

Flintshire County Council –
Waste Management Services

Brookhill Landfill Site

Retro-Drilling of Leachate Wells

Construction Quality Assurance Report

November 2013

Flintshire County Council – Waste Management Services Ltd.

Brookhill Landfill Site

Retro-Drilling of Leachate Wells

Construction Quality Assurance Report

Contents

Section Number

- 1) Introduction
- 2) Location and Description of Site
- 3) Brief Description and Timing of the Works
- 4) Construction Quality Assurance
- 5) Problems Encountered
- 6) Conclusions

Appendices

1. CQA Inspectors Daily Reports
2. CQA Inspectors Drilling Logs
3. Photographic Log

4996



Flintshire County Council Waste Management Services
Ltd.

Brookhill Landfill Site

Retro-Drilling of Leachate Wells

Construction Quality Assurance Report

November 2013

Prepared for
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Waste Management Services
Mold Road
Alltami
Flintshire
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Prepared by
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Document Review

Version No.	Date of Review	Prepared By	Reviewed By	Approved By
0	06/11/2013	T. Ashton	R. Furniss	T. Ashton

1.0 INTRODUCTION

- 1.1 Egniol Environmental Ltd. (Egniol) of Tre Felin, Bangor, Gwynedd have been appointed by Flintshire County Council Waste Management Services Ltd. (FCC) as Construction Quality Assurance (CQA) Consultants for the Retro-Drilling of Leachate wells at Brookhill Landfill Site.
- 1.2 The appointment required the professional services of Egniol for the provision of a CQA Inspector. The CQA Inspector was required to monitor the progress and report upon completion of the works, with regard to quality assurance and compliance with the approved CQA Plan for the works (*Caulmert Ltd - Brookhill Closed Landfill Site, Flintshire County Council Waste Management Services, Retro-drilling of Leachate Monitoring Points, Construction Quality Assurance Plan.*)
- 1.3 In accordance with this appointment, Egniol have produced this report which covers the Retro-Drilling of Leachate wells at Brookhill Landfill Site.

2.0 LOCATION AND DESCRIPTION OF SITE

2.1 Brookhill Closed Landfill Site is located approximately 1.5 km north of Buckley, Flintshire, North Wales at NGR SJ 278 656. The site is accessed via the Pinfold Industrial Estate, Pinfold Lane, which is located off the A494 Mold to Ewloe Road.

2.2 Site Address:

Brookhill Landfill Site,
Pinfold Industrial Estate.
Pinfold Lane,
Buckley,
Flintshire.

3.0 BRIEF DESCRIPTION AND TIMING OF WORKS

3.1 Description of Works

In accordance with the approved COA Plan (*Caulmert Ltd - Brookhill Closed Landfill Site, Flintshire County Council Waste Management Services, Retro-drilling of Leachate Monitoring Points, Construction Quality Assurance Plan.*), 4no. leachate extraction wells were to be re-drilled and installed into areas of capped waste at Brookhill Landfill Site by way of Retro-Drilling.

The Works commenced on the 30th September 2013 and were completed on the 11th October 2013.

The proposed locations were supplied by the Employer and Main Contractor prior to the Works commencing. These locations were surveyed and marked with the erection of a wooden peg. Each peg was labeled with its own identification number.

3.2 Well Information

Table 1 – Well Location and Drill Depth Information

Installed Well ID	Ground Level (m AOD)	Base Level (MAOD)	Proposed Drill Depth (m)	Actual Drill Depth (m)	Approximate Stone Volume Installed (m ³)
R1b	149.9689	117.07	32.90	32.90	3.02
R2b	154.3463	112.20	42.15	41.97	4.04
R4b	150.1937	112.46	37.73	37.69	3.56
R6b	154.6975	120.25	34.45	34.32	3.18

Note: The stone volumes listed are approximate values for the volumes installed to each well.

4.0 CONSTRUCTION QUALITY ASSURANCE

4.1 Leachate Well Specification

Drilling operations consisted of initially drilling the boreholes using a 450mm diameter barrel auger in order to advance the drilling operations quickly. Upon reaching 500mm above the target depth, the barrel auger was switched out with a bailer and drilling advanced in 100mm increments. This was undertaken in order maintain control of the drilling works and prevent the borehole from inadvertently being drilled through the base of the cell. After each 100mm increment, the arisings were carefully examined by the CQA Inspector for any signs of potential drainage gravel or signs of engineered clay liner.

Borehole R1b was drilled to the target depth with no drainage stone or engineered clay being encountered. Boreholes R2b, R4b and R6b showed signs of drainage gravel being encountered prior to the proposed target depth. Upon consultation between the CQA Inspector and an FCC representative, the boreholes were installed at the level reached.

Details of the drilling works, arisings and installation of materials can be found in the CQA Inspectors drilling logs in Appendix 2 of this Report.

All pipework lengths were connected by screwing lengths of pipework together to the required length for each well as stated in the CQA Plan within the borehole for each well.

The pipework installed consisted of 244mm diameter steel pipe with a solid upper section and a lower 6.0m perforated section. The upper section of solid pipework had a minimum of 1.0m above ground level. The base of the perforated pipework was fitted with a solid end cap. The solid pipework was fitted with a rubber air-tight end cap to prior to installation of the well headworks and connection to the leachate extraction system.

The annulus between the HDPE pipe and waste was carefully backfilled with 20-40mm non-calcareous stone to a minimum depth of 6.0m below ground level. Care was taken when installing the stone in order to prevent bridging. The stone was also agitated with the use of metal rods. The remaining annulus was sealed using a hydrated bentonite seal to ground level.

All pipework was measured by the CQA Inspector to verify the length of solid and perforated pipe prior to being installed within the borehole.

4.2 Leachate Well Details

Well Reference R1b

The well was drilled to a target depth of 32.90m. Upon reaching a depth of 32.4mBGL, the barrel auger was changed to a bailer and drilling continued in 100mm increments to the target depth.

Steel casing was installed to 32.90mBGL with the lower 6.0m portion of the casing consisting of perforated pipework. The remaining steel casing consisted of solid pipework with 1.0m protruding above ground level.

20-40mm clean gravel was carefully installed into the annulus of the borehole between the casing and the sides of the borehole. The gravel was installed to 6.0m below ground level.

The remaining 6.0m to ground level was backfilled with hydrated bentonite to form a gas tight seal around the well. Prior to the installation of the hydrated bentonite, dry bentonite was installed on top of the gravel pack to prevent the hydrated bentonite from entering the gravel surround.

Upon completion, the installed pipework was capped off with a temporary rubber end cap which was clamped into position.

Well Reference R2b

The well was drilled to a target depth of 42.14m. Upon reaching a depth of 41.6mBGL, the barrel auger was changed to a bailer and drilling continued in 100mm increments to the target depth.

