



**CONSTRUCTION QUALITY ASSURANCE (CQA)
VERIFICATION REPORT FOR THE INSTALLATION OF
GAS AND GROUNDWATER MONITORING BOREHOLES
AT CWMRHYDYCEIRW QUARRY LANDFILL,
MORRISTON, SWANSEA**

ENVIRONMENTAL PERMIT NUMBER EPR/TP3835LV

Report reference: SIG/CW/KE/20012/01/BHCQAVF
February 2023

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This report has been prepared by MJCA with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between MJCA and the Client. This report is confidential to the client and MJCA accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by MJCA beforehand. Any such party relies upon the report at their own risk.

1. Introduction

- 1.1** MJCA is commissioned by SI Green UK Limited to carry out the Construction Quality Assurance (CQA) for the installation of replacement gas and groundwater monitoring boreholes and additional gas monitoring boreholes at Cwmrhydyceirw Quarry Landfill (the site). The drilling and installation works were carried out in October and November 2022.
- 1.2** A proposal for the drilling and installation of three additional perimeter gas monitoring boreholes (LFG49, LFG50 and LFG51) is presented in a CQA Plan (Report reference SIG/CW/KE/20012/01/BHCQA) (the September 2020 CQA Plan) provided to Natural Resources Wales (NRW) on 4 September 2020. NRW provided confirmation of agreement of the September 2020 CQA Plan in an email dated 11 September 2020. A copy of the September 2020 CQA Plan is presented at Appendix A. The September 2020 CQA Plan also included borehole decommissioning works at the site which are the subject of a separate CQA Validation report.
- 1.3** A proposal for the drilling and installation of nine replacement gas monitoring boreholes (LFG2R¹, LFG18R, LFG23R, LFG35R, LFG43R, LFG44R, LFG46R, LFG47R and LFG48R), the drilling and installation of four pairs of replacement gas monitoring boreholes (LFG24R-A, LFG24R-B, LFG25R-A, LFG25R-B, LFG26R-A, LFG26R-B, LFG27R-A and LFG27R-B) and the drilling and installation of two replacement groundwater monitoring boreholes (CWMGW03R and CWMGW08R) is presented in a CQA Plan (Report reference SIG/CW/KE/20012/01/BHCQA-R dated September 2022) (the September 2022 CQA Plan) provided to NRW on 6 September 2022. NRW provided confirmation of agreement of the September 2022 CQA Plan in an email dated 13 September 2022. A copy of the September 2022 CQA Plan is presented at Appendix B.
- 1.4** Copies of email correspondence from NRW dated 11 September 2002 and 13 September 2022 confirming their agreement of the CQA Plans are presented at Appendix C.

¹ Note that borehole LFG2R is a combined gas and groundwater monitoring borehole but for the purposes of the CQA Plan and this CQA Verification report it is referred to as a gas monitoring borehole.

- 1.5** This report comprised the CQA Verification Report for the installation of twenty gas monitoring boreholes LFG2R¹, LFG18R, LFG23R, LFG24R-A, LFG24R-B, LFG25R-A, LFG25R-B, LFG26R-A, LFG26R-B, LFG27R-A, LFG27R-B, LFG35R, LFG43R, LFG44R, LFG46R, LFG47R, LFG48R, LFG49, LFG50 and LFG51 and two groundwater monitoring boreholes CWMGW03R and CWMGW08R. The locations of the boreholes are shown on Figure 1. This CQA Verification report is submitted pursuant to Condition 2.7.4 of Environmental Permit reference EPR/TP3835LV (the permit).
- 1.6** MJCA personnel providing the role of the CQA Inspector were present for the duration of the borehole drilling and installation works to provide instructions for the borehole installation design. The initial installation works commenced 10 October 2022 and were completed 11 November 2022.

2. Description and results of the site works

Locations

- 2.1** The locations of the gas and groundwater monitoring boreholes are shown on Figure 1. The coordinates of the boreholes are presented in Table 1 and on the borehole logs presented at Appendix D. Prior to commencement of drilling works the proposed locations of the gas and groundwater monitoring boreholes were surveyed to record the coordinates and ground level of each borehole location to verify that the locations and ground levels were consistent generally with those proposed in the agreed CQA Plans. The coordinates for the proposed locations of gas monitoring boreholes LFG23R and LFG47R were not included in the September 2022 CQA plan. During the drilling works it was necessary to reposition some of the borehole locations due to access and safety reasons, in particular to facilitate the safe positioning of the drilling rig near to the edge of the quarry and on stable and even ground surfaces. Gas monitoring boreholes LFG23R and LFG35R and groundwater monitoring borehole CWMGW08R were repositioned due to access issues. Groundwater monitoring borehole CWMGW03R was repositioned as the proposed location was considered not to be stable. Gas monitoring borehole LFG48R was repositioned to be closer to the location of the original location of gas monitoring borehole LFG48.

Drilling works

- 2.2** The drilling and installation of the gas and groundwater monitoring boreholes was supervised by an MJCA CQA inspector who recorded the ground conditions and other relevant information in accordance with BS5930:2015 + A1:2020 “Code of practice for ground investigations” and the Environment Agency guidance document reference LFTGN02 entitled “Guidance on monitoring of landfill leachate, groundwater and surface water” dated February 2003. The borehole logs were prepared by an MJCA CQA inspector and are presented at Appendix D. As presented in Table 2 of the agreed September 2020 CQA Plan dated (Appendix A) and Tables 2 and 3 of the September 2022 CQA Plan (Appendix B) and with the exception of boreholes LFG23R, LFG24R-A, LFG24R-B, LFG25R-A, LFG25R-B, LFG26R-A, LFG26R-B, LFG27R-A and LFG27R-B, the depths to the base of the boreholes were determined to be equivalent to the approximate level of the base of the landfill which is approximately at 31mAOD. The final depths of the boreholes were determined based on on-site

observations. Boreholes LFG23R, LFG24R-A, LFG24R-B, LFG25R-A, LFG25R-B, LFG26R-A, LFG26R-B, LFG27R-A and LFG27R-B were drilled to monitor the shallower ground as the existing boreholes at these locations which were drilled to levels consistent with the base of the landfill were flooding hence were not providing effective gas monitoring facilities.

- 2.3** The borehole locations, the ground levels and the cover levels were surveyed on completion of the drilling works consistent with the agreed CQA Plans and the information is presented in Table 1 and on the borehole logs presented at Appendix D.

Gas and groundwater monitoring borehole installation overview

- 2.4** The monitoring installations comprised approximately 50mm internal diameter (ID) diameter HDPE pre-slotted standpipes with a geo-wrap which comprised a geotextile sleeve. Before the slotted sections of pipe were installed the CQA Inspector verified that the sleeve was not damaged and that all slots in the pipe were covered by the sleeve and that the ends of the sleeve were secured firmly to the pipe. The slot aperture was approximately 2mm. The slotted pipe and plain pipe had threaded joint connections. The standpipe in each borehole was fitted at the base with a push on end cap which was taped to the geo-wrap and a gas tight push-on gas cap with sampling tap was fitted at the top of each standpipe.
- 2.5** The annulus between the slotted section of the monitoring standpipe and the outer borehole wall in the gas and groundwater monitoring boreholes was filled with a low fines gravel filter pack. The annulus between the plain section of monitoring standpipe and the outer borehole wall in the gas and groundwater monitoring boreholes was filled with bentonite pellets to create a seal.
- 2.6** Due to the final ground levels at the site not being finished the boreholes were left with the standpipes elevated by approximately 1m to 3m above ground level. The length of the standpipe will be cut down where necessary to facilitate access for monitoring and will be subject to installation of headworks once development works have been completed in the area of the monitoring boreholes. Protective concrete or plastic rings have been placed around the boreholes to mitigate the risk of damage to the boreholes due to site activity until the site ground levels are completed and the protective headworks are installed.

- 2.7 The headworks at a number of the monitoring boreholes have not been installed as the finished ground level in these areas of the development is still to be completed. On completion of the finished ground levels the headworks will be installed in accordance with the specifications set out in the CQA Plans (September 2020 CQA Plan and September 2022 CQA Plan) and will be subject to CQA procedures and verification and information provided as an addendum to the borehole CQA Verification report.

Gas monitoring borehole installation

- 2.8 Gas monitoring borehole LFG48R was repositioned compared to the location proposed in the agreed September 2022 CQA plan to be closer to the location of the original borehole LFG48. Gas monitoring boreholes LFG23R and LFG35R were repositioned due to accessibility issues. The remaining gas monitoring boreholes were located in general accordance with the proposed locations in the agreed CQA Plans.
- 2.9 It was estimated in the CQA Plans (Appendix A and Appendix B) that the top of the response zone, which is the base of the plain pipe in each gas monitoring borehole, would be approximately 0.5mbgl to 4mbgl. The depth to the base of the plain pipe varied depending on the depth of the boreholes, the lengths of slotted pipe used, the need to allow for settlement of the gravel pack and the installation of a sufficient length of bentonite seal. Consistent with the CQA Plans the depth to the base of the plain pipe was determined by the CQA Inspector in consultation with the CQA Project Manager as necessary. The depth to the base of the plain section of pipe in each borehole is presented in Table 1 and on the borehole logs presented at Appendix D.
- 2.10 The filter gravel backfill was installed from the base of each borehole to approximately 1m above the base of the plain section of monitoring standpipe to allow for settlement of the gravel. Bentonite pellets were placed in the annulus of the remainder of each borehole to just below ground level to form a seal a minimum of 1m thick. Water was added during the addition of the bentonite pellets to hydrate the bentonite.

Groundwater monitoring borehole installation

- 2.11 Groundwater monitoring borehole CWMGW08R was repositioned due to access restrictions. Groundwater monitoring borehole CWMGW03R was repositioned as the ground conditions at the proposed location were considered not to be stable.

- 2.12** It was estimated in the September 2022 CQA Plan (Appendix B) that the top of the response zone, which is the base of the plain pipe in each groundwater monitoring borehole, would be at between approximately 22.5mbgl and 29mbgl. The depth to the base of the plain pipe varied depending on the depth of the boreholes, the groundwater levels recorded in the boreholes and the lengths of slotted pipe used. Consistent with the September 2022 Plan the depth to the base of the plain pipe was determined by the CQA Inspector in consultation with the CQA Project Manager where necessary. The depth to the base of the plain section of pipe in each borehole is presented in Table 1 and on the borehole logs presented at Appendix D.
- 2.13** The filter gravel backfill was installed from the base of each borehole to approximately 1m above the base of the plain section of monitoring standpipe to allow for settlement of the gravel. Bentonite pellets were placed in the annulus of the remainder of each borehole to just below ground level to form a seal a minimum of 1m thick. Water was added during the addition of the bentonite pellets to hydrate the bentonite.
- 2.14** Groundwater levels recorded in the groundwater monitoring boreholes following the drilling and installation works are summarised in the table below:

Borehole reference	Groundwater level (mbgl)	Groundwater elevation (mAOD)	Depth of borehole (mbgl)	Column of water (m)
CWMGW03R	23.50	21.67	32.50	9.00
CWMGW08R	21.00	31.63	43.00	22.00

Summary

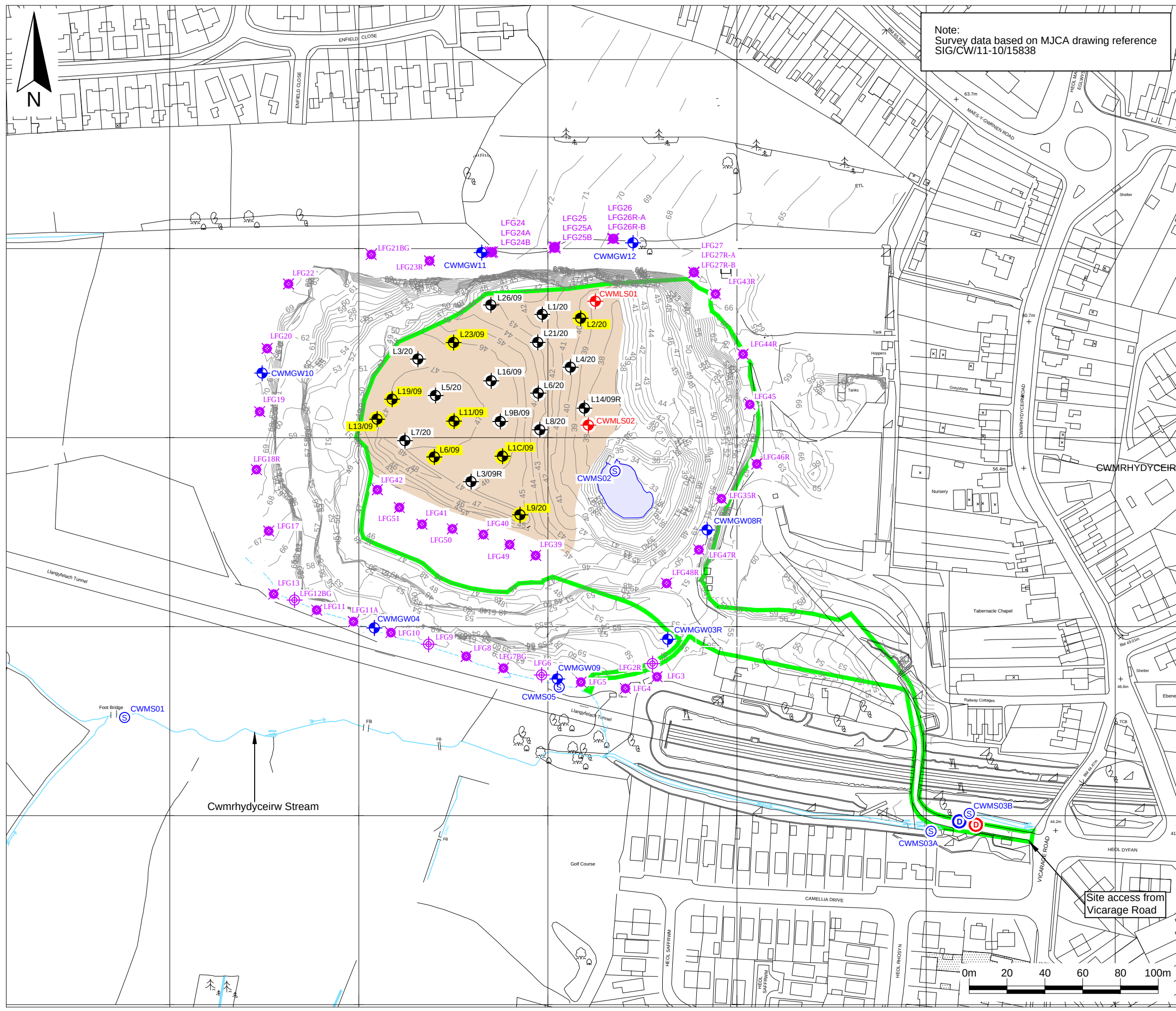
- 2.15** The gas and groundwater monitoring borehole installations were completed in general accordance with the agreed CQA Plans. The recorded depths of the boreholes and the recorded levels of the borehole installations, filter gravel pack and bentonite backfill are presented in Table 1. The borehole logs are presented at Appendix D. A record comprising daily site diary forms of the installation of the boreholes is presented at Appendix E. A photographic record of the installation works is presented at Appendix F. The borehole logs provided by the drilling contractor are presented at Appendix G. The accreditation details of the drilling contractor is presented at Appendix H. The curriculum vitae of the CQA Project Manager and the curriculum vitae of the CQA Inspector are presented at Appendix I.

TABLE

Table 1
Summary of the gas monitoring borehole and the groundwater monitoring borehole locations and installation depths

Borehole reference	Easting	Northing	Ground level (mAOD)	Depth of borehole (mbgl)	Base of borehole (mAOD)	Base of slotted pipe (mbgl)	Base of plain pipe (mbgl)	Base of gravel (mbgl)	Base of bentonite (mbgl)
Gas monitoring boreholes									
LFG2R	266563.493	199193.337	54.225	22.0	32.225	22.0	4.2	22.0	3.7
LFG18R	266345.639	199282.857	70.994	39.0	31.994	39.0	3.0	39.0	2.5
LFG23R	TBC	TBC	TBC	45.0	TBC	45.0	3.0	45.0	2.5
LFG24R-A	266470.686	199398.220	74.198	2.2	71.998	2.2	0.5	2.2	0.2
LFG24R-B	266469.512	199398.244	74.278	5.3	68.978	5.3	2.0	5.3	1.5
LFG25R-A	266503.782	199400.955	72.226	2.0	70.226	2.0	0.5	2.0	0.2
LFG25R-B	266503.097	199400.675	72.192	5.0	67.192	5.0	2.0	5.0	1.5
LFG26R-A	266534.855	199405.208	70.397	2.3	68.097	2.3	0.5	2.3	0.2
LFG26R-B	266577.306	199387.365	68.109	5.4	62.709	5.4	2.0	5.4	1.5
LFG27R-A	266577.184	199387.410	68.034	4.9	63.134	4.9	0.5	4.9	0.5
LFG27R-B	266577.184	199387.410	68.034	8.0	60.034	8.0	5.0	8.0	5.0
LFG35R	266591.754	199267.664	55.226	32.0	23.226	32.0	4.1	32.0	3.5
LFG43R	266588.612	199375.904	67.904	35.8	32.104	35.8	2.8	35.8	2.4
LFG44R	266603.261	199344.113	65.774	32.5	33.274	32.5	2.5	32.5	2.0
LFG46R	266610.096	199268.065	62.338	32.2	30.138	32.2	3.5	32.2	3.0
LFG47R	266579.789	199240.695	51.636	32.0	19.636	32.0	2.5	32.0	2.0
LFG48R	266562.750	199222.888	51.508	22.0	29.508	22.0	4.0	22.0	3.5
LFG49	266479.701	199243.384	46.997	15.0	31.997	15.0	1.5	15.0	1.0
LFG50	266449.488	199251.612	48.400	16.0	32.400	16.0	1.5	16.0	1.0
LFG51	266421.362	199263.011	49.154	17.0	32.154	17.0	1.5	17.0	1.0
Groundwater monitoring boreholes									
CWMGW03R	266563.430	199193.294	54.173	32.5	21.67	31.5	22.5	32.5	23.5
CWMGW08R	266584.314	199251.031	52.626	43.0	9.626	43.0	28.0	43.0	27.0
TBC – to be confirmed (the location is still to be surveyed)									

FIGURE



Note:
Survey data based on MJCA drawing reference
SIG/CW/11-10/15838

Key / Notes

- Approximate of boundary of Environmental Permit reference EPR/TP3835LV
- Approximate area of the former landfill that has been capped
- Approximate route of a watercourse which outfalls to Cwmrhydyceirw Stream
- Watercourse external to the site
- Ground level contour (mAOD) (Pre-development)
- Approximate location of the groundwater and surface water sump
- CWMLS02** Approximate location of a leachate collection sump
- LFG1** Approximate location of an existing gas monitoring borehole
- LFG2** Approximate location of an existing combined gas and groundwater monitoring borehole
- L1/09** Approximate location of an existing combined leachate monitoring and gas venting well
- L2/20** Approximate location of a combined leachate monitoring and gas venting well which will be replaced
- CWMGW08** Approximate location of an existing groundwater monitoring borehole
- CWMS01** Approximate location of a surface water monitoring point
- Approximate location of the discharge to the Cwmrhydyceirw Stream
- Approximate location of the discharge to sewer

Note:
The locations of boreholes LFG23R and LFG43R are to be confirmed during the next topographical survey of the site.

	Final	KR	KE	GT	02/02/23
Rev	Status	Drn	App	Chk	Date

Site
CWMRHYDYCEIRW QUARRY LANDFILL
Client
SI Green (UK) Ltd

Title
Plan showing the locations of the gas and groundwater monitoring boreholes and the leachate monitoring and gas venting wells

Figure 1
Scale
1:2,000@A3

Drawing Ref
SIG/CW/01-23/23552
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APPENDICES

APPENDIX A

**CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN REFERENCE
SIG/CW/KE/20012/01/BHCQA DATED SEPTEMBER 2020**



Technical advisers on environmental issues

**CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN
FOR THE INSTALLATION OF ADDITIONAL IN-WASTE
LANDFILL GAS VENTING WELLS AND PERIMETER
LANDFILL GAS MONITORING BOREHOLES AT
CWMRHYDYCEIRW QUARRY LANDFILL, MORRISTON,
SWANSEA**

ENVIRONMENTAL PERMIT NUMBER EPR/TP3835LV

Report reference: SIG/CW/KE/20012/01/BHCQA
September 2020

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Table 1	Gas venting wells installation details
Table 2	Landfill gas monitoring boreholes installation details

FIGURES

Figure 1	Plan showing the locations of all current and proposed wells and boreholes (drawing reference SIG/CW/06-20/21807)
Figure 2	Schematic cross section through a typical gas venting well (drawing reference SIG/CW/06-20/21856)
Figure 3	Typical gas venting headworks construction details (drawing reference SIG/CW/07-20/21866)
Figure 4	Schematic cross section through a typical landfill gas monitoring borehole (drawing reference SIG/CW/06-20/21857)

APPENDICES

- Appendix A Cirricula vitae
- Appendix B A copy of the site diary for well/borehole CQA work proforma
- Appendix C A copy of a well/borehole log proforma
- Appendix D A copy of a summary table for the CQA drilling and installation proforma
- Appendix E Drawings showing the anticipated residential development on the plateau to the south of the landfill and the public open space in the area of the landfill
- Appendix F Copies of logs L3/09, L14/09 and L21/09
- Appendix G Copies of borehole logs LFG29, LFG40, LFG41 and LFG42

This report has been prepared by MJCA with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between MJCA and the Client. This report is confidential to the client and MJCA accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by MJCA beforehand. Any such party relies upon the report at their own risk.

1. Introduction

- 1.1** MJCA is commissioned by SI Green UK Limited to prepare a Construction Quality Assurance (CQA) Plan for the proposed installation of ten in waste landfill gas venting wells, three additional perimeter landfill gas monitoring boreholes and one replacement landfill gas monitoring borehole at Cwmrhydyceirw Quarry Landfill (the site). The additional landfill venting wells at the site also will provide for leachate monitoring, but their primary purpose is to provide for the venting to atmosphere of landfill gas generated at the site. One of the landfill gas venting wells comprises a replacement for landfill gas venting well L3/09 which is blocked. Rotating cowl headworks are being installed on a number of the existing in waste landfill gas venting wells and this work is the subject of a separate CQA Plan (Report reference SIG/CW/DFR/1392/01/HWCQA dated July 2020). As part of this work it may be necessary to replace two of the existing in waste landfill gas venting wells, numbers L14/09 and L21/09. If this is necessary the replacement wells also will be the subject of this CQA Plan.
- 1.2** This CQA plan is submitted pursuant to Condition 2.7.4 of Environmental Permit reference TP3835LV (the permit) for the site in respect of construction proposals for landfill infrastructure. Planning Appeal reference number APP/B6855/A/16/3157177 was allowed by the Welsh Government on 11 January 2018 and planning permission was granted. The permission provides for the cessation of landfill and other operations enabled by residential development of approximately 300 dwellings, public open space, associated highway and ancillary works (outline) at the site. Full planning permission has subsequently been granted for Phases 1 and 2 of the residential development and the public open space and the construction of the residential development commenced on. As part of the consented proposals no further waste will be deposited at the site, and the former landfill area will be retained in situ and capped and restored. An application has been submitted to Natural Resources Wales (NRW) to Definitely Close the landfill site.
- 1.3** The purpose of the installation of the additional wells and boreholes at the site the subject of this CQA plan is to facilitate additional landfill gas venting from the wells in the waste and to provide closer spaced perimeter landfill gas monitoring boreholes between the site and the consented residential development on a plateau adjacent to and south of the previously deposited waste in the site.

- 1.4** This CQA Plan has been prepared to provide information on the locations of the proposed wells and boreholes and the proposed quality assurance procedures for the drilling and installation works. The CQA Plan includes information on how the records associated with the CQA Activities will be reported and presented to NRW. While the general principles and design of the wells and boreholes are similar to those presented in a report for the proposed design for an intrusive site investigation for the purpose of characterising the waste in Cwmrhydyceirw Quarry¹ and the approved CQA Plan SIG/CW/JRC/2943/01/BHCQA², this CQA Plan includes information on CQA procedures, records and reporting relevant to the works now proposed.

¹ "Proposed design for an intrusive site investigation for the purpose of characterising the waste in Cwmrhydyceirw Quarry" report reference SIG/CW/GT/1392/01revA dated July 2009

² Construction Quality Assurance (CQA) plan for the installation of gas and combined gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea, dated February 2018.

2. Construction Quality Assurance (CQA) Plan

Parties involved with the works

2.1 The following parties will be involved with the proposed well and borehole drilling and installation works:

- Site operator: SI Green UK Limited
- CQA project consultant: MJCA
 - CQA Project Manager: K Eaton, MJCA
 - CQA Inspector: ***MJCA site personnel to be confirmed.***
- Drilling contractor: Apex Drilling Services, Bridgend, CF33 6BZ.

Responsibilities

2.2 The responsibilities of the key parties involved in the works the subject of the CQA Plan are set out below:

CQA Project Manager

2.3 The CQA Project Manager will be responsible for the management of the project and liaison with the client and NRW for the duration of the project. Specific duties that will be undertaken by the CQA Project Manager include:

- Notifying NRW in advance in respect of the proposed programme for the site works and providing additional notification should the proposed date for mobilisation change.
- Checking the CQA Plan including the information relevant to the expected in waste conditions and external geological and hydrogeological conditions including developing a suitable specification for the well and borehole installations and identifying suitable locations for the proposed wells and boreholes.

- Providing the drilling contractor with relevant information on the well and borehole drilling and the well and borehole specification prior to mobilisation. Verifying that the drilling contractor confirms that the materials supplied meet the specification set out in the agreed CQA Plan and that the drilling contractor has provided confirmation that the drilling crew will be suitably experienced and trained and have the relevant British Drilling Association (BDA) accreditation.
- Providing details of relevant certifications held by the Lead Driller appointed for the works to NRW prior to the commencement of the drilling works. Notification regarding changes in personnel relevant to CQA will be provided to NRW as soon as is practicable.
- Providing technical support as necessary to the CQA Inspector regarding the works and in particular if there is a need to deviate from the specification set out in the agreed CQA Plan and notifying NRW regarding any significant changes to the specification for the works.
- Technical checking of the CQA Verification Report.

2.4 A curriculum vitae for the CQA Project Manager is provided at Appendix A to this report.

CQA Inspector

2.5 The CQA Inspector will be a suitably qualified and experienced geologist or engineer responsible for the verification of the drilling and installation of the venting facilities in the wells and the monitoring facilities in the boreholes. The duties of the CQA Inspector will include the following:

- Reviewing information relevant to the expected in waste conditions and external geological and hydrogeological conditions including developing a suitable specification for the well and borehole installations and identifying on site the locations which are potentially suitable for the proposed wells and boreholes.
- Preparing this CQA Plan.
- Verifying that field testing equipment are operational and where necessary calibrating the equipment.

- Liaising with the site operator regarding activities being carried out in the vicinity of the proposed locations for the wells and boreholes and health and safety matters including in respect of the operator's safe systems of work and the provision of information necessary to secure a permit to work from the site operator where necessary.
- Verifying that suitable information is available regarding services at and in the vicinity of the proposed locations for the wells and boreholes and that appropriate safe clearance for example a cable avoidance tool (CAT) scan of the well and borehole locations is carried out.
- Verifying before its use in the construction of the wells and boreholes the quantity and quality of materials delivered to site for consistency with the specifications set out in the agreed CQA Plan including but not limited to standpipes, filter gravel, bentonite, caps and covers, rotating cowl headworks and recording the outcome of the checks in the daily site diary.
- Collecting and recording information including materials delivery notes, certificates of conformity for the well and borehole standpipes and maintaining a photographic record of the materials to be used in the works.
- Verifying that the materials are stored in a suitable location on site and that the site operator is aware of the storage location to minimise the risk that the stored materials will be damaged.
- Verifying that the locations at which drilling is carried out on site are consistent generally with the proposed locations presented on the relevant figure in the agreed CQA Plan including the use of a GPS device to assist. In the event that a proposed well or borehole location needs to be changed the CQA Inspector will agree the new location with the CQA Project Manager prior to drilling and NRW will be notified of the change in advance insofar as it is reasonably practicable and details of the reason for the change of the well or borehole location will be provided.
- Liaison with the Lead Driller at each well and borehole location to confirm with the Lead Driller the well or borehole drilling and installation specifications.

- The full time CQA verification of the well and borehole drilling and installation works to verify that the agreed CQA procedures are followed and that the wells and boreholes are installed in accordance with the specifications set out in the agreed CQA Plan.
- Maintaining a daily site diary of the drilling and the installation of the facilities and providing photographic evidence of the drilling and installation works. A copy of a proforma of a daily site diary for well and borehole CQA verification work is presented at Appendix B.
- Recording the ground conditions, groundwater or leachate strikes and other relevant information in accordance with BS5930:2015 +A1:2020 “Code of practice for ground investigations” and the Environment Agency guidance document reference LFTGN02 entitled “Guidance on monitoring of landfill leachate, groundwater and surface water” dated February 2003 and the preparation of well and borehole logs. A copy of a proforma of a well or borehole log template is presented at Appendix C.
- Undertaking field testing and monitoring consistent with the agreed CQA Plan.
- Providing regular progress updates to the CQA Project Manager and making the CQA Project Manager aware of relevant site observations and in particular where site observations have the potential to necessitate changes to the suitability of the specification set out in the agreed CQA Plan.
- As necessary the CQA Inspector will discuss with the CQA Project Manager differences between the expected ground conditions and ground conditions recorded during drilling and agree any changes that are necessary to the specification for the well or borehole installations set out in the agreed CQA Plan.
- Recording the details of the well and borehole installations including the diameter and depth of the wells and boreholes, the depth and length of installed sections of both the slotted and plain standpipe sections, verifying that end caps which meet the requirements of the specification are used and that the pipe joints are connected in accordance with the specifications set out in the agreed CQA Plan. A copy of the proforma for verifying the well and borehole drilling and installation is presented at Appendix D.

- Recording the depth intervals over which backfill materials such as filter gravel, bentonite and concrete grout are placed and the number of bags (and mass) of filter gravel and bentonite used.
 - Verifying that bentonite seals are hydrated with clean water and that well headworks comprising rotating cowl headworks with anti-flashback gauzes and borehole headworks comprising caps, gas valves and headworks are installed in accordance with the specification set out in the agreed CQA Plan.
 - Verifying that insofar as it is practicable based on the nature of the ground intrusive site investigation works and the current site conditions that the areas in which work is carried out are left tidy. Spoil from the wells and boreholes will be managed in accordance with site specific arrangements made with the client.
- 2.6** The curriculum vitae for a CQA Inspector will be provided prior to the commencement of the drilling works. Notification regarding changes in personnel relevant to CQA will be provided to NRW as soon as is practicable.
- 2.7** The CQA Inspector will prepare a CQA Verification Report incorporating well and borehole logs, drawings, a photographic log, daily site diary logs and copies of information documenting the materials used in the works.

Drilling contractor

- 2.8** The duties performed by the drilling contractor include duties which may be carried out by other parties for example sub-contractors and suppliers. The duties of the drilling contractor will include the following:
- Making available suitably experienced and trained drilling crew and providing to the CQA Project Manager confirmation of British Drilling Association (BDA) accreditation.
 - Checking that there are safe routes of access and egress at each well and borehole location for the drilling equipment and associated plant and equipment prior to the commencement of drilling and that the ground conditions and gradients are safe and suitable for the drilling rig and associated equipment.

- Undertaking the drilling of the wells and boreholes and the well and borehole installation works in accordance with health and safety information comprising risk assessment and method statements prepared by the drilling contractor and the agreed specification as verified by the CQA Inspector and updating the health and safety information as appropriate where changes to the works are necessary.
- Checking the quantity and specification of materials delivered to site to be used in the well and borehole installations including but not limited to standpipes, filter gravel, bentonite, caps and covers.
- Prior to starting the drilling, the Lead Driller will confirm with the CQA Inspector the well or borehole reference, the expected ground conditions, the proposed depth of the well or borehole and the installation specifications presented in the CQA Plan.
- Preparing a record for each well or borehole including a record of the depth in the changes in lithology, a brief description of each lithology encountered, well or borehole testing information, leachate or groundwater strikes, the addition of water during drilling, details of the number and types of samples taken, details of the installation of casing and the depth of casing used to facilitate drilling, the duration and reasons for standing time, the total drilled depth of the well or borehole and details of the well and borehole installations.

MJCA Quality procedures

- 2.9** MJCA operates a quality assurance system externally certified in accordance with BS EN ISO 9001:2015. The quality assurance system sets out company policy on maintaining quality in all aspects of the company's operations including our procedures for communication, contract management, supplier assessment, the control of technical documentation, training, calibration of field equipment and management review. All reports and other project related documents produced by MJCA are reviewed as necessary by technical staff and in accordance our externally certified quality assurance system prior to a final review at a senior level.

Health, safety and environmental management

- 2.10** MJCA has a health and safety system which sets out the roles and responsibilities in the company and procedures associated with our business. A Health and Safety Plan including risk assessments and method statements will be prepared prior to the site works. The drilling contractor will provide risk assessments and method statements for the drilling and well and borehole installation works.
- 2.11** CQA Inspectors undertake a range of external health and safety training for example relevant training and certification consistent with approved schemes such as the Safety Passport Alliance (SPA) and Construction Skills Certification Scheme (CSCS).
- 2.12** Any modification of site health and safety requirements or work plans including changes to Personal Protective Equipment will be raised by the CQA Inspector and agreed with MJCA Health and Safety Manager prior to commencing the works.

3. Proposals for the installation of additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes at the site

- 3.1** The proposed locations of the additional gas venting wells and gas monitoring boreholes are shown on Figure 1 (drawing reference SIG/CW/06-20/21807). The wells and boreholes will be drilled as close as practicable to the proposed locations shown on Figure 1. The well and borehole locations have been selected such that they will not conflict with the consented residential development and the use of the former landfill as public open space as part of the consented residential development. Drawings showing the anticipated residential development on the plateau to the south of the landfill and the public open space in the area of the landfill are presented at Appendix E. The precise location of each well and borehole will depend on ground conditions and ease of access to the proposed locations.

Ground conditions

- 3.2** The site comprises an old quarry and landfill site. It is understood that quarrying at the site ceased in 1979 and that landfilling took place between 1985 and 1991. The site is the subject of Environmental Permit (EP) reference EPR/TP3835LV. The site no longer accepts waste and has been capped. The cap comprises a geosynthetic capping system including a 1mm LLDPE geomembrane overlain by a drainage composite. Restoration is nearing completion prior to the use of the former landfill as public open space. Restoration soils above the cap will be 1m to 2m in thickness.
- 3.3** It is proposed that ten in-waste gas venting wells (L1/20 to L9/20 and L3/09R) and potentially two replacement gas venting wells (L14/09R and L21/09R) will be installed at the site. MJCA carried out a site investigation in the waste at the site in November and December 2009 and installed in waste gas and leachate monitoring boreholes. Copies of the logs of the wells L3/09, L14/09 and L21/09 are presented at Appendix F. A report prepared by MJCA entitled "An intrusive site investigation in the existing waste and in the extracted quarry at Cwmrhydyceirw Quarry, Morriston, Swansea" dated April 2010 includes a drawing showing the approximate topography of the base of the existing waste based on the results of the site investigation carried out in November and December 2009 which together information of the ground conditions recorded during the site investigation has been used to determine the likely depth and installation details of the proposed in waste gas venting wells.

- 3.4** The site was excavated through Quaternary glacial Till (formerly termed boulder clay) into the Pennant Sandstone Formation of the Carboniferous Upper Coal Measures. The Pennant Sandstone Formation comprises thickly bedded massive sandstone with subordinate shales and mudstones together with siltstones and a few coal horizons.
- 3.5** Three gas monitoring boreholes (LFG49, LFG50 and LFG51) will be installed between the existing four gas monitoring boreholes LFG39 to LFG42 located along the southern boundary of the landfill. A replacement monitoring borehole will be installed for borehole at location LFG18 which has become lost. Copies of the borehole logs for borehole LFG39 to LFG42 are presented at Appendix G. The boreholes will be drilled in the Pennant Sandstone Formation along the southern boundary of the landfill.
- 3.6** The well and borehole installations will be based on the expected ground conditions and a summary of the potential installation details is presented in Table 1.

Gas venting well drilling and installation specifications

- 3.7** The thickness of the waste at each well location has been estimated based on the results of the 2009 site investigation. The gas venting wells will be drilled using cable percussion methods at a diameter of approximately 200mm and will be terminated approximately 0.5m above the base of the waste. These depths are based on an assessment of the base of the waste from previous site investigations findings. . In accordance with information in the waste industry guidance³ published on the Environmental Services Association (ESA) website the drilling will be through the waste in Zones 1 and 2 and into Zone 3. Wells will not be drilled beneath the base of the waste.
- 3.8** As the drilling progresses the well will be cased, which will stop the well from collapsing, keep waste materials from being transferred down the well and reduce the potential for seepage of perched leachate into the well. The gas venting wells will be drilled using cable percussive methods. Drilling using cable percussive methods typically involves driving a cutting shoe or drilling bailer in short 0.1m to 0.3m

³ Drilling in waste on landfill sites. Landfill Guidance Group Industry Code of Practice No. LGG 112 dated February 2018

increments typically. The drilling will progress in Zone 2 in 300mm increments and in Zone 3 at 150mm increments to approximately 0.5m above the assumed base of the waste at which point the drilling will be terminated. Although the drilling will be terminated at approximately 0.5 above the base of the waste, the depths are estimated based on the findings of previous investigation work. Should the base of the waste be encountered, the drilling will be terminated and a bentonite grout will be added in the base of the well prior to the installation of the venting facilities to provide a seal at the base of the well.

