium. Gravel is angular to subangular. (MADE GROUND - GRANULAR).	
	Firm to stiff dark grey, slightly sandy slightly gravelly silty clay from 0.7m to 1.5m. (GAULT CLAY).	
	1.5	
Plant on site: 1 x 5T Excavator		Signed: 


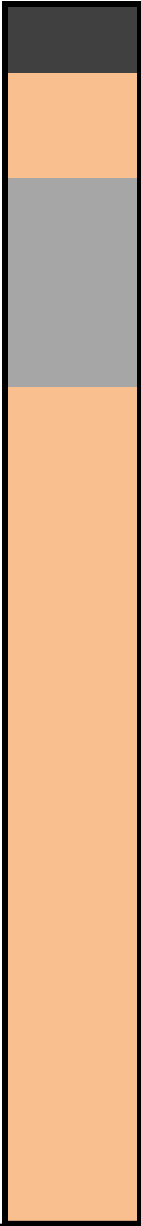
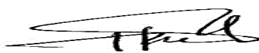
DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 2	Dates Drilled:	8th October 2019	
Design Depth: 1.5m		Completed Depth: 1.5m	
Well Schematic		Description of Strata	
Width : 0.6m Length : 1.7m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular and subangular. (TOPSOIL)	
		Orangish brown slightly silty gravelly sand from 0.1m to 0.5m. Sand is fine to coarse. Gravel is angular to sub angular. (MADE GROUND - GRANULAR)	
		Dark bluish grey firm to stiff slightly gravelly silty clay. Rare pockets of orangish brown gravelly sand present from 0.5m to 1.5m. (GAULT CLAY)	
Plant on site: 1 x 5T Excavator		Signed: 	


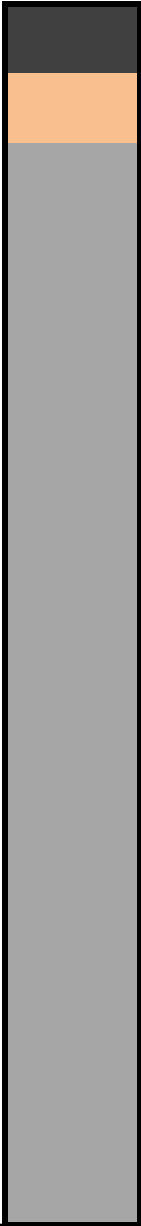

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 3	Dates Drilled:	8th October 2019	
Design Depth: 1.5m		Completed Depth: 1.5m	
Well Schematic		Description of Strata	
Width : 1 m Length : 5 m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL)	
		Orangish brown slightly gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND - GRANULAR)	
		Dark bluish grey firm to stiff slightly gravelly silty clay from 0.2m to 1m Rare pockets of orangish brown gravelly sand present. (GAULT CLAY)	
		Dark bluish grey firm to stiff slightly gravelly silty clay from 1m to 1.5m Rare pockets of orangish brown gravelly sand present. (GAULT CLAY)	
		1.5	
Plant on site: 1 x 5T Excavator		Signed: 	

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 4	Dates Drilled:	9th October 2019	
Design Depth: 1.8m		Completed Depth: 1.8m	
Well Schematic		Description of Strata	
Width : 1.7m Length : 6m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular.(TOPSOIL)	
		Rare pockets of orangish brown slightly gravelly sand present from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND - GRANULAR)	
		Dark bluish grey stiff slightly gravelly silty clay from 0.2 to 1m.(GAULT CLAY)	
		Dark bluish grey stiff slightly gravelly silty clay from 1m to 1.8m.(GAULT (CLAY)	
		1.8	
Plant on site: 1 x 9T Excavator		Signed: 	

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 5	Dates Drilled:	9th October 2019	
Design Depth: 1		Completed Depth: 1 m	
Well Schematic		Description of Strata	
Width : 1.7m Length : 4m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular.(TOPSOIL).	
		Dark grey stiff slightly gravelly silty clay from 0.1m to 0.5m. (GAULT CLAY).	
		Dark grey stiff slightly gravelly silty clay from 0.5m to 1.0m. (GAULT CLAY)	
Plant on site: 1 x 9T Excavator		Signed: 	

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 6	Dates Drilled:	9th October 2019	
Design Depth: 1.5m		Completed Depth: 1.8m	
Well Schematic		Description of Strata	
Width : 1.7m Length : 4m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree roots from 0m to 0.1m. Gravel is angular to subangular.(TOPSOIL)	
		Orangish brown slightly silty gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND- GRANULAR)	
		Dark grey stiff slightly gravelly silty clay from 0.2m to 1.45m. (MADE GROUND-COHESIVE). Occasional pockets of orangish brown slightly gravelly sand. Sand is fine to coarse. Gravel is subangular with occasional cobbles of bricks and concrete aggregates. Possible surplus material from former roadworks.(MADE GROUND - GRANULAR).	
		Dark bluish grey stiff slightly gravelly silty clay from 1.45m to 1.8m. (GAULT CLAY)	
Plant on site: 1 x 9T Excavator		Signed: 	

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 7	Dates Drilled:	9th October 2019	
Design Depth: 1.5m		Completed Depth: 1.8m	
Well Schematic		Description of Strata	
Width : 1.7m Length : 4m 			
		Dark blackish grey slightly gravelly silty clay with occasional root fibres and tree roots 0m to 0.2m. Gravel is angular to subangular from 0m to 0.2m. (TOPSOIL)	
		Rare pockets of orangish brown slightly gravelly sand present. Sand is fine to coarse. (MADE GROUND - GRANULAR)	
		Dark grey stiff slightly gravelly silty clay 0.2m to 0.4m.(MADE GROUND-COHESIVE).Orangish brown slightly silty gravelly sand. Sand is fine to coarse. (MADE GROUND -GRANULAR)	
		Dark grey stiff slightly gravelly silty clay from 0.4m to 0.9m. (MADE GROUND - COHESIVE)	
		Dark orangish brown slightly gravelly sand from 0.9m to 1.5m. Sand is fine to coarse. Gravel is angular to subangular with occasional brick cobbles, concrete aggregate and wood deposits. Possible surplus material from former roadworks. (MADE GROUND GRANULAR).	
		Dark orangish brown slightly gravelly sand from 1.5m to 1.8m. Sand is fine to coarse. Gravel is angular to subangular with occasional brick cobbles, concrete aggregate and wood deposits. Possible surplus material from former roadworks. (MADE GROUND GRANULAR).	
Plant on site: 1 x 9T Excavator		Signed: 	

DRILLING LOG		Job N°: HA528983-ACJV-Revision P03 P04	
		Site: Milton Landfill	
		CQA Engineer: A Uwandu	
TP N°: TPML 8	Dates Drilled:	10th October 2019	
Design Depth: 1.5m		Completed Depth: 1.5m	
Well Schematic		Description of Strata	
Width : 1.7m Length : 6m 			
		Dark brown slightly gravelly silty clay with occasional root fibres and tree root from 0m to 0.1m. Gravel is angular to subangular. (TOPSOIL)	
		Orangish brown slightly silty gravelly sand from 0.1m to 0.2m. Sand is fine to coarse. (MADE GROUND GRANULAR).	
		Greyish blue stiff slightly gravelly silty clay from 0.2m to 1m.(GAULT CLAY)	
		Greyish blue stiff slightly gravelly silty clay from 1m to 1.5m. (GAULT CLAY)	
Plant on site: 1 x 9T Excavator		Signed: 	

APPENDIX D. AS BUILT DRAWING



Actual trial hole area



Trail hole area of interest

Trial Hole 1

41698.52	473275.8	10.893
41699.67	473275.2	10.881
41702.16	473284.4	11.246
41701.25	473284.9	11.238
41700.79	473283.1	9.37
41698.82	473275.9	9.408
41699.65	473275.8	9.462
41701.27	473282.4	9.249

Trial Hole 3

41831.64	473290.1	12.38
41830.96	473286.1	11.937
41831.74	473286.1	11.935
41832.29	473289.8	12.42
41832.73	473290.5	13.97
41831.67	473284.5	13.599
41830.73	473284.7	13.658
41831.72	473291.5	14.156

Trial Hole 5

41908.42	473305.5	15.346
41909	473306.9	15.358
41904.03	473309.1	15.835
41903.25	473307.6	15.881
41904.73	473307	14.517
41907.86	473305.7	14.424
41908.43	473307	14.417
41905.18	473308.4	14.541

Trial Hole 7

41924.1	473361.6	14.123
41925.24	473361.4	15.538
41922.1	473362	14.196
41920.97	473362.4	15.69
41920.62	473360.9	15.747
41921.93	473360.7	14.145
41924.9	473359.8	15.535
41923.83	473360.2	14.098

Trial Hole 2

41781.87	473296.3	13.798
41774.63	473295.4	13.554
41766.21	473294.8	13.136
41766.12	473295.4	13.198
41774.6	473296.1	13.709
41782.07	473297	13.846
41780.98	473296.8	12.435
41774.22	473295.9	12.104
41766.9	473295.4	11.683
41767.03	473295	11.621
41775.32	473295.7	12.11
41781.1	473296.4	12.415

Trial Hole 4

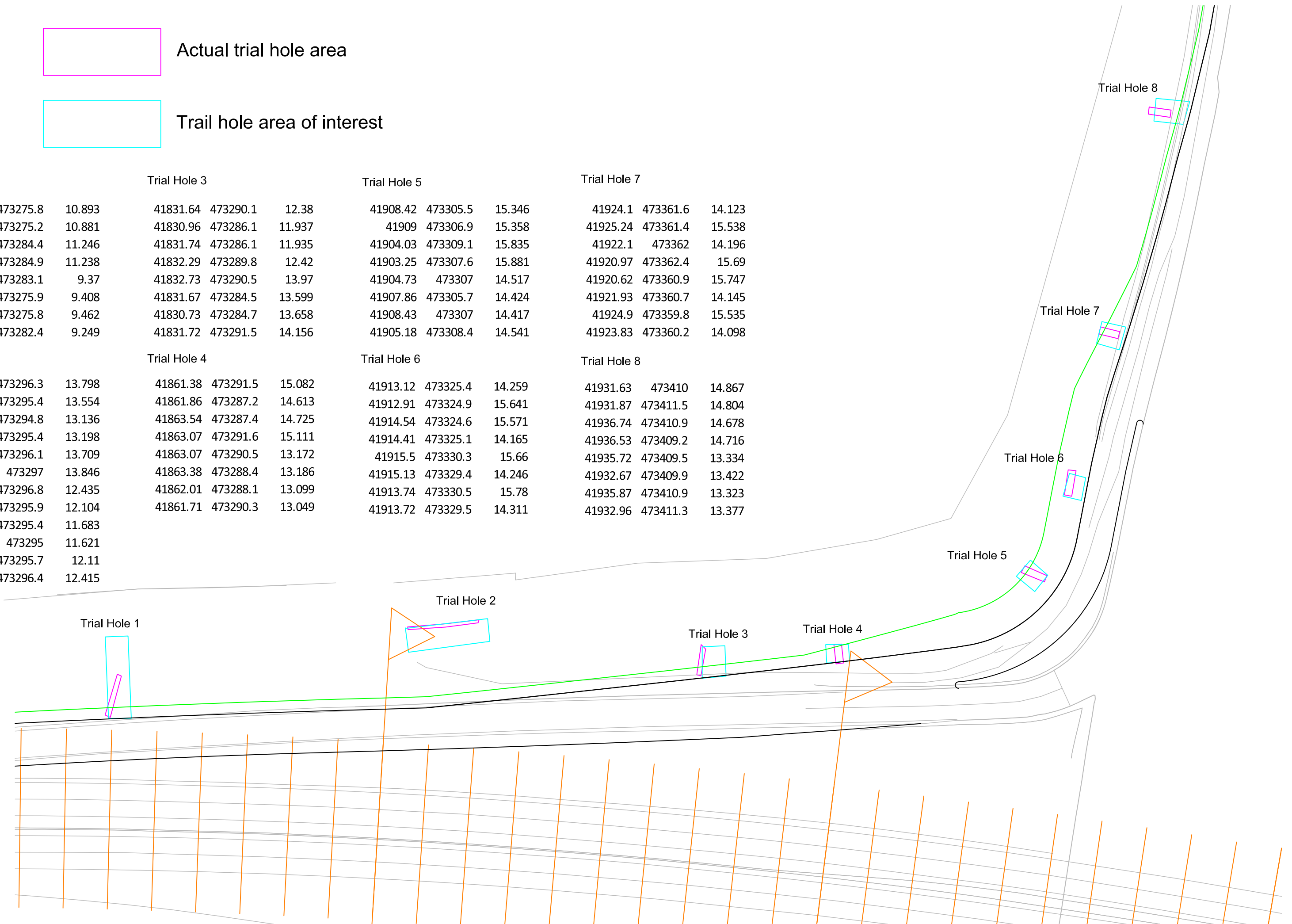
41861.38	473291.5	15.082
41861.86	473287.2	14.613
41863.54	473287.4	14.725
41863.07	473291.6	15.111
41863.07	473290.5	13.172
41863.38	473288.4	13.186
41862.01	473288.1	13.099
41861.71	473290.3	13.049

Trial Hole 6

41913.12	473325.4	14.259
41912.91	473324.9	15.641
41914.54	473324.6	15.571
41914.41	473325.1	14.165
41915.5	473330.3	15.66
41915.13	473329.4	14.246
41913.74	473330.5	15.78
41913.72	473329.5	14.311

Trial Hole 8

41931.63	473410	14.867
41931.87	473411.5	14.804
41936.74	473410.9	14.678
41936.53	473409.2	14.716
41935.72	473409.5	13.334
41932.67	473409.9	13.422
41935.87	473410.9	13.323
41932.96	473411.3	13.377



APPENDIX E. UTILITY DRAWING AT MILTON

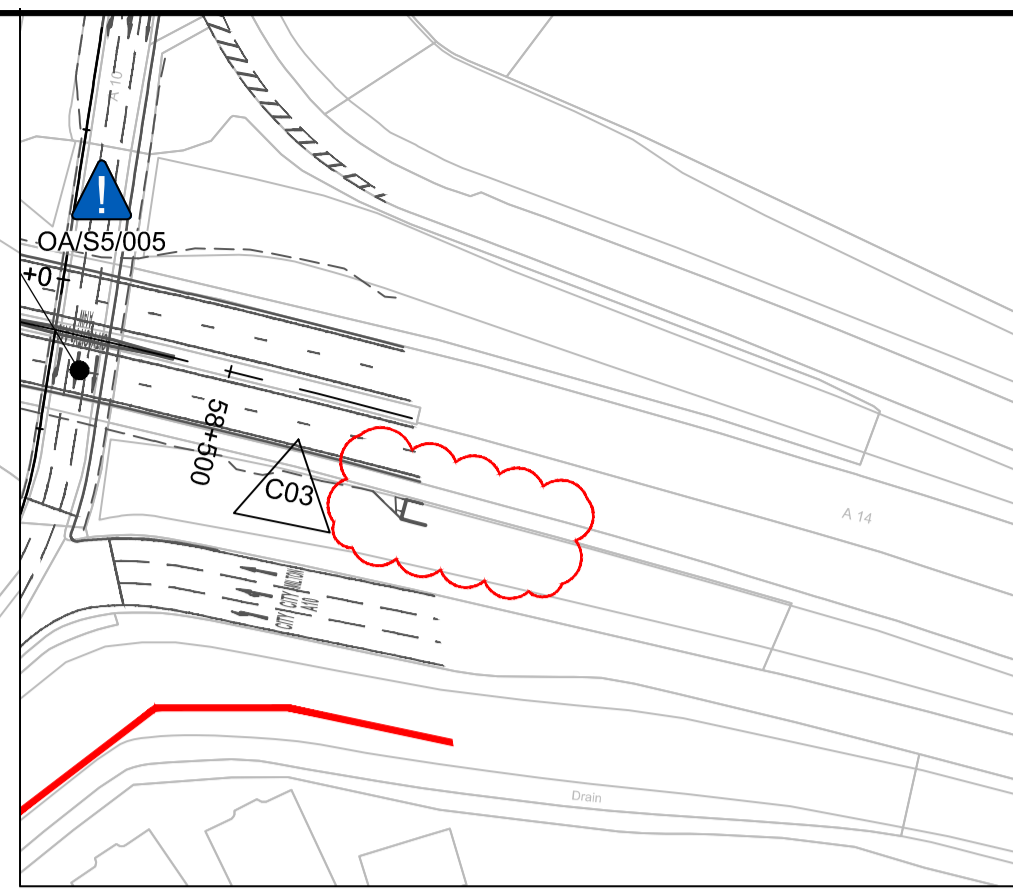
WESTBOUND DIVERGE

DO NOT SCALE

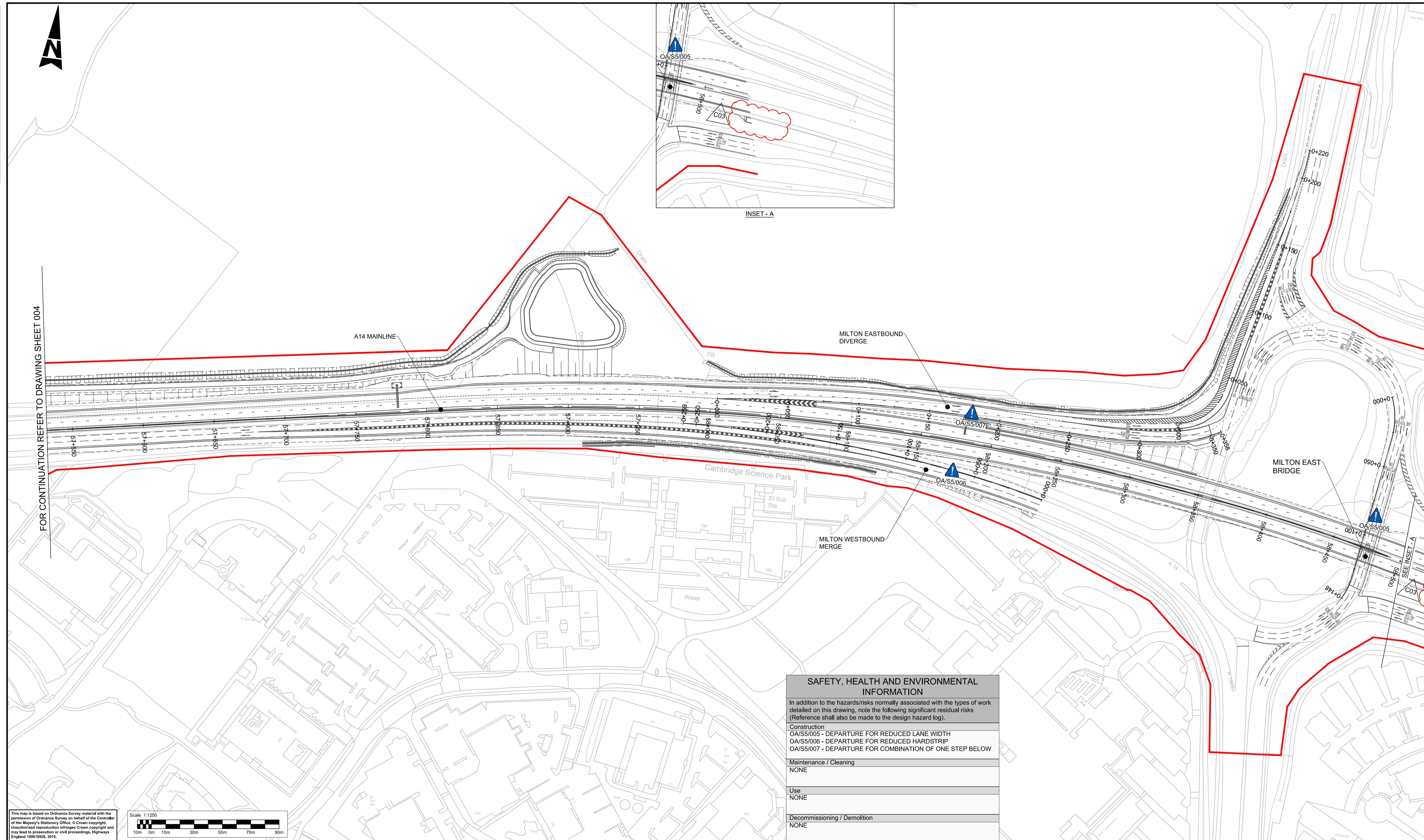
100
0 10
Millimetres



FOR CONTINUATION REFER TO DRAWING SHEET 004

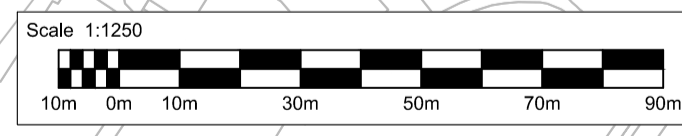


INSET - A



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).	
Construction	
OA/S5/005 - DEPARTURE FOR REDUCED LANE WIDTH	
OA/S5/006 - DEPARTURE FOR REDUCED HARDSTRIP	
OA/S5/007 - DEPARTURE FOR COMBINATION OF ONE STEP BELOW	
Maintenance / Cleaning	
NONE	
Use	
NONE	
Decommissioning / Demolition	
NONE	

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- NOTES:
- THIS DRAWING SHALL ONLY BE USED FOR THE DESIGN ELEMENT STATED IN THE DRAWING TITLE.
 - ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
 - ONLY WRITTEN DIMENSION SHALL BE USED.
 - REFER TO HA528983-ACJV-HGN-S5_COVER-DR-C-0001 FOR SHEET LAYOUT PLAN.
 - REFER TO HA528983-ACJV-HGN-S5_PROFILE-DR-C-0003 TO 0004, HA528983-ACJV-HGN-S5_PROFILE-DR-C-0007 TO 0008 FOR LONGITUDINAL PROFILES.

KEY: — DCO BOUNDARY

Rev.	Date	Description	By	CHK'd	App'd
C01	22/12/16	ISSUED FOR CERTIFICATION	SN	AV	AEM
C02	16/02/17	ISSUED FOR CONSTRUCTION	SN	AV	KW
C03	08/05/17	MAINTENANCE ACCESS PATH PROVISION	SN	AV	DL

Drawing Status	FOR CONSTRUCTION	Suitability	A	Project Title	A14 CAMBRIDGE TO HUNTINGDON								
				Drawing Title	PLAN SECTION 5 SHEET 5 OF 5								
Copyright © ACJV - Atkins Limited and Ch2m (2015)				Scale	1:1250	Drawn	SN	Checked	AV	Approved	DL	Authorised	AP
Client				Original Size	A1	Date	08/05/17	Date	08/05/17	Date	08/05/17	Date	08/05/17
				Drawing Number	HA528983 - ACJV - HGN - S5_PLAN - DR - C - 0005			Project Ref. No.	C03		Revision		
				Location	Type	Role	Number						

Appendix D. RAMS Document HE528983- IDT-HSE-S5-GEN-MST-W-00160

Document Title:	Trade Contractor:	Trade contractor doc number:
Construction of J33 EB Exit Slip & A10 Dedicated Slip (Milton Landfill Area)	A14 IDT	HE528983-IDT-HSE-S5-GEN-MST-W-

Subcontractor – Document Approval

First & Last Names:	Position:	Signature:	Date:
A14 IDT: Ashley Walker	Section.Engineer		

A14 IDT reviews (as requested by A14 IDT RAMS Approver)

Role:	First & Last Names:	Signature:	Date:
Fire and emergency coordinator			
Scaffold coordinator			
Lifting operations coordinator			
Temporary works coordinator			
New roads and street works co-ordinator			
Confined spaces coordinator			
Asbestos removal coordinator			
COSHH coordinator			
Work at height coordinator			
Environmental Lead			
Health, Safety and Wellbeing Advisor			

RAMS Approved:		RAMS Rejected:	
----------------	--	----------------	--

Authority to proceed / start work (A14 IDT RAMS Approver)

First & Last Names:	Position:	Signature	Next Review Date:

Periodic Review (max od 1 month)

Date:	First & Last Names:	Position:	Signature:	Next Review Date:



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	1 of 33

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On completion of the review please insert name, position, signature and next review date

Comments:

Serial number (as marked on RAMS):	Comments / Remarks:
First & Last Names:	Signature:

RAMS Evaluation Sheet

When reviewing the HS&W Risk Assessment and Method Statement of the A14 IDT or a Sub-contractor, the following should be considered to evaluate the information. The list is not exhaustive and supervisors/engineers should use their own experience in completing the form.

When evaluating the method statement consider the following elements of controlling risks: (ERICPD)

Eliminate:	The safest control measure is to eliminate the hazard completely
Reduce or Substitute:	We cannot eliminate but can we use a less hazardous material or method.
Isolate:	Could it be isolated from the workforce, activity and or be controlled locally.
Control:	Consider controls such as safe systems of work, procedures, training, supervision, safety devices and tools.
Personal Protective Equipment:	Consider suitable, well-maintained specific task PPE (the last resort)
Discipline:	Check how all controls will be monitored, reviewed and enforced.

	Yes	No
1. Has the work activity been identified?		
2. Check that all foreseeable risks to health, safety and the environment have been assessed via a structured risk assessment procedure:		
a) Process been identified i.e. are all the specific hazards identified?		
b) Are the persons who are at risk identified?		
c) Have the risks been quantified i.e. High/Med/Low or 1, 2, 3 etc?		



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Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	2 of 33

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d) Have effective control measures been put into place?		
---	--	--

3. Check that adequate health, safety and environment arrangements have been specified in the Method Statement:		
a) Supervisor in charge of operations named?		
b) Has a person(s) been appointed to take charge of HSW issues?		
c) Has a person(s) been appointed to take charge of Environmental issues?		
d) Has communication with the Principal Contractor been established?		
e) Has information, instruction and training been given due regard?		
f) Are emergency arrangements detailed including rescue from height / confined space etc?		
4. Check that the Method Statement is compatible with the CPP and CEMP (Construction Environmental Management Plan) and addresses the following:		
a) Are emergency plans (including fire and environmental emergency) compatible?		
b) Are measures for site security, storage and waste management as required?		
c) Are Site HSW rules being given due consideration?		
d) Has the scope/description of work been adequately identified?		
e) Is the sequence of operations clearly detailed in logical steps?		
f) Do these steps have hold points for key requirements such as the issue of permits?		
g) Do these steps cover all the activity from start to finish?		
h) Is plant and equipment needed for the activity clearly detailed?		
i) If lifting operations are included, is reference made to the Lifting Plan & Permit to Lift?		
j) Is interface & coordination with other activities / operations covered?		
5. Check that the Method Statement is compatible with the work of other contractors:		
a) Are there any specific hazards required e.g. requirements for noise, COSHH, manual handling, welfare etc.		
b) If there are specific hazards such as COSHH, manual handling, noise, vibration etc. are there separate and suitable assessments?		
6. Check that all Permits below have been identified as hold points stating that the permits must be in place before that activity can commence		
a) Permit to Break Ground		
b) Confined Space Permit		
c) Hot work Permit		
d) Permit to Work Adjacent or Under H/V Overhead Cables		
e) Permit to work on Electrical Equipment		
f) Section 61 Noise Consent		
g) European/UK Protected Species Licence		
h) Protected Provisions Consent (Flood Consent)		
i) Land Drainage Consent		
j) Other permits (e.g. access permit from client), licences or consents		



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	3 of 33

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7. Have the six project fatal safety risks been considered throughout the RAMS?		
a) Working at height		
b) Electricity		
c) Plant and people interface		
d) Public interface		
e) Lifting operations		
f) Service strikes (overhead and underground)		
8. Have the six project health risks been considered throughout the RAMS?		
a) Noise		
b) Skin disorders		
c) Musculoskeletal disorders		
d) Dust		
e) Hand arm vibration (including HAVS risk assessment)		
f) Fatigue		
9. Have the six project environmental risks been considered throughout the RAMS?		
a) Ecology		
b) Waste		
c) Pollution (land / air / water)		
d) Protected areas (SSSI / AONB / SAC)		
e) Nuisance (Noise / Dust / Vibration / Mud / Section 61)		
f) Archaeology / Heritage		

Use the answers to the above questions to determine if further investigation will be required. On completion of the evaluation, the form MUST then be appended to the Method Statement. This form MUST be signed by both parties: A14 IDT and the subcontractor.

Approvals

A14 IDT

First & Last Names:	Signature	Date:

Subcontractor

First & Last Names:	Signature	Date:



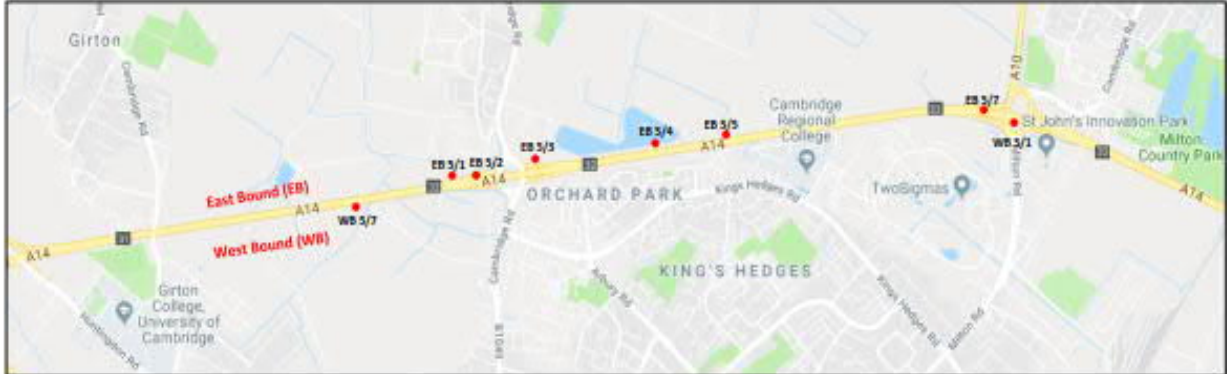
A14 IMS Ref	HSAW-004-FM-006		
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Document Owner	Wendy Luxton	Page	4 of 33

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1. Scope of Works

Detail the precise location(s) and outline description of the operation(s)/task/key activities to be carried out. Include/attach sketches, photographs etc. as required.

A14 IDT – Section 5 – TM Access Points:



Section 5 - Main Office Compound - Cambridge Rd, Milton, Cambridgeshire CB24 6AZ (What3Words: wisdom.themes.focus)



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	5 of 33

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A14 IDT – Section 5 – TM Access Points:

<p>Section 5 – A14 (EB) - Works Access EB 5/1 - Just before Jcn 32 off-slip – Left hand side (Grid Ref: N52.234733 E0.106817) (What3Words: pads.vague.spice)</p> 	<p>Section 5 – A14 (EB) - Works Access EB 5/2 - Just on Jcn 32 off-slip - Right hand side (Grid Ref: N52.234855 E0.108037) (What3Words: quiet.bliss.preoccupied)</p> 
<p>Section 5 - A14 (EB) - Works Access / Exit EB 5/3 - Jcn 32 Off Slip - Fisheries Access Gate (Grid Ref: N52.235636 E0.115488) (What3Words: parts.twist.transfers)</p> 	<p>Section 5 - A14 (EB) - Works Access EB 5/4 - Access Gate (Grid Ref: N52.2366149 E0.123575) (What3Words: bill.grant.joke)</p> 



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	6 of 33

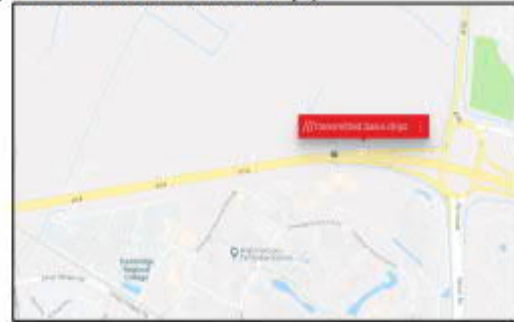
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A14 IDT – Section 5 – TM Access Points:

Section 5 - A14 (EB) - Works Access EB 5/5 - Access Gate
(Grid Ref: N52.236637 E0.128727) CURRENTLY CLOSED
(What3Words: stocks.fully.signal)



Section 5 - A14 (EB) - Works Access EB 5/7 - Just on Jcn 33 off-slip - Right hand side (Grid Ref: N52.238062 E0.145197)
(What3Words: transmitted.basin.drips)



Section 5 - A14 (WB) - Works Access WB 5/1 - Jcn 33
(Grid Ref: N52.236637 E0.128727)
(What3Words: keeps.hunt.dizzy)



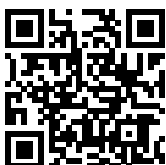
Section 5 - A14 (WB) - Works Access WB 5/7 - On Left between Jcn 32 - 31 (Grid Ref: N52.234155 E0.101777) (What3Words: activism.star.button)



2. Personnel

Identify all those engaged in the process including statutory inspection (e.g. Working Platforms and lifting equipment etc.) together with their qualifications and experience in this particular type of work including operators of plant and equipment.

First & Last Names:	Number	Date:
Section 4 & 5 – TSCO	07342 049 480	
Ondrej Humplik – A14 IDT Section Lead	07891567151	
Neil Kennard – Construction Manager	07969610467	
Colin Redpath – A14 IDT Lead Health, Safety & Wellbeing Advisor	07967 424 484	
Ross Baird – A14 IDT Environmental Advisor	07812237686	
Richard Walker – Section 1 & 5 Works Manager	07736 056 824	
Claire Stacey Safety & Wellbeing Advisor	07876 213 528	



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	7 of 33

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Michael Mayer – A14 IDT Site Agent	07973 642 116	
Tim Rennie – A14 IDT Section Engineer	07702 634 051	
Craig Carney – A14 IDT Ecological Clerk of Works	07908141266	
John Akester – A14 IDT Stakeholder Manager	07384 540 677	
Mark Bower – A14 IDT Section Foreman	07976 859 635	
Pat McEvoy – A14 IDT Section Foreman	07715 161 084	
Simon Ing – A14 IDT Sub-Agent	07739 634 081	
Jade Maher – A14 IDT Section Engineer	07557 541 282	
Ashley Walker – A14 Section Engineer	07597 647 583	

3. Working Environment Considerations

Flood area / Working near a water course or a ditch

Either permanent or temporary works performed within close proximity to local authority ditches. Will need advice from environmental advisor before works can proceed.

Before commencing any work check if authorisation is in place with the environmental advisor.

Surface water management measures will be in place prior to excavation works commencing. These will typically comprise of cut off ditches to intercept clean water entering site and channel it to the nearest discharge point – these will be permanent drainage ditches where possible. Temporary ditches will be excavated to collect dirty site run off water that will lead to a settlement lagoon containing silt netting.

Additional emergency measures (straw bales etc.) will be available on site and will be implemented in the event of heavy rainfall inundating the lagoons. Any pollution incidents noted whilst on site must be reported to IDT site manager. If a pollution incident did occur on site, the relevant controlling authority will be informed by the environmental manager.

All machines will be refuelled at least 20m away from any watercourse or routes to watercourse (gullies etc.) and in designated areas where environmental conditions require. Appropriate spillage kits, namely nappies, granulates, etc. will be provided when filling the machines with gas oil. Refuelling on larger plant will generally be carried out with fast fill non-drip couplers. Any problems i.e. leaking fluid will be picked up by the driver and noted on the daily plant inspections.

No fuel will be stored in the working areas e.g. jerry cans.

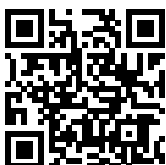
Plant will be parked in a designated area well away from any existing water courses and outside of the flood plains at end of shift (minimum 25m).

A minimum of 1 spill kit will also be kept with each earthworks team. If a spill occurs the environmental emergency response plan will be put into place by the supervisor.

Refuelling will be done in the lay by area more than 20m away of the ditch with 250-gallon bowser.

Dust may need suppressing during dry weather. Vehicles are to travel at a reduced speed to reduce dust levels. Water sprayed to reduce dust will not be discharged so excessively that run off problems result.

4. Plant, Equipment, Materials and Welfare Arrangements



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	8 of 33

UNCONTROLLED WHEN PRINTED

Plant

All plant will comply with A14 IDT minimum requirements - mobile plant specification sheets. Before plant is put into use it must be inspected by an IDT appointed plant inspector to confirm compliance. Plant operators must do A14 operators induction and competence assessment must be recorded. Mobile plant operators must have a safety critical medical completed and provided as evidence. All plant operators must complete daily check sheets as per A14 requirements.

The equipment to be used will be inspected daily by the operator and recorded on a daily plant inspection sheet (collected every week), to ensure that it is in good working order. Any defects will be reported to the site foreman immediately and in the case of major or safety critical defects the equipment will be excluded from use by the Foreman until repaired or replaced. Machines parked up with safety critical defects will be clearly signed as such and immobilised to prevent accidental use. All checks will be carried out in accordance with the PUWER Reg's and the relevant test certificates will be checked to make sure that they are valid and a copy kept on site.