At 41.97mBGL evidence of a gravel drainage blanked was encountered. Drilling operations were suspended. The COA Inspector liaised with an FCC representative and the COA Inspector was instructed by the Client to install the steel casing to this depth.

Steel casing was installed to 41.97mBGL with the lower 6.0m portion of the casing consisting of perforated pipework. The remaining steel casing consisted of solid pipework with 1.0m protruding above ground level.

20-40mm clean gravel was carefully installed into the annulus of the borehole between the casing and the sides of the borehole. The gravel was installed to 6.0m below ground level.

The remaining 6.0m to ground level was backfilled with hydrated bentonite to form a gas tight seal around the well. Prior to the installation of the hydrated bentonite, dry bentonite was installed on top of the gravel pack to prevent the hydrated bentonite from entering the gravel surround.

Upon completion, the installed pipework was capped off with a temporary rubber end cap which was clamped into position.

Well Reference R6b

The well was drilled to a target depth of 34.45m. Upon reaching a depth of 33.95mBGL, the barrel auger was changed to a bailer and drilling continued in 100mm increments to the target depth.

At 34.32mBGL evidence of a gravel drainage blanked was encountered. Drilling operations were suspended. The CQA Inspector liaised with an FCC representative and the CQA Inspector was instructed by the Client to install the steel casing to this depth.

Steel casing was installed to 34.32mBGL with the lower 6.0m portion of the casing consisting of perforated pipework. The remaining steel casing consisted of solid pipework with 1.0m protruding above ground level.

20-40mm clean gravel was carefully installed into the annulus of the borehole between the casing and the sides of the borehole. The gravel was installed to 6.0m below ground level.

The remaining 6.0m to ground level was backfilled with hydrated bentonite to form a gas tight seal around the well. Prior to the installation of the hydrated bentonite, dry bentonite was installed on top of the gravel pack to prevent the hydrated bentonite from entering the gravel surround.

Upon completion, the installed pipework was capped off with a temporary rubber end cap which was clamped into position.

Well Reference R4b

The well was drilled to a target depth of 37.73m. Upon reaching a depth of 37.23mBGL, the barrel auger was changed to a bailer and drilling continued in 100mm increments to the target depth.

At 37.69mBGL evidence of a gravel drainage blanked was encountered. Drilling operations were suspended. The CQA Inspector liaised with an FCC representative and the CQA Inspector was instructed by the Client to install the steel casing to this depth.

Steel casing was installed to 37.69mBGL with the lower 6.0m portion of the casing consisting of perforated pipework. The remaining steel casing consisted of solid pipework with 1.0m protruding above ground level.

20-40mm clean gravel was carefully installed into the annulus of the borehole between the casing and the sides of the borehole. The gravel was installed to 6.0m below ground level.

The remaining 6.0m to ground level was backfilled with hydrated bentonite to form a gas tight seal around the well. Prior to the installation of the hydrated bentonite, dry bentonite was installed on top of the gravel pack to prevent the hydrated bentonite from entering the gravel surround.

Upon completion, the installed pipework was capped off with a temporary rubber end cap which was clamped into position.

4.3 Contract Particulars

During the drilling of the boreholes, the verticality of the borehole was regularly checked at approximately 5.0m intervals.

All arisings from the boreholes were disposed of in skips to be disposed of by the Client.

When moving the drilling rig between locations, it was ensured that the route had been walked to establish the most suitable access route and to check for services or penetrations along the way. The area of drilling was also cleared of any obstruction that could prevent the drilling rig from carrying out the Works.

Any boreholes that were not completed by the end of the day were sealed with bentonite overnight to prevent gas emissions.

5.0 PROBLEMS ENCOUNTERED

5.1 Some minor repair/maintenance works were carried out on the rig, resulting in one day on no drilling.

5.2 No further problems were encountered during these Works.

6.0 CONCLUSIONS

- 6.1 From the observations and measurements made by the CQA Inspector, to the best of our knowledge, 4no. Leachate extraction wells were installed at Brookhill Landfill Site to a satisfactory standard and in accordance with the previously approved CQA Plan.

Flintshire County Council – Waste Management Services Ltd.

Brookhill Landfill Site

Retro Drilling of Leachate Wells

Construction Quality Assurance Report

CQA Inspectors Daily Reports

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	30.09.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Dry</td> </tr> <tr> <td>a.m</td> <td>Drizzle/overcast</td> </tr> <tr> <td>p.m</td> <td>Light rain/cloudy</td> </tr> </table>	Previous Night	Dry	a.m	Drizzle/overcast	p.m	Light rain/cloudy
Previous Night	Dry						
a.m	Drizzle/overcast						
p.m	Light rain/cloudy						
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:	0700 – 1800 hours 0730 hours 0730 hours 1740 1740						
Contractors Plant / Resources Utilised	Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 1 No 450mm barrel 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water						
Contract Works Undertaken	Contractor mobilized plants and equipment to drilling area Client representative showed Contractor and CQA Inspector all the proposed four (4) drill positions. Positions were pegged and Well ID labelled on each peg Client representative provided currently surveyed drill depths and incremental start depths for each well. Contractor performed rig, plant and equipment checks. Slope and ground conditions were checked for rig safety Magpie moved rig to first location (R1b) and commenced drilling BH safely drilled to 16m by end of day. BH secured with bentonite seal.						
Testing Undertaken	Tool measurements of barrel assemble and rod lengths Inspected rig stability and slope Inspected operatives certificates Inspection and logging of arisings during drilling						
Meetings/ Correspondence	Continuous on-site drilling progress meeting between Drilling crew and CQA Inspector						
Health and Safety	Use of PPE Consequences of over drill						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

	All parties demonstrated effective communication and coordination, cooperation No HSE issue recorded
Visitors to Site	Client representative – 3x
Comments	Satisfactory quality of drilling operation and drilling attitude of crew. Regular Supervision Client representative and presence on site commendable