3.9 The standpipes installed in the wells and boreholes will comprise high density polyethylene (HDPE) manufactured to DIN 8074/5 standard supplied in lengths of one and three metres, with an approximate 100mm inside diameter (ID) and threaded joint connections. The perforated standpipe sections will comprise slotted pipe with a slot aperture of approximately 2mm. The gravel pack will comprise washed, bagged and dried natural silica gravel at diameters of between approximately 3mm and 6mm. Bentonite pellets or granules used to construct seals will comprise naturally occurring high purity montmorillonite.

3.10 The gas venting well installation details are as follows. The wells will be drilled and installed consistent with the construction details presented on Figure 2 (drawing reference SIG/CW/06-20/21856):-

- A 100mm inside diameter (ID) high density polyethylene (HDPE) slotted pipe with a geotextile wrap will be installed from the base of the well to a level approximately 1.0m from the estimated level of the base of the landfill cap as determined by the CQA Inspector. The pipe will be continued to ground level through the restoration soils with plain 100mm ID HDPE pipe. The plain pipe will be finished approximately 1.0m above ground level. The HDPE pipe will be manufactured to the DIN 8074/5 standard and supplied in lengths of one and three metres, with threaded joint connections. The perforated slotted pipe sections will have a slot aperture of approximately 2mm.
- The annulus between the well and the slotted section of pipe will be filled with a gravel pack. The gravel pack will extend to approximately 0.5m above the top of the slotted section of pipe to allow for settlement of the gravel. The volume between the standpipe and the annulus of the well is approximately 0.0943m³ and

the estimated mass of gravel per metre length of well to fill the annulus between the well and the pipe is approximately 16.5kg per metre assuming a density for the gravel of approximately 1.75Mg/m³. The gravel pack will comprise washed, bagged and dried natural silica gravel at diameters of between approximately 3mm and 6mm.

- As each well will be drilled at a diameter of approximately 200mm and the diameter of the standpipe will be approximately 100mm there will be an annulus between the internal wall of the well and the standpipe that is significantly larger in diameter than the diameter of the gravel particles. As the gravel pack will comprise loose, granular material only it is considered that the potential for bridging is minimised. The installation of the gravel pack will be verified by the CQA Inspector. In the unlikely event that bridging occurs it will be identified by monitoring the quantity of gravel used and appropriate action such as manipulating the pipework to free the bridged gravel will be taken to remedy the situation.
- The annulus between the well and the plain section of pipe above the gravel pack will be filled with bentonite pellets or granules and progressively hydrated with clean water to provide a bentonite seal to the ground surface. Granules or pellets will be placed initially to a depth of approximately 200mm above the gravel pack and hydrated progressively in approximately 200mm intervals to ground level. The method of bentonite seal construction and hydration will be recorded on the daily site diary forms. Bentonite pellets or granules used to construct seals will comprise naturally occurring high purity montmorillonite.
- The standpipe will be fitted at the base with a threaded end cap.
- Consistent with the principles presented in the Closure Report⁴ for the site which was included in the November 2018 application to vary the permit to definitely close the site (Closure application reference PAN-004085) it is proposed that headworks that incorporate a wind assisted rotating cowl will be fitted to the gas wells. The principle of the operation of the headworks is that the rotation of the cowl under the influence of the wind results in a vortex effect beneath the cowl which creates a partial vacuum (negative pressure) thereby promoting gas flow

⁴ Cwmrhydyceirw Quarry Landfill the subject of Environmental Permit reference EPR/TP3835LV Closure Report. Reference SIG/CW/DFR/1392/01/CLOS dated November 2018

from the waste mass. The wind assisted headworks will comprise a sleeve that is placed over the well standpipe with a rotating cowl and protective cage placed on top of the sleeve. The bottom of the passive gas venting cowl will be approximately 3.5m above ground level in order to position the cowl above head height therefore making it difficult for persons to accidentally or deliberately come into contact with the rotating cowl or to vandalise the cowl. The headworks will incorporate a monitoring port to facilitate monitoring of the gas wells with the monitoring point located approximately 1.5m above ground level. The sleeve of the headworks will incorporate a hinge located at approximately 1.25m above ground level to allow easy access to the cowl and dipping of the gas well. An ant flashback gauze will be located at the hinge point and will be placed across the sleeve annulus. The headworks will incorporate lugs on the section of the sleeve that is embedded in the ground to improve stability against toppling. An example configuration for the headworks is shown on Figure 3 (drawing reference SIG/CW/05-20/21764).

- The headworks will be installed over the well standpipes such that the well standpipes are centred within the sleeve of the headworks. The headworks will be installed in accordance with the manufacturer's instructions but is anticipated that they will need to be embedded into the restoration soils to a minimum depth of 1m and concreted into place. Care will be taken and the plant and working methods will be selected in consultation with the CQA Inspector to mitigate against potential damage to the well standpipes and the geomembrane capping system when installing the headworks.
- An identification reference will be marked in the gas venting well.
- The final installation details of the gas venting wells will be confirmed by the CQA Inspector in consultation with the CQA Project Manager and will be in accordance with the specifications as determined by the ground and leachate conditions encountered. The final installation details will be confirmed with the Lead Driller and recorded on the daily site diary forms.
- The locations of the wells together with the ground level, hinge level and monitoring port level elevations will be surveyed relative to National Grid Co-ordinates and to Ordnance datum and recorded on the borehole logs.

Landfill gas monitoring borehole drilling and installation specifications

- 3.11** The gas monitoring boreholes will be drilled using rotary drilling techniques and air and/or water flush at a diameter of between approximately 115mm and 150mm to a depth of 15m below ground level (mbgl) consistent with the other gas monitoring boreholes in this area of the site. Should groundwater be encountered in a monitoring borehole, the depth at which groundwater is struck during drilling will be recorded. When the monitoring installation is complete groundwater levels will be measured relative to a datum point surveyed to Ordnance datum established for each borehole.
- 3.12** The gas monitoring borehole installation details are as follows. The boreholes will be drilled and installed consistent with the construction details presented on Figure 4 (drawing reference SIG/CW/06-20/21857):-
- A 50mm ID HDPE slotted pipe with a geotextile wrap will be installed to a depth of 15mbgl in the Pennant Sandstone Formation as determined by the CQA Inspector. The upper 1.5m pipe to ground level will comprise plain 50mm ID HDPE pipe. The plain pipe will be finished approximately 0.3m above ground level. The HDPE pipe will be manufactured to the DIN 8074/5 standard and supplied in lengths of one and three metres, with threaded joint connections. The perforated slotted pipe sections will have a slot aperture of approximately 2mm.
 - The annulus between the borehole and the slotted section of pipe will be filled with a gravel pack. The gravel pack will extend to approximately 0.5m above the top of the slotted section of pipe to allow for settlement of the gravel. The volume between the standpipe and the annulus of the well will be dependent on the diameter. For a 115mm diameter borehole the volume will be 0.0337m³ per metre length and for a 150mm diameter borehole will be 0.0628m³ per metre length. the estimated mass of gravel per metre length of borehole to fill the annulus between the borehole and the pipe is between approximately 6kg and 11kg per metre assuming a density for the gravel of approximately 1.75Mg/m³. The gravel pack will comprise washed, bagged and dried natural silica gravel at diameters of between approximately 3mm and 6mm.
 - As each borehole will be drilled at a diameter of approximately 150mm and the diameter of the standpipe will be approximately 50mm there will be an annulus

between the internal wall of the borehole and the standpipe that is significantly larger in diameter than the diameter of the gravel particles. As the gravel pack will comprise loose, granular material only it is considered that the potential for bridging is minimised. The installation of the gravel pack will be verified by the CQA Inspector. In the unlikely event that bridging occurs it will be identified by monitoring the quantity of gravel used and appropriate action such as manipulating the pipework to free the bridged gravel will be taken to remedy the situation.

- The annulus between the borehole and the upper 1m of the plain section of pipe above the gravel pack will be filled with bentonite pellets or granules and progressively hydrated with clean water to provide a bentonite seal to the ground surface. Granules or pellets will be placed initially to a depth of 200mm above the gravel pack and hydrated progressively in approximately 200mm intervals to ground level. The method of bentonite seal construction and hydration will be recorded on the daily site diary forms. Bentonite pellets or granules used to construct seals will comprise naturally occurring high purity montmorillonite.
- The monitoring pipe will be fitted at the base with a threaded end cap and at the top with a removable gas tight cap with an integral gas monitoring tap.
- The monitoring standpipes in each borehole will be protected by headworks comprising a lockable steel riser pipe concreted securely at ground level. The steel riser pipe will extend to approximately 0.5m above ground level. Where identified by the CQA Inspector and agreed with the CQA Project Manager protective fencing and/or a marker post will be installed.
- An identification reference will be marked in the borehole cover and borehole headworks.

4. Construction Quality Assurance Verification Report

4.1 A CQA Verification report will be submitted to NRW following completion of the installation of the wells and boreholes. The CQA Verification Report will comprise a summary of the works carried out together with copies of relevant CQA documentation. The CQA Verification Report will include the following information:

- Final as built construction details of each well and borehole together with a plan showing the locations where the wells and boreholes were installed.
- Copies of the well and borehole logs prepared by the CQA Inspector and copies of the well and borehole records provided by the drilling contractor.
- Selected photographs of the works and materials used in the works.
- Copies of the daily site diary forms.

4.2 The CQA Verification Report will confirm that the works have been carried out in accordance with the CQA Plan.

TABLES

Table 1 – Gas venting wells installation details

Borehole reference	Easting ¹	Northing ¹	Estimated ground level (mAOD) ^{2, 3}	Estimated base of the slotted pipe (m below the cap)	Estimated depth of the well or borehole (m below the cap)	Estimated well or borehole base level (mAOD)
Gas venting wells³						
L1/20	266496.49	199371.84	41.5	9.0	9.5	32.0
L2/20	266515.63	199361.82	40.0	7.0	7.5	32.5
L3/20	266433.78	199339.23	46.8	14.0	14.5	32.3
L4/20	266510.98	199337.73	40.3	14.0	14.5	31.8
L5/20	266440.17	199322.46	47.2	13.8	14.7	32.5
L6/20	266494.87	199323.49	44.0	15.0	15.5	31.8
L7/20	266424.28	199298.12	47.2	15.0	15.5	31.7
L8/20	266496.79	199304.23	42.5	11.0	11.5	33.0
L9/20	266485.99	199259.55	47.0	10.0	10.5	36.5
L3/09R	266457.54	199276.85	46.11	10.5	11.0	35.11
Replacement gas venting wells						
L14/09R	266519.23	199315.54	38.02	5.1	5.1	32.92
L21/09R	266490.01	199350.00	43.72	11.4	12.3	31.42

1 - The eastings and northings are approximate based on the proposed locations for the wells shown on Figure 1 except wells L3/09R, L14/09R and L21/09R which are the existing surveyed well locations. The well and borehole locations will be surveyed to establish the co-ordinates and datum levels for the boreholes and will be included in the CQA Verification Report.

2 - The estimated ground levels are based on the proposed locations for the wells shown on Figure 1, the topographical survey for the site dated 2010 and additional topographical data dated 2017, except wells L3/09R, L14/09R and L21/09R which have been surveyed

3 – Restoration soils will be placed to cap the landfill area and site levels recorded in the table will be raised by approximately 1.5m to achieve the final restoration levels.

mAOD – metres above Ordnance datum mbgl – metres below ground level.

Table 2 – Landfill gas monitoring borehole installation details

Borehole reference	Easting ¹	Northing ¹	Estimated ground level (mAOD) ^{2, 3}	Estimated top of the slotted pipe (mbgl)	Estimated base of the slotted pipe (mbgl)	Estimated depth of the well or borehole (mbgl)	Estimated well or borehole base level (mAOD)
Gas monitoring boreholes							
LFG18 (replacement)	266342.19	199283.24	69.66	1.5	39.0	39.0	30.66
LFG49	266479.64	199243.28	44.82	1.5	15.0	15.0	39.82
LFG50	266251.37	199251.49	45.26	1.5	15.0	15.0	40.26
LFG51	266421.34	199263.04	45.55	1.5	15.0	15.0	40.55

1 - The eastings and northings are approximate based on the proposed locations for the boreholes shown on Figure 1. The borehole locations will be surveyed to establish the co-ordinates and datum levels for the boreholes and will be included in the CQA Verification Report.

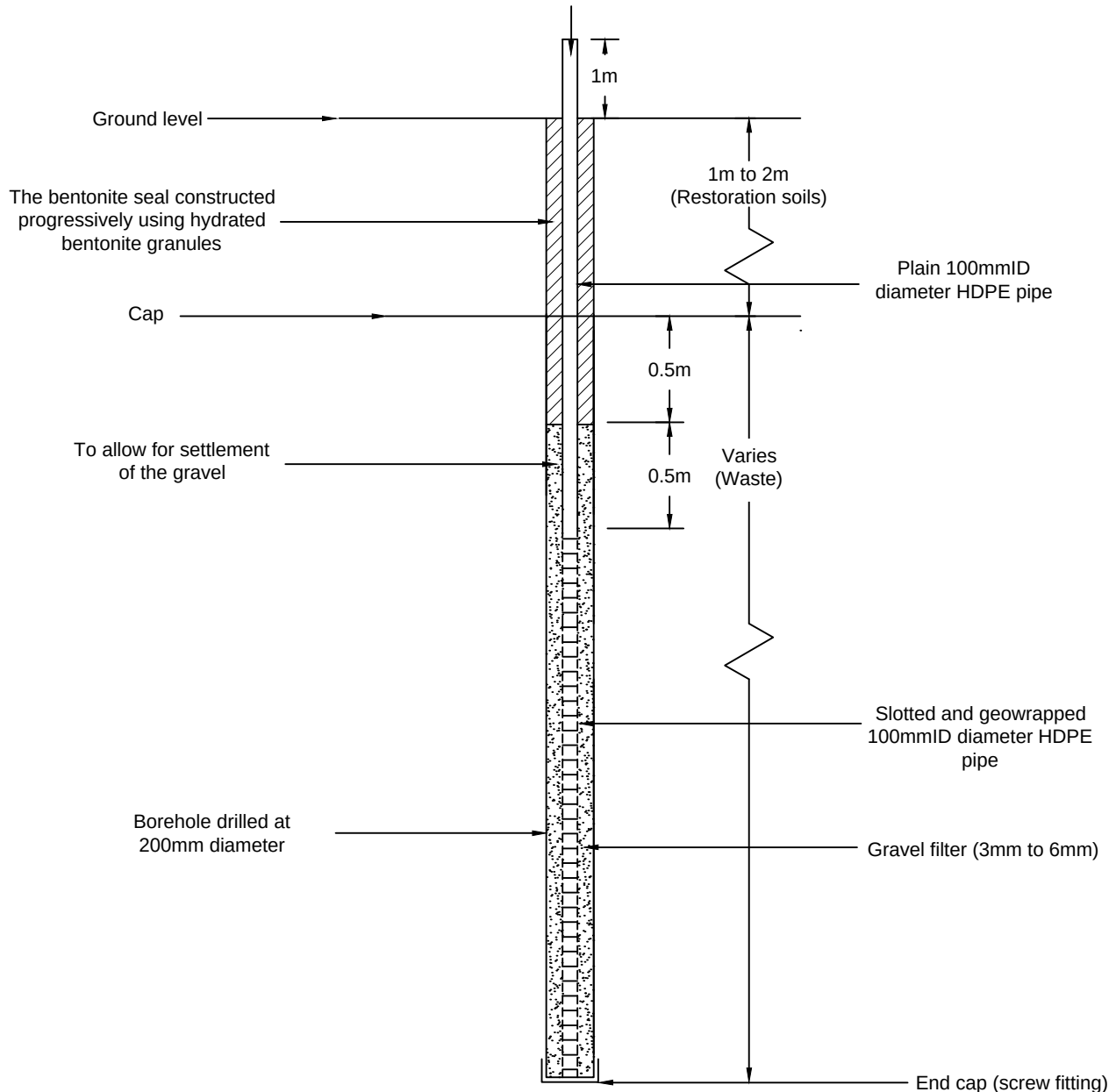
2 - The estimated ground levels are based on the proposed locations for the boreholes shown on Figure 1 based on an estimate level between the surveyed levels of the nearby existing boreholes.

3 Details of the borehole taken from the report entitled "Construction Quality Assurance (CQA) Verification report for the installation of gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea, Environmental permit number EPR/TP 3835lv. Report reference: SIG/CW/JRC/2943/01/BHCQAVF dated July 2019

mAOD – metres above Ordnance datum mbgl – metres below ground level.

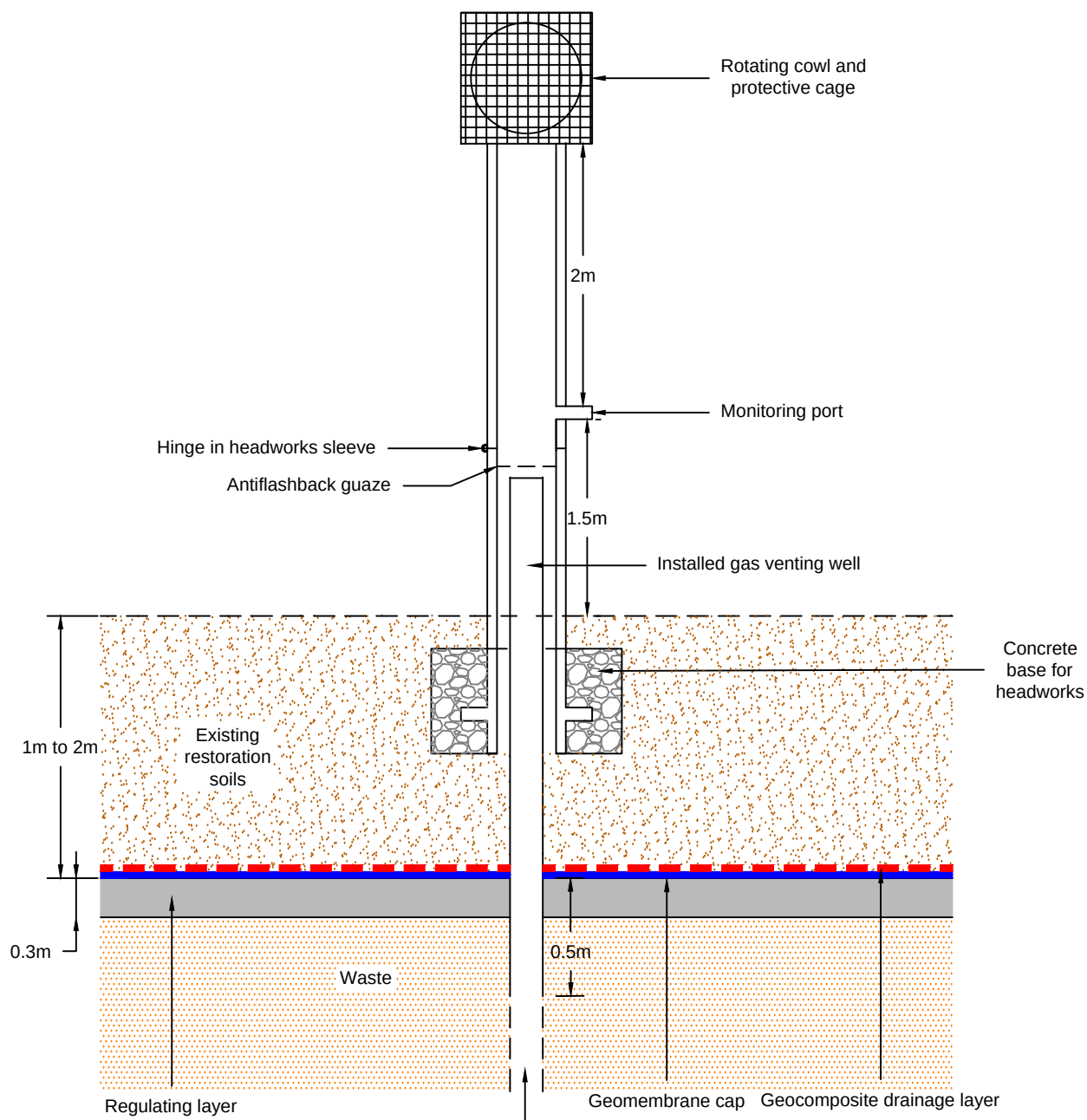
FIGURES

For the headworks which will comprise a venting cowl see
Figure 3 Typical gas venting headworks construction details
(drawing reference SIG/CW/07-20/21866)



Key / Notes

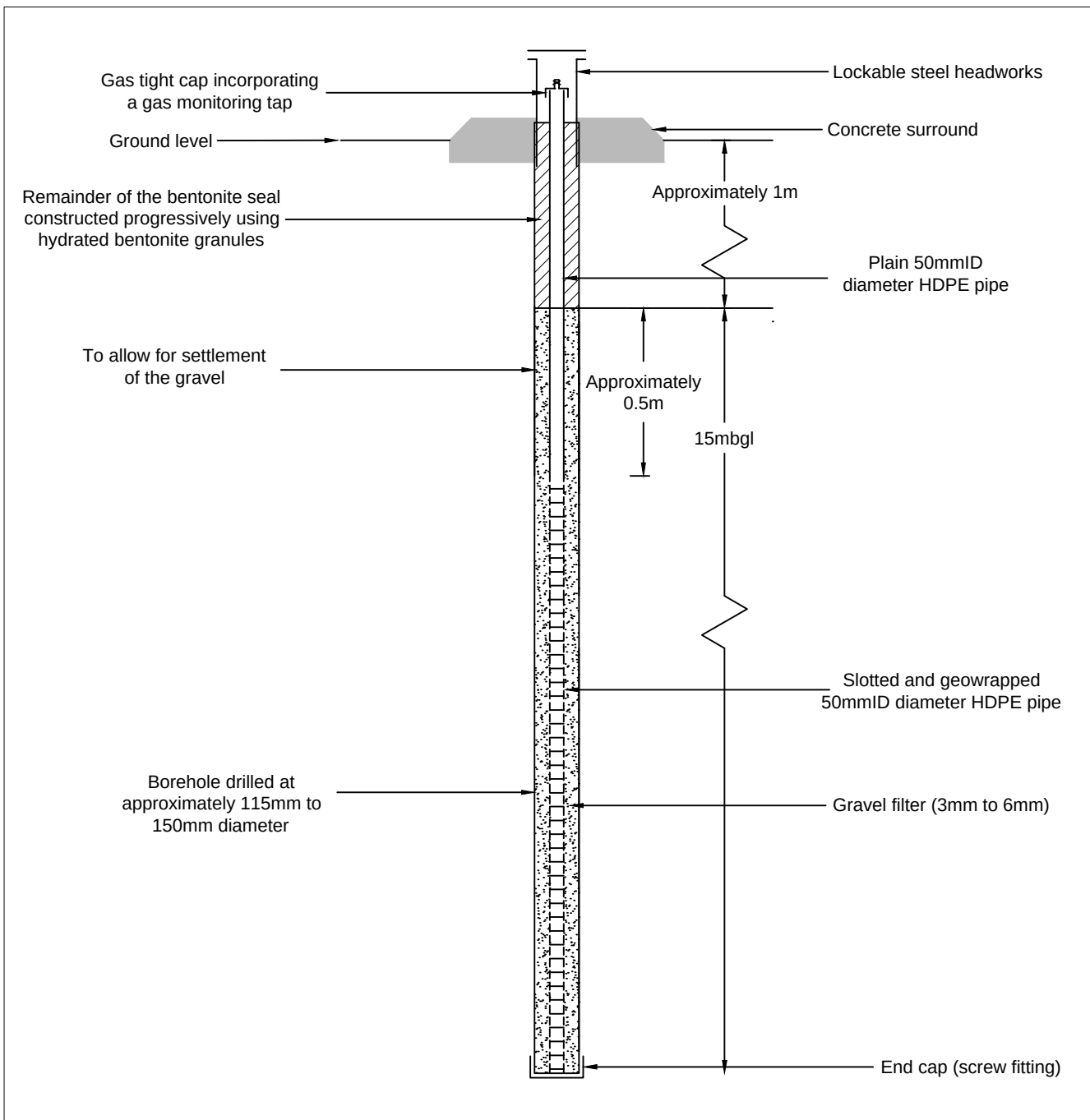
	Final	KR	KE	GT	04/09/20
Rev	Status	Drn	App	Chk	Date
Site CWMRYHDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Schematic cross section through a typical gas venting well					
Figure 2		Scale Not to scale			
Drawing Ref SIG/CW/06-20/21856					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					



For the well installation details see Figure 2
Schematic cross section through a typical gas venting well
(drawing reference SIG/CW/06-20/21856)

Key / Notes

	Final	KR	KE	GT	04/09/20
Rev	Status	Drn	App	Chk	Date
Site CWMRHYDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Typical gas venting headworks construction details					
Figure 3		Scale Not to scale			
Drawing Ref SIG/CW/07-20/21866					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					



Key / Notes

	Final	KR	KE	GT	04/09/20
Rev	Status	Drn	App	Chk	Date
Site CWMRYHDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Schematic cross section through a typical landfill gas monitoring borehole					
Figure 4		Scale Not to scale			
Drawing Ref SIG/CW/06-20/21857					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					

APPENDICIES

APPENDIX A
CIRRICULA VITAE

NAME: K EATON

POSITION: Technical Director

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:

MSc, DIC, Engineering Geology - Imperial College, London

BSc Honours, Geology - University of Manchester

Fellow of the Geological Society (FGS) and Chartered Geologist (C.Geol)

Register Specialist in Land Condition (SiLC), SiLC Assessor, SiLC Champion (2010-2017).

Registered Qualified Person (QP 005) under the CL:AIRE Code of Practice.

Drafting panel member for the revision of British Standard BS:10175 Investigation of potentially contaminated sites.

PROFESSIONAL PROFILE:

Over 27 years of experience in environmental consultancy across a range of disciplines with extensive project management skills in the assessment of the risks and liabilities associated with the management of contaminated land. Experience extends across a broad range of sectors, including public bodies and agencies, petro-chemical, energy, manufacturing, transport, waste facilities, property, legal and financial institutions. Project experience includes permitting and compliance, mergers and acquisitions and site closures assessing the financial impacts to business; designing and implementing remediation strategies, environmental due diligence for transactions and refinancing. Advises and works with multi-disciplinary technical and legal teams and is highly experienced in negotiating with regulatory authorities to deliver the safe and successful project closure.

Experienced in the assessment of contaminated land under Part 2A legislation, planning applications and providing technical support for legal matters arising from pollution incidents together with providing technical evidence and opinion in arbitration and litigation cases. A registered Specialist in Land Condition (SiLC) and a member of the Professional and Technical Panel (PTP) that administer the SiLC scheme between 2010 and 2017, and since 2005 a SiLC Assessor. Panel member for the preparation of the revisions to the SiLC National Brownfield Skills Framework (NBSF) and responsible for creating the SiLC NBSF assessment tool, which forms part of a National Quality Mark Scheme.

PROJECT EXPERIENCE

Responsible for the safe and effective management of site investigations applying a range of techniques associated with site development, divestiture, acquisition, pollution incidents and permitting, identifying risk/liabilities and contingencies, including feasibility studies, remediation design, providing cost liability assessment and risk management strategies for dealing with a range of stakeholders including presentation at public meetings and providing the 'non-technical' communication of data. Extensive experience in the evaluation and characterisation of contaminated land and groundwater environments, geotechnical assessment, assessing contaminant behaviour and the characterisation of product plumes (mass balance, phase distribution, isotope studies), assessing risk and impacts to the environment, human health and ecology. Project examples include:

- Oil Sector – a range of projects for major oil companies (Texaco, Shell, Mobil, Fina, BP, ConocoPhillips/Phillips66, Oil Pipeline Agency/CLH-PS, Kuwait Oil Company) including petrol service stations, fuel depots, fuel terminals and refinery, assessing environmental liability and risks for site divestiture, development and remediation contingency.
- Pharmaceutical and Chemical Sector - including assessment of significant spill incidents and impacts from historical activities for example characterisation of chlorinated solvents and fuel hydrocarbons plumes; risk assessment, implementing remediation actions.

- Manufacturing and industrial facilities – due diligence, development and pollution incidents
- Energy Sector - including baseline pre-closure and permit application investigations to assess ground conditions and environmental liabilities.
- Transport including rail – Investigation of pollution incidents, risk assessment, design and implementation of the remediation works.
- Property sector – site assessments and remediation for development, contaminated land liability assessments for divestiture and acquisitions including the assessment of financial risk, risk transfer and insurance options.
- Waste sector – site investigations and assessment as part of due diligence and costs liabilities, project manager for the preparation of CQA plans and verifications report for borehole investigation

Designed and implemented a range of remediation projects, feasibility studies and strategies applying key guidance such as CLR 11 in remediation option appraisal, cost benefit analysis and decision support tools. Highly experienced in negotiating risk based remediation strategies with the regulatory authorities and other stakeholders leading to successful and effective project closure. Experienced with various groundwater and human health risk assessment models including contaminant fate models. Has undertaken quantitative risk assessments to derive remedial targets for projects associated with site redevelopment, for example: a former gas works - residential housing; chlorinated and aromatic solvent contamination – commercial and residential developments; spills/emergency response – fuels, chlorinated solvents, ethanol; fuel hydrocarbons - numerous sites (service stations, industrial and manufacturing).

Provided technical support for arbitration and litigation matters and the preparation of reports for the opinion of evidence and duty to the Court. Examples include:

- Fuel loss incidents adjacent to residential properties involving an assessment of ground conditions, an assessment of the likelihood of impact and risk to residents and associated cost liabilities arising from the fuel loss. Preparation of technical documents
- Review of a pollution incident at an industrial facility to assess the magnitude of contamination and the issue of contributory negligence. Preparation of an expert opinion report for submission to the court as an independent expert.
- Assessment of the impacts associated with a fuel leak from a major fuel distribution pipeline and preparing a technical report including assessing ecological damage for the preparation of a document for submission in support of mitigating circumstances against prosecution by the Environment Agency.
- Provision of technical documentation and expert opinion for arbitration associated with a dilapidations claim regarding the disposal of waste by a tenant on the client's land including an assessment of cost liabilities associated with the need for remedial works.
- A review of third party technical documentation and advice provided to the developer of an industrial site which was subsequently identified during the development to have asbestos containing materials in the made ground. The preparation of an expert opinion report to assist in determining if there was a prima facie case of negligence and breach of contract regarding information and advice provided to the developer.
- Provision of an expert report presenting opinion on matters regarding the performance of the firm's duties to prepare an Environmental Assessment Report carried out as part of a site acquisition due diligence process and to assist in determining if there was a prima facie case of negligence.

APPENDIX B

A COPY OF THE SITE DIARY FOR WELL/BOREHOLE CQA WORK PROFORMA



Site diary CQA well and borehole drilling and installation

Site	
Project reference	
Date	
Weather	
CQA Inspector	
Drilling contractor	
Lead driller	
Drilling rig /method	
Well/borehole/casing diameter	
H&S Plan/RAMS	

Checklist

Borehole reference: _____ GPS coordinates: _____

Pre-well/borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan			
Services cleared			
Hand dug inspection pit			
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve /cowl			
Headworks			

General notes

E.g. Progress of drilling, delays, details of groundwater strikes etc

Signed (CQA Inspector):

Date: _____

APPENDIX C

A COPY OF A WELL/BOREHOLE LOG PROFORMA

 Technical advisers on environmental issues		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project				Client				Date Completed		
Project No.			Ground Level (mAOD*)		Coordinates			Borehole No.		
Contractor				Location				Sheet		
SAMPLES & TESTS			STRATA						Instrument/ Backfill	
Sample depth	Type / No	Result / Blows	Depth		DESCRIPTION					
GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed			Plant:	
									Crew:	
									Type and Diameter	Depth m
							LOGGED BY			

SIG/CW/KE/20012/01/BHCQA

September 2020



SIG_CWg25559 FV

APPENDIX D

**A COPY OF A SUMMARY TABLE FOR THE CQA DRILLING AND INSTALLATION
PROFORMA**



Summary table for the CQA drilling and installation

Well/borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)

Well/borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl

General notes:

Signed (CQA Inspector): _____

Date: _____

SIG/CW/KE/20012/01/BHCQA

September 2020



APPENDIX E

**DRAWINGS SHOWING THE ANTICIPATED RESIDENTIAL DEVELOPMENT ON THE
PLATEAU TO THE SOUTH OF THE LANDFILL AND THE PUBLIC OPEN SPACE IN THE
AREA OF THE LANDFILL**



GENERAL NOTES

10 0 10 20 30 40 50

North Arrow

KEY

APPLICATION RED LINE (REFER TO SLP)

COMMUNITY HUB

GYM BUILDING

BIN & CYCLE STORE

ALL INFO BELOW FOR OPEN SPACE ARE VIA SEPERATE APPLICATION

FOOTPATH TRAIL (STONE BLINDED PATH)

INFORMAL MOWN FOOTPATH TRACK

FOOTPATH LINK TO RESIDENTIAL DEVELOPMENT

EXTERNAL TRIM TRAIL

BENCH SEATING LOCATIONS

TOP CLIFF FACE

BOTTOM OF CLIFF FACE

APPROX EDGE OF NATURAL WOODLAND

BORE HOLE LOCATION - MIN 5M FROM BUILT FORM

GAS MONITORING STATION WITH EITHER / OR CCTV / LIGHTING / SIGN VIA BRACKET (TBA)

APPROXIMATE PUMP STATION LOCATION

SUMP LOCATION

KIOSK LOCATION

STORM WATER SUMP LOCATION

STORM WATER KIOSK LOCATION

STORM WATER LAND DRAIN

EXISTING POND

DULOCK SAFETY FENC 1.8m

POST & WIRE FENCE WITH 'PIG WIRE' LOW LEVEL

TIMBER POST & RAIL WITH 'PIG WIRE' LOW LEVEL

TIMBER HIT & MISS FENCE (L.E.A.P & L.A.P)

GRASSCRETE OR SIMILAR TBA

PROPOSED HOUSING - SUBJECT TO APPROVAL

BIN COLLECTION POINT

NOTE:

REFER TO SOLTYS BREWSTER LANDSCAPING STRATEGY DESIGN FOR DETAILS

REFER TO SHEAR DESIGN FOR ENGINEERING STRATEGY & DETAILS

A 20.12.19 DA surrounding open space area updated

Redline Adjusted to follow road

Alignment

Rev	Date	By	Comment
-----	------	----	---------

Eden

STONE

HOMES

1st Floor

Building 102

Wales 1 Business Park

Magor

NP26 3DG

Tel - 01291 674800

Project Title

Parc Ceirw Quarry

Cwmrhydyceirw

Swansea

Drawing Title

Community Hub

Application

Drawing Status

Master Layout

Phase 6

Drawn By

Checked By

Scales

DA

1:1000

A1

Date

Aug 2019

Project No.

Drawing No.

Rev.