People Vehicle Plant Interface – Safety Zones (Yellow, Amber, Red and Hatched Areas)

<p>100 Excavator</p>	<p>Dozer</p>	<p>Loaded Forward/Swivel Tipping Dumper</p>	<p>Telehandler</p>
<p>360 Tracked Excavator</p>	<p>Forward/Swivel Tipping Dumper</p>	<p>Lorry - Tipping</p>	<p>Tractor</p>
<p>360 Wheeled Excavator</p>	<p>Front Loading Shovel</p>	<p>Roller</p>	<p>Traxcavator</p>
<p>Articulated/Rigid Dump Truck</p>	<p>Grader</p>	<p>Suction Excavator</p>	<p>Vehicles, Vans and Lorries</p>
<p>Yellow Zone The Excavator Vehicle Marshal (VM) or Machine Controller (MC) must remain within this zone to be able to direct the plant operator. All personnel approaching operating plant must do so from this zone to gain visual contact with the plant operator and authorisation from the VM or MC before entering Plant Interface Zones.</p>	<p>Amber Zone Entry prohibited until positive visual contact is confirmed by the plant operator (e.g. thumbs up), authorisation from the VM / MC, the dipper arm / hydraulics are grounded, the machine is immobilised using the safety lever and the engine is switched off. Where work in the amber zone is unavoidable a robust, task specific, safe system of work must be produced which minimises the time spent within the zone and includes detailed controls for communication between the machine operator and the VM / MC.</p>	<p>Red Zone Entry prohibited unless the machine is completely isolated, the engine is switched off and a specific safe system of work is in place that prevents the machine being operated either inadvertently or deliberately.</p>	<p>Hatched Zone Denotes typical sight lines of the plant operator</p>

Welfare

All personnel will use the nearest welfare provision to the work area with plant being parked in agreed safe locations near the welfare. Private vehicles will be parked in designated locations and not brought on to the working area.

Emergency Procedures and First Aid Arrangements

First Aid Kits will be available in site offices and the Foreman's vehicle. Ensure there is also a portable defibrillator on site. A First Aider will be contactable at ALL times. First Aiders are shown on the front of this document and others can be identified on site by stickers on helmets and/or picture identification posted in welfare units.

Start of Shift safety briefing sheet makes known the First Aider to the workforce for that shift.

A means of communication (mobile phones/radios) will be available. This will be in accordance with A14 site policy.

A14 IDT Emergency number as per pg. 14. Hospital details are in part 6 of this document (See page 17)



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	9 of 33

UNCONTROLLED WHEN PRINTED

SPILL RESPONSE PROCEDURE

WITHIN THE CONSTRUCTION SITE

Stop the source of the pollution if possible, i.e. fuel, silt etc. and notify your supervisor.

No

Contain as much as possible.

Monday – Friday
(8am-6pm)

Contact Ross Baird –
07812 237686

All other times

Contact the designated
Supervisor for the
works taking place.

Environment Team /
Supervisor

Is 24hr spill response
help required?

No

Environment
Team to
attend site.
Assist clean
up/disposal
and assess
what, if any,
further action
is required.

Can the pollution be easily
contained and cleaned up by
the site team?

Yes

Use spill response
kits to **contain** the
spill (prevent it from
entering drains/water
courses), and **clean**
up the contaminants.

Put used spill kit
materials into bags
and **dispose** of into
designated receptacles
in the compound. Ask
Environmental Lead
about dealing with
other contaminated
materials (e.g. soils).

Replenish spill kit.

Report the
pollution incident

If the spill cannot be easily
contained by one spill kit, or
potentially may enter a drainage
system or watercourse, call out
the Spill Response Team.

The Spill Response Team

Steve Whitehead: 07449 948028
Kevin Scales: 07715 471966
Marius Cesas: 07522 970799
Simon Scriven: 07482 237756
Victor Chokor: 07401 623748
Roberto Ramos: 07930 597912

Yes

Call out Adler and Allen
(0800 592 827) to respond
to the incident.

Adler and Allen to mitigate
and clean up the spill

Environment Team to report the incident to
site management team and the Sector
Sustainability Manager for Highways.
Environment Agency will be notified if there
is a serious risk to watercourses.

Environment Team to produce
incident report and ensure all actions
are implemented.

ON HIGHWAYS WITHIN PROJECT BOUNDARIES

Contact the
TSCO
07342 049 797


TSCO to notify
Highways
England
Regional
Control
Centre, the
Section
Environmental
Lead and the
spill response
team

TSCO to
confirm
highway
before spill
clean-up
activities
start.



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	10 of 33

A14 Integrated
Delivery Team

	<ul style="list-style-type: none"> • Stop the source of the spill.
 	<ul style="list-style-type: none"> • Contain the spill using granules to form a temporary bund or boom. • If no spill kit is present utilise sand or soil to form a temporary bund.
 	<ul style="list-style-type: none"> • Soak up the spill using granules or pads. • If no spill kit is available utilise sand or soil.
	<ul style="list-style-type: none"> • Place drainage covers over or mini booms around nearby drainage.
	<ul style="list-style-type: none"> • Clean up all materials (double bagged) and place in the appropriate sealed container.
	<ul style="list-style-type: none"> • Replenish spill kit
	<ul style="list-style-type: none"> • Report incident to your supervisor and the Environmental Lead.



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	11 of 33

UNCONTROLLED WHEN PRINTED

5. Safe System of Work to be adopted & methodology

Permits:

- Permit to Break Ground** To be provided by the Engineer
- Section 61 Consent** Out of core hours work must be submitted to Environmental Lead 2 weeks in advance
- Hot Works Permit N/A
- Permit to work under overhead lines** To be provided by the Engineer if required
- Permit of Isolation N/A
- Permit to Load / Unload N/A
- Lift Plan** For any mechanical lifting
- Confined Space N/A
- Others not listed above N/A
- Permit to pump** Where required for dewatering excavations - to be provided by an environmental advisor
- Permit to clear** If any vegetation removal is required for excavators –
NOTE vegetation clearance activity is beyond the scope of this RAMS

Hold Points:

During these works, the hold points which must be implemented are:

- All persons must receive an induction
- All required permits must be in place.
- The permit holder nominee must be in attendance
- All persons must receive a Task Briefing Sheet and Start of Shift Daily Briefing (to include: Golden Rules, Main risks, and emergency contacts).

A Start of Shift (SOS) co-ordination briefing will take place before each shift which will identify any interfaces for that shift. Any other interfaces not covered above are to be included in the TBS and SOS briefings. The interfaces must be recorded on the TBS Briefing Form. SOS Briefing Record Form to be filled out Daily.

Close liaison is required between all parties to ensure that all activities are carried out safely. The A14 IDT weekly coordination meetings are arranged in order to discuss the programme and potential interface issues.

Front Line Supervisor (FLS) and Start of Shift (SOS) meetings and general communication will be daily.



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	12 of 33

UNCONTROLLED WHEN PRINTED

Methodology

This Risk Assessment, Method Statement (RAMS) will cover the construction of J33 EB Exit Slip, inclusive of the proposed dedicated A10 North Lane. This document will contain specific controls and identify hazards working within the Milton Landfill Area. Specific methodology of works will be referenced to the individual tasks RAMS.

The below activities will be completed following trial trenching of the Milton Landfill in its current state to determine the presence of any contaminated land and/ or landfill in the footprint of the construction works. It is envisaged that any ground remediation is completed prior to commencing the following works.

Prior to any ground-breaking activity, the area is to be scanned by an appointed A14 IDT Engineer. Any known services found or on the utility's drawings are to be marked up as exclusions and safe digging procedures are to be applied to prevent striking the service. A14 IDT is to issue a Permit to Break Ground and valid service drawing. In the event of striking a service, inform your Supervisor, HS&W Advisor and Utilities Provider (details can be found within the SOS Briefing).

This RAMS will outline the following activities. For specific methodology and risk associated with each task refer to the RAMS at the foot of each sub-heading, highlighted in red.

- Removal of Street Furniture
- *Over grounding of traffic signal cables and signal heads placed on temporary blocks*
- Topsoil Strip and De-Stumping
- *A10 Comms 'slew and lower' (see separate CDM lite package)*
- Fill and Embankment Construction
- Construction of Roadbox
- Installation of NFD, Carrier Drain, Gullies and Associated Chambers
- Installation of Street Lighting, Motorway Communications and Cabinet Sites
- Trim Roadbox
- Install Combined Drainage Kerb Unit
- Paving Base and Binder Course Asphalt
- Installation of Vehicle Restraint System
- Installation of Street Lighting Columns
- Installation of Boundary Fencing
- Installation of Traffic Signs
- Topsoiling
- Paving Surface Course Asphalt
- Road-marking/ White-lining
- Cable Installation/ Pulling
- *Landscaping*

Removal of Street Furniture:

Note: All Asbestos surveys have been completed. Details of which can be found on a register on Business Collaborator (BC). If you suspect Asbestos is present during this operation. Stop works and inform your supervisor

Existing traffic signs and vehicle restraint systems will be removed. If the signs are of a manageable height and size, the sign face will be dismantled by hand tools. The sign posts can then be either removed by means of an excavator or cut to ground level with a Disc Cutter. Using

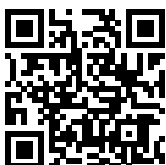
If the signs are large, tall and heavy. Mechanical means will be applied. A MEWP can be utilised to gain access to dismantle the sign faces, using hand tools. MEWP must be inspected by an A14 Plant Inspector and operated by a competent trained operator. MEWP rescue procedure is to be followed in the event of an emergency. Strops to support the sign face and posts can be used to lift to ground by an excavator or Hiab. A valid lift plan and permit must be issued separately to this document, covering this operation.

Vehicle restraint systems will be dismantled using a power ratchet guns. Length and weight of the beam is to be assessed by the operatives. 2 man lifted will always be required to drop the beam. If the post is driven, an excavator with a post pulling attachment will extract the posts from the ground. In the event of concrete foundations, the excavator will excavate the foundation out and reinstate with sufficient fill. Both methods of post extraction will require a valid Permit to Break Ground.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00108; Street Furniture Removal.

Topsoil Strip and De-stumping:

Area for topsoil stripping will be marked out by A14 IDT Engineer. Area will be inspected by a trained ecologist or the environmental lead. If the area is clear of ecological sensitive receptors, de-stumping and topsoil stripping may commence.



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	13 of 33

Stumps will be identified and pulled out using a 20T 360 Excavator and loaded away in road wagons/ ADT's to be disposed of. A suitable location for stockpiling will be identified by the A14 IDT Foreman.

Using a D6 Bulldozer the topsoil will be stripped into windrows and the loaded away by the excavator into the road wagons/ ADTs. These will then be stockpiled at a suitable location, away from any watercourses, and sealed to prevent silt run off.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00076; Topsoil Strip and General Earthworks.

Fill and Embankment construction:

Fill All acceptable excavated materials will be hauled by ADT's or road wagons directly to fill/stockpile areas and tipped for placement by dozer, which will have either GPS guidance or onsite setting out. Where room does not allow this then an excavator will place the fill then rolled and compacted with a roller no less than one drum width. Where material is to go into embankment fill the following should be noted. Original ground conditions, following topsoil strip, will be assessed for their suitability as a foundation prior to placing of fill materials.

Large compaction equipment will be fitted with 360 vision aids and all ride on compaction equipment will be fitted audible reversing alarm system/white noise alarms. Make sure the area to be rolled is level and roll parallel to edge and don't go within 0.5m of the edge. Edge bunds minimum 0.75m height must be in place always on fill embankments.

Any testing of compacted materials will be undertaken by IDT and subject to separate RAMS. Form RAMS Template. A14 IMS Ref HSAW-004-FM-006 Issue Date 23/10/2018 Rev 2 Document Owner Wendy Luxton Page 19 of 72 UNCONTROLLED WHEN PRINTED.

All fill areas will be rolled to ensure they are sealed from adverse weather. All fill area edges >2m high when slopes are trimmed to design slope or 1.2m, if steeper will be protected by a bump bank, likewise with any temporary ramps. No 3rd parties are to enter the fill area, unless indicated to do so by the dozer/excavator driver or traffic marshal. Thumbs up system to be implemented. Where bulk fill occurs alongside the existing road, then existing barriers shall be maintained in position until replacement barriers are installed, or the safety hazard has been removed. Traffic control measures will be required to ensure an adequate 1.2m safety zone.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00076; Topsoil Strip and General Earthworks.

Construction of Roadbox:

Construction of the roadbox will be a similar procedure as embankment fill. This operation will follow the fill of the embankment. The extent of the carriageway +500mm will be excavated to sub-formation level and built back up as per the proposed pavement design.

All deliveries of material will be from a Quarry/recycled stone supplier set up by IDT, or from site won stockpile. The deliveries/removal of material will enter and leave through the designated access/egress points. An exclusion zone will be in operation at the stockpile location. Only dumper drivers are permitted in the area while excavation of stockpile is carried out.

Once the vehicle has reached the works area, the Traffic Marshal is in control of the vehicle and oversees this vehicle for the duration of the off-loading. The import stone will be placed in layers as per Highways Specification and suitable for the compaction equipment used. See ITP for further details. The ganger, dozer or excavator operator will ensure stone is placed and trimmed to correct levels.

All Road wagons will be fitted with rear facing CCTV, mirrors, flashing beacon, a fully automatic tailgate and an audible reversing alarm and comply with IDT reversing vehicle policy. Large compaction equipment will be fitted with 360 vision aids and all ride-on compaction equipment will be fitted with audible reversing alarm systems, all hand-held compaction plant i.e. whacker's will have a HAV's assessment carried out showing the maximum trigger times. These times will not be exceeded, and records of use will be maintained.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00076; Topsoil Strip and General Earthworks.

Installation of Carrier Drain, Narrow Filter Drain (NFD), Gullies and Associated Chambers:

Following the construction of the roadbox, an NFD pipe will be installed on the low side of the carriageway to collect water from the formation layers. The line of the NFD will be determined by the A14 IDT Engineer and the depth (dependant on the depth of the sub-formation layer) will be established by setting out of profile boards. An Excavator >5T and <13T will excavate to the design depth with a maximum of 300mm wide bucket. The NFD will be laid on a 100mm bed of Clause 515 drainage sand, which will be imported by road wagons and will be stockpiled and worked by the excavator into place. The clause 515 will then be filled to the top of capping level.

Carrier drain will be installed in a similar process to NFD. The line of the Carrier Drain will be determined by the A14 IDT Engineer and the depth be established by setting out of profile boards. An Excavator >5T and <13T will excavate to the design depth to a suitable width as per HCD F1 & F2. A single base and bed will be used to pipe work, however, if the crown of the pipe is within 900mm of the finished ground level a concrete surround will be required. Backfill will be as-dug material reinstated and compacted with a hand-held controlled RAMMAX (Padfoot vibrating compaction plant).



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	14 of 33

During the carrier drain install, Y-Junctions on the pipework will be used to create a connection to Combined Drainage Kerb Units outfalls. (CDKU). The junctions attach to the pipework in the same way as the pipe sockets work. The junctions will be secured using an FND2 concrete mix. The gully pipe will be raised out of the ground, capped and secured for connection later.

The whole drainage network around the slip road will be connected into a series of chambers (man-holes/ catchpits). The depth of excavation will be determined by the A14 IDT Engineer. The depth and working room available will determine if the chamber is to be installed using a trench box or a benched excavation. If a trench box is required an appropriate lift plan and permit is to be in place, briefed and understood by all operatives. Competent operatives must only install the trench boxes and the operation must always be supervised by a Blackhat supervisor. Safe access and egress from the excavation must also be maintained. If space allows the excavation may be benched at intervals of up to 1m x 1m. FND 2 concrete will be used to set the chamber bases. Mick George will supply the concrete in a volumetric lorry or a concrete truck. Discharge will be to ground on a polythene sheet or direct into the excavation. Plant Vehicle Marshall (PVM) will be used to guide the delivery vehicles into place ensuring red zone procedure is always applied.

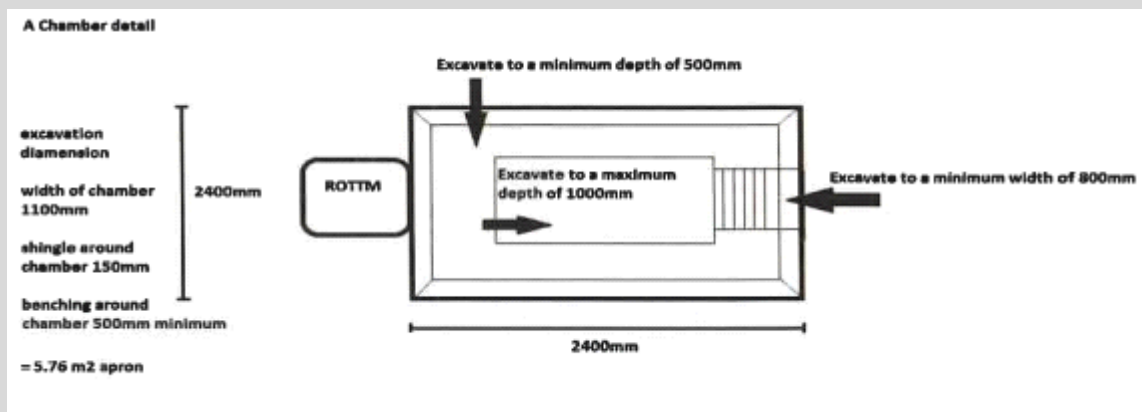
Following installation of drainage, all pipework will be flushed with water and CCTV'd to ensure its integrity and workability. This operation will be completed by Onsite. Mechanical means of lifting chamber lids can be applied, alternatively, 2 man lifting of lids using lifting keys can be applied using safe manual handling techniques. Gas monitors will be used to check for hazardous atmosphere within the confined space, starting 10 minutes before entry to the chamber and continually until the confined space is closed. Fall arrest apparatus will be set up and used by trained personnel if entry to the chamber is required.

For further details, risks and controls refer to RAMS:
[HE528983-IDT-HSE-S5-GEN-MST-W-00069; Drainage.](#)
[HE528983-IDT-HSE-S5-GEN-MST-W-00115; CCTV and Jetting Drainage.](#)

Installing Street lighting ducting, Motorway Communications and Cabinet Sites:

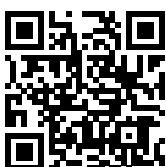
Location, line and level of ducting installation is to be marked out by the A14 IDT Engineer. Trench will be excavated by a tracked excavator and supervised by a blackhat and PVM. The minimum cover required to the crown of the ducting is 450mm. All arisings will be side cast a minimum of 1m away, to be used as backfill. Ducting will be placed into the centre of the excavation in the delivered length, minimise connections. The backfill will be in layers as per recommended method of compaction. Each layer will be compacted using a trench rammer, by a trained operative. If the as-dug material is unsuitable, imported material will be used, delivered to a stockpile locally and worked by the excavator, ensuring red-zone procedure is applied. Yellow marker tape will be placed 150mm below final ground level to demarcate the ducting installed.

Chambers will be excavated using a tracked excavator, unless the chamber location is within the exclusion zone of another service/ utility, when it will be hand dug. All excavated material will be stored a minimum of 1m away from the edge of the trench. Excavations will be fenced off to prevent access when unattended. Suitable access and egress to the excavation must be maintained. Excavation may be cut back to provide benching to stabilise work area.



Cabinet sites and aprons will be excavated to dimensions to approximately 2400mm x 2400mm x 500mm. A further 150mm will be excavated to accommodate a bed of 10mm shingle. This operation will use a similar method used to install the chambers. For pre-cast units, cabinet boxes and chamber lids, a lift plan and permit will be required to use the excavator to lift these in to place. Associated footpaths, steps, hand rails and extended edge retaining walls will be required. 600mm square slabs will be positioned into place using suitable manual handling techniques and stored on pallets to aid the operation.

For further details, risks and controls refer to RAMS:
[HE528983-IDT-HSE-PJW-GEN-MST-W-00034; Motorway Communications and Street Lighting Civil Works.](#)



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	15 of 33

Trimming Roadbox:

Trimming of the road box (extend of asphalt surfacing and associated kerbs and drainage units) will be completed by an Excavator. Pedestrian barriers will be used to demarcate work area and prevent access during plant movements. The work area will be either manned or remotely controlled with Doffy gates. The excavator will use the GPS system, to scrape the subbase to design level. A dual drum roller will vibrate and compact the subbase as per recommended method of compaction.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00076; Topsoil Strip and General Earthworks.

Installation of CDKU/ Drainage Kerbs:

Carbon Fibre setting out pins will be installed to denote the alignment of kerblines (approx. 400mm deep). Kerbs will be lifted by mechanical means only. A suitable lift plan and permit will be issued. ST1 Concrete will be directly discharged by the volumetric wagon or concrete lorry to area of kerb installation. Using an excavator or hand tools the concrete will be spread evenly ensuring sufficient concrete bedding is given to the kerb as per manufacturers instructions. An excavator with kerb lifting attachment will lift the kerb into place and guided into place by a close proximity training operative. Hand tools will be used to secure the kerb into place and the process repeated. Combined Drainage Kerb Units may have to be assembled, secured and sealed using a mastic and mastic gun. The ST1 concrete will be used to support the kerb in front and behind the kerb.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S5-GEN-MST-W-00146; Kerb Installation.

Paving Base and Binder Course Asphalt:

There will be 3 different methods and materials used to construction the pavement for the off-slip and dedicated A10 Route.

Method 1: Following the road box, an asphaltic base course layer can be used. Road wagons will be used to haul the base course to site. Following a survey from Aggregate Industries Engineers to check the levels are as per design, the paver or midi-paver (smaller type) will gather the discharge from the road wagons and spread the asphalt to the extents and level required. A gang with hand tools such as shovels and rakes will be on hand to remediate any blemishes. A 13T Roller will then compact the material as per method of compactions, in the same direction in which the material is being laid. A smaller dual drum roller will then roll behind, ensuring joints between lanes and any final blemishes in the finished layer are smoothed out. The rollers, paver and road wagons will all adhere to the red zone procedure and headphones/ ear sets will be used to ensure communication between the full gang is maintained.

Method 2: This method will work in exactly to the same principles, however, instead of 2 layers of base course, a CBGM (Cement Bound Granular Material) and HBM (Hydraulically Bound Material) will be used instead. For areas in which the width of pavement to be constructed is less than 1.2m, an ST4 concrete can be used as a narrow infill. The concrete will be directly discharged from the concrete lorry and finished using hand tools.

Method 3: The slip road pavement will require reconstructing from the HBM layer upwards as part of the A14 IDT scope. The process of re-laying the slip road is the same as method 1 and 2. The only difference is a 30-35mm of SAMI (Stress Absorbing Membrane Interlayer) is used to protect the HBM and allow movement in the pavement. The binder course will be replaced with a SMA Asphalt (Stone Mastic Asphalt), which is a more durable option.

The use of a road planer/ miller will be required to complete any reconstruction works and planing joints in layers to overlap the material. Care must be taken to ensure a joint is not placed within the wheel track zone. The A14 IDT Engineer will provide a lane line design model to ensure the Wheel Track Zone is joint free. A permit to dig will be issued by an A14 IDT Engineer to complete these works.

For further details, risks and controls refer to RAMS: HE528983-IDT-HSE-S2-GEN-MST-W-00078; Kerb Installation.

Installation of Vehicle Restraint Systems (VRS):

A permit to break ground/ dig will be issued by an A14 IDT Engineer. All services in the ground will be marked out to denote the alignment to prevent clashes. The VRS contractor will lay out the beam to determine the post centre location.

Using an Orteco Post Driver or lorry mounted rig a trained operator, will lift the barrier post into position. The post will be driven to 610mm (centre of beam) above finished road level. If the finished road level is more than 1.5m away, the local finished ground level will be used.

Test posts will be installed every 100m, change of barrier type or change of ground type. These will be push tested to up to 11KN, against the Orteco rig using a hydraulic hand pump. If the post moves more than 100mm, then the foundation for this area will be a concrete foundation as below.

- 600mm deep x 800mm wide and length (or 1m wide x 400mm deep ground beam) hole is to be dug by an excavator less than or equal to 5T.



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	16 of 33

UNCONTROLLED WHEN PRINTED

- Alternatively, this foundation can be hand dug using insulated hand tools and wearing flame retardant overalls or excavated using none contact methods such as Vacuum Excavation.
- Once excavated the hole is to be filled with a ST5 Concrete mix, usually discharged by a volumetric truck.
- A socket or post cradle for the barrier post can then be inserted by hand to the desired level and line.
- Once the concrete has cured the installation of the beam can commence. The beam will be hung by hand and tightened using nuts, bolts and an impact socket gun.

Installation of Street Lighting Columns:

Installation of Boundary Fencing:

Installation of Traffic Signs:

Topsoiling:

Paving of Surface Course Asphalt:

White line/ Road Marking:

HAVS Assessment

Name	Model	Supplier	Hire no.	Vibration m/s ²	Weight	Noise(dB)	Maximum Time (as per 100pts)
Disc Cutter	TS410	Aplant	A841555	3.9	9900g	116	4 hr
Disc Cutter	TS410	Aplant	A984378	3.9	9600g	109	4 hr
9inch Grinder	DCG 230	Aplant	A826148	5.8	6500g	94	1 hr
DeWalt Rotary Drill	XR Volt Li-on	A14	Sec5001	9.4	3900g	94	30 mins
Bosch Hammer Drill	GBH 18V-20	Aplant	712064582	14	3200g	96	15 mins
Demo Pick	SK10	Aplant	A593256	6	1050g	10	1 hr
Demo Pick	SK10	Aplant	A843417	6	1050g	10	1 hr
Makita Circular Saw	DSS611	A14	A1456	2.5	3300g	91	8 hr
Makita Circular Saw	5903R	Speedy	MA1259722	4.5	7200g	106	2 hr
4.5inch grinder	GWS750	A14	A1457	6.5	1800g	0	1 hr



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	17 of 33

UNCONTROLLED WHEN PRINTED

Personnel Protective Equipment (PPE):

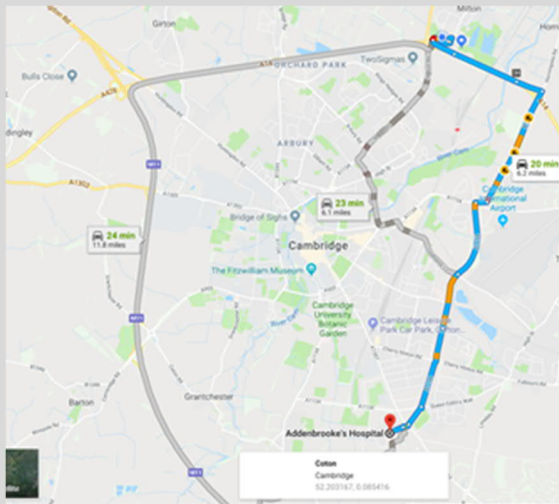
The minimum requirement when working on the Site – **BIG 6**:

1. SAFETY HELMET (check expiry date)
2. EYE PROTECTION
3. YELLOW HIGH-VISIBILITY VEST / JACKET – (Class 3) fastened at all times
4. YELLOW HIGH-VISIBILITY TROUSERS (Class 1)
5. GLOVES – Category 5 Cut Resistant - Minimum specification for all tasks.
6. MID SOLE SAFETY BOOTS
(Ankle Support / Lace-Up / Steel Toe-Capped)
 - No Rigger Boots
 - Wellington Boots – Project Management agreement and specific RA completed.
 - FLAME RETARDANT OVERALLS AND GLOVES – Hot works, Breaking ground and Electrics
 - Additional PPE as required from Risk Assessments



6. Emergency Procedures and First Aid Arrangements

- The emergency preparedness plan to be communicated and available
- First aid kits and defibrillator will be available in site offices and the Foreman's vehicle
- A first aider will be contactable at ALL times
- First aiders are shown on the front of this document and others can be identified on site by stickers on hard hats and/or picture identification in welfare units, as well as SOS briefing
- A means of communication will be available



Addenbrookes hospital (With A&E)
Hills road,
Cambridge
Cb2 0QQ
Tel: 01223 245 151

7. Amendments to Safe System of Work

OUR COMMITMENTS

STOP WORKS



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	18 of 33

UNCONTROLLED WHEN PRINTED

Wherever unexpected risk is perceived, work must stop immediately and the issue brought to the attention of the responsible Engineer / Supervisor.



If plant / equipment / situation differ from that stated on the Safety documentation works must stop until the documentation is rechecked updated and approved.

Manual Handling

Manual Handling is to be limited to Maximum of 25kg per person anything greater that this limit must be lifted by suitable equipment and must have relevant lift plan in place.

NOTE: 20kg loads perperson (below knee level) must only be completed through the use of mechanical lifting aids.

REMEMBER THE A14 GOLDEN RULES



A14 SCHEME FATAL RISKS:

On the A14 scheme 6 Fatal and 6 Health risks have been targeted. These titles must be assessed through the Risk assessment process.

These are the main causes of fatal accidents on construction sites. Be mindful of these risks at all times. Ensure that you have a safe system of work in place that eliminates or reduces the likelihood of these risks to a minimum.

STOP work if you do not have adequate controls in place or if anything changes that increases the risk.

For details on how these fatal risks will be controlled in this activity refer to the risk assessment



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	19 of 33

UNCONTROLLED WHEN PRINTED

A14 Integrated Delivery Team 

FATAL RISKS

The Safety of our employees and the communities in which we work is our **TOP PRIORITY** - Nothing means more to us than ensuring everyone goes home **Safely** every day. We have identified **Six Top Fatal Risks** around our Sites:



Make sure that a safe system of work is **ALWAYS** in place before you start any work that involves these **ACTIVITIES**. We must be uncompromising in our approach to removing all risks.

FOLLOW THE YELLOW BRICK ROAD ...



STOP! IF THE WORK DOESN'T LOOK OR FEEL RIGHT
FOR MORE INFORMATION CONTACT THE A14 H&SW TEAM

A14 Integrated Delivery Team 

HEALTH RISKS

The Health of our employees and the communities in which we work is a **TOP PRIORITY** - Nothing means more to us than ensuring everyone goes home every day without their **Health** being affected. We have identified **Six Top Health Risks** around our Sites:



Make sure that a safe system of work is **ALWAYS** in place before you start any work that involves these **ACTIVITIES**. We must be uncompromising in our approach to removing all risks.

FOLLOW THE YELLOW BRICK ROAD ...



STOP! IF THE WORK DOESN'T LOOK OR FEEL RIGHT
FOR MORE INFORMATION CONTACT THE A14 H&SW TEAM

A14 Integrated Delivery Team 

WELLBEING RISKS

The Wellbeing of our employees and the communities in which we work is our **TOP PRIORITY** - Nothing means more to us than ensuring everyone goes home **Safely** every day. We have identified **Six Top Wellbeing Risks** around our Sites:



Make sure that a safe system of work is **ALWAYS** in place before you start any work that involves these **ACTIVITIES**. We must be uncompromising in our approach to removing all risks.

FOLLOW THE YELLOW BRICK ROAD ...



STOP! IF THE WORK DOESN'T LOOK OR FEEL RIGHT
FOR MORE INFORMATION CONTACT THE A14 H&SW TEAM

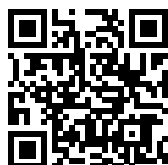
Amendment/Revision 1 – Provide brief details of amendments:



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	20 of 33

UNCONTROLLED WHEN PRINTED

Amendment completed by:		
First & Last Names:	Signature	Date:
Amendment approved by:		
First & Last Names:	Signature	Date:
8. Document Review Requirements		
State the frequency of MS review and review requirements i.e. to be reviewed as a minimum monthly, reviews to be completed with all parties etc.		



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	21 of 33

UNCONTROLLED WHEN PRINTED

10. Risk Assessment					
Risk Assessment No.	Review Date:	Revision No:	First & Last Names:	Signature:	Date:
HE528983-IDT-HSE-S5-GEN-MST-W-00108	16/09/2019	00	Tim Rennie		
First & Last Names of Person Supervising Work:		Employer:	First & Last Names:	Signature:	Date:
B.Covus		A14	Pat McEvoy		
No. of Person Exposed:	No. of Employees:	No. of Other Workers:	No. of Public / Visitors:	No. of Vulnerable Persons	Total No. of Persons at Risk:

Severity	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
	1	2	3	4	5	

Likelihood

Likelihood
Rating 1 = Very unlikely
Rating 2 = Unlikely
Rating 3 = Likely
Rating 4 = Very Likely
Rating 5 = Almost Certain

Severity
Rating 1 = No Injury
Rating 2 = Minor injury or illness
Rating 3 = "7 day" injury or illness
Rating 4 = Major injury or illness
Rating 5 = Fatality, disabling injury, etc

Risk = Likelihood x Severity

Acceptable	Further review	Unacceptable Risk
------------	----------------	-------------------

Health & Safety Hazard	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 x 2	Control Measures	Factors of Harm		Residual risk Multiple of columns 5 x 6	Control measures implemented by	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Heavy Plant Collision	4	4	16	<ul style="list-style-type: none"> Qualified Operators CPCS and safety critical medicals completed. All round visibility – CCTV, Convex Mirrors and reversing alarms. 	1	4	4	General Foreman / All operators	Ongoing; Plant Checks recorded daily



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	22 of 33

UNCONTROLLED WHEN PRINTED

Form

Risk Assessment and Method Statement Template

				<ul style="list-style-type: none"> No pedestrians to mix with heavy plant. Segregated pedestrian routes need to be in place All plant to be subject to the A14 plant inspection prior to use on site. Daily plant inspections to be carried out by the operator. If possible set up Exclusion Zone within Carriageway closure. Traffic marshal to manage passing site traffic 					
Falling objects	3	4	12	<ul style="list-style-type: none"> Where possible perform all tasks at ground level to prevent a situation where objects are at height and therefore cannot fall. When using MEWPs to take down signs, ensure an exclusion zone is setup which is sufficient to prevent hard from falling objects. 	1	4	4	General Foreman / All operators	Ongoing
Unauthorised parking on Road Closure	3	5	15	<ul style="list-style-type: none"> No unauthorised parking of vehicles on lane closure Make sure vehicles that are parked up are to the left hand side of lane 1 to keep clear access for passing site traffic. 	1	5	5	Operatives / Supervisors / Foremen	Ongoing
Pedestrian/ Vehicle incursions FATAL RISKS – Public interface	3	5	15	<ul style="list-style-type: none"> If a member of the public enters the site stop work immediately. Where safe to do so and when the person is on foot, guide the member of the public to an area of safety. Then inform your supervisor and any others working on site. If this happens during a road closure, then inform the TSCO immediately. 	1	5	5	Operatives / Supervisors / Foremen	Ongoing
Working adjacent to Live carriageway FATAL RISKS – Public interface	3	5	15	<ul style="list-style-type: none"> No work is to be carried out directly adjacent to the live carriageway without static Traffic Management or permanent containment barrier. If this isn't possible works are to be carried out under a carriageway closure. 	1	5	5	Operatives / Supervisors / Foremen	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	23 of 33

UNCONTROLLED WHEN PRINTED

			16	<ul style="list-style-type: none"> All personnel working in vicinity (within 5m), irrespective of role, to hold a safety critical medical. The office is to check that medicals are in date. Safety zone to be set up from live carriageway which no plant or personnel to stray in to, minimum 1.2m from live lane. (note if working in C/R working from one closed carriageway then lane 2 closure may be required on lane 2 of opposing carriageway) Plant to be selected / positioned in such a way that it can't stray / slew in to the carriageway, if this is not possible then a plant marshal will be used. 			4		
Travelling around site/ using carriageway closure FATAL RISK – People and plant interface	4	4	16	<ul style="list-style-type: none"> Ensure to keep to site speed limit of 11mph when within carriageway closure. Slow down to 5mph when approaching and passing a work area. Wait for traffic marshal or operative working to wave you past the works activity. Use experienced and trained operatives. Loaded vehicles must be given priority. Plant may only overtake stationary vehicles. No overtaking of moving vehicles unless called on by lead vehicle operator. 	1	4	4	Operatives / Supervisors / Foremen	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	24 of 33

UNCONTROLLED WHEN PRINTED



Form

Risk Assessment and Method Statement Template

			15	<ul style="list-style-type: none"> Flashing amber beacons must be operated at all times on light plant and personnel transport vehicles. 					
Passing other operations adjacent to the haul road	3	5	15	<ul style="list-style-type: none"> All activities to be discussed and safe system of work planned in the daily meeting, this will be briefed to site op's in the daily start of shift briefing. Where other works are to be carried out adjacent to the haul road a safety bund will be formed to segregate operations. 	1	5	5	Operatives / Supervisors / Foremen	Ongoing
Emerging from site access and egress FATAL RISKS – Public interface	3	4	12	<ul style="list-style-type: none"> Only signed site access/exits are to be used. Wait for adequate gap in traffic then Merge in turn. Site access bell mouths must be of adequate width to allow for unimpeded entry-exit of vehicles. Ensure trees or vegetation liable to obstruct vision are trimmed or removed. Ensure correct signage and traffic management is in place to warn highway users of site entrance/exit. Use experienced traffic marshal if necessary to guide out site transport. Do not work within 1.2m of live lane or if not behind safety fence. Monitor traffic flow to determine whether site restrictions may be necessary. See site safety procedure. Vehicles should comply with Chapter 8, namely to have twin flashing beacons and compliant chevron markings, 'Highway Maintenance' sticker and yellow stripes (yellow and white vehicles are exempt). 	1	4	4	General Foreman / Low Loader Operator / Plant Operators	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	25 of 33

