

CQA VALIDATION REPORT

PHASE 4A CAPPING WORKS

Bryn Pica Landfill Site

Report Number 1384r2v1d1014

Commissioned by

Amgen Cymru

Bryn Pica

Llwydcoed

Aberdare

CF44 0BX

Prepared by

Geotechnology Ltd

Ty Coed

5 Cefn yr Allt

Aberdulais

SA10 8HE

Table of Contents

1	INTRODUCTION	1
1.1	Site Location	1
1.2	Site Description	2
1.3	Project Organisation	2
1.4	Construction Contract	2
1.5	CQA Plan and Specification	2
2	SCOPE OF THE WORKS	3
2.1	Overview	3
2.2	Communications with NRW	3
2.3	Delays and Timescales	3
2.4	Materials Handling	3
2.5	Preparatory Earthworks	4
2.6	Leachate Seepage Collection Trench	4
2.7	Leachate Seepage Drainage Layer	4
2.8	Geomembrane	4
2.9	Geotextile Protection Layer	4
2.10	Soil Under-Drainage Layer	4
2.11	Restoration Soils	5
3	SITE PREPARATION	6
3.1	Materials	6
3.2	Placement and Acceptance	6
4	LEACHATE BREAKOUT COLLECTION SYSTEM	7
4.1	Materials	7
4.2	Placement and Acceptance	7
5	LEACHATE BREAKOUT DRAINAGE LAYER	8
5.1	Materials	8
5.2	Manufacture and Testing	8
5.3	Placement	9
6	GEOMEMBRANE LINING	10
6.1	Materials	10
6.2	Manufacture and Testing	10
6.3	Placement	11
6.3.1	Geomembrane Panel Deployment	11
6.4	Trial Seams	11
6.5	Fusion Welding	11
6.6	Extrusion Welding	11
6.7	LLDPE Walkover Inspection	12
6.8	LLDPE Repairs	12
6.9	Seam Testing	12
6.9.1	Air Pressure Testing	12
6.9.2	Vacuum Box Testing	12
6.9.3	Destructive Testing	12

7	SOIL UNDER-DRAINAGE LAYER	14
7.1	Materials	14
7.2	Manufacture and Testing	14
7.3	Placement	14
8	RESTORATION SOILS	15
8.1	Materials	15
8.2	Placement	16
9	PROBLEMS DURING CONSTRUCTION	17
10	CERTIFICATION	18
10.1	Earthworks	18
10.2	Leachate Seepage Drainage Layer	18
10.3	Geomembrane	18
10.4	Soil Under-Drainage Layer	18
10.5	Restoration Soils	18
10.6	Verification	18
10.7	Signatures	18

List of Tables

Table 3-1	Comparison of Regulating Layer Properties with Specification	6
Table 4-1	Comparison of Leachate Drainage Stone Properties with Specification	7
Table 5-1	Comparison of Conformance Test Results with Specification	8
Table 6-1	Comparison of Textured LLDPE Conformance Test Results with Specification	10
Table 6-2	Destructive Laboratory Test Results	13
Table 8-1	Comparison of Blinding Layer Properties with Specification	15
Table 8-2	Comparison of Restoration Soil Leachate Properties with Specification	15

List of Figures

Figure 1	Extent of Capping Scheme
Figure 2	Regulating layer and Leachate Drainage Pipework
Figure 3	Regulating Layer and Leachate Drainage Stone
Figure 4	HDPE Panel Layout
Figure 5	Thickness of Restoration Soils

List of Appendices

Appendix 1	Photographic Record and Daily Records
Appendix 2	Communication with NRW
Appendix 3	Regulating Layer Assessment and Test Results
Appendix 4	Delivery Records
Appendix 5	Leachate Drainage Stone Test Results
Appendix 6	Pozidrain Manufacturers QC Data
Appendix 7	Pozidrain Conformance Test Results
Appendix 8	LLDPE Manufacturers QC data
Appendix 9	LLDPE Conformance Test Results
Appendix 10	Lining Contractor Certificates and Method Statement
Appendix 11	LLDPE Panel Deployment Records
Appendix 12	LLDPE Destructive Test Results
Appendix 13	Restoration Soils Testwork

1 INTRODUCTION

Bryn Pica Landfill site was granted its PPC Permit (Number DP3732SQ) on 27 June 2006 following a formal application process. The application documents included an Environmental Setting and Installation Design report (ESID) which outlined the engineering systems to be used at the site. These were shown to be protective of the environment in a series of risk assessments which also accompanied the application. In particular, the hydrogeological risk assessment demonstrated how the proposed engineering systems provide appropriate environmental protection.