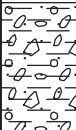
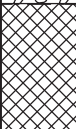
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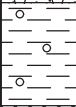
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A

APPENDIX F

COPIES OF LOGS L3/09, L14/09 AND L21/09

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw site investigation of the waste							Client SI Green UK Ltd					Date Completed 25/11/2009		
Project No. SIG/CW/JRC/2685/01				Ground Level (mAOD) 46.11			Co-ordinates () E 266457.54 N 199276.85				Borehole No. L3/09			
Contractor Hughes Exploration & Environmental Ltd						Location Cwmrhydyceirw, Morriston, Swansea					Sheet 1 of 1			
Scale	SAMPLES & TESTS			STRATA							Legend	Water	Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION								
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	0.35	HSV	58kPa	46.01	0.10	Stiff brown sandy gravelly CLAY with rootlets (MADE GROUND - TOPSOIL)								
	0.50-1.15	G		(2.15)	Stiff brown sandy gravelly CLAY with cobbles. Cobbles are sub angular medium hard rock. (MADE GROUND - PROBABLE COVER SOILS)									
	1.15-1.75	G												
	1.30-1.60	C		43.86	2.25	1.00 - 1.25 Clay becoming dark brown. Gravel is coal, brick, ceramic tile and medium hard sandstone.								
	2.25-3.00	C				1.15 - 1.75 Becoming soft and more sandy.								
						(3.10)								
						Plastic and mineral wool in a black silt (70/30) (MADE GROUND - PROBABLE COMMERCIAL / INDUSTRIAL GENERAL WASTE)								
	4.75-4.90	C		40.76	5.35	4.75 - 5.15 Soft dark brown with blue mottling sandy gravelly CLAY with cobbles. Cobbles are concrete, brick, medium strong rock and rare glass.								
						5.15 - 5.35 Concrete.								
	6.50-7.05	C	6.5ppm			Plastic, fabric, wood, medium strong rock, metal, paper and glass in a black SILT. (70/30) (MADE GROUND - PROBABLE DOMESTIC WASTE)								
	6.50-7.50	PID				7.60 - 8.35 Urine odour.								
						(5.65)								
	8.35-8.85	C												
	9.35-9.85	PID	<0.1ppm											
	10.35-11.00	C	12.5ppm	35.11	11.00									
	10.35-11.00	PID		35.11	11.00	Smooth black plastic. (HDPE - FLEXIBLE MEMBRANE LINER)								
						END OF BOREHOLE								
GROUNDWATER							REMARKS / INSTALLATIONS				DRILLING			
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Installation comprised bentonite from 11.0mbgl - 9.85mbgl, slotted pipe from 9.75mbgl - 0.75mbgl and plain pipe from 0.7mbgl to approximately 1magl. Gravel backfill below and around the standpipe to 1.0mbgl with bentonite backfill to ground level				Plant: X Track Maverick Crew: P Stanesby and A Close		
25/11				9.58	9.85							Type and Diameter Barrel auger 200mm		Depth 11m
25/11												LOGGED BY BMJ		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw site investigation of the waste							Client SI Green UK Ltd					Date Completed 18/12/2009	
Project No. SIG/CW/JRC/2685/01				Ground Level (mAOD) 38.02			Co-ordinates () E 266519.23 N 199315.54				Borehole No. L14/09		
Contractor Hughes Exploration & Environmental Ltd						Location Cwmrhydyceirw, Morriston, Swansea					Sheet 1 of 1		
Scale	SAMPLES & TESTS			STRATA							Legend	Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION							
1	1.80-2.10 1.80-2.10	C PID	<0.1ppm	37.92	0.10	Soft dark brown gravelly CLAY with rootlets (MADE GROUND - TOPSOIL)							
2				36.22	1.80	Soft dark brown gravelly CLAY with rootlets and cobbles (MADE GROUND - PROBABLE COVER SOILS)							
3	3.70-4.30 3.70-4.30	C PID	<0.1ppm		(3.60)	Plastic sacking, wood, metal, plastic, glass, wire, fabric, cemented brick and occasional cobbles and boulders in a soft dark grey or black gravelly occasionally clayey SILT. Boulders are sandstone. (MADE GROUND - PROBABLE COMMERCIAL / INDUSTRIAL GENERAL WASTE)							
4													
5				32.62	5.40	Black plastic. (HDPE - FLEXIBLE MEMBRANE LINER)							
6				32.62	5.40								
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													

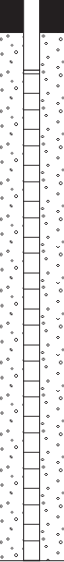
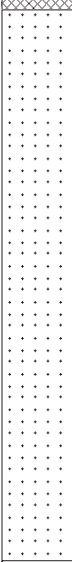
GROUNDWATER							REMARKS / INSTALLATIONS			DRILLING		
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	The installation comprised bentonite from 5.4mbgl to 4.3mbgl, slotted pipe from 5.1mbgl to 2.6mbgl and plain pipe from 2.6mbgl to approximately 1magl. Gravel was backfilled to 2mbgl with bentonite backfill to ground level.			Plant: X Track Maverick Crew: P Stanesby and G Powell	
											Type and Diameter Barrel auger 200mm	
LOGGED BY								LCH				

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw site investigation of the waste							Client SI Green UK Ltd					Date Completed 12/11/2009	
Project No. SIG/CW/JRC/2685/01				Ground Level (mAOD) 43.72			Co-ordinates () E 266490.01 N 199350.00				Borehole No. L21/09		
Contractor Hughes Exploration & Environmental Ltd						Location Cwmrhydyceirw, Morriston, Swansea					Sheet 1 of 1		
Scale	SAMPLES & TESTS			STRATA						Legend	Water	Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION							
1	1.70-2.00	C		43.12	0.60	Soft to firm dark brown sandy CLAY with gravel and rootlets. Gravel is sub angular to sub rounded sandstone and quartzite. (MADE GROUND - TOPSOIL)							
2				42.02	(1.10) 1.70	Soft to firm dark brown sandy CLAY with boulders and gravel. Gravel is sub angular to sub rounded sandstone and quartzite (MADE GROUND - PROBABLE COVER SOIL) 1.20 - 1.70 Becoming dark grey to black sandy SILT							
3	2.70-2.80	C			(3.60)	Plastic, wood, mineral wool, fabric, glass, metal, sandstone and quartzite cobbles and plastic sacking in a soft dark grey to black occasionally brown slightly gravelly SILT. (50/50) (MADE GROUND - PROBABLE COMMERCIAL / INDUSTRIAL GENERAL WASTE)							
4	2.80-3.20	PID											
5	4.55-5.30	C		38.42	5.30	Plastic, wood, metal, fabric, glass, toys, bones, metal cans and paper in a firm becoming soft dark brown or dark grey gravelly CLAY. (70/30) (MADE GROUND - PROBABLE DOMESTIC WASTE)							
6	4.55-5.30	PID	8.4ppm										
7	6.80-7.20	C			(6.90)	7.20 - 8.00 Newspaper dated September 1986							
8	8.00-8.50	G											
9	8.00-8.50	HSV	32kPa										
10	8.90-9.50	C											
11	10.90-11.40	C		31.52	12.20	Black plastic. (HDPE - FLEXIBLE MEMBRANE LINER)							
12	10.90-11.40	PID	74.6ppm										
13													
14				31.42	12.30	Firm dark grey very slightly gravelly CLAY. Gravel is sub rounded to sub angular. (MADE GROUND - PROBABLE CLAY LAYER)							
15						END OF BOREHOLE							
16													
17													
18													
19													
GROUNDWATER							REMARKS / INSTALLATIONS				DRILLING		
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	The installation comprised bentonite from 12.3mbgl to 11.4mbgl, slotted pipe from 11.4mbgl to 2.2mbgl and plain pipe from 2.2mbgl to approximately 1magl. Gravel was backfilled around the standpipe to 2mbgl with bentonite backfill to ground level.				Plant: X Track Maverick Crew: P Stanesby and A Close	
12/10				7.02								Type and Diameter Barrel auger 200mm	
							LOGGED BY		LCH				

APPENDIX G

COPIES OF BOREHOLE LOGS LFG29, LFG40, LFG41 AND LFG42

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG39 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266493.69mE 199237.74mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 44.57mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD	FI							
							0.40	44.17			FILL (Driller's Description) SANDSTONE (Driller's Description)	1	
													2
													3
													4
													5
													6
													7
													8
													9
													10
													11
													12
													13
													14
								15.00	29.57				End of Borehole at 15.00 m
													16
													17
													18
													19
													20
													21
													22
													23
													24
													25
													26
													27
													28
													29
													30
													31
													32
													33
													34
													35
													36
													37
													38
													39
													40

Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.1m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG40 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266465.58mE 199248.75mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 45.07mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							0.40	44.67			FILL (Driller's Description) SANDSTONE (Driller's Description)	1
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12
												13
												14
							15.00	30.07			End of Borehole at 15.00 m	15
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25
												26
												27
												28
												29
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												35
												36
												37
												38
												39
												40

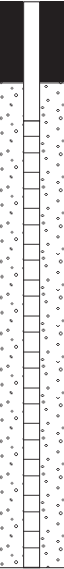
Remarks: 1. rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.53m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)				W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry		Project No.: 12095		Borehole No.: LFG41 Sheet 1 of 1	
Location: Morrison		Client: Edenstone Homes		Coordinates: 266433.15mE 199254.20mN		Hole Type: RO	
Equipment: Klemm		Diameter of Casing: 150mm		Level: 45.45mAOD		Scale 1:200	
Diameter of Boring: 142mm		Depth of Casing: 1.50m		Dates 08/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD						
						0.20	45.25			FILL (Driller's Description) SANDSTONE (Driller's Description)	1
											2
											3
											4
											5
											6
											7
											8
											9
											10
											11
											12
											13
											14
						15.00	30.45			End of Borehole at 15.00 m	15
											16
											17
											18
											19
											20
											21
											22
											23
											24
											25
											26
											27
											28
											29
											30
											31
											32
											33
											34
											35
											36
											37
											38
											39
											40

Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.95m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG42 Sheet 1 of 1	
Location: Morryston				Client: Edenstone Homes				Coordinates: 266409.52mE 199271.82mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 45.65mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							0.60	45.05			FILL (Driller's Description)	1
											SANDSTONE (Driller's Description)	2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12
												13
												14
							15.00	30.65			End of Borehole at 15.00 m	
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25
												26
												27
												28
												29
												30
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 46.12m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)				W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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APPENDIX B

**CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN REFERENCE
SIG/CW/KE/20012/01/BHCQA-R DATED SEPTEMBER 2022**



**CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN
FOR THE REPLACEMENT AND ADDITION OF
MONITORING BOREHOLES AT CWMRHYDYCEIRW
QUARRY LANDFILL, MORRISTON, SWANSEA**

ENVIRONMENTAL PERMIT NUMBER TP3835LV

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This report has been prepared by MJCA with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between MJCA and the Client. This report is confidential to the client and MJCA accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by MJCA beforehand. Any such party relies upon the report at their own risk.

1. Introduction

1.1 MJCA is commissioned by SI Green UK Limited to prepare a Construction Quality Assurance (CQA) Plan for the decommissioning and replacement and addition of landfill gas monitoring boreholes and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill (the site). The works will comprise:-

- The decommissioning and replacement including the installation of monitoring facilities of 9 gas monitoring boreholes (LFG2, LFG18, LFG23, LFG35, LFG43, LFG44, LFG46, LFG47 and LFG48) and 2 groundwater monitoring boreholes (GW03 and GW08). It is necessary to decommission and replace the majority of these boreholes to facilitate the residential development areas. Boreholes LFG2, LFG23, LFG43 and GW03 have been damaged and need decommissioning and replacing.
- The installation of additional monitoring facilities at four borehole locations (LFG24, LFG25, LFG26 and LFG27). It is necessary to install additional monitoring facilities as these existing borehole locations are prone to flooding from the seepage of groundwater and may no longer be suitable for landfill gas monitoring.

1.2 The specification for the installation of other gas and groundwater monitoring boreholes at the site have been presented previously in a CQA Plan Report reference SIG/CW/JRC/2943/01/BHCQA¹ provided to and agreed with Natural Resources Wales (NRW) (CAR form reference: CAR_NRW0033618). While the general principles and design of the boreholes are similar to those presented in the approved CQA Plan reference SIG/CW/JRC/2943/01/BHCQA, this CQA Plan includes information on CQA procedures, records and reporting relevant to the further works now proposed.

1.3 A number of boreholes at the site have been decommissioned previously. The specification for these decommissioning works is presented in a CQA Plan Report reference SIG/CW/JRC/2943/01/BHCQADecV2² provided to NRW on 20 August 2020 which was a revised and resubmitted CQA Plan taking account the comments received from NRW in emails dated 22 May 2020 and 17 June 2020 in response to a CQA plan

¹ Construction Quality Assurance (CQA) plan for the installation of gas and combined gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea, dated February 2018.

² Construction Quality Assurance (CQA) plan for the decommissioning of gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea dated August 2020

for the decommissioning of gas and groundwater monitoring boreholes submitted to NRW in January 2020. Additional clarification was provided regarding the grout mix ratios in an email to NRW on 3 September 2020. NRW provided confirmation of agreement of the specification for the previous decommissioning works in an email dated 10 September 2020. The borehole decommissioning works included in this CQA Plan are consistent with the specification agreed with NRW in 2020.

- 1.4** The CQA Plan is submitted pursuant to Condition 2.7.4 of Environmental Permit reference EPR/TP3835LV (the permit) for the site in respect of construction proposals for landfill infrastructure.

2. Construction Quality Assurance (CQA) Plan

Parties **involved** with the works

2.1 The following parties will be involved with the proposed well and borehole drilling and installation works:

- Site operator: SI Green UK Limited
- CQA project consultant: MJCA
 - CQA Project Manager: K Eaton, MJCA
 - CQA Inspector: ***MJCA site personnel to be confirmed.***
- Drilling contractor: Apex Drilling Services, Bridgend, CF33 6BZ.

Responsibilities

2.2 The responsibilities of the key parties involved in the works the subject of the CQA Plan are set out below:

CQA Project Manager

2.3 The CQA Project Manager will be responsible for the management of the project and liaison with the client and NRW for the duration of the project. Specific duties that will be undertaken by the CQA Project Manager include:

- Notifying NRW in advance in respect of the proposed programme for the site works and providing additional notification should the proposed date for mobilisation change.
- Checking the CQA Plan including the information relevant to the external geological and hydrogeological conditions including developing a suitable specification for the borehole installations and decommissioning and identifying suitable locations for the proposed boreholes.

- Providing the drilling contractor with relevant information on the borehole drilling and decommissioning and the borehole drilling and decommissioning specifications prior to mobilisation. Verifying that the drilling contractor confirms that the materials supplied meet the specification set out in the agreed CQA Plan and that the drilling contractor has provided confirmation that the drilling crew will be suitably experienced and trained and have the relevant British Drilling Association (BDA) accreditation.
- Providing details of relevant certifications held by the Lead Driller appointed for the works to NRW prior to the commencement of the drilling works. Notification regarding changes in personnel relevant to CQA will be provided to NRW as soon as is practicable.
- Providing technical support as necessary to the CQA Inspector regarding the works and in particular if there is a need to deviate from the specifications set out in the agreed CQA Plan and notifying NRW regarding any significant changes to the specifications for the works.
- Technical checking of the CQA Verification Report.

2.4 A curriculum vitae for the CQA Project Manager is provided at Appendix A to this report.

CQA Inspector

2.5 The CQA Inspector will be a suitably qualified and experienced geologist or engineer responsible for the verification of the drilling and installation of the monitoring facilities in the boreholes and the decommissioning works. The duties of the CQA Inspector will include the following:

- Reviewing information relevant to the expected external geological and hydrogeological conditions including developing suitable specifications for the borehole installations and decommissioning and identifying on site the locations which are potentially suitable for the proposed boreholes.
- Preparing this CQA Plan.
- Verifying that field testing equipment are operational and where necessary calibrating the equipment.

- Liaising with the site operator regarding activities being carried out in the vicinity of the proposed locations for the boreholes and health and safety matters including in respect of the operator's safe systems of work and the provision of information necessary to secure a permit to work from the site operator where necessary.
- Verifying that suitable information is available regarding services at and in the vicinity of the proposed locations for the boreholes and that appropriate safe clearance for example a cable avoidance tool (CAT) scan of the borehole locations is carried out.
- Verifying before its use in the construction of the boreholes and the decommissioning works the quantity and quality of materials delivered to site for consistency with the specifications set out in the agreed CQA Plan including but not limited to standpipes, filter gravel, bentonite, caps and covers and recording the outcome of the checks in the daily site diary.
- Collecting and recording information including materials delivery notes, certificates of conformity for the borehole standpipes and maintaining a photographic record of the materials to be used in the works.
- Verifying that the materials are stored in a suitable location on site and that the site operator is aware of the storage location to minimise the risk that the stored materials will be damaged.
- Verifying that the locations at which drilling is carried out on site are consistent generally with the proposed locations presented on the relevant figure in the agreed CQA Plan including the use of a GPS device to assist. In the event that a proposed borehole location needs to be changed the CQA Inspector will agree the new location with the CQA Project Manager prior to drilling and NRW will be notified of the change in advance insofar as it is reasonably practicable and details of the reason for the change of the well or borehole location will be provided.
- Liaison with the Lead Driller at each borehole location to confirm with the Lead Driller the borehole drilling and installation or the decommissioning specifications.
- The full time CQA verification of the borehole drilling and installation works and the decommissioning works to verify that the agreed CQA procedures are followed and

that the boreholes are installed and decommissioned in accordance with the specifications set out in the agreed CQA Plan.

- Maintaining a daily site diary of the drilling and the installation of the facilities and the decommissioning works and providing photographic evidence of the drilling and installation and decommissioning works. A copy of a proforma of a daily site diary for borehole CQA verification work is presented at Appendix B.
- Recording the ground conditions, groundwater strikes and other relevant information in accordance with BS5930:2015 +A1:2020 “Code of practice for ground investigations” and the Environment Agency guidance document reference LFTGN02 entitled “Guidance on monitoring of landfill leachate, groundwater and surface water” dated February 2003 and the preparation of borehole logs and decommissioning records. A copy of a proforma of a borehole log template is presented at Appendix C.
- Undertaking field testing and monitoring consistent with the agreed CQA Plan.
- Providing regular progress updates to the CQA Project Manager and making the CQA Project Manager aware of relevant site observations and in particular where site observations have the potential to necessitate changes to the suitability of the specification set out in the agreed CQA Plan.
- As necessary the CQA Inspector will discuss with the CQA Project Manager differences between the expected ground conditions and ground conditions recorded during drilling and agree any changes that are necessary to the specification for the borehole installations or decommissioning set out in the agreed CQA Plan.
- Recording the details of the borehole installations and decommissioning works including the diameter and depth of the wells and boreholes, the depth and length of installed or removed sections of both the slotted and plain standpipe sections, verifying that end caps which meet the requirements of the specification are used and that the pipe joints are connected in accordance with the specifications set out in the agreed CQA Plan. A copy of a proforma for verifying the borehole drilling and installation and a copy of a proforma for verifying the decommissioning works is presented at Appendix D.

- Recording the depth intervals over which backfill materials such as filter gravel, bentonite and concrete grout are placed and the number of bags (and mass) of filter gravel and bentonite used.
 - Verifying that bentonite seals are hydrated with clean water and that borehole headworks comprising caps, gas valves and headworks are installed in accordance with the specification set out in the agreed CQA Plan.
 - Verifying that insofar as it is practicable based on the nature of the ground intrusive site investigation works and the current site conditions that the areas in which work is carried out are left tidy. Spoil from the boreholes will be managed in accordance with site specific arrangements made with the client.
- 2.6** The curriculum vitae for a CQA Inspector will be provided prior to the commencement of the drilling and decommissioning works. Notification regarding changes in personnel relevant to CQA will be provided to NRW as soon as is practicable.
- 2.7** The CQA Inspector will prepare a CQA Verification Report(s) incorporating borehole logs, decommissioning information, drawings, a photographic log, daily site diary logs and copies of information documenting the materials used in the works.

Drilling contractor

- 2.8** The duties performed by the drilling contractor include duties which may be carried out by other parties for example sub-contractors and suppliers. The duties of the drilling contractor will include the following:
- Making available suitably experienced and trained drilling crew and providing to the CQA Project Manager confirmation of British Drilling Association (BDA) accreditation.
 - Checking that there are safe routes of access and egress at each borehole location for the drilling equipment and associated plant and equipment prior to the commencement of drilling and decommissioning and that the ground conditions and gradients are safe and suitable for the drilling rig and associated equipment.
 - Undertaking the drilling and decommissioning of the boreholes and the borehole installation works in accordance with health and safety information comprising risk

assessment and method statements prepared by the drilling contractor and the agreed specifications as verified by the CQA Inspector and updating the health and safety information as appropriate where changes to the works are necessary.

- Checking the quantity and specification of materials delivered to site to be used in the borehole installations and decommissioning works including but not limited to standpipes, filter gravel, bentonite, caps and covers.
- Prior to starting the drilling or decommissioning, the Lead Driller will confirm with the CQA Inspector the borehole reference, the expected ground conditions, the existing or proposed depth of the borehole and the installation and decommissioning specifications presented in the CQA Plan.
- Preparing a record for each borehole including a record of the depth in the changes in lithology, a brief description of each lithology encountered, borehole testing information, groundwater strikes, the addition of water during drilling, details of the number and types of samples taken, details of the installation of casing and the depth of casing used to facilitate drilling, the duration and reasons for standing time, the total drilled depth of the well or borehole and details of the well and borehole installations.
- Preparing a record of the borehole decommissioning works including the depth to the base of the borehole recorded prior to decommissioning, the volume of the 1:1 and 95:5 OPC/bentonite grout used, the base and top of the grout and the base and top of the cement grout.

MJCA Quality procedures

- 2.9** MJCA operates a quality assurance system externally certified in accordance with BS EN ISO 9001:2015. The quality assurance system sets out company policy on maintaining quality in all aspects of the company's operations including our procedures for communication, contract management, supplier assessment, the control of technical documentation, training, calibration of field equipment and management review. All reports and other project related documents produced by MJCA are reviewed as necessary by technical staff and in accordance our externally certified quality assurance system prior to a final review at a senior level.

Health, safety and environmental management

- 2.10** MJCA has a health and safety system which sets out the roles and responsibilities in the company and procedures associated with our business. A Health and Safety Plan including risk assessments and method statements will be prepared prior to the site works. The drilling contractor will provide risk assessments and method statements for the drilling and borehole installation works and the borehole decommissioning works.
- 2.11** CQA Inspectors undertake a range of external health and safety training for example relevant training and certification consistent with approved schemes such as the Safety Passport Alliance (SPA) and Construction Skills Certification Scheme (CSCS).
- 2.12** Any modification of site health and safety requirements or work plans including changes to Personal Protective Equipment will be raised by the CQA Inspector and agreed with MJCA Health and Safety Manager prior to commencing the works.

3. Proposals for the decommissioning and replacement and addition of landfill gas monitoring boreholes and groundwater monitoring boreholes

- 3.1** The proposed locations of the replacement and additional landfill gas monitoring boreholes and groundwater monitoring boreholes are shown on Figure 1 (drawing reference SIG/CW/09-22/23343)..

Ground conditions

- 3.2** The site comprises an old quarry and landfill site. It is understood that quarrying at the site ceased in 1979 and that landfilling took place between 1985 and 1991. The site is the subject of Environmental Permit (EP) reference EPR/TP3835LV. The site no longer accepts waste for disposal and has been capped. The cap comprises a geosynthetic capping system including a 1mm LLDPE geomembrane overlain by a drainage composite. Restoration is nearing completion prior to the use of the former landfill as public open space. Restoration soils above the cap will be 1m to 2m in thickness.
- 3.3** The site was excavated through Quaternary glacial Till (formerly termed boulder clay) into the Pennant Sandstone Formation of the Carboniferous Upper Coal Measures. The Pennant Sandstone Formation comprises thickly bedded massive sandstone with subordinate shales and mudstones together with siltstones and a few coal horizons.
- 3.4** The decommissioning details of the boreholes which are proposed to be decommissioned are summarised in Table 1. The construction details of the proposed replacement and additional monitoring boreholes based on the expected ground conditions including the grid references of the locations are summarised in Tables 2 and 3.

Proposal for the decommissioning of boreholes at the site

- 3.5** It is necessary to decommission a total of nine landfill gas monitoring boreholes and two groundwater monitoring boreholes at the site as the majority of the locations of the boreholes conflict with the consented housing development at the site. Four of the boreholes have been damaged and need decommissioning and replacing.

- 3.6** The monitoring boreholes will be decommissioned generally in accordance with the Environment Agency guidance³. The locations of the monitoring boreholes which are to be decommissioned and replaced are shown on Figure 1.
- 3.7** The details of the ground conditions and the monitoring borehole construction details for each borehole which will be decommissioned are recorded on the borehole logs, copies of which are presented at Appendix E. The borehole decommissioning method has taken account of the ground conditions and the monitoring borehole construction details. A summary of the borehole construction details is presented in Table 1 which includes the depth of each borehole, the depth to the top of the slotted standpipe in each borehole and the length of plain standpipe and the length of slotted standpipe in each borehole. Borehole logs are not available for landfill gas monitoring boreholes LFG2 and LFG35 and therefore the construction of the monitoring boreholes has been assumed to be similar to the closest monitoring boreholes.
- 3.8** Based on the ground conditions and the construction details of the monitoring boreholes in summary it is proposed to infill the boreholes with low permeability backfill comprising bentonite granules. The decommissioning works will comprise the following scope at each borehole:-
- i. The headworks comprising the monitoring borehole cover and the surrounding concrete plinth will be excavated and removed. The borehole standpipes are completed with a top cap/gas tap, which will remain in place while the removal of the headworks is carried out to minimise the risk that loose materials will fall down the standpipe. The top cap will be removed together with any groundwater sampling infrastructure (such as Wattera piping).
 - ii. Details of the borehole and monitoring facilities installations, where they are available, are presented in Table 1. Prior to backfilling each borehole the borehole will be plumbed to confirm the depth of the borehole.
 - iii. The monitoring borehole facilities will be sealed from the base of the monitoring boreholes using an Ordinary Portland Cement (OPC) and bentonite powder grout mix applied by a high shear mixer or a re-circulating centrifugal pump mixer and a tremie pipe placed in the base of the monitoring borehole and withdrawn

³ Environment Agency, 2012. Good practice for decommissioning redundant boreholes and wells. Environment Agency product code: LIT 6478 / 657_12.

progressively. The whole length of the monitoring pipe will be sealed to the ground surface. The bentonite grout will comprise a 1:1 mix of OPC to bentonite powder with approximately 90 litres of water for every 25kg of the mixed dry grout, although this may vary subject to providing a pumpable mix in each borehole. The amount of grout used in each borehole will vary subject to the diameter of the standpipe, and the diameter of the borehole.

- iv. The volumes of grout will be recorded on the site diary sheet. The bentonite grout will be left for a period of time to settle. This will be monitored and topping up of the grout will be carried out if necessary.
- v. Once the bentonite grout has sufficiently set the upper 3m of the plain standpipe section will be removed by over-drilling the borehole using rotary drilling methods to remove the upper 3m to remove the standpipe and the existing surrounding grout. The open borehole will then be sealed using an OPC to bentonite ratio mix of 95:5 applied with a tremie pipe.

3.9 All the materials excavated from the boreholes will be removed off site to a suitably authorised waste management facility.

3.10 The works will be supervised by a CQA Inspector who will keep a record of the works.

Landfill gas and groundwater monitoring borehole drilling and installation specifications

3.11 The drilling and installation specification for the nine landfill gas monitoring boreholes (LFG2, LFG18, LFG23, LFG35, LFG43, LFG44, LFG46, LFG47 and LFG48) and two groundwater monitoring boreholes (GW032 and GW08) are as follows.

3.12 The landfill gas monitoring boreholes will be drilled using rotary drilling techniques and air and/or water flush at a diameter of between approximately 115mm and 150mm. Should groundwater be encountered in a monitoring borehole, the depth at which groundwater is struck during drilling will be recorded. When the monitoring installation is complete groundwater levels will be measured relative to a datum point surveyed to Ordnance datum established for each borehole. The proposed depths of each borehole are summarised in Table 2.

3.13 The landfill gas and groundwater monitoring borehole installation details are as follows. The landfill gas monitoring boreholes will be drilled and installed consistent with the construction details presented on Figure 2 (drawing reference SIG/CW/09-22/23344) and the groundwater monitoring boreholes will be drilled and installed consistent with the construction details presented on Figure 3 (drawing reference SIG/CW/09-22/23345):-

- A 50mm ID HDPE pipe will be installed to the base of the boreholes as determined by the CQA Inspector. The HDPE pipe will be manufactured to the DIN 8074/5 standard and supplied in lengths of one and three metres with threaded joint connections. The perforated slotted pipe sections will have a slot aperture of approximately 2mm with a geotextile wrap.
- The upper section of plain pipe comprising 50mm ID HDPE pipe will be installed from ground level to the depths presented in Table 2. For the landfill gas monitoring boreholes the plain pipe will be installed to depths between approximately 2.7m below ground level (bgl) and 4.2mbgl and for the groundwater monitoring boreholes the plain pipe will be installed to depths between approximately 24.7mbgl and 28.7mbgl. The remaining length of pipe to the base of the boreholes will comprise 50mm ID HDPE slotted pipe. The plain pipe will be finished approximately 0.3m above ground level or approximately at ground level subject to the location of the boreholes with respect to the residential development layout. It may be necessary to change the installation details subject to the ground and groundwater conditions which are encountered whilst drilling the boreholes.
- The annulus between the borehole and the slotted section of pipe will be filled with a gravel pack. The volume between the standpipe and the annulus of the borehole will be dependent on the diameter. For a 115mm diameter borehole the volume will be 0.0337m^3 per metre length and for a 150mm diameter borehole the volume will be 0.0628m^3 per metre length. The estimated mass of gravel per metre length of borehole to fill the annulus between the borehole and the pipe is between approximately 6kg and 11kg per metre assuming a density for the gravel of approximately 1.75Mg/m^3 . The gravel pack will comprise washed, bagged and dried natural silica gravel at diameters of between approximately 3mm and 6mm. As the gravel pack will comprise loose, granular material only it is considered that the potential for bridging is minimised. In the unlikely event that bridging occurs it will

be identified by monitoring the quantity of gravel used and appropriate action such as manipulating the pipework to free the bridged gravel will be taken to remedy the situation.

- The annulus between the borehole and the plain section of pipe above the gravel pack will be filled with bentonite pellets or granules and progressively hydrated with clean water to provide a bentonite seal to the ground surface. Granules or pellets will be placed initially to a depth of 200mm above the gravel pack and hydrated progressively in approximately 200mm intervals to ground level. The method of bentonite seal construction and hydration will be recorded on the daily site diary forms. Bentonite pellets or granules used to construct seals will comprise naturally occurring high purity montmorillonite.
- The monitoring pipe will be fitted at the base with a push fit or threaded end cap and at the top with a removable gas tight cap with an integral gas monitoring tap.
- Subject to the location of the borehole with respect to the development layout the monitoring standpipes will be protected by headworks comprising a lockable steel riser pipe extended approximately 0.5m above ground level and concreted securely at ground level or a bolt down cover set in concrete at ground level.
- An identification reference will be marked in the borehole cover/borehole headworks.

The additional shallow landfill gas monitoring borehole drilling and installation specifications

- 3.14** The existing monitoring boreholes LFG24, LFG25, LFG26 and LFG27 extend to a depth of between approximately 37m below ground level (bgl) and 43mbgl. The slotted section of the existing monitoring facilities starts from a depth of approximately 3.5mbgl to 4.5mbgl and is positioned within the sandstone to the base of the boreholes. Boulder Clay overlies the sandstone. The groundwater recorded in the monitoring boreholes extends above the slotted section and consequently the monitoring boreholes may not be functional to facilitate monitoring for landfill gas. Based on the recorded geology and the observations of groundwater in the monitoring boreholes it is not possible to determine the depth at which the groundwater seepage occurs. Therefore it is proposed to install shallow monitoring boreholes as a pair of monitoring boreholes at

each location, with one monitoring borehole with monitoring facilities positioned in the Boulder Clay and the other with monitoring facilities extending 3m below the base of the Boulder Clay.

3.15 The shallow landfill gas monitoring boreholes will be drilled using rotary drilling techniques and air and/or water flush at a diameter of between approximately 115mm and 150mm. Should groundwater be encountered in a monitoring borehole, the depth at which groundwater is struck during drilling will be recorded. When the monitoring installation is complete groundwater levels will be measured relative to a datum point surveyed to Ordnance datum established for each borehole. The proposed depths of each borehole are summarised in Table 3.

3.16 The shallow landfill gas monitoring borehole installation details are as follows. The boreholes will be drilled and installed consistent with the construction details presented on Figure 4 (drawing reference SIG/CW/09-22/23346):-

- A 50mm ID HDPE slotted pipe with a geotextile wrap will be installed to the base of the shallow boreholes as determined by the CQA Inspector. In the shallow monitoring boreholes installed in the Boulder Clay the upper 0.5m pipe to ground level will comprise plain 50mm ID HDPE pipe and in the shallow boreholes installed in the sandstone the plain 50mm ID HDPE pipe will be installed through the Boulder Clay and to 0.5m below the base of the Boulder Clay. The plain pipe will be finished approximately 0.3m above ground level or approximately at ground level subject to the location of the boreholes with respect to the residential development layout. It may be necessary to change the installation details subject to the ground and groundwater conditions which are encountered whilst drilling the boreholes.
- The HDPE pipe will be manufactured to the DIN 8074/5 standard and supplied in lengths of one and three metres with threaded joint connections. The perforated slotted pipe sections will have a slot aperture of approximately 2mm.
- The annulus between the borehole and the slotted section of pipe will be filled with a gravel pack. The volume between the standpipe and the annulus of the borehole will be dependent on the diameter. For a 115mm diameter borehole the volume will be 0.0337m³ per metre length and for a 150mm diameter borehole the volume will be 0.0628m³ per metre length. The estimated mass of gravel per metre length of borehole to fill the annulus between the borehole and the pipe is between

approximately 6kg and 11kg per metre assuming a density for the gravel of approximately 1.75Mg/m³. The gravel pack will comprise washed, bagged and dried natural silica gravel at diameters of between approximately 3mm and 6mm. As the gravel pack will comprise loose, granular material only it is considered that the potential for bridging is minimised. In the unlikely event that bridging occurs it will be identified by monitoring the quantity of gravel used and appropriate action such as manipulating the pipework to free the bridged gravel will be taken to remedy the situation.

- The annulus between the borehole and the plain section of pipe above the gravel pack will be filled with bentonite pellets or granules and progressively hydrated with clean water to provide a bentonite seal to the ground surface. Granules or pellets will be placed initially to a depth of 200mm above the gravel pack and hydrated progressively in approximately 200mm intervals to ground level. The method of bentonite seal construction and hydration will be recorded on the daily site diary forms. Bentonite pellets or granules used to construct seals will comprise naturally occurring high purity montmorillonite.
- The monitoring pipe will be fitted at the base with a push fit or threaded end cap and at the top with a removable gas tight cap with an integral gas monitoring tap.
- Subject to the location of the borehole with respect to the development layout the monitoring standpipes will be protected by headworks comprising a lockable steel riser pipe extended approximately 0.5m above ground level and concreted securely at ground level or a bolt down cover set in concrete at ground level.
- An identification reference will be marked in the borehole cover/borehole headworks.

3.17 The existing monitoring boreholes LFG24, LFG25, LFG26 and LFG27 will be retained and landfill gas monitoring will be carried out at these locations should the recorded groundwater conditions change.

4. Construction Quality Assurance Verification Report

- 4.1** The CQA Inspector will verify that the drilled and decommissioned boreholes meet the specification and will verify that the CQA procedures have been followed.
- 4.2** A CQA Verification report will be submitted to NRW following completion of the installation of the boreholes. The CQA Verification Report will comprise a summary of the works carried out together with copies of relevant CQA documentation. The CQA Verification Report will include the following information:-
- Final as built construction details of each borehole together with a plan showing the locations where the boreholes were installed.
 - Copies of the borehole logs prepared by the CQA Inspector and copies of the borehole records provided by the drilling contractor.
 - Selected photographs of the works and materials used in the works.
 - Copies of the daily site diary forms and a written log of the works.
- 4.3** A CQA Verification report will be submitted to NRW following completion of the decommissioning of the boreholes. The CQA Verification Report will comprise a summary of the works carried out together with copies of relevant CQA documentation. The CQA Verification Report will include the following information:-
- A plan showing the locations where boreholes were decommissioned.
 - Selected photographs of the works and materials used in the works.
 - Copies of the daily site diary forms and a written log of the works.
- 4.4** The CQA Verification Report will confirm that the works have been carried out in accordance with the CQA Plan.

TABLE

Table 1

Summary of the construction details of the landfill gas monitoring boreholes and groundwater monitoring boreholes which will be decommissioned and replaced

Borehole (BH) name in CQA plan/ BH name on logs	Installation type	BH dia (mm)	Depth of borehole (mbgl)	Base of borehole (mAOD)	Base of slotted pipe (mbgl)	Base of plain pipe (mbgl)	Pipe dia (mm) ID
LFG2	Gas monitoring borehole	No borehole log found					
LFG18		150	39.0	30.66	38.8	3.28	50
LFG23		150	45.0	30.46	45.0	3.56	50
LFG35		No borehole log found					
LFG43		150	36.0	30.62	36.0	3.44	50
LFG44		150	33.0	31.76	33.0	3.40	50
LFG46		150	32.2	30.34	32.2	4.08	50
LFG47		150	32.3	30.98	32.3	2.70	50
LFG48		150	22.0	30.12	22.0	4.24	50
GW03 (CWMGW08R)	Groundwater monitoring borehole	155	32.47	24.12	31.6	24.7	50
GW08 (BH08)		150	43.0	18.75	43.0	28.7	50

mAOD – metres above Ordnance datum mbgl – metres below ground level.

Table 2

Summary of the construction details of the of the proposed replacement landfill gas monitoring boreholes and groundwater monitoring boreholes

Proposed borehole reference	Anticipated Easting¹	Anticipated Northing¹	Estimated ground level (mAOD)²	Estimated top of the slotted pipe (mbgl)²	Estimated base of the slotted pipe (mbgl)²	Estimated depth of the borehole (mbgl)²	Estimated borehole base level (mAOD)²
LFG2 R ³	266565.4708	199193.4787	-	4.2	22.0	22.0	-
LFG18 R	266346.4654	199283.4529	69.66	3.28	38.8	39.0	30.66
LFG23 R			75.46	3.56	45.0	45.0	30.46
LFG35 R ⁴	266591.6857	199267.7441	-	4.1	32.0	32.0	-
LFG43 R	266604.6819	199344.6048	66.62	3.44	36.0	36.0	30.62
LFG44 R	266609.6588	199285.3073	64.76	3.40	33.0	33.0	31.76
LFG46 R	266591.6857	199267.7441	62.54	4.08	32.2	32.2	30.34
LFG47 R			63.28	2.70	32.3	32.3	30.98
LFG48 R	266573.737	199230.350	52.12	4.24	22.0	22.0	30.12
GW03 R (CWMGW08R) ⁵	266550.5621	199180.6405	56.61	24.7	31.6	32.47	24.12
GW08 R (BH08) ⁵	266584.3053	199251.10	-	28.7	43.0	43.0	18.75

- 1 The anticipated eastings and northings are taken from the drawing 'Proposed Bore Hole Locations Layout' drawing reference BHL.01 dated October 2021 prepared for Bluebell Homes.
- 2 The anticipated ground levels and proposed construction details are taken from the Verification report entitled "Construction quality assurance (CQA) verification report for the installation of gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea. Environmental Permit number EPR/TP3835LV". Report reference: SIG/CW/JRC/2943/01/BHCQAVF dated July 2019 with the exception of GW03 and GW08.
- 3 Given that no borehole log is available the proposed construction details are taken from the closest borehole which is LFG48.
- 4 Given that no borehole log is available the proposed construction details are taken from the closest borehole which is LFG46.
- 5 The anticipated ground level and construction details are taken from the borehole logs for the existing boreholes.
 mAOD – metres above Ordnance datum mbgl – metres below ground level.
 Note: the locations of the boreholes and the monitoring facilities installation details will be subject to access and the ground conditions encountered.