UNCONTROLLED WHEN PRINTED

Public Interface FATAL RISK – Public interface	3	5	15	<ul style="list-style-type: none"> All access/s to be signed gated/barrier or, in sensitive areas manned. Appropriate fencing to be in place. Traffic Management to be installed for all operations in close proximity to the carriageway. Any member of the public straying into the works to be immediately approached and guided out of the area. All operatives to remain vigilant at all times and stop works if the public enter in to the works. 	1	4	4	TSCO All Teams General Foreman	Daily Briefing Ongoing
Mounting and Dismounting Plant	4	3	12	<ul style="list-style-type: none"> Only use manufacturer designed method to mount and dismount the machine. Personnel must be fit for work. Use 3 points of contact when mounting and dismounting Report any damage of mounting equipment i.e. steps, handrails etc. Ensure that all steps and handrails are clean and free from oil or grease. 	1	3	3	General foreman and all operatives	Ongoing
Plant Maintenance	4	4	16	<ul style="list-style-type: none"> All fitters to report to the site office. All fitters to have a site induction and produce the required RAMS for the works to be undertaken. All machines receiving maintenance or repair are to be moved away from the work area to level stable ground that is isolated. 	1	4	4	General Foreman / Plant manager / Operatives	Ongoing; Plant checks recorded daily
Existing OH and UG services FATAL RISKS – ELECTRICITY & SERVICES	3	4	12	<ul style="list-style-type: none"> Permit to break ground must be in place prior to breaking ground. Responsible person to receive briefing on known services. The following measures are to be used for service identification; 	1	4	4	IDT team engineers; supervisors; all operatives	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	26 of 33

UNCONTROLLED WHEN PRINTED

			16	<p>RD8100 CAT and Genny pre-work scan / Trial holes/ Desk Top Survey. Also GPR and Vacuum excavation should be considered when practicable.</p> <ul style="list-style-type: none"> Ongoing CAT4+ scanning every 300mm during the excavation works. Locate all existing services, mark and protect. Set up safety zone around the services. No mechanical dig within 1m of services. Setup GS6 controls around OH services, ensure an overhead permit is in place before working under overheads. Follow the conditions of the permit including height restriction on plant. 					
Lifting Operations FATAL RISK – People and plant interface	4	4	16	<ul style="list-style-type: none"> Ensure all 360 excavators which are intended for lifting are capable of lifting. Ensure machine operatives as well as the slinger/signallers have the correct CPCS certification. A Lift Plan needs to be in place for all lifting operations, with and all procedures stipulated in the lift plan followed. 	1	4	4	General foreman	Ongoing
Failure of Plant FATAL RISK – People and plant interface	2	4	8	<ul style="list-style-type: none"> All Plant inspected prior to use and daily plant inspections to be carried out by the operator and recorded daily. For excavators less than 10 tons: Quick hitch pins in place and checked visually before use see manufactures recommendations. Pins to be painted. 	1	4	4	General Foreman / all operators	Operator Checks Daily; Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	27 of 33

UNCONTROLLED WHEN PRINTED

				<ul style="list-style-type: none"> Operators will have training for the use of quick hitches. It should be use double – locking quick hitches only. Quick hitches on excavators will be used only when the operator has checked there is no-one near his machine. Alarms will be fitted to indicate the device is being used where the machine will be working with people on the ground. 					
Plant stability: Overloading/ Unsuitable excavator/ unstable ground. FATAL RISK – People and plant interface	2	4	8	<ul style="list-style-type: none"> Only use competent operator with CPCS certificates for the particular item of plant. Maintain a 1m clear space from edge of batter/ leading edges with machine. 1m zone to be marked with stop blocks/bunds, where practicable. Do not extend heaped bucket to maximum radius Ensure that the excavator is on stable ground and the conditions are suitable for loading. Adequate supervision operations. Ensure adequate bench width and length, do not undermine tracks/jacks 	1	4	4	General foreman / all operators	Ongoing
Working from a MEWP FATAL RISK – WORKING AT HEIGHT	2	4	8	<ul style="list-style-type: none"> Note Operative must have Correct IPAF Ticket relative to the MEWP in question. Must also be competent and trained in using Harness Must also have Fall Restraint attached at all times MEWP Must only be set up on suitable hardstanding in this case the Road. Suitable exclusion Zone set up in order to protect anyone from potential falling objects 	1	4	4	General Foreman / all operators	Ongoing; Recorded excavation inspection weekly



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	28 of 33

UNCONTROLLED WHEN PRINTED

Form

Risk Assessment and Method Statement Template

				<ul style="list-style-type: none"> Operative on ground must be IPAF trained or know how to use ground controls if MEWP in an emergency situation. 					
Use of Mobile Platforms and Ladders FATAL RISK – WORKING AT HEIGHT	4	4	16	<ul style="list-style-type: none"> Ladder use to be assessed and ladder permit issued; adhere to conditions. Ensure ground is flat, clear of obstruction and unstable materials Trained, competent operatives to erect and use mobile platforms Ensure 3 points of contact are kept whilst climbed steps/ rungs at all times No lone working permitted. Operative to foot the ladder. Ensure Mobile platform gate is kept closed. 	2	4	8	General Foreman/ All operatives	Ongoing, Daily prestart checks
Loading and tipping Using 9T Hydrema FATAL RISK – People and plant interface	3	3	9	<ul style="list-style-type: none"> Note when loading Hydrema be sure that no objects such as posts are protruding out from the sides to avoid incursion or objects falling out of the Hydrema when traveling in and out of road closure. Do not overload skip, excavator operator to ensure load is stable. 	1	3	3	General Foreman Supervisor	Daily Briefing Ongoing
Access and falls	3	3	9	<ul style="list-style-type: none"> Ensure appropriate PPE is worn, this includes ankle supporting boots with midsole, no cracks or splits with decent tread. Setup, maintain and use pedestrian routes to access and navigate site. Segregate and protect all work areas using barrier and air lock systems. Do not litter, inform your supervisor of potential trip hazards 	1	3	3	General Foreman / All operators	Ongoing
Health hazards - Weil disease	2	3	6	<ul style="list-style-type: none"> Take extreme care whilst on site. Wear PPE, long trousers and long sleeved tops. Wear gloves and glasses. 	1	3	3	General Foreman / All operators	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	29 of 33

UNCONTROLLED WHEN PRINTED

				<ul style="list-style-type: none"> Wash hands before eating. Be aware when accessing sites. Check COSHH assessments. 					
Health hazards - Dust	3	3	9	<ul style="list-style-type: none"> Ensure measures are in place to minimise dust e.g. dust suppression by dampening down, reducing site speed limits. Reduce the distance travelled by utilising stock piles closest to the work site. Construct haul routes out of none/less friable materials. 	1	3	3	General Foreman / All operators	Ongoing
Health hazards – Noise	3	3	9	<ul style="list-style-type: none"> Ensure reversing is minimised to lessen impact of reversing alarms. Do not sit in reverse gear unnecessarily. Where appropriate use directional white noise reversing alarms. Monitor noise levels to check 85dB are not exceeded. If required setup a protection zone to exclude persons not wearing hearing protection from the work area. 	1	3	3	General Foreman / All operators	Ongoing
Reversing to loader FATAL RISK – People and plant interface	2	4	8	<ul style="list-style-type: none"> Minimise reversing distance. Approaching vehicles must give way to reversing vehicles. Sufficient visual aids must be operational to provide 360° vision around the machine. Establish one-way systems where possible. Audio alarms must be fitted and operational. Reversing lights must be fully functional for low-light operations. No pedestrians on reversing route. No parked vehicles on reversing routes. 	1	4	4	Operatives / Supervisors / Foremen	Ongoing



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	30 of 33

UNCONTROLLED WHEN PRINTED

Form

Risk Assessment and Method Statement Template

				<ul style="list-style-type: none"> Signal system to be standardised between vehicles. Competent certified operators. 					
--	--	--	--	--	--	--	--	--	--

Environmental Hazard	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 x 2	Control Measures	Factors of Harm		Residual risk Multiple of columns 5 x 6	Control measures implemented by	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Environmental factors	2	3	6	<ul style="list-style-type: none"> Wear appropriate warm or wet weather clothing. Use sun block or barrier cream to protect form UV, if you are allergic to sun scream seek advice. Avoid, where possible, working in adverse conditions. 	1	3	3	General Foreman / all operators	Ongoing

Site Changes: If required, add any changes to the methodology or risks on this page, by hand. These must be included in the next formal revision of the task briefing.

Methodology:



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	31 of 33

UNCONTROLLED WHEN PRINTED



Form

Risk Assessment and Method Statement Template

Sketches / Drawing:

Author		
First & Last Names:	Signature:	Date:
Approver		
First & Last Names:	Signature:	Date:

Briefing Record				
RAMS Number:	Date and Time of Briefing:	First & Last Names:	Signature:	Date:
Attendees				



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	32 of 33

UNCONTROLLED WHEN PRINTED

Form

Risk Assessment and Method Statement Template

First & Last Names:	Role:	Company Name:	Signature:



A14 IMS Ref	HSAW-004-FM-006		
Issue Date	23/10/2018	Rev	2
Document Owner	Wendy Luxton	Page	33 of 33

UNCONTROLLED WHEN PRINTED



John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	1	of	12

Project:	A14 Upgrade		
Address	A14 / Milton Junction – A10 slip Road		
Author:	Ian Hutchinson	Position: Project Supervisor	Date: 09/10/19

1. Purpose

This CDM 'Lite' Plan describes the steps & safe system of work controls that the John Henry Group (JHG) will implement on the above project. The plan is designed for smaller works that do not meet the trigger points of CDM whereby a full Construction Phase Plan is required (if they are met then a full Construction Phase Plan will be submitted (F-JHG-SA001-A) but fulfills the requirements of the Construction Design and Management Regulations 2015 in ensuring that suitable roles, controls, communication and co-operation are put in place.

This plan MUST be read in conjunction with our Task Risk and Method Statements and the site-specific assessment controlled by the lead engineer on site.

Access to the Site is gained via permission from *Neil K*

Start Date for Installation: *TBC*
Duration: *2 weeks (estimated)*
End Date of Installation: *TBC*

2. Scope

This Plan sets out the safe systems of work for the JHG install methodology as described in the risk and method statements contained in **Appendix A**.

3. Information

Prior to any working activities all JHG staff involved in the works on site will attend a site induction as required.

All site rules will be adhered to unless JHG controls are greater

4.1 Introduction

This Plan details how the JHG will execute the *Slew and lower of Virgin Media 2way duct, Vodafone 1way duct and Openreach 1way duct. Lay additional ducts together with the demolish / rebuild of associated chambers* and has been prepared to satisfy the following requirements:

- Identify the client
- Identify who the key contractors working on the project are
- Identify potential health, safety and environmental hazards and risks to which JHG staff, Contractors or members the public may be exposed whilst the installation works are carried out.
- Identify any special plant or procedures needed.
- Outline difficulties that may be encountered in carrying out the works.
- Ensure compliance with all statutory legislation.
- Describe how the works are undertaken in order to remove or minimise hazards, risks or difficulties.
- Assessment of the way the works are to be executed and to liaise with other contractors within the Project when applicable.

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	2	of	12

4.2 Responsibilities

4.2.1 Client

The clients for this project are *Virgin Media (VM), Vodafone (VF) and Openreach (Bt)* who have engaged the John Henry Group to undertake these works on their behalf. These works form part of a wider package of works to enable the building of a new section of the A14.

4.2.2 John Henry Group (acting as contractor)

The overall responsibility for the installation contract in compliance with all statutory and contractual obligations is the responsibility of JHG within the demise of this work site under a Handover Of Site Work Area (HOSWA) Agreement.

The JHG HSEQ Department is responsible for ensuring that this document is maintained and kept up to date. The JHG Health & Safety Advisor will liaise with the JHG Project Manager and the JHG HSEQ department to ensure that this Plan is reviewed when there are changes to JHG HSEQ documents, Project Standards and/or relevant Legislative and Regulatory requirements.

4.2.3 Employers Representative

The Employers representative for this project is *Keith Cahill*

4.2.4 JHG Site Representative

Once the JHG Project Manager has received all project information from the client, they will ensure the JHG Site Supervisor carries out the following for each site, including briefing the JHG Project Team accordingly:

- Verify risk assessment and method statement
- Read the changes and agree any changes
- Up date and change the Risk Log if necessary.
- Fully brief the JHG installation team on scope of works and any site-specific risks.
- Ensure those changes are briefed to all Site staff and contractors to ensure safety is maintained through out the project

The Project Team works out of an office within *The Sidings Long Stanton*

Key members of the project are:

- Clients Representatives *Mick Coe (Virgin Media VM)*
- *Dave Oakes (Openreach Bt)*
- *Gavin Ralph (Vodafone VF)*
- Designer *Karl Gough (Virgin Media VM)*
- JHG Project Manager: *Keith Cahill*
- JHG Project Supervisor: *Ian Hutchinson*

Emergency Contact Numbers for this project are:

Local Emergency Contact	<i>As per site induction</i>	<i><<Insert number here>></i>
Project Safety Advisor	<i>Matthew Street</i>	<i>07803 626 066</i>
JHG Project Manager	<i>Keith Cahill</i>	<i>07590 446 262</i>

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	3	of	12

5. Procedure - Content of Plan

5.1 Mandatory Sections

5.1.1 Scope of Work

This project is being carried out to facilitate the A14 Cambridge to Huntingdon Scheme construction scope. The aim is to expose existing telecommunication assets located in the west verge of the A10, which will then be slewed and lowered below the proposed A10 dedicated left lane off the A14, Junction 33. These telecommunication assets comprise of series of 100mm nominal diameter ducts, a number containing optical fibre and copper communication cables. In addition to relocating the existing duct networks, existing telecommunications chambers will require demolition & reconstruction. The works involved are as follows:

- *Expose the telecommunications ducts as laid*
- *Excavate the new route to a suitable level and slew the duct to the new depth*
- *Demolish and rebuild of new chambers north & south of the slewed duct extents, for each of the telecommunication providers. will be required to accommodate the new duct depth.,*
- *Bed, cover & surround all ducting with a suitable medium*
- *Backfill the remainder of the excavation with as-dug material*
- *Hand the site over to A14IDT for follow on construction activities*

Key Control Measures:

- *Excavated Materials: all spoil won from duct networks excavation will be stored on site immediately to the west of the excavation extents, neatly shaped to protect material against weather, avoiding quality degradation. Surplus material not used during backfill operation will be disposed of by A14IDT project management, in accordance with Waste Management legislation.*
- *Leach Risk: Personal gas monitors will be worn by all JHG site operatives, as a warning system in the event harmful gases are released in the atmosphere, resulting from disturbing ground in relative close proximity to the neighbouring landfill site. If any unusual odours or visual cause for concern is exposed during excavation works, all work will be stopped and the site evacuated until proven safe by the relevant authorities.*

All works are to be undertaken following procedures laid down by the JHG

5.2 Limits of work and site boundaries, including time limits

All site boundaries access and egress to and from and limits of the work sites are under the control of JHG in accordance with [A14IDT Handover of Statutory Works Area \(HOSWA\)](#).

For works in the Public Highway site to be guarded in accordance with the New Roads and Street Works Act (Chapter 8) and guidance outlined within 'Red Book'.

Where works are on private land (non-adopted roads etc.) or within the [A14 Cambridge to Huntingdon Scheme](#) site boundary (Red Line) site to be guarded in accordance with A.C.O.P's to ensure the safety of operatives, clients' personnel and other contractors.

Further guidance will be given at the site induction on what additional requirements are to be adhered to. To be recorded on Site Specific Risk Assessment and HOSWA.

5.3 Hazard Identification

The site-specific induction run by the A14 project team will be used to populate the site-specific risk assessment with additional information (as required).

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	4	of	12

The site-specific Risk Assessment in this plan has been completed from findings of our site survey, however as conditions change and in line with our policy, our engineers will complete a [Start-of-Shift](#) risk assessment on the day, taking into account the hazards and controls already identified at the planning/design stage. The site-specific risk assessment is contained in **Appendix A**

5.4 Road Traffic Management

Site access will be provided by A14 Cambridge to Huntingdon Scheme project management. JHG vehicles shall enter & exit traffic management in a considerate manner with respect to other road users and general public. If any element of proposed works cannot be completed within daytime traffic management arrangements, a road closure will be requested.

5.5 Plant and Equipment

5.5.1 Inspection and Examination certificates available for Inspection

All equipment & devices are subject to regular checks in line with manufacturer's instructions and legislation. All records are held at our Longstanton offices and are available upon request.

All equipment is checked by the operative prior to use and this is recorded on the site-specific risk assessment.

5.5.2 Details of Cranes, lifting machines, appliances and lifting tackle; including details of site access, rigging and de-rigging

5-ton excavator (A14 project director sign off required)

Pecker attachment

Hand Tools

5.6 Personnel Involved

5.6.1 Contractors Monitoring Arrangements

The JHG Site Supervisor will be in charge of the [HOSWA](#) area and will monitor the conduct and performance of all staff, [within the HOSWA area and within the wider A14 Cambridge to Huntingdon Scheme site boundary \(Red Line\)](#)

5.6.2 Supervision arrangements, including names of person in charge

Total Safety Supervision of the site will be under the control of the JHG lead operative/Site Supervisor.

5.7 Working hours

The hours worked will be recorded by JHG Site Supervisor and kept for proof at Audit stage.

Working Hours for this project shall be:

Monday to Friday 8am to 6pm; planned duration = 2 weeks (estimated).

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	5	of	12

5.8 Welfare and First Aid Arrangements

On site facilities available to the team.

First Aid and accident reporting will be under control of the JHG Site Supervisor.

Nominated First Aider:

- *Mick Matsell*

5.9 Access requirements, special conditions

All access and egresses will be managed by the JHG Site Supervisor Methodology

5.9.1 State order of work:

In advance of the works

- *Site Supervisor to receive site specific safety briefing*
- *All operatives to have received a Safety Critical Medical prior to attending inductions*

Day before works commence

- *Site Supervisor to organise HOSWA (Handover of Site Work Area)*

Week of works

- *All plant and vehicles to be checked prior to arriving on site*
- *Operatives to travel to site and guard off works area and complete site-specific risk assessment*
- *Ensure HOSWA is displayed on guarding.*
- *Prior to entering FW6 chamber, gas testing to take place in accordance with JHG procedures*
- *All operatives to wear Gas Detection Units (GDU's)*
- *FW6 Chamber pumped out (if required); filter bag to be used to avoid silt pollution*
- *Site CAT scanned to locate services in the area - identified services to be marked up in accordance with JHG procedures and HSG47*
- *Excavate to expose the Virgin Media, Vodafone and Openreach Ducts as laid, excavate the new duct route in conjunction with exposing the existing ducts.*
- *Topsoil to be stored at the side of the excavation to be reused*
- *Subsoil to be stored at the side of the topsoil; any excess to be remove by the A14IDT when constructing the proposed A10 dedicated left merge lane*
- *Demolish and rebuild chambers to accommodate the new duct depth, once sufficient depth obtained as per levels set by the A14 Integrated Delivery Team*
- *Slew the 2-way Virgin Media assets, 1way Vodafone assets and 1-way Openreach assets into the new trench*
- *Additional ducts to be laid in formation with relocated ducting to give a total of 4 x Virgin Media (VM) ducts, 2 x Vodafone (VF) ducts and 2 x Openreach (BT) ducts*
- *Proprietary spacers to be used to provide 25mm separation between ducts*
- *All split duct to be secured and made tight, in order for no material to enter*
- *Backfill with C35 concrete between duct formation.*
- *Site reinstated to specification as directed by A14 Integrated Delivery team upon completion.*
- *Guarding removed and HOSWA handed back to project team for signoff and site handover.*

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	6	of	12

5.10 Briefing Arrangements

5.10.1 Who is responsible for briefing arrangements

The JHG Supervisor will brief all staff on any safety instruction within their control.

The A14 Integrated Delivery team will provide the Site Supervisor with their site-specific induction who will inform JHG staff of any reporting requirements that are expected of them.

5.10.2 How is understanding confirmed

This plan and the associated Risk Assessments and Method Statements shall be briefed to all site operatives and their understanding shall be sort, once briefed they will sign the site-specific risk assessment. Any visitors to the site shall be briefed in its contents and asked to sign the form.

- Verbal control by the JHG Site Supervisor

5.10.3 How is briefing recorded

The briefing will be recorded on the JHG Site Specific risk assessment and all persons who sign are confirming that they have understood and will comply with those instructions.

5.10.4 Who is briefed on site safety arrangements

All site personnel, and anyone entering JHG HOSWA site.

5.11 CONTRACTOR'S MONITORING ARRANGEMENTS

5.11.1 Monitoring Compliance with Plan, Risk and Method Statements

The site supervisor is responsible for the compliance with this method statement on a daily basis. An entry will be made within the site diary detailing any required action to be taken.

Site inspections shall be conducted at random by the site supervisor/manager/HSEQ team and the findings input onto CMS (in-house compliance database) where any actions will be assigned an owner and tracked through to resolution.

If for any reason the site check identifies major non-conformances the works may be stopped, and the process reviewed to find a more suitable option.

5.12 ENVIRONMENTAL

5.12.1 Environment Protection Arrangements are covered within the JHG Environment Plan

However, JHG will ensure the following:

WASTE AND POLLUTION

All waste from the installation of the equipment will be taken off site and checked by the JHG site supervisor.

However Standard practices in force include: -

- Use of non-permanent/non-destructive marking systems.
- Use of approved places of access.
- Use of approved walking routes.
- Containment and proper disposal of all litter and waste.
- Use of recycled/recyclable, environmentally friendly materials where appropriate.
- Avoidance of excessive noise at all times.

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	7	of	12

5.13 SAFETY OF CONTRACTORS STAFF

5.14 Control Measures for Specific Health Hazards

Refer to Risk Assessments in **Appendix A**

5.15 Personal Protective Equipment Requirements

All personnel will be issued with the personal protective equipment conforming to any health and safety signs present.

All operatives will follow the requirements contained in the risk and method statements, but as a minimum the following PPE equipment as required:

- Head Protection
- Steel Toe Cap Boots
- High Visibility Jacket and trousers
- Safety Goggles – (Mandatory)
- Gloves Cut5 – (Mandatory)
- Hearing Protection (when breaking out Manhole or when required)

All staff shall ensure that PPE is clean, operational, in date and correctly worn at all times.

All staff will hold a current CSCS card and will be able to evidence on site as required.

COMMUNICATION & LIAISON

5.15.1 Specific Persons Who Must Be Contacted

Any Subcontractors being used for the works and if required, specific people who must be in attendance during the works will be listed in this section on a site by site basis and must consider and liaise with representatives of:

Tick if Affected

- other contractors working nearby
- highway authorities,
- occupiers of adjacent property,
- businesses
- A14 Project team

Any other companies (as listed above) will be notified in writing prior to works commencing. Contact details will be given of the JHG Project team for liaison and where possible and required, plans and Method Statements for works which will affect the other party.

5.16 EMERGENCY PLANS

5.19.1 Contact Phone Numbers - Emergency Services

The most effective method of contacting the Emergency Services to attend an incident is by dialling 999. The JHG Head Office must also be notified 01945 288011 where the call will be logged, and an issue reference assigned.

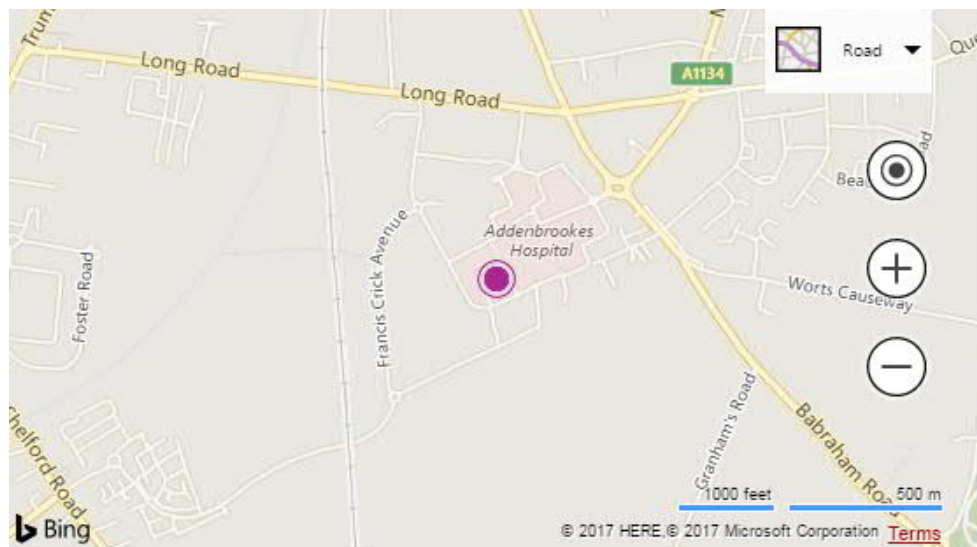
John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	8	of	12

5.19.2 Location of Accident & Emergency Hospitals for this Contract

HOSPITAL	ADDRESS	TELEPHONE NUMBER
<i>Hinchingbrooke Hospital</i>	<i>Hinchingbrooke Park, Huntingdon, Cambridgeshire PE29 6NT</i>	<i>01480 416 416</i>



HOSPITAL	ADDRESS	TELEPHONE NUMBER
<i>Addenbrooke's Hospital</i>	<i>Hills Road, Cambridge, Cambridgeshire, CB2 0QQ</i>	<i>01223 245151</i>



John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	9	of	12

5.19.3 Location of Fire, Ambulance & Police for this Contractor

Contact	Notes	Internal 9-5 Mon- Fri	External or mobile
AMBULANCE SERVICE			999
FIRE SERVICE			999

5.19.4 Prime Contractors Contact Numbers

Contact	Notes	Internal 9-5 Mon- Fri	External or mobile
JHG Head Office	Longstanton	01954 288011	N/A
<i>Keith Cahill</i>	Longstanton	01954 288011	07590 446262
<i>Matthew Street</i>	Longstanton	01954 288011	N/A
<i>Ian Hutchinson</i>	Site	07771 817 985	
<i>Rob Fisher</i>	Site	07736 296735	

5.20 Accident Reporting and Investigation

All accidents shall be reported as per JHG, Accident, and Incident & Near Miss Reporting Procedure. All incidents, accidents and near misses/positive interventions must be reported to:

01954 288011 & 0845 6050477

All accidents shall be investigated as per JHG, Accident, and Incident & Near Miss Investigation Procedure.

Accidents will also be reported to the site supervisor and or Client as required via reporting procedure detailed in inductions.

6 Records

All records relating to projects shall be retained for period of not less than 3 years by the respective departmental manager. Records relating to accidents incidents shall be retained by the HSEQ department for period of not less than 5 years, records relating to occupational ill health as a result of the of the project shall be retained for a period of not less than 40 years by the HR department.

John Henry Group	CDM 'Lite' Plan – A14 Upgrade	Reference	F-JHG-SA001-L-A14		
		Revision	1	Date	Mar 2017
		Sheet No	10	of	12

7 Appendices

Appendix A. – Risk and Method Statements (Site specific – to be completed on day) and Task Assessments.

Note: - this assessment is a planning stage assessment. A daily on-site assessment WILL be carried out by the lead engineer prior to any works starting. This is due to changing site conditions and controls.

All details shall be recorded on the site-specific form (held on a carbonated pad by the lead engineer) and the Task Risk and Method Statements shall be used to build up the plan. Where additional controls are required on site these shall be entered by the engineer and scored accordingly to ensure the risk has been reduced to a minimum.

Any controls shall be conveyed to the team and any affected persons.

Appendix A

Must be Completed Before Starting Work & Amended if Site Conditions Change

Name	<i>Ian Hutchinson</i>				Signed					Job Number	<<enter details>>								
Address	<i>A14 / Milton interchange</i>									Date/s									
Description of Works	<i>Slew / Lower 2-way VM, 1-way VF, and 1-way Bt ducts, lay additional ducts as required, and demolish/re-build associated chambers</i>									Highest Individual HAVs Points - If over 300									
										Name of Individual & Contact Supervisor									
					Activity	Excavation	Reinstatement	Cabling			Jointing		Environment			Cust Conn			
						<<Y/N>>	<<Y/N>>	Cable	Sub Duct	Blown Fibre	Rod & Rope	Copper	Fibre	Int	Ext	O/H	U/G		
Persons at Risk?	Competent Staff	Client Staff	M.O.P.		Briefed to / site visitors:														
<i>Mick Matsell</i>					CAT & Genny Used?	Y	N	Risk Element											
<i>Chris Masell</i>					Gas Test Result (P/N)		Manual Handling			X	Electrical Equipment		Vehicles		X				
<i>Ian Hutchinson</i>							Mechanical Lifting				Working at Height		X	Excavation					
Weather	Sunny	Rain	Frost	Snow	Windy	Other	Hand Tools			X	Confined Space Working		COSHH						
Comments & Instruction	<i>Site supervisor to attend site specific induction day before works. On day vehicles to be checked and on site HOSWA to be in place. All other working practices as per JHG and VM procedures.</i>									Severity of harm	High	M	M	H	Likelihood of Harm (L)		Severity of Harm (S)		
											Med	L	M	M	Very likely to occur	High	Fatal, loss of limb, sight etc.		
											Low	L	L	M	May occur	Med	Broken bones, deep cuts etc		
												Low	Med	High	Unlikely to occur	Low	Small cuts, grazes etc		
Risk Element	Task Risk Assessment Nos.				Site Specific Action Taken / Controls Required additional to task assessment										L	S	RRR		
Environment																			
Handling / lifting	<i>RA002</i>																		
Tools	<i>RA005/006/007/017</i>																		
Working at Height	<i>RA008</i>																		
Working U/G	<i>RA013/015/018/35</i>																		
Electrical Equipment																			
Work Equipment	<i>RA033</i>																		
COSHH/Other/ Sub Contractor Risk Assessments										All tools and equipment checked prior to use and fit for use?					Y	N			
Personal Protective Equipment (PPE)	Overalls		High Visibility Vest	X	Eye Protection	X	Hard Hat	X	Dust Mask	X	Other List	GDU							
	Safety Boots	X	Jacket	X	Ear Protection	X	Gloves	X	Respirator										
Residual Risk Ratings (RRR)	High	STOP WORK – Contact manager / supervisor				Med	Apply additional controls to reduce to low. If still Med. contact manager / supervisor for advice				Low	Carry out work as per knowledge, skills, training and experience							

John Henry Group	CDM 'Lite' Plan	Reference	F-JHG-SA001-L		
		Revision	7	Date	Dec 2016
		Sheet No	12	of	12

List of Task Assessments – Relevant assessments as detailed previously shall be added to the plan

Assessment Number	Description
F-JHG-RA002	Manual Handling Task Risk and Method Statement
F-JHG-RA003	Mechanical Lifting Task Risk and Method Statement
F-JHG-RA004	Use of Ladders and Step Ladders Task Risk and Method Statement
F-JHG-RA005	Use of Portable Electric Equipment Task Risk and Method Statement
F-JHG-RA006	Use of Hand Tools Task Risk and Method Statement
F-JHG-RA007	Use of Vibrating Work Equipment Task Risk and Method Statement
F-JHG-RA008	Working at Height Task Risk and Method Statement
F-JHG-RA009	Working off Tower Scaffolds Task Risk and Method Statement
F-JHG-RA010	Working of Fixed Scaffolds Task Risk and Method Statement
F-JHG-RA011	Working in the Hours of Darkness Task Risk and Method Statement
F-JHG-RA012	Avoiding Danger from Overhead Services Task Risk and Method Statement
F-JHG-RA013	Avoiding Danger from Underground Services Task Risk and Method Statement
F-JHG-RA014	Rodding and Roping of Ducts Task Risk and Method Statement
F-JHG-RA015	Excavations Task Risk and Method Statement
F-JHG-RA016	Underground Cabling Task Risk and Method Statement
F-JHG-RA017	Use of Stihl/Floor Saws (Abrasive Wheels) Task Risk and Method Statement
F-JHG-RA018	Backfill and Reinstatement Task Risk and Method Statement
F-JHG-RA019	Working with Optical Fibre Task Risk and Method Statement
F-JHG-RA020	Confined Space – Low Risk (Category C) Task Risk and Method Statement
F-JHG-RA021	De-classified Confined Space– Medium Risk (Category B) Task Risk and Method Statement
F-JHG-RA022	Confined Space – High Risk (Category A) Task Risk and Method Statement
F-JHG-RA023	Diamond Core drilling into underground chambers and basements
F-JHG-RA024	Use of Elevating Work Platforms (MEWPS) Task Risk and Method Statement
F-JHG-RA025	Sub-duct installation
F-JHG-RA026	Out of hours call out
F-JHG-RA027	Installation of carriageway cover and frame (see RA036)
F-JHG-RA028	Installation of telecoms cabinet
F-JHG-RA029	Working Near Radio Frequencies Task Risk and Method Statement
F-JHG-RA030	Operation of Pipe Trailers Task Risk and Method Statement
F-JHG-RA031	Electro Fusion Welding of Polyethylene Pipe Task Risk and Method Statement
F-JHG-RA032	Internal Cabling - Task Risk and Method Statement
F-JHG-RA033	Use of Lorry Loaders (Grab/HIAB) Task Risk and Method Statement
F-JHG-RA034	Cabinet Earth Rod Installation Task Risk and Method Statement
F-JHG-RA035	Laying Concrete Bound Granular Material Task Risk and Method Statement
F-JHG-RA036	Demolish and/or Rebuild Underground Chambers Task Risk and Method Statement
F-JHG-SA037	Core Drilling Task Risk and Method Statement
F-JHG-SA038	Installing Slabs in Steps and Footways Task Risk and Method Statement
F-JHG-SA039	Impact Moling Task Risk and Method Statement Task Risk and Method Statement
F-JHG-SA040	Foam Concrete Task Risk and Method Statement Task Risk and Method Statement
F-JHG-SA041	Use of Road Sweeper Task Risk and Method Statement
F-JHG-SA042	Excavations Next to and Over Pipelines Task Risk and Method Statement
F-JHG-SA043	Installation of Twin Wall Pipe Task Risk and Method Statement
F-JHG-SA044	Traffic Management – Priority Systems 30MPH or Less Task Risk and Method Statement
F-JHG-RA045	Moleplough Task Risk and Method Statement
F-JHG-RA046	Use of Dumpers Task Risk and Method Statement
F-JHG-RA047	Use of Compact Rollers Task Risk and Method Statement

Appendix E. Appendix 26/6 Groundwater Monitoring Well Replacement, Milton Landfill

A14 Cambridge to Huntingdon Improvement Scheme

Appendix: 26/6

Specification Appendix Title: Groundwater Monitoring Well Replacement, Milton Landfill

Suitability: A For Construction For Construction

Notice

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C05	Update of Clauses 1.10.12 and 1.16.3 in line with EA/FCC comments	NC	DM	DM	DM	12/08/20
C04	Borehole reference numbers updated as requested by FCC	NC	DM	DM	DM	01/05/20
C03	Updated details for replacement to well BH12.	NC	DM	DM	DM	20/04/20
C02	Updated works as agreed with FCC/EA	NC	DM	DM	GJ	13/02/20
C01	Construction Issue	TB	DM	DM	PN	15/01/19
P01	First Issue	NC	DM	DM	PN	06/12/18
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

Table of contents

Chapter	Pages
0. Preamble to the Specification	5
1. Schedule 1: Information and site-specific requirements	6
1.1. Name of Contract	6
1.2. Investigation Supervisor	6
1.3. Description of site	6
1.4. Main works proposed and purpose of this contract	6
1.5. Scope of investigation	6
1.6. Geology and ground conditions	6
1.7. Schedule of drawing(s) and documents	7
1.8. General requirements (Specification Section 3) Particular restrictions/relaxations	7
1.9. Percussion boring (Specification Section 4) Particular restrictions/ relaxations	12
1.10. Rotary drilling (Clause 4.6) Particular restrictions/ relaxations	12
1.11. Pitting and trenching (Specification Section 6) Particular restrictions/ relaxations	14
1.12. Sampling and monitoring during intrusive investigation (Specification Section 7) Particular restrictions/ relaxations	14
1.13. Probing and cone penetration testing (Specification Section 8) Particular restrictions/ relaxations	15
1.14. Geophysical testing (Specification Section 9) Particular restrictions/ relaxations	15
1.15. In situ testing (Specification Section 10) Particular restrictions/ relaxations	15
1.16. Instrumentation (Specification Section 11) Particular restrictions/ relaxations	16
1.17. Installation monitoring and sampling (Specification Section 11) Particular restrictions/ relaxations	17
1.18. Daily records (Specification Section 13) Particular restrictions/ relaxations	18
1.19. Geotechnical laboratory testing (Specification Section 14)	18
1.20. Geoenvironmental laboratory testing (Specification Section 15) Particular restrictions/ relaxations	19
1.21. Reporting (Specification Section 16) Particular restrictions/ relaxations	19
2. Schedule 2: Exploratory Holes	25
2.1. Hole number	25
2.2. Type	25
2.3. Scheduled depth	25
2.4. National grid reference	25
2.5. Approximate ground level	25
2.6. Remarks	25
3. Schedule 3: Investigation Supervisor's Facilities	27
3.1. Accommodation	27
3.2. Furnishings	27
3.3. Services	27
3.4. Equipment	27
3.5. Transport	27
3.6. Personal Protective Equipment for Investigation Supervisor	27
4. Schedule 4: Specification Amendments	28
5. Schedule 5: Specification Additions	29
Annex 1: Bill of Quantities for Ground Investigation	30

Bill of Quantities for Ground Investigation	31
Preamble to the Bill of Quantities	31
Bill A General items, provisional services and additional items	36
Bill B Percussion boring	37
Bill C Rotary drilling	38
Bill D Pitting and trenching	39
Bill E Sampling and monitoring during intrusive investigation	40
Bill F Probing and cone penetration testing	41
Bill G Geophysical testing	42
Bill H In situ testing	43
Bill I Instrumentation	44
Bill J Installation monitoring and sampling	45
Bill K Geotechnical laboratory testing	46
Bill L Geoenvironmental laboratory testing	47
Summary of Bill of Quantities	48
Appendix A: Rates for Ground Practitioners and other Personnel	49
Appendix B: Long-term sample	50
Appendix C: Drawings	51
Appendix D: FCC Documents	56
Tables	
Table 1-1 Anticipated Geological Sequence at the Site	7

0. Preamble to the Specification

The Specification referred to in this document shall be the "UK Specification for Ground Investigation, Second Edition" published by ICE Publishing on behalf of the Site Investigation Steering Group, modified and extended by any Substitute Clause or Additional or Cancelled Clause or Table listed in Schedules 4 and 5.