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	01.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Dry</td> </tr> <tr> <td>a.m</td> <td>Dry/hazy</td> </tr> <tr> <td>p.m</td> <td>Dry/cloudy</td> </tr> </table>	Previous Night	Dry	a.m	Dry/hazy	p.m	Dry/cloudy
Previous Night	Dry						
a.m	Dry/hazy						
p.m	Dry/cloudy						
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:	0700 – 1800 hours 0730 hours 0730 hours 1740 1740						
Contractors Plant / Resources Utilised	Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water						
Contract Works Undertaken	<p>Contractor drilled R1b to 32.40m bgl. Changed 450mm barrel to bailer and commenced 100mm incremental drilling.</p> <p>Thorough inspection of arising from incremental drilling showed evidence of gravel drainage blanket at TD, 32.90m bgl. Following liaison with client casing was installed and well completed as per CQA specification.</p> <p>Rig moved to R2b, set up over proper position and spudded hole. BH safely drilled to 6m by end of day. BH secured with bentonite seal overnight.</p> <p>Additional drilling materials delivered to site.</p> <p>Magpie continued to store arising from drilling in a dedicated waste skip position at a safe distance from the rig</p>						
Testing Undertaken	<p>Measured and recorded rig reference datum for R1b.</p> <p>Calculation of drill depths while drilling. As built records of casing installation and well completion.</p> <p>All casing joints numbered and photographs taken</p> <p>Inspection and logging of arisings during normal and incremental drilling</p>						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Meetings/ Correspondence	Continuous on-site drilling progress meeting between Drilling crew and CQA Inspector
Health and Safety	<p>Reviewed incremental drilling procedure with Drilling crew</p> <p>Contractor performed rig, plant and equipment checks before commencing day's work. Slope and ground conditions were checked for rig safety</p> <p>Proper Manual handling demonstrated</p> <p>All parties continue to demonstrated effective communication and coordination, cooperation</p> <p>No HSE issue recorded</p>
Visitors to Site	Client representative – 3x
Comments	<p>Satisfactory quality of drilling operation and drilling attitude of crew.</p> <p>Regular Supervision Client representative and presence on site commendable</p>

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	02.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Rain</td> </tr> <tr> <td>a.m</td> <td>Foggy/light rain</td> </tr> <tr> <td>p.m</td> <td>Dry/foggy</td> </tr> </table>	Previous Night	Rain	a.m	Foggy/light rain	p.m	Dry/foggy
Previous Night	Rain						
a.m	Foggy/light rain						
p.m	Dry/foggy						
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:	0700 – 1800 hours 0730 hours 0730 hours 1740 1740						
Contractors Plant / Resources Utilised	Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water						
Contract Works Undertaken	Contractor advanced R2b from 6m to incremental depth of 41.67 mgbf by end of day. BH secured with bentonite seal overnight. Rig experienced grinding noise from the Drill head. Magpie office was contacted and rig was instructed to continue unless noise develops further. Magpie support team arrived PM and rig was down for some servicing, after which drilling continued.						
Testing Undertaken	Calculation of depths while drilling Inspection and logging of arisings during drilling						
Meetings/ Correspondence	Continuous on-site drilling progress meeting between Drilling crew and CQA Inspector Need for placement of bentonite dry seal before installation of hydrated bentonite seal						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Health and Safety	Contractor performed plat and equipment checks. Rig condition and stability confirmed ok prior to starting drilling Safe working at heights demonstrated All parties continue to demonstrated effective communication and coordination, cooperation No HSE issue recorded
Visitors to Site	Client representative – 3x
Comments	Satisfactory quality of drilling operation and drilling attitude of crew. Regular Supervision Client representative and presence on site commendable

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	03.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Rain</td> </tr> <tr> <td>a.m</td> <td>Dry/Hazy</td> </tr> <tr> <td>p.m</td> <td>Dry/foggy</td> </tr> </table>	Previous Night	Rain	a.m	Dry/Hazy	p.m	Dry/foggy
Previous Night	Rain						
a.m	Dry/Hazy						
p.m	Dry/foggy						
Site Hours:	0700 – 1800 hours						
Contractors Arrival Time:	0730 hours						
CQA Arrival Time:	0730 hours						
Contractors Departure Time:	1740						
CQA Departure Time:	1740						
Contractors Plant / Resources Utilised	<p>Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water</p>						
Contract Works Undertaken	<p>Contractor performed daily pre-work checks on rig, plants and equipment before commencing work.</p> <p>Magpie continued drilling work on leachate well R2b. Changed 450mm barrel to bailer and commenced 100mm incremental drilling to 41.97mbgl.</p> <p>Evidence of gravel drainage blanket encountered at 41.97m bgl. Following client instruction casing was installed at this depth. Well completed as per CQA specification.</p> <p>Rig safely tracked off R2b to position for planned maintenance works.</p> <p>Waste skip exchange – TG Services removed a full waste skip and delivered one empty skip</p> <p>Magpie continued to store arising from drilling in a dedicated waste skip position at a safe distance from the rig</p>						
Testing Undertaken	<p>Measured the length of bailer assemble used for incremental drilling</p> <p>Recorded rig reference datum for R2b.</p> <p>Calculation of drill depths while drilling and computed gravel volume for annulus packing</p>						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
 Project: Retro Drilling of Leachate Wells

	<p>Measured height of installed gravel pack and volume used. Ensured dry bentonite seal is placed on top of gravel pack before installing hydrated bentonite seal. About 40 bags of bentonite used.</p> <p>Inspection and logging of arisings during normal and incremental drilling</p>
Meetings/ Correspondence	<p>Continuous on-site drilling progress meeting between Drilling crew and CQA Inspector</p> <p>Reviewed incremental drilling procedure with Drilling crew. The consequences and emergency response action for over drill highlighted</p>
Health and Safety	<p>Contractor performed rig, plant and equipment checks before commencing work. Slope and ground conditions were checked for rig safety</p> <p>Proper Manual handling demonstrated</p> <p>All parties continue to demonstrated effective communication and coordination, cooperation</p> <p>No HSE issue recorded</p>
Visitors to Site	<p>Client representative – 3x</p>
Comments	<p>Satisfactory quality of drilling operation and drilling attitude of crew.</p> <p>Regular Supervision Client representative and presence on site commendable</p>

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
 Project: Retro Drilling of Leachate Wells

Date	04.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Dry</td> </tr> <tr> <td>a.m</td> <td>Dry/overcast</td> </tr> <tr> <td>p.m</td> <td>Dry/cloudy</td> </tr> </table>	Previous Night	Dry	a.m	Dry/overcast	p.m	Dry/cloudy
Previous Night	Dry						
a.m	Dry/overcast						
p.m	Dry/cloudy						
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:	0700 – 1800 hours 0730 hours 0730 hours 1740 1740						
Contractors Plant / Resources Utilised	Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water						
Contract Works Undertaken	No drilling, Contractor carried out rig maintenance						
Testing Undertaken	None						
Meetings/ Correspondence	None						
Health and Safety	None						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Visitors to Site	Magpie Support team
Comments	None