Table 3

Summary of the construction details of the proposed additional landfill gas monitoring boreholes which will be drilled as the existing boreholes are subject to flooding through groundwater seepage

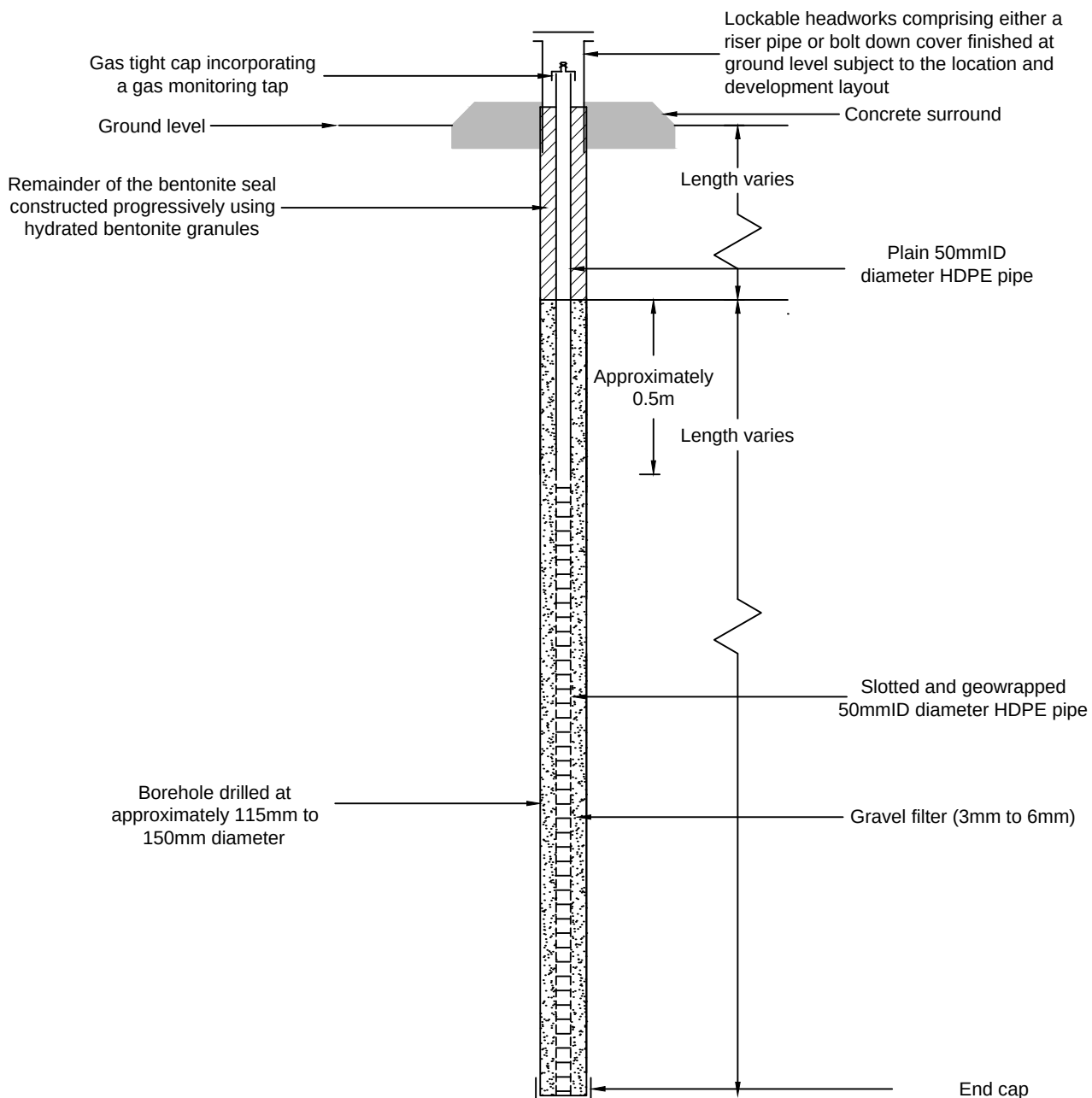
Proposed borehole reference	Anticipated Easting ¹	Anticipated Northing ¹	Estimated ground level (mAOD) ¹	Estimated top of the slotted pipe (mbgl)	Estimated base of the slotted pipe (mbgl)	Estimated depth of the borehole (mbgl)	Estimated borehole base level (mAOD)
Gas monitoring boreholes							
LFG24R-A	266469.91	199397.95	73.28	0.5	2.2	2.3	70.98
LFG24R-B			73.28	2.0	5.3	5.3	67.98
LFG25R-A	266503.79	199400.09	71.50	0.5	2.0	2.1	69.40
LFG25R-B			71.50	2.0	5.1	5.1	66.40
LFG26R-A	266538.39	199403.46-	69.51	0.5	2.3	2.4	67.11
LFG26R-B			69.51	2.0	5.4	5.4	64.11
LFG27R-A	266578.73	199389.82	67.84	0.5	4.9	5.0	62.84
LFG27R-B	-	-	67.84	5.0	8.0	8.0	59.84

1 - The anticipated ground levels and proposed construction details are taken from the Verification report entitled "Construction quality assurance (CQA) verification report for the installation of gas and groundwater monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea. Environmental permit number EPR/TP3835LV". Report reference: SIG/CW/JRC/2943/01/BHCQAVF dated July 2019.

mAOD – metres above Ordnance datum mbgl – metres below ground level.

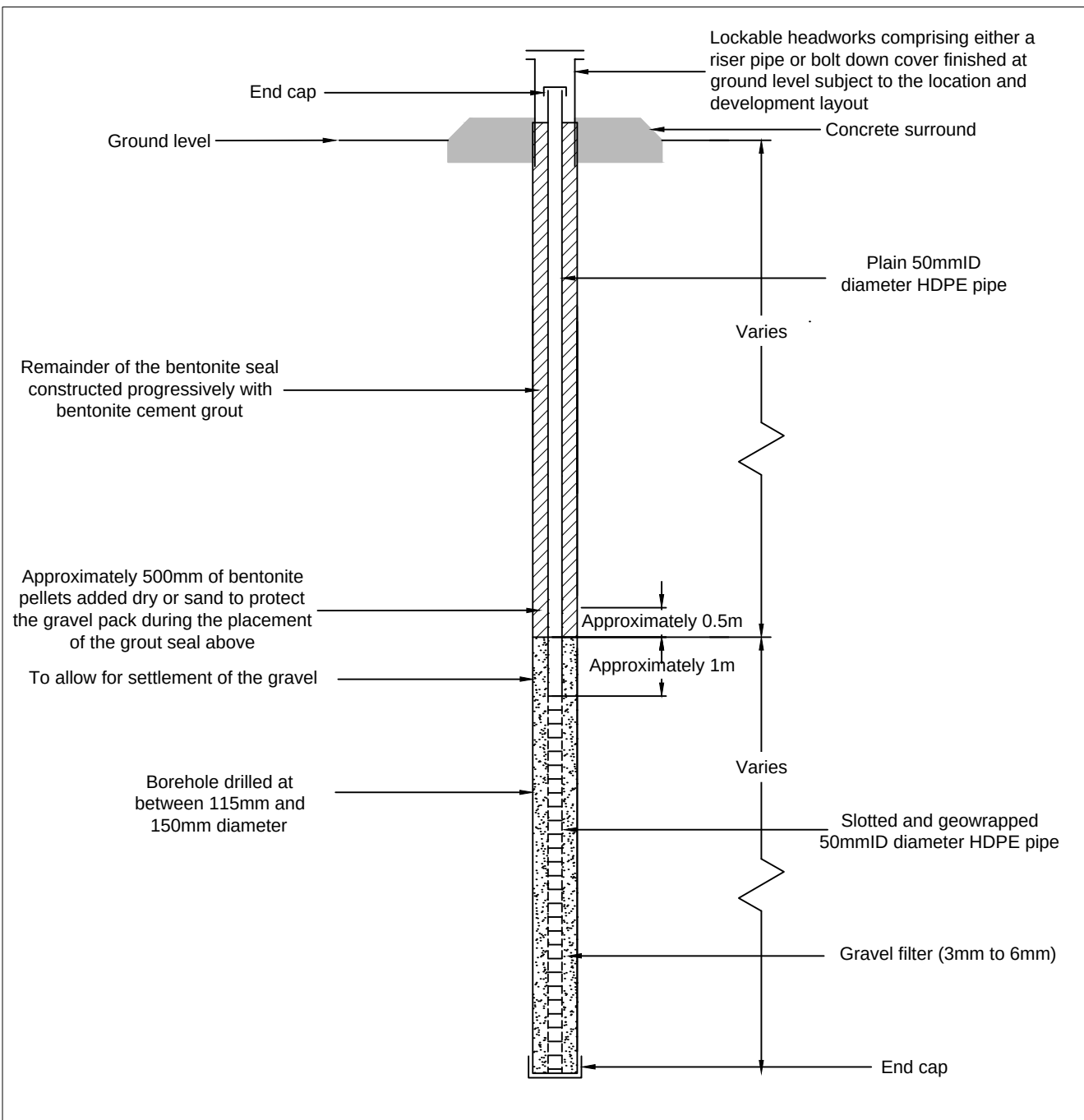
Note: the locations of the boreholes and the monitoring facilities installation details will be subject to access and the ground conditions encountered

FIGURES



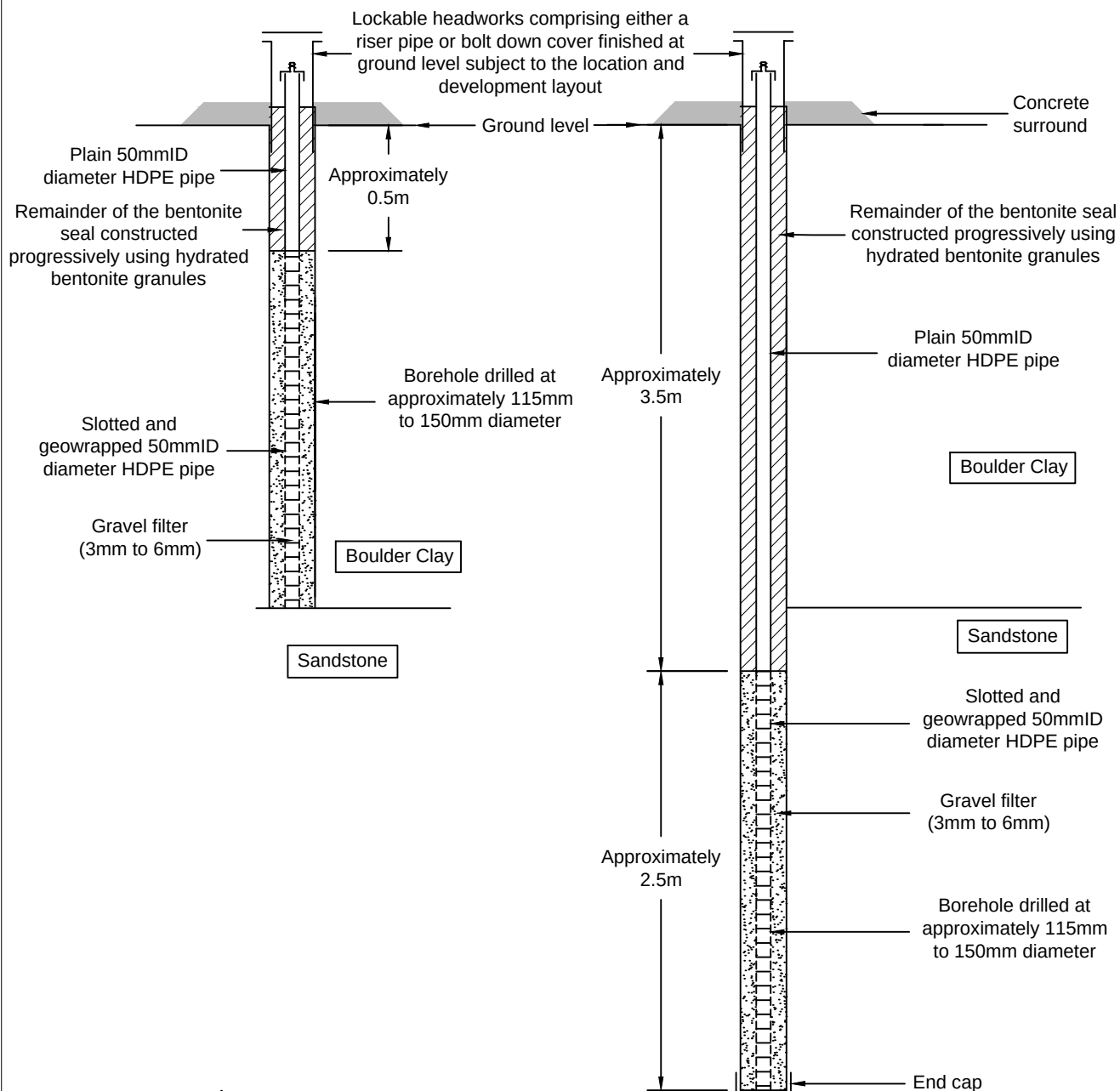
Key / Notes

	Final	KR	KE	GT	06/09/22
Rev	Status	Drn	App	Chk	Date
Site CWMRYHDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Schematic cross section through a typical landfill gas monitoring borehole					
Figure 2		Scale Not to scale			
Drawing Ref SIG/CW/09-22/23344					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					



Key / Notes

	Final	KR	KE	GT	06/09/22
Rev	Status	Drn	App	Chk	Date
Site CWMRYHDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Schematic cross section through a typical groundwater monitoring borehole					
Figure 3		Scale Not to scale			
Drawing Ref SIG/CW/09-22/23345					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					



Key / Notes

	Final	KR	KE	GT	06/09/22
Rev	Status	Drn	App	Chk	Date
Site CWMRYHDYCEIRW QUARRY LANDFILL					
Client SI Green UK Limited					
Title Schematic cross section through a typical shallow landfill gas monitoring boreholes (LFG24 A/B, LFG25 A/B, LFG26 A/B and LFG27 A/B)					
Figure 4		Scale Not to scale			
Drawing Ref SIG/CW/09-22/23346					
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone Warwickshire, CV9 2LE. Telephone : 01827 717891 Fax : 01827 718507			
Technical advisers on environmental issues					

APPENDICES

APPENDIX A
CIRRICULA VITAE

NAME: K EATON
POSITION: Technical Director

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:

MSc, DIC, Engineering Geology - Imperial College, London
BSc Honours in Geology - University of Manchester
Fellow of the Geological Society (FGS) and Chartered Geologist (C.Geol)
Specialist in Land Condition (SiLC) – Registered SiLC, SiLC Assessor, SiLC Champion (2010-2017). Registered Qualified Person (QP 005) under the CL:AIRE Code of Practice.
Drafting panel member for the revision of British Standard BS:10175+A2 Investigation of potentially contaminated sites.

PROFESSIONAL PROFILE:

Over 30 years of experience in environmental consultancy across a range of disciplines with extensive project management skills in the assessment of the risks and liabilities associated with the management of contaminated land. Experience extends across a broad range of sectors, including public bodies and agencies, petro-chemical, energy, manufacturing, transport, waste facilities, property, legal and financial institutions.

Project experience includes permitting and compliance, mergers and acquisitions and site closures assessing the financial environmental liabilities to business; designing and implementing remediation strategies, environmental due diligence for transactions and refinancing. Provision of advice with multi-disciplinary technical and legal teams. Highly experienced in negotiating with regulatory authorities to deliver the safe and successful project closure.

Experienced in the assessment of contaminated land under Part 2A legislation, planning applications and providing technical support for legal matters arising from pollution incidents together with providing technical evidence and opinion in arbitration and litigation cases.

A registered Specialist in Land Condition (SiLC) and previous member of the Professional and Technical Panel (PTP), and a SiLC Assessor for the exam process. Panel member for the preparation of the revisions to the SiLC National Brownfield Skills Framework (NBSF) and responsible for creating the SiLC NBSF assessment tool ([link](#)), which forms part of a National Quality Mark Scheme.

PROJECT EXPERIENCE

Responsible for the safe and effective management of site investigations applying a range of techniques associated with site development, divestiture, acquisition, pollution incidents and permitting, identifying risk/liabilities and contingencies, including feasibility studies, remediation design, providing cost liability assessment and risk management strategies for dealing with a range of stakeholders including presentation at public meetings and providing the 'non-technical' communication of data. Extensive experience in the evaluation and characterisation of contaminated land and groundwater environments, geotechnical assessment, assessing contaminant behaviour and the characterisation of product plumes (mass balance, phase distribution, isotope studies), assessing risk and impacts to the environment, human health and ecology. Project examples include:

- Oil Sector – a range of projects for major oil companies (Texaco, Shell, Mobil, Fina, BP, ConocoPhillips/Phillips66, Oil Pipeline Agency/CLH-PS/Exolum, Kuwait Oil Company)

including petrol service stations, fuel depots, fuel terminals and refinery, assessing environmental liability and risks for site divestiture, development and remediation contingency.

- Pharmaceutical and Chemical Sector - including assessment of significant spill incidents and impacts from historical activities for example characterisation of chlorinated solvents and fuel hydrocarbons plumes; risk assessment, implementing remediation actions.
- Manufacturing and industrial facilities – due diligence, development and pollution incidents
- Energy Sector - including baseline pre-closure and permit application investigations to assess ground conditions and environmental liabilities.
- Transport including rail – Investigation of pollution incidents, risk assessment, design and implementation of the remediation works.
- Property sector – site assessments and remediation for development, contaminated land liability assessments for divestiture and acquisitions, assessing financing, risk transfer and insurance options.

Designed and implemented a range of remediation projects, feasibility studies and strategies following key guidance such as LCRM for remediation option appraisal, cost benefit analysis and decision support tools. Highly experienced in negotiating risk based remediation strategies with the regulatory authorities and other stakeholders leading to successful project closure.

Experienced with various groundwater and human health risk assessment models including contaminant fate models. Has undertaken quantitative risk assessments to derive remedial targets for projects associated with site redevelopment, for example: a former gas works - residential housing; chlorinated and aromatic solvent contamination – commercial and residential developments; spills/emergency response – fuels, chlorinated solvents, ethanol; fuel hydrocarbons - numerous sites (service stations, industrial and manufacturing).

Provided technical support for arbitration and litigation matters and produced opinion of evidence and duty to the Court. Examples include:

- Fuel loss incidents adjacent to residential properties involving an assessment of ground conditions, an assessment of the likelihood of impact and risk to residents and associated cost liabilities arising from the fuel loss. Preparation of technical documents
- Review of a pollution incident at an industrial facility to assess the magnitude of contamination and the issue of contributory negligence. Preparation of an expert opinion report for submission to the court as an independent expert.
- Assessment of the impacts associated with a fuel leak from a major fuel distribution pipeline and preparing a technical report including assessing ecological damage for the preparation of a document for submission in support of mitigating circumstances against prosecution by the Environment Agency.
- Provision of technical documentation and expert opinion for arbitration associated with dilapidations claim regarding the disposal of waste by a tenant on the client's land including an assessment of cost liabilities associated with the need for remedial works.
- A review of third party technical documentation and advice provided to the developer of an industrial site which was subsequently identified during the development to have asbestos containing materials in the made ground. The preparation of an expert opinion report to assist in determining if there was a prima facie case of negligence and breach of contract regarding information and advice provided to the developer.
- Provision of an expert report presenting opinion on matters regarding the performance of the firm's duties to prepare an Environmental Assessment Report carried out as part of a site acquisition due diligence process and to assist in determining if there was a prima facie case of negligence

APPENDIX B

A COPY OF THE SITE DIARY FOR BOREHOLE CQA WORK PROFORMA



Site diary CQA borehole drilling and installation

Site	
Project reference	
Date	
Weather	
CQA Inspector	
Drilling contractor	
Lead driller	
Drilling rig /method	
Well/borehole/casing diameter	
H&S Plan/RAMS	

Checklist

Borehole reference: _____ GPS coordinates: _____

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan			
Services cleared			
Hand dug inspection pit			
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve /cowl			
Headworks			

General notes

E.g. Progress of drilling, delays, details of groundwater strikes etc

Signed (CQA Inspector):

Date: _____

SIG/CW/KE/20012/01/BHCQA-R

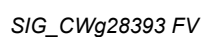
September 2022



APPENDIX C

A COPY OF A BOREHOLE LOG PROFORMA

SIG/CW/KE/20012/01/BHCQA-R
September 2022



APPENDIX D

**A COPY OF A SUMMARY TABLE FOR THE CQA DRILLING AND INSTALLATION
PROFORMA AND A SUMMARY TABLE FOR THE CQA DECOMMISSIONING WORKS
PROFORMA**



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl

General notes:

Signed (CQA Inspector): _____

Date: _____

SIG/CW/KE/20012/01/BHCQA-R

September 2022





Summary table for the CQA borehole decommissioning

Date	Borehole reference	Depth to the base of the borehole recorded in the decommissioning CQA Plan (mbgl)	Depth to the base of the borehole recorded prior to decommissioning (mbgl)	Volume of the 1:1 OPC/bentonite grout (grout) used (L)	Base of the grout (mbgl)	Top of the grout (mbgl)	Volume of the 95:5 OPC/bentonite grout (cement) used (L)	Base of the cement grout (mbgl)	Top of the cement grout (mbgl)

General notes:

Signed (CQA inspector): _____

Date: _____

SIG/CW/KE/20012/01/BHCQA-R

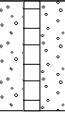
September 2022

SIG_CWg28393 FV



APPENDIX E
COPIES OF BOREHOLE LOGS

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: CWMGW10 Sheet 1 of 2				
Location: Morrison				Client: Edenstone Homes				Coordinates: 266348.56mE 199334.01mN		Hole Type: RO				
Equipment: Fraste				Diameter of Casing:				Level: 70.26mAOD		Scale 1:200				
Diameter of Boring:				Depth of Casing:				Dates 28/08/2018 -		Logged By: RP				
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description			
		Depth (m)	TCR	SCR	RQD	FI								
											SANDSTONE with siltstone bands (Driller's Description)	1		
												2		
												3		
												4		
												5		
												6		
												7		
												8		
												9		
												10		
												11		
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												39		
												40		
Remarks: 1. Rotary openhole GL-43m depth 2. Cover level 70.61m AOD									Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)			W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: CWMGW10 Sheet 2 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266348.56mE 199334.01mN		Hole Type: RO		
Equipment: Fraste				Diameter of Casing:				Level: 70.26mAOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 28/08/2018 -		Logged By: RP		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							43.00	27.26			End of Borehole at 43.00 m	41
												42
												43
												44
												45
												46
												47
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												49
												50
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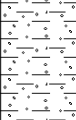
Remarks:
 1. Rotary openhole GL-43m depth
 2. Cover level 70.61m AOD

Key:
 D - Small disturbed sample
 B - Bulk disturbed sample
 ES - Environmental soil sample
 SPT - Standard Penetration Test (split spoon)
 CPT - Standard Penetration Test (solid cone)

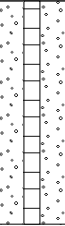
W - Water sample
 U - Undisturbed sample
 TCR - Total Core Recovery
 SCR - Solid Core Recovery
 RQD - Rock Quality Designation



		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: CWMGW11 Sheet 1 of 2	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266464.89mE 199398.05mN		Hole Type: RO	
Equipment: Fraste				Diameter of Casing:				Level: 73.63m AOD		Scale 1:200	
Diameter of Boring:				Depth of Casing:				Dates 11/09/2018 -		Logged By: SG	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							3.50	70.13			Boulder CLAY with sand (Driller's Description)	1
												2
												3
											Very hard SANDSTONE (Driller's Description)	4
												5
												6
												7
												8
												9
												10
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Remarks: 1. Rotary openhole GL-46m depth 2. Cover level 73.9m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: CWMGW11 Sheet 2 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266464.89mE 199398.05mN		Hole Type: RO		
Equipment: Fraste				Diameter of Casing:				Level: 73.63m AOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 11/09/2018 -		Logged By: SG		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							46.00	27.63				41
												42
												43
												44
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												80

Remarks:

- Rotary openhole GL-46m depth
- Cover level 73.9m AOD

Key:

D - Small disturbed sample

B - Bulk disturbed sample

ES - Environmental soil sample

SPT - Standard Penetration Test (split spoon)

CPT - Standard Penetration Test (solid cone)

W - Water sample

U - Undisturbed sample

TCR - Total Core Recovery

SCR - Solid Core Recovery

RQD - Rock Quality Designation



		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: CWMGW12 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266541.75mE 199403.58mN		Hole Type: RO	
Equipment: Fraste				Diameter of Casing:				Level: 69.41mAOD		Scale 1:200	
Diameter of Boring:				Depth of Casing:				Dates 29/09/2018 -		Logged By: DH	

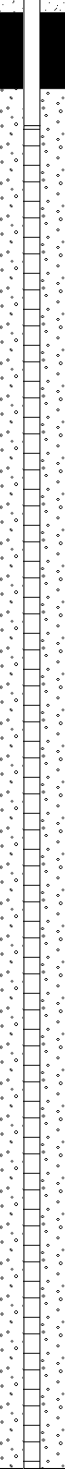
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							1.50	67.91			Boulder CLAY (Driller's Description)	1
											Weathered MUDSTONE (Driller's Description)	2
							3.10	66.31			SANDSTONE (Driller's Description)	3
												4
												5
												6
												7
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												36
												37
												38
								39.00	30.41			End of Borehole at 39.00 m
												40

Remarks: 1. Rotary openhole GL-39m depth 2. Cover level 69.72m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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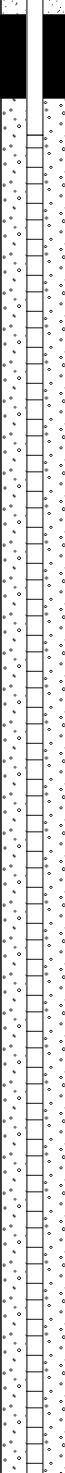
Intégral Géotechnique		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com				Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG17 Sheet 1 of 1	
Location: Morrison						Client: Edenstone Homes				Coordinates: 266352.24mE 199250.61mN		Hole Type: RC	
Equipment: Fraste						Diameter of Casing:				Level: 67.44mAOD		Scale 1:200	
Diameter of Boring:						Depth of Casing:				Dates 15/08/2018 -		Logged By: AF	
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD	FI							
		0.00 - 3.00	100	93	62		5.85	61.59			Medium strong to strong light grey thinly locally very thin and medium bedded medium grained SANDSTONE. Rare thin carbonaceous laminae. Weathering - Heavy brown discolouration of discontinuity surfaces less than 15mm on bedding and joint surfaces. Discontinuities - Sub horizontal to 15 degrees plain, close, rough and tight locally <1-2mm silty clay infill 2.60 - 2.65: Siltstone, dark brown - weak closely spaced sub horizontal discontinuities. 3.00 - 4.00: Sub vertical to 80 degrees close, rough, tight - iron stained. 4.35 - 4.55: Sub vertical to 60 degrees close, rough, tight iron stained 5.45-5.55: Weathered mudstone extremely close to very close spaced discontinuities Medium strong to strong light grey medium to thickly bedded fine to medium grained SANDSTONE locally with thin carbonaceous laminae. Discontinuities: sub horizontal closely to medium spaced (locally very closely and widely) plain, rough and smooth bedding. Joints sub vertical close and plain, rough and tight 7.03-7.75 sub vertical to 80 degrees close, rough, tight with iron staining 7.80-8.80 occasional carbonaceous laminae and medium grain sized silty inclusions 10.50-11.85 sub vertical to 75 degrees close, rough, tight with light iron staining 11.45-11.65 sub vertical with heavy iron staining very closely paced sub horizontal discontinuities 14.40-14.58 60 degree plain, rough, tight <1m silt grey 14.90-16.30 60 degrees plain, rough, close 19.00-19.40 20.40 sub vertical 21.10-21.30 sub vertical plain, rough, tight 23.40-25.10 sub vertical rough, tight light iron staining 25.60-27.80 very weak to weak becoming very weak grey SILTSTONE/MUDSTONE. Very close to closely spaced sub horizontal to 30 degrees plain and close, rough and tight 32.80-35.10 35.20-37.00	1	
		3.00 - 5.85	100	84	53							2	
		5.85 - 8.80	100	91	87							3	
		8.80 - 11.80	100	74	71							4	
		11.80 - 14.80	100	90	70							5	
		14.80 - 17.40	100	91	87							6	
		17.40 - 20.40	100	97	95							7	
		20.40 - 23.40	99	95	84							8	
		23.40 - 26.40	92	58	49							9	
		26.40 - 29.40	100	88	73							10	
		29.40 - 32.40	95	94	91							11	
		32.40 - 35.00	92	76	63							12	
		35.00 - 37.70	93	77	64							13	
		37.70 - 39.00	100	98	87							14	
													15
						39.00	28.44			End of Borehole at 39.00 m		16	
Remarks: 1. Rotary cored GL to 39.0m depth 2. Borehole reamed out to 150mm diameter for installation 3. Cover level 67.85m AOD													17
Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation													18
													19

Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG19 Sheet 1 of 1									
Location: Morrison				Client: Edenstone Homes		Coordinates: 266347.53mE 199313.64mN		Hole Type: RC									
Equipment: Fraste				Diameter of Casing:		Level: 69.70m AOD		Scale 1:200									
Diameter of Boring:				Depth of Casing:		Dates 07/08/2018 -		Logged By: AF									
	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40						
		Depth (m)	TCR	SCR	RQD							FI					
		0.00 - 1.40	100	30	0								2.40	67.30			Medium strong very thinly to thinly bedded SANDSTONE; locally thin carbonaceous laminae <2mm and inclusions. Occasional vugs <5mm. Weathering - Heavy orange and brown staining on discontinuity surfaces. Increased iron staining Increased fracture spacing and locally loss of strength weak. Discontinuities - Sub horizontal to 20 degrees very closely to closely spaced rough and tight bedding. Joints sub vertical closely to very closely spaced plain, S and R and tight. Medium strong to strong closely and medium bedded SANDSTONE; locally occasionally thin carbonaceous laminae and inclusions. Weathering - Locally heavy orange brown and brown staining particularly on joints. Increased fracture spacing and locally slight loss of strength Discontinuities - Sub horizontal to 15 degrees closely to medium spaced locally very closely spaced planar rough, spaced and tight bedding locally infilled with silty sand. Joints sub vertical very closely and closely spaced plain, curved, smooth and tight. 8.10 - 8.30: Weak grey SILTSTONE; very closely spaced sub horizontal bedding. 8.45 - 8.50: very weak to weak non intact recovered as very angular to angular medium to coarse gravel (possibly very closely spaced) 9.80 - 10.20: 80 degrees plain, rough tight iron stained joint. 11.50 - 12.10: 80 degrees rough and tight iron stained joint. 13.30 - 14.00: 2 sets of sub vertical to 70 degrees close, rough and tight iron stained joints. Locally very closely spaced discontinuities. 14.00 - 14.70: Medium spaced discontinuous bedding. 15.20 - 15.50: Very closely and closely spaced 20 - 50 degree stepped close iron stained bedding with carbonaceous inclusions. 15.50 - 16.50: Sub vertical to 70 degrees close, rough, tight and iron stained. Increased inclusions below 18m. 18.50 - 19.15: Sub vertical plain, rough and tight. 21.80 - 22.20: Sub vertical to 80 degrees close, rough and tight. 23.00 - 25.10: 2 sets very closely spaced 75-85 degrees plain, rough and tight locally very closely spaced discontinuities. 25.20 - 26.50: Weak to medium strong grey slightly sandy SILTSTONE with very closely and closely spaced sub horizontal to 50 degrees bedding. 28.00 - 31.60: Sub vertical to 80 degrees close, rough and tight. 32.20 - 33.05: Moderately spaced bedding. 34.00 - 37.80: 2 sets very closely spaced sub vertical plain, rough and tight. 38.05 - 38.35: 60 degree joints. 38.95 - 39.25: 2 sets of very closely spaced sub vertical tight, plane and rough.
		1.40 - 2.90	100	48	20												
		2.90 - 4.40	97	79	59												
		4.40 - 5.90	87	75	72												
		5.90 - 7.30	96	93	67												
		7.30 - 8.80	100	77	76												
		8.80 - 10.30	95	89	76												
		10.30 - 11.70	100	93	46												
		11.70 - 14.00	91	75	57												
		14.00 - 17.00	99	90	79												
		17.00 - 20.00	100	99	72												
		20.00 - 23.00	100	99	97												
		23.00 - 25.20	93	54	41												
		25.20 - 27.70	100	78	60												
		27.70 - 30.30	100	87	77												
		30.30 - 33.30	100	90	72												
		33.30 - 36.30	97	83	74												
		36.30 - 39.25	100	77	48												
					39.30	30.40				End of Borehole at 39.25 m							
Remarks: 1. Rotary cored GL to 39.3m depth 2. Borehole reamed out to 150mm diameter for installation 3. Cover level 70.02m AOD						Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation											

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG20 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266351.57mE 199347.41mN		Hole Type: RC	
Equipment: Fraste				Diameter of Casing:				Level: 69.95m AOD		Scale 1:200	
Diameter of Boring:				Depth of Casing:				Dates 02/08/2018 -		Logged By: AF	

Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD						
		0.00 - 1.20	96	73	56					Strong locally medium strong medium to thickly bedded locally thinly bedded light grey fine to medium grey SANDSTONE.. Occasional carbonaceous laminae and inclusions. Weathering - Occasional orange brown and brown staining on bedding and joint surfaces.	1
		1.20 - 2.70	96	93	87					Discontinuities - Sub horizontal to 15 degrees medium to widely spaced locally closely spaced tight, planar, rough and smooth bedding. Occasional sub vertical tight, planar and rough joints.	2
		2.70 - 4.10	89	86	76					0.00 - 0.20: Non intact very closely spaced rough discontinuities.	3
		4.10 - 5.60	97	94	82					0.90 - 1.15: Sub vertical tight, plain, smooth and stained joint.	4
		5.60 - 6.80	93	69	46					1.60 - 1.65: Very closely spaced rough and sub horizontal discontinuities - weak to very weak OB strong.	5
		6.80 - 8.30	100	99	99					10.30 - 13.00: Very closely spaced sub vertical, tight, plain, smooth heavily stained joints.	6
		8.30 - 9.80	100	97	87					8.30 - 12.80: Closely to medium spaced locally very closely spaced with some thin carbonaceous laminae inclusions.	7
		9.80 - 11.30	100	96	75					12.80 - 17.00: Widely locally medium spaced bedding.	8
		11.30 - 12.80	94	75	48					21.21 - 22.60: Sub vertical, tight, plain, smooth and heavily stained joints with very closely and closely spaced sub horizontal discontinuities.	9
		12.80 - 14.30	100	99	99					29.30 - 30.05: Weak to medium strong grey sandy SILSTONE with very closely and closely rough discontinuities locally non intact. Discontinuity raised and rough.	10
		14.30 - 15.80	97	97	95					30.45 - 33.85: Sub vertical tight, clean, plain, small joint.	11
		15.80 - 17.30	99	97	97					36.00 - 36.80: 45 degree tight, plain, rough, joint.	12
		17.30 - 18.70	95	88	63					36.80 - 36.90: Sub vertical joint white crystal surface possible quartz	13
		18.70 - 20.10	100	98	82						14
		20.10 - 22.40	100	76	47						15
		22.40 - 24.70	100	97	84						16
		24.70 - 27.70	92	85	77						17
		27.70 - 30.70	100	80	57						18
	30.70 - 33.70	100	94	79						19	
	33.70 - 36.70	98	92	73						20	
	36.70 - 38.10	100	96	88						21	
						38.10	31.85				22
						39.00	30.95				23
										SANDSTONE (Driller's Description)	24
										End of Borehole at 39.00 m	25