Insofar as any of the numbered Appendices, Additional or Amended Clauses may conflict or be inconsistent with any provision of the UK Specification for Ground Investigation then the numbered Appendices, Additional or Amended Clauses shall always prevail.

Any reference in the Specification to a Clause number or Appendix shall be deemed to refer to any amended version of that Clause or Appendix.

Reference to Clauses shall apply equally to Tables. Where a Clause is amended, any Tables referred to in the original Clause shall apply unless the Table is also amended. When a Table is amended any reference in a Clause to the original Tables shall apply to the amended Table.

Any Clauses in the Specification which relate to work or materials not required for the Investigation shall be deemed not to apply.

Any Schedules referred to in the Specification which are not used shall be deemed not to apply.

For the purposes of this document the ground investigation/well installation contractor is referred to as the "Contractor".

1. Schedule 1: Information and site-specific requirements

1.1. Name of Contract

A14 Cambridge to Huntingdon Improvement Scheme – Milton Landfill Replacement Well.

1.2. Investigation Supervisor

The Investigation Supervisor for the Contract shall be Mr Nathan Cummins ACJV.

1.3. Description of site

The proposed replacement well is to be located within the southern part of Milton Landfill, located adjacent to the A14. Milton Landfill is operated by FCC and regulated by the Environment Agency. The Landfill is operational, but the proposed replacement well is located away from the active part of the site.

1.4. Main works proposed and purpose of this contract

The purpose of the Works is to install replacement groundwater monitoring wells to satisfy the requirements of FCC's landfill permit. Existing well (BH-W01) is located close to the existing A14. It has been determined that there is insufficient protection between the running carriageway of the A14 and the well for FCC's operatives to safely undertaking monitoring and sampling activities. Existing well BH12 will be within the new hardstrip and it will not be practical to carryout groundwater monitoring in that installation in future. It is required, therefore, to install replacement wells within suitable safe areas of the site.

The replacement wells will be monitored by FCC in accordance with its Environmental Permit for operating the landfill site. The drilling of the borehole and the installation of the well must, therefore, be carried out under a Construction Quality Assurance (CQA) protocol.

The proposed replacement wells have been located to avoid drilling through the waste or landfill containment systems at the site. Should evidence of either waste or a containment system be encountered the borehole will be terminated and discussions held with FCC and the EA to agree the action to be taken. Replacement wells are to be replaced on a "like-for-like" basis, as far as is practicable.

1.5. Scope of investigation

The replacement well for BH-W01, to be identified as BH-W01R (A14 reference ID754) is to have a response zone within the Lower Greensand aquifer, which is expected to be present at a depth of approximately 35m below ground level.

BH12 is to be replaced with borehole BH12R (A14 reference ID755). It is intended that BH12R will monitor River Terrace Deposits which comprise sand and gravel. However, the historical record for the existing BH12 shown that while some granular material was encountered within the upper 2.2m of the borehole, the installation and standpipe was extended to a depth 19.0m, terminated within the Gault Clay which was encountered at 2.8m depth. The Environment Agency has advised that it requires borehole BH12R to be installed as a like-for-like replacement for BH12.

1.6. Geology and ground conditions

The geology and ground conditions anticipated at the at the site based on available information are summarised in Table 1-1. No assurance is given to the accuracy of this information.

Table 1-1 Anticipated Geological Sequence at the Site

Superficial Geology	Bedrock Geology
Made Ground	(Possible River Terrace Deposits towards east of Milton landfill site) Gault Clay Woburn Sands Formation (Lower Greensand Group - Principal Aquifer) Kimmeridge Clay

Previous trial pitting in the vicinity of the existing BH12 did not encounter River Terrace Deposits; should it be the case that suitable ground conditions are not encountered, confirmation will be required from both the EA and FCC about where the borehole should be relocated.

1.7. Schedule of drawing(s) and documents

The existing well locations are shown on drawing HA528983-ACJV-HGN-S5_ML-SK-C-0006. The proposed well locations are shown on drawing HA528983-ACJV-HGN-S5_ML-SK-C-0017. Copies of these drawings are included in Appendix C.

The Designer’s Risk Assessment is presented in document HA528983-ACJV-HGT-S5_MILLWELL-RP-C-0001.

1.8. General requirements (Specification Section 3) Particular restrictions/relaxations

1.8.1. Quality Management System (Clause 3.3)

The borehole and well construction shall operate under a CQA protocol. The Contractor shall prepare a draft CQA Plan for the works and at least four weeks prior to his proposed commencement of the works shall submit it to the Investigation Supervisor for acceptance. Within one week of receipt of the draft CQA Plan the Investigation Supervisor shall confirm that the plan is either:

- accepted
- accepted with comments (requiring addressing)
- unacceptable and should be revised and resubmitted.

If the CQA Plan is accepted or accepted with comments the Contractor shall submit his final CQA Plan to the Investigation Supervisor within one week. If the CQA Plan is unacceptable the Contractor shall submit a revised draft CQA Plan to the Investigation Supervisor for acceptance within one week.

The Investigation Supervisor shall submit a copy of the final CQA Plan to the Environment Agency and FCC for their acceptance.

An independent CAQ engineer shall oversee the works, clause 1.8.3 refers.

The Contractor will not be allowed to commence the works until a CQA Plan and an independent CQA engineer, accepted by both the Environment Agency and FCC are in place.

1.8.2. Professional Attendance (Clause 3.5.2)

The Contractor shall provide experienced geotechnical/geo-environmental engineers or geologists full time on site for the supervision of all site activities, logging boreholes and core, taking photographs and providing daily records and logs (except where daily records are for activities carried out by boring operatives).

The Contractor shall detail in his Method Statement the names and experience of the proposed staff to be present on site and involved with the direction and technical input of the investigation.

1.8.3. Provision of Ground Practitioners and Other Personnel (Clauses 3.6.1 and 3.6.2)

The Contractor shall provide an independent CQA engineer to overview the works and to prepare a CAQ Validation Report. The CQA engineer shall have proven competency in the supervision of installation works with specific experience in drilled installations to meet the quality standards under Landfill Directive 1999. The CQA engineer's appointment will be subject to both Environment Agency and FCC approval. The Contractor shall provide the name, qualifications and an up to date curriculum vitae for his nominated CQA engineer to the Investigation Supervisor at least four weeks prior to his planned commencement of the works. The Investigation Supervisor will then seek Environment Agency and FCC approval of the nominated CQA engineer. If the Environment Agency or FCC or both reject the nominated CQA engineer the Contractor will be required to make a replacement nomination.

The CQA engineer shall prepare a comprehensive daily record covering the period of the drilling and well installation works. The record shall include all information relevant to the works including start/finish times, progress of works, communications, incidents, compliance and deviations from specification. Each entry should have a corresponding time entered.

Should an incident occur, the CQA engineer shall prepare an Incident Report and submit it to the Investigation Supervisor.

The CQA engineer shall prepare a CQA Validation Report which shall include his own records and relevant Contractor's records including photographs, the borehole log and well installation details. A draft of the CQA Validation Report shall be submitted to the Investigation Supervisor for acceptance within one week of completion of the well installation. Within two weeks of receipt of the CQA Validation Report the Investigation Supervisor shall confirm that the report is either:

- accepted
- accepted with comments (requiring addressing)
- unacceptable and should be revised and resubmitted.

If the CQA Validation Report is accepted or accepted with comments the CQA engineer shall submit his final report to the Investigation Supervisor within two weeks. If the CQA Validation Report is unacceptable the CQA engineer shall submit a revised draft report to the Investigation Supervisor within two weeks.

The Investigation Supervisor shall submit a copy of the final CQA Validation Report to the Environment Agency and FCC for their records.

1.8.4. Hazardous Ground, Land Affected by Contamination and Notification Invasive Weeds (Clauses 3.7.1 and 3.22)

In accordance with the Guidelines for safe investigation by drilling of landfills and contaminated land (SIGG 2011) the site is classified as yellow.

Land affected by contamination is expected to be local and associated with historical and current activities. Therefore, the Contractor is to maintain careful attention to materials being recovered and to inform the Investigation Supervisor immediately of any noticeable colour change/variation or olfactory observations of the soils and water encountered.

The Contractor shall maintain clean drilling equipment and maintain good personal hygiene.

If the contractor identifies suspected ACM, work shall immediately cease and the Investigation Supervisor shall be informed.

1.8.5. Additional Information on Services Not Shown on Contract Drawings (Clause 3.7.2)

Information on the approximate location of underground services has been extracted from statutory undertakers information by the Principal Contractor. Information on buried services, including mains and sewers etc. will be provided for information only by the Principal Contractor and is based upon available records and may be incomplete. The accuracy of this information cannot be relied upon and the Principal Contractor shall identify the line, level, size, status and type of all services and undertake an appropriately detailed risk assessment before undertaking any works that may cause damage to property or risk to health and safety.

Highways England utilities, such as communications, electricity supply and drainage network, are not currently available. The Contractor shall liaise with the Principal Contractor to identify the services present at those hole locations within the Highways England boundary.

Prior to commencing work the Contractor shall locate and mark all known services and confirm their location by physical means (i.e. hand excavated trial holes). Where services locations cannot be confirmed the location shall be revised and the checking of the location for services shall be repeated.

1.8.6. Known/suspected mine workings, mineral extractions, etc. (Clause 3.7.3)

None.

1.8.7. Protected species (Clause 3.7.4)

Not Applicable.

1.8.8. Archaeological Remains (Clause 3.7.5)

Not Applicable.

1.8.9. Security of site (Clause 3.11)

Exploratory holes and equipment shall be fenced off and protected for the period of the works as may be required to avoid injury to others, in addition to any requirements stipulated by clause S1.8.20 of this specification.

It should be noted that enhanced security may be required; there is a traveller's site nearby, and Milton Landfill site has a history of being accessed by unauthorised persons.

1.8.10. Traffic Management Measures (Clause 3.12)

The following site constraints shall be considered prior to undertaking the works and where necessary the appropriate permissions to enter and or access particular parts of the site shall be obtained by the Contractor in a timely manner:

- Access to the site shall be arranged with FCC via the Principal Contractor.

All work shall be carried out such that no damage is caused to the existing structures on site.

1.8.11. Restricted working hours (Clause 3.13)

The Principal Contractor will seek to obtain consents from the relevant local authority where required under Section 61 of the Control of Pollution Act 1974 for the proposed construction works, excluding non-intrusive surveys. Applications will include details on proposed working hours.

Fieldwork hours shall be discussed with and approved by the Principal Contractor and Investigation Supervisor through written submission and formal approval. Core working hours will be from 08:00 to 18:00 on weekdays (excluding bank holidays) and from 08:00 to 12:00 on Saturdays. It is expected that only in exceptional circumstances will work be permitted after mid-day on Saturday, or on Sunday. The Contractor will adhere to the core working hours unless otherwise permitted under Section 61 of the Control of Pollution Act 1974.

The Contractor shall comply with the general recommendations of BS5228 Code of Practice for noise control on construction and other open sites.

Without prejudice to the Contractor's obligations under the Contract, the Contractor or any Sub-Contractor, concerned in any way with the Contract, shall comply with the following requirements. (The following is indicative only and is to be confirmed.)

- The noise occurring at any location as defined in paragraph (ii) resulting from the Contractor's operations shall not exceed the following unless absolutely necessary for the saving of life or property or for the Safety of the Works in which case the Contractor shall immediately advise the Investigation Supervisor

Dates	Noise Emission Limit	Peak Noise
Mon to Fri (0800 hours to 1800 hours) inclusive	75 dB(A) LAeq, (12h)	85 dB(A)
Saturday (0800 hours to 1300 hours) inclusive	75 dB(A) LAeq (12h)	85 dB(A)
Saturday (1300 hours to 1900 hours) inclusive	65 dB LAeq (12h)	75 dB(A)
Sunday (if permitted 0900 hours to 1700 hours)	65 dB LAeq (12h)	75 dB(A)
All other times	55 dB(A) LAeq (12h)	65 dB(A)

Notes:

- The noise levels shall be measured 3.5m from the nearest ground floor sensitive façade and 1m from the centre of the most exposed upper floor façade window of any occupied building during the relevant periods of operations (Planning Condition 90);
- The sound level shall be monitored by the methods set out in BS5228, Part 1, Appendix B. All measurements shall be made on either a sound level meter to BS EN 60651 set on slow response, or an equivalent noise level meter;
- All compressors shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed when the machines are in use, and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers;
- All vehicles and mechanical plant used for the purpose of the Works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order so that extraneous noise from mechanical vibrations, squeaking, hissing etc. shall be reduced to a minimum;
- Machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum;
- All static plant shall be so located and installed as to minimise nuisance to persons living or working in the vicinity.

Compliance with this clause shall not relieve the Contractor of any of his other obligations and liabilities under the Contract or the Environmental Protection Act 1990

1.8.12. Trainee site operatives (Clause 3.14.1)

Not permitted.

1.8.13. Contamination avoidance and/or aquifer protection measures required (Clauses 3.15.2 and 3.15.3)

Where signs of contamination have been identified, the procedures to backfill boreholes and handle/sample arisings shall be reviewed, and altered as required, in order not to cause or spread contamination. Contaminated and non-contaminated samples and arisings shall be stored separately.

Aquifer protection methods will be required when drilling into the Woburn Sand Formation (Parent Unit: Lower Greensand Group).

1.8.14. Maximum period for boring, pitting and trenching through hard material, hard stratum or obstruction (Clauses 2.8, 4.3 and 6.4)

1 hour at which time the instructions of the Investigation Supervisor shall be obtained.

1.8.15. Reinstatement requirements (Clause 3.16)

The Contractor shall confine his operations to the minimum area of ground required for the works.

Upon completion of the required installation the Contractor shall make good damage, whether in the vicinity of the borehole or on the access route thereto to the condition upon entry and to the satisfaction of the Investigation Supervisor and shall be responsible for any damage to property due to his failure to carry out such restoration.

1.8.16. Hygiene facilities required (Clauses 2.20 and 3.16.1)

Welfare facilities in accordance with CDM 2015 shall be provided by the Principal Contractor.

1.8.17. Unavoidable damage to be reinstated by Contractor (Clause 3.16.1)

Reinstatement of damaged areas shall be in accordance with Client's instruction and/or with clauses S1.8.15 and Clause 3.16.1. For example the Contractor shall make good any rutting of access routes and work areas.

1.8.18. Accuracy of exploratory hole locations (Clauses 3.19 and 3.20)

The provisional location of the replacement wells are shown on Drawing HA528983-ACJV-HGN-S5_ML-SK-C-0017 included in Appendix C and are to be confirmed by the Contractor with the Investigation Supervisor prior to commencement of the borehole. Prior to sinking the borehole, the Contractor shall check for the absence of services on available plans liaising with FCC and the Principal Contractor and perform CAT scanning of borehole location.

On completion of the well the Contractor shall survey the 'as-built' location to a horizontal accuracy of +/- 100mm and report it to National Grid. The ground level and cover level if different at the well shall be established to an accuracy of +/- 25 mm and reported to Ordnance Datum. This information shall be included on the borehole log.

1.8.19. Photography requirements (Clause 3.25)

The Contractor shall allow for photographs to be taken of each exploratory hole location before, during and after drilling as a record of ground conditions and for proof of reinstatement. The location photographs of each exploratory hole position shall be submitted to the Principal Contractor and the Investigation Supervisor and shall be included in the Ground Investigation Factual Report.

1.8.20. Health safety & security requirements

The ground investigation contractor will be appointed as "Contractor" under the CDM regulations 2015 working under the control of the Principal Contractor.

The Contractor shall carry out his own Health and Safety risk assessment for the works which is to be submitted no less than ten working days before commencement of works to the Principal Contractor for review.

The Contractor (and all site staff) will attend a full scheme induction at the Principal Contractor's office before commencement of any works.

The Contractor shall comply with FCC's health and safety requirements for the site set out in its method statements for groundwater monitoring and sampling (purging) and landfill gas monitoring included in Appendix D.

1.8.21. Exploratory hole location entry/egress requirements

Land access permissions shall be arranged by the Principal Contractor. The means of accessing the exploratory hole locations and the entry methods and requirements to the exploratory hole locations shall, however, be obtained by the Contractor in a timely manner

1.9. Percussion boring (Specification Section 4) Particular restrictions/ relaxations

None.

1.10. Rotary drilling (Clause 4.6) Particular restrictions/ relaxations

1.10.1. Augering Requirements and Restrictions (Clause 5.1)

All drillers employed on the Contract shall hold a certificate of competence for percussion/dynamic boring and rotary drilling applicable to the work on which they are engaged, as issued by the British Drilling Association Limited under the Ground Investigation Drillers Accreditation Scheme or an equivalent body in a State of the European Economic Area.

1.10.2. Particular Rotary Drilling Techniques (Clause 5.2)

BH_W01R

It is anticipated that the borehole BH_W01R will extend to approximately 42m bgl, with the target strata, Woburn Sand, being encountered at approximately 35m bgl. Open-hole drilling to a depth of 30m bgl is acceptable, thereafter coring technique shall be used to provide an accurate depth and thickness for the Woburn Sand. Once the underlying Kimmeridge Clay has been encountered and proven at least 3m, the borehole can be terminated. The cored section of the borehole shall then be over-reamed by open-hole techniques to increase the diameter of the borehole to the minimum required for well installation.

BH12R

It is anticipated that the borehole BH12R will extend to approximately 19m bgl, as per the existing BH12. The target stratum is the River Terrace Deposits, which is underlain by Gault Clay. Rotary coring techniques are anticipated for the upper 5m, within which the River Terrace Deposits, if present, will be encountered. Open-hole drilling to the terminal depth of 19m are therefore acceptable below 5m.

General

Core runs shall not exceed 1.5m length. All operations entailed in recovering the cores from the ground after completion of drilling shall be carried out in a manner such as to minimise disturbance to the cores. Immediately after removing the liner, the top and bottom shall be marked in indelible ink. The ends of liners shall be capped and sealed using adhesive tape.

The Contractor shall achieve no less than 90% core recovery. If recovery falls below 90% the Contractor shall take immediate steps to rectify the problem. If in the Investigation Supervisor's opinion of the Contractor fails to take appropriate steps, the Contractor may be required to re-drill all or parts of the borehole at his own expense.

Heras fencing will be required around each borehole location in areas accessible to the public or livestock during site operations.

Groundwater readings shall be taken at the start and end of each shift.

1.10.3. Drilling fluid type and collection (Clause 5.3)

The use of drilling fluid should be minimised where possible. Where required it shall be limited to an air-mist fluid, however, the drilling fluid suggested by the Contractor will be taken into consideration provided it is within the Environment Agency standards and guidelines.

Drilling fluid must be contained at all times and appropriately disposed of offsite as and when required.

1.10.4. Rotary core drilling equipment and core diameter (Clauses 5.4.1 and 5.4.2)

Rotary core drilling shall produce cores of nominal 100mm diameter.

1.10.5. Core logging (Clause 5.4.6)

Detailed logging is required to BS EN ISO 14688-1 and BS EN ISO 14689-1. Provision of all necessary facilities is to be made by the Contractor for the core to be photographed, logged and sub-sampled on site.

1.10.6. Core Sub-Samples for laboratory testing (Clause 5.4.7)

None.

1.10.7. Address for delivery of selected cores (Clauses 5.4.8 and 5.4.9)

None.

1.10.8. Rotary open-hole drilling general requirements (Clause 5.5.1)

None.

1.10.9. Rotary open-hole drilling for locating mineral seams, mine workings, etc. (Clause 5.5.2)

None.

1.10.10. Open-hole resonance (Sonic) Drilling (Clause 5.6.1)

None.

1.10.11. Resonance (sonic) drilling with sampling or continuous coring (Clause 5.6.2)

None.

1.10.12. Backfilling (Clause 5.7)

The Investigation Supervisor shall be consulted prior to the backfilling or installation of the well.

Bentonite or bentonite/cement granules, hydrated in situ, tamped with a punner where practicable, or a bentonite or bentonite/cement slurry placed by tremie tube shall be used for the backfilling of boreholes where no installation is required as agreed with the Investigation Supervisor.

The Contractor shall clean, make good (including the placement of well head works) and reinstate all surfaces affected by the works to at least their existing standard and to the satisfaction of the Investigation Supervisor and, where appropriate, the local and highway authorities. Any settlement of backfill developing after placement of the initial backfill will require to be topped up. Personnel shall be prevented from entering the location of the borehole until it has been made safe.

1.10.13. Core photographic requirements (Clause 5.8)

The Contractor's attention is drawn to the requirements for photographs detailed in Clause 5.8. Digital colour photographs shall be taken and supplied by the Contractor. The Contractor shall photograph cores in a fresh condition prior to logging and ensure that the following criteria are fulfilled.

- a. A graduated scale in centimetres is provided.
- b. Labels and markers are clearly legible in the photograph.
- c. A clearly legible reference board identifying the project title, exploratory hole number, date and depth range of drill runs shall be included in each photograph.
- d. Core boxes are evenly and consistently lit.
- e. The length of the core box in each photograph fills the frame.

- f. The focal plane of the camera and the plane of the core box are parallel.
- g. The camera is placed in the same position with respect to the core box in every photograph.

The core box photographs shall be presented by the Contractor as an appendix to the ground investigation factual report. The Contractor shall also provide electronic copies of the photographs in high resolution, at least 3 megapixel jpeg format, as fully referenced associated files within the AGS Format digital data.

1.11. Pitting and trenching (Specification Section 6) Particular restrictions/ relaxations

1.11.1. Indirect detection of buried services and inspection pits (Clauses 3.8.3 and 6.1)

None.

1.11.2. Restrictions on plant or pitting/trenching methods (Clauses 6.2 and 6.3)

None.

1.11.3. Entry of personnel (Clause 6.5)

None.

1.11.4. Alternative pit and trench dimensions (Clause 6.7)

None.

1.11.5. Abstracted groundwater from land affected by contamination (Clause 6.9.2)

If contaminated groundwater is encountered, the Investigation Supervisor shall be immediately informed in order that appropriate action can be taken with respect to disposal.

1.11.6. Photographic requirements (Clause 6.12)

None.

1.11.7. Artificial lighting (Clause 6.12.2)

None.

1.11.8. Provision of pitting equipment and crew for Investigation Supervisor's use (Clause 6.13)

None.

1.12. Sampling and monitoring during intrusive investigation (Specification Section 7) Particular restrictions/ relaxations

1.12.1. Address for delivery of selected geotechnical samples (Clause 7.6.1)

None.

1.12.2. Retention and disposal of geotechnical samples (Clause 7.6.2)

None.

1.12.3. Frequency of sampling for geotechnical purposes (Clause 7.6.3 – 7.6.11)

None.

1.12.4. Open-tube and piston sample diameters

None.

1.12.5. Retention of cutting shoe samples (Clause 7.6.5)

None.

1.12.6. Delft and Mostap sampling (Clause 7.6.12)

None.

1.12.7. Groundwater level measurements during exploratory hole construction (Clause 7.7)

Groundwater level readings shall also be taken at the start and end of each shift.

1.12.8. Special geotechnical sampling (Clause 7.8)

None.

1.12.9. Address for delivery of selected samples (Clause 7.9.2)

As specified.

1.12.10. Retention and disposal of contamination/WAC samples (Clause 7.9.3)

None.

1.12.11. Frequency of contamination sampling (Clause 7.9.4)

None.

1.12.12. Sampling method (Clause 7.9.5)

None.

1.12.13. Headspace testing (Clause 7.9.8)

None.

1.12.14. Environmental soil samples

None.

1.13. Probing and cone penetration testing (Specification Section 8) Particular restrictions/ relaxations

None

1.14. Geophysical testing (Specification Section 9) Particular restrictions/ relaxations

None.

1.15. In situ testing (Specification Section 10) Particular restrictions/ relaxations

None.

1.16. Instrumentation (Specification Section 11) Particular restrictions/ relaxations

1.16.1. Protective covers for installations (Clause 11.2)

The top of the wells are to be protected with a steel all-weather lockable upstanding cover, similar to those already in use at the site. The Contractor shall agree the type of cover to be installed with the Investigation Supervisor. The protective cover shall be set in concrete 1m deep.

1.16.2. Protective fencing (Clause 11.3)

None.

1.16.3. Standpipe and standpipe piezometer installations (Clauses 11.4.1 and 11.4.2)

Indicative borehole installation details are provided as drawings HA528983-ACJV-HGT-S5_BH-W01A-SK-C-0001 and HA528983-ACJV-HGT-S5_ML_BH12-SK-C-0001 in Appendix C. Upon completion of the borehole the Contractor shall provide a draft engineer's log to the Investigation Supervisor, who will then use that information to confirm the well installation details including the well response zone and seals.

The well shall comprise HDPE pipes of nominal 100mm internal diameter. The pipes shall be male-female coarse threaded and available in at least lengths of 1 and 3m. The pipes shall be manufactured to DIN 8074.

The pipe for the well response zone shall be comprise 2mm slots and shall be wrapped with a single layer of 150µm geotextile.

The well pipe shall be placed in the borehole with its vertical axis consistent with the vertical axis of the borehole and shall be maintained central within the borehole during its installation.

Where the depth of the borehole is greater than the depth to which the filter and well piping is to be installed then the hole shall be backfilled with low permeability materials including bentonite and bentonite/cement as instructed by the Investigation Supervisor. The filter material shall be sealed in the borehole using bentonite or bentonite/cement granules, hydrated in situ, tamped with a punner where practicable, or a bentonite or bentonite/cement slurry placed by tremie tube.

The filter material in the well response zone shall be non-calcareous gravel size 6 – 10mm.

The portion of filter material below the well base shall be placed first. The filter material over the response zone shall be placed by tremie pipe 1m above the top of the screen. Where there is water in the borehole the Contractor shall allow sufficient time for all the filter material to settle and measurements of the upper surface of the filter material shall be taken from time to time to ensure this. The elevation of the top of the filter material shall be recorded. Above the filter the remaining formation stabiliser shall be added using a tremie pipe as described above.

The well shall be labelled with an identifying stamp or metal tag giving its number.

1.16.4. Other piezometer installations (Clause 11.4.3)

None.

1.16.5. Development of standpipes and standpipe piezometers (Clause 11.4.5)

The well shall be developed by removing at least 3 times the volumes of the well at the end of the site works.

1.16.6. Ground gas standpipes (Clause 11.5)

None.

1.16.7. Inclinator installations (Clause 11.6)

None.

1.16.8. Slip indicators (Clause 11.7)

None.

1.16.9. Extensometers and settlement gauges (Clause 11.8)

None.

1.16.10. Settlement monuments (Clause 11.9)

None.

1.16.11. Removal of installations (Clause 11.10)

None.

1.16.12. Other instrumentation (Clause 11.11)

None.

1.17. **Installation monitoring and sampling (Specification Section 11) Particular restrictions/ relaxations**

1.17.1. Groundwater level readings in installations (Clause 12.2)

The Contractor shall record the depth to the base and the groundwater level in the well. The results shall be presented in terms of depth below ground level and elevation mAOD in the ground investigation factual report and in the CQA Validation Report.

1.17.2. Groundwater sampling from installations (Clause 12.3.1)

The Contractor is required to recover groundwater samples from the well on behalf FCC. The sampling shall be undertaken following FCC's method statement in Appendix D. The Contractor shall liaise with FCC to agree the programme for the collection of the sample bottles from FCC, the groundwater sampling itself and the delivery of the samples to FCC for FCC to arrange the laboratory chemical testing. It is expected that immediate delivery of the samples to FCC will be required and at a time and day that will allow onward transfer of the samples to the testing laboratory such that the samples remain in date.

The determinants suite of testing that FCC will be undertaking is "MILGWA Ground Water Annual" presented in Appendix D. The Contractor shall ensure that the appropriate numbers and volume of samples are taken for the intended testing and shall liaise with FCC as necessary.

The contact details for the Contractor to liaise with FCC in respect of the sampling are as follows:

Roisin Bennet – Compliance Advisor
Direct Dial: 01502 679830
Mobile: 07827 231024
Email: Roisin.Bennett@fccenvironment.co.uk

FCC Environment
Milton
Butt Lane
Milton
Cambridgeshire
CB24 6DQ
<http://www.fccenvironment.co.uk/>

1.17.3. Purging/micro-purging (Clause 12.3.2)

The groundwater / perched water boreholes will be developed at least three times the well volume upon completion of the installation.

The Contractor will be required to collect and dispose of the purged water.

1.17.4. Ground gas monitoring (Clause 12.4)

The Contractor is required to undertake gas monitoring from the well, on behalf FCC. The monitoring shall be undertaken following FCC's procedure, set out in Appendix D. The results shall be presented in the ground investigation factual report and in the CQA Validation Report.

1.17.5. Sampling from ground gas installations (Clause 12.5)

None.

1.17.6. Other monitoring (Clause 12.8)

None.

1.18. Daily records (Specification Section 13) Particular restrictions/ relaxations

1.18.1. Information for daily records (Clause 13.1)

The Contractor shall submit a proforma or example record for approval to the Investigation Supervisor at least 7 days prior to commencement of fieldwork.

The information to be transmitted in Daily Records shall be as given in Clauses 13.1 and 13.2.

Daily Records shall be provided as AGS format digital data (AGS 4.0).

An essential requirement of these investigations is the rapid daily delivery of AGS format digital data from the field to enable rapid assimilation of the new data into the design database. Transmission of field and laboratory data to the designer with the minimum possible delay will be of great importance in avoiding repetitive or abortive work. A suggested method for achieving this is the use of KeyLogBook (or a similar approved system) which facilitates the production, and transmission, of AGS format digital data in the field, by the driller.

1.18.2. Special in situ tests and instrumentation records (Clause 13.4)

Any groundwater monitoring records from the well as may be available shall be reported.

1.19. Geotechnical laboratory testing (Specification Section 14) Particular restrictions/ relaxations

1.19.1. Investigation Supervisor or Contractor to schedule testing (Clause 14.1.1)

None.

1.19.2. Tests required (Clause 14.1.2)

None.

1.19.3. Specifications for tests not covered by BS 1377 and options under BS 1377 (Clauses 14.2.1 and 14.4)

None.

1.19.4. UKAS accreditation to be adopted (Clause 14.3)

All laboratory tests shall be carried out by a laboratory accredited by the United Kingdom Accreditation Services (UKAS).

1.19.5. Rock testing requirements (Clause 14.5)

None.

1.19.6. Chemical testing for aggressive ground/groundwater for concrete (Clause 14.6) (Test Suites A-D)

None.

1.19.7. Laboratory testing on site (Clause 14.7)

None.

1.19.8. Special Laboratory Testing (Clause 14.8)

None.

1.20. Geoenvironmental laboratory testing (Specification Section 15) Particular restrictions/ relaxations

1.20.1. Investigations Supervisor and Contractor to schedule testing (Clause 15.1)

None.

1.20.2. Accreditation required (Clause 15.2)

None.

1.20.3. Chemical testing for contamination (Clause 15.3) (Test Suites E-G)

None.

1.20.4. Waste Characterisation (Clause 15.4)

None.

1.20.5. Waste Acceptance Criteria testing (Clause 15.5) (Test Suites I-K)

None.

1.20.6. Laboratory testing (Clause 15.6)

None.

1.20.7. Special laboratory testing (Clause 15.7)

None.

1.21. Reporting (Specification Section 16) Particular restrictions/ relaxations

1.21.1. Form of exploratory hole logs (Clauses 16.1 and 16.2.1)

Exploratory hole logs shall be prepared in accordance with the requirements of relevant BS EN ISO standards. The Contractor shall submit specimen borehole logs for approval of the Investigation Supervisor. Preliminary logs shall be submitted to the Investigation Supervisor within 2 working days.

1.21.2. Information on exploratory hole logs (Clause 16.2.2)

The information on exploratory hole logs shall be in accordance with Clause 16.2.

1.21.3. Variations to final digital data supply requirements (Clause 16.5.1)

All data which is collected during the investigation in accordance with the codes and standards used for the contract are to be transferred in electronic format.

Fieldwork data provided in an AGS format data files to the Investigation Supervisor is required upon completion of the borehole. This can be achieved using electronic data recording system equipment such as

KeyLogBook facilitating the daily transmittal of preliminary data from site to laboratory and/or design office, by email.

The Contractor is to prepare the factual part of the Ground Investigation Report as specified in Eurocode 7.

The format of the digital data files shall comply with the Association of Geotechnical and Geoenvironmental Specialists (AGS) publication 'Electronic transfer of geotechnical and geoenvironmental data' Edition 4.0.3, known as AGS4.

The Contractor is to provide all field and laboratory data in digital form. This shall include all daily records and all data from sub-contractors.

The AGS data and associated files shall be complete and identical to the data provided in the paper copy of the factual report. In order to ensure that the AGS4 data provided is identical to the paper copy version, both the paper and digital versions of the data must be generated from the same source. The preferred approach is to use database software specifically intended for this purpose.

The units of measurement and abbreviations within the data file should accord with those presented in the AGS publication unless otherwise stated below.

No additional groups, fields or codes shall be accepted without the prior agreement of the Project Manager, and then only in exceptional circumstances.

The Contractor shall be responsible for assigning GEOL_GEOL and GEOL_GEO2 codes, in collaboration with the Investigation Supervisor.

Where particular or project-specific requirements are required they are listed below:

Group	Field	Note / example
PROJ	PROJ_ID	Contractors project/investigation reference
	PROJ_NAME	A14 Cambridge to Huntingdon
	PROJ_CLNT	Highways England
	PROJ_ENG	Atkins CH2M Joint Venture
TRAN	TRAN_STAT	Preliminary – Drillers Daily Records; Draft 1 – Engineers Logs; Draft 2 – Draft Factual Report; Final – Final Factual Report
LOCA	LOCA_ID	See list in Schedule
	LOCA_TYPE	Compound abbreviations to be used where appropriate, e.g. CP+RC
	LOCA_NATE LOCA_NATN LOCA_GL	Used to report hole collar position in UK National Grid coordinates and datum
	LOCA_LOCX LOCA_LOCY LOCA_LOCZ	Used to report hole collar position in site coordinates and datum
	LOCA_CLST	Set to 'IDT Supplementary'
	LOCA_LOCA	Not used
	LOCA_STAT	Preliminary – Drillers Daily Record Draft 1 – Engineers Log Draft 2 – Draft Factual Report Final – Final Factual Report
ISPT	Incremental blows and penetrations must be provided. Use of other fields that duplicate this data (ISPT_MAIN etc.) is optional. The Contractor may determine the format for ISPT_REP.	
WETH	Group required.	

The units of measurement for the data presented within the data file shall be those required by the specifications and standards specified in the Contract. Where these are different to the Suggested Units defined in the AGS4 publication they are listed below:

Group	Field	Unit
IREs	IREs_IREs	ohm cm

Note that all units used in the data file are to be fully defined in the UNIT Group. A standard list of units is provided on the AGS website (www.ags.org.uk).

A standard list of abbreviations is provided on the AGS website (www.ags.org.uk). These shall be used except as listed below.

Other abbreviations shall only be used where no alternative exists in AGS4 or this specification and where the Investigation Supervisor has given prior approval to their use.

Note that all abbreviations used in the data file are to be fully defined in the ABBR Group.