The ESID not only provided details on the basal lining system and leachate control systems but also identified the requirement for a capping system to control post-filling infiltration into the waste mass (Section 2.2.4). The design of the capping system proposed for the site comprised a low density polyethylene welded barrier membrane sandwiched between protective geocomposite layers. The geocomposites provide protection to the barrier membrane but also transmit water (above) and leachate (below) to the appropriate collection infrastructure. The synthetic elements are shown laid onto a mineral support layer and overlain by restoration soils. Restoration soils are described in the ESID as being site-won and supplemented with compost produced at the facility.

In order to demonstrate that the proposed capping system is not at risk from instability or excessive deformation, its design was considered in detail in the stability risk assessment (SRA) which supports the application. The SRA concluded that instability was a risk when smooth membrane was used on slopes steeper than 1v in 6h. However, textured membrane improved the stability of the capping system and providing that textured membrane is used, the SRA demonstrates adequate factors of safety against failure and integrity for slopes of up to 1v in 2.5h. The influence of temporary plant loading (during construction) and elevated gas pressures (during failure of the gas extraction system) were also considered in the SRA.

Since the permit was granted, several phases of permanent capping have been undertaken, the most recent being Phase 3B.

Geotechnology Limited (Geotechnology) was recently commissioned by Amgen Cymru (Amgen) to provide CQA site supervision and monitoring during the capping of Phase 4A at Bryn Pica Landfill Site. This report covers the construction monitoring undertaken on the earthworks, drainage systems, deployment of the geosynthetic materials and placement of the restoration soils.

The design of the capping system and the construction quality assurance (CQA) scheme was submitted to the Environment Agency (now NRW, Natural Resources Wales) in accordance with requirement 2.7.1 of the Permit. Having received assent for the works to be carried out in accordance with the submitted documents, the latest capping works were undertaken during September 2014. As the works are now complete this CQA Validation Report is intended to discharge requirement 2.7.6 of the Permit validating that the works were undertaken in accordance with the plan. The Plan is documented in Geotechnology report *1384r1v1d0714 CQA Method Statement and Quality Plan*.

1.1 Site Location

The Bryn Pica Landfill Site is located approximately 2 km north of Aberdare, at an elevation of approximately 280m AOD, on the northern side of the Cynon Valley. The Ordnance Survey National Grid Reference (NGR) for the centre of the Installation is SO 009 049.

1.2 Site Description

Phase 4A lies on the northern part of the landfill. The waste surface slopes west from an elevation of approximately 320m AoD down to approximately 310m AoD. The western/northwestern edge of the area to be capped, shown on Figure 1, is the existing haul road while the other boundaries adjoin areas that have either been previously capped (Phase 2C to the south and 3B to the north) or temporary capped slopes to the east.

1.3 Project Organisation

The Client for the contract is Amgen Cymru.

The Designer for the Works was Ewan Thomas of Geotechnology.

The CQA Monitors for the Works were Ewan Thomas and Ben Rees of Geotechnology.

The Contractors involved with the project are listed below:

- Amgen Cymru – Principal Contractor
- Celtic Lining Limited - Geomembrane Installer
- BICS Laboratories Limited - Geosynthetic Testing Laboratory
- Apex Testing Solutions (ATS) – Aggregate and Soil Grading
- National Laboratory Services (NLS) – Restoration Soils Chemical Analysis

The following suppliers were involved with the works:

- ABG – supplier of pozidrain geocomposite
- GSE – supplier of LLDPE Liner Materials
- Buxoplas – supplier of extrusion welding rods
- Hanson – supplier of aggregates
- Burdens - Pipework

1.4 Construction Contract

The Contract was executed under Construction, Design and Management (CDM) Regulations.

The CDM requirements are being met under the direction of Hurley and Davies on behalf of Amgen Cymru.

1.5 CQA Plan and Specification

The installation of the lining system was carried out in accordance with the approach set out in the Construction Quality Assurance (CQA) Method Statement and Quality Plan. (Geotechnology Ref 1384r1v1d0714).

2 SCOPE OF THE WORKS

This section highlights the works undertaken before the detailed CQA records are presented in later sections.

2.1 Overview

The Phase 4A cap was constructed in accordance with the principles set out in the outline design approved in the Permit application. Prior to placement of the capping systems, the waste surface was prepared with a smooth regulating layer comprising screened imported soil. The overlying capping systems comprised a 1mm thick linear low density polyethylene (LLDPE) double textured barrier membrane sandwiched between two layers of drainage geocomposite capable of providing adequate protection to the membrane between. The lower geocomposite is designed to discharge perched leachate beneath the cap into the existing leachate drainage infrastructure, whilst the upper geocomposite directs percolating rainwater into the surface water collection system. The lower geocomposite was underlain by the regulating layer and the upper geocomposite was overlain by a blinding layer up to 300mm thick beneath a minimum of approximately 700mm of restoration soil.