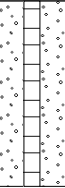
Remarks: 1. Rotary cored GL to 38.1m depth 2. Borehole reamed out to 150mm diameter for installation to 39.0m depth 3. Cover level 70.28m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)				W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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Intégral Géotechnique		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG22 Sheet 1 of 1		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266362.76mE 199381.34mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 69.20mAOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 31/07/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
		0.00 - 1.50	90	68	17		14.40	54.80		Medium strong thinly and medium bedded locally thickly and thinly bedded light grey fine to medium grained SANDSTONE. With rare thin carbonaceous laminae and siltstone inclusions. Weathering - Heavy orange brown and brown on bedding and joint surfaces. Local increase in fracture spacing and loss of spacing to weak. Discontinuities - sub horizontal to 15 degrees closely to medium spaced locally very closely and widely spaced plain, close, rough and tight locally with sandy and silty infill (1-2mm). Joints sub vertical, plain, rough and tight with iron staining.	1	
		1.50 - 3.00	100	98	91						2	
		3.00 - 4.30	100	99	90						3	
		4.30 - 5.80	100	85	69						4	
		5.80 - 7.25	97	83	52						5	
		7.25 - 8.80	100	83	70						6	
		8.80 - 10.30	100	79	72						7	
		10.30 - 11.75	100	97	83						8	
		11.75 - 13.20	95	88	77						9	
		13.20 - 14.70	99	80	65						10	
		14.70 - 16.20	99	85	60		17.10	52.10		Weak to moderately strong grey thinly bedded SILTSTONE Weathering-local increase in fracture spacing and slight loss of spacing locally with light brown staining Discontinuities-sub horizontal to 30 degrees plain, close, stepped and tight	11	
		16.20 - 17.60	93	51	30						12	
		17.60 - 19.10	100	46	35						13	
		19.10 - 20.60	100	87	61						14	
		20.60 - 22.10	97	84	49		21.80	47.40		Moderately strong to strong grey thinly bedded locally thickly bedded fine locally medium SANDSTONE. Rare/occasional carbonaceous laminae locally grading to sandy SILTSTONE Weathering-local orange brown to brown staining <1mm penetration on joint surfaces Discontinuities-sub horizontal to 20 degrees very close and closely spaced plain, rough, tight bedding (occasional carbonaceous laminae) and sub vertical plain, close, rough and tight joints	15	
		22.10 - 23.60	100	99	43						16	
		23.60 - 25.10	99	82	69						17	
		25.10 - 26.50	89	77	27						18	
		26.50 - 28.00	99	93	79						19	
		28.00 - 29.55	100	93	83						20	
		29.55 - 30.55	95	14	0		26.50	42.70		Weak to moderately strong grey thinly bedded SILTSTONE Weathering-local loss of strength and increased fracture spacing Discontinuities-closely locally very closely and medium spaced sub horizontal to 30 degrees close, rough and tight bedding	21	
		30.55 - 32.05	97	83	80						22	
		32.05 - 33.30	100	76	46						23	
		33.30 - 34.70	96	77	59						24	
		34.70 - 36.20	97	63	23						25	
		36.20 - 37.70	100	87	67						26	
		37.70 - 39.20	99	95	80						27	
											28	
					39.20	30.00		Strong medium bedded locally thinly bedded and thickly bedded light grey medium SANDSTONE. Rare thin carbonaceous laminae (<1-2mm) Weathering-local light brown staining on joint surfaces increase in fracture spacing and slight loss of strength Discontinuities-sub horizontal to 20 degrees closely to medium spaced locally very closely spaced plain, rough, tight and I bedding. Sub vertical to 70 degrees 27.80-27.80 50 degrees plain, rough light brown discolouration on joints 29.50-30.75 sub-vertical to 75 degrees very closely spaced joints with 5mm silty sand infill 31.90-37.70 sets closely spaced sub vertical to 75 degrees plain, rough, tight joints locally light brown discolouration 1-2mm silty sand infill locally very close spaced sub horizontal discontinuities. White crystals 35.20-35.50 37.60-38.05 sub vertical to 80 degrees closely spaced joints 5-10mm ??infill	29			
									30			
End of Borehole at 39.20 m												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Remarks:			Key:					
1. Rotary cored GL to 39.2m depth			D - Small disturbed sample			W - Water sample		
2. Borehole reamed out to 150mm diameter for installation			B - Bulk disturbed sample			U - Undisturbed sample		
3. Cover level 69.65m AOD			ES - Environmental soil sample			TCR - Total Core Recovery		
			SPT - Standard Penetration Test (split spoon)			SCR - Solid Core Recovery		
			CPT - Standard Penetration Test (solid cone)			RQD - Rock Quality Designation		



Intégral Géotechnique		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG23 Sheet 1 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266437.40mE 199393.52mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 75.46mAOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 06/09/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD							FI
							4.00	71.46		Boulder CLAY with gravel (Driller's Description)		
											Sandy GRAVEL (Driller's Description)	
								6.50	68.96		SANDSTONE (Driller's Description)	
								7.00	68.46		Medium strong to strong very thinly and thinly locally medium bedded. Light grey to grey fine to medium grained SANDSTONE occasional thin carbonaceous laminae (<1mm) Weathering-heavy orange brown staining with loss of strength local to weak. Occasional increased fracture spacing	
		7.00 - 10.00	97	81	46			10.00	65.46		Discontinuities-sub horizontal to 15 degrees very closely to closely locally medium spaced plain, rough, tight and incipient	
		10.00 - 13.00	97	90	78						Strong thinly and medium bedded light grey fine to medium grained SANDSTONE. Locally with occasional thin carbonaceous laminae (<1-2mm) and occasional bands silty inclusions/clasts	
		13.00 - 16.00	90	60	54						Weathering-locally with heavy orange brown discolouration staining on bedding and joint surfaces (1-2mm). Slight loss of strength. Occasional zones of increased fracture spacing and associated carbonaceous laminae	
		16.00 - 19.00	100	99	97						Discontinuities-sub horizontal to 20 degrees plain, close, rough, tight bedding sub vertical with iron staining on the joints 10.80-11.00 sub vertical plain, rough, tight and incipient bedding, iron staining on the joints. Close to very closely spaced sub horizontal discs	
		19.00 - 22.00	100	73	63						13.30-14.80 sets very closely spaced sub vertical to 75 degrees plain, close, rough, tight with iron staining on the joints	
		22.00 - 25.00	100	75	51			22.00	53.46		19.30-22.00 sets closely spaced sub vertical plain, rough, tight with iron staining on the joints locally very closely to closely spaced sub horizontal discs	
		25.00 - 28.00	99	94	93			23.10	52.36		Weak grey SILTSTONE. Weathered slight loss of strength and increase in fracture spacing	
		28.00 - 30.00	80	18	0						Discontinuities-very closely locally extra closely and closely spaced sub horizontal plain, close, rough, tight bedding	
									Strong to very strong medium locally thinly bedded light grey fine to medium grained SANDSTONE. Occasional carbonaceous laminae			
									Weathering-local orange brown discolouration staining On joint surfaces (<1mm)			
									Discontinuities-sub horizontal to 20 degrees medium to closely spaced plain, close, rough, tight intact bedding with sub vertical joints (local associated carbonaceous laminae)			
									23.70-25.00 sub vertical to 80 degrees plain, rough, tight brown staining (<1.2mm)			
									27.25-27.65 many siltstone clasts and carbonaceous discs			
									Very weak to weak grey MUDSTONE/SILTSTONE. Generally non-intact recovered as very angular/angular fine to coarse gravel. Possible extra closely to very closely spaced discs			
									SANDSTONE (Driller's Description)			
Remarks: 1. Rotary openhole GL to 7.0m depth 2. Rotary cored 7.0m to 30.0m depth 3. Borehole reamed out to 150mm diameter for installation to 45.0m depth 4. Cover level 75.76m AOD												
Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation												
AGS												

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG23 Sheet 2 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266437.40mE 199393.52mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 75.46m AOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 06/09/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							45.00	30.46			End of Borehole at 45.00 m	41
												42
												43
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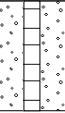
Remarks:
 1. Rotary openhole GL to 7.0m depth
 2. Rotary cored 7.0m to 30.0m depth
 3. Borehole reamed out to 150mm diameter for installation to 45.0m depth
 4. Cover level 75.76m AOD

Key:
 D - Small disturbed sample
 B - Bulk disturbed sample
 ES - Environmental soil sample
 SPT - Standard Penetration Test (split spoon)
 CPT - Standard Penetration Test (solid cone)

W - Water sample
 U - Undisturbed sample
 TCR - Total Core Recovery
 SCR - Solid Core Recovery
 RQD - Rock Quality Designation



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Location: Morrison				Client: Edenstone Homes				Coordinates: 266469.91mE 199397.95mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 73.28mAOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 05/09/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							2.30	70.98			Boulder CLAY (Driller's Description)	1
							2.50	70.78				2
		2.50 - 5.50	87	59	12						SANDSTONE (Driller's Description) Strong locally medium strong light grey and grey (very thinly to thinly bedded) fine to medium grained SANDSTONE. With zones of some thin carbonaceous laminae (1-3mm) Weathering-Heavy orange brown to brown staining on joints and bedding surfaces penetrating <5mm, local loss of strength on fracture surfaces. Increased fracture spacing and associated carbonaceous laminae Discontinuities-sub horizontal to 15 degrees very closely to closely spaced plain, rough, tight and incipient bedding, locally infilled <5mm with silty sandy clay 5.50-6.50 non intact recovered as very angular and angular fine to coarse gravel (possible extra closely to very closely fracture spacing, weak to moderately strong)	3
		5.50 - 7.60	95	37	5							4
		7.60 - 10.00	96	43	15		9.05	64.23			9.00-9.05 Very weak MUDSTONE	5
		10.00 - 13.00	100	75	59						Strong to very strong medium (locally thinly to thickly bedded) fine to medium grained SANDSTONE, local carbonaceous laminae (<1-2mm) and zones of siltstone inclusions Weathering-local heavy orange brown and brown staining on joint surfaces (penetration <1-2mm), local loss of strength. Increased fracture spacing associated with carbonaceous laminae Discontinuities-sub horizontal to 20 degrees medium (locally closely) spaced plain, rough, tight and incipient bedding. Joints sub vertical plain, rough, tight. 9.35-11.05 sub vertical plain, stepped, rough, tight with iron staining on joints very closely to closely spaced sub horizontal discs 12.80-13.00 50-60 degrees plain, rough, tight joints 13.00-13.32 sub vertical to 80 degrees plain, rough, tight joints 14.00-14.21 60-70 degrees plain, rough, tight joints 16.70-16.95 with sub rounded to rounded siltstone clasts and inclusions 16.95-17.35 weak to moderately strong grey SILTSTONE extra closely to very closely spaced discs 17.38-18.50 a/a 22.00-23.50 weak to medium strong grey very thinly to thinly bedded SILTSTONE with sub horizontal locally sub vertical very closely to closely spaced bedding. Extra closely spaced incipient sub horizontal discs 24.55-24.72 extra closely spaced sub horizontal discs 27.50-28.30 poor recovery weak grey siltstone/mudstone, sub vertical joints with iron staining. Non intact recovered as angular fine to medium gravel near base	6
		13.00 - 15.50	58	55	55							7
		15.50 - 18.50	97	73	53							8
		18.50 - 21.50	100	95	81							9
		21.50 - 24.50	100	89	73							10
		24.50 - 27.50	98	90	88							11
		27.50 - 28.30	100	40	19		28.30	44.98				SANDSTONE (Driller's Description)
Remarks: 1. Rotary openhole GL to 2.5m depth 2. Rotary cored 2.5m to 28.3m depth 3. Borehole reamed out to 150mm diameter for installation to 43.0m depth 4. Cover level 73.61m AOD Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation												

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG24 Sheet 2 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266469.91mE 199397.95mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 73.28m AOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 05/09/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							43.00	30.28			End of Borehole at 43.00 m	41
												42
												43
												44
												45
												46
												47
												48
												49
												50
												51
												52
												53
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												78
												79
												80

Remarks:
 1. Rotary openhole GL to 2.5m depth
 2. Rotary cored 2.5m to 28.3m depth
 3. Borehole reamed out to 150mm diameter for installation to 43.0m depth
 4. Cover level 73.61m AOD

Key:
 D - Small disturbed sample
 B - Bulk disturbed sample
 ES - Environmental soil sample
 SPT - Standard Penetration Test (split spoon)
 CPT - Standard Penetration Test (solid cone)

W - Water sample
 U - Undisturbed sample
 TCR - Total Core Recovery
 SCR - Solid Core Recovery
 RQD - Rock Quality Designation



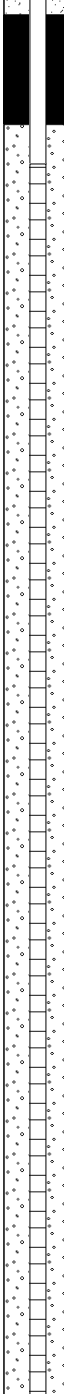
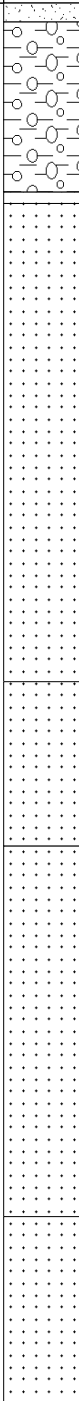
 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG25 Sheet 2 of 2				
		Location: Morrison				Client: Edenstone Homes		Coordinates: 266503.79mE 199400.09mN		Hole Type: RC		
Equipment: Fraste		Diameter of Casing:				Level: 71.50m AOD		Scale 1:200				
Diameter of Boring:		Depth of Casing:				Dates 03/09/2018 -		Logged By: AF				
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							41.00	30.50			End of Borehole at 41.00 m	41
												42
												43
												44
												45
												46
												47
												48
												49
												50
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												78
												79
												80

Remarks:
1. Rotary openhole GL to 2.5m depth
2. Rotary cored 2.5m to 29.5m depth
3. Borehole reamed out to 150mm diameter for installation to 41.0m depth
4. Cover level 71.81m AOD

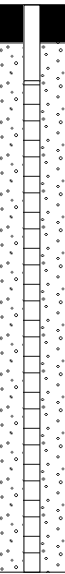
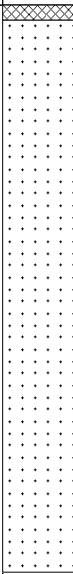
Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)

W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation



Intégral Géotechnique		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG27 Sheet 1 of 1		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266578.73mE 199389.82mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 67.84m AOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 23/08/2018 -		Logged By: AF		
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD							FI
							0.50	67.34		Concrete (Driller's Description) Boulder clay with gravel (Driller's Description)		

		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG39 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266493.69mE 199237.74mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 44.57mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD	FI							
							0.40	44.17			FILL (Driller's Description) SANDSTONE (Driller's Description)	1	
													2
													3
													4
													5
													6
													7
													8
													9
													10
													11
													12
													13
													14
								15.00	29.57				End of Borehole at 15.00 m
													16
													17
													18
													19
													20
													21
													22
													23
													24
													25
													26
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													39
													40

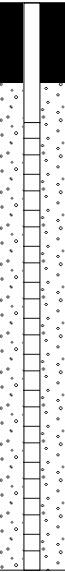
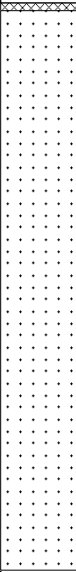
Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.1m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)				W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG40 Sheet 1 of 1	
		Location: Morrison				Client: Edenstone Homes				Coordinates: 266465.58mE 199248.75mN	
Equipment: Klemm		Diameter of Casing: 150mm				Level: 45.07mAOD		Scale 1:200			
Diameter of Boring: 142mm		Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND			

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							0.40	44.67			FILL (Driller's Description) SANDSTONE (Driller's Description)	1
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12
												13
												14
							15.00	30.07			End of Borehole at 15.00 m	15
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25
												26
												27
												28
												29
												30
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Remarks: 1. rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.53m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG41 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266433.15mE 199254.20mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 45.45mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 08/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD	FI							
							0.20	45.25			FILL (Driller's Description) SANDSTONE (Driller's Description)	1	
													2
													3
													4
													5
													6
													7
													8
													9
													10
													11
													12
													13
													14
								15.00	30.45				End of Borehole at 15.00 m
													16
													17
													18
													19
													20
													21
													22
													23
													24
													25
													26
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													34
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													37
													38
													39
													40

Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 45.95m AOD		Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)		W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation		
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG42 Sheet 1 of 1	
Location: Morrison				Client: Edenstone Homes				Coordinates: 266409.52mE 199271.82mN		Hole Type: RO	
Equipment: Klemm				Diameter of Casing: 150mm				Level: 45.65mAOD		Scale 1:200	
Diameter of Boring: 142mm				Depth of Casing: 1.50m				Dates 07/05/2019 -		Logged By: ND	

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
							0.60	45.05		 FILL (Driller's Description)  SANDSTONE (Driller's Description)	1	
							15.00	30.65			End of Borehole at 15.00 m	15
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25
												26
												27
												28
												29
												30
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Remarks: 1. Rotary openhole GL to 15.0m depth 2. Standpipe installed to 15.0m depth 3. Cover level 46.12m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone)				W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry		Project No.: 12095		Borehole No.: LFG43 Sheet 1 of 1					
Location: Morrison		Client: Edenstone Homes		Coordinates: 266592.19mE 199377.52mN		Hole Type: RC					
Equipment: Fraste		Diameter of Casing:		Level: 66.62m AOD		Scale 1:200					
Diameter of Boring:		Depth of Casing:		Dates 20/08/2018 -		Logged By: AF					
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD						
										Boulder CLAY (Driller's Description)	1
		2.40 - 3.00	100	18	0		2.40 2.80	64.22 63.82		Firm brown grey mottled orange brown slightly gravelly sandy CLAY.	2
		3.00 - 6.00	95	85	41					Medium strong to strong light grey very thinly to thinly bedded medium grained SANDSTONE. Weathering - Heavy light brown staining penetrating 15mm on bedding and joints. Increased fracture spacing and slight loss of strength to weak to medium strong. Discontinuities - Sub horizontal to 15 degrees locally very closely spaced plain, rough, tight bedding locally infilled with <1-2mm of silty sand.	3
		6.00 - 9.00	100	85	69					4.50 - 5.15: Sub vertical to 75 degrees plain, cwr? rough, tight with heavy iron staining and <2mm of clayey sandy infill. 5.00 - 9.30: Thinly locally medium spaced bedding. Medium and closely spaced discontinuities with penetration <5mm.	4
		9.00 - 11.50	96	63	50		9.30 10.30	57.32 56.32		6.60 - 7.24: Sub vertical plain, rough, tight, iron stained joint. 8.40 - 9.30: Sub vertical to 75 degree close, rough, open, iron stained joints infilled with 10mm of sandy clay. 8.80 - 8.88: Vugs of 40mm quarts crystals.	5
		11.50 - 14.50	100	50	24		12.30	54.32		Weak grey very thinly bedded SILTSTONE. Weathering - Local increase in fracture spacing and loss of strength. Discontinuities - 30 to 40 degree very cloosely locally closely spaced plain, smooth, tight bedding.	6
		14.50 - 17.50	100	52	39		15.50	51.12		Strong very thinly and thinly bedded light grey SANDSTONE with carbonaceous inclusions and carbonaceous laminae. Weathering - heavy brown staining with 1-2mm penetration in joints. Joints locally increased fracture spacing and loss of strength.	7
		17.50 - 20.50	97	81	79					Discontinuities - Sub horizontal to 30 degree close, rough, tight bedding. Joints are sub vertical plain, rough, tight and iron stained. 11.80 - 12.30: 2 sets of 90 degree plain, rough, tight, iron stained joints.	8
		20.50 - 23.50	87	45	31					Weak locally medium strong grey SILSTONE/MUDSTONE. Discontinuities: Sub horizontal plain, stepped, rough, tight discontinuities. Locally non intact closely and very closely spaced.	9
		23.50 - 26.50	100	88	64					Medium strong to strong light grey medium locally thinly spaced SANDSTONE locally with carbonaceous inclusions. Weathering - Locally heavy orange brown and brown staining with penetration <1mm on joint surfaces, local increase in fracture spacing.	10
		26.50 - 29.50	100	99	95					Discontinuity - Sub horizontal to 15 degree medium locally closely and very closely spaced plain, close, rough, tight bedding. 16.50 - 17.70: 2 sets close, rough, tight iron stained joints locally weak to medium strong very closely spaced discontinuities.	11
		29.50 - 32.50	100	95	62					17.50 - 17.60: 45 degree close, rough, tight, iron stained joints. 19.50 - 19.90: 70 degree plain, rough, tight, iron stained joints. 20.30 - 20.80: 70 degree plain, rough, tight, iron stained joints. 21.80 - 21.84: Open discontinuity infilled with brown gravelly CLAY.	12
		32.50 - 35.50	98	93	78					23.30 - 23.50: Non intact recorded very weak to weak mudstone. 23.80 - 23.90: Silt inclusions <40mm 23.90 - 32.50: Locally close to extra closely spaced discontinuities with occasional carbonaceous inclusions. 34.50 - 35.50: ??	13
					36.00	30.62			End of Borehole at 36.00 m	14	
Remarks:											
1. Rotary openhole GL to 2.4m depth 2. Rotary cored 2.4m to 36.0m depth 3. Borehole reamed out to 150mm diameter for installation 4. Cover level 67.08m AOD											
Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation											

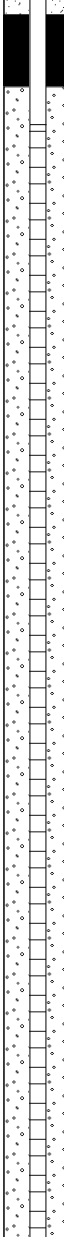
Remarks:

1. Rotary openhole GL to 2.4m depth
2. Rotary cored 2.4m to 36.0m depth
3. Borehole reamed out to 150mm diameter for installation
4. Cover level 67.08m AOD

Key:

D - Small disturbed sample	W - Water sample
B - Bulk disturbed sample	U - Undisturbed sample
ES - Environmental soil sample	TCR - Total Core Recovery
SPT - Standard Penetration Test (split spoon)	SCR - Solid Core Recovery
CPT - Standard Penetration Test (solid cone)	RQD - Rock Quality Designation



Intégral Géotechnique		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com				Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG44 Sheet 1 of 1	
Location: Morrison						Client: Edenstone Homes				Coordinates: 266607.07mE 199345.47mN		Hole Type: RC	
Equipment: Fraste						Diameter of Casing:				Level: 64.76m AOD		Scale 1:200	
Diameter of Boring:						Depth of Casing:				Dates 22/08/2018 -		Logged By: AF	
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description			
		Depth (m)	TCR	SCR	RQD								FI
							3.60	61.16		Clay fill (Driller's Description)		1	
												2	
												3	
		3.60 - 6.20	100	89	68					Medium strong to strong very thinly and thinly bedded fine to medium grained SANDSTONE; locally with thin carbonaceous laminae and siltstone inclusions. Weathering - Heavy orange brown and brown staining penetrating 2-3mm on bedding and joint surfaces local increase in fracture spacing with a slight loss of strength. Discontinuities - Sub horizontal to 15 degrees plain, close, rough, tight beds locally infilled with <1mm silty sandy infill.		4	
							7.20	57.56				5	
		6.20 - 9.20	97	83	67					Medium strong to strong very thinly and thinly bedded fine to medium grained SANDSTONE with thin carbonaceous laminae. Weathering - Locally light brown non penetrative staining on bedding and joint surfaces, medium fracture spacing. Rock mass associated with carbonaceous laminae and slight loss of strength ? Discontinuities - Sub horizontal to 15 degrees very closely and closely spaced, locally extra closely spaced, plain, rough, tight bedding with local sandy infill.		6	
												7	
		9.20 - 12.20	100	75	50					7.60 - 8.40: Sub vertical plain, tight, rough, iron stained joints. Non intact between 7.70 - 7.80m. 11.00 - 12.60: Locally grades to weak with sandy ?? very closely and closely spaced discontinuities.		8	
							12.60	52.16				9	
		12.20 - 15.20	100	77	71					Strong light grey medium bedded, locally thinly and thinly bedded fine to medium grained sandstone locally occasional thin carbonaceous laminae. Weathered - Rare light brown non penetrative discolouration on bed and joint, local increase in fracture spacing associated with the carbonaceous laminae. Discontinuities - Sub horizontal to 15 degree medium to widely spaced locally closely spaced plain, rough, tight and incipient. 14.00 - 15.05: Sub vertical plain, rough, tight highly iron stained joints. Locally very closely spaced sub horizontal discontinuities.		10	
										20.30 - 20.80: Very weak to weak dark grey ??? fine to coarse grained 20.80 - 21.10: extra close to very close bedding associated with carbonaceous laminae. 24.90 - 25.05: Extra close to very closely spaced sub horizontal bedding. 30.05 - 30.10: 30 degree bedding very closely spaced.		11	
		15.20 - 17.80	100	98	98							12	
										13			
17.80 - 20.80	90	77	77							14			
										15			
20.80 - 23.80	100	94	88							16			
										17			
23.80 - 26.80	100	99	75							18			
										19			
26.80 - 29.80	100	98	90							20			
										21			
29.80 - 32.80	97	90	84							22			
										23			
					32.80	31.96					24		
					33.00	31.76					25		
									SANDSTONE (Driller's Description)		26		
									End of Borehole at 33.00 m		27		
											28		
											29		
											30		
											31		
											32		
											33		
											34		
											35		
											36		
											37		
											38		
											39		
											40		

Remarks: 1. Rotary openhole GL to 3.6m depth 2. Rotary cored hole 3.6m to 32.8m depth 3. Borehole reamed out to 150mm diameter for installation to 33.0m depth 4. Cover level 65.13m AOD				Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation					
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		Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG45 Sheet 2 of 2		
Location: Morrison				Client: Edenstone Homes				Coordinates: 266606.75mE 199317.53mN		Hole Type: RC		
Equipment: Fraste				Diameter of Casing:				Level: 61.52mAOD		Scale 1:200		
Diameter of Boring:				Depth of Casing:				Dates 26/09/2018 -		Logged By: GNS		
Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI						
											stepped, tight SANDSTONE/SILTSTONE (Driller's Description) End of Borehole at 31.20 m	41
												42
												43
												44
												45
												46
												47
												48
												49
												50
												51
												52
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												76
												77
												78
												79
												80

Remarks:
 1. Openhole GL-4.5m depth
 2. Rotary cored 4.5m to 27.0m depth
 3. Borehole reamed out to 150mm diameter for installation to 31.2m depth
 4. Cover level 61.83m AOD

Key:
 D - Small disturbed sample
 B - Bulk disturbed sample
 ES - Environmental soil sample
 SPT - Standard Penetration Test (split spoon)
 CPT - Standard Penetration Test (solid cone)

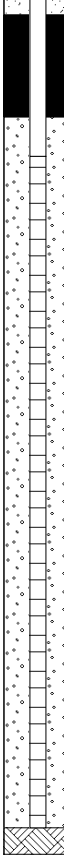
W - Water sample
 U - Undisturbed sample
 TCR - Total Core Recovery
 SCR - Solid Core Recovery
 RQD - Rock Quality Designation



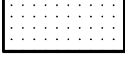
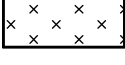
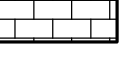
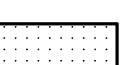
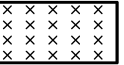
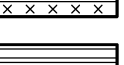
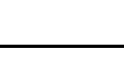
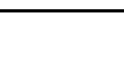
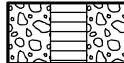
Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG46 Sheet 1 of 1					
Location: Morrison		Client: Edenstone Homes				Coordinates: 266613.43mE 199284.17mN		Hole Type: RC					
Equipment: Fraste		Diameter of Casing:				Level: 62.54mAOD		Scale 1:200					
Diameter of Boring:		Depth of Casing:				Dates 03/09/2018 -		Logged By: AF					
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description			
		Depth (m)	TCR	SCR	RQD							FI	
							2.00	60.54			BACKFILL (Driller's Description)	1	
											Weathered SANDSTONE (Driller's Description)	2	
							3.50	59.04				3	
		3.50 - 4.40	97	60	0					Moderately strong to strong light grey fine to medium grained SANDSTONE with occasional thin carbonaceous laminae (<1-2mm) Weathering-heavy light brown and orange brown staining on bedding and joint surfaces penetrating 5-17mm slight loss of strength increased fracture spacing up to 4.40m Discontinuities-sub horizontal to 20 degrees extra closely to very closely becoming very closely to closely spaced plain, close, tight bedding 5.90-6.20 sub vertical plain, rough, tight with iron staining on the joints Strong light grey fine to medium SANDSTONE, locally with rare occasional thin carbonaceous laminae Weathering-heavy orange brown staining on bedding surfaces (<1mm penetration) and locally increased fracture spacing and slight loss of strength Discontinuities-sub horizontal to 15 degrees closely and medium spaced plain, close, rough, tight and incipient bedding <1mm silty infill. Joints sub vertical plain, rough, tight 10.85-11.50 very closely spaced plain, rough, tight with iron staining on the joints 11.80-12.77 plain, sub vertical rough, tight iron stained joints 17.60-17.80 sub vertical stepped rough, tight joints 20.25-20.33 40-50 degrees plain, rough, tight joints 24.35-26.30 very closely spaced sub vertical to 75 degrees plain, close, rough, tight joints infilled 2-3mm with sandy clay 27.70-27.95 extremely closely to very closely spaced plain, rough, tight bedding with associated carbonaceous laminae	4		
		4.40 - 5.90	100	77	37						5		
		5.90 - 8.90	100	99	87		6.90	55.64				6	
		8.90 - 11.50	100	85	80							7	
		11.50 - 14.30	100	91	80							8	
		14.30 - 17.30	100	98	98							9	
		17.30 - 20.20	100	99	98							10	
		20.20 - 23.20	97	95	85							11	
		23.20 - 26.20	97	71	62							12	
		26.20 - 29.20	100	96	79							13	
		29.20 - 32.20	98	97	91							14	
							32.20	30.34					15
													16
End of Borehole at 32.20 m											17		
											18		
											19		
											20		
											21		
											22		
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											24		
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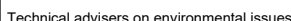
Remarks:				Key:			
1. Rotary openhole GL to 3.5m depth				D - Small disturbed sample		W - Water sample	
2. Rotary cored 3.5m to 32.2m depth				B - Bulk disturbed sample		U - Undisturbed sample	
3. Borehole reamed out to 150mm diameter for installation				ES - Environmental soil sample		TCR - Total Core Recovery	
4. Cover level 62.97m AOD				SPT - Standard Penetration Test (split spoon)		SCR - Solid Core Recovery	
				CPT - Standard Penetration Test (solid cone)		RQD - Rock Quality Designation	

Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG47 Sheet 1 of 1			
Location: Morrison				Client: Edenstone Homes				Coordinates: 266593.53mE 199239.98mN		Hole Type: RC	
Equipment: Fraste				Diameter of Casing:				Level: 63.28m AOD		Scale 1:200	
Diameter of Boring:				Depth of Casing:				Dates 05/09/2018 -		Logged By: AF	
Well	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD						
							0.50	62.78		CONCRETE BACKFILL (Driller's Description)	
							5.20	58.08			
							6.00	57.28			
		6.00 - 7.50	100	89	40						
		7.50 - 8.70	100	89	70						
		8.70 - 10.00	93	71	9						
		10.00 - 11.50	98	72	42						
		11.50 - 14.50	100	94	66						
		14.50 - 16.90	100	85	62						
		16.90 - 19.30	100	81	68						
		19.30 - 21.70	100	83	79						
		21.70 - 24.80	97	68	65						
		24.80 - 26.60	100	99	99						
26.60 - 29.30	100	99	83								
29.30 - 31.20	100	92	91								

Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com		Project Name: Cwmrhydyceirw Quarry				Project No.: 12095		Borehole No.: LFG48 Sheet 1 of 1				
Location: Morrison		Client: Edenstone Homes				Coordinates: 266578.64mE 199214.16mN		Hole Type: RC				
Equipment: Fraste		Diameter of Casing:				Level: 52.12mAOD		Scale 1:200				
Diameter of Boring:		Depth of Casing:				Dates 29/08/2018 -		Logged By: AF				
Well 	Water Strikes	Rotary Coring				Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description		
		Depth (m)	TCR	SCR	RQD					FI	Concrete (Driller's Description)	
		1.00 - 2.00	95	64	32						Weathered broken SANDSTONE (Driller's Description)	
		2.00 - 3.40	100	89	71						Medium strong grey thinly bedded fine grained SANDSTONE. Weathering - Occasional orange brown and brown discolouration on discontinuity surfaces < 1mm penetration. Discontinuities - Sub horizontal RO plain, close, rough, tight with silt infill.	
		3.40 - 6.20	100	97	97						Strong medium bedded, locally thinly bedded, light grey medium grained SANDSTONE with occasional thin carbonaceous laminae and siltstone inclusions/clasts. Weathering - Locally light orange brown and brown non penetrative staining on 3 surfaces, local increase in fracture spacing. Discontinuities - Sub horizontal to 20 degrees medium spaced, locally closely spaced, plain, close, rough, tight bedding. Joints are sub vertical to 80 degrees plain, close and infilled with silt. 6.40 - 6.60: 60 degree plain, rough, tight joint. 8.80 - 9.78: two sets of infilled sub vertical to 80 degree plain, close, incipient, joints with iron staining. 10.80 - 11.10: Many siltstone inclusions. 11.10 - 12.20: Grading to sandy SILSTONE. 15.00 - 16.45: Widely spaced bedding. 16.45 - 16.75: 60 degree plain, rough, tight joints with light brown staining. 16.75 - 17.15: Medium strong with many carbonaceous laminae. Locally very closely spaced ???	
		6.20 - 9.20	100	94	79							
		9.20 - 12.20	100	83	64							
		12.20 - 15.00	100	95	78							
		15.00 - 17.90	100	93	49							
		17.90 - 20.90	100	86	69							
		20.90 - 22.70	92	88	71							
											22.70	29.42
Remarks: 1. Rotary openhole GL to 1.0m depth 2. Rotary cored 1.0m to 22.0m depth 3. Borehole reamed out to 150mm diameter for installation 4. Cover level 52.15m AOD Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample SPT - Standard Penetration Test (split spoon) CPT - Standard Penetration Test (solid cone) W - Water sample U - Undisturbed sample TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation												
AGS												

Borehole Log Legend

Soils	Rocks	Installations	Samples and Testing
 Topsoil/ soil  Made ground  Boulders and cobbles  Gravel  Sand  Silt  Clay  Peat NOTE: Composite soil types will be signified by combined symbols, e.g.  gravelly Sand	 Chalk  Limestone  Conglomerate  Breccia  Sandstone  Siltstone  Mudstone  Interbedded mudstone and siltstone  Shale  Coal  Pyroclastic (volcanic ash)	 Slotted pipe with gravel pack  Plain pipe with bentonite seal  Backfilled with arisings  Backfilled with Bentonite	TCR Total core recovery (%) SCR Solid core recovery (%) RQD Rock quality designation (%) FI Fracture Index (m) SPTN Standard Penetration Test (Number of blows)
		Symbols	
		 Water strike  Water level after 20mins  Water level mbgl metres below ground level <u>NB</u> Depth (thickness) in metres Reduced Level in metres above Ordnance Datum	
		 Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507	



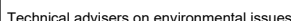
BOREHOLE LOG

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Borehole not completed with a monitoring installation as the returns could not be flushed out causing the hole to be filled with arisings from 31mbgl to 22mbgl. Bentonite pellet seal from 22mbgl to 18mbgl. Bentonite cement grout from 18mbgl to surface. Rotary open hole from surface to 18mbgl. Rotary core from 18mbgl to 31mbgl. Cored section was reamed using rotary open hole to 155mm diameter.	Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn	
									Type and Diameter	Depth
									Rotary core with air flush 92mm	13m
									Rotary open hole with air flush. 155mm	18m
							LOGGED BY	CN		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw monitoring borehole installation								Client SI Green (UK) Limited				Date Completed 17/03/2010		
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.61		Co-ordinates () E 266572.26 N 199179.43				Borehole No. CWMGW03A				
Contractor Soil Mechanics						Location Cwmrhydyceirw Quarry, Swansea				Sheet 2 of 4				
Scale	CORE					STRATA					Legend	Water	Instrument/ Backfill	
	Depth	TCR	SCR	RQD	FI	Reduced Level	Depth (Thickness)	DESCRIPTION						
11								Medium strong or greater light grey to dark grey fine to medium grained micaceous SANDSTONE with thin laminae of coal. (UPPER COAL MEASURES).						
12														
13														
14								14.00 sandstone becoming lighter in colour and comprises generally fine grains.						
15														
16														
17								(12.89)						
18	18.00-19.50	90	90	90	1.3			18.18 very tight planar smooth fracture with a coating of small clusters of white fine grained crystals.						
19								18.98 1mm thick bed of coal.						
	19.50-21.00	100	100	73.3	3.3			19.60 - 20.30 series of four moderately open smooth planar or undulating fractures with slight weathering comprising orange						
GROUNDWATER								REMARKS / INSTALLATIONS				DRILLING		
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Borehole not completed with a monitoring installation as the returns could not be flushed out causing the hole to be filled with arisings from 31mbgl to 22mbgl. Bentonite pellet seal from 22mbgl to 18mbgl. Bentonite cement grout from 18mbgl to surface. Rotary open hole from surface to 18mbgl. Rotary core from 18mbgl to 31mbgl. Cored section was reamed using rotary open hole to 155mm diameter.				Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn		
												Type and Diameter		Depth
												Rotary core with air flush 92mm		13m
								LOGGED BY		CN		Rotary open hole with air flush. 155mm		18m