The following groups and fields require specific abbreviations to be used:

Field	Abbreviation	Description
LOCA_TYPE		As AGS website (www.ags.org.uk)
SAMP_TYPE		As AGS website (www.ags.org.uk)
GEOL_GEOl		As table below
GEOL_GEO2		As table below

Geology Codes (GEOL_GEOl)	
Drift / superficial deposits	
Code	Name
TS	Topsoil
HS	Hardstanding
MG	Made Ground
AL-AI	Alluvium – Alconbury Brook
AL-EI	Alluvium – Ellington Brook
AL-GO	Alluvium – Great Ouse
AL-C	Alluvium – River Cam
HD	Head Deposits
RTD-UND	River Terrace Deposits (undifferentiated)
TG1	First Terrace Gravels
TG2	Second Terrace Gravels
TG1-2	Undifferentiated First and Second Terrace Gravels
TG3	Third Terrace Gravels
GT-C	Glacial Till (cohesive)
GT-G	Glacial Till (granular)
Solid Geology	
GLT	Gault Formation
LG	Lower Greensand (Woburn Sand Formation)

<i>KIM</i>	<i>Kimmeridge Clay Formation</i>
<i>AMP</i>	<i>Ampthill Clay Formation</i>
<i>OC</i>	<i>Oxford Clay Formation</i>
<i>KLC</i>	<i>Kellaways Clay</i>
<i>KLS</i>	<i>Kellaways Sand</i>
<i>CB</i>	<i>Cornbrash Formation</i>
Hole Type (LOCA_TYPE)	
Code	Name
<i>CP</i>	<i>Cable Percussion</i>
<i>DS</i>	<i>Dynamic Sampling</i>
<i>DS+RC</i>	<i>Dynamic Sampling followed by Rotary Coring</i>
<i>HH</i>	<i>Hand-held window sampler</i>
<i>HP</i>	<i>Hand Pit</i>
<i>SCP</i>	<i>Static Cone Penetration Test</i>
<i>TP</i>	<i>Trial Pit</i>
<i>WS</i>	<i>Window Sampler</i>

The following associated files are to be included in the AGS data submission. The formats for specific associated files are given below:

Files Format (Clause)	Group	File format
<i>Photographs of cores and trial pits (Cl. 5.8 & 6.12)</i>	<i>FILE</i>	JPG
<i>Drawing(s) (Cl. 16.4)</i>	<i>FILE</i>	AutoCAD v13 DXF

Other formats for these data deliverables shall only be used with the prior approval of the Investigation Supervisor

1.21.4. Preliminary digital data (Clause 16.5.3)

Preliminary digital data shall accompany all issues of drillers' daily records, draft borehole logs, laboratory testing results or instrumentation monitoring.

1.21.5. Type(s) of report required (Clause 16.6)

The factual part of the Geotechnical Investigation Report is required. Draft and Final versions of the report shall be provided in digital form in PDF format, with embedded AGS digital data.

A drawing showing the location and elevation of the borehole shall be included in the report.

1.21.6. Electronic report requirements (Clause 16.6.3)

Electronic reports shall be delivered on CD/DVD ROM, and photographs shall be in JPG format. AGS data is to be in AGS Edition 4.0 format. Photographs shall be cross-referenced within the AGS data as associated files. The AGS data file shall be provided both as a stand-alone file or files and shall be embedded within the PDF format report.

1.21.7. Format and contents of Desk Study Report (Clause 16.7)

None.

1.21.8. Contents of Ground Investigation Report (or specified part thereof) (Clause 16.9)

Factual part of Geotechnical Investigation Report in accordance with Specification Clause 16.8.1.

1.21.9. Contents of Geotechnical Design Report (or specified part thereof) (Clause 16.9)

None.

1.21.10. Time for supply of electronic information (Clause 16.10.1)

The electronic data is to be submitted in accordance with the following schedule:

Data Type	Timing
<i>Preliminary (Field) data (Daily record)</i>	<i>Within one day of completion of hole</i>
<i>Draft 1 (Engineers Log)</i>	<i>Within two working days of completion of hole or test</i>
<i>Draft 2 (Draft Factual Report)</i>	<i>Within two weeks of completion of all testing</i>
<i>Final</i>	<i>Within one week of Investigation Supervisor's approval of final draft report</i>

Preliminary digital data for the fieldwork is to be issued to the Investigation Supervisor by email attachment on completion of each exploratory hole. Other draft data, and updates to fieldwork data, are to be issued with each issue of hard copy information in accordance with the above schedule.

1.21.11. Electronic information transmission media (Clause 16.10.2)

AGS Format data shall be issued as a single file. However, subject to the agreement of the Investigation Supervisor, separate files may be permitted in the following cases:

- Separate field and laboratory data for preliminary issue (if this serves to expedite the issue of data)
- SCP and other in situ data as separate files for each test where the data files are large (for preliminary issue).

The associated files that are required to complete the factual data submission shall be provided and referenced in the associated file (FILE_FSET) fields. When these are submitted the Contractor shall provide AGS Format data and associated files within single identifiable submissions.

The digital data provided by the Contractor with the Factual Report is required to be complete and a total replacement of any previous preliminary data.

In addition to the paper copies of the Factual Report, the Contractor shall provide a Report with a digital copy of those field and laboratory data and associated files specified in the Contract to be in digital form. This report shall consist of a disc(s), or other agreed transmission medium, containing the digital data and associated files and paper copies of any data or drawings not included in digital form.

Draft data is that which is represented by the draft factual report. Submission of data shall be by email to the Investigation Supervisor. Where data files are too large for practical transmission by email, alternative methods of transmittal may be agreed with the Investigation Supervisor which may include CD/DVD, FTP transfer or distribution via extranet.

If CD/DVD is used, the media shall be clearly labelled with project information and issue details, including unique sequence number. Where more than one disk is required for a particular issue of digital data, this fact shall be clearly identified on the labels in that issue, and referenced within the transmission issue number (TRAN_ISNO) field of the files concerned (eg. TRAN-ISNO set to 1-1 and 1-2 respectively).

Files shall not be compressed (zipped) without the agreement of the Investigation Supervisor.

All issues of data, including preliminary, shall be accompanied by an issue record that shall include the following information: This information is also included in the TRAN group.

- The heading 'AGS Format Data'
- The title 'Media Index Record' (or similar)
- The project identification (PROJ_ID)
- The unique issue sequence number (TRAN_ISNO)
- The date of issue to the Investigation Supervisor (TRAN_DATE)
- The name of the Contractor issuing the transmission media (TRAN_PROD)
- The name of the Investigation Supervisor to whom the transmission media was issued (TRAN_RECV)
- A general description of the data transferred and/or a file listing for associated files
- The status of the data (preliminary, draft or final)

For each AGS Format data set, including all associated files, the index will detail:

- The file name including the file extension
- The date and time the file was created
- The file size in bytes/kilobytes/megabytes as appropriate
- A general description of the data contained in each file and/or a file listing for associated files.

All data shall be checked for AGS format errors / integrity prior to issue using AGS checking software. All files shall be checked for viruses etc. prior to issue.

Preliminary and draft information may be transmitted by email. Final information is to be provided additionally on CD/DVD ROM.

1.21.12. Report approval (Clause 16.11)

The Contractor shall submit a draft preliminary copy of the factual report within 3 weeks of the completion of the field works. This report is to contain draft borehole logs and the results of the completed laboratory testing, if any, at this stage.

One electronic copy of the draft report is to be submitted to the Investigation Supervisor within 2 weeks of the completion of laboratory testing. The Investigation Supervisor's comments on the draft report and associated digital data will be issued within 1 week from receipt of the draft.

One electronic copy of the final report is to be submitted to the Investigation Supervisor within a further 2 weeks.

2. Schedule 2: Exploratory Holes

2.1. Hole number

Hole numbers are given in the table. Holes shall not be renumbered without reference to, and the agreement of, the Investigation Supervisor.

2.2. Type

The type codes used are AGS format type codes.

2.3. Scheduled depth

The scheduled depth given is the anticipated depth, which may be varied on site depending on the ground conditions encountered.

2.4. National grid reference

The national grid reference given is provisional, for setting out purposes. The final positions must be determined by survey.

2.5. Approximate ground level

The actual ground level must be determined by survey.

2.6. Remarks

The remarks column gives an indication of any in situ tests or instrument installations, together with any further controlling detail, where these are known in advance.

Borehole Reference Number	Type	Scheduled depth (m BGL)	National Grid Reference		Installation	In situ Test	Remarks	Rationale
			Easting (m)	Northing (m)				
Milton Landfill Site – Section 5								
BH_W01R	Open hole (to 30m depth) and rotary coring (below 30m depth)	42	546528.20	262186.62	Nominal 100mm ID standpipe piezometer (well) with raised cover to be installed with groundwater response zone located within the Woburn Sand Formation (Lower Greensand Group). Installation details to be confirmed by the Investigation Supervisor.		To be drilled and installed under CQA.	Replacement groundwater monitoring well.
BH12R	Rotary core hole (to 10m) and rotary open hole to 20m depth	20	546913.25	262251.12	Nominal 100mm ID standpipe piezometer (well) with raised cover to be installed with groundwater response zone located throughout full depth of borehole. Installation details to be confirmed by the Investigation Supervisor.		To be drilled and installed under CQA.	Replacement groundwater monitoring well.

3. Schedule 3: Investigation Supervisor's Facilities

3.1. Accommodation

Not required.

3.2. Furnishings

Not required.

3.3. Services

Not required.

3.4. Equipment

Not required.

3.5. Transport

Not required.

3.6. Personal Protective Equipment for Investigation Supervisor

Not required

5. Schedule 5: Specification Additions

The following clauses are added to the Specification		
Section number	Clause number	Clause wording
S1.10.4	5.4.2	<p>Drilling shall normally be carried out with diamond-tipped or tungsten carbide-tipped bits which shall be suitable for the ground conditions encountered and for the requirements of the investigation. Rotary core drilling shall be carried out with a double tube coring system with an approved semi-rigid liner, a triple tube system or a wireline core drilling system in which the core barrel is lined with a one-piece cylindrical transparent semi-rigid plastic liner (minimum thickness 3mm). A minimum 90mm diameter core shall be recovered irrespective of the system used.</p> <p>All bits, core barrels and casing shall conform to BS 4019: Part 1.</p> <p>The makes and types of drilling rigs, core barrels and associated equipment, method of drilling, types of flush medium, methods of flush circulation and type of core liner to be used shall be detailed by the Contractor in a method statement and shall be approved by the Investigation Supervisor before use on site.</p>
S1.10.5	5.4.6	<p>The cores shall be logged on site by a competent and suitably experienced Engineer or Geologist who shall prepare a detailed preliminary record. Access for the inspection of the cores by the Investigation Supervisor shall be provided by the Contractor for the duration of the Contract.</p> <p>Immediately on recovery of the core the liner shall be split. A palette knife and absorbent towel shall be used to clean disturbed material and drilling fluid from the surface of the core. Sub-samples for laboratory testing shall then be identified and removed from the core.</p> <p>Initial logging (TCR, RQD, SCR, Fi and a brief description) and photographing shall be undertaken immediately on recovery.</p> <p>If final logging is not to take place immediately after sampling the core shall be resealed using the existing core liner, plastic sheet and end caps all secured with electrical tape.</p> <p>The Contractor shall be responsible for the collection of all samples from exploratory hole locations, for safe storage and packaging of all samples and transport to the laboratory.</p> <p>The Contractor shall be responsible for storing the core.</p>

Annex 1: Bill of Quantities for Ground Investigation

Bill of Quantities for Ground Investigation

Preamble to the Bill of Quantities

Preamble

1. In this Bill of Quantities the sub-headings and item descriptions identify the work covered by the respective items. The exact nature and extent of the work to be performed shall be ascertained by reference to the Conditions of Contract, the Specification and the Schedules and Appendices to the Specification, as appropriate. The rates and prices entered in the Bill of Quantities shall be deemed to be the full inclusive value of the work covered by the several items, including the following unless stated otherwise.
 - (a) Contract management and superintendence, labour and all costs in connection therewith
 - (b) the supply of materials, goods, storage, facilities and services, and all costs in connection therewith, including wastage and delivery to site
 - (c) plant and all costs in connection therewith
 - (d) fixing, erecting and installing or placing of materials and goods in position
 - (e) all temporary works
 - (f) all general obligations, requirements, liabilities and risks involved in the execution of the investigation as set forth or implied in the documents on which the tender is based
 - (g) establishment charges, overheads and profit
 - (h) bringing plant and sampling, in situ testing and monitoring equipment to the site of each exploratory hole, erecting, dismantling and removing on completion
 - (i) on completion, removal of all equipment and services from site and disposal of arisings.
2. Unless identified as Not required, all items in section A of the Bill of Quantities (general items, provisional services and additional items), and also all items in subsequent sections against which quantities are entered shall be priced.
3. If lump sum items are not required by the Contractor this shall be stated against the rate item in the Bill of Quantities and £0:00 entered in the amount. Where rates are not priced they shall have £0.00 placed against them and £0:00 entered in the amount.
4. When full- or part time professional attendance on site is required in accordance with Clause 3.5.2, this shall normally be paid for under item A7 of the Bill of Quantities.

Unless otherwise detailed in Schedule S1.8.2, the on-site professional attendance services provided by the technical staff shall comprise the technical supervision of site activities, site liaison, logistics, logging, in situ testing and sampling, photography and the preparation of daily records and preliminary logs (except where any of the above activities are carried out by site operatives and boring/drilling operatives).

When individuals are not carrying out their specific duties or are otherwise away from site, then daily rates will not apply and these costs will be deemed to be covered under general items.

5. The rate entered under Item A3 shall include for the provision of any additional PPE, ground surface protection measures, additional welfare and hygiene facilities and plant and equipment decontamination facilities required as a direct result of the contamination or hazard(s) detailed in Schedule S1.8.4 and/or S1.8.6.

Preamble

- 6.** The item for photographs shall allow for the standing time of associated plant, and supply of negatives, enprints and bound volume or electronic equivalents.
- 7.** Rates for moving plant and equipment to the site of each exploratory hole shall allow for the formation of access routes and working areas, and making-good avoidable damage to access routes and working areas on completion as required by the Contract.
- 8.** The rates for moving rotary drilling plant to the site of each hole shall include for setting up over a previously formed borehole, including for any additional costs arising from pulling casings left in the ground or providing temporary casings.
- 9.** Payment for forming exploratory holes shall be based on
 - (a) full thickness of strata investigated and described in accordance with the Specification
 - (b) depths measured from ground level
 - (c) depth measured from original ground level where an inspection pit has been excavated
 - (d) that part of a drillhole below the bottom of a borehole where a drill hole has been ordered to continue from the bottom of a borehole
 - (e) core recovery of at least 90% in any core run, unless the Investigation Supervisor is satisfied it cannot be achieved
 - (f) volume calculated as measured length times measured depth times specified width for trial and observation trenches.
- 10.** Rates for forming exploratory holes shall allow for
 - (a) temporary casing installation, where necessary, and removal
 - (b) dealing with surface water
 - (c) backfilling with arisings
 - (d) taking information and supply of daily record for works carried out by site operatives
 - (e) additional site supervision of non-qualified operatives.
- 11.** Rates for aquifer protection measures shall allow for the measures detailed in Schedule S1.8.13.
- 12.** Standing time shall be measured as the duration of time for which plant, equipment and personnel are standing on the instruction of the Investigation Supervisor or in accordance with the Specification.

Standing time shall be paid for interruption of the formation of exploratory holes to record groundwater entry in accordance with Clause 7.7. The rates for standing time shall allow for

 - (a) plant equipment and personnel
 - (b) consequential costs
 - (c) changes in the programme of working
 - (d) recording information and preparing daily record.
- 13.** The rates for daily provision of dynamic sampling and probing, hand augering and pitting and trenching crews and equipment at locations as directed by the Investigation Supervisor shall allow for compliance with the requirements of the Contract, including preparation of records (unless the Investigation Supervisor takes responsibility for the logging and preparation of records).

Preamble

The rates for dynamic sampling items B15 to B17 and B19 shall include for the provision of liners.

- 14** The rates for sampling shall allow for the standing time of associated plant. The rates for sampling shall also include for the costs of the sample containers and transport and storage of the samples up to the specified time limits.

The rate for taking a U100 or UT100 sample does not include for recovery of a sample from the cutting shoe.

The rates for each of Items E14.1 – E15.3 shall include for all necessary containers and collected samples for an individual determination of the specified contamination or WAC suite.

- 15** The rates for in situ testing shall allow for the standing time of associated plant and for interpretation and presentation of the results on preliminary logs/exploratory hole logs or on separate agreed report forms using the same dates of presentation as the exploratory hole to which they refer.

In the case of the self-boring pressuremeter, high pressure dilatometer, or Menard pressuremeter the rates shall also allow for the mutual standing of the respective boring/drilling plant and specialist testing equipment and crews during the combined process.

Where in situ testing is paid for on an hourly basis, the time measured shall be the actual time taken to carry out the test in accordance with the Investigation Supervisor's instruction and/or the Specification but excluding the time taken to erect and dismantle test equipment where this is itemised separately.

The rate for carrying out an SPT (whether using a split spoon or solid cone) does not include for recovery of an associated sample.

- 16.** The rates for cone penetration tests items F15 and F21 shall allow for provision of daily records and for interpretation and presentation of the results on agreed report forms/exploratory hole logs in accordance with BS 1377 and Schedule 1.13.3 or 1.13.4.

For the seismic cone the recorded and presented data shall include the specified CPT data recorded between seismic test depths.

The rates for dynamic probing shall allow for undertaking and reporting torque measurements at the prescribed vertical intervals.

- 17.** The rates for installation of instruments shall allow for

- (a) clearing and keeping hole free of unwanted materials
- (b) all costs associated with equipment, installation, specified seals, surround and backfill materials excluding backfill below the instrument
- (c) proving correct functioning
- (d) delays due to installations, including the setting time for grout.
- (e) recording information and preparing daily record and additional reports.

- 18.** The rates for monitoring and sampling of installations during the fieldwork period shall allow for

- (a) purging and dealing with disposal of recovered water,
- (b) all costs associated with consumables and provision of data recording equipment to site
- (c) proving correct calibration and recalibration

Preamble

- (d) recording information, preparing, updating and submitting additional reports successively and at the completion of monitoring, including notification of any unexpected readings and/or variation in readings
- (e) delays due to interruptions of other site activities

The rates for monitoring and sampling of installations during the post fieldwork period shall allow for:

- (a) Items (a) to (d) above
- (b) All costs associated with remobilising the appropriate (number and experience) staff to site and all travelling and accommodation expenses.

The rates for recording of water level, soil gas or other monitoring measurements shall allow for notices of re-entry to the Investigation Supervisor, owners or occupiers affected by the location or access route.

19. The rates for laboratory testing shall include for:

- (a) the supply of a copy of the preliminary test results to the Investigation Supervisor
- (b) notification of unavailable test samples, failed tests and/or deviating samples (e.g. samples not correctly preserved)
- (c) the cost of determining a parameter (e.g. moisture content or density) where that parameter forms part of the information to be reported for the specified test (e.g. undrained shear strength, consolidation test or unconfined compressive strength)
- (d) the disposal of samples in accordance with the relevant regulations.

20. The provisional sum, Item A6, for the off-site disposal of contaminated waste shall include for temporary storage and for organising the transport and disposal by a suitably licenced waste disposal contractor. Payment shall be made only against receipted invoices.

The costs of laboratory testing to determine the nature of the waste shall be covered by laboratory testing rates for tests actually completed and to an agreed schedule. Those sums shall be offset against the Provisional sum Item A6.

21. Appendix A to the Bill of Quantities (Rates for Ground Practitioners and other Personnel) shall be priced. The rates given will be used by the Investigation Supervisor to make an initial estimate of costs, where applicable, of employing the Contractor's staff in accordance with Clauses 3.5.2, 3.6.1 and/or 3.6.2 of the Specification.

22. Items for the supply of the master and copies of the Desk Study Report, Ground Investigation Report and/or Geotechnical Design Report shall include for the printing and supply of the specified number of draft and final copies (Specification Clause 16.11 and Schedule S1.21.12). All other duties in compiling, preparing and checking the draft and final reports shall normally be paid for either under Item A7 of the Bill of Quantities or using the rates given under Appendix A.

Units of measurement

23. The following abbreviations shall be used for the units of measurements

Millimetres: mm

Metre: m

Kilometre: km

Square millimetres: mm²

Preamble

Square metre: m²

Cubic metre: m³

Square metre per day: m²/day

Linear metre: lin.m

Kilogramme: kg

Tonne: t

Sum: sum

Number: nr

Hour: h

Week: wk

Vehicle week: v.wk

Item: item

Day: day

Specimen day: sp.day

Person day: p.day

Preamble amendments and additions shall be entered below, using sequential numbers to those above

The following clauses are amended or added to the Preamble.

Bill of Quantities

The following pages constitute the Bill of Quantities.

Bill A General items, provisional services and additional items

Number	Item description	Unit	Quantity	Rate	Amount £
A	General items, provisional services and additional items				
A1	Offices and stores for the Contractor	sum	1		
A2	Establish on site all plant, equipment and services for a Green category site	sum	1		
A3	Extra over Item A2 for a Yellow Category site	sum	1		
A4	Maintain on site all site safety equipment for a Yellow Category site	week	2		
A5	Decontamination of equipment during and at end of intrusive investigation for a Yellow category site	sum	1		
A7	Provide professional attendance in accordance with Clause 3.5.2				
A7.2	Provide graduate ground engineer	p.day			
A7.3	Provide Experienced Ground Engineer	p.day	10		
A7.5	Provide Registered Ground Engineering Specialist	p.day			
A7.7	Provide CQA Engineer	p.day	10		
A8	Establish the location and elevation of the ground at each exploratory hole	sum	1		
A9	Preparation of Health and safety documentation and Safety Risk Assessment	sum	1		
A21	Electronic copy of Ground Investigation Report (or specified part thereof)	sum	1		
A21.1	Electronic copy of CQA Report	sum	1		
A25	Digital data in AGS transfer format	sum	1		
A27	Photographic volume	nr	1		
	Contract specific additional bill items				
Total section A carried to summary					

Bill B Percussion boring

Number	Item description	Unit	Quantity	Rate	Amount £
B	<p>Percussion Boring <u>Not required</u></p> <p>Contract specific additional bill items</p>				
Total section B carried to summary					

Bill C Rotary drilling

Number	Item description	Unit	Quantity	Rate	Amount £
C	Rotary drilling				
	<u>Rotary drilling with and without core recovery</u>				
C15	Move rotary drilling plant and equipment to the site of each exploratory drillhole and set up	nr	2		
C18	Break out surface obstructions where present at exploratory drillhole	h	4		
C19	Standing time for rotary drilling plant, equipment and crew	h	8		
C20	Provide aquifer protection measures at a single aquiclude/aquifer boundary in a drillhole	nr	2		
	<u>Drilling without cores</u>				
C21	Rotary drill in materials other than hard strata from which cores are not required, between ground level and 10 m depth	m	5		
C27	Rotary drill in hard strata at the specified diameter, from which cores are not required, between ground level and 10 m depth	m	10		
C28	As Item C27 but between 10 m and 20 m depth	m	20		
C29	As Item C27 but between 20 m and 30 m depth	m	10		
C30	As Item C27 but between 30 m and 40 m depth	m	5		
	<u>Drilling to obtain cores</u>				
C34	Rotary drill in hard strata to obtain cores of the specified diameter between existing ground level and 10 m depth	m	5		
C35	As Item C34 but between 10 m and 20 m depth	m			
C36	As Item C34 but between 20 m and 30 m depth	m			
C37	As Item C34 but between 30 m and 40 m depth	m	5		
C38	As Item C34 but between 40 m and 50 m depth	m	3		
C39	Extra over Items C34 to C38 for use of semi-rigid core liner	m	8		
C58	Backfill rotary percussive drillhole with cement/bentonite grout or bentonite pellets	m			
	Contract specific additional bill items				
Total section C carried to summary					

Bill D Pitting and trenching

Number	Item description	Unit	Quantity	Rate	Amount £
D	Pitting and trenching				
	<u>Inspection pits</u>				
D1	Excavate inspection pit by hand to 1.2 m depth	Nr	2		
D2	Extra over Item D1 for breaking out surface obstructions	H	2		
	Contract specific additional bill items				
Total section D carried to summary					

Bill G Geophysical testing

Number	Item description	Unit	Quantity	Rate	Amount £
G	Geophysical testing				
	<u>NOT REQUIRED</u>				
	Contract specific additional bill items				
				Total section G carried to summary	

Bill H In situ testing

Number	Item description	Unit	Quantity	Rate	Amount £
H	In situ testing				
	<u>Not required</u>				
	Contract specific additional bill items				
	Total section H carried to summary				

Bill I Instrumentation

Number	Item description	Unit	Quantity	Rate	Amount £
I	Instrumentation				
	<u>Standpipes and piezometers</u>				
I1	Backfill exploratory hole with cement/bentonite grout below standpipe or standpipe piezometer	m	3		
I7	Provide and install soil gas monitoring standpipe (nominal 100 mm)	m	60		
I9	Provide and install headworks for ground gas monitoring standpipe, standpipe or standpipe piezometer	nr	2		
I11	Provide and install protective cover (raised)	nr	1		
I15	<u>Standpipe and piezometer development</u>				
I15.1	Supply equipment and personnel to carry out development by pump (new well BH-W01R and BH12R)	nr	2		
I15.2	Develop standpipe or piezometer (new well BH-W01 and BH12R)	h	15		
	Contract specific additional bill items				
Total section I carried to summary					

Bill J Installation monitoring and sampling

Number	Item description	Unit	Quantity	Rate	Amount £
J	Installation monitoring and sampling				
	<u>Installation monitoring and sampling (during Fieldwork Period)</u>				
J1	Reading of water level in standpipe or standpipe piezometer during fieldwork period (existing wells BH-W01, BH08 & BH12)	nr	20		
J2	Ground gas measurement in gas monitoring standpipe during fieldwork period (existing wells BH-W01, BH05, BH06, BH07, BH08, BH10, BH11, BH12 & BH13) (one set prior to and one set after well modification works)	nr	20		
J2.1	Ground gas measurement in borehole during borehole construction and after well installation	nr	10		
J5	Water sample from standpipe or standpipe piezometer during fieldwork period, including purging or micro-purging up to 3.0 hours (existing wells BH-W01, BH8, BH12) prior to commencement of modification works. Sample containers provided by FCC. Containers to be collected from FCC and samples delivered to FCC.	nr	3		
J6	Extra over Item J5 for purging or micro-purging in excess of 3.0 hours	h	10		
	<u>Installation monitoring and sampling (post Fieldwork Period)</u>				
J9	Return visit to site following completion of fieldwork to take readings in, or recover samples from, installations	sum	1		
J10	Extra over item J9 for reading of water level in standpipe or standpipe piezometer during return visit after well development	nr	2		
J11	Extra over item J9 for ground gas measurement in ground gas monitoring standpipe during return visit after modification works.	nr	16		
J14	Extra over item J9 for water sample from standpipe or standpipe piezometer during return visit to site, including purging or micro-purging up to 3.0 hours. Sample containers provided by FCC. Containers to be collected from FCC and samples delivered to FCC.	nr	2		
J15	Extra over Item J14 for purging or micro-purging in excess of 3.0 hours	h	2		
	Contract specific additional bill items				
Total section J carried to summary					

Bill L Geoenvironmental laboratory testing

Number	Item description	Unit	Quantity	Rate	Amount £
L	Geoenvironmental laboratory testing <u>Not required</u>				
Contract specific additional bill items					
Total section I carried to summary					

Summary of Bill of Quantities

	£
A.	General items, provisional services and additional items
B.	Percussion boring
C.	Rotary drilling
D.	Pitting and trenching
E.	Sampling and monitoring during intrusive investigation
F.	Probing and cone penetration testing
G.	Geophysical testing
H.	In situ testing
I.	Instrumentation
J.	Installation monitoring and sampling
K.	Geotechnical laboratory testing
L.	Geoenvironmental laboratory testing
Total	<hr/>

Appendix A: Rates for Ground Practitioners and other Personnel

Not required.

Appendix B: Long-term sample

Not required.

Appendix C: Drawings

- HA528983-ACJV-HGN-S5_ML-SK-C-0006 – Existing Milton Junction Plan
- HA528983-ACJV-HGN-S5_ML-SK-C-0017 – Milton Landfill Site Well Modification Works Plan
- HA528983-ACJV-HGT-S5_BH-W01A-SK-C-0001
- HA528983-ACJV-HGT-S5_ML_BH12-SK-C-0001

DO NOT SCALE

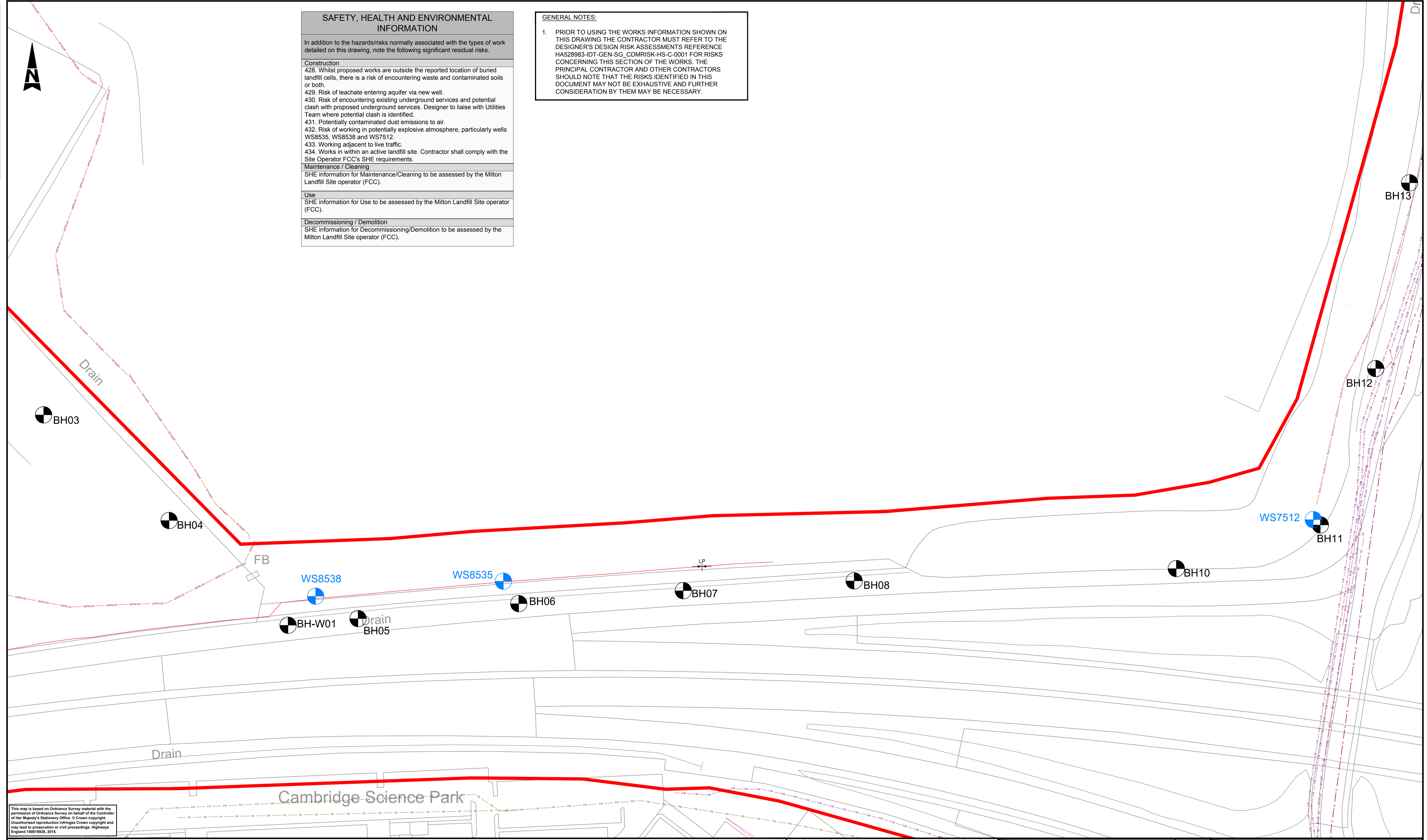
Millimetres

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks.	
Construction	
428. Whilst proposed works are outside the reported location of buried landfill cells, there is a risk of encountering waste and contaminated soils or both.	
429. Risk of leachate entering aquifer via new well.	
430. Risk of encountering existing underground services and potential clash with proposed underground services. Designer to liaise with Utilities Team where potential clash is identified.	
431. Potentially contaminated dust emissions to air.	
432. Risk of working in potentially explosive atmosphere, particularly wells WS8535, WS8538 and WS7512.	
433. Working adjacent to live traffic.	
434. Works in within an active landfill site. Contractor shall comply with the Site Operator FCC's SHE requirements.	
Maintenance / Cleaning	
SHE information for Maintenance/Cleaning to be assessed by the Milton Landfill Site operator (FCC).	
Use	
SHE information for Use to be assessed by the Milton Landfill Site operator (FCC).	
Decommissioning / Demolition	
SHE information for Decommissioning/Demolition to be assessed by the Milton Landfill Site operator (FCC).	

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KEY:

	- EXISTING MONITORING WELL [SURVEYED LOCATION (24-04-18)]
	- DCO SCHEME BOUNDARY
	- 2015 REPLACEMENT MONITORING WELL

NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWINGS HA528983-ACJV-HGN-S5_XX-SK-C-0008, 0009, 0010 AND 0011 SERIES.
- THIS DRAWING IS NOT TO SCALE.
- HAZARD TRIANGLES MUST BE READ IN CONJUNCTION WITH HIGHWAYS DESIGNERS RISK ASSESSMENT HA528983-ACJV-HGN-SG_DRA-HS-C-0001. FOR HAZARD PREFIX "G" SEE THE GEOTECHNICAL RISK REGISTER HA528983-ACJV-HGT-SG_DRA-RP-C-0001
- HAZARD TRIANGLES REFER TO RELEVANT KNOWN HEALTH AND SAFETY HAZARDS RECORDED AT THE TIME OF PRODUCTION, BUT THIS CANNOT BE ASSUMED TO INCLUDE ALL POTENTIAL HAZARDS. THIS DRAWING MUST BE READ IN CONJUNCTION WITH INDIVIDUAL CONTRACTORS AND SITE SPECIFIC RISK ASSESSMENTS/METHOD STATEMENTS, TECHNICAL NOTES AND MAPS TO ENSURE ALL POTENTIAL HEALTH AND SAFETY ISSUES ARE KNOWN PRIOR TO COMMENCEMENT OF WORKS.

Rev.	Date	Description	By	Chk'd	App'd
C01	16/01/19	FIRST ISSUE	TB	TB	DM

Drawing Status FOR CONSTRUCTION		Suitability A	Project Title A14 CAMBRIDGE TO HUNTINGDON			
 Copyright © ACJV - Atkins Limited and Ch2m (2015)		Drawing Title SECTION 5 - EXISTING MILTON JUNCTION LANDFILL INSPECTION WELLS LOCATION PLAN				
Scale NTS	Drawn TB	Checked TB	Approved DM	Authorised PN		
Original Size A1	Date 16/01/19	Date 16/01/19	Date 16/01/19	Date 16/01/19		
Client Working on behalf of highways england		Drawing Number Project HA528983 - ACJV - HGN - S5_ML - SK - C - 0006		Project Ref. No. Revision C01		

DO NOT SCALE

Millimetres

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks.

Construction

428. Whilst proposed works are outside the reported location of buried landfill cells, there is a risk of encountering waste and contaminated soils or both.

429. Risk of leachate entering aquifer via new well.

430. Risk of encountering existing underground services and potential clash with proposed underground services. Designer to liaise with Utilities Team where potential clash is identified.

431. Potentially contaminated dust emissions to air.

432. Risk of working in potentially explosive atmosphere, particularly wells WS8535, WS8538 and WS7512.

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434. Works in within an active landfill site. Contractor shall comply with the Site Operator FCC's SHE requirements.

Maintenance / Cleaning

SHE information for Maintenance/Cleaning to be assessed by the Milton Landfill Site operator (FCC).

Use

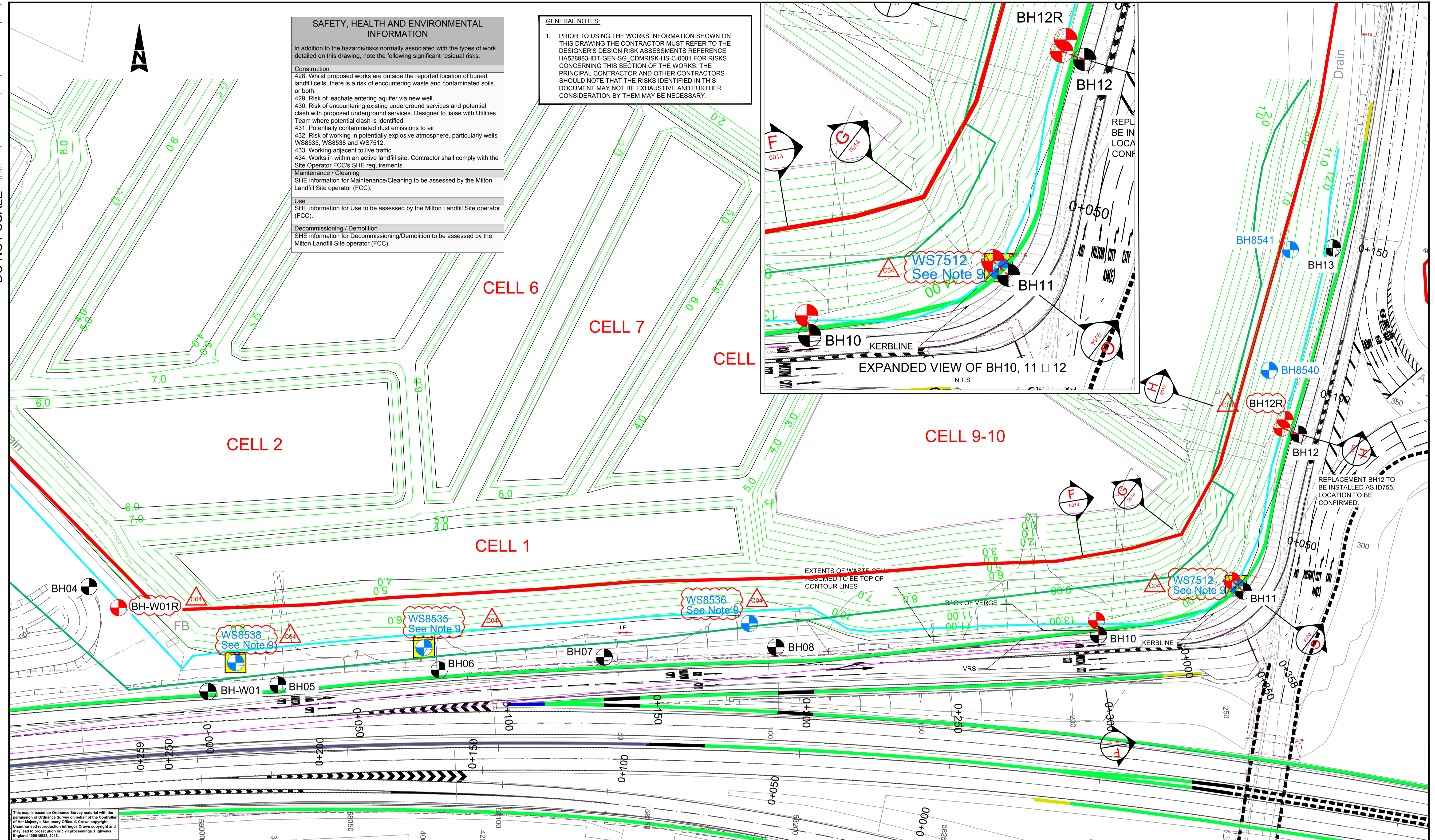
SHE information for Use to be assessed by the Milton Landfill Site operator (FCC).