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	07.10.13
Weather	Dry
Previous Night	Dry/clear
a.m	Dry/clear
p.m	Dry/clear
Site Hours:	0700 – 1800 hours
Contractors Arrival Time:	0900 hours
CQA Arrival Time:	0830 hours
Contractors Departure Time:	1740
CQA Departure Time:	1740
Contractors Plant / Resources Utilised	<p>Magpie Drilling</p> <p>1 No Comacchio MC3000</p> <p>1 No TA6 Dump truck</p> <p>1 No Telehandler</p> <p>2 Waste skips</p> <p>244mm plain steel casings (various lengths)</p> <p>244mm slotted steel casings (6m)</p> <p>406mm temporary steel casings</p> <p>1 No 450mm barrel</p> <p>1 No Flight auger</p> <p>1 No leader driller and two mates</p> <p>20-40mm gravels</p> <p>1 No Mercedes Mini bus</p> <p>1 No Diesel tank</p> <p>Pallets of 20Kg bentonite granules</p> <p>1 No Decontamination unit</p> <p>Fire extinguishers and gas monitors</p> <p>1 No 1000L IBC filled with water</p>
Contract Works Undertaken	<p>Rig, plants and equipment check were found ok and diesel added</p> <p>Additional delivery to site included a bailer refurbished to improve flap opening.</p> <p>Magpie moved Rig over to the proper position pegged for R6b leachate well. Well was drilled using 450mm barrel to the planned incremental depth of 33.95mBGL by the end of day. BH secured with a seal of bentonite.</p> <p>The contractor continue to haul and tip waste arising from drilling into a dedicated skip</p>
Testing Undertaken	<p>Rig reference datum to GL taken</p> <p>CQA Inspector continue to inspect and log waste arising from drilling</p> <p>Continuous measurement of depth while drilling</p>
Meetings/ Correspondence	Need for thorough inspection of every step of incremental drill arising as gravel drainage blanket may be encountered before the anticipated depth to ensure the base barrier is not breached
Health and Safety	Rig, plants and equipment inspection before use

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Visitors to Site	Client representative and delivery personnel
Comments	Drilling activities progressed in quality and safe manner

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date		08.10.13
Weather	Previous Night	No rain
	a.m	Dry/clear
	p.m	Dry/clear
Site Hours:		0700 – 1800 hours
Contractors Arrival Time:		07300 hours
CQA Arrival Time:		0730 hours
Contractors Departure Time:		1750
CQA Departure Time:		1750
Contractors Plant / Resources Utilised		<p>Magpie Drilling</p> <p>1 No Comacchio MC3000</p> <p>1 No TA6 Dump truck</p> <p>1 No Telehandler</p> <p>2 Waste skips</p> <p>244mm plain steel casings (various lengths)</p> <p>244mm slotted steel casings (6m)</p> <p>406mm temporary steel casings</p> <p>1 No 450mm barrel</p> <p>1 No Flight auger</p> <p>1 No leader driller and two mates</p> <p>20-40mm gravels</p> <p>1 No Mercedes Mini bus</p> <p>1 No Diesel tank</p> <p>Pallets of 20Kg bentonite granules</p> <p>1 No Decontamination unit</p> <p>Fire extinguishers and gas monitors</p> <p>1 No 1000L IBC filled with water</p>
Contract Works Undertaken		<p>Rig, plants and equipment check were found ok</p> <p>Magpie commenced incremental drilling on R6b using a bailer. Convincing evidence of gravel drainage blanket was hit at 34.32mbgl. This was witnessed by EA and client representatives on site.</p> <p>Following client instruction, BH was cased at 34.32 mbgl and completed as per specification.</p> <p>Contractor moved rig to R4b, positioned over the proper position and spudded well. BH was advanced to 13mbgl and hole secured with bentonite seal overnight.</p> <p>Sub-contractor did a waste skip exchange</p> <p>The contractor continue to haul and tip waste arising from drilling into a dedicated skip</p>
Testing Undertaken		<p>Continuous measurement of depth while drilling incremental zone</p> <p>Thorough examination of every 100mm incremental drill arising</p> <p>CQA Inspector Inspected permanent casing threads and found them ok</p>

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

	Documented as-built permanent casing installation. Ensured all 244m steel casing joints are properly screwed and took photographic record of all casing joints.
Meetings/ Correspondence	Maintain good housekeeping on drill site and area around completed leachate wells
Health and Safety	Rig, plants and equipment inspection before use
Visitors to Site	Client representative, EA representative and delivery personnel
Comments	Drilling activities progressed in quality and safe manner EA representative was satisfied at the drilling and CQA processes being followed.

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	09.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>Dry</td> </tr> <tr> <td>a.m</td> <td>Spells of rain/overcast</td> </tr> <tr> <td>p.m</td> <td>Dry/clear</td> </tr> </table>	Previous Night	Dry	a.m	Spells of rain/overcast	p.m	Dry/clear
Previous Night	Dry						
a.m	Spells of rain/overcast						
p.m	Dry/clear						
Site Hours:	0700 – 1800 hours						
Contractors Arrival Time:	07300 hours						
CQA Arrival Time:	0730 hours						
Contractors Departure Time:	1750						
CQA Departure Time:	1750						
Contractors Plant / Resources Utilised	<p>Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water</p>						
Contract Works Undertaken	<p>Daily rig, plants and equipment check were found ok</p> <p>Magpie advanced R4b BH to incremental start depth of 37.23 mgbl. BH secured with bentonite seal overnight.</p> <p>The contractor continue to haul and tip waste arising from drilling into a dedicated skip located on site</p> <p>Contractor sorted out permanent steel casings and fuelled machines diesel machines</p>						
Testing Undertaken	<p>Continuous measurement of depth while drilling through waste mass.</p> <p>CQA Inspector logged and recorded waste mass arising from drilling</p>						
Meetings/ Correspondence	None						
Health and Safety	Demonstrated safe use of telehandler and dumper truck on slopes						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Visitors to Site	Client representative
Comments	Drilling tasks were performed in quality and safe manner Client happy with progress

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	10.10.13						
Weather	<table border="1"> <tr> <td>Previous Night</td> <td>No rain</td> </tr> <tr> <td>a.m</td> <td>Dry/clear</td> </tr> <tr> <td>p.m</td> <td>Dry/clear</td> </tr> </table>	Previous Night	No rain	a.m	Dry/clear	p.m	Dry/clear
Previous Night	No rain						
a.m	Dry/clear						
p.m	Dry/clear						
Site Hours:	0700 – 1800 hours						
Contractors Arrival Time:	07300 hours						
CQA Arrival Time:	0730 hours						
Contractors Departure Time:	1750						
CQA Departure Time:	1750						
Contractors Plant / Resources Utilised	<p>Magpie Drilling 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water</p>						
Contract Works Undertaken	<p>Rig, plants and equipment check were found ok</p> <p>Magpie encountered minor problem from bailer release spring damage, this was repaired and drilling continued. Incremental drilling of R4b commenced and was completed to a depth of 37.69. Convincing evidence of gravel drainage blanket was hit at this depth and steel casings installed following client's approval.</p> <p>Magpie installed gravel pack in the annulus followed by bentonite seal. Casing stick-up was capped with a HDPE flexi-cap.</p> <p>Contractor continue to haul and tip waste arising from drilling into a dedicated skip</p> <p>Rig moved away from R4b location to demob position</p>						
Testing Undertaken	<p>Continuous measurement of depth while drilling incremental zone</p> <p>CQA and drilling crew examined every 100mm incremental drill arising for evidence of gravel drainage blanket</p> <p>CQA Inspector recorded as-built installation of permanent 244mm steel casing. Photographic records of all joint were taken.</p> <p>Well ID inscribed on casing stick-up</p>						