		Baddeley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw monitoring borehole installation								Client SI Green (UK) Limited				Date Completed 17/03/2010		
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.61		Co-ordinates () E 266572.26 N 199179.43				Borehole No. CWMGW03A				
Contractor Soil Mechanics						Location Cwmrhydyceirw Quarry, Swansea				Sheet 3 of 4				
Scale	CORE					STRATA					Legend	Water	Instrument/ Backfill	
	Depth	TCR	SCR	RQD	FI	Reduced Level	Depth (Thickness)	DESCRIPTION						
21	21.00-22.50	100.7	100.7	97.3	3.3			staining. Two of the fractures are oblique to bedding. One of the vertical fractures is moderately weathered and contains sand, clay and gravel. Medium strong or greater light grey to dark grey fine to medium grained micaceous SANDSTONE with thin laminae of coal. (UPPER COAL MEASURES). <i>(continued)</i> 20.35 - 20.45 common laminae of coal. 20.55 sandstone is light grey. 21.30 - 22.34 massive sandstone becoming interbedded with thin laminae of black siltstone with white mica.						
22														
23	22.50-24.00	26	21.3	18.7	2.0	33.72	22.89	22.50 - 22.86 series of three open unweathered smooth planar, smooth undulating and rough undulating vertical, horizontal and sub vertical respectfully connected fractures with a thin coating of grey or light grey silt.						
24	24.00-25.50	90.7	61.3	58	2.7			Weak dark grey brown MUDSTONE with soft sediment deformation features, comprising load casing and pseudonodules. Fractures are generally closely to medium spaced, tight, smooth, undulating or stepped and unweathered. (UPPER COAL MEASURES).						
25								22.89 - 24.00 core loss. 24.00 - 24.15 with occasional fine sand sized pyrite. 24.40 rough irregular fracture.						
26	25.50-27.00	88	64	61.3	1.3									
27						30.08	26.53							
28	27.00-28.50	75.3	75.3	69.3	3.3	29.61	(0.47) 27.00	Medium strong or greater grey well cemented medium grained SANDSTONE with occasional mudstone clasts. (UPPER COAL MEASURES).						
29						29.17	27.44	Weak very dark purplish brown MUDSTONE. (UPPER COAL MEASURES).						
	28.50-30.00	85.3	85.3	82.7	3.3			27.00 - 28.50 37cm of core loss. Position of the loss is unclear. Massive medium strong or greater well cemented grey micaceous SANDSTONE with occasional thin laminae of black coal. Fractures are medium to closely spaced horizontal and sub vertical generally open, rough planar or undulating and unweathered. Occasionally the vertical and horizontal fracture are connected. Horizontal fractures are occasionally associated with a coal laminae. 27.46 - 27.66 2-4mm thick sub vertical vein of moderately to slightly weathered calcite. 27.66 - 27.78 fracture with a coating of very common fine white crystals. 27.78 fracture with a light coating of silt.						
GROUNDWATER								REMARKS / INSTALLATIONS				DRILLING		
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Borehole not completed with a monitoring installation as the returns could not be flushed out causing the hole to be filled with arisings from 31mbgl to 22mbgl. Bentonite pellet seal from 22mbgl to 18mbgl. Bentonite cement grout from 18mbgl to surface. Rotary open hole from surface to 18mbgl. Rotary core from 18mbgl to 31mbgl. Cored section was reamed using rotary open hole to 155mm diameter.				Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn		
												Type and Diameter		Depth
												Rotary core with air flush 92mm Rotary open hole with air flush. 155mm		13m 18m
								LOGGED BY		CN				

		Baddeley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw monitoring borehole installation								Client SI Green (UK) Limited				Date Completed 17/03/2010		
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.61		Co-ordinates () E 266572.26 N 199179.43				Borehole No. CWMGW03A				
Contractor Soil Mechanics						Location Cwmrhydyceirw Quarry, Swansea				Sheet 4 of 4				
Scale	CORE					STRATA					Legend	Water	Instrument/ Backfill	
	Depth	TCR	SCR	RQD	FI	Reduced Level	Depth (Thickness)	DESCRIPTION						
	30.00-31.00	97	97	95	3.0			28.50 - 29.80 fracture with a light coating of silt. 28.50 - 30.00 22cm of core loss. Position of the loss is unclear. 30.55 fracture with some slight weathering and a coating of fine white crystals.						
31						25.61	31.00	END OF BOREHOLE						
32														
33														
34														
35														
36														
37														
38														
39														
GROUNDWATER								REMARKS / INSTALLATIONS				DRILLING		
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Borehole not completed with a monitoring installation as the returns could not be flushed out causing the hole to be filled with arisings from 31mbgl to 22mbgl. Bentonite pellet seal from 22mbgl to 18mbgl. Bentonite cement grout from 18mbgl to surface. Rotary open hole from surface to 18mbgl. Rotary core from 18mbgl to 31mbgl. Cored section was reamed using rotary open hole to 155mm diameter.				Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn		
												Type and Diameter		Depth
												Rotary core with air flush 92mm		13m
								Rotary open hole with air flush. 155mm		18m				
LOGGED BY								CN						



BOREHOLE LOG

Scale	SAMPLES & TESTS			STRATA			Legend	Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level	Depth (Thick- ness)	DESCRIPTION			
				56.49	0.10	Brown silty SAND with rootlets. (TOPSOIL). Dark greyish brown silty, slightly clayey, slightly gravelly SAND. (GLACIAL DEPOSITS).			
1									
2									
3									
4									
5					(8.60)				
6									
7									
8									
9				47.89	8.70	Green grey moderately weathered SANDSTONE. (UPPER COAL MEASURES).			
					(1.30)				
				46.59	10.00				

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		Baddeley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw monitoring borehole installation							Client SI Green (UK) Limited				Date Completed 19/03/2010			
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.59		Co-ordinates () E 266570.29 N 199174.15				Borehole No. CWMGW03R				
Contractor Soil Mechanics					Location Cwmrhydyceirw Quarry, Swansea					Sheet 2 of 4				
Scale	SAMPLES & TESTS			STRATA						Legend	Water	Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION								
11				45.59	(1.00)	Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE. (UPPER COAL MEASURES).								
12						Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE with common thin interbeds of black siltstone. (UPPER COAL MEASURES). 11.50 - 12.50 rare slight orange staining on rock.				x x x				
13					(4.50)	13.50 - 14.50 rare orange staining on rock.				x x x				
14										x x x				
15				41.09	15.50	Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE. (UPPER COAL MEASURES).				x x x				
16														
17														
18														
19					(6.50)									
GROUNDWATER							REMARKS / INSTALLATIONS				DRILLING			
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted 50mm pipe from 30.66mbgl to 24.66mbgl. Plain 50mm pipe from 24.66mbgl to surface. Gravel pack from 32.47mbgl to 23mbgl. Bentonite pellet seal from 23mbgl to 21mbgl. Bentonite cement grout from 21mbgl to surface. CWMGW03R is a replacement borehole for CWMGW03.				Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn		
19/03 19/03 10/04		32.47 32.47		30.10 22.07	27.00	31.72						Type and Diameter Rotary open hole with air flush. 155mm		Depth 32.47m
							LOGGED BY		CN					

		Baddeley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG										
Project Cwmrhydyceirw monitoring borehole installation							Client SI Green (UK) Limited				Date Completed 19/03/2010			
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.59		Co-ordinates () E 266570.29 N 199174.15				Borehole No. CWMGW03R				
Contractor Soil Mechanics					Location Cwmrhydyceirw Quarry, Swansea					Sheet 3 of 4				
Scale	SAMPLES & TESTS			STRATA						Legend	Water	Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION								
21						Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE. (UPPER COAL MEASURES). <i>(continued)</i>								
22				34.59	22.00	21.00 - 22.00 with probable clasts of mudstone and rare orange staining on the sandstone.								
23				33.59	23.00	Weak dark grey brown MUDSTONE. (UPPER COAL MEASURES). (1.00)								
24				32.59	24.00	Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE. (UPPER COAL MEASURES). 23.00 - 24.00 mudstone clasts in sandstone and some orange staining on the sandstone.								
25				31.59	25.00	Medium strong or greater grey to dark grey fine to medium grained micaceous SANDSTONE with weak dark grey mudstone. (UPPER COAL MEASURES). (1.00)								
26				30.59	26.00	Weak dark grey MUDSTONE. (UPPER COAL MEASURES). (1.00)								
27						Grey medium grained micaceous SANDSTONE. (UPPER COAL MEASURES).								
28					(4.00)	28.00 - 29.00 with rare orange staining.								
29						29.00 - 30.00 possible 2mm thick quartz vein.								
				26.59	30.00									
GROUNDWATER							REMARKS / INSTALLATIONS				DRILLING			
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted 50mm pipe from 30.66mbgl to 24.66mbgl. Plain 50mm pipe from 24.66mbgl to surface. Gravel pack from 32.47mbgl to 23mbgl. Bentonite pellet seal from 23mbgl to 21mbgl. Bentonite cement grout from 21mbgl to surface. CWMGW03R is a replacement borehole for CWMGW03.				Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn		
19/03 19/03 10/04		32.47 32.47		30.10 22.07	27.00	31.72						Type and Diameter Rotary open hole with air flush. 155mm		Depth 32.47m
							LOGGED BY		CN					

		Baddeley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw monitoring borehole installation								Client SI Green (UK) Limited				Date Completed 19/03/2010	
Project No. SIG/CW/JRC/2686/01				Ground Level (mAOD) 56.59		Co-ordinates () E 266570.29 N 199174.15				Borehole No. CWMGW03R			
Contractor Soil Mechanics						Location Cwmrhydyceirw Quarry, Swansea				Sheet 4 of 4			

Scale	SAMPLES & TESTS			STRATA			Legend	Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level	Depth (Thickness)	DESCRIPTION			
31					(2.00)	Grey medium grained micaceous SANDSTONE with weak black to medium strong siltstone. (UPPER CORE MEASURES). 30.00 - 32.47 possible 2mm thick quartz vein		▼	
32				24.59	32.00	Grey medium grained micaceous SANDSTONE. (UPPER CORE MEASURES).		▼	
				24.12	(0.47) 32.47	END OF BOREHOLE			
33									
34									
35									
36									
37									
38									
39									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	AM PM	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted 50mm pipe from 30.66mbgl to 24.66mbgl. Plain 50mm pipe from 24.66mbgl to surface. Gravel pack from 32.47mbgl to 23mbgl. Bentonite pellet seal from 23mbgl to 21mbgl. Bentonite cement grout from 21mbgl to surface. CWMGW03R is a replacement borehole for CWMGW03.	Plant: Tracked Hands England 36 Crew: K Osborn and M Osborn	
19/03		32.47		30.10	27.00	31.72			Type and Diameter	Depth
19/03 10/04		32.47		22.07					Rotary open hole with air flush. 155mm	32.47m
							LOGGED BY	CN		

TERRA FIRMA (WALES) LIMITED							Borehole No. :8	
Equipment and Methods : Klem Rotary Drilling Rig							Sheet 1 of 3	
Location : Cwmrhydycefnw Quarry, Swansea								
Carried out for : Si Green UK Limited								
Job No. : 8411			Level: 61.75 m.a.o.d		Co-ordinates : 266599.29 199246.58		Date : 24-25/02/03	

Description of Strata	Reduced Level	Legend	Depth (m)	Sample/Tests			Chiselling (hr)	Depth to Water (m)
				Depth (m)	Sample Type	Sample No.		
MADE GROUND: FILL (drillers description)	61.75		0.00					
			1.00	DS	1			
	59.65		2.00	DS	2			
SANDSTONE with clay bands								
			3.00	DS	3			
			4.00	DS	4			
			5.00	DS	5			
			6.00	DS	6			
	55.95		5.80					
SANDSTONE with small mudstone bands								
			7.00	DS	7			
			8.00	DS	8			
			9.00	DS	9			
			10.00	DS	10			
	52.35		9.40					
MUDSTONE								
			11.00	DS	11			
			12.00	DS	12			
			13.00	DS	13			
			14.00	DS	14			
	50.15		11.60					
SANDSTONE								
			15.00	DS	15			
			16.00	DS	16			
			17.00	DS	17			
			18.00	DS	18			
			19.00	DS	19			
	41.75		20.0					

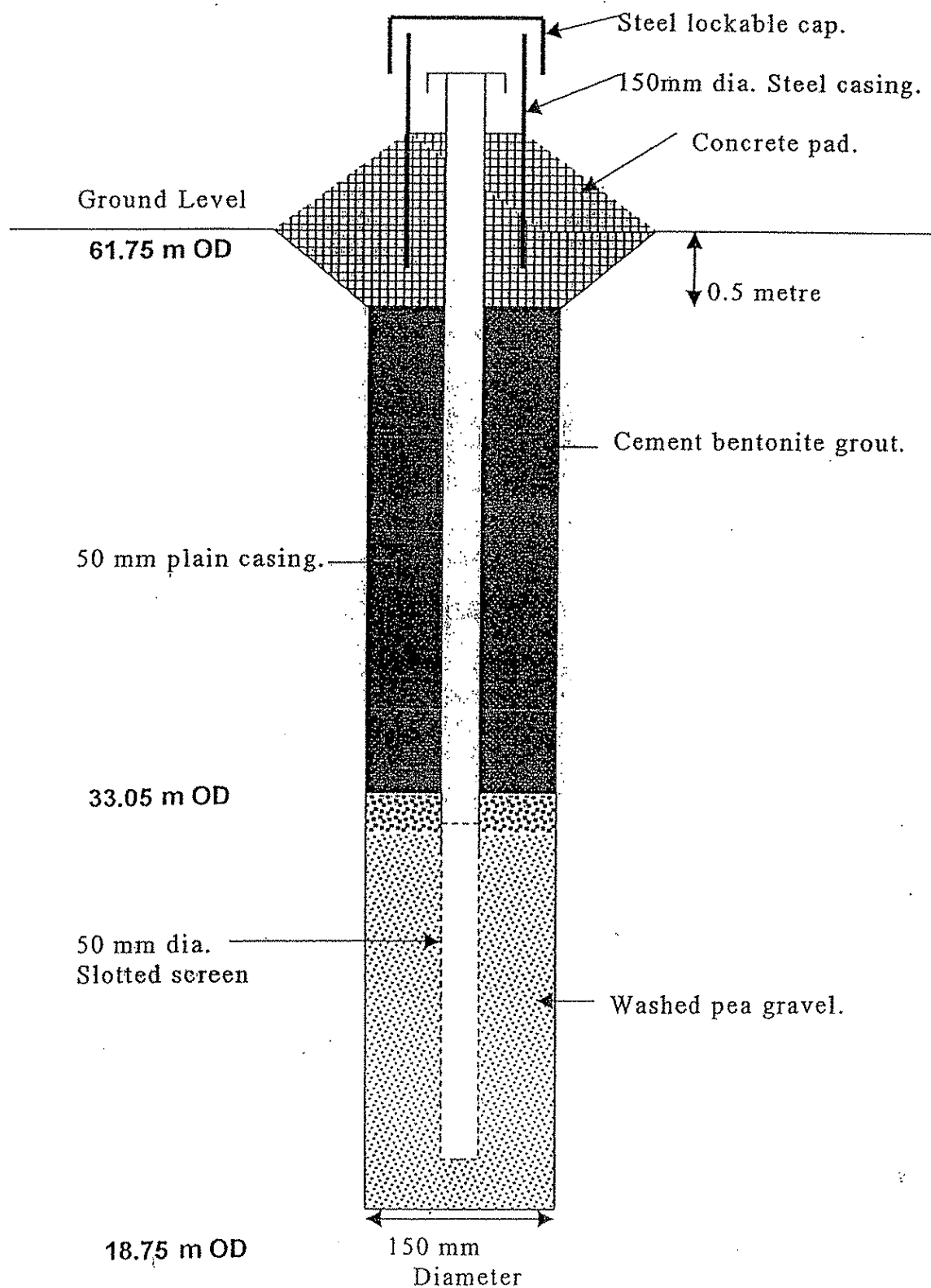
Remarks: 1.0 Bulk Samples taken every 1.0m 2.0 Groundwater Inflows (a) Groundwater inflow encountered at 30.8m depth rising to 30.6m after 20mins 3.0 Piezometer installed to 43.0m depth, for installation details, see attached sheet		Logged by :SJH
		Scale : NTS

TERRA FIRMA (WALES) LIMITED							Borehole No. :8	
Equipment and Methods : Klein Rotary Drilling Rig							Sheet 2 of 3	
Location : Cwmrhydyceirw Quarry, Swansea								
Carried out for : SI Green UK Limited								
Job No. : 8411			Level : 61.75 m.a.s.d		Co-ordinates : 266599.29 199246.58		Date : 24-25/02/03	

Description of Strata	Reduced Level	Legend	Depth (m)	Sample/Tests			Chiselling (hr)	Depth to Water (m)
				Depth (m)	Sample Type	Sample No.		
SANDSTONE	41.75	[Pattern]	20.00	20.00	DS	20		
			21.00	DS	21			
			22.00	DS	22			
			23.00	DS	23			
			24.00	DS	24			
			25.00	DS	25			
			26.00	DS	26			
			27.00	DS	27			
			28.00	DS	28			
			29.00	DS	29			
			30.00	DS	30			
			31.00	DS	31		30.60	
			32.00	DS	32			
			33.00	DS	33			
			34.00	DS	34			
			35.00	DS	35			
			36.00	DS	36			
			37.00	DS	37			
			38.00	DS	38			
			39.00	DS	39			
	21.75		40.0	40.00	DS	40		

Remarks: 1.0 See Sheet 1 of 3		Logged by : SJH
		Scale : NTS

[illegible]



GROUNDWATER MONITORING BOREHOLE 8
FOR CWMRYDYCEIRW QUARRY LANDFILL

APPENDIX C

**COPIES OF EMAILS FROM NATURAL RESOURCES WALES (NRW) DATED 11
SEPTEMBER 2020 AND 13 SEPTEMBER 2022**

From: Herbert, Neil <Neil.Herbert@cyfoethnaturiolcymru.gov.uk>
Sent: 11 September 2020 16:29
To: Guy Titman
Subject: CQA plan - additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes
Attachments: SIG_CWg25559 FV.pdf

Hello Guy

I can confirm that NRW will accept the proposed CQA plan for the installation of additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes, as set out in the attached submission.

Thanks
Neil

From: Guy Titman <Guytitman@mjca.co.uk>
Sent: 04 September 2020 16:54
To: Herbert, Neil <Neil.Herbert@cyfoethnaturiolcymru.gov.uk>
Cc: 'piergiorgio.cominetta@greenthesisgroup.com' <piergiorgio.cominetta@greenthesisgroup.com>; 'alberto.vivarelli@greenthesisgroup.com' <alberto.vivarelli@greenthesisgroup.com>; 'CEdge@edenstonegroup.com' <CEdge@edenstonegroup.com>
Subject: Construction Quality Assurance (CQA) plan for the installation of additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea

4 September 2020

Dear Neil

Construction Quality Assurance (CQA) plan for the installation of additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes at Cwmrhydyceirw Quarry Landfill, Morriston, Swansea

We are pleased to provide information pursuant to Condition 2.7.4 of Environmental Permit reference TP3835LV (the permit) for Cwmrhydyceirw Quarry Landfill, Morriston, Swansea (the site) comprising a Construction Quality Assurance (CQA) Plan for the installation of additional in-waste landfill gas venting wells and perimeter landfill gas monitoring boreholes at the site.

The additional landfill venting wells at the site also will provide for leachate monitoring, but their primary purpose is to provide for the venting to atmosphere of landfill gas generated at the site. One of the landfill gas venting wells comprises a replacement for landfill gas venting well L3/09 which is blocked. Rotating cowl headworks will be installed on a number of the existing in waste landfill gas venting wells and this work is the subject of a separate CQA Plan (Report reference SIG/CW/DFR/1392/01/HWCQA dated July 2020). As part of this work it may be necessary to replace two of the existing in waste landfill gas venting wells, numbers L14/09 and L21/09. If this is necessary the replacement wells also will be the subject of this CQA Plan.

As we explained in our email to Paul Williams dated 26 June 2020 landfill gas monitoring at the site has continued on a generally monthly basis since the new landfill gas monitoring boreholes were installed in 2018 and 2019 and the results are being used currently to update the landfill gas risk assessment. From a preliminary review of the monitoring data collected in 2019 and 2020 it is unlikely that the conclusions of the landfill gas risk assessment included in the definite closure application will change. Given that it is unlikely that the conclusions of the landfill gas risk assessment included in the definite closure application will change it is likely that it will be concluded that the existing landfill gas management and monitoring infrastructure will

be appropriate with the exception of the provision of wind assisted rotating cowl headworks to the existing landfill gas vents and the need to replace up to three of the landfill gas vents. However, it is recognised that based on discussions with NRW, that NRW will insist on the provision of additional landfill gas venting capacity and closer spaced landfill gas monitoring boreholes along the southern boundary of the landfill and between the edge of the waste and the proposed development platform on the southern plateau in the base of the quarry. Accordingly, it is proposed to install approximately eleven additional landfill gas venting wells and three additional landfill gas monitoring boreholes. It is anticipated that the drilling works will commence around late September or early October 2020. Given the timescales we should be grateful for any comments you may have on the CQA Plan as soon as possible. Thank you for your assistance in this matter.

We trust the attached CQA Plan meets with your approval. Should you have any queries or need any further information please do not hesitate to contact us.

Regards

Guy

Attachment

CQA Plan - SIG_CWg25559

www.mjca.co.uk

Our ref:

SIG/CW/KE/20012/01/BHCQA/25559

SIG_CWg25559 NRW

Baddesley Colliery Offices

Main Road

Baxterley

Atherstone

Warwickshire

CV9 2LE

Telephone: (01827) 717891

Fax: (01827) 718507



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From: Herbert, Neil <Neil.Herbert@cyfoethnaturiolcymru.gov.uk>
Sent: 13 September 2022 15:18
To: Guy Titman
Cc: 'piergiorgio.cominetta@greenthesisgroup.com'; 'alberto.vivarelli@greenthesisgroup.com'; 'CEdge@edenstonegroup.com'; 'Richard Senior'
Subject: Construction Quality Assurance (CQA) Plan for the decommissioning, replacement and addition of monitoring boreholes at Cwmrhydyceirw Quarry Landfill

Dear Guy

I can confirm that our geoscience team have no comments to make with regards to this CQA plan so please feel free to progress with the installation at your earliest convenience.

In terms of future correspondence with regards to this facility I would be grateful if all emails are in future sent to the south west industry regulation team's central email account.

industryregulation.swwales@cyfoethnaturiolcymru.gov.uk

I trust this will be acceptable. My role has changed in recent months and I no longer have regulatory responsibility for this site.

Best regards

Neil Herbert

Uwch Arbenigwr - Rheoleiddio Diwidiant

Senior Specialist – Industry Regulation

Tîm Rheoleiddio Diwydiant

Industry Regulation Team

Cyfoeth Naturiol Cymru / Natural Resources Wales

E-bost/E-mail: neil.herbert@cyfoethnaturiolcymru.gov.uk

Siaradwr Cymraeg – Welsh Speaker

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future

Since the 1st of April 2013, Natural Resources Wales has taken over the functions previously carried out by the Countryside Council for Wales and Forestry Commission Wales, the devolved functions of Environment Agency Wales and some functions that were carried out within the Welsh Government.

For more information about the change to Natural Resources Wales and what this might mean for you, please visit [our website](#) or speak to your usual contact.

From: Guy Titman <Guytitman@mjca.co.uk>

Sent: 06 September 2022 16:10

To: Herbert, Neil <Neil.Herbert@cyfoethnaturiolcymru.gov.uk>

Cc: 'piergiorgio.cominetta@greenthesisgroup.com' <piergiorgio.cominetta@greenthesisgroup.com>; 'alberto.vivarelli@greenthesisgroup.com' <alberto.vivarelli@greenthesisgroup.com>; 'CEdge@edenstonegroup.com' <CEdge@edenstonegroup.com>; 'Richard Senior' <RSenior@edenstonegroup.com>

Subject: Construction Quality Assurance (CQA) Plan for the decommissioning, replacement and addition of monitoring boreholes at Cwmrhydyceirw Quarry Landfill

6 September 2022

Dear Neil

Construction Quality Assurance (CQA) Plan for the decommissioning, replacement and addition of monitoring boreholes at Cwmrhydyceirw Quarry Landfill

MJCA has prepared a Construction Quality Assurance (CQA) Plan for the decommissioning and replacement of 9 gas monitoring boreholes (LFG2, LFG18, LFG23, LFG35, LFG43, LFG44, LFG46, LFG47 and LFG48) and 2 groundwater monitoring boreholes (GW03 and GW08) at Cwmrhydyceirw Quarry which is the subject of Environmental Permit reference EPR/TP3835LV. It is necessary to decommissioning and replace the majority of these boreholes to facilitate the residential development areas. Boreholes LFG2, LFG23, LFG43 and GW03 have been damaged and need decommissioning and replacing. In addition to the decommissioning and replacement works the CQA Plan includes also the installation of additional monitoring facilities at four borehole locations (LFG24, LFG25, LFG26 and LFG27). It is necessary to install additional monitoring facilities as these existing borehole locations are prone to flooding from the seepage of

groundwater and may no longer be suitable for landfill gas monitoring. The CQA Plan for the decommissioning, replacement and addition of monitoring boreholes is attached for your approval pursuant to Condition 2.7.4 of Environmental Permit reference EPR/TP3835LV. As you will recall CQA Plans for the decommissioning and installation of other monitoring boreholes have been agreed recently for the site. This CQA Plan is based on the approach to works which has been agreed previously by Natural Resources Wales albeit that this CQA Plan relates to other boreholes at the site.

We trust the attached CQA Plan meets with your approval. Should you have any queries or need any further information please do not hesitate to contact us.

Regards

Guy

Attachment:

CQA Plan for the decommissioning, replacement and addition of monitoring boreholes at Cwmrhydyceirw Quarry Landfill

www.mjca.co.uk

Our ref: SIG/CW/KE/20012/01/28393

SIG_CWg28393 NRW



Baddesley Colliery Offices

Main Road

Baxterley

Atherstone

Warwickshire

CV9 2LE

Telephone: (01827) 717891

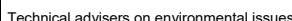
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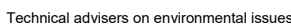
APPENDIX D
BOREHOLE LOGS



BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
				70.89	0.10	Firm dark brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone. Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
1									
2									
3									
4									
5									
6									
7									
8									
9									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 39mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
20/10/22	39.00m		DRY					Crew: D. Thomas; S. G		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	39.00	
LOGGED BY							E. Brown			



BOREHOLE LOG

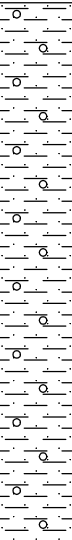
Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
11									
12									
13									
14									
15									
16									
17									
18									
19									
					(38.90)				

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 39mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
20/10/22	39.00m		DRY					Crew: D. Thomas; S. G		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	39.00	
LOGGED BY							E. Brown			

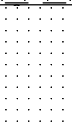
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 70.99		Co-ordinates () E 266 345.639 N 199 282.857			Borehole No. LFG18R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 4			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>					
22											
23											
24											
25											
26											
27											
28											
29											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 39mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; S. G	
20/10/22	39.00m		DRY				LOGGED BY			Type and Diameter Rotary open hole 150mm	Depth m 39.00
						E. Brown					

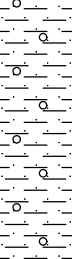
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 70.99		Co-ordinates () E 266 345.639 N 199 282.857			Borehole No. LFG18R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
32									
33									
34									
35									
36									
37									
38									
39				31.99	39.00	END OF BOREHOLE			
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 39mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
20/10/22	39.00m		DRY						Type and Diameter Rotary open hole 150mm
							LOGGED BY	E. Brown	Depth m 39.00

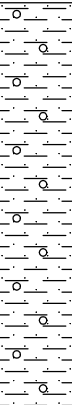
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 07/11/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG24R-A	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1					(2.20)	Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.			
2					2.20	END OF BOREHOLE			
3									
4									
5									
6									
7									
8									
9									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 2.2mbgl and 0.5mbgl and plain HDPE pipe installed from 0.5mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 0.5mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G Crew: T. Davies; J. Brown
07/11/22	2.20m		DRY				Type and Diameter		Depth m
							Rotary open hole 150mm		2.20
LOGGED BY							E. Brown		

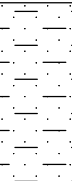
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 07/11/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG24R-B		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend		
1						Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.				
2					(4.50)					
3					4.50					
4						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]				
5					(0.80) 5.30	END OF BOREHOLE				
6										
7										
8										
9										
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 5.3mbgl and 2.0mbgl and plain HDPE pipe installed from 2.0mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 1.5mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G Crew: T. Davies; J. Brown	
07/11/22	5.30m		DRY				LOGGED BY E. Brown		Type and Diameter Rotary open hole 150mm	Depth m 5.30

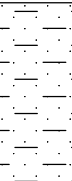
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 08/11/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG25R-A			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
1					(2.00)	Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.					
2					2.00	END OF BOREHOLE					
3											
4											
5											
6											
7											
8											
9											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 2mbgl and 0.5mbgl and plain HDPE pipe installed from 0.5mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 0.2mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Fraste PL G Crew: T. Davies; J. Brown	
08/11/22	2.00m		DRY				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 2.00

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 08/11/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG25R-B	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1						Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.			
2					(4.00)				
3					4.00				
4					(1.00)	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
5					5.00	END OF BOREHOLE			
6									
7									
8									
9									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 5mbgl and 2.0mbgl and plain HDPE pipe installed from 2.0mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 1.5mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G Crew: T. Davies; J. Brown
08/11/22	5.00m		DRY				LOGGED BY E. Brown		Type and Diameter Rotary open hole 150mm
								Depth m 5.00	

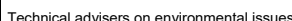
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 08/11/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG26R-A			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
1					(2.30)	Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.					
2					2.30	END OF BOREHOLE					
3											
4											
5											
6											
7											
8											
9											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 2.3mbgl and 0.5mbgl and plain HDPE pipe installed from 0.5mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 0.3mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Fraste PL G	
08/11/22	2.30m		DRY							Crew: T. Davies; J. Brown	
										Type and Diameter	Depth m
							Rotary open hole 150mm		2.30		
LOGGED BY						E. Brown					

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw Quarry						Client SI Green UK Limited						Date Completed 08/11/2022	
Project No. SIG/CW/KE/20012/01				Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC				Borehole No. LFG26R-B			
Contractor APEX Drilling Services Limited						Location Cwmrhydyceirw Quarry, Morriston, Swansea						Sheet 1 of 1	
Scale (m)	SAMPLES & TESTS			STRATA							Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION			Legend				
1					(3.40)	Medium dense greyish brown gravelly clayey SAND. Gravel is sub-rounded to rounded fine to coarse of flint.							
2					3.40	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]							
3					(2.00)	END OF BOREHOLE							
4					5.40								
5													
6													
7													
8													
9													
GROUNDWATER						REMARKS / INSTALLATIONS				DRILLING			
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 5.4mbgl and 2.0mbgl and plain HDPE pipe installed from 2.0mbgl to approximately 0.1m below ground level. Borehole annulus backfilled with gravel to 1.5mbgl and bentonite pellets progressively washed with clean water to approximately 0.1m below ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Fraste PL G			
08/11/22	5.40m		DRY							Crew: T. Davies; J. Brown			
Type and Diameter		Depth m											
Rotary open hole 150mm		5.40		LOGGED BY		E. Brown							

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Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 12/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 68.03		Co-ordinates () E 266 557.184 N 199 387.41			Borehole No. LFG27R-A	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1				66.53	1.50 (1.50)	Medium dense greyish brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of sandstone.			
2					(3.40)	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
3				63.13	4.90	END OF BOREHOLE			
4									
5									
6									
7									
8									
9									
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 4.9mbgl and 0.5mbgl and plain HDPE pipe installed from 0.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 0.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F
12/10/22	4.90m		DRY				Type and Diameter Rotary open hole 150mm		Depth m 4.90
LOGGED BY							E. Brown		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 12/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 68.03		Co-ordinates () E 266 557.184 N 199 387.41			Borehole No. LFG27R-B	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 1	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION			
1				66.53	1.50 (1.50)	Medium dense greyish brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of sandstone.			
2						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
3									
4									
5									
6									
7									
8				60.03	8.00 (6.50)	END OF BOREHOLE			
9									
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 8.0mbgl and 5.0mbgl and plain HDPE pipe installed from 5.0mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 5.0mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F
12/10/22	8.00m		DRY				Type and Diameter		Depth m
							Rotary open hole 150mm		8.00
LOGGED BY							E. Brown		

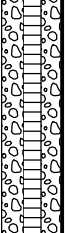
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 19/10/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 54.23		Co-ordinates () E 266 563.493 N 199 193.337			Borehole No. LFG2R		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 3		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend		
1					(2.00)	Loose dark brown slightly clayey gravelly fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of sandstone.				
2				52.23	2.00	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]				
3										
4										
5										
6										
7										
8										
9										
GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4.2mbgl and plain HDPE pipe installed from 4.2mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 3.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G	
19/10/22	22.00m		DRY						Type and Diameter	Depth m
							LOGGED BY		E. Brown	
							Rotary open hole 150mm		22.00	

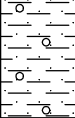
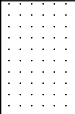
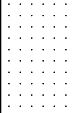
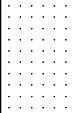
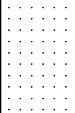


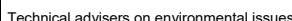
BOREHOLE LOG

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GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4.2mbgl and plain HDPE pipe installed from 4.2mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 3.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
19/10/22	22.00m		DRY						Crew: D. Thomas; S. G	
									Type and Diameter	Depth m
									Rotary open hole 150mm	22.00
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 19/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 54.23		Co-ordinates () E 266 563.493 N 199 193.337			Borehole No. LFG2R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 3	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
22				32.23	22.00	END OF BOREHOLE			
23									
24									
25									
26									
27									
28									
29									
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4.2mbgl and plain HDPE pipe installed from 4.2mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 3.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
19/10/22	22.00m		DRY				Type and Diameter Rotary open hole 150mm		Depth m 22.00
						LOGGED BY	E. Brown		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 12/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 67.90		Co-ordinates () E 266 588.612 N 199 375.904			Borehole No. LFG43R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 4			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
1				66.90	(1.00) 1.00	Medium dense dark greyish brown gravelly clayey SAND. Gravel is angular to sub-angular fine to coarse of sandstone.					
2						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]					
3											
4											
5											
6											
7											
8											
9											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 35.8mbgl and 2.8mbgl and plain HDPE pipe installed from 2.8mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.4mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F	
12/10/22	35.80m		DRY				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 35.80



BOREHOLE LOG

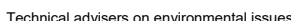
Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
11						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
12									
13									
14									
15									
16									
17									
18									
19									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 35.8mbgl and 2.8mbgl and plain HDPE pipe installed from 2.8mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.4mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
12/10/22	35.80m		DRY			Crew: D. Thomas; C. F				
						Type and Diameter			Depth m	
						Rotary open hole 150mm			35.80	
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 12/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 67.90		Co-ordinates () E 266 588.612 N 199 375.904			Borehole No. LFG43R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION			
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
22									
23									
24									
25									
26									
27									
28									
29									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 35.8mbgl and 2.8mbgl and plain HDPE pipe installed from 2.8mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.4mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F
12/10/22	35.80m		DRY						Type and Diameter Rotary open hole 150mm
							LOGGED BY	E. Brown	Depth m 35.80

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 12/10/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 67.90		Co-ordinates () E 266 588.612 N 199 375.904			Borehole No. LFG43R		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 4		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>				
32										
33										
34										
35										
36				32.10	35.80	END OF BOREHOLE				
37										
38										
39										
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 35.8mbgl and 2.8mbgl and plain HDPE pipe installed from 2.8mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.4mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F
12/10/22	35.80m		DRY				LOGGED BY			Type and Diameter Rotary open hole 150mm
							E. Brown			Depth m 35.80

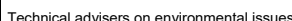
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 11/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 65.77		Co-ordinates () E 266 603.261 N 199 344.113			Borehole No. LFG44R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1 2 3 4 5 6 7 8 9				65.27	(0.50) 0.50	Medium dense greyish brown gravelly clayey SAND. Gravel is angular to sub-angular fine to coarse of sandstone. Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.5mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F
11/10/22	32.50m		DRY				Type and Diameter Rotary open hole 150mm		Depth m 32.50
LOGGED BY							E. Brown		



BOREHOLE LOG

[illegible]

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed				
11/10/22	32.50m		DRY				Slotted HDPE pipe with geowrap installed between 32.5mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F	
							Type and Diameter		Depth m	
							Rotary open hole 150mm		32.50	
							LOGGED BY		E. Brown	

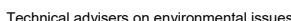


BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
22									
23									
24									
25									
26									
27									
28									
29									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.5mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
11/10/22	32.50m		DRY			Crew: D. Thomas; C. F				
						Type and Diameter			Depth m	
						Rotary open hole 150mm			32.50	
LOGGED BY							E. Brown			

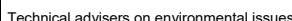
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw Quarry						Client SI Green UK Limited						Date Completed 11/10/2022	
Project No. SIG/CW/KE/20012/01				Ground Level (mAOD) 65.77		Co-ordinates () E 266 603.261 N 199 344.113				Borehole No. LFG44R			
Contractor APEX Drilling Services Limited						Location Cwmrhydyceirw Quarry, Morriston, Swansea						Sheet 4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA							Water	Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend			
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>							
32				33.27	32.50	END OF BOREHOLE							
33													
34													
35													
36													
37													
38													
39													
GROUNDWATER						REMARKS / INSTALLATIONS				DRILLING			
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.5mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.				Plant: Klemm 802 Crew: D. Thomas; C. F		
11/10/22	32.50m		DRY								Type and Diameter	Depth m	
							LOGGED BY				Rotary open hole 150mm	32.50	
							E. Brown						



BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA			Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		
				62.04	0.30	Firm greyish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone. Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]		
1								
2								
3								
4								
5								
6								
7								
8								
9								

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.2mbgl and 3.5mbgl and plain HDPE pipe installed from 3.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
11/10/22	32.20m		DRY						Crew: D. Thomas; C. F	
									Type and Diameter	Depth m
									Rotary open hole 150mm	32.20
							LOGGED BY		E. Brown	



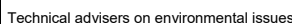
BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
11									
12									
13									
14									
15									
16					(31.90)				
17									
18									
19									

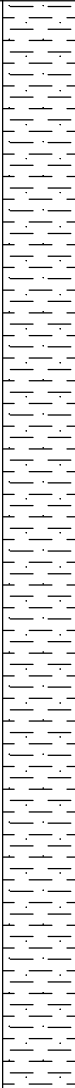
GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.2mbgl and 3.5mbgl and plain HDPE pipe installed from 3.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802		
11/10/22	32.20m		DRY						Crew: D. Thomas; C. F		
									Type and Diameter	Depth m	
							LOGGED BY	E. Brown		Rotary open hole 150mm	32.20

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 11/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 62.34		Co-ordinates () E 266 610.096 N 199 286.065			Borehole No. LFG46R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 4			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>					
22											
23											
24											
25											
26											
27											
28											
29											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.2mbgl and 3.5mbgl and plain HDPE pipe installed from 3.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F	
11/10/22	32.20m		DRY							Type and Diameter Rotary open hole 150mm	
						LOGGED BY			E. Brown		
									Depth m 32.20		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project						Client						Date Completed	
Cwmrhydyceirw Quarry						SI Green UK Limited						11/10/2022	
Project No.				Ground Level (mAOD)		Co-ordinates ()				Borehole No.			
SIG/CW/KE/20012/01				62.34		E 266 610.096 N 199 286.065				LFG46R			
Contractor						Location						Sheet	
APEX Drilling Services Limited						Cwmrhydyceirw Quarry, Morriston, Swansea						4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA								Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thickness)	DESCRIPTION				Legend			
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>							
32				30.14	32.20	END OF BOREHOLE							
33													
34													
35													
36													
37													
38													
39													
GROUNDWATER						REMARKS / INSTALLATIONS				DRILLING			
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32.2mbgl and 3.5mbgl and plain HDPE pipe installed from 3.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.				Plant: Klemm 802		
11/10/22	32.20m		DRY								Crew: D. Thomas; C. F		
						Type and Diameter					Depth m		
						Rotary open hole 150mm		32.20					
LOGGED BY						E. Brown							



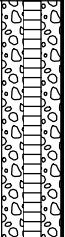
BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
1						Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone.			
2									
3									
4									
5									
6									
7									
8									
9									

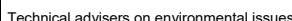
GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed				
17/10/22	32.00m		DRY				Slotted HDPE pipe with geowrap installed between 32mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G	
							Type and Diameter		Depth m	
							Rotary open hole 150mm		32.00	
							LOGGED BY		E. Brown	

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project				Client				Date Completed		
Cwmrhydyceirw Quarry				SI Green UK Limited				17/10/2022		
Project No.			Ground Level (mAOD)		Co-ordinates ()			Borehole No.		
SIG/CW/KE/20012/01			51.64		E 266 579.789 N 199 240.695			LFG47R		
Contractor				Location				Sheet		
APEX Drilling Services Limited				Cwmrhydyceirw Quarry, Morriston, Swansea				2 of 4		
Scale (m)	SAMPLES & TESTS			STRATA					Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thickness)	DESCRIPTION		Legend		
11					(21.50)	Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone. <i>(continued)</i>				
12										
13										
14										
15										
16										
17										
18										
19										
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
17/10/22	32.00m		DRY					Crew: D. Thomas; S. G		
								Type and Diameter	Depth m	
							Rotary open hole 150mm	32.00		
LOGGED BY						E. Brown				

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 17/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 51.64		Co-ordinates () E 266 579.789 N 199 240.695			Borehole No. LFG47R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 4			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
21				30.14	21.50	Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone. <i>(continued)</i>					
22						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]					
23											
24											
25											
26											
27					(10.50)						
28											
29											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; S. G	
17/10/22	32.00m		DRY				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 32.00

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 17/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 51.64		Co-ordinates () E 266 579.789 N 199 240.695			Borehole No. LFG47R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
32				19.64	32.00	END OF BOREHOLE			
33									
34									
35									
36									
37									
38									
39									
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 2.5mbgl and plain HDPE pipe installed from 2.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
17/10/22	32.00m		DRY						Type and Diameter Rotary open hole 150mm
							LOGGED BY	E. Brown	Depth m 32.00

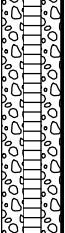
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 18/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 51.51		Co-ordinates () E 266 562.75 N 199 222.888			Borehole No. LFG48R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 3			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
1				50.31	(1.20) 1.20	Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone.					
2						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]					
3											
4											
5											
6											
7											
8											
9											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4mbgl and plain HDPE pipe installed from 4mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; S. G	
18/10/22	22.00m		DRY				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 22.00



BOREHOLE LOG

[illegible]

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4mbgl and plain HDPE pipe installed from 4mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
18/10/22	22.00m		DRY					Crew: D. Thomas; S. G		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	22.00	
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw Quarry						Client SI Green UK Limited						Date Completed 18/10/2022	
Project No. SIG/CW/KE/20012/01				Ground Level (mAOD) 51.51		Co-ordinates () E 266 562.75 N 199 222.888				Borehole No. LFG48R			
Contractor APEX Drilling Services Limited						Location Cwmrhydyceirw Quarry, Morriston, Swansea						Sheet 3 of 3	
Scale (m)	SAMPLES & TESTS			STRATA							Water	Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend			
21						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>							
22				29.51	22.00	END OF BOREHOLE							
23													
24													
25													
26													
27													
28													
29													
GROUNDWATER						REMARKS / INSTALLATIONS				DRILLING			
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 22mbgl and 4mbgl and plain HDPE pipe installed from 4mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.				Plant: Klemm 802 Crew: D. Thomas; S. G		
18/10/22	22.00m		DRY								Type and Diameter Rotary open hole 150mm	Depth m 22.00	
						LOGGED BY		E. Brown					

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 47.00		Co-ordinates () E 266 479.701 N 199 243.384			Borehole No. LFG49			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 2			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
1				45.50	1.50 (1.50)	Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone.					
2						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]					
3											
4											
5											
6											
7											
8					(13.50)						
9											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 15mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; S. G	
20/10/22	15.00m		DRY				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 15.00

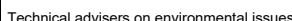
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 47.00		Co-ordinates () E 266 479.701 N 199 243.384			Borehole No. LFG49	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 2 of 2	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
11						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
12									
13									
14									
15				32.00	15.00	END OF BOREHOLE			
16									
17									
18									
19									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 15mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
20/10/22	15.00m		DRY				Type and Diameter Rotary open hole 150mm		Depth m 15.00
						LOGGED BY		E. Brown	

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 48.40		Co-ordinates () E 266 449.488 N 199 251.612			Borehole No. LFG50	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 2	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1				46.80	(1.60) 1.60	Firm dark brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone.			
2						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
3									
4									
5									
6									
7									
8									
9					(14.40)				
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 16mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
20/10/22	16.00m		DRY				Type and Diameter		Depth m
							Rotary open hole 150mm		16.00
LOGGED BY							E. Brown		

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 48.40		Co-ordinates () E 266 449.488 N 199 251.612			Borehole No. LFG50	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 2 of 2	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
11						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
12									
13									
14									
15									
16				32.40	16.00	END OF BOREHOLE			
17									
18									
19									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 16mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
20/10/22	16.00m		DRY				Type and Diameter Rotary open hole 150mm		Depth m 16.00
						LOGGED BY		E. Brown	

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 49.15		Co-ordinates () E 266 421.362 N 199 263.011			Borehole No. LFG51	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 1 of 2	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
1					(1.60)	Firm dark brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone.			
				47.55	1.60	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			
2									
3									
4									
5									
6									
7									
8									
9									
					(15.40)				
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 17mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; S. G
20/10/22	17.00m		DRY						Type and Diameter Rotary open hole 150mm
							LOGGED BY	E. Brown	Depth m 17.00

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 20/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 49.15		Co-ordinates () E 266 421.362 N 199 263.011			Borehole No. LFG51			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 2 of 2			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
11						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>					
12											
13											
14											
15											
16											
17				32.15	17.00	END OF BOREHOLE					
18											
19											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 17mbgl and 1.5mbgl and plain HDPE pipe installed from 1.5mbgl to approximately 2m above ground level. Borehole annulus backfilled with gravel to 1mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; S. G	
20/10/22	17.00m		DRY				LOGGED BY			Type and Diameter Rotary open hole 150mm	Depth m 17.00
						E. Brown					

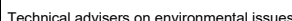


BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA			Legend	Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION			
1						Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine and medium of sandstone.			
2									
3									
4									
5									
6									
7									
8									
9						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]			

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 31.5mbgl and 22.5mbgl and plain HDPE pipe installed from 22.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 23.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G	
10/11/22	32.50m		23.5m						Crew: D. Thomas; S. G	
									Type and Diameter	Depth m
									Rotary open hole 150mm	32.50
LOGGED BY							E. Brown			

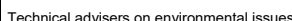
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG									
Project Cwmrhydyceirw Quarry						Client SI Green UK Limited						Date Completed 10/11/2022	
Project No. SIG/CW/KE/20012/01				Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC				Borehole No. CWMGW03R			
Contractor APEX Drilling Services Limited						Location Cwmrhydyceirw Quarry, Morriston, Swansea						Sheet 2 of 4	
Scale (m)	SAMPLES & TESTS			STRATA							Water	Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend			
11						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>							
12													
13													
14													
15													
16													
17													
18													
19													
GROUNDWATER						REMARKS / INSTALLATIONS				DRILLING			
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 31.5mbgl and 22.5mbgl and plain HDPE pipe installed from 22.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 23.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.				Plant: Fraste PL G Crew: D. Thomas; S. G		
10/11/22	32.50m		23.5m								Type and Diameter	Depth m	
							LOGGED BY				E. Brown	Rotary open hole 150mm	32.50



BOREHOLE LOG

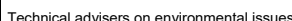
GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed				
10/11/22	32.50m		23.5m				Slotted HDPE pipe with geowrap installed between 31.5mbgl and 22.5mbgl and plain HDPE pipe installed from 22.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 23.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G Crew: D. Thomas; S. G	
							Type and Diameter		Depth m	
							Rotary open hole 150mm		32.50	
							LOGGED BY		E. Brown	

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 10/11/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. CWMGW03R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
32					32.50	END OF BOREHOLE			
33									
34									
35									
36									
37									
38									
39									
GROUNDWATER						REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 31.5mbgl and 22.5mbgl and plain HDPE pipe installed from 22.5mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 23.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Fraste PL G Crew: D. Thomas; S. G
10/11/22	32.50m		23.5m				Type and Diameter Rotary open hole 150mm		Depth m 32.50
						LOGGED BY E. Brown			



BOREHOLE LOG

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 43mbgl and 28.7mbgl and plain HDPE pipe installed from 28.7mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 27.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
14/10/22	43.00m		21m					Crew: D. Thomas; C. F		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	43.00	
LOGGED BY							E. Brown			

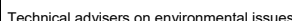


BOREHOLE LOG

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GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 43mbgl and 28.7mbgl and plain HDPE pipe installed from 28.7mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 27.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
14/10/22	43.00m		21m						Crew: D. Thomas; C. F	
									Type and Diameter	Depth m
									Rotary open hole 150mm	43.00
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 14/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 52.63		Co-ordinates () E 266 584.314 N 199 251.031			Borehole No. CWMGW08R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 3 of 5			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
21				31.13	21.50	Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone. <i>(continued)</i>					
22						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]					
23											
24											
25											
26											
27											
28											
29											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 43mbgl and 28.7mbgl and plain HDPE pipe installed from 28.7mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 27.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F	
14/10/22	43.00m		21m				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 43.00

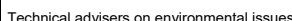


BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA			Legend	Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION			
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
32					(21.50)				
33									
34									
35									
36									
37									
38									
39									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 43mbgl and 28.7mbgl and plain HDPE pipe installed from 28.7mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 27.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Klemm 802		
14/10/22	43.00m		21m					Crew: D. Thomas; C. F		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	43.00	
LOGGED BY							E. Brown			

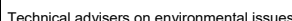
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG							
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 14/10/2022			
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 52.63		Co-ordinates () E 266 584.314 N 199 251.031			Borehole No. CWMGW08R			
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 5 of 5			
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill		
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend	
41						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>					
42											
43				9.63	43.00	END OF BOREHOLE					
44											
45											
46											
47											
48											
49											
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING		
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 43mbgl and 28.7mbgl and plain HDPE pipe installed from 28.7mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 27.7mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F	
14/10/22	43.00m		21m				LOGGED BY E. Brown			Type and Diameter Rotary open hole 150mm	Depth m 43.00



BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA			Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		
1					(4.00)	Medium dense greyish brown gravelly clayey SAND with occasional cobbles after 2mbgl. Gravel is sub-angular to sub-rounded fine to coarse of sandstone and occasional flint. Cobbles are sub-angular to sub-rounded of sandstone.		
2								
3								
4								
5					4.00	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]		
6								
7								
8								
9								

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 45mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Fraste PL G		
09/11/22	45.00m		31m					Crew: T. Davies; J. Brown		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	45.00	
LOGGED BY							E. Brown			

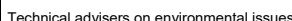


BOREHOLE LOG

Project Cwmrhydyceirw Quarry		Client SI Green UK Limited		Date Completed 09/11/2022
Project No. SIG/CW/KE/20012/01	Ground Level (mAOD) TBC	Co-ordinates () E TBC N TBC		Borehole No. LFG23R
Contractor APEX Drilling Services Limited		Location Cwmrhydyceirw Quarry, Morriston, Swansea		Sheet 2 of 5

[illegible]

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 45mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Fraste PL G		
09/11/22	45.00m		31m					Crew: T. Davies; J. Brown		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	45.00	
LOGGED BY							E. Brown			



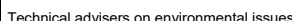
BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA				Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION	Legend		
						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
21									
22									
23									
24									
25					(41.00)				
26									
27									
28									
29									

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 45mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.	Plant: Fraste PL G		
09/11/22	45.00m		31m					Crew: T. Davies; J. Brown		
								Type and Diameter	Depth m	
								Rotary open hole 150mm	45.00	
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 09/11/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG23R		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 5		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>				
32										
33										
34										
35										
36										
37										
38										
39										
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 45mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Fraste PL G Crew: T. Davies; J. Brown
09/11/22	45.00m		31m				LOGGED BY			Type and Diameter Rotary open hole 150mm
						E. Brown			Depth m 45.00	

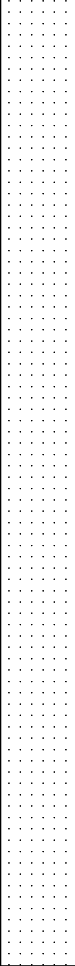
		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 09/11/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) TBC		Co-ordinates () E TBC N TBC			Borehole No. LFG23R		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 5 of 5		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend
41						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>				
42										
43										
44										
45					45.00	END OF BOREHOLE				
46										
47										
48										
49										
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 45mbgl and 3mbgl and plain HDPE pipe installed from 3mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 2.5mbgl and bentonite pellets progressively washed with clean water to ground level. Installation comprised of bolt down metal covers flush with ground level. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Fraste PL G Crew: T. Davies; J. Brown
09/11/22	45.00m		31m				LOGGED BY			Type and Diameter Rotary open hole 150mm
							E. Brown		Depth m 45.00	

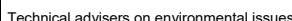


BOREHOLE LOG

Scale (m)	SAMPLES & TESTS			STRATA			Water	Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		
				55.03	0.20	Strong dark grey CONCRETE. 60-70% aggregate of sub-angular to sub-rounded fine to coarse gravel.		
1						Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone.		
2								
3								
4								
5								
6					(11.80)			
7								
8								
9								

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed				
13/10/22	32.00m		31m				Slotted HDPE pipe with geowrap installed between 32mbgl and 4.1mbgl and plain HDPE pipe installed from 4.1mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F	
							Type and Diameter		Depth m	
							Rotary open hole 150mm		32.00	
							LOGGED BY		E. Brown	

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG						
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 13/10/2022		
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 55.23		Co-ordinates () E 266 591.754 N 199 267.664			Borehole No. LFG35R		
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 2 of 4		
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill	
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION				Legend
11						Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone. <i>(continued)</i>				
12				43.23	12.00	Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION]				
13										
14										
15										
16										
17										
18										
19										
GROUNDWATER						REMARKS / INSTALLATIONS			DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 4.1mbgl and plain HDPE pipe installed from 4.1mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.			Plant: Klemm 802 Crew: D. Thomas; C. F
13/10/22	32.00m		31m				LOGGED BY			E. Brown
							Type and Diameter		Depth m	
							Rotary open hole 150mm		32.00	



BOREHOLE LOG

[illegible]

GROUNDWATER							REMARKS / INSTALLATIONS		DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 4.1mbgl and plain HDPE pipe installed from 4.1mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802	
13/10/22	32.00m		31m						Crew: D. Thomas; C. F	
									Type and Diameter	Depth m
									Rotary open hole 150mm	32.00
LOGGED BY							E. Brown			

		Baddesley Colliery Offices, Main Road, Baxterley, Atherstone, Warwickshire, CV9 2LE Telephone: 01827 717891 Facsimile: 01827 718507		BOREHOLE LOG					
Project Cwmrhydyceirw Quarry				Client SI Green UK Limited				Date Completed 13/10/2022	
Project No. SIG/CW/KE/20012/01			Ground Level (mAOD) 55.23		Co-ordinates () E 266 591.754 N 199 267.664			Borehole No. LFG35R	
Contractor APEX Drilling Services Limited				Location Cwmrhydyceirw Quarry, Morriston, Swansea				Sheet 4 of 4	
Scale (m)	SAMPLES & TESTS			STRATA					Water Instrument/ Backfill
	Depth	Type No	Test Result	Reduced Level (mAOD)	Depth (Thick- ness)	DESCRIPTION		Legend	
31						Strong greyish brown SANDSTONE. [PENNANT SANDSTONE FORMATION] <i>(continued)</i>			
32				23.23	32.00	END OF BOREHOLE			
33									
34									
35									
36									
37									
38									
39									
GROUNDWATER				REMARKS / INSTALLATIONS				DRILLING	
Date	Depth of hole	Depth of casing	Depth to water	Depth struck	Depth after 20 mins	Depth sealed	Slotted HDPE pipe with geowrap installed between 32mbgl and 4.1mbgl and plain HDPE pipe installed from 4.1mbgl to approximately 0.5m above ground level. Borehole annulus backfilled with gravel to 3.5mbgl and bentonite pellets progressively washed with clean water to ground level. Standpipe left without headworks as finished ground levels were not known. Standpipe fitted with a removable gas tight cap with gas tap.		Plant: Klemm 802 Crew: D. Thomas; C. F
13/10/22	32.00m		31m						Type and Diameter Rotary open hole 150mm
							LOGGED BY	E. Brown	Depth m 32.00

APPENDIX E

SITE DIARY AND SUMMARY TABLES FOR THE CQA BOREHOLE INSTALLATIONS



Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	10/10/22
Weather	Clear skies, cold, wet
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG46RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

9:00-13:30 – Waiting for APEX, waiting for borehole positions to be set out by Edenstone

13:30-16:15 – Drilling LFG46R to 30mbgl

Signed (CQA Inspector):

Tom CoatesDate: 10/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	11/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG46RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:00-11:00 – Drilling LFG46R to 32.2mbgl. Hole collapsed during install, redrill required.

11:00-11:30 – Installation of LFG46R

Signed (CQA Inspector):

Tom CoatesDate: 11/10/2022

SIG/CW/KE/20012/01

January 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	11/10/22
Weather	Overcast, cool, dry
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG44RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

12:45-15:40 – Drilling LFG44R to 33mbgl

16:00-16:25 – Installation of LFG44R

Signed (CQA Inspector):

Tom CoatesDate: 11/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	12/10/22
Weather	Overcast, cool, dry
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG43RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:45-11:20 – Drilling LFG43R to 35.8mbgl

11:20-12:15 – Installation of LFG43R

Signed (CQA Inspector):

Tom CoatesDate: 12/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	12/10/22
Weather	Overcast, cool, dry
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG27R-A and LFG27R-B GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

13:00-13:20 – Drilling LFG27R-A to 4.9mbgl
 13:25-13:45 – Drilling LFG27R-B to 8mbgl
 14:05-14:20 – Installation of LFG27R-B
 14:20-14:50 – Installation of LFG27R-A

Signed (CQA Inspector):

Tom Coates

Date: 12/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	13/10/22
Weather	Clear skies, cool, wet
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG35RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to access issues
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:15-12:30 – Drilling LFG35R to 32mbgl

13:00-13:30 – Installation of LFG35R

Signed (CQA Inspector):

Tom CoatesDate: 13/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	13/10/22
Weather	Clear skies, cool, wet
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: CWMGW08RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to access issues
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

14:35-15:30 – Drilling CWMGW08R to 15mbgl

Signed (CQA Inspector):

Tom CoatesDate: 13/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	14/10/22
Weather	Overcast, cool, wet, rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: CWMGW08RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to access issues
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:15-13:30 – Drilling CWMGW08R to 43mbgl

13:50-15:45 – Several attempts to install failed due to the borehole collapsing. Installed by 15:45.

Signed (CQA Inspector):

Tom CoatesDate: 14/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	17/10/22
Weather	Cloudy, cool, wet
CQA Inspector	Tom Coates & Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG47RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:30-13:00 – Drilling LFG47R to 32mbgl

13:15-14:35 – Installation of LFG47R

Signed (CQA Inspector):

Tom CoatesDate: 17/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	17/10/22
Weather	Cloudy, cool, wet
CQA Inspector	Tom Coates & Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG48RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned to be closer to the original LFG48
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

15:15-15:45 – Drilling LFG48R to 12mbgl

Signed (CQA Inspector):
Tom CoatesDate: 17/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	18/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Tom Coates & Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG48RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned to be closer to the original LFG48
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:45-9:40 – Drilling LFG48R to 22mbgl

9:50-10:10 – Installation of LFG48R

Signed (CQA Inspector):

Ethan BrownDate: 18/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	18/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: CWMGW03R

GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

10:20-15:00 – Drilling CWMGW03R to 32.5mbgl. Hole repeatedly collapsing to approximately 4mbgl.

Signed (CQA Inspector):
Ethan BrownDate: 18/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	19/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: CWMGW03RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

8:30-9:20 – Attempted to case CWMGW03R to prevent collapsing.

9:20-9:40 – Installation failed – standpipe stuck at 18mbgl

10:00-10:30 – Borehole abandoned. Hole backfilled with bentonite to 1mbgl and cement to ground level.

Signed (CQA Inspector):
Ethan BrownDate: 19/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	19/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG2RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

10:45-13:30 – Drilling LFG2R to 22mbgl

9:50-10:10 – Installation of LFG48R

Signed (CQA Inspector):

Ethan BrownDate: 19/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	19/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG49GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

14:50-16:10 – Drilling LFG49 to 15mbgl

Signed (CQA Inspector):
Ethan BrownDate: 19/10/2022

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	20/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG49GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:30-8:50 – Installation of LFG49

9:00 – Ground levels in the area have changed and therefore it was necessary that LFG50 and LFG51 need to be drilled to 1mbgl-2mbgl deeper than specified in the CQA plan.

Signed (CQA Inspector):

Ethan BrownDate: 20/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	20/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG50GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

9:00-10:45 – Drilling LFG50 to 16mbgl

10:50-11:00 – Installation of LFG50

Signed (CQA Inspector):

Ethan BrownDate: 20/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	20/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG51GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

11:00-12:30 – Drilling LFG51 to 17mbgl

12:40-12:50 – Installation of LFG51

Signed (CQA Inspector):

Ethan BrownDate: 20/10/2022

SIG/CW/KE/20012/01

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Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	21/10/22
Weather	Clear skies, cold, dry
CQA Inspector	Ethan Brown
Drilling contractor	APEX Drilling Services Limited
Lead driller	Dylan Thomas
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG51GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

8:10-13:45 – Drilling LFG18R to 39mbgl

14:20-14:40 – Installation of LFG18R

Signed (CQA Inspector):

Ethan BrownDate: 21/10/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	7/11/22
Weather	Overcast, cool, wet, rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG24R-A and LFG24R-BGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Bolt down metal covers flush with ground level

General notes

9:00-11:20 – Awaiting access for the rig to be provided

11:20-13:40 – Drilling LFG24R-B to 5mbgl

13:40-13:50 – Installation of LFG24R-B

13:50-13:55 – Drilling LFG24R-A to 2.2mbgl

13:55-14:10 – Installation of LFG24R-A

Signed (CQA Inspector):

Tom CoatesDate: 7/11/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	8/11/22
Weather	Overcast, cool, wet, rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG25R-A and LFG25R-B GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Bolt down metal covers flush with ground level

General notes

9:10-9:20 – Drilling LFG25R-B to 5mbgl

9:20-9:30 – Installation of LFG25R-B

9:30-9:40 – Drilling LFG25R-A to 2mbgl

9:40-9:45 – Installation of LFG25R-A

Signed (CQA Inspector):

Tom Coates

Date: 8/11/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	8/11/22
Weather	Overcast, cool, wet, rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG26R-A and LFG26R-B GPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	Y		
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Bolt down metal covers flush with ground level

General notes

10:00-10:20 – Drilling LFG26R-B to 5.4mbgl
 10:20-10:25 – Installation of LFG26R-B
 10:25-10:30 – Drilling LFG26R-A to 2.3mbgl
 10:30-10:35 – Installation of LFG26R-A

Signed (CQA Inspector):

Tom Coates

Date: 8/11/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	8/11/22
Weather	Overcast, cool, wet, rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG23RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to access issues
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)			
Gravel (size/type)			
Bentonite (size/type)			
End cap			
Top cap/valve			
Headworks			

General notes

14:20-15:30 – Drilling LFG23R to 18mbgl

Signed (CQA Inspector):
Tom CoatesDate: 8/11/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	9/11/22
Weather	Cloudy, cool, wet, occasional rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: LFG23RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to access issues
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Bolt down metal covers flush with ground level

General notes

8:45-12:20 – Drilling LFG23R to 45mbgl

12:20-14:30 – Attempting to install LFG23R. Casing and redrill required due to hole collapsing.

14:30-15:50 – Installation of LFG23R

Signed (CQA Inspector):

Tom CoatesDate: 9/11/2022

SIG/CW/KE/20012/01

February 2023





Site diary CQA borehole drilling and installation

Site	Cwmrhydyceirw Quarry Landfill
Project reference	SIG/CW/KE/20012/01
Date	10/11/22
Weather	Overcast, cool, wet, light rain
CQA Inspector	Tom Coates
Drilling contractor	APEX Drilling Services Limited
Lead driller	Terry Davies
Drilling rig /method	Rotary open hole
Well/borehole/casing diameter	150mm
H&S Plan/RAMS	Y

Checklist

Borehole reference: CWMGW03RGPS coordinates: TBC

Pre-borehole drilling and installation checking of the materials and location details	Check (Y/N)	Photographic log (Y/N)	Details with regard to consistency with the specification set out in the agreed CQA Plan
Confirm the location is consistent with the CQA plan	N		Repositioned due to proposed location not being stable
Services cleared	Y		Landfill – no services
Hand dug inspection pit	N	N	As above
Pipe (slot aperture/pipe diameter/geowrap)	Y	Y	63mm OD HDPE slotted + plain pipe. Slotted pipe fitted with geowrap
Gravel (size/type)	Y	Y	3-6mm/filter
Bentonite (size/type)	Y	Y	Bentonite pellets (hydrated)
End cap	Y	Y	Push-fit end cap
Top cap/valve	Y	Y	Removable gas-tight cap with a gas tap
Headworks	N	N	Finished ground levels not yet known therefore headworks not installed

General notes

12:30-16:00 – Drilling of CWMGW03R to 32.5mbgl and installation.

Signed (CQA Inspector):

Tom CoatesDate: 10/11/2022

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
10/10/22	LFG46R	30.00	1.50					
11/10/22	LFG46R	32.20	1.50	32.20	3.50	32.20	1500	3.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
11/10/22	LFG46R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 9.57 Plain: 1.17	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 11/10/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
11/10/22	LFG44R	33.00	1.5	32.50	2.50	32.5	1500	2.0

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
11/10/22	LFG44R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 10 Plain: 1	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 11/10/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
12/10/22	LFG43R	35.80	4.50	35.8	2.80	35.80	1600	2.40

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
12/10/22	LFG44R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 11 Plain: 1	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 12/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
12/10/22	LFG27R-A	4.90	1.50	4.90	0.50	4.90	200	0.50
12/10/22	LFG27R-B	8.00	1.50	8.00	5.00	8.00	150	5.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
12/10/22	LFG27R-A	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 1.47 Plain: 0.33	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known
12/10/22	LFG27R-B	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 1 Plain: 2	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 12/10/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
13/10/22	LFG35R	32.00	12.50	32.00	4.10	32.00	1500	3.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
13/10/22	LFG35R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 9.3 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 13/10/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
13/10/22	CWMGW08R	15.00	15.00					
14/10/22	CWMGW08R	43.00	15.00	43.00	28.70	43.00	750	27.70

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
14/10/22	CWMGW08R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 4.77 Plain: 9.66	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 14/10/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
17/10/22	LFG47R	32.00	21.50	32.00	2.50	32.00	1500	2.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
17/10/22	LFG47R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 9.83 Plain: 1	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Tom Coates

Date: 17/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
17/10/22	LFG48R	12.00	1.50					
18/10/22	LFG48R	22.00	1.50	22.00	4.00	22.00	1000	3.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
18/10/22	LFG48R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 6 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 18/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
19/10/22	LFG2R	22.00	6.00	22.00	4.20	22.00	900	3.70

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
19/10/22	LFG2R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 5.93 Plain: 2	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 19/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
19/10/22	LFG49	15.00	1.50					
20/10/22	LFG49	15.00	1.50	15.00	1.50	15.00	750	1.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
20/10/22	LFG49	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 4.5 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 20/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
20/10/22	LFG50	16.00	3.00	16.00	1.50	16.00	750	1.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
20/10/22	LFG50	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 4.83 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 20/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
20/10/22	LFG51	17.00	3.00	17.00	1.50	17.00	800	1.00

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
20/10/22	LFG51	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 5.17 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 20/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
21/10/22	LFG18R	39.00	1.50	39.00	3.00	39.00	2000	2.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/cowl
21/10/22	LFG18R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 12 Plain: 1.5	Y	Progressively hydrated with clean water	Standpipe left without headworks as finished ground levels were not known

General notes:

Signed (CQA Inspector): Ethan Brown

Date: 21/10/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
7/11/22	LFG24R-A	2.20	2.20	2.20	0.50	2.20	100	0.20
7/11/22	LFG24R-B	5.30	4.50	5.30	2.00	5.30	200	1.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
7/11/22	LFG24R-A	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 0.57 Plain: 0.17	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level
7/11/22	LFG24R-B	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 1.07 Plain: 0.67	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level

General notes:

Signed (CQA Inspector): Tom Coates

Date: 7/11/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
8/11/22	LFG25R-A	2.00	2.00	2.00	0.50	2.00	100	0.20
8/11/22	LFG25R-B	5.00	4.00	5.00	2.00	5.00	200	1.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
8/11/22	LFG25R-A	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 0.5 Plain: 0.17	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level
8/11/22	LFG25R-B	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 1 Plain: 0.67	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level

General notes:

Signed (CQA Inspector): Tom Coates

Date: 8/11/22

SIG/CW/KE/20012/01

February 2023





Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
8/11/22	LFG26R-A	2.30	2.30	2.30	0.50	2.30	100	0.20
8/11/22	LFG26R-B	5.40	3.40	5.40	2.00	5.40	200	1.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
8/11/22	LFG26R-A	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 0.6 Plain: 0.17	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level
8/11/22	LFG26R-B	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 1.13 Plain: 0.67	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level

General notes:

Signed (CQA Inspector): Tom Coates

Date: 8/11/22



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
8/11/22	LFG23R	18.00	4.00					
9/11/22	LFG23R	45.00	4.00	45.00	3.00	45.00	2200	2.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
9/11/22	LFG23R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 14 Plain: 1	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level

General notes:

Signed (CQA Inspector): Tom Coates

Date: 9/11/22

SIG/CW/KE/20012/01

February 2023



Summary tables



Summary table for the CQA drilling and installation

Borehole drilling record								
Date	Well/borehole reference	Depth to the base of the Well/borehole (mbgl)	Depth of the drilling casing (mbgl)	Depth to the base of the slotted pipe (mbgl)	Depth to the base of the plain pipe (mbgl)	Depth to the base of the gravel (mbgl)	Mass of gravel added (kg)	Depth to the base of the bentonite (mbgl)
10/11/22	CWMGW03R	32.50	9.00	31.50	22.50	32.50	500	23.50

Borehole installation								
Date	Well/borehole reference	Geowrap	End cap fittings	Details of the top fittings (cap/gas valve/vent)	Number of sections of pipe	Pipe fittings checked	Details of the hydration of bentonite	Details of the cover/headworks/ cowl
10/11/22	CWMGW03R	Permeable filter geotextile sleeve	Push-fit	Removeable gas-tight cap with gas tap	Slotted: 3 Plain: 8	Y	Progressively hydrated with clean water	Bolt down metal covers flush with ground level

General notes:

Signed (CQA Inspector): Tom Coates

Date: 10/11/22

SIG/CW/KE/20012/01

February 2023



APPENDIX F

PHOTOGRAPHIC RECORD OF THE BOREHOLE INSTALLATIONS



Photograph 1
3-6mm filter gravel supplied for the works



Photograph 2
Bentonite pellets supplied for the works



Photograph 3
Push-fit end cap supplied for the works



Photograph 4
63mm outer diameter 51mm internal diameter slotted HDPE pipe with Geowrap Geofilter permeable filter geotextile sleeve



Photograph 5
63mm outer diameter 51mm internal diameter plain HDPE pipe



Photograph 6

Rotary open hole drilling rig on position at borehole LFG35R



Photograph 7
Rotary open hole drilling rig on position at borehole LFG44R



Photograph 8
Rotary open hole drilling rig on position at borehole LFG23R



Photograph 9

Completed landfill gas monitoring borehole LFG43R. Headworks are to be installed following complete site levels.



Photograph 10

Completed landfill gas monitoring boreholes LFG24R-A and LFG24R-B with bolt down flush steel covers



Photograph 10

Completed landfill gas monitoring borehole LFG51. The headworks are to be installed following completed site levels

APPENDIX G

COPIES OF THE BOREHOLE LOGS FROM THE DRILLING CONTRACTOR

Contract Name CwmRHVH YCEIRW

Contract No

Date 21/10/22 - 24/10/22

Sheet 1 of 1 Working Day 10 + 11

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149
E-mail: admin@apex-drilling.com

Client Edenstone

Order No

Drill Crew Dylan T / Steve G.

Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
LFG 18 ft.	000	3900	3900		35T.	CASING 1.5m	Borehole			
Instal	000	300	300		Plain 50mm Well Casing					
	300	3900	3600		BENTONITE END CAP. SLOTTED 50mm Well Screen Gravel Pack, Gas Valve.					
LFG 18	000	300	300		Drill Out 50mm.	140mm.				
24/10	Grout	DLH 18			Cement, Bentonite Mix. - 55GRS					
	END OF SITE									
	Demob	Rig								

QUANTITIES	Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
	Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
	Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
	Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)



Signed by Apex M. Thomas

Signed by Client Date

Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)
Cover Type RAISED / FLUSH
Water Level.....m
Remarks

Contract Name Cumalhydyceirw

Contract No

Date 20/10/22

Sheet 1 of 1 Working Day 9



DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Edenstone

Order No

Drill Crew DYAN T / STEVE G.

Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
LFG	000	300	300		WLG	CASING 3m	Borehole			
50	300	1600	1300		8.5T					
Instal	000	1.50	1.50		Plain 50mm Well Casing					
	1.50	1600	14.50		BENTONITE, 1x GAS VALVE					
					Slotted 50mm Well Screen					
					Gravel Pack, 1x END CAP					
LFG	000	3.50	3.50		WLG					
49	3.50	1700	13.50		8.5T					
Instal	000	1.50	1.50		Plain 50mm Well Casing					
	1.50	1700	15.50		BENTONITE, END CAP					
					Slotted 50mm Well Screen					
					Gravel Pack, GAS VALVE					
					ONLY MOVE TO NEXT POSITION	2 1/2 hrs				

QUANTITIES

Site Moves.....(No) Core Boxes.....(No) Fixed Plant.....
 Bore Moves.....(No) Open Hole.....m Core Liner.....m
 Return Moves.....(No) W. Samples.....m SPT/CPT.....(No) Standing Times.....(hrs)
 Security YES / NO Coring.....m Installation.....m Breakdown.....(hrs)

Diameter.....Ø
 Well Casing.....m
 Well Screen.....m
 Gravel.....m
 Bentonite.....m
 Gas Bung.....(No)
 End Cap.....(No)
 Cover Type RAISED / FLUSH
 Water Level.....m
 Remarks



Signed by Apex

[Signature]

Signed by Client

Date

Blue – Client's Copy Yellow – QS Copy White – Site Copy

Contract Name Cumharbycineu
 Contract No
 Date 19/10/22
 Sheet 1 of 1 Working Day 8

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149
 E-mail: admin@apex-drilling.com

Client Ebenstone
 Order No
 Drill Crew DYLAN T / STEVE G.
 Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
Instal failed 2 Boreholes. EXTRACT 50mm Advise to BACKFILL WITH BENTONITE							Borehole			
LFG 2R	000 5.50	5.50 2200	5.50 16.50		MG. + SG CUT SST.	CASING 6m				
Instal	000 420	420 2200	420 1780		Plain 50mm Well CASING BENTONITE SLOTTER 50mm Well SCREEN GRAVEL PACK 1x END CAP, 1x GAS VALVE					
LFG 49	000 1.20	1.20 1.500	1.20 1380		MG. SST.	CASING 1.5m				
Instal	000 1.50	1.50 1500	1.50 13.50		Plain 50mm Well CASING BENTONITE SLOTTER 50mm Well SCREEN GRAVEL PACK 1x END CAP, 1x GAS VALVE					

QUANTITIES

Site Moves(No) Core Boxes(No) Fixed Plant
 Bore Moves(No) Open Holem Core Linerm
 Return Moves(No) W. Samplesm SPT/CPT(No) Standing Times(hrs)
 Security YES / NO Coringm Installationm Breakdown(hrs)

DiameterØ
 Well Casingm
 Well Screenm
 Gravelm
 Bentonitem
 Gas Bung(No)
 End Cap(No)
 Cover Type RAISED / FLUSH
 Water Levelm
 Remarks



Signed by Apex [Signature]

Signed by Client Date

Contract Name Cwmrhydyceirw
Contract No
Date 18/10/22
Sheet 1 of 1 Working Day 7

APEX
DRILLING
SERVICES
DAILY DRILLING LOG
Tel: 01656 749149
E-mail: admin@apex-drilling.com

Client Edenstone
Order No
Drill Crew DYLAN T / STEVE G.
Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
LFG 48R	1000	2200	1200		SH.		Borehole			
INSTAL	000	400	400		PLAIN 50m Well CASING					
	400	2200	1800		BENTONITE					
					SLOTTED 50m Well					
					SURGEN GRASS PACE					
					1x END CAP, 1x GAS VALVE					
GW03	000	500	500		MG. LG CLAY					
	500	900	400		BROKEN 1ST					
	900	32.50	29.50		1ST					
INSTAL	falcon		2	9mtr						
	CASE TO		9mtr		+ KLEMM B/H. TO DEPTH					

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)
Cover Type RAISED / FLUSH
Water Level.....m
Remarks



Certificate No: 08750A

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by Apex

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by Client Date

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Contract Name CWMRHVDYCEINW

Contract No

Date 17/10/22

Sheet 1 of 1 Working Day 6

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149
E-mail: admin@apex-drilling.com

Client Edenstone

Order No

Drill Crew Dylan T / STEVE G

Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
							Borehole			
LEG 47R	600 2100	2100 3200	1500 1100		MG S&H	CASING 21m				
Instal	000 250	250 3200	250 2950		Plain 50m Well Casing BENTONITE SLOTTED 50m Well SCREEN GRAVEL PACK 1x GAS VALVE, 1x END CAP.					
LEG 48R	000 1.10	1.10 1000	1.10 890		MG S&H	CASING 1.5m				

QUANTITIES

Site Moves.....(No) Casing.....m Core Boxes.....(No) Fixed Plant.....
Bore Moves.....(No) Open Hole.....m Core Liner.....m
Return Moves.....(No) W. Samples.....m SPT/CPT.....(No) Standing Times.....(hrs)
Security YES / NO Coring.....m Installation.....m Breakdown.....(hrs)

Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)

Cover Type RAISED / FLUSH
Water Level.....m

Remarks



Signed by Apex D Thomas

Signed by Client Date

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Sheet 1 of 1 Day 2

APEX
DRILLING
SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Love's Jewels

Order No. _____

Drill Crew BYRON

Rig Type PLS-MMA

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
							Borehole			
	15.00 21.30	21.30 4300	6.30 2170.		M.G. JST.	Casing 21.50 ft.				
Instal	000 2800	2800 4300	2800 1500		Pipe 50m Well Casing. BENTONITE SEAL SLOTTED PIPE WELL SCREEN GRAVEL PACK 1x EMS CAP, 1x GAS VALVE.					
LEG W.R.	000 - 600	600			M.G.					
							Diameter.....			
							Well Casing.....			
							Well Screen			

QUANTITIES

Site Moves.....(No)	Casingm	Core Boxes(No)	Fixed Plant.....
Bore Moves(No)	Open Holem	Core Linerm	
Return Moves(No)	W. Samplesm	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Corinam	Installationm	Breakdown(hrs)

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	m
Remarks.....	



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by Client _____ Date _____

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Contract Name CumRH/DYCnew

Contract No

Date 13/10/12

Sheet 1 of 1 Working Day 4



DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Eckersstone

Order No

Drill Crew DYAN.T / CARL F.

Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
	TRACK TO		5/4		LFG 35m	1 hr.	Borehole			
LFG 35R	000 1250	1250 3200	1250 1970		M.G. SST.	CASING 12.5m WET 2 37m				
Instal	000 400	400 3200	400 2800		Plain 50mm bore casing BENTONITE SEAL SLOTTED 50mm WIRE SCREEN CRAUCH PAIL					
GW08	000	1500	1500		M.G.	CASING 15m				

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)
Cover Type RAISED / FLUSH
Water Level.....m
Remarks.....



Certificate No: 08750A

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Date

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Contract Name CWMRHYDYCEIRW

Contract No /

Date 12/13/21

Sheet 1 of 1 Day 5

Working
Day.....

3

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Eden Stone

Order No.

Drill Crew DRAGON / KALU +

Rig Type AC-119

[illegible]

Diameter	Ø
Well Casing	m
Well Screen	m
Gravel	m
Bentonite	m
Gas Bung	(No)
End Cap	(No)
Cover Type	RAISED / FLUSH
Water Level	m
Remarks	

Site Moves.....(No)
Bore Moves(No)
Return Moves(No)
Security YES / NO

Casing	m
Open Hole	m
W. Samples	m
Coring	1 m

Core Boxes(No)
Core Liner.....m
SPT/CPT.....(No)
Installationm

Fixed Plant.....

.....

Standing Times.....(hrs)

Breakdown.....(hrs)



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by Client

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Contract Name CUMR-HYDRO
 Contract No
 Date 12/10/22
 Sheet 1 of 2 Working Day 3

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DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149
 E-mail: admin@apex-drilling.com

Client Edenstone
 Order No
 Drill Crew DYAN.T / CARL.F.
 Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
	Await	D/H		LOCATION		1hr.	Borehole		
LFG 43	000 400	400 3300	400 2900		MLG + clay SST	CASING & sub.			
INSTAL	000 300	300 3300	300 3000		Plain 50m Well CASING BENTONITE SEAL SLOTTER 50m Well SCREEN GRAVEL PACK 1 x END CAP, 1 x GAS VALVE.				
LFG 27a									
A	000 480	480 500	480 0.20		MLG + Clay SST	CASING SUB.			
INSTAL	000 0.50 480	0.50 480 500	0.50 430 0.20		Plain 50m Well CASING SLOTTER 50m Well SCREEN BENTONITE 1 x END CAP, 1 x GAS VALVE.	BENTONITE CMAA			

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....Ø
 Well Casing.....m
 Well Screen.....m
 Gravel.....m
 Bentonite.....m
 Gas Bung.....(No)
 End Cap.....(No)
 Cover Type RAISED / FLUSH
 Water Level.....m
 Remarks



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Signed by Client Date

Contract Name Cwm Rhvdygerw

Contract No

Date 11/10/22Sheet 1 of 1 Working Day 2

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Solent Stone

Order No

Drill Crew DYLAN T / CARL F.Rig Type KLEMM

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
Instal	000	3.50	3.50		Main 50m Well Casing BENTONITE SEAL. SLOTS 50m Well SCREEN GRAVEL PACK. 1x END CAP, 1x GAS VALVE.		Borehole			
	3.50	32.00	28.50							
	UNABLE TO GET ON NEXT POSITION.					1 1/2 hrs.				
D/H										
LEG	000	4.40	4.40		M/G. CLAY. JST.					
	4.40	33.00	28.60							
Instal	000	3.00	3.00		Main 50m Well Casing BENTONITE SEAL. SLOTS 50m Well SCREEN GRAVEL PACK. 1x END CAP 1x GAS VALVE.					
	3.00	32.50	29.50							
							Diameter			
							Well Casing			
							Well Screen			

QUANTITIES

Site Moves.....(No)
Bore Moves.....(No)
Return Moves.....(No)
Security YES / NOCasing.....m
Open Hole.....m
W. Samples.....m
Coring.....mCore Boxes.....(No)
Core Liner.....m
SPT/CPT.....(No)
Installation.....mFixed Plant.....
Standing Times.....(hrs)
Breakdown.....(hrs)Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)Cover Type RAISED / FLUSH
Water Level.....m

Remarks

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Sheet of Working Day.....

APEX
DRILLING
SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client Eden Stone

Order No

Drill Crew LYNN. T. CALL T.

Rig Type WELLS[illegible]

QUANTITIES

Site Moves.....(No)	Casing.....3160m	Core Boxes.....(No)
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)
Security <u>YES</u> / NO	Coring.....1m	Installation.....m

Fixed Plant.....

Standing Times.....(hrs)

Breakdown.....(hrs)

Diameter	Ø
Well Casing	m
Well Screen	m
Gravel	m
Bentonite	m
Gas Bung	(No)
End Cap	(No)
Cover Type	RAISED / FLUSH
Water Level	m
Remarks	



Signed by Apex *H. Hernandez*

Signed _____
by Client _____ Date _____

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Contract Name

Contract No

Date _____

Sheet

Working
Day.....

6

E-mail: admin@apex-drilling.com

Client

Order No

Drill Crew

Rig Type

Diameter.....	2
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)

Site Moves.....
Bore Moves
Return Moves
Security YES / NO

by Apex

by Client

Date

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Contract Name Swansea - Park View

Contract No

Date Tue 4/10/22

Sheet 1 of 1 Working Day 5



DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client I. G. Edwards

Order No

Drill Crew M. Paine K Richards

Rig Type T44

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
8.00am-9.30am					Waiting for Access to BH'S		Borehole			
9.30am-11.00am					Compressor Being fixed					
Move to BH LFG 48					Reem out BH to 3.00mts 1hr					
Move to BH LFG 44					Unable to Drill BH as Electric + Gas Services only 0.80mts away from BH 1hr					
GW08 Base 3.00					Grout used 60L					
LFG 42 Base 3.00					Grout used 45L					
LFG 35 Base 3.00					Grout used 70L					
LFG 46 Base 3.00					Grout used 65L					
GW03 Base 3.00					Grout used 420L					
4 hours					Grouting					

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	m
Remarks.....	



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Signed by Client Date

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Contract Name Swansea - Para Area

Contract No

Date Mon 3/10/22

Sheet 1 of 1 Working Day 4

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client I G Eden House

Order No

Drill Crew M. Paine M. Meavary N. Davies

Rig Type T44

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
8.00am - 8.30am					Waiting for Access to site		Borehole			
Move to BH LFG 48					SET UP 1hr					
9.30am - 11.30am					Compressor NOT Working					
Reem out LFG 48					TO 3.00mts 1hr					
Set up on GWO8					Reem out TO 3.00mts 1hr					
Waiting for Access to BH'S					LFG 35 + LFG 47 1hr					
Move to BH LFG 47					SETUP Reem out Btl TO 3.00mts 1hr					
Move to BH LFG 35					SETUP Reem out Btl TO 3.00mts 1hr					
4.00pm - 5.00pm					Waiting for Access to Btl'S LFG 46 + LFG 43					

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....Ø

Well Casing.....m

Well Screen.....m

Gravel.....m

Bentonite.....m

Gas Bung.....(No)

End Cap.....(No)

Cover Type RAISED / FLUSH

Water Level.....m

Remarks



Signed by Apex [Signature]

Signed by Client

Date

Contract Name Swansea - PACE GARDEN

Contract No

Date Fri 30/9/22

Sheet 1 of 1 Working Day 3



Client I.G. Edenstone

Order No

Drill Crew M. Paine K Tomlinson K Richards

Rig Type T44

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
LFG 47	Base	17.00			Grout used 125L		Borehole		
GWO 8	Base	26.00			Grout used 125L				
LFG 35	Base	16.00			Grout used 125L				
LFG 46	Base	18.00			Grout used 125L				
LFG 18	Base	9.00			Grout used 75L				
LFG 48	Base	21.10			Grout used 500L				
Set up Rig on BH LFG 2 Reem BH out to 3.00m 1hr									
Set up on GWO 3 Reem out BH to 3.00m 1hr									
6 hours Grouting									
							Diameter		Ø
							Well Casing		m
							Well Screen		m
							Gravel		m
							Bentonite		m
							Gas Bung		(No)
							End Cap		(No)
							Cover Type	RAISED / FLUSH	
							Water Level		m
							Remarks		

QUANTITIES

Site Moves(No) Casingm Core Boxes(No) Fixed Plant

Bore Moves 2 (No) Open Holem Core Linerm

Return Moves(No) W. Samplesm SPT/CPT(No) Standing Times(hrs)

Security YES / NO Coringm Installationm Breakdown(hrs)



Certificate No: 08750A

Signed by Apex M. Paine

Signed by Client Date

Swansea - PTA Arch

Contract No

Thur 29/9/22

_____ of _____

2

Day

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

I.G.

Order No.

M. Paine K. Tomlinson K. Richards

~~144~~

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	m
Remarks.....	

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Swansa - Ace GELAN

Contract No. _____
Date Wed 28/9/22

Sheet of Working Day.....

E-mail: admin@apex-drilling.com

Client I.G.

Order No _____
Drill Crew M. Paine D. Thomas K Richards

Drill Crew M. Kaine D. Thomas K Richards

Rig Type 144

Diameter	Ø
Well Casing	m
Well Screen	m
Gravel	m
Bentonite	m
Gas Bung	(No)
End Cap	(No)
Cover Type	RAISED / FLUSH
Water Level	m
Remarks	

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Contract Name CWMBRHYDYCEIRW QUARRY

Contract No

Date 7-11-22Sheet 1 of 2 Working Day 1**APEX**
DRILLING
SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client MJCA

Order No

Drill Crew T. DAVIES J. BROWNRig Type FRASTE PLG

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
					<u>MOVED TO SITE</u>		Borehole		
					<u>8.00 - 11.00 WAITING FOR BH POSITIONS</u>				
<u>LFG24</u> <u>RA</u>	<u>0.00</u> <u>4.50</u>	<u>4.50</u> <u>5.30</u>	<u>4.50</u> <u>0.80</u>		<u>CLAY + WEATHERED SANDSTONE</u> <u>SANDSTONE</u>				
					<u>INSTALLED SO. PIPE TO 5.30-</u>				
					<u>0.00 - 2.00 PLAIN PIPE</u> <u>2.00 - 5.30 SLOTTED PIPE</u> <u>WITH GRAVEL FILTER + BENTONITE SEAL</u>				
<u>LFG24</u> <u>RB</u>	<u>0.00</u>	<u>2.20</u>	<u>2.20</u>		<u>CLAY + WEATHERED SANDSTONE</u>				
					<u>INSTALLED SO. PIPE TO 2.20-</u>				
					<u>0.00 - 0.50 PLAIN PIPE</u> <u>0.50 - 2.20 SLOTTED PIPE</u> <u>WITH GRAVEL FILTER + BENTONITE SEAL</u>				

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	(hrs)
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Water BOWSER

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	
Remarks.....	

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Contract Name CWMK14YDYCEIKW QUARKY

Contract No

Date 1-11-22

Sheet 2 of 2 Working Day 1

DAILY DRILLING LOG

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client MISCA

Order No

Drill Crew T. JAMES J. BROWN

Rig Type FRASTE PLG

[illegible]

QUANTITIES

Site Moves.....(No)

Bore Moves(No)

Return Moves(No)

Security	YES / NO
----------	----------

Casingm

Open Holem

W. Samplesm

Coring.....m

Core Boxes(No)

Core Liner.....m

SPT/CPT.....(No)

Installationm

Fixed Plant

.....

Standing Times.....(hrs)

Breakdown (hrs)

Diameter Ø

Well Casingm

Well Screenm

Gravelm

Bentonitem

Gas Bung (No)

End Cap (No)

Cover Type RAISED / FLUSH

Water Level..... m

Remarks	
---------	--

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by Client _____ Date _____

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Contract Name

Contract No

Date _____

Sheet

Working
Day.....

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client

Order No

Drill Crew

Rig Type

INSTALLATION DETAILS

Borehole

Diameter..... $\varnothing$

Well Casing.....m

Well Screenm

Gravelm

Bentonitem

Gas Bung(No)

End Cap (No)

Cover Type RAISED / FLUSH

Water Level.....m

Remarks

Site Moves.....(No)

Bore Moves(No)

Return Moves (No)

Security YES / NO

Casingm

Open Hole.....m

W. Samplesm

Coringm

Core Boxes(No)

Core Liner.....m

SPT/CPT.....(No)

Installationm

Fixed Plant.....

Breakdown

Signed

by Client

Date



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Contract Name CWMRH YDYCEIRW QUARRY

Contract No

Date 8-11-22Sheet 2 of 3 Working Day 2

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client MJCA

Order No

Drill Crew T. DAVIES J. BROWNRig Type FRASTE PLG

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
LFG 26 RB	0.00	2.30	2.30		CLAY + WEATHERED SANDSTONE INSTALLED SA PIPE TO 2.30 0.00 - 0.30 PLAIN PIPE 0.30 - 2.30 SLOTTED PIPE WITH GRAVEL FILTER + BENTONITE SEAL		Borehole		
LFG 26 RA	0.00 3.60	3.60 5.40	3.60 1.80		CLAY + WEATHERED SANDSTONE SANDSTONE INSTALLED SA PIPE TO 5.40 0.00 - 1.00 PLAIN PIPE 1.00 - 5.40 SLOTTED PIPE WITH GRAVEL FILTER + BENTONITE SEAL				

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	m
Remarks.....	



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Contract Name

Contract No

Date _____

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Working
Day.....

Day.

DRILLING SERVICES

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client

Order No

Drill Crew

Rig Type

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS			
							Borehole			
					2½HRS CEMENT IN 4 FLUSH COVERS CLEAN UP BH POSITIONS WASH DOWN FOOTPATH ½HR DIG OUT BUND FOR ACCESS TO BH - 23					
LFG 23	0.00	1.40	1.40		CLAY + WEATHERED SANDSTONE					
	1.40	4.10	2.70		WEATHERED SANDSTONE					
	4.10	16.00	11.90		SANDSTONE	ODEX 4.00~				

Site Moves.....(No)
Bore Moves(No)
Return Moves(No)
Security YES / NO

Casing	m
Open Hole	m
W. Samples	m
Coring	m

Core Boxes(No)
Core Liner.....m
SPT/CPT.....(No)
Installation.....m

Fixed Plant.....

.....

Standing Times.....(hrs)

Breakdown.....(hrs)

Diameter	Ø
Well Casing	m
Well Screen	m
Gravel	m
Bentonite	m
Gas Bung	(No)
End Cap	(No)
Cover Type	RAISED / FLUSH
Water Level	m
Remarks	



Signed
by Apex 

Signed _____
by Client _____ Date _____

Blue – Client's Copy Yellow – QS Copy White – Site Copy

Contract Name CWMBRHYDYCEIRW Quarry

Contract No

Date 9-11-22

Sheet 1 of 1 Working Day 3



Client MSCA

Order No

Drill Crew T. DAVIES J. BROWN

Rig Type FRASTE PLG

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
LFG 23	1600	45.00	29.00		SANDSTONE		Borehole		
					INSTALLED 50 PIPE TO 45.00				
					0.00 - 2.50 PLAIN PIPE				
					2.50 - 45.00 SLOTTED PIPE				
					0.00 - 2.50 BENTONITE				
					2.50 - 45.00 GRAVEL				
					CEMENT IN RAISED COVER				
					3.45 - 5.00				
					INSTRUCTED NOT TO MOVE TO NEXT				
					BH- TO LATE IN THE DAY				

QUANTITIES

Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....	Ø
Well Casing.....	m
Well Screen.....	m
Gravel.....	m
Bentonite.....	m
Gas Bung.....	(No)
End Cap.....	(No)
Cover Type	RAISED / FLUSH
Water Level.....	m
Remarks.....	



Signed by Apex T. Davies

Signed by Client Date

Contract Name CWMBHYDYCEIRW QUARRY

Contract No

Date 10-11-22Sheet 1 of 1 Working Day 4

APEX

DRILLING SERVICES

DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client MJCA

Order No

Drill Crew T. DAVIES J. BROWNRig Type FRASTE PLG

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
					DECOMMISSION PREVIOUS BH AS INSTRUCTED		Borehole		
					TAKE RIG + EQUIPMENT OFF BH TAKE DOWN HERAS FENCING + WASH DOWN FOOTPATH 8.00-11.00				
					11.00-11.45 TRACK TO NEXT BH				
					11.45-12.15 MAKING ACCESS TO BH				
?	0.00	6.40	6.40		CLAY GRAVEL + BOULDERS	ODex 10.00-			
	6.40	8.50	2.10		CLAY + GRAVEL	WET 8.00 + 23.00			
	8.50	32.00	23.50		SANDSTONE				
					3.30 - 5.00 INSTRUCTED TO STAND WAITING FOR WATER LEVEL				

QUANTITIES

Site Moves.....(No)
Bore Moves.....(No)
Return Moves.....(No)
Security YES / NOCasing.....m
Open Hole.....m
W. Samples.....m
Coring.....mCore Boxes.....(No)
Core Liner.....m
SPT/CPT.....(No)
Installation.....mFixed Plant.....
Standing Times.....(hrs)
Breakdown.....(hrs)Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)
Cover Type RAISED / FLUSH
Water Level.....m
RemarksSigned
by ApexSigned
by Client

Date

Blue - Client's Copy Yellow - OS Copy White - Site Copy

Contract Name CWMRH/DYCEIRW Quarry

Contract No

Date 11-11-22

Sheet 1 of 1 Working Day 5



DAILY DRILLING LOG

Tel: 01656 749149

E-mail: admin@apex-drilling.com

Client MJCA

Order No

Drill Crew T. DAVIES J. BROWN

Rig Type FRASTE PLG

Bore Hole	Top Depth	Base Depth	Thickness	Recovery	Strata Description	Standing Time — Reason	INSTALLATION DETAILS		
<u>P</u>					<u>WATER LEVEL 8.00</u>		Borehole		
					<u>INSTALLED 50 PIPE TO 31.50</u>				
					<u>0.00 - 22.00 PLAIN P.I.P.E</u>				
					<u>22.00 - 31.50 SLOTTED P.I.P.E</u>				
					<u>0.00 - 22.00 BENTONITE</u>				
					<u>22.00 - 31.50 GRAVEL</u>				
					<u>31.50 - 32.00 BENTONITE</u>				
					<u>SITE COMPLETE</u>				
					<u>⊛ SUPPLY ADDITIONAL 10 (NO) x 1 MTS LENGTHS OF PIPEWORK AS INSTRUCTED.</u>				

QUANTITIES	Site Moves.....(No)	Casing.....m	Core Boxes.....(No)	Fixed Plant.....
	Bore Moves.....(No)	Open Hole.....m	Core Liner.....m	
	Return Moves.....(No)	W. Samples.....m	SPT/CPT.....(No)	Standing Times.....(hrs)
	Security YES / NO	Coring.....m	Installation.....m	Breakdown.....(hrs)

Diameter.....Ø
Well Casing.....m
Well Screen.....m
Gravel.....m
Bentonite.....m
Gas Bung.....(No)
End Cap.....(No)
Cover Type RAISED / FLUSH
Water Level.....m
Remarks



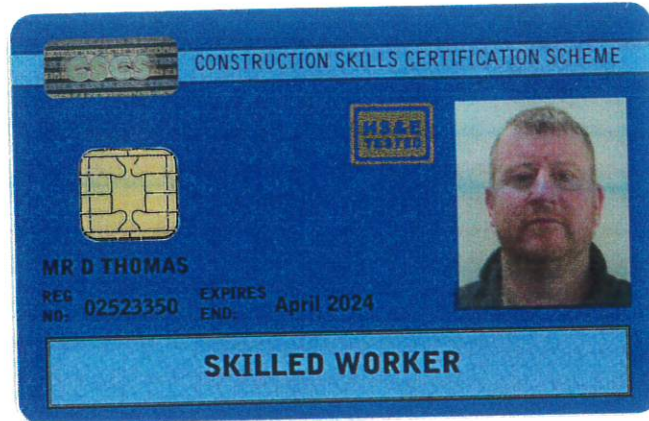
Signed by Apex [Signature]

Signed by Client Date

Blue – Client's Copy Yellow – QS Copy White – Site Copy

APPENDIX H

COPIES OF THE DRILLING CONTRACTOR ACCREDITATION DETAILS



Tel: 0344 994 4777 www.cscs.uk.com
Registration No: 02523350

Land Drilling - Lead Driller Level 2 NVQ Diploma

Cards issued by CSCS do not confirm the holder's right to work in the UK.
The cardholder has demonstrated knowledge of Health and Safety awareness as laid out
in the CSCS Scheme Requirements.

Construction Awards Alliance is an alliance between Cskills Awards and City & Guilds

cskills
awards

City & Guilds

This
Cskills Awards
Level 2 NVQ Diploma

in

Land Drilling Operations (Construction) - Land Driller (QCF)

(500/9495/6)

is awarded to

Dylan Llewellyn Thomas

A.B.

Adrian Beckingham
Head of Cskills Awards

Chris Jones

Chris Jones
Director General
The City & Guilds of London Institute

Regulated by

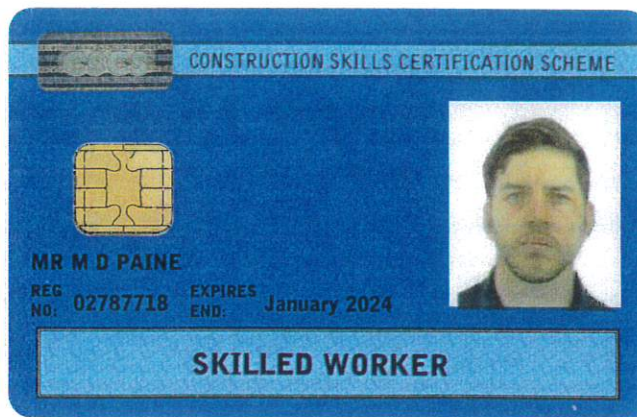
Ofqual

For more information see <http://register.ofequal.gov.uk>

Issued Date: 10-06-2013

1647974

Registration No: 2523350



Tel: 0344 994 4777 www.cscs.uk.com
Registration No: 02787718

Land Drilling - Lead Driller Ground Invest Cable Percussion
Land Drilling - Lead Driller Level 2 NVQ Diploma
Land Driller Support Operative NVQ Level 2

Cards issued by CSCS do not confirm the holder's right to work in the UK.
The cardholder has demonstrated knowledge of Health and Safety awareness as laid out
in the CSCS Scheme Requirements.

This is to certify that

Matthew Paine

has achieved the following Qualification

**NOCN_Cskills Awards Level 2 NVQ Diploma
in Land Drilling Operations (Construction) -
Land Driller**



Qualification Approval No: 601/4994/2
ULN: 3250921237
Award Date: 14/08/2018
Certificate No: 46665501



Graham Hasting-Evans

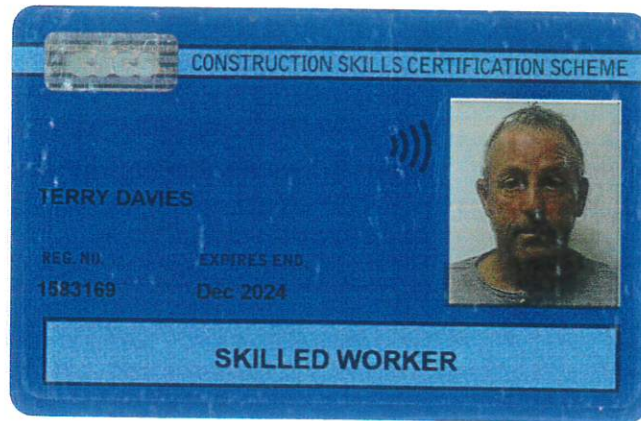
Graham Hasting-Evans
Group Managing Director
NOCN Group



Regulated by

Ofqual

For more information see <http://registers.ofqual.gov.uk>



Construction Awards Alliance is an alliance
between Cskills Awards and City & Guilds

This

Cskills Awards Level 2

National Vocational Qualification

in

Land Drilling - Land Driller

(100/5909/X)

is awarded to

Terry Davies



Adrian Beckingham
Head of Cskills Awards



Chris Jones
Director General
The City & Guilds of London Institute

Ofqual
.....

APPENDIX I

**CURRICULUM VITAE OF MJCA CQA PROJECT MANAGER AND CURRICULUM VITAE
OF MJCA CQA INSPECTORS**

NAME: K EATON
POSITION: Technical Director

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:

MSc, DIC, Engineering Geology - Imperial College, London
BSc Honours in Geology - University of Manchester
Fellow of the Geological Society (FGS) and Chartered Geologist (C.Geol)
Specialist in Land Condition (SiLC) – Registered SiLC, SiLC Assessor, SiLC Champion (2010-2017). Registered Qualified Person (QP 005) under the CL:AIRE Code of Practice.
Drafting panel member for the revision of British Standard BS:10175+A2 Investigation of potentially contaminated sites.

PROFESSIONAL PROFILE:

Over 30 years of experience in environmental consultancy across a range of disciplines with extensive project management skills in the assessment of the risks and liabilities associated with the management of contaminated land. Experience extends across a broad range of sectors, including public bodies and agencies, petro-chemical, energy, manufacturing, transport, waste facilities, property, legal and financial institutions.

Project experience includes permitting and compliance, mergers and acquisitions and site closures assessing the financial environmental liabilities to business; designing and implementing remediation strategies, environmental due diligence for transactions and refinancing. Provision of advice with multi-disciplinary technical and legal teams. Highly experienced in negotiating with regulatory authorities to deliver the safe and successful project closure.

Experienced in the assessment of contaminated land under Part 2A legislation, planning applications and providing technical support for legal matters arising from pollution incidents together with providing technical evidence and opinion in arbitration and litigation cases.

A registered Specialist in Land Condition (SiLC) and previous member of the Professional and Technical Panel (PTP), and a SiLC Assessor for the exam process. Panel member for the preparation of the revisions to the SiLC National Brownfield Skills Framework (NBSF) and responsible for creating the SiLC NBSF assessment tool ([link](#)), which forms part of a National Quality Mark Scheme.

PROJECT EXPERIENCE

Responsible for the safe and effective management of site investigations applying a range of techniques associated with site development, divestiture, acquisition, pollution incidents and permitting, identifying risk/liabilities and contingencies, including feasibility studies, remediation design, providing cost liability assessment and risk management strategies for dealing with a range of stakeholders including presentation at public meetings and providing the 'non-technical' communication of data. Extensive experience in the evaluation and characterisation of contaminated land and groundwater environments, geotechnical assessment, assessing contaminant behaviour and the characterisation of product plumes (mass balance, phase distribution, isotope studies), assessing risk and impacts to the environment, human health and ecology. Project examples include:

- Oil Sector – a range of projects for major oil companies (Texaco, Shell, Mobil, Fina, BP, ConocoPhillips/Phillips66, Oil Pipeline Agency/CLH-PS/Exolum, Kuwait Oil Company)

including petrol service stations, fuel depots, fuel terminals and refinery, assessing environmental liability and risks for site divestiture, development and remediation contingency.

- Pharmaceutical and Chemical Sector - including assessment of significant spill incidents and impacts from historical activities for example characterisation of chlorinated solvents and fuel hydrocarbons plumes; risk assessment, implementing remediation actions.
- Manufacturing and industrial facilities – due diligence, development and pollution incidents
- Energy Sector - including baseline pre-closure and permit application investigations to assess ground conditions and environmental liabilities.
- Transport including rail – Investigation of pollution incidents, risk assessment, design and implementation of the remediation works.
- Property sector – site assessments and remediation for development, contaminated land liability assessments for divestiture and acquisitions, assessing financing, risk transfer and insurance options.

Designed and implemented a range of remediation projects, feasibility studies and strategies following key guidance such as LCRM for remediation option appraisal, cost benefit analysis and decision support tools. Highly experienced in negotiating risk based remediation strategies with the regulatory authorities and other stakeholders leading to successful project closure.

Experienced with various groundwater and human health risk assessment models including contaminant fate models. Has undertaken quantitative risk assessments to derive remedial targets for projects associated with site redevelopment, for example: a former gas works - residential housing; chlorinated and aromatic solvent contamination – commercial and residential developments; spills/emergency response – fuels, chlorinated solvents, ethanol; fuel hydrocarbons - numerous sites (service stations, industrial and manufacturing).

Provided technical support for arbitration and litigation matters and produced opinion of evidence and duty to the Court. Examples include:

- Fuel loss incidents adjacent to residential properties involving an assessment of ground conditions, an assessment of the likelihood of impact and risk to residents and associated cost liabilities arising from the fuel loss. Preparation of technical documents
- Review of a pollution incident at an industrial facility to assess the magnitude of contamination and the issue of contributory negligence. Preparation of an expert opinion report for submission to the court as an independent expert.
- Assessment of the impacts associated with a fuel leak from a major fuel distribution pipeline and preparing a technical report including assessing ecological damage for the preparation of a document for submission in support of mitigating circumstances against prosecution by the Environment Agency.
- Provision of technical documentation and expert opinion for arbitration associated with dilapidations claim regarding the disposal of waste by a tenant on the client's land including an assessment of cost liabilities associated with the need for remedial works.
- A review of third party technical documentation and advice provided to the developer of an industrial site which was subsequently identified during the development to have asbestos containing materials in the made ground. The preparation of an expert opinion report to assist in determining if there was a prima facie case of negligence and breach of contract regarding information and advice provided to the developer.
- Provision of an expert report presenting opinion on matters regarding the performance of the firm's duties to prepare an Environmental Assessment Report carried out as part of a site acquisition due diligence process and to assist in determining if there was a prima facie case of negligence

NAME: Ethan Brown

NATIONALITY: British

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:

BSc (Hons) Geology – University of Liverpool
Fellow of the Geological Society

CAREER SUMMARY:

January 2022 - Present: Consultant Hydrogeologist with MJCA

Mr Brown undertakes geological, hydrogeological and hydrological assessments for waste management facilities, contaminated land sites and mineral extraction sites associated with environmental permitting and environmental planning projects. His experience includes the preparation of desk studies, the supervision of site investigations and the preparation of site investigation reports. Mr Brown has experience in the use of geospatial software tools such as QGIS and gINT.

Mr Brown is experienced in a range of field testing methods and sampling techniques for groundwater, surface water, leachate and landfill gas monitoring. Mr Brown is experienced in the preparation of health and safety plans for site works and making sure that health and safety procedures are followed during site works including for works carried out under Construction (Design and Management) Regulations 2015. Mr Brown is experienced in the preparation of borehole Construction Quality Assurance (CQA) Plans and has worked as a CQA inspector on boreholes drilled using cable percussion, rotary open hole and rotary coring techniques at a range of quarry and landfill sites. These have included landfill infrastructure groundwater and landfill gas monitoring boreholes at active landfill sites and in-waste leachate monitoring boreholes at closed landfill sites. Mr Brown has supervised the excavation of trial pits including through waste and natural strata at inert landfill sites. Mr Brown is experienced in recording ground conditions in accordance with BS5930:2015+A1:2020 “Code of practice for ground investigations”.

NAME: Thomas William Coates

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:

MSc Engineering Geology – University of Portsmouth
BSc (Hons) Geology – University of Portsmouth
Fellow of the Geological Society

CAREER SUMMARY:

August 2020 - Present: Consultant Engineering Geologist with MJCA

Mr Coates undertakes Construction Quality Assurance (CQA) works for landfill sites including the preparation of CQA Plans and Specifications, CQA supervision of construction works and the preparation of CQA Verification Reports. He has provided CQA supervision on a number of landfill construction projects, including the construction of mineral and composite liners and caps, together with leachate and surface water infrastructure.

October 2019 – September 2020: Geotechnical Engineer with Applied Geology

Mr Coates supervised window sampling, cable percussive, and rotary drilling, trial pitting and ground investigation operations. Work included logging of samples in accordance with BS5930, completion of technical reports, method statements, risk assessments and organisation and evaluations of in-situ data collection and external soil testing data.

February 2019 – August 2019: Geotechnical Engineer with Optera Ltd

Mr Coates supervised property site investigations which involved carrying out drain surveys and foundation trial pits, logging of samples in accordance with BS5930, completion of factual reports, and evaluations of external root sample data. Mr Coates also supervised and operated a window sampling rig along with organising the rigs maintenance and transportation.

June 2016 – February 2019: Graduate Engineer with Geotechnics Ltd

Mr Coates supervised window sampling, cable percussive, and rotary drilling, trial pitting and ground investigation operations. Work included logging of samples in accordance with BS5930, completion of technical reports, method statements, and risk assessments. Mr Coates organised the collection of and evaluated in-situ data and external soil testing data as well as carrying out internal soil testing.