Decommissioning / Demolition

SHE information for Decommissioning/Demolition to be assessed by the Milton Landfill Site operator (FCC).

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 - THIS DRAWING REFLECTS HIGHWAYS DESIGN FIX F.
 - DRAWING TO BE READ IN CONJUNCTION WITH THE EARTHWORKS DETAILS DRAWINGS
- HA528983-ACJV-HDG-S5_XX-M2-C-0007, THE DRAINAGE DRAWING
 HA528983-ACJV-HFE-SG_XX-M2-C-0001 AND 1001, THE FENCING DRAWING
 HA528983-ACJV-HGT-SG_DECOM-M2-C-0001 AND 0002, THE GEOTECHNICAL DRAWING
- HA528983-ACJV-HMK-S5_XX-M2-C-0001, THE ROAD MARKINGS DRAWING
 HA528983-ACJV-HML-S5_XX-M2-C-0002, THE HIGHWAYS DRAWING
 HA528983-ACJV-HRR-S5_XX-M2-C-0001, THE ROAD RESTRAINTS DRAWING
 HA528983-ACJV-HSC-S5_XX-M2-C-0001, THE STR. CULVERTS DRAWING
 HA528983-ACJV-VOS-S5_XX-M2-C-0001, THE ORDANCE SURVEY DRAWING
7. REFER TO UTILITY KEY PLAN HA528983-ACJV-HUT-SG_XX-SK-C-0001
 8. MILTON LANDFILL LAYOUT PROVIDED BY FCC ON 28/04/19
 9. 2015 BOREHOLES. WELLS WERE INSTALLED IN BOREHOLE WS8535, WS8538 AND WS7512. BOREHOLE WS8536 WAS BACKFILLED WITHOUT INSTALLATION OF A WELL.

	- EXISTING MONITORING WELL [SURVEYED LOCATION (24-04-18)]		- FCC OWNERSHIP BOUNDARY
	- REINSTALLED MONITORING WELLS		- FCC PPC BOUNDARY
	- SWAN NECK		- PROPOSED BOUNDARY PROVIDED 31-03-20
	- VRS		- ROAD MARKING SEPARATION ISLAND
	- HEADWALL		
	- 2015 BOREHOLE		
	- WELL TO BE DECOMMISSIONED		
	- LANDFILL CELL		
	- LANDFILL CONTOUR		

Rev.	Date	Description	By	Chk'd	App'd
C01	14/02/20	AMENDED HIGHWAY DETAILS	EC	DM	DM
C02	18/02/20	AMENDED HIGHWAY DETAILS	EC	NC	AP
C03	20/04/20	BH'S 10, 11, 12 MOVED TO 3.0M BEHIND VR	ME	ME	NC
C04	01/05/20	HOLE IDS - LEGEND UPDATED, NOTE 9 ADDED.	AS	NC	DM

Drawing Status: **FOR CONSTRUCTION**

Subsidiary: **A**

Project Title: **A14 CAMBRIDGE TO HUNTINGDON**

Drawing Title: **MILTON LANDFILL SITE WELL MODIFICATION WORKS PLAN WITH MILTON LANDFILL LAYOUT**

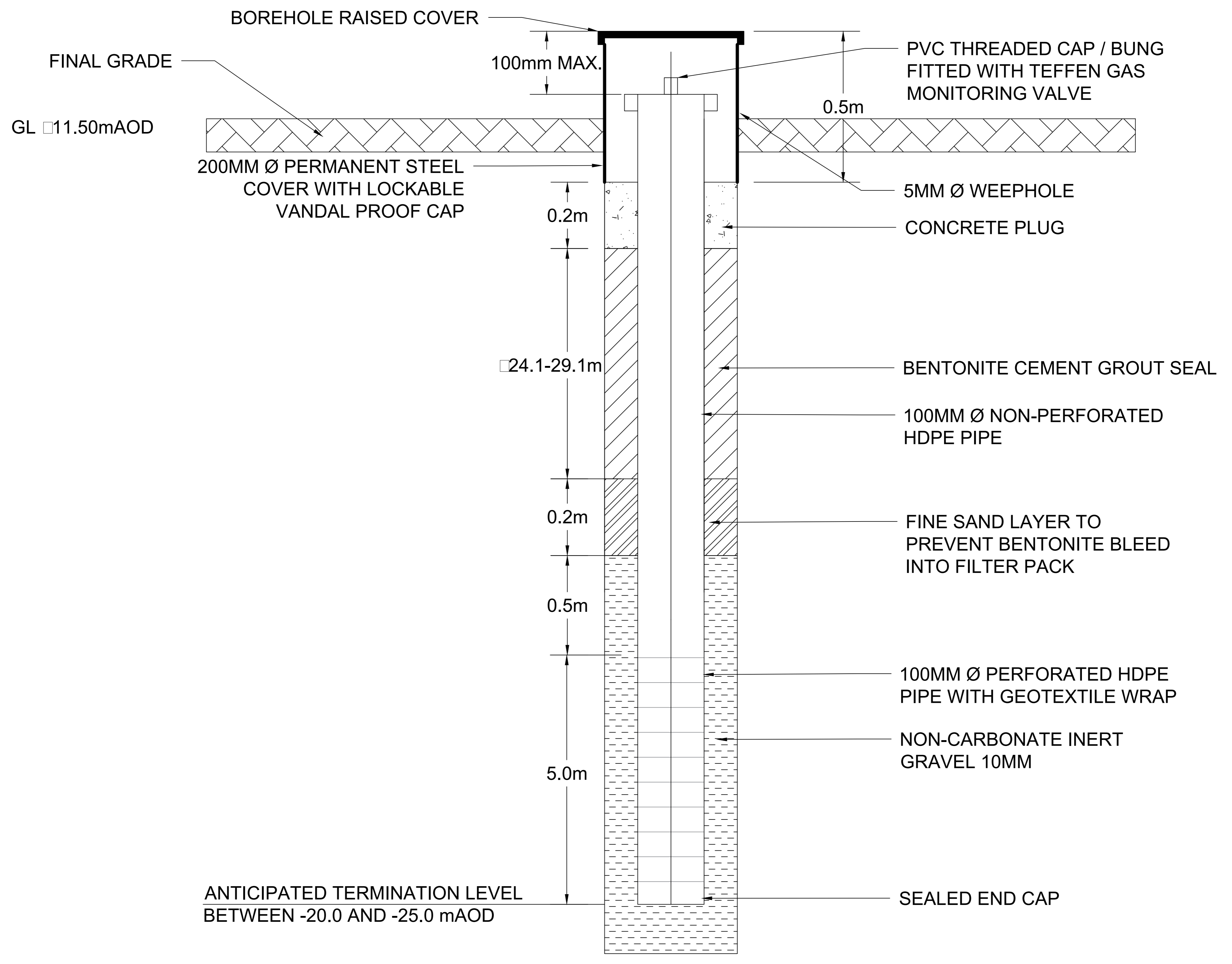
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Client: **Working on behalf of highways england**

Scale	Drawn	Checked	Approved	Authorised
NTS	AS	NC	DM	DM
Original Size	Date	Date	Date	Date
A1	29/04/20	30/04/20	01/05/20	01/05/20
Drawing Number	Project		Project Ref. No.	
	HA528983 - ACJV - HGN - S5_ML - SK - C - 0017		C04	

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 1. PRIOR TO USING THE WORKS INFORMATION SHOWN ON THIS DRAWING THE CONTRACTOR MUST REFER TO THE DESIGNER'S DESIGN RISK ASSESSMENTS REFERENCE HA528983-IDT-GEN-SG_CDMRISK-HS-C-0001 FOR RISKS CONCERNING THIS SECTION OF THE WORKS. THE PRINCIPAL CONTRACTOR AND OTHER CONTRACTORS SHOULD NOTE THAT THE RISKS IDENTIFIED IN THIS DOCUMENT MAY NOT BE EXHAUSTIVE AND FURTHER CONSIDERATION BY THEM MAY BE NECESSARY.



**BH-W01R (ID 754)
 BOREHOLE DETAIL**

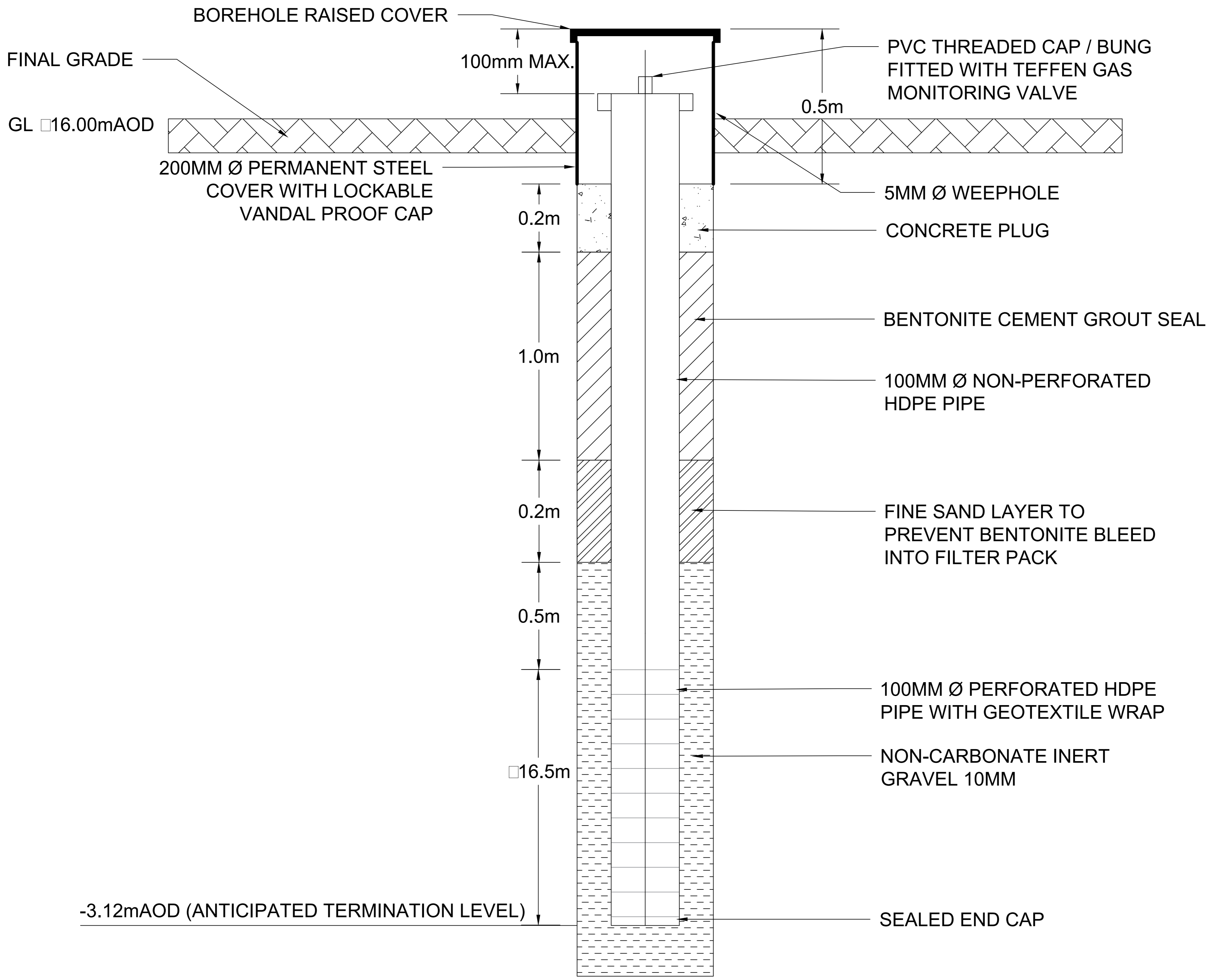
SCALE N.T.S.

- NOTES:**
- DRAWING TO BE READ IN CONJUNCTION WITH THE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN, HA528983-ACJV-HGT-S5_CQA-RP-C-0004.
 - DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION APPENDIX 26/6, GROUNDWATER MONITORING WELL REPLACEMENT, MILTON LANDFILL, HA528983-ACJV-HGT-S5_26_6-SP-C-0001.
 - THE DEPTHS SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED DURING DRILLING, BASED ON THE GROUND CONDITIONS ENCOUNTERED.

Drawing Status FOR CONSTRUCTION						Suitability A		Project Title A14 CAMBRIDGE TO HUNTINGDON													
						Drawing Title MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH-W01R (ID 754)															
						Scale	Drawn	Checked	Approved	Authorised	Drawing Number HA528983 - ACJV - HGT - S5_BH-W01A - SK - C - 0001		Project Ref. No. C01								
Copyright © ACJV - Atkins Limited and Ch2m (2015)						NTS	KR	NC	DM	DM	Original Size A4		Date 01/05/2020		Date ---		Date ---				
Client Working on behalf of 						Date 01/05/2020		Date ---		Date ---		Date ---		Date ---		Date ---					
C01	01/05/2020	ISSUED FOR CONSTRUCTION	KR	NC	DM	Originator HA528983 - ACJV - HGT - S5_BH-W01A - SK - C - 0001		Volume HA528983 - ACJV - HGT - S5_BH-W01A - SK - C - 0001		Project Ref. No. C01		Revision C01		Location ---		Type ---		Role ---		Number ---	
Rev.	Date	Description	By	Chk'd	App'd	Location ---		Type ---		Role ---		Number ---		Date ---		Date ---		Date ---			

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DO NOT SCALE

GENERAL NOTES:
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BH12R (ID 755)
BOREHOLE DETAIL
SCALE N.T.S.

- NOTES:
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 - DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION APPENDIX 26/6, GROUNDWATER MONITORING WELL REPLACEMENT, MILTON LANDFILL, HA528983-ACJV-HGT-S5_26_6-SP-C-0001.
 - THE DEPTHS SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED DURING DRILLING, BASED ON THE GROUND CONDITIONS ENCOUNTERED.

Drawing Status						FOR CONSTRUCTION		Suitability		A		Project Title				A14 CAMBRIDGE TO HUNTINGDON																			
Drawing Title						MILTON LANDFILL SITE REPLACEMENT MONITORING BOREHOLE BH12R (ID 755)																													
Copyright						© ACJV - Atkins Limited and Ch2m (2015)						Scale		NTS		Drawn		KR		Checked		NC		Approved		DM		Authorised		DM					
Client						Working on behalf of						Original Size		A4		Date		01/05/2020		Date		---		Date		---									
Rev.						Date						Description						By						Chk'd						App'd					
C01						01/05/2020						ISSUED FOR CONSTRUCTION						KR						NC						DM					
P01.1						---						FIRST ISSUE						LZ						LZ						LZ					
Project						Originator						Volume						Project Ref. No.																	
HA528983 - ACJV - HGT -						S5_ML_BH12 - SK - C - 0001						C01						Revision																	
Location						Type						Role						Number																	

Appendix D: FCC Documents

- Method Statement - Groundwater Monitoring and Sampling (Purging)
- Method Statement - Landfill Gas Monitoring
- Groundwater testing suites



from waste to resource

1.0 Introduction

This method statement has been prepared to cover the activity of groundwater level monitoring, purging boreholes and subsequent sampling on site. It should be read in conjunction with the risk assessment for groundwater monitoring and sampling.

FCC's Method Statements are based on industry best practice together with guidance from various sources including the Environment Agency's LFTGN03 'Guidance on the management of landfill gas' and LFTGN02 'Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water'. They also incorporate new legislation (such as DSEAR) following the relevant ESA Infrastructure Code of Practices.

The Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) 2002 require Operators to have systems in place to reduce or mitigate the risk of an explosive atmosphere forming and where it does to eliminate or reduce the risk of personal injury or harm to an acceptable level. Before work can take place the DSEAR site zoning plan must be consulted. Be aware of any operational changes that may have taken place since the last visit that may have altered the zoning rating of the working area e.g. contractors on site, changes in the gas well system or if the work being undertaken alters the zoning.

2.0 Description

Sampling of groundwater from monitoring facilities is undertaken as required by the Permit or to determine any contamination of the water table in the vicinity. These samples are then tested for a range of parameters on site using portable instrumentation. Laboratory analysis is then conducted to verify these readings and to test for a wider range of determinants

3.0 Pre-Monitoring Procedures

3.1 Pre-site visit Checks

- Check the location of the site and the precise location of the groundwater points.
- Take necessary keys and equipment to enter the site safely and locate the monitoring facilities.
- Check to ensure that all the correct personal protective equipment (PPE) is available and is worn at the appropriate time. The PPE must be in good order.
- Ensure pumping equipment is required ensure this is in correct safe working order.
- Ensure all analytical instrumentation for the in-situ determination of temperature, pH and electrical conductivity are in working order and calibrate with appropriate solutions if needed. Any instrument that is faulty or showing erroneous readings should be removed from daily use until either repaired or recalibrated.
- Collect the boxes of sample bottles sent by the laboratory.
- If glass bottles are to be used ensure they are transported to site in appropriate packaging to avoid breakage.

Method Statement	Page	Reviewed	Review Due
Groundwater - Purging	1	January 2016	January 2017

Method Statement – Groundwater Monitoring and Sampling (Purging)

3.2 On-site Pre-Start Checks

- Check DSEAR site zoning plan to ensure equipment (including battery powered tools) is suitable for the designated zone. Also note that non-ATEX approved items should not be used in any DSEAR zoned area of a site e.g. cameras, MP3 players, personal stereos etc.
- Sign in at the site office or weighbridge / Inform FCC's point of contact in line with the Lone Worker Policy.
- A Multi-Gas Alarm must be worn as part of PPE equipment. Anti-static clothing (particularly footwear) should be worn when traversing in a zoned area (check site zoning plan).
- Check for additional hazards that may be present.
- Make sure that the results of any Risk or CoSHH assessments applicable to this have been taken into account.
- Familiarise with any site specific risk assessments.
- Check the location of the site and the precise location of the groundwater points to ensure safe access to boreholes.
- Put on the appropriate personal protective equipment, wearing disposable gloves at all times.
- Take necessary keys, equipment to enter the site safely and locate the monitoring facilities.
- Ensure that all equipment is carried around the site without causing damage to it. Glass bottles should be stored safely to avoid breakage (bubble wrap, divided box).
- Care should be taken when sampling as groundwater may be contaminated.
- Make sure that a mobile phone is readily available, however a phone should ideally not be used within any DSEAR zone, except in an emergency – move outside the zone e.g. further than 2.2m away from a gas well in all other situations (a metal clasp mobile should not be used). ESA ICoP5 (July 2006) states that mobile phones (without a metal case) may be used in zone 2 but not in zone 1 or 0.

4.0 Groundwater sampling

4.1 Purging boreholes – pre sample measurements

- Use separate dip meters for groundwater and leachate wells. If working in a zoned area, only dip meters with an ATEX rating appropriate to the zone being worked in should be used e.g. geotechnical 'ATEX' dip meter for use in zone 1 & 2.
- Remove borehole lid or remove dipping point plug as necessary.
- Lower the dip meter into the borehole and record the level at which water is encountered. This is usually to the top of the well casing; ensure the correct location is determined to provide continuity of results.
- This reading should then be converted into a level relative to the borehole survey datum. This can be done using the following formula:

$$\text{Surveyed datum (mAOD)} - \text{Dip reading (m)} = \text{Water level (mAOD)}$$

The purging requirement for boreholes varies; where three well volumes are required this is calculated by using the following standard methodology.

- Lower the dip meter until it reaches the base of the borehole and record the base level.
- The difference between the two readings is the column of water, record in metres.
- To calculate the volume of water use the following formula:

$$\pi r^2 h = \text{one well volume (cubic metres)}$$

$\pi = \text{pi (3.14)}$

$r = \text{Radius of borehole (millimetres)}$

$h = \text{Column of water (metres)}$

Multiply this figure by three to obtain volume of water to purge.

Note – 1 cubic metre is equivalent to 1000 litres.

Method Statement	Page	Reviewed	Review Due
Groundwater - Purging	2	January 2016	January 2017

Method Statement – Groundwater Monitoring and Sampling (Purging)

4.2 Purging using a pump

In order to remove the required volume a Waterra PP1 pump and pipework (or similar) are generally used.

- Prior to sampling being undertaken a gas reading should be obtained.
- If concentrations are within the explosive limits (5-15% volume methane) then let the borehole vent to see if the methane concentration falls below the explosive limit range. Continue to monitor the borehole throughout purging.
- If methane is recorded at elevated levels i.e. in excess of 20% by volume, then the borehole should be monitored to ensure that the methane concentration does not fall below 20% by volume.
- If the methane concentration does fall below 20% by volume then pumping should be stopped to ensure that the explosive range is not entered.
- Similarly, if the methane concentration is below the lower explosive limit then if during monitoring the concentration reaches 3% by volume pumping should also be stopped to ensure that the explosive range is not entered.
- If the methane concentration falls/rises/remains within explosive limits, hand-purge 20 litres in order to comply with DSEAR regulations. Note all actions within 'comments' column.
- Lower the pump/waterra into the borehole to just above the base level. When using dedicated waterra installed in the boreholes, first check the condition of the tubing and the foot valve at each borehole to ensure efficiency of the equipment. This may involve removing the tubing which may lead to cross-contamination. Record start time.
- Commence pumping and note the removal of water by filling up an appropriately sized measuring container. The pump is located above ground level
- When the desired volume has been removed fill and empty the sample bottle in order to rinse out and prime then fill up sample bottle(s) ensuring that there is no air gap when the top is screwed on.
- Label the bottle(s) correctly with company, site, location and date.
- Add fixative to the sample, if necessary.
- Rinse beaker for in-situ measurements.
- Note that if a borehole is purged dry before the appropriate volume, then a sample may be obtained when recharge has allowed sufficient water into the borehole. .
- Record volume purged and any relevant comments.
- Close borehole lid.
- When refuelling Waterra pump - Prevent spillage by taking pump away from borehole & place on a spill mat to refuel. Wear latex gloves whilst refuelling. Wipe any drips from pump with tissue. Screw lid of pump & fuel containers back on tightly. Take off gloves and dispose of carefully, together with any used tissue. Put on fresh gloves. Replace pump onto borehole.

4.3 Groundwater in-situ testing

The following parameters are tested for on site: temperature (°C), electrical conductivity (µs/cm) and pH. These readings are taken to determine whether any change in chemistry has occurred in the groundwater since the last sampling visit.

- If the borehole is within a DSEAR zoned area, undertake the field analysis at least 2.2m away from the borehole to comply with DSEAR regulations.
- Rinse a beaker with the sample water from the pump thoroughly before undertaking the analysis.
- Use one instrument at a time, taking temperature readings first to give the most accurate reading. If a temperature dip meter is available this may be used to gain a reading directly from the borehole.
- For pH and electrical conductivity record stable readings.
- Rinse all the instruments with deionised water once all the measurement have been taken.
- Ensure all equipment is transported, safely without causing damage, to the next monitoring point.
- When all sampling has been undertaken check that the correct number of bottles has been filled and place in cool boxes for transportation.

Method Statement	Page	Reviewed	Review Due
Groundwater - Purging	3	January 2016	January 2017

Method Statement – Groundwater Monitoring and Sampling (Purging)

4.4 Sample storage and transport

- When transporting the samples across the site ensure they are kept upright. Glass bottles should be safely protected to avoid breakage.
- Make out a chain of custody form for all samples to ensure that all bottles are correctly labelled and the correct analysis is being undertaken.
- Bottles must be kept from extremes of temperature and not left in direct sun light.
- Safe bottle storage - ensure sample bottle lids are tight after taking samples. Keep sample bottles & fuel can separate. In van, keep fuel can in separate container/tray to contain any spillages.
- There should not be more than 48 hours between sample collection and delivery to the appropriate laboratory.

5.0 Reporting procedures

- Leave a copy of the in-situ analysis with the Site Business Manager if required.
- Let the Site Business Manager know you have finished and sign out if required.
- Comply with the Lone Worker Policy at time of departure from site.
- Groundwater data and relevant comments obtained on site are then added to the laboratory certificate once the analysis has been completed.
- All field and laboratory data are then entered onto the database/Excel for reference.

Method Statement	Page	Reviewed	Review Due
Groundwater - Purging	4	January 2016	January 2017



from waste to resource

1.0 Introduction

This method statement has been prepared to cover the activity of landfill gas monitoring. It should be read in conjunction with the risk assessment for landfill gas monitoring.

FCC's Method Statements are based on industry best practice together with guidance from various sources including the Environment Agency's LFTGN03 'Guidance on the management of landfill gas' and LFTGN02 'Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water'. They also incorporate new legislation (such as DSEAR) following the relevant ESA Infrastructure Code of Practices (ICoP's).

The Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) 2002 require operators to have systems in place to reduce or mitigate the risk of an explosive atmosphere forming and where it does to eliminate or reduce the risk of personal injury or harm to an acceptable level. Before work can take place the DSEAR site zoning plan must be consulted. Be aware of any operational changes that may have taken place since the last visit that may have altered the zoning rating of the working area e.g. contractors on site, changes in the gas well system or if the work being undertaken alters the zoning.

The potential hazards associated with landfill gas include flammability, explosivity and its potential to be an asphyxiant. Therefore regular monitoring to detect its presence is of great importance.

Methane – Flammability and Explosivity

Methane is a flammable gas which forms explosive mixtures with air when present between the concentration limits of 4.4%v/v and 16.5%v/v at 20 Deg C.

These limits are known as the lower explosive limit (LEL) and the upper explosive limit (UEL) of methane. In order for a methane/air mixture to be explosive methane must be present in the explosive range (4.4%v/v and 16.5%v/v) along with a minimum oxygen concentration of 14%v/v.

Asphyxiation

Landfill gas can accumulate in enclosed spaces or topographical depressions especially in sheltered areas where there is little wind. The principle asphyxia risks are associated with depleted oxygen by displacement by a landfill gas mixture and accumulations of carbon dioxide.

Asphyxia could result if the breathing zones air mixture contains <10%v/v oxygen as a result of admixture with landfill gas. Carbon dioxide gas has a density greater than atmospheric air and therefore can pond in hollows, depressions and confined spaces where conditions allow. Evidence has been collected to suggest that carbon dioxide concentrations exceeding 5%v/v can accumulate in depressions and gullies where there is little wind.

2.0 Description

Landfill gas monitoring is routinely undertaken in order to comply with the relevant Permit conditions using portable infra-red gas analysers. The readings obtained are verified for accuracy by a competent person before being sent to the Environment Agency. Further verification of results obtained by portable infra-red gas analysers can be undertaken using gas chromatography. This involves the collection of gas samples from individual monitoring wells using Gresham Tubes and/or Tedlar gas sample bags (see Section 4 below).

Method Statement	Page	Reviewed	Review Due
Gas Monitoring	1	January 2016	January 2017

Method Statement – Landfill Gas Monitoring

3.0 Monitoring Procedures

3.1 Pre-site Visit Checks

- Obtain all site specific information including the location of the site, a list of all gas monitoring points to be visited, site plans and any site specific monitoring protocols that must be adhered to. Refer to previous information on the site relating to best routes for navigating between points, previous readings, and any relevant safety risk assessments.
- Take necessary keys and equipment to enter the site safely and access all monitoring facilities.
- Ensure monitoring equipment required is in correct safe working order and that a hydrogen sulphide filter is fitted as required.
- Ensure that portable infra-red gas analysers are compliant with the manufacturer's calibration and servicing recommendations. Quarantine any instrument that is beyond its calibration date or showing erroneous readings.
- The gas analyser should be fully charged and water/dust filters should be checked for visible signs of moisture/dirt and replaced if necessary. Dirty and/or wet filters can interfere with relative pressure readings and air flow through the instrument impacting on the validity of the results obtained.
- It is recommended that all channels are zeroed on a daily basis to limit calibration drift and maximise the accuracy of the equipment (see manufacturers instruction manual).
- Routinely perform an accuracy check using a calibration gas canister of known composition by attaching it to the inlet port of the analyser and dispensing the calibration gas at the recommended flow rate. N.B gas fed through the analyser at too low or too high flow rates will give false readings. Log the obtained readings.
- Gas analysers can be field calibrated if accuracy checks show that the field calibration has drifted significantly (see manufactures operating instructions).
- Any instrument that is faulty or showing erroneous readings should be removed from daily use until either repaired or recalibrated.
- Ensure that a spare set of gas analyser consumables such as filters inline filters, water trap filters, valve adapters and tubing are carried at all times.

3.2 On-Site Pre-Monitoring Checks

- Inspect the latest edition of the DSEAR site zoning plan to ensure monitoring equipment (including battery powered tools) is suitable for the designated zones to be visited during the visit. Also note that non-ATEX approved items should not be used in any DSEAR zoned area of a site e.g. cameras, MP3 players, personal stereos etc.
- Where applicable, a Register to Work must be completed.
- The EPD (Explosion Protection Document) must be reviewed on a regular basis to identify relevant changes.
- Sign in at the site office or weighbridge / inform the designated point of contact in line with the Lone Worker Policy.
- Check for additional hazards that may be present eg. locations of active haul roads and tipping/quarrying areas.
- Make sure that the results of any Risk or CoSHH assessments applicable to this activity have been taken into account.
- Take necessary keys and equipment to enter the site safely and locate the monitoring facilities.
- A multi gas alarm should be worn at all times as part of PPE equipment. Anti-static clothing (particularly footwear, which is FCC's standard issue) should be worn when undertaking the monitoring in a zoned area (check site zoning plan).
- Familiarise with any site-specific risk assessments.
- Ensure that all equipment is carried around the site without causing damage to it.
- Make sure that a mobile phone is readily available, however a phone should ideally not be used within any DSEAR zone, except in an emergency – move outside the zone e.g. further than 2.2m away from a gas well in all other situations (a metal clasp mobile should not be used). ESA ICoP5 (July 2006) states that mobile phones (without a metal case) may be used in zone 2 but not in zone 1 or 0.
- Switch on instrument and record the following information:

Method Statement	Page	Reviewed	Review Due
Gas Monitoring	2	January 2016	January 2017

Method Statement – Landfill Gas Monitoring

- Site Name
- Date
- Operator Name
- Equipment Type & Serial Number
- Calibration Due Date
- Atmospheric Pressure (mb)

3.3 Monitoring Landfill Gas

- Locate the monitoring points (note if any are damaged or cannot be monitored stating reason where appropriate). As a minimum each gas monitoring point should include an airtight lid or bung complete with a gas monitoring valve. Check that the hose tail on the gas valve is not blocked by dirt etc.
- Turn on the infra-red gas analyser and ensure the readings including the pressure transducer have been zeroed before commencing monitoring.
- Attach instrument to the gas monitoring point of the borehole/probe.

Tefen Type Quick Release Valves

A red Tefen adaptor is required for the attachment of the gas analysers sampling hose to the monitoring point. An audible click signifies satisfactory engagement of the adapter to the Tefen valve. Valve automatically opens upon engagement.

Manually Gas Monitoring Valve

Securely attach the sampling hose of the gas analyser to the hose tail of the monitoring valve (tap). There must be a tight seal between hose tail and hose in order to gain an accurate gas reading. Some hose tails may be too wide for the standard hose tail, in this instance a small length of larger diameter rubber pipe can be used as an adapter. Once the hose is securely fitted to the hose tail of the gas monitoring valve the valve handle can be manually opened.

If required, record relative pressure (it may take a few seconds for the displayed reading to stabilise). If you are using a separate relative pressure meter, close tap and remove sample hosing and repeat the above connection procedure for the gas analyser.

- Once the relative pressure reading has been recorded gas monitoring can be commenced by engaging the air pump on the infra-red gas analyser. The pump should be run for a minimum of 30 seconds in order to allow sufficient time for gas within the borehole to be drawn through the analyser before recording a result.
- Readings should be allowed to stabilise before recording methane (% by volume), carbon dioxide (% by volume) and oxygen (% by volume). N.B in some cases CO₂ and O₂ readings can take a number of minutes to stabilise, it is important that all readings settle before obtaining a result. When datalogging readings will be stored after a set period of purging (usually 30 secs- 2mins).
- Caution must be taken when monitoring from piezometers and other small diameter facilities that water is not drawn into the instrument. This may be prevented by using a section of transparent hose and observing closely if any water is drawn into and up the sampling hose. An audible strain on the instrument pump may also be detected. If this occurs, stop the gas analyser's air pump, record the readings if possible. Check filters are not saturated. If they are, replace appropriately. In the event that it is not possible to obtain a valid reading record an appropriate comment to explain the failure to attain a set of readings from the flooded sample point.
- On-site facilities such as vents or leachate wells may not always have an air tight lid and or a dedicated gas monitoring valve. In this instance a piece of extension hose can be fitted to the analyser and lowered into the well/vent to reduce the dilution affect of atmospheric air at the top of the installation. N.B Ensure that the hose is not lowered into any leachate or water within the facility.
- Once data is recorded, remove the sample hose from the gas monitoring valve and ensure that the valve is closed after use. Replace the borehole lid and lock if necessary. Allow the air pump on the infra-red gas analyser to run for at least 30 seconds after it has been detached from the sample point in order to purge the unit of all gas from the sample point before monitoring the next sample point methane and carbon dioxide concentrations should return to zero and the oxygen to atmospheric levels at approximately 20.7%v/v - 21.0%v/v.

Method Statement	Page	Reviewed	Review Due
Gas Monitoring	3	January 2016	January 2017

Method Statement – Landfill Gas Monitoring

- Repeat this procedure at each gas monitoring location.
- Record atmospheric pressure once all the monitoring has been completed. Compare with reading taken at the beginning of the visit. This allows for the atmospheric pressure trend to be recorded ie – rising, falling or steady.
- Sign out at the site office or weighbridge and if required, email a copy of the results to the Site Manager and whoever else is on the distribution list together with a non-conformance record sheet.
- Comply with the Lone Worker Policy at time of departure from site if necessary.

4.0 Sampling Landfill Gas

In order to verify gas readings obtained from portable instruments, gas samples can be taken and subjected to laboratory analysis via gas chromatography (GC), gas chromatography mass spectrometry (GCMS) or inductively coupled plasma (ICP). The methods employed to obtain gas samples are outlined in the section below.

The procedures outlined above should be adhered to when undertaking gas sampling.

Gas samples can be collected and transported to a laboratory by a Tedlar bag.

4.1 Pre-Visit Checks

- Check the condition of the sample collection apparatus and number of sample tubes/bags needed (always take a few spare tubes/bags in case any problems are encountered on site. Use attached gauge to ensure that tubes are empty and ensure that the capacity of the sample receptacles is sufficient for the required analysis. Assess gas bags for signs of damage/perforations.

4.2 On Site Procedures

4.2.1 Tedlar bags

Application

Tedlar bags are square polythene bags, suitable for the collection of gas samples requiring a wide range of analyses. The bags come in volume sizes 0.5, 1, 2, 3, 5 and 10 litres. A minimum one litre volume is suitable for GCMS analysis; an additional one litre is required for analysis of Carbon Monoxide. A 10 litre bag is required for Carbon 14 analysis (at 15% methane conc.)

Using a Tedlar bag

When taking a sample from an in-waste gas well, the gas suction should be tapped off for a period of time before sampling to allow a suitable volume of gas to build up. This is to be done in strict accordance with the site gas technician/responsible person and should not be done alone.

- For off-waste monitoring probes and boreholes, first ensure that they have been bunged and capped for 24 hours prior to the sampling exercise taking place.
- A pumped sample can be obtained using an electric pump or the internal pump in the GA2000/GA2000+ instrument, which is both a quick and easy method. Make sure all pipes and seals are airtight and let the instrument purge through with the gas for one minute before attaching and filling the Tedlar bag.
- It is important to note that standard boreholes should be sampled before sampling boreholes that are likely to contaminate pipework. Clean air should be purged before any sampling takes place.
- Mark the bag with the time and date of sampling, site name, sample point name, sampler initials and name of person to receive laboratory analysis results.