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Meetings/ Correspondence	Leaving site in clean and safe condition was discussed
Health and Safety	None
Visitors to Site	Client representative
Comments	Drilling activities progressed in quality and safe manner

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Date	11.10.13
Weather	No rain Dry/clear Dry/clear
Previous Night a.m p.m	
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:	0700 – 1800 hours 07300 hours 0730 hours 1230 1230
Contractors Plant / Resources Utilised	Magpie Drilling plants and equipment listed below were all removed from site 1 No Comacchio MC3000 1 No TA6 Dump truck 1 No Telehandler 2 Waste skips 244mm plain steel casings (various lengths) 244mm slotted steel casings (6m) 406mm temporary steel casings 1 No 450mm barrel 1 No Flight auger 1 No leader driller and two mates 20-40mm gravels 1 No Mercedes Mini bus 1 No Diesel tank Pallets of 20Kg bentonite granules 1 No Decontamination unit Fire extinguishers and gas monitors 1 No 1000L IBC filled with water
Contract Works Undertaken	Magpie cleaned up all drilling locations and general work site area affected Rig, plants and equipment were prepared for demob
Testing Undertaken	None Collation and commenced drilling reports
Meetings/ Correspondence	Discussed project completion and reports with CQA Project Manager
Health and Safety	None

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)



CQA Inspector's Daily Report

Site Name: Brookhill Landfill Site
Project: Retro Drilling of Leachate Wells

Visitors to Site	Client representative, Magpie demob personnel
Comments	Drilling activities progressed in quality and safe manner No HSE incident recorded during the entire drilling works and the crew were exceptionally professional with good attitude to the drilling works requirements

For Egniol Environmental Ltd: Maduka Agbeze-Onuma (CEnv.)

**ENGINEERING
ENVIRONMENTAL
HEALTH & SAFETY**

egniol

Flintshire County Council – Waste Management Services Ltd.

Brookhill Landfill Site

Retro Drilling of Leachate Wells

Construction Quality Assurance Report

CQA Inspectors Drilling Logs

DRILLING REPORT					Well Number: R1b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flnshire County Council					Site: Brookhill Landfill Site	
Date: 30.09.13 - 01.10.13		Installation Details			Target Depth (m): 32.90	
Drilling Rig type: Comacchio MC3000		Solid AGL (m): 1.00		Actual Depth (m): 32.90		
Extruder Dimensions:		Solid BGL (m): 26.90		Dip Level (mBGL): 32.90		
Auger Dimensions: 450mm		Perforated BGL (m): 6.00		Dip Level (mBGL) after 24hrs: 32.90		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 26.90				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
	+1.0	1	+1			
0.0	0.0	0	0		+0.5	
0.0	1.0	1	0	Restoration soil		GL
1.0	2.0	1	1	Restoration soil	0.5	Soil
2.0	3.0	1	2	Restoration soil		Joint No 6
3.0	4.0	1	3	Dry consolidated waste	1.5	Soil
4.0	5.0	1	4	Dry consolidated waste	2.5	Joint No 5
5.0	6.0	1	5	Dry consolidated waste	3.5	
6.0	7.0	1	6	Dry consolidated waste	4.5	
7.0	8.0	1	7	Dry consolidated waste	5.5	
8.0	9.0	1	8	Dry consolidated waste	6.5	
9.0	10.0	1	9	Dry consolidated waste	7.5	
10.0	11.0	1	10	Dry consolidated waste	8.5	Joint No 4
11.0	12.0	1	11	Dry consolidated waste with concrete rubbles	9.5	
12.0	13.0	1	12	Dry consolidated waste with concrete rubbles	10.5	Dry waste
13.0	14.0	1	13	Dry consolidated waste with concrete rubbles	11.5	Dry waste
14.0	15.0	1	14	Dry consolidated waste	12.5	
15.0	16.0	1	15	Dry consolidated waste	13.5	
16.0	17.0	1	16	Dry consolidated waste	14.5	Joint No 3
17.0	18.0	1	17	Dry consolidated waste	15.5	
18.0	19.0	1	18	Dry consolidated waste	16.5	
19.0	20.0	1	19	Dry consolidated waste	17.5	
20.0	21.0	1	20	Dry consolidated waste	18.5	
21.0	22.0	1	21	Damp consolidated waste	19.5	Joint No 2
22.0	23.0	1	22	Damp consolidated waste	20.5	
23.0	24.0	1	23	Damp consolidated waste	21.5	
24.0	25.0	1	24	Damp consolidated waste	22.5	Damp waste
25.0	26.0	1	25	Damp consolidated waste	23.5	Damp waste
26.0	27.0	1	26	Damp consolidated waste	24.5	
27.0	28.0	1	27	Damp consolidated waste	25.5	
28.0	29.0	1	28	Damp consolidated waste	26.5	Joint No 1
29.0	30.0	1	29	Wet consolidated waste	27.5	
30.0	31.0	1	30	Wet consolidated waste	28.5	
31.0	32↓	1	31	Wet consolidated waste	29.5	Wet waste
				Wet consolidated waste	30.5	Wet waste
				Wet consolidated waste	31.5	

DRILLING REPORT					Well Number: R1b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flintshire Conty Council					Site: Brookhill Landfill Site	
Date: 30.09.13 - 01.10.13		Installation Details			Target Depth (m): 32.90	
Drilling Rig type: Ciomacchio MC3000		Solid AGL (m): 1.00		Actual Depth (m): 32.90		
Extruder Dimensions:		Solid BGL (m): 26.90		Dip Level (mBGL): 32.90		
Auger Dimensions: 450mm		Perforated BGL (m): 6.00		Dip Level (mBGL) after 24hrs:		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 26.90				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
32.0	33.0	1	32	Wet consolidated waste		
				Wet consolidated waste	32.5	
33.0	34.0	1	33	Wet consolidated waste		
					33.5	
34.0	35.0	1	34			
					34.5	
35.0	36.0	1	35			
					35.5	
36.0	37.0	1	36			
					36.5	
37.0	38.0	1	37			
					37.5	
38.0	39.0	1	38			
					38.5	
39.0	40.0	1	39			
					39.5	
40.0	41.0	1	40			
					40.5	
41.0	42.0	1	41			
					41.5	
42.0	43.0	1	42			
					42.5	
43.0	44.0	1	43			
					43.5	
44.0	45.0	1	44			
					44.5	
45.0	46.0	1	45			
					45.5	
46.0	47.0	1	46			
					46.5	
47.0	48.0	1	47			
					47.5	
48.0	49.0	1	48			
					48.5	
49.0	50.0	1	49			
					49.5	
50.0	51.0	1	50			
					50.5	
51.0	52.0	1	51			
					51.5	
52.0	53.0	1	52			
					52.5	
53.0	54.0	1	53			
					53.5	
54.0	55.0	1	54			
					54.5	
55.0	56.0	1	55			
					55.5	
56.0	57.0	1	56			
					56.5	
57.0	58.0	1	57			
					57.5	
58.0	59.0	1	58			
					58.5	
59.0	60.0	1	59			
					59.5	
60.0	61.0	1	60			
					60.5	
61.0	62.0	1	61			
					61.5	
62.0	63.0	1	62			
					62.5	
63.0	64.0	1	63			
					63.5	
64.0	65.0	1	64			
					64.5	