5.0 Reporting Procedures

- Gas monitoring data obtained from the site is then entered onto the Monitor Pro database, either manually or downloaded directly from the instrument if data-logging is being used.
- Ensure data is accurate and correct.

Method Statement	Page	Reviewed	Review Due
Gas Monitoring	4	January 2016	January 2017

Groundwater Testing Suites

EP Suites Milton						
Suite Name	MILGWM	MILGWQ	MILGWA	MILLBiA	MILLA	MILSWD
Sites	Ground water Monthly	Ground water Quaterly	Ground Water Annual	Leachate Bi Annual	Leachate Annual	Surface Water Discharge
Determinands						
Level						
pH	✓	✓	✓	✓	✓	✓
Temp						
EC	✓	✓	✓	✓	✓	✓
Chloride	✓	✓	✓	✓	✓	✓
Ammoniacal nitrogen	✓	✓	✓	✓	✓	✓
Sulphate		✓	✓	✓	✓	
Alkalinity		✓	✓	✓	✓	
COD		✓	✓	✓	✓	
BOD		✓	✓	✓	✓	
TON		✓	✓	✓	✓	
TOC		✓	✓	✓	✓	
Sodium		✓	✓	✓	✓	
Potassium		✓	✓	✓	✓	
Calcium		✓	✓	✓	✓	
Magnesium		✓	✓	✓	✓	
Cadmium		✓	✓	✓	✓	
Tin						
Iron		✓	✓	✓	✓	
Lead		✓	✓	✓	✓	
DO	✓	✓	✓			
Bromide		✓	✓			
Ionic Bal		✓	✓			
Mercury		✓	✓	✓	✓	
Nitrate						
Nitrite						
Nickel		✓	✓	✓	✓	
Copper				✓	✓	
Manganese				✓	✓	
Zinc	✓	✓	✓	✓	✓	
Chromium	✓	✓	✓	✓	✓	
Sulphide						
Arsenic						
Phenols		✓	✓			
Suspended solids						✓
Cyanide		✓	✓			
Atrazine						
Simazine						
Diuron						
Isoproturon						
Mecoprop		✓	✓	✓	✓	
Ethofumesate						
Trichloroethene						
Tetrachloroethene						
Tetrachloromethane						
Xylene		✓	✓	✓	✓	
Napthalene						
Total Sulphur				✓	✓	
Full list 1			✓*		✓	
* Only required 4 yearly prior to HRA review. Next required in October 2012						

Appendix F. Appendix 26/7 Well Modification Works, Milton Landfill

A14 Cambridge to Huntingdon Improvement Scheme

Appendix: 26/7

Specification Appendix Title: Well Modification Works, Milton Landfill

Suitability: A For Construction

Notice

This report was produced by ACJV for Highways England for the specific purpose of the A14 Cambridge to Huntingdon Improvements Scheme.

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Document History

PROJECT NUMBER: HA528983			DOCUMENT REF: HA528983-ACJV-HGT-S5_26/7-SP-C-0001			
C06	Well backfilling details updated for EA comments	DM	NC	DM	DM	13/08/2020
C05	Updated with identities of additional wells to be decommissioned	NC	DM	DM	DM	29/06/2020
C04	Borehole BH-W01 details updated.	NC	DM	DM	DM	01/05/2020
C03	Updated works with reduced swan-neck lengths	NC	DM	DM	DM	20/04/2020
C02	Updated works as agreed with FCC/EA	NC	DM	DM	GJ	13/02/2020
C01	Construction Issue	TB	DM	DM	PN	15/01/2019
P01	First Issue	NC	DM	DM	PN	06/12/2018
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

Table of contents

Chapter	Pages
1. Introduction	4
2. Construction Quality Assurance	5
3. Well decommissioning	6
4. Well modifications	7

1. Introduction

1.1. The Milton Landfill Site operator, FCC, has nine wells around the southern boundary of the landfill site which are either close to, or are directly affected by the re-modelling of the A14 eastbound off-slip and Milton Junction. Four wells are to be modified to allow their continued use for gas monitoring, and the remaining five are considered to be sufficiently far from the realigned A14 and will be protected by the provision of the Vehicle Restraint System (VRS), as presented in Table 1. One well, BH-W01 will be decommissioned in due course, following a period of validation monitoring, ref Section 3.

Table 1: Summary of wells and modifications to be made

Well reference	Current well monitoring activity		Modification to be made
	Gas	Groundwater	
BH-W01	X	X	No modifications required. A replacement for BH-W01 for future gas monitoring and groundwater monitoring and sampling will be installed. Replacement well referred to as BH-W01R (A14 scheme reference ID754).
BH05	X	-	No modifications required. Existing well configuration is a sufficient distance from the proposed VRS to allow the installation to be safely monitored.
BH06	X	-	No modifications required. Existing well configuration is a sufficient distance from the proposed VRS to allow the installation to be safely monitored.
BH07	X	-	No modifications required. Existing well configuration is a sufficient distance from the proposed VRS to allow the installation to be safely monitored.
BH08	X	X	No modifications required. Existing well configuration is a sufficient distance from the proposed VRS to allow the installation to be safely monitored and sampled.
BH10	X	-	Existing well head to be adapted with extension to new termination headworks.
BH11	X	-	Existing well head to be adapted with extension to new termination headworks.
BH12	X	X	Existing well head to be adapted with extension to new termination headworks to allow gas monitoring to continue. Replacement well to be installed to allow gas monitoring and groundwater sampling. Replacement well to be referred to as ID755.
BH13	X	-	No modifications required. Existing well configuration is a sufficient distance from the proposed VRS to allow the installation to be safely monitored.

1.2. There are a further six wells, numbered WS7512, WS8535, WS8536, WS8538, WS8541 and BH8540 that were installed as replacement wells as part of preparatory works for the A14 Scheme that are to be decommissioned during the Site Operations.

- 1.3. The locations of the wells are shown on Drawing HA528983-ACJV-HGN-S5_ML-SK-C-0006.
- 1.4. The specification for well decommissioning is presented in Section 3 and the specification for the well modifications is presented in Section 4.

2. Construction Quality Assurance

- 2.1. The Investigation Supervisor is Mr Nathan Cummins, ACJV.
- 2.2. The well decommissioning and the well modifications shall operate under a Construction Quality Assurance (CQA) protocol. The CQA Plan is subject to acceptance by the Environment Agency and FCC, which the Contractor is to arrange.
- 2.3. An independent CQA engineer shall oversee the works, clause 2.6 refers.
- 2.4. The Contractor will not be allowed to commence the works until a CQA Plan and an independent CQA engineer, accepted by both the Environment Agency and FCC, are in place.
- 2.5. The Contractor shall provide an independent CQA engineer to overview the works and to prepare a CQA Validation Report. The CQA engineer shall have proven competency in the supervision of installation works with specific experience in drilled installations to meet the quality standards under Landfill Directive 1999. The CQA engineer's appointment will be subject to both Environment Agency and FCC approval. The Contractor shall provide the name, qualifications and an up to date curriculum vitae for his nominated CQA engineer to the Investigation Supervisor and shall seek Environment Agency and FCC approval of the nominated CQA engineer. If the Environment Agency or FCC or both reject the nominated CQA engineer the Contractor will be required to make a replacement nomination.
- 2.6. The CQA engineer shall prepare a comprehensive daily record covering the period of the works. The record shall include all information relevant to the works including start/finish times, progress of works, communications, incidents, compliance and deviations from specification. Each entry should have a corresponding time entered.
- 2.7. Should an incident occur, the CQA engineer shall prepare an Incident Report and submit it to the Investigation Supervisor.
- 2.8. The CQA engineer shall prepare a CQA Validation Report which shall include his own records and relevant Contractor's records including photographs and well decommissioning and well modification details. A draft of the CQA Validation Report shall be submitted to the Investigation Supervisor for acceptance within one week of completion of the well decommissioning and well modification works. Within two weeks of receipt of the CQA Validation Report the Investigation Supervisor shall confirm that the report is either:
 - Accepted
 - Accepted with comments (requiring addressing)
 - Unacceptable and should be revised and resubmitted.
- 2.9. If the CQA Validation Report is accepted or accepted with comments the CQA engineer shall submit his final report to the Investigation Supervisor within two weeks. If the CQA Validation Report is unacceptable the CQA engineer shall submit a revised draft report to the Investigation Supervisor within two weeks.

- 2.10. The Contractor shall submit a copy of the final CQA Validation Report to the Environment Agency and FCC for their records.

3. Well decommissioning

- 3.1. The known details of the wells to be decommissioned are summarised in Table 2.

Table 2: Known details for wells to be decommissioned

Well reference	National Grid coordinates [Local Grid coordinates]		Well dimensions	
	Easting	Northing	Diameter (mm)	Depth (approx.) (m)
WS7512	546897.00 [41905.59]	262196.00 [473302.54]	50	6
WS8535	546627.50 [41636.04]	262175.5 [473282.03]	50	6
WS8536	546735.50 [41744.06]	262183.50 [473290.04]	50	5.0
WS8538	546565.00 [41573.50]	262170.50 [473277.00]	50	6
WS8541	546915.00 [41923.59]	262307.50 [473414.06]	50	8.0
BH8540	546908.00 [41916.59]	262267.50 [473374.05]	50	8.5
BH-W01*	546525.88 [41534.41]	262188.71 [473295.25]	100	42
Notes: * Well to be decommissioned following agreement with EA & FCC that replacement well BH_W01R (ref Specification Appendix 26/6) is correctly functioning expected to include a period of monitoring of both installations of at least 6 months.				

- 3.2. Wells WS7512, WS8535, WS8536, WS8538, WS8541 and BH8540 are located within the waste areas of the landfill site and therefore, the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) applies. The Contractor shall liaise with FCC to determine any specific requirements associated with working in these areas.
- 3.3. Prior to decommissioning the Contractor shall record the depth to the base and the groundwater level in each well. The results shall be presented in terms of depth below ground level and elevation mAOD in the CQA Validation Report.
- 3.4. The Contractor shall follow the Environment Agency guidance for the decommissioning of wells given in the “Good practice for decommissioning redundant boreholes and wells” Product Code: LIT 6478 / 657_12, updated October 2012. Complete removal of the well casing is, however, not required.

- 3.5. Decommissioning shall comprise the removal of the steel headworks and the subsequent backfilling of the well casing with bentonite cement granules, hydrated in situ, tamped with a punner where practicable, or bentonite/cement slurry placed by tremie tube. Once the well has been backfilled to within approximately 1m of ground level, the well casing shall be cut-off.
- 3.6. The remaining void shall be backfilled to within 0.3m of ground surface with natural cohesive soils or bentonite granules, hydrated in situ and tamped in-place in layers not exceeding 0.15m thickness. Topsoil of general purpose grade complying with BS 3882 shall be placed between ground level and 0.3m depth. The backfill shall be placed to form a shallow dome to allow for self-settlement of the backfill materials,
- 3.7. The Contractor shall dispose of the headworks appropriately, or if recovered in serviceable condition, shall retain for re-use in subsequent works where headworks are to be relocated.
- 3.8. Any required seeding of the reinstated area shall be confirmed by the Investigation Supervisor, following agreement with the land owner.
- 3.9. All excess material arising from the works shall be disposed of to a suitable waste management facility.

4. Well modifications

- 4.1. The known details of the wells to be modified are summarised in Table 3. The proposed locations of the new well headworks are also presented in Table 3.

Table 3: Known and proposed details for wells to be modified

Well reference	Existing location of well headworks		Diameter ⁽¹⁾ (mm)	Proposed location of new well headworks	
	National Grid coordinates [Local Grid coordinates]			National Grid coordinates [Local Grid coordinates]	
	Easting	Northing		Easting	Northing
BH10	546851.41 [41859.93]	262179.71 [473286.22]	100	546850.68 [41859.26]	262184.46 [473290.99]
BH11	546899.34 [41907.96]	262194.23 [473300.78]	100	546895.64 [41904.23]	262197.66 [473304.20]
BH12	546917.76 [41926.35]	262245.30 [473352.85]	100	546912.23 [41920.82]	262248.30 [473354.84]
Notes (1) To be confirmed by the Contractor					

- 4.2. In advance of commencing the well modification works, the Contractor shall confirm the diameter and the material of the existing well casing. The Contractor shall also propose the most suitable material for the pipe extension works and jointing techniques to be used to the Investigation Supervisor for acceptance.
- 4.3. The Contractor is to establish the most suitable vertical alignment for the pipe extension for the acceptance of the Investigation Supervisor taking into account the following:

- i. Within the landfill site excavation into existing ground along the line of the pipe extension shall as far as possible be limited to the removal of topsoil where present. The topsoil is to be re-used to cover the protective fill to the completed pipe extension.
 - ii. The pipe extension shall be laid to provide a continual fall of at least 1v:100h towards the well without sudden changes in gradient.
 - iii. The allowable flexure of the pipe materials and availability of shallow bends where appropriate.
- 4.4. Prior to modifying well BH12 the Contractor shall undertake a round of groundwater monitoring and sampling following the procedure set out in clauses 1.17.1 and 1.17.2 of Specification Appendix 26/6. The Contractor shall provide a Method Statement for undertaking the monitoring and sampling to the Investigation Supervisor for acceptance not less than one week before the intended work. A round of groundwater monitoring and sampling shall also be undertaken in BH-W01 and BH08.
- 4.5. As the response zones of wells BH-W01, BH08 and BH12 are deep and screened within the natural soils aquifer the purge-water may be discharged to ground.
- 4.6. Prior to modifying wells BH-W01 and BH12, the Contractor shall undertake a round of gas monitoring following the procedure set out in clause 1.17.4 of Specification Appendix 26/6. The Contractor shall provide a Method Statement for undertaking the testing to the Supervisor for acceptance not less than one week before the intended work. A round of gas monitoring shall also be undertaken in BH08.
- 4.7. For all wells to be modified the Contractor shall undertake a round of gas monitoring as described in Clause 3.5.
- 4.8. The existing well headworks shall be carefully de-constructed and the protective cover re-used at the new headworks location if its condition is considered to be suitable by the Investigation Supervisor. Otherwise the Investigation Supervisor will confirm need for a new protective cover.
- 4.9. During the works the Contractor shall prevent any debris falling into the well.
- 4.10. The Contractor shall undertake gas monitoring of the modified wells, as described in Clause 4.6, but at least two days after the completion of the modification works.



CAUSEWAY
— GEOTECH

A14 Section 5 - Milton Landfill, Groundwater Wells Replacement

FACTUAL GROUND INVESTIGATION REPORT

Client: The A14
Client's Representative: Atkins
Report No.: 20-0525
Date: October 2020
Status: Final for Issue

CONTENTS

Document Control Sheet




Note on: Methods of describing soils and rocks & abbreviations used on exploratory hole logs

1	AUTHORITY	4
2	SCOPE	4
3	DESCRIPTION OF SITE	4
4	SITE OPERATIONS.....	5
	4.1 Summary of site works.....	5
	4.2 Rotary drilled boreholes.....	5
	4.3 Standpipe installations.....	6
	4.4 Standpipe installations - decommissioning	6
	4.5 Surveying.....	6
	4.6 Groundwater and ground gas monitoring.....	6
5	GROUND CONDITIONS	7
	5.1 General geology of the area.....	7
	5.2 Ground types encountered during investigation of the site	7
6	REFERENCES	7

APPENDICES

Appendix A	Site and exploratory hole location plans
Appendix B	Borehole logs
Appendix C	Core photographs
Appendix D	Groundwater and ground gas monitoring
Appendix E	Pre and post condition photos

Document Control Sheet

Report No.:		20-0525			
Project Title:		A14 Section 5 - Milton Landfill Groundwater Wells Replacement			
Client:		The A14			
Client's Representative:		Atkins			
Revision:	A00	Status:	Final for Issue	Issue Date:	30 October 2020
Prepared by:		Reviewed by:		Approved by:	
 Tom McIntyre BSc (Hons) MSc FGS		 Neil Haggan BSc (Hons) MSc FGS		 Darren O'Mahony BSc MSc MIEI EurGeol PGeo	

The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of $N \times 5 = C_u$ is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.

A14 Section 5 - Milton Landfill Site

1 AUTHORITY

On the instructions of Atkins Consulting Engineers, (“the Client’s Representative”), acting on the behalf of A14 (“the Client”), a ground investigation was undertaken at the above location to provide two replacement groundwater wells at the FCC Milton Landfill site. The works also included decommissioning historic boreholes, groundwater and ground gas monitoring.

This report details the work carried out on site; it contains a description of the site and the works undertaken, the exploratory hole logs and the gas and groundwater monitoring results.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client’s Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client’s Representative, included boreholes, groundwater sampling, groundwater and ground gas monitoring, decommissioning of historic boreholes and the preparation of a Factual Report.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted along the southern and eastern boundary of the Milton landfill site, located to the east of Milton village, just north of Cambridge. The site is bordered by the A14 to the south and the A10 to the east.

The site has nine wells (BH-W01, BH05, BH06, BH07, BH08, BH10, BH11, BH12 and BH13) used for monitoring purposes along the site boundary which are in the vicinity of the A14 Cambridge to Huntingdon improvement scheme (A14 scheme) works.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 5th – 16th October 2020, comprised:

- two rotary drilled boreholes
- a standpipe installation in two boreholes
- decommissioning of seven historic boreholes
- groundwater sampling
- groundwater and ground gas monitoring

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

4.2 Rotary drilled boreholes

Two boreholes (BH12R and BH-W01R) were put to their completion by rotary drilling techniques only. The boreholes were completed using a low ground bearing tracked Comacchio 601 drilling rig.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes, after which rotary coring was employed to recover core samples.

Where coring was carried, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in boreholes BH12R and BH-W01R as per the Investigation Supervisor's site instructions.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 Standpipe installations - decommissioning

Several existing standpipe installations from a number of previous phases of site investigation were decommissioned as part of this contract; BH-W01, BH8540, WS7512, WS8535, WS8536, WS8538 and WS8541 were all backfilled with cement bentonite grout and the headworks removed at surface.

Pre and post condition photos of the decommissioned boreholes are presented in Appendix E.

4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (UK National Grid) and ground elevation (Newlyn (GB) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

4.6 Groundwater and ground gas monitoring

During site works, groundwater and ground gas monitoring was conducted. Ground water monitoring was carried out using a water interface probe. Ground gas measurements were carried out using a GFM435 gas analyser.

As part of this contract Causeway Geotech were tasked with collecting a round of water samples from three previous-phase well installations. These samples were dropped off to the Landfill site operator (FCC) prior to shipping on to SOCOTEC labs for testing. The results of these tests are not part of this Factual Report as the testing was outside the scope of this contract.

The monitoring records are presented in Appendix D.

5 GROUND CONDITIONS

5.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise River Terrace Deposits. These deposits are underlain by mudstone of the Gault Formation and sandstone of the Greensand Formation.

5.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered typically in 250mm thickness at the two positions.
- **Made Ground (fill):** reworked sandy gravelly clay fill extending to a depth of 2.00-2.50m.
- **Fluvioglacial deposits:** typically loose to medium dense slightly clayey sands and gravels
- **Bedrock (Gault Clay and Sandstone):** Gault Clay was encountered at depths ranging from 5.50m in BH12R to 3.00m in BH-W01R, showing a trend of dipping east. BH-W01R encountered the Greensand Formation at 30.50m – 41.75m.

6 REFERENCES

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

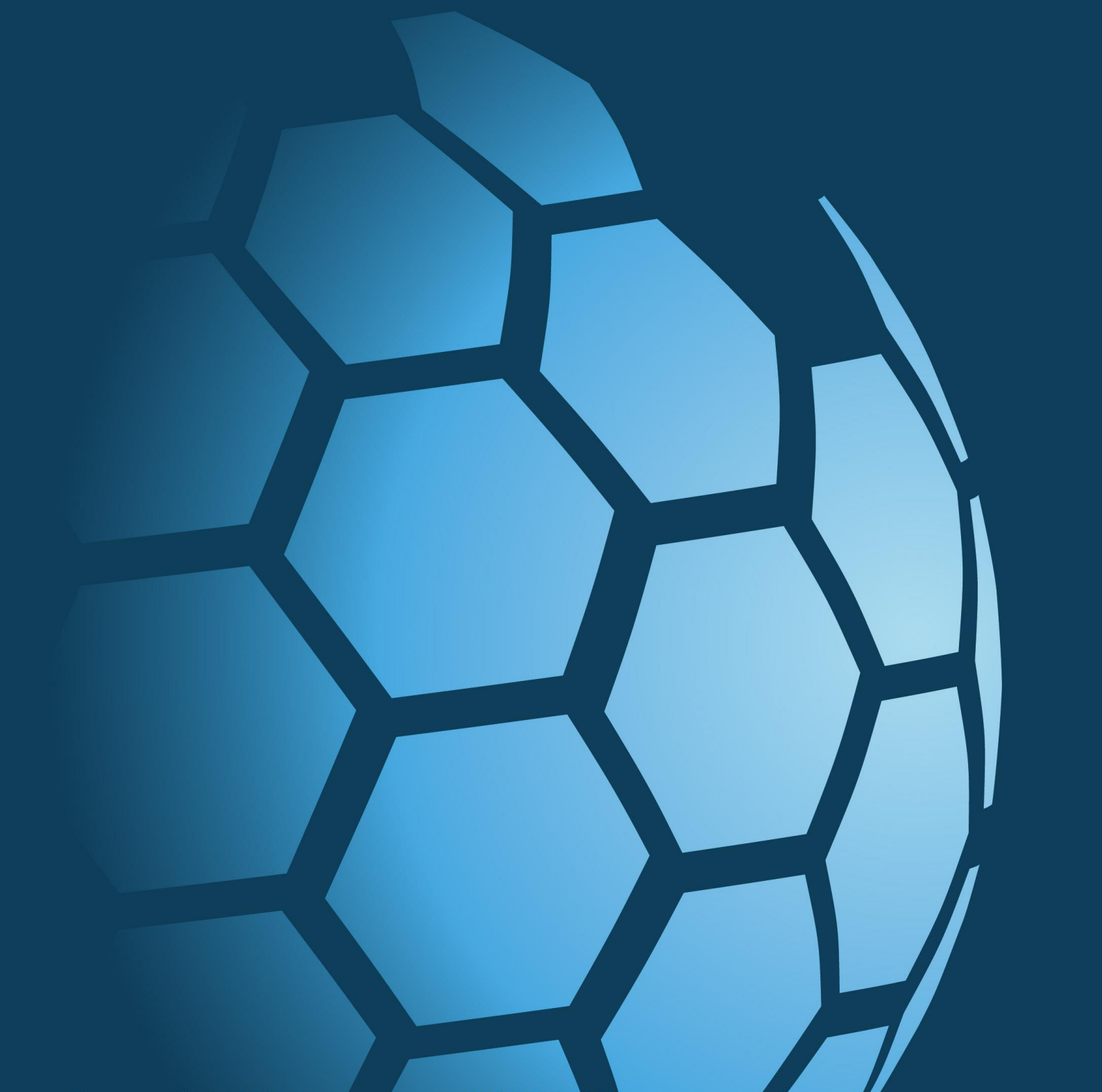
BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.



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APPENDIX A
SITE AND EXPLORATORY HOLE LOCATION PLANS





Project No.: 20-0525

Client: A14

Project Name: A14 Section 5 Milton Landfill Groundwater Well Replacement

Client's Representative: Atkins

Legend Key



Title:
Site Location Plan

Last Revised:
02/11/2020

Scale:
1:50000

 Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

2 Kilometres
1 Miles



Project No.: 20-0525

Client: A14

Project Name: A14 Section 5 Milton Landfill Groundwater Well Replacement

Client's Representative: Atkins

Legend Key

 Locations By Type - RO+RC



Title:
Site Location Plan

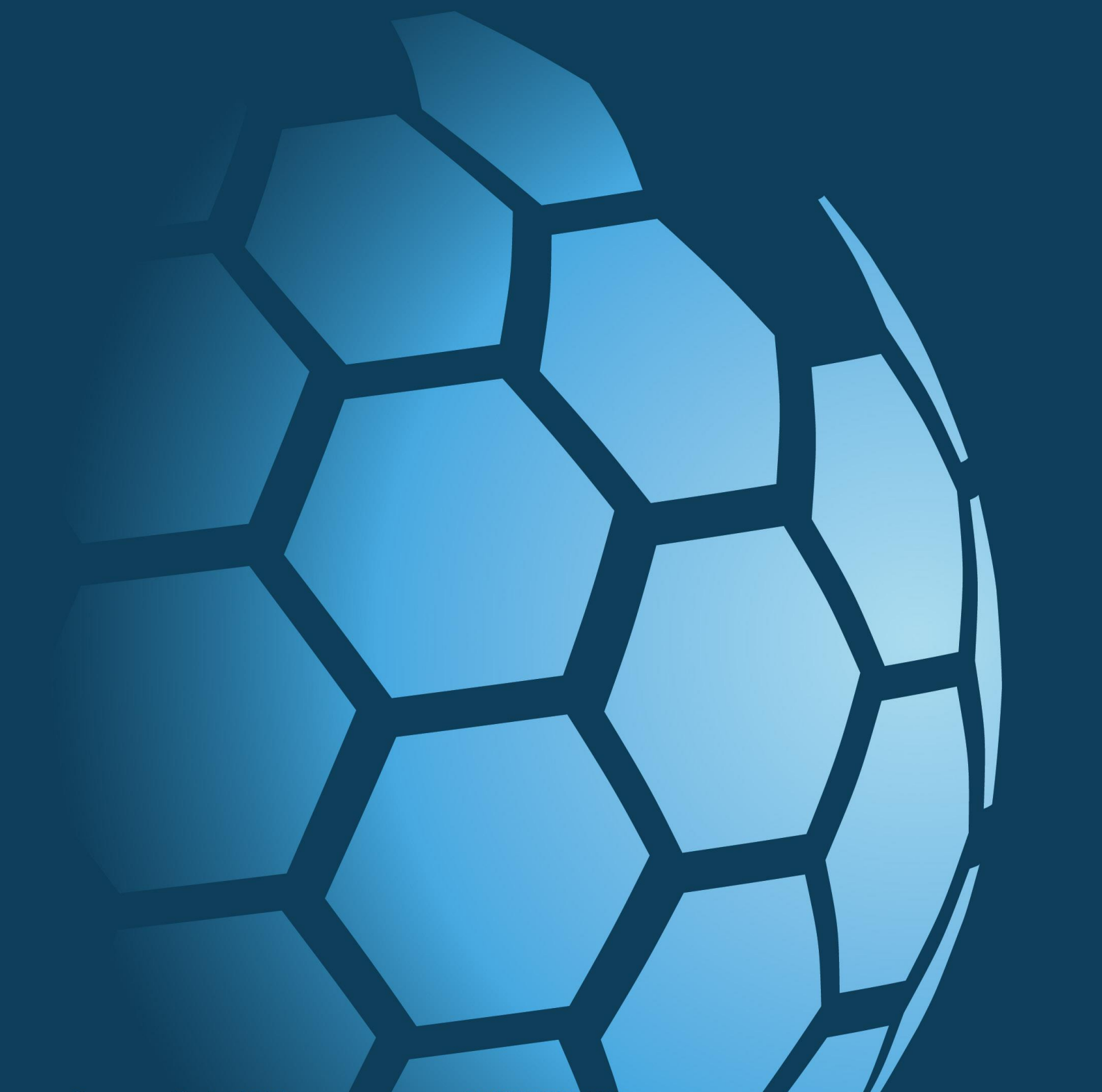
Last Revised:
28/10/2020

Scale:
1:2500



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APPENDIX B
BOREHOLE LOGS





Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 3
Rotary Drilling	Comacchio 601	0.00	2.50	546910.60 E	20.00 m	08/10/2020	JG	Scale: 1:50
Rotary Coring	Comacchio 601	2.50	5.50	262251.85 N	Elevation: 16.28 mOD	End Date: 09/10/2020	Logger: TMcl	FINAL
Rotary Drilling	Comacchio 601	5.50	10.00					
Rotary Coring	Comacchio 601	10.00	20.00					

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill						
4.00		<table border="1"> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0			16.03	0.25	TOPOSIL	MADE GROUND: Soft to firm greyish brown slightly andy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to medium of mixed lithologies.		
			0	0	0											
			0	0	0											
			1.20	Possible MADE GROUND: Firm grey slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is angular to subangular fine to medium of flint and chalk.												
2.50	Orangish brown clayey sandy subangular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to medium.															
(3.00)																
5.50					10.78	5.50		Firm grey slightly sandy silty CLAY with rare angular to subangular fine to medium gravel.								

Water Strikes				Remarks			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)				
				Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)			
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
10.00	200						
20.00	150						
Core Barrel	Flush Type	Termination Reason		Last Updated			
SK6L/SK6L	Water/Water	Terminated by Engineer at scheduled depth		02/11/2020			



Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 3
Rotary Drilling	Comacchio 601	0.00	2.50	546910.60 E	20.00 m	08/10/2020	JG	Scale: 1:50
Rotary Coring	Comacchio 601	2.50	5.50	262251.85 N	Elevation: 16.28 mOD	End Date: 09/10/2020	Logger: TMcl	FINAL
Rotary Drilling	Comacchio 601	5.50	10.00					
Rotary Coring	Comacchio 601	10.00	20.00					

Depth (m)	Sample / Tests	Field Records				Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
11.50		0	0	0			6.78	9.50	[Symbol]	Firm grey slightly sandy silty CLAY with rare angular to subangular fine to medium gravel. Stiff to very stiff light grey silty CLAY.		9.5	
								(2.00)					
12.50		0	0	0			4.78	11.50	[Symbol]	Very stiff light grey silty CLAY.		11.5	
								(1.00)					
14.00		100	97				3.78	12.50	[Symbol]	Stiff locally firm thickly laminated grey silty CLAY.		12.5	
								(1.20)					
15.50		91	78				2.58	13.70	[Symbol]	Very stiff locally stiff thickly laminated grey silty CLAY.		13.5	
								(2.00)					
17.00		100	99				0.58	15.70	[Symbol]	Very stiff thinly laminated grey silty CLAY.		15.0	
								(4.30)					
18.50												18.5	

Water Strikes				Remarks			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)				
				Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)			
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
10.00	200						
20.00	150						
Core Barrel	Flush Type	Termination Reason		Last Updated			
SK6L/SK6L	Water/Water	Terminated by Engineer at scheduled depth		02/11/2020			



Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 3 of 3
Rotary Drilling	Comacchio 601	0.00	2.50	546910.60 E 262251.85 N	20.00 m	08/10/2020	JG	Scale: 1:50
Rotary Drilling	Comacchio 601	2.50	5.50		Elevation: 16.28 mOD	End Date: 09/10/2020	Logger: TMcl	FINAL
Rotary Drilling	Comacchio 601	5.50	10.00					
Rotary Coring	Comacchio 601	10.00	20.00					

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
20.00		100	100					-3.72	20.00		Very stiff thinly laminated grey silty CLAY.		
											End of Borehole at 20.00m		

Water Strikes				Chiselling Details			Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	
Casing Details		Water Added					Termination Reason Terminated by Engineer at scheduled depth Last Updated 02/11/2020
To (m)	Diam (mm)	From (m)	To (m)				
10.00	200						
20.00	150						
				Core Barrel	Flush Type		
				SK6L/SK6L	Water/Water		





Project No.
20-0525

Project Name: A14 Section 5 Milton Landfill Groundwater Well Replacement

Borehole ID
BH-W01R

Client: A14

Client's Rep: Atkins

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 43.50 m	Start Date: 10/10/2020	Driller: JG	Sheet 1 of 5 Scale: 1:50
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 29.50	29.50 43.50	546520.24 E 262188.85 N	Elevation: 12.44 mOD	End Date: 13/10/2020	Logger: TMcl	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						12.19	0.25	TOPSOIL		
						11.34	1.10	MADE GROUND: Soft to firm brownish grey slightly sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to medium of flint, chalk and mudstone.		
						10.44	2.00	MADE GROUND: Firm brownish grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to medium of flint and mudstone.		
						9.44	3.00	Orangish brown slightly clayey gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of various lithologies.		
								Firm grey slightly sandy silty CLAY. Sand is fine.		

Water Strikes				Remarks			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)			
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
29.50	200						
43.50	150						
Core Barrel		Flush Type		Termination Reason		Last Updated	
SK6L		Water		Terminated by Engineer at scheduled depth		02/11/2020	





Project No.
20-0525

Project Name: A14 Section 5 Milton Landfill Groundwater Well Replacement

Borehole ID
BH-W01R

Client: A14

Client's Rep: Atkins

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 43.50 m	Start Date: 10/10/2020	Driller: JG	Sheet 2 of 5 Scale: 1:50
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 29.50	29.50 43.50	546520.24 E 262188.85 N	Elevation: 12.44 mOD	End Date: 13/10/2020	Logger: TMcl	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					0.44	12.00		Firm grey slightly sandy silty CLAY. Sand is fine.		
								Stiff thinly laminated grey silty CLAY		

Water Strikes				Remarks							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)							
Casing Details		Water Added									
To (m)	Diam (mm)	From (m)	To (m)								
29.50	200										
43.50	150										
				Core Barrel	Flush Type	Termination Reason			Last Updated		
				SK6L	Water	Terminated by Engineer at scheduled depth			02/11/2020		



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Project No.
20-0525

Project Name: A14 Section 5 Milton Landfill Groundwater Well Replacement

Borehole ID
BH-W01R

Client: A14

Client's Rep: Atkins

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 43.50 m	Start Date: 10/10/2020	Driller: JG	Sheet 3 of 5 Scale: 1:50
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 29.50	29.50 43.50	546520.24 E 262188.85 N	Elevation: 12.44 mOD	End Date: 13/10/2020	Logger: TMcl	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
							Stiff thinly laminated grey silty CLAY			
					-9.56	22.00	Very stiff thinly laminated locally fissured grey silty CLAY with rare shell fragments.			

Water Strikes				Remarks							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)							
Casing Details		Water Added									
To (m)	Diam (mm)	From (m)	To (m)								
29.50	200										
43.50	150										
Core Barrel		Flush Type		Termination Reason				Last Updated			
SK6L		Water		Terminated by Engineer at scheduled depth				02/11/2020			



Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 4 of 5
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 29.50	29.50 43.50	546520.24 E 262188.85 N	43.50 m	10/10/2020	JG	Scale: 1:50
					Elevation:	End Date:	Logger:	FINAL
					12.44 mOD	13/10/2020	TMcl	

Depth (m)	Sample / Tests	Field Records				Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
31.00										Very stiff thinly laminated locally fissured grey silty CLAY with rare shell fragments.			
		100	100	0			-18.06	30.50					
		100	99	0				(4.00)					
		93	73	0									
32.50										Dark grey locally dark orangish brown slightly gravelly clayey fine to medium SAND. Gravel is subangular to subrounded fine of various lithologies.			
		77	54	52			-22.06	34.50					
34.00										Extremely weak to very weak thinly bedded medium grained weakly cemented greenish grey SANDSTONE. Largely unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures, medium spaced (20/200/550), undulating, rough.			
		0	0	0				(3.10)					
35.50										<u>No Recovery - Zone of assumed core loss</u>			
		TCR	SCR	RQD	FI								

Water Strikes				Remarks			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)			
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
29.50	200						
43.50	150						
				Core Barrel	Flush Type	Termination Reason	Last Updated
				SK6L	Water	Terminated by Engineer at scheduled depth	02/11/2020





Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 43.50 m	Start Date: 10/10/2020	Driller: JG	Sheet 5 of 5 Scale: 1:50
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 29.50	29.50 43.50	546520.24 E 262188.85 N	Elevation: 12.44 mOD	End Date: 13/10/2020	Logger: TMcl	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
37.50								-25.06	37.50	Extremely weak to very weak thinly bedded medium grained weakly cemented greenish grey SANDSTONE. Largely unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures, medium spaced (20/200/550), undulating, rough. Extremely weak decomposed SANDSTONE recovered as greenish grey slightly clayey fine to medium SAND. [LOW RECOVERY]			
		40	32	0									
39.00									(4.25)	No Recovery - Zone of assumed core loss			
		0	0	0									
40.50													
		27	0	0									
42.00								-29.31	41.75	Very stiff thinly laminated grey silty CLAY with occasional rare shell fragments.			
		87	85	0					(1.75)				
43.50								-31.06	43.50	End of Borehole at 43.50m			

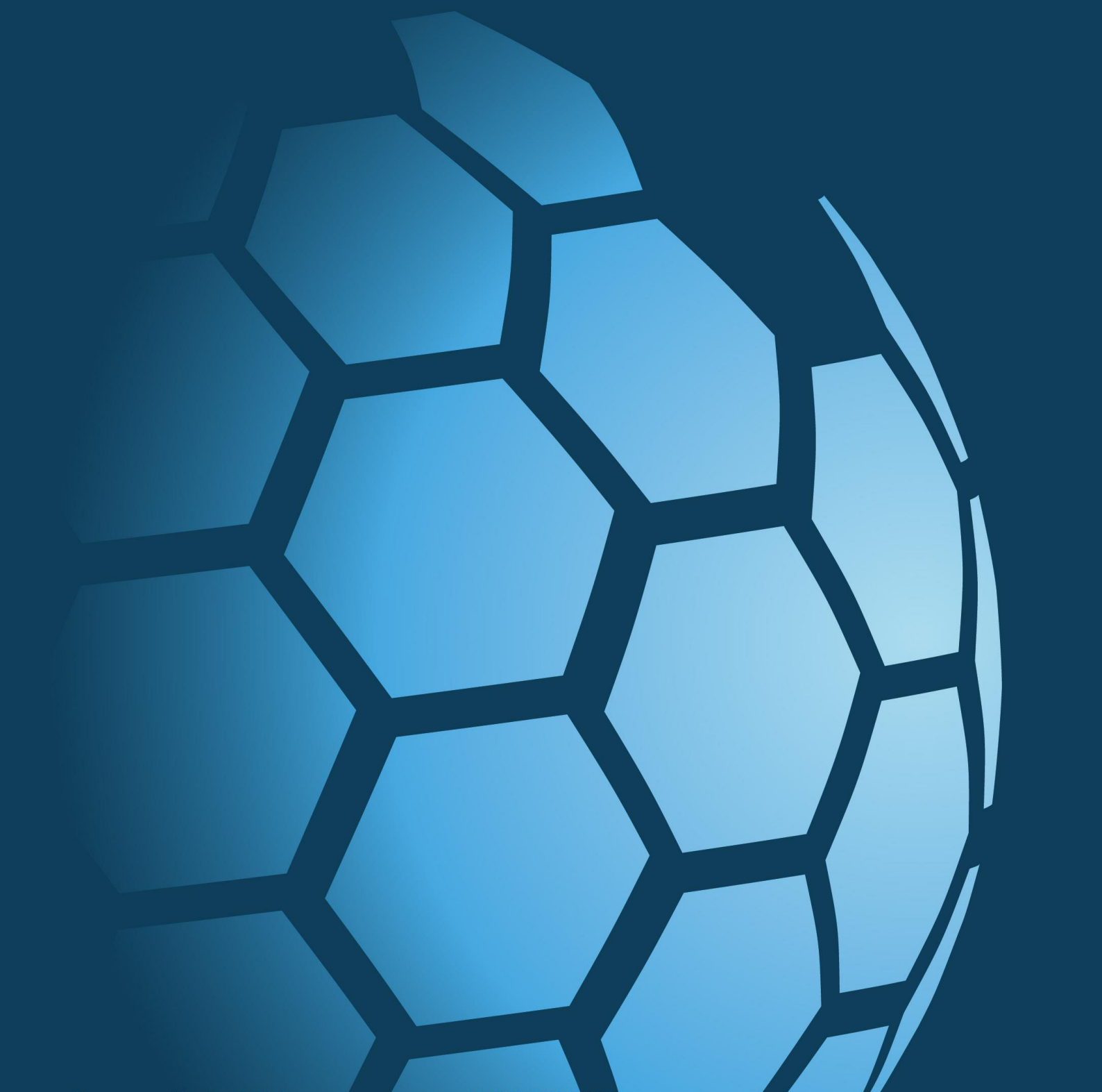
Water Strikes				Chiselling Details			Remarks Hand dug inspection pit to 1.20m Standpipe Installation (100mm diameter)
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
29.50	200						
43.50	150						
				Core Barrel	Flush Type	Termination Reason	Last Updated
				SK6L	Water	Terminated by Engineer at scheduled depth	02/11/2020





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APPENDIX C
CORE PHOTOGRAPHS





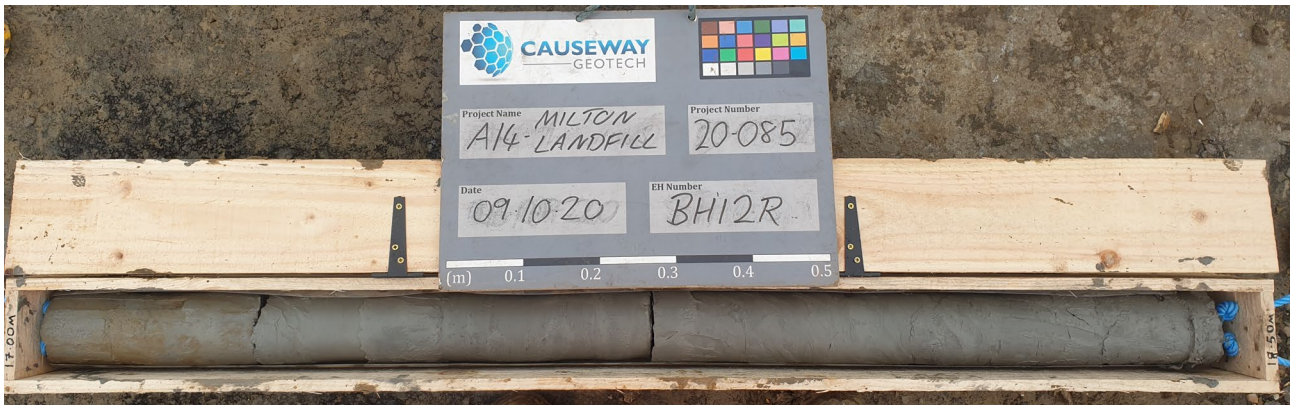
BH12R Box 1 12.50-14.00m



BH12R Box 2 14.00-15.50m



BH12R Box 3 15.50-17.00m



BH12R Box 4 17.00-18.50m



BH-W01R Box 1 29.50-31.00m



BH-W01R Box 2 31.00-32.50m



BH-W01R Box 3 32.50-34.00m



BH-W01R Box 4 34.00-35.50m

[NO CORE RECOVERY - ZONE OF CORE LOSS]

BH-W01R 35.50-37.50m



BH-W01R Box 5 37.50-39.00m

[NO CORE RECOVERY - ZONE OF CORE LOSS]

BH-W01R 39.00-40.50m



BH-W01R Box 6 40.50-42.00m



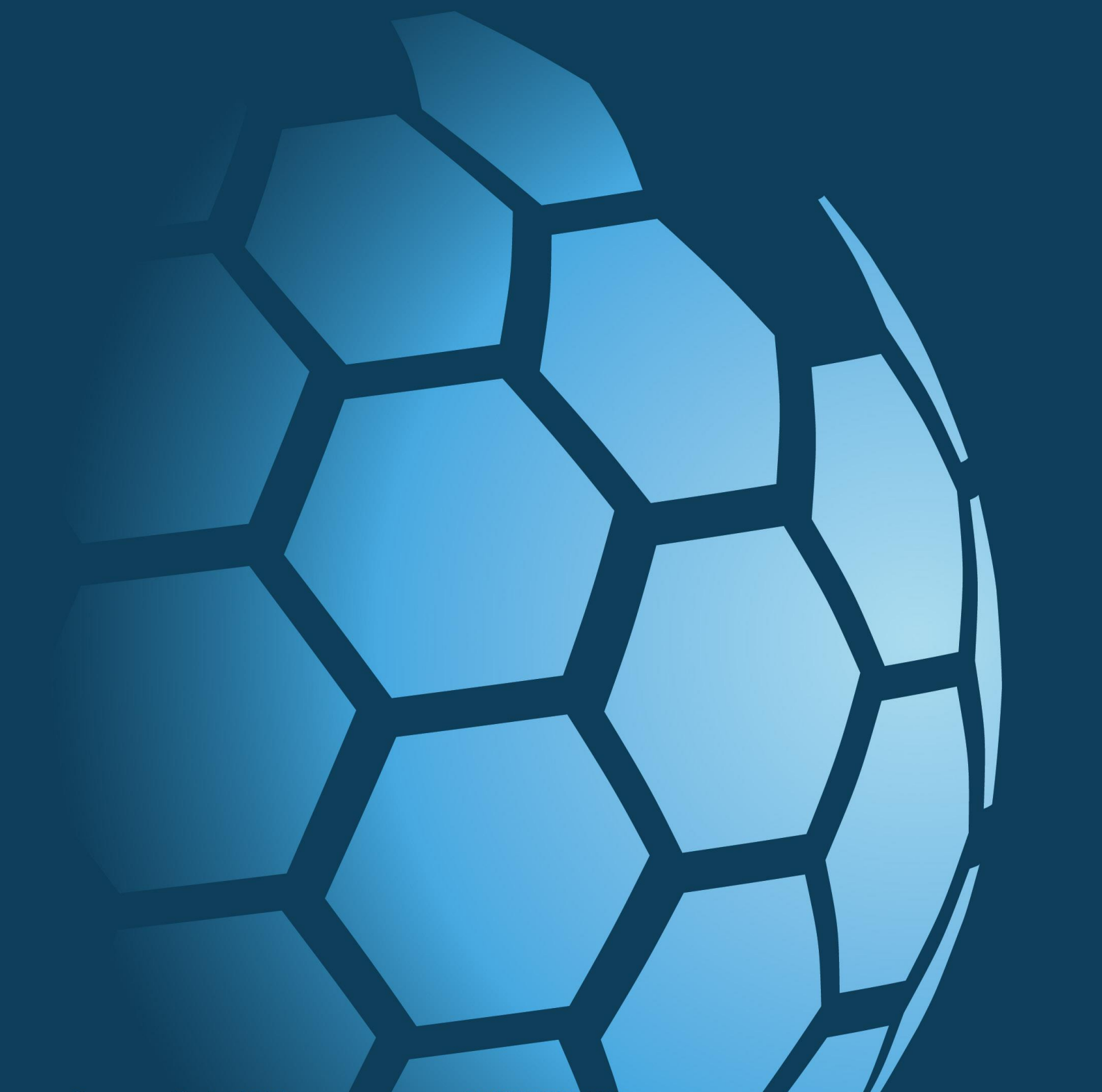
BH-W01R Box 7 42.00-43.50m



CAUSEWAY
— GEOTECH

APPENDIX D

GROUND WATER AND GAS MONITORING RECORDS



Site:	A14-Milton Landfill Site, Cambridge
Project No.:	20-0525
Date:	10/10/2020
Weather:	Dry, Sunny spells

Equipment:		GFM435 Gas Analyser				
Ambient Conditions	Barometric Pressure	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)
Before:	1019	0.0	0.0	20.4	0	0
After:	1012	0.0	0.0	20.5	0	0

BH-W01		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.4	20.0	0	1	
60	0.0	0.4	20.0	0	0	
90	0.0	0.4	20.0	0	0	
120	0.0	0.4	20.0	0	0	
150	0.0	0.4	20.0	0	0	
180	0.0	0.4	20.0	0	0	
240	0.0	0.4	20.0	0	0	
300	0.0	0.4	20.0	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		5.01m
Depth to bottom of BH		>50.00m+
Sample collected (Y/N)		N

BH05		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.3	19.7	1	1	
60	0.0	0.3	19.7	1	1	
90	0.0	0.3	19.7	1	1	
120	0.0	0.3	19.7	1	0	
150	0.0	0.3	19.7	1	0	
180	0.0	0.3	19.7	1	0	
240	0.0	0.3	19.7	0	0	
300	0.0	0.3	19.7	0	1	

Flow rates	
Time (sec)	Flow (l/h)
30	-0.6
60	-0.4
90	-0.1
120	-0.1
150	-0.1
180	0.0
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		2.01m
Depth to bottom of BH		N/A
Sample collected (Y/N)		N/A

BH06		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.1	20.6	0	0	
60	0.0	0.1	20.6	4	0	
90	0.0	0.0	20.6	0	0	
120	0.0	0.0	20.5	0	0	
150	0.0	0.0	20.5	0	0	
180	0.0	0.0	20.5	0	0	
240	0.0	0.0	20.5	0	0	
300	0.0	0.0	20.5	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.1
60	0.1
90	0.1
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		N/A
Depth to bottom of BH		N/A
Sample collected (Y/N)		N/A
Comment - Unable to remove cap end		

BH07		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.3	20.3	0	0	
60	0.0	0.3	20.4	0	0	
90	0.0	0.3	20.4	0	0	
120	0.0	0.3	20.4	0	0	
150	0.0	0.3	20.4	0	0	
180	0.0	0.3	20.4	0	0	
240	0.0	0.3	20.3	4	0	
300	0.0	0.3	20.3	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		1.84m
Depth to bottom of BH		N/A
Sample collected (Y/N)		N/A

BH08		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	15.1	14.1	0.5	0	0	
60	15.2	13.3	1.8	0	0	
90	15.0	14.2	0.2	0	0	
120	15.4	14.1	0.7	0	0	
150	15.6	14.3	0.2	0	0	
180	15.4	14.3	0.2	0	0	
240	15.4	14.3	0.2	0	0	
300	15.4	14.3	0.2	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		3.45m
Depth to bottom of BH		12.6m
Sample collected (Y/N)		N
Sample depth		N/A
Comment - Valve slightly damaged		

BH10		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.5	18.4	0	0	
60	0.2	0.4	18.4	0	0	
90	0.0	0.3	18.5	0	0	
120	0.0	0.3	18.5	0	0	
150	0.0	0.3	18.5	0	0	
180	0.0	0.3	18.5	0	0	
240	0.0	0.3	18.4	0	0	
300	0.0	0.3	18.4	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.3
60	0.2
90	0.2
120	0.1
150	0.1
180	0.1
240	0.0
300	0.0

Groundwater monitoring		mbgl
Depth to top of water		N/A
Depth to bottom of BH		N/A
Sample collected (Y/N)		N/A
Comment - Unable to remove cap end		



Site:	A14-Milton Landfill Site, Cambridge
Project No.:	20-0525
Date:	10/10/2020
Weather:	Dry, Sunny spells

Equipment:		GFM435 Gas Analyser				
Ambient Conditions	Barometric Pressure	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)
Before:	1019	0.0	0.0	20.4	0	0
After:	1012	0.0	0.0	20.5	0	0

BH11		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	44.6	26.0	1.6	0	0	
60	44.9	26.6	1.2	0	0	
90	45.3	26.9	1.0	0	0	
120	42.3	26.1	1.6	0	0	
150	43.1	26.0	2.0	0	0	
180	42.3	25.0	2.8	0	0	
240	42.3	25.3	2.8	0	0	
300	42.2	25.3	1.8	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	-0.6
60	-0.6
90	-0.4
120	-0.4
150	-0.3
180	-0.3
240	-0.2
300	-0.2

Groundwater monitoring	mbgl
Depth to top of water	8.38m
Depth to bottom of BH	N/A
Sample collected (Y/N)	N/A
Comment - Gas bung loose	

BH12		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.0	20.5	0	0	
60	0.0	0.0	20.5	0	0	
90	0.0	0.0	20.5	0	0	
120	0.0	0.0	20.5	0	0	
150	0.0	0.0	20.5	0	0	
180	0.0	0.0	20.5	0	0	
240	0.0	0.0	20.5	0	0	
300	0.0	0.0	20.5	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring	mbgl
Depth to top of water	6.74m
Depth to bottom of BH	16.75m
Sample collected (Y/N)	Y

BH12R		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	1.1	0.8	18.8	4	1	
60	1.2	0.8	18.7	4	0	
90	1.2	0.8	18.7	9	0	
120	1.2	0.8	18.6	4	0	
150	1.2	0.8	18.6	4	0	
180	1.2	0.8	18.6	0	0	
240	1.2	0.8	18.6	0	0	
300	1.2	0.8	18.6	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring	mbgl
Depth to top of water	8.45m
Depth to bottom of BH	19.26m
Sample collected (Y/N)	N
Sample depth	N/A

BH13		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	5.5	11.2	0	0	
60	0.0	5.6	11.0	0	0	
90	0.0	5.6	11.1	0	0	
120	0.0	5.5	11.0	0	0	
150	0.0	5.5	11.0	1	1	
180	0.0	5.5	11.0	0	0	
240	0.0	5.5	11.0	0	0	
300	0.0	5.5	11.0	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	0.0
60	0.0
90	0.0
120	0.0
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring	mbgl
Depth to top of water	6.89m
Depth to bottom of BH	N/A
Sample collected (Y/N)	N

BH-W01R		Gas readings				
Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)	
30	0.0	0.0	21.3	0	0	
60	0.0	0.0	21.3	0	0	
90	0.0	0.0	21.2	0	0	
120	0.0	0.0	21.2	0	0	
150	0.0	0.0	21.2	0	0	
180	0.0	0.0	21.2	0	0	
240	0.0	0.0	21.2	0	0	
300	0.0	0.0	21.2	0	0	

Flow rates	
Time (sec)	Flow (l/h)
30	2.5
60	2.0
90	1.0
120	0.3
150	0.0
180	0.0
240	0.0
300	0.0

Groundwater monitoring	mbgl
Depth to top of water	5.61m
Depth to bottom of BH	>30.00m
Sample collected (Y/N)	N
Comment - Monitored on 15/10/20	

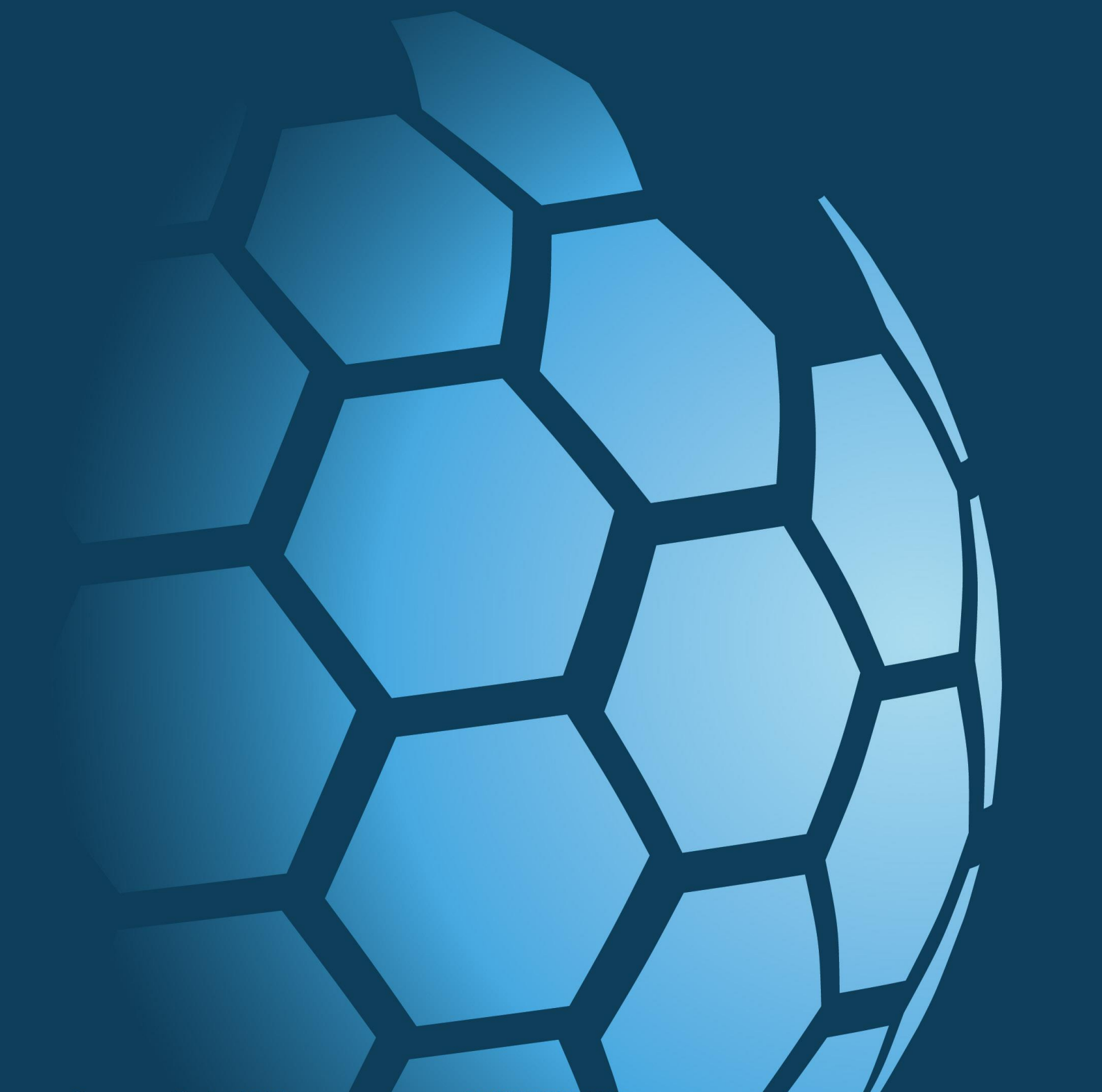




CAUSEWAY
— GEOTECH

APPENDIX E

PRE AND POST CONDITION PHOTOGRAPHS





WS8541 - Pre condition



WS8541 - Post condition



BH8540 - Pre condition



BH8540 - Post condition



WS7512 - Pre condition



WS7512 - Post condition



WS8536 - Pre condition



WS8536 - Post condition



WS8535 - Pre condition



WS8535 - Post condition



WS8538 - Pre condition



WS8538 - Post condition



BHW01- Pre condition



BHW01 - Post condition



BHW01 - Post condition

APPENDIX 3
Gas Well Table

Phase	Cell	Proposed level	Well i/d	dip to base (m)	% original drilled depth	dip to liquid (m)	Ground level mAOD	Leachate mAOD	Existing leachate lower than proposed	Base mAOD	Base above proposed leachate level	Effective slotted depth (m)	% original effective slotted depth	% slotted below liquid level
1	container	8	MILWB001	-	-	-						-	-	-
1	container	8	MILWB008	-	-	-						-	-	-
1		8	MILRA004	-	-	-	12.895					-	-	-
1		8						0		0				
1		8	MILRD023	12	96.00%	12	21.678	9.678		9.678	1	5.3	91.40%	0.00%
1		8	MILWB15L	11.5	84.10%	5.1	14.498	9.398		2.998		-	-	-
1		8	MILWB17L	11.8	88.90%	6.9	16.458	9.558		4.658		-	-	-
1		8	MILWB18L	12.1	91.00%	3.9	15.865	11.965		3.765		-	-	-
1		8					19.085			19.085				
1		8	MILWB20L	16.7	92.90%	13.4	19.836	6.436	1	3.136		-	-	-
1		8	MILWB21L	21.6	161.50%	14.2	20.361	6.161	1	-1.239		-	-	-
1		8	MILRB010	15.2	88.40%	7.9	18.064	10.164		2.864		1.9	17.00%	79.40%
1		8	MILWB13L	14	86.20%	14	15.687	1.687	1	1.687		-	-	-
1		8	MILWB14L	17.5	91.60%	16.6	14.556	-2.044	1	-2.944		-	-	-
1		8	MILWB16L	15.1	-	13.2	17.753	4.553	1	2.653		-	-	-
1		8	MILWB23L	14.5	90.80%	8	15.747	7.747	1	1.247		-	-	-
2	2	8	MILRD014	5.9	88.10%	3.4	14.071	10.671		8.171	1	-0.3	-9.30%	112.70%
2	2	8	MILRD016	7.6	97.40%	5.3	15.607	10.307		8.007		-0.1	-5.00%	105.50%
2	3	8	MILRF004	6.6	37.90%	6.6	22.054	15.454		15.454	1	1.2	9.80%	0.00%
2	4	8	MILRE006	7.1	97.80%	2.7	14.698	11.998		7.598		-1.6	-54.70%	157.80%
2	4	8	MILRE007	8.7	64.30%	4.6	18.513	13.913		9.813	1	-4.6	-1.07	-7.846
2	4	8	MILRE008	11.6	74.00%	10.5	22.15	11.65		10.55	1	6.7	56.30%	14.30%
2	4	8	MILRD015	-	-	-	13.224					-	-	-
2	5	8	MILRE001	12.5	90.70%	5.4	17.807	12.407		5.307		0.4	4.30%	95.00%
2	5	8	MILRE002	12.4	82.00%	7.3	18.999	11.699		6.599		0.7	8.70%	87.20%
2	5	8	MILRE003	9.3	60.30%	8.1	19.237	11.137		9.937	1	1.6	17.30%	45.10%
2	5	8	MILRE004	12	80.30%	4.2	18.386	14.186		6.386		-1.7	-19.20%	128.60%
2	5	8	MILRE013	8.7	99.50%	6.5	16.074	9.574		7.374		4	65.20%	34.40%
2	6	8	MILRD001	13.6	95.60%	11.3	20.305	9.005		6.705		6	67.20%	27.80%
2	6	8	MILRD012	12.6	98.90%	9.4	18.776	9.376		6.176		5.6	62.70%	36.30%
2	7	8	MILRD011	10.4	88.10%	9.6	17.258	7.658	1	6.858		3.8	63.70%	17.00%
2	7	8	MILRD013	9.8	95.70%	6.5	16.349	9.849		6.549		2.3	38.70%	58.30%
2	8	8	MILRD009	13	94.50%	8.5	18.507	10.007		5.507		3.6	40.50%	55.80%
2	9&10	8	MILRD005	11.4	84.70%	9	20.058	11.058		8.658	1	-	-	-
2	9&10	8	MILW1601	10.1	-	4.7	14.989	10.289		4.889		-	-	-
2	9&10	8	MILWD007	4.4	-	2.7	14.320	11.62		9.92	1	-	-	-
2	9&10	8	MILWD008	-	-	-	14.792					-	-	-
2	9&10	8	MILRD002	11.8	79.30%	10.7	17.002	6.302	1	5.202		-	-	-
2	9&10	8	MILRD003	16.2	89.80%	11.6	17.181	5.581	1	0.981		-	-	-
2	9&10	8	MILRD004	13.3	80.60%	8.6	15.359	6.759	1	2.059		2.6	25.00%	64.10%

Phase	Cell	Proposed level	Well i/d	dip to base (m)	% original drilled depth	dip to liquid (m)	Ground level mAOD	Leachate mAOD	Existing leachate lower than proposed	Base mAOD	Base above proposed leachate level	Effective slotted depth (m)	% original effective slotted depth	% slotted below liquid level
2	9&10	8	MILRD04A	13.3	83.10%	12.7	18.022	5.322	1	4.722		3.9	54.40%	12.90%
2	9&10		MILWD26L	13.3	175.50%	12.6	17.148	4.548	1	3.848		-	-	-
3	22	9	MILW1801	-	-	-	24.253					-	-	-
3	22	9	MILW1802	-	-	-	25.126					-	-	-
3	22	9	MILW1804	-	-	-	26.035					-	-	-
3	22	9	MILW1805	-	-	-	24.917					-	-	-
3	22	9	MILW1806	12.6	103.30%	12.6	25.759	13.159		13.159	1	7.6	105.60%	0.00%
3	22	9	MILW1807	3.4	24.40%	3.4	25.533	22.133		22.133	1	-1.6	-18.40%	0.00%
3	22	9	MILW1817	-	-	-	23.996					-	-	-
3	22	9	MILW2002	-	-	-	24.425					-	-	-
3	22	9	MILW2003	-	-	-	25.414					-	-	-
3	22	9	MILW2004	-	-	-	25.947					-	-	-
3	22	9	MILW2010	-	-	-	22.867					-	-	-
3	23	9	MILW1811	-	-	-	21.739					-	-	-
3	23	9	MILW1812	13.8	99.30%	13.8	20.067	6.267	1	6.267		8.8	98.90%	0.00%
3	23	9	MILW1813	12	96.00%	12	18.632	6.632	1	6.632		7	93.30%	0.00%
3	23	9	MILW1814	13.4	100.40%	12.6	19.614	7.014	1	6.214		7.6	91.60%	9.00%
3	23	9	MILW2005	-	-	-	25.146					-	-	-
3	23	9	MILW2007	11.4	101.60%	10.2	20.295	10.095		8.895		4.2	99.80%	22.10%
3	12A	8.5	MILRF012	14.8	97.60%	14.1	20.199	6.099	1	5.399		10.8	90.60%	6.60%
3	12A	8.5	MILRF021	11.6	94.80%	8.5	19.730	11.23		8.13		1.3	25.60%	70.60%
3	12A/12C	8.5	MILRF009	14.7	95.80%	9.4	20.478	11.078		5.778		6.1	51.30%	46.30%
3	12B	9	MILWF016	16	90.20%	14.4	21.379	6.979	1	5.379		-	-	-
3	12B	9	MILWF018	-	-	-	21.721					-	-	-
3	12C	8.5	MILRF002	8.1	67.50%	6.2	18.672	12.472		10.572	1	3.1	35.10%	37.60%
3	12C	8.5	MILRF003	10.6	81.90%	6.8	21.594	14.794		10.994	1	2.7	30.30%	58.70%
3	12C	8.5	MILRF008	10.2	70.30%	10.2	22.887	12.687		12.687	1	4.6	51.70%	0.00%
3	12C	8.5	MILW1204	14.5	88.00%	9	21.136	12.136		6.636		4	67.30%	57.60%
3	12C	8.5	MILW1308	6.9	96.00%	3.3	13.848	10.548		6.948		-0.7	-21.20%	123.30%
3	12D	9	MILRF007	15.3	96.40%	13.4	23.014	9.614		7.714		9.4	81.00%	17.00%
3	13A	8.5	MILRG004	-	-	-	20.813					-	-	-
3	13A	8.5	MILW1307	-	-	-	23.561					-	-	-
3	13B	9	MILRF014	13.9	98.60%	13.8	21.654	7.854	1	7.754		8.6	96.20%	1.60%
3	13B	9	MILRF015	19.7	168.40%	10.6	18.784	8.184	1	-0.916		4.9	81.70%	65.00%
3	13B	9	MILRG002	19.1	105.00%	16.1	23.157	7.057		4.057		5.1	29.60%	37.50%
3	13B	9	MILWG001	15.3	91.10%	13.1	20.420	7.32	1	5.12		-	-	-
3	14A	8.5	MILRH003	16.9	94.80%	14.8	23.188	8.388	1	6.288		4	56.90%	34.50%
3	14A	8.5	MILRH012	21	120.10%	15.9	24.503	8.603		3.503		9.1	84.70%	36.30%
3	14A	8.5	MILRH11A	13.4	98.00%	7.8	17.630	9.83		4.23		-0.2	-3.50%	103.70%
3	14B	9	MILRH005	19.3	214.00%	12.9	23.496	10.596		4.196		5.4	360.00%	54.10%

Phase	Cell	Proposed level	Well i/d	dip to base (m)	% original drilled depth	dip to liquid (m)	Ground level mAOD	Leachate mAOD	Existing leachate lower than proposed	Base mAOD	Base above proposed leachate level	Effective slotted depth (m)	% original effective slotted depth	% slotted below liquid level
3	14B	9	MILRH007	-	-	-	20.010					-	-	-
3	14B	9	MILRH014	14.8	90.40%	13.1	22.696	9.596		7.896		3.7	52.90%	31.70%
3	14B	9	MILRH015	15.2	102.00%	10.8	20.601	9.801		5.401		3.9	48.30%	53.50%
3	15A	9	MILWJ004	8.5	82.50%	8.5	22.369	13.869		13.869	1	-	-	-
3	15A	9	MILWJ006	11.3	86.10%	8.7	17.282	8.582	1	5.982		-	-	-
3	15B	8.5	MILRK001	19.1	95.50%	18.4	23.129	4.729	1	4.029		5.4	76.90%	11.80%
3	15B	8.5	MILRK002	17.4	95.30%	17	23.403	6.403	1	6.003		5.7	80.90%	7.80%
3	15B	8.5	MILW0001	16.7	115.60%	16	21.335	5.335	1	4.635		-	-	-
3	15B	8.5	MILW1401	14.3	95.30%	14	23.493	9.493		9.193	1	8	89.10%	3.40%
3	16A	9	MILW0011	16	90.40%	14.9	22.564	7.664	1	6.564		8.1	74.30%	12.00%
3	16A	9	MILWK006	9.5	87.20%	8.9	17.963	9.063		8.463		-	-	-
3	16B	9	MILW0009	-	-	-	24.282					-	-	-
3	16B	9	MILW1309	-	-	-	22.094					-	-	-
3	16B	9	MILW1310	-	-	-	23.184					-	-	-
3	16B	9	MILW1704	16.7	95.60%	16.1	23.752	7.652	1	7.052		11.1	96.40%	5.50%
3	16B	9	MILW1705	-	-	-	25.321					-	-	-
3	16B	9	MILW1703	12.8	97.80%	8.6	21.891	13.291		9.091	1	3.6	51.10%	53.60%
3	17A	9	MILW0015	10.2	100.20%	9.3	18.296	8.996	1	8.096		2.6	74.30%	26.10%
3	17A	9	MILW0016	14	95.40%	13.5	20.086	6.586	1	6.086		-	-	-
3	17A	9	MILW0026	15.4	89.40%	14.2	21.622	7.422	1	6.222		7.7	72.00%	13.30%
3	17A	9	MILW1301	-	-	-	22.444					-	-	-
3	17A	9	MILW1302	15.4	86.00%	13.7	22.995	9.295		7.595		9.7	70.00%	14.50%
3	17A	9	MILW1311	-	-	-	25.428					-	-	-
3	17A	9	MILW1706	-	-	-	24.780					-	-	-
3	17A	9	MILW0013	13.7	98.90%	13.2	20.903	7.703	1	7.203		6.5	89.70%	8.20%
3	18A	9	MILW0017	12.9	93.50%	10.9	18.758	7.858	1	5.858		-	-	-
3	18A	9	MILW0018	8.2	55.80%	8.2	18.911	10.711		10.711	1	-	-	-
3	18A	9	MILW0019	12.4	95.40%	11.5	17.973	6.473	1	5.573		-	-	-
3	18A	9	MILW0020	10.2	89.10%	10.2	16.996	6.796	1	6.796		-	-	-
3	18B	9	MILW0021	-	-	-	17.996					-	-	-
3	18B	9	MILW0023	11.4	71.90%	10.3	19.685	9.385		8.285		4.3	43.60%	20.40%
3	18B	9	MILW1304	-	-	-	20.204					-	-	-
3	18B	9	MILW1305	-	-	-	19.111					-	-	-
3	18C	9	MILW1303	16.2	95.10%	13.6	21.893	8.293	1	5.693		9.6	73.50%	21.60%
3	18C	9	MILW1306	-	-	-	19.974					-	-	-
3	18D	9	MILW1312	-	-	-	22.014					-	-	-
3	18D	9	MILW1403	-	-	-	19.029					-	-	-
3	19A	9	MILW1404	-	-	-	18.359					-	-	-
3	19A	9	MILW1505	-	-	-	19.450					-	-	-
3	19A	9	MILW1506	-	-	-	17.892					-	-	-

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3	19A	9	MILW1609	-	-	-	19.894					-	-	-
3	19A	9	MILW1610	-	-	-	20.364					-	-	-
3	19A	9	MILW1611	11.7	92.40%	8.1	17.794	9.694		6.094		3.1	46.30%	54.00%
3	19A	9	MILW1612	13.2	99.30%	6.2	18.332	12.132		5.132		1.2	16.40%	85.40%
3	19A	9	MILW1613	-	-	-	21.252					-	-	-
3	19A	9	MILW1614	-	-	-	21.240					-	-	-
3	19A	9	MILW1407	-	-	-						-	-	-
3	19A	9	MILW1507	-	-	-	12.193					-	-	-
3	19B	9	MILW1606	-	-	-	23.709					-	-	-
3	19B	9	MILW1608	-	-	-	25.434					-	-	-
3	19B	9	MILW1615	-	-	-	24.003					-	-	-
3	19B	9	MILW1616	9.1	52.90%	9.1	24.953	15.853		15.853	1	6.1	50.00%	0.00%
3	19B	9	MILW1702	-	-	-	25.197					-	-	-
3	19B	9	MILW1803	9.7	50.40%	9.7	24.903	15.203		15.203	1	4.7	33.00%	0.00%
3	19B	9	MILW1808	-	-	-	25.234					-	-	-
3	20B	8.5	MILW0006	-	-	-	19.600					-	-	-
3	20B	8.5	MILW1408	-	-	-	22.819					-	-	-
3	20B	8.5	MILW1604	17.1	-	10.9	23.979	13.079		6.879		-	-	-
3	20B	8.5	MILW1701	-	-	-	22.616					-	-	-
3	20B	8.5	MILW2001	-	-	-	24.284					-	-	-
3	21a	9	MILW1809	-	-	-	24.887					-	-	-
3	21a	9	MILW1810	-	-	-	22.910					-	-	-
3	21a	9	MILW1815	11.1	101.80%	11.1	21.027	9.927		9.927	1	6.1	103.40%	0.00%
3	21a	9	MILW1816	9.9	96.10%	9.9	22.290	12.39		12.39	1	4.9	92.50%	0.00%
3	21a	9	MILW2009	-	-	-	25.747					-	-	-
3	24A	9	MILW2006	-	-	-	22.336					-	-	-
3	24A	9	MILW2008	-	-	-	17.133					-	-	-
			MILRF010	-	-	-						-	-	-
								0		0				
			MILW1201	9	108.40%	6.1		-6.1		-9		1.1	33.30%	72.50%
			MILW1202	10.3	99.30%	8.6		-8.6		-10.3		3.6	67.40%	31.70%
			MILW1405	-	-	-	20.923					-	-	-
								0		0				
			MILWD009	-	-	-						-	-	-
			MILWD010	-	-	-						-	-	-
			MILWD011	-	-	-						-	-	-
			MILWD012	-	-	-						-	-	-

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			MILWE007	-	-	-						-	-	-
		Average		12.74	93.20%	10.17	20.49	8.78		6.43		4.28	0.54	0.26
		Count	154						35		21			