DRILLING REPORT					Well Number: R2b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flinshire County Council					Site: Brookhill Landfill Site	
Date: 01.10.13 - 03.10.13		Installation Details			Target Depth (m): 42.14	
Drilling Rig type: Comacchio MC3000		Solid AGL (m): 1.20		Actual Depth (m): 41.97		
Extruder Dimensions:		Solid BGL (m): 35.81		Dip Level (mBGL): 41.97		
Auger Dimensions: 450mm		Perforated BGL (m): 6.16		Dip Level (mBGL) after 24hrs: 41.97		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 35.97				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
	+1.0	1	+1		+0.5	
0.0	0.0	0	0			GL
0.0	1.0	1	0	Restoration soil		GL
1.0	2.0	1	1	Restoration soil	0.5	Soil
2.0	3.0	1	2	Dry consolidated waste	1.5	Joint No 8 @ 0.313mbgl
3.0	4.0	1	3	Dry consolidated waste	2.5	Joint No 7 @ 1.323mbgl
4.0	5.0	1	4	Dry consolidated waste	3.5	
5.0	6.0	1	5	Dry consolidated waste	4.5	
6.0	7.0	1	6	Dry consolidated waste	5.5	
7.0	8.0	1	7	Dry consolidated waste	6.5	Joint No 6 @ 7.263mbgl
8.0	9.0	1	8	Dry consolidated waste	7.5	
9.0	10.0	1	9	Dry consolidated waste	8.5	
10.0	11.0	1	10	Dry consolidated waste	9.5	
11.0	12.0	1	11	Dry consolidated waste	10.5	Dry waste
12.0	13.0	1	12	Dry consolidated waste	11.5	Dry waste
13.0	14.0	1	13	Dry consolidated waste	12.5	Joint No 5 @ 13.233 mbgl
14.0	15.0	1	14	Dry consolidated waste	13.5	
15.0	16.0	1	15	Dry consolidated waste	14.5	
16.0	17.0	1	16	Dry consolidated waste	15.5	
17.0	18.0	1	17	Dry consolidated waste	16.5	
18.0	19.0	1	18	Dry consolidated waste	17.5	
19.0	20.0	1	19	Dry consolidated waste	18.5	
20.0	21.0	1	20	Dry consolidated waste	19.5	Joint No 4 @ 19.323 mbgl
21.0	22.0	1	21	Dry consolidated waste	20.5	
22.0	23.0	1	22	Dry consolidated waste	21.5	
23.0	24.0	1	23	Dry consolidated waste	22.5	
24.0	25.0	1	24	Damp consolidated waste	23.5	Damp waste
25.0	26.0	1	25	Damp consolidated waste	24.5	Damp waste
26.0	27.0	1	26	Damp consolidated waste	25.5	Joint No 3 @ 25.333 mbgl
27.0	28.0	1	27	Damp consolidated waste	26.5	
28.0	29.0	1	28	Damp consolidated waste	27.5	
29.0	30.0	1	29	Wet consolidated waste	28.5	
30.0	31.0	1	30	Wet consolidated waste	29.5	Wet waste
31.0	32↓	1	31	Wet consolidated waste	30.5	Wet waste
				Wet consolidated waste	31.5	

DRILLING REPORT					Well Number: R2b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flintshire Conty Council					Site: Brookhill Landfill Site	
Date: 01.10.13 - 03.10.13		Installation Details			Target Depth (m): 42.14	
Drilling Rig type: Ciomacchio MC3000		Solid AGL (m): 1.20		Actual Depth (m): 41.97		
Extruder Dimensions:		Solid BGL (m): 35.81		Dip Level (mBGL):		
Auger Dimensions: 450mm		Perforated BGL (m): 6.16		Dip Level (mBGL) after 24hrs:		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 35.97				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
32.0	33.0	1	32	Wet consolidated waste		<p>Joint No 2 @ 31.813 mbgl</p> <p>Joint No 1 @ 35.813 mbgl</p> <p>Wet Waste</p>
				Wet consolidated waste	32.5	
33.0	34.0	1	33	Wet consolidated waste	33.5	
				Wet consolidated waste	34.5	
34.0	35.0	1	34	Wet consolidated waste	35.5	
				Wet consolidated waste	36.5	
35.0	36.0	1	35	Wet consolidated waste	37.5	
				Wet consolidated waste	38.5	
36.0	37.0	1	36	Wet consolidated waste	39.5	
				Wet consolidated waste	40.5	
37.0	38.0	1	37	Wet consolidated waste	41.5	
				Wet consolidated waste	42.5	
38.0	39.0	1	38	Wet consolidated waste	43.5	
				Wet consolidated waste	44.5	
39.0	40.0	1	39	Wet consolidated waste	45.5	
				Wet consolidated waste	46.5	
40.0	41.0	1	40	Wet consolidated waste	47.5	
				Wet consolidated waste	48.5	
41.0	42.0	1	41	Wet consolidated waste	49.5	
				Wet consolidated waste	50.5	
42.0	43.0	1	42	Wet consolidated waste	51.5	
				Wet consolidated waste	52.5	
43.0	44.0	1	43	Wet consolidated waste	53.5	
				Wet consolidated waste	54.5	
44.0	45.0	1	44	Wet consolidated waste	55.5	
				Wet consolidated waste	56.5	
45.0	46.0	1	45	Wet consolidated waste	57.5	
				Wet consolidated waste	58.5	
46.0	47.0	1	46	Wet consolidated waste	59.5	
				Wet consolidated waste	60.5	
47.0	48.0	1	47	Wet consolidated waste	61.5	
				Wet consolidated waste	62.5	
48.0	49.0	1	48	Wet consolidated waste	63.5	
				Wet consolidated waste	64.5	
49.0	50.0	1	49	Wet consolidated waste		
				Wet consolidated waste		
50.0	51.0	1	50	Wet consolidated waste		
				Wet consolidated waste		
51.0	52.0	1	51	Wet consolidated waste		
				Wet consolidated waste		
52.0	53.0	1	52	Wet consolidated waste		
				Wet consolidated waste		
53.0	54.0	1	53	Wet consolidated waste		
				Wet consolidated waste		
54.0	55.0	1	54	Wet consolidated waste		
				Wet consolidated waste		
55.0	56.0	1	55	Wet consolidated waste		
				Wet consolidated waste		
56.0	57.0	1	56	Wet consolidated waste		
				Wet consolidated waste		
57.0	58.0	1	57	Wet consolidated waste		
				Wet consolidated waste		
58.0	59.0	1	58	Wet consolidated waste		
				Wet consolidated waste		
59.0	60.0	1	59	Wet consolidated waste		
				Wet consolidated waste		
60.0	61.0	1	60	Wet consolidated waste		
				Wet consolidated waste		
61.0	62.0	1	61	Wet consolidated waste		
				Wet consolidated waste		
62.0	63.0	1	62	Wet consolidated waste		
				Wet consolidated waste		
63.0	64.0	1	63	Wet consolidated waste		
				Wet consolidated waste		
64.0	65.0	1	64	Wet consolidated waste		
				Wet consolidated waste		

DRILLING REPORT					Well Number: R4b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flnshire County Council					Site: Brookhill Landfill Site	
Date: 08.10.13 - 10.10.13		Installation Details			Target Depth (m): 37.73	
Drilling Rig type: Comacchio MC3000		Solid AGL (m): 0.60		Actual Depth (m): 37.69		
Extruder Dimensions:		Solid BGL (m): 31.72		Dip Level (mBGL): 37.69		
Auger Dimensions: 450mm		Perforated BGL (m): 5.97		Dip Level (mBGL) after 24hrs: 37.69		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 31.69				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
	+1.0	1	+1		+0.5	
0.0	0.0	0	0			GL
0.0	1.0	1	1	Restoration soil	0.5	Soil
1.0	2.0	1	2	Dry consolidated waste	1.5	Joint No 14 @ 1.190mbgl
2.0	3.0	1	3	Dry consolidated waste	2.5	Joint No 13 @ 2.690mbgl
3.0	4.0	1	4	Dry consolidated waste	3.5	Joint No 12 @ 3.655mbgl
4.0	5.0	1	5	Dry consolidated waste	4.5	Joint No 11 @ 4.655mbgl
5.0	6.0	1	6	Dry consolidated waste	5.5	Joint No 10 @ 5.645mbgl
6.0	7.0	1	7	Dry consolidated waste	6.5	Joint No 9 @ 6.665mbgl
7.0	8.0	1	8	Dry consolidated waste	7.5	Joint No 8 @ 7.665mbgl
8.0	9.0	1	9	Dry consolidated waste	8.5	
9.0	10.0	1	10	Dry consolidated waste	9.5	Dry waste
10.0	11.0	1	11	Dry consolidated waste	10.5	Joint No 7 @ 10.670mbgl
11.0	12.0	1	12	Dry consolidated waste	11.5	
12.0	13.0	1	13	Dry consolidated waste	12.5	
13.0	14.0	1	14	Dry consolidated waste	13.5	Joint No 6 @ 13.670mbgl
14.0	15.0	1	15	Dry consolidated waste	14.5	
15.0	16.0	1	16	Dry consolidated waste	15.5	
16.0	17.0	1	17	Wet consolidated waste	16.5	Wet waste
17.0	18.0	1	18	Wet consolidated waste	17.5	Joint No 5 @ 16.675mbgl
18.0	19.0	1	19	Damp consolidated waste	18.5	Wet waste
19.0	20.0	1	20	Damp consolidated waste	19.5	Joint No 4 @ 19.680mbgl
20.0	21.0	1	21	Damp consolidated waste	20.5	
21.0	22.0	1	22	Damp consolidated waste	21.5	
22.0	23.0	1	23	Damp consolidated waste	22.5	Joint No 3 @ 22.695mbgl
23.0	24.0	1	24	Damp consolidated waste	23.5	
24.0	25.0	1	25	Damp consolidated waste	24.5	Damp waste
25.0	26.0	1	26	Damp consolidated waste	25.5	Joint No 2 @ 25.705mbgl
26.0	27.0	1	27	Damp consolidated waste	26.5	
27.0	28.0	1	28	Damp consolidated waste	27.5	
28.0	29.0	1	29	Wet consolidated waste	28.5	
29.0	30.0	1	30	Wet consolidated waste	29.5	
30.0	31.0	1	31	Wet consolidated waste	30.5	
31.0	32↓	1	31	Wet consolidated waste	31.5	Joint No 1 @ 31.715mbgl

DRILLING REPORT					Well Number: R4b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flintshire Conty Council					Site: Brookhill Landfill Site	
Date: 08.10.13 - 10.10.13		Installation Details			Target Depth (m): 37.73	
Drilling Rig type: Ciomacchio MC3000		Solid AGL (m): 1.00		Actual Depth (m): 37.69		
Extruder Dimensions:		Solid BGL (m): 31.72		Dip Level (mBGL): 37.69		
Auger Dimensions: 450mm		Perforated BGL (m): 5.97		Dip Level (mBGL) after 24hrs: 37.69		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 31.69				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
32.0	33.0	1	32	Wet consolidated waste		
				Wet consolidated waste	32.5	
33.0	34.0	1	33	Wet consolidated waste		
				Wet consolidated waste	33.5	
34.0	35.0	1	34	Wet consolidated waste		
				Wet consolidated waste	34.5	Damp waste
35.0	36.0	1	35	Wet consolidated waste		
				Wet consolidated waste	35.5	
36.0	37.0	1	36	Wet consolidated waste		
				Wet consolidated waste	36.5	
37.0	38.0	1	37	Wet consolidated waste		
				Wet consolidated waste	37.5	Wet waste
38.0	39.0	1	38	Wet consolidated waste		
					38.5	
39.0	40.0	1	39			
					39.5	
40.0	41.0	1	40			
					40.5	
41.0	42.0	1	41			
					41.5	
42.0	43.0	1	42			
					42.5	
43.0	44.0	1	43			
					43.5	
44.0	45.0	1	44			
					44.5	
45.0	46.0	1	45			
					45.5	
46.0	47.0	1	46			
					46.5	
47.0	48.0	1	47			
					47.5	
48.0	49.0	1	48			
					48.5	
49.0	50.0	1	49			
					49.5	
50.0	51.0	1	50			
					50.5	
51.0	52.0	1	51			
					51.5	
52.0	53.0	1	52			
					52.5	
53.0	54.0	1	53			
					53.5	
54.0	55.0	1	54			
					54.5	
55.0	56.0	1	55			
					55.5	
56.0	57.0	1	56			
					56.5	
57.0	58.0	1	57			
					57.5	
58.0	59.0	1	58			
					58.5	
59.0	60.0	1	59			
					59.5	
60.0	61.0	1	60			
					60.5	
61.0	62.0	1	61			
					61.5	
62.0	63.0	1	62			
					62.5	
63.0	64.0	1	63			
					63.5	
64.0	65.0	1	64			
					64.5	

DRILLING REPORT					Well Number: R6b	
COA INSPECTOR:- Maduka Agbeze-Onuma					Site: Brookhill Landfill Site	
Date: 07.10.13 - 08.10.13			Installation Details		Target Depth (m): 34.45	
Drilling Rig type: Comacchio MC3000			Solid AGL (m): 1.10		Actual Depth (m): 34.32	
Extruder Dimensions:			Solid BGL (m): 28.02		Dip Level (mBGL): 34.32	
Auger Dimensions: 450mm			Perforated BGL (m): 6.30		Dip Level (mBGL) after 24hrs: 34.32	
Casing Dimensions: 244mm			Bentonite (m): 6.00		HDPE Casing Dimensions:	
			Gravel (m): 28.32			
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
	+1.0	1	+1		+0.5	
0.0	0.0	0	0			GL
0.0	1.0	1	0	Top soil	0.5	
1.0	2.0	1	1	Brownish-black sandy CLAY	1.5	Soil
2.0	3.0	1	2	Brownish-black sandy CLAY	2.5	
3.0	4.0	1	3	Brownish-black sandy CLAY	3.5	
4.0	5.0	1	4	Brownish-black sandy CLAY	4.5	
5.0	6.0	1	5	Dry consolidated waste	5.5	
6.0	7.0	1	6	Dry consolidated waste	6.5	
7.0	8.0	1	7	Dry consolidated waste	7.5	
8.0	9.0	1	8	Dry consolidated waste	8.5	
9.0	10.0	1	9	Dry consolidated waste	9.5	
10.0	11.0	1	10	Dry consolidated waste	10.5	
11.0	12.0	1	11	Dry consolidated waste	11.5	
12.0	13.0	1	12	Dry consolidated waste	12.5	
13.0	14.0	1	13	Dry consolidated waste	13.5	
14.0	15.0	1	14	Dry consolidated waste	14.5	
15.0	16.0	1	15	Dry consolidated waste	15.5	
16.0	17.0	1	16	Dry consolidated waste	16.5	
17.0	18.0	1	17	Dry consolidated waste	17.5	
18.0	19.0	1	18	Dry consolidated waste	18.5	
19.0	20.0	1	19	Dry consolidated waste	19.5	
20.0	21.0	1	20	Dry consolidated waste	20.5	
21.0	22.0	1	21	Wet consolidated waste	21.5	
22.0	23.0	1	22	Wet consolidated waste	22.5	
23.0	24.0	1	23	Wet consolidated waste	23.5	
24.0	25.0	1	24	Damp consolidate waste	24.5	
25.0	26.0	1	25	Damp consolidate waste	25.5	
26.0	27.0	1	26	Damp consolidate waste	26.5	
27.0	28.0	1	27	Damp consolidate waste	27.5	
28.0	29.0	1	28	Damp consolidate waste	28.5	
29.0	30.0	1	29	Wet consolidated waste	29.5	
30.0	31.0	1	30	Wet consolidated waste	30.5	
31.0	32↓	1	31	Wet consolidated waste	31.5	

DRILLING REPORT					Well Number: R6b	
COA INSPECTOR:- Maduka Agbeze-Onuma						
CLIENT: Flintshire Conty Council					Site: Brookhill Landfill Site	
Date: 07.10.13 - 08.10.13		Installation Details			Target Depth (m): 34.45	
Drilling Rig type: Ciomacchio MC3000		Solid AGL (m): 1.10		Actual Depth (m): 34.32		
Extruder Dimensions:		Solid BGL (m): 28.02		Dip Level (mBGL): 34.32		
Auger Dimensions: 450mm		Perforated BGL (m): 6.30		Dip Level (mBGL) after 24hrs: 34.32		
Casing Dimensions: 244mm		Bentonite (m): 6.00		HDPE Casing Dimensions:		
		Gravel (m): 28.32				
Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION		STRATA	
			m		m	
32.0	33.0	1	32	Damp consolidated waste		
				Damp consolidated waste	32.5	
33.0	34.0	1	33	Damp consolidated waste		Wet waste
				Damp consolidated waste	33.5	
34.0	35.0	1	34	Damp consolidated waste		
				Damp consolidated waste	34.5	
35.0	36.0	1	35			
					35.5	
36.0	37.0	1	36			
					36.5	
37.0	38.0	1	37			
					37.5	
38.0	39.0	1	38			
					38.5	
39.0	40.0	1	39			
					39.5	
40.0	41.0	1	40			
					40.5	
41.0	42.0	1	41			
					41.5	
42.0	43.0	1	42			
					42.5	
43.0	44.0	1	43			
					43.5	
44.0	45.0	1	44			
					44.5	
45.0	46.0	1	45			
					45.5	
46.0	47.0	1	46			
					46.5	
47.0	48.0	1	47			
					47.5	
48.0	49.0	1	48			
					48.5	
49.0	50.0	1	49			
					49.5	
50.0	51.0	1	50			
					50.5	
51.0	52.0	1	51			
					51.5	
52.0	53.0	1	52			
					52.5	
53.0	54.0	1	53			
					53.5	
54.0	55.0	1	54			
					54.5	
55.0	56.0	1	55			
					55.5	
56.0	57.0	1	56			
					56.5	
57.0	58.0	1	57			
					57.5	
58.0	59.0	1	58			
					58.5	
59.0	60.0	1	59			
					59.5	
60.0	61.0	1	60			
					60.5	
61.0	62.0	1	61			
					61.5	
62.0	63.0	1	62			
					62.5	
63.0	64.0	1	63			
					63.5	
64.0	65.0	1	64			
					64.5	

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Flintshire County Council – Waste Management Services Ltd.

Brookhill Landfill Site

Retro Drilling of Leachate Wells

Construction Quality Assurance Report

Photographic Log

PHOTO LOG

Plate No.	Description
1	MC3000 Drilling Rig.
2	Drilling in progress.
3	Discharging waste into dumper.
4	Installing casing and jointing.
5	Installing stone and measuring depth.
6	Installed hydrated bentonite.
7	Completed well showing bentonite and end-cap.
8	Evidence of drainage stone layer.

Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6



Plate 7



Plate 8



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