A photographic record of key stages of the works and records of the activities undertaken is presented in Appendix 1.

2.2 Communications with NRW

Following issue of the CQA Plan, feedback was provided by NRW. The feedback and subsequent response from Geotechnology is provided in Appendix 2.

The CQA Plan was formally agreed with NRW with written approval of the Plan received by email on 18 August 2014.

2.3 Delays and Timescales

Works on Phase 4A capping commenced May 2014 and were largely complete by end of September 2014. There were no significant delays in the work programme.

2.4 Materials Handling

All materials used in the works were either directly delivered to site or to a prepared temporary storage area. All of these areas were inspected prior to use and were approved for material storage by the CQA Monitor.

- Pipe materials delivered to site were stored in designated areas on or close to the working area. Storage was in accordance with the manufacturer's recommendations. Pipes were stored on flat prepared ground. Visual inspections of all pipework and fittings were made following delivery and prior to incorporation into the works.
- The geocomposites used for the management of leachate and surface water (pozidrain) and the capping geomembrane (LLDPE) were handled and stored in accordance with the manufacturer's recommendations. In most cases, the rolls of geocomposite were labelled by the manufacturer, but several of the labels on the pozidrain were damaged. In response, each roll was manually labelled. All rolls were

stored on a prepared flat surface and each roll was logged and inspected. A visual inspection of the rolls took place immediately after delivery and prior to deployment in the works.

Aggregate and soils for use in the works were brought to site on an as-required basis during the construction, with each material being stockpiled separately.

2.5 Preparatory Earthworks

The earthworks initially comprised placement of a regulating layer, nominally 300mm thick, over the existing wastes. The regulating layer was prepared in a manner that provided a smooth, dry, clean and firm surface for the installation of the overlying geosynthetics layers. Any stones, sharp objects or other material within the bedding layer which could damage the regulating geosynthetics were removed.

2.6 Leachate Seepage Collection Trench

The leachate seepage collection trench was constructed to connect the lower geocomposite leachate seepage drainage layer beneath the cap to the existing leachate collection system. The trench was filled with free draining stone.

2.7 Leachate Seepage Drainage Layer

The lower geocomposite drainage layer is designed to collect leachate seepage below the capping system and direct this to the existing leachate collection system. The drainage layer comprised ABG pozidrain which is a cusped HDPE core thermally bonded to a filter geotextile on both sides.

2.8 Geomembrane

A 1mm textured Linear Low Density Polyethylene (LLDPE) geomembrane, manufactured by GSE, was installed directly above the leachate seepage drainage layer. Each panel and each seam was assessed for flaws. Non-destructive and destructive testing was undertaken on the seams.

2.9 Geotextile Protection Layer

Based on experience from previous phases a geotextile protection layer above the membrane was not used. Instead, the pozidrain used in the soil under-drainage layer provided both drainage and protection beneath a 300mm deep blinding layer comprised of graded 40mm soils.

2.10 Soil Under-Drainage Layer

The soil under-drainage layer was placed directly onto the LLDPE geomembrane. This comprised the same geocomposite material used for the leachate seepage drainage layer; ABG Pozidrain 6S250D/NW8.

2.11 Restoration Soils

Restoration soils meeting the Specification were directly placed onto the soil under-drainage geocomposite. These comprised a screened (<40mm) 300mm thick blinding layer overlain by a minimum of 700mm of restoration soils.

3 SITE PREPARATION

3.1 Materials

The material used in the regulating layer was sourced from arisings from works on the Sobell's Sports Centre and new Aberdare High School in Aberdare. Approximately 2,400 tonnes was used.

Three source evaluation tests and, thereafter, sampling at a frequency of 1 sample per 1000 tonnes delivered was completed. The results of the testing of the regulating layer are summarised in Appendix 3 and summarised in Table 3-1. The test data confirms the regulating layer satisfied the Specification.

Table 3-1 Comparison of Regulating Layer Properties with Specification

Parameter	Specification		R01	R02	R03
Particle Size Distribution	63mm	100%	100	100	100
	40mm	50 to 100%	100	100	100
	10mm	50 to 100%	79	75	82
	2mm	30 to 100%	59	52	61
	0.6mm	10-70%	45	42	50

3.2 Placement and Acceptance

The surface of the regulating layer upon which the geosynthetics were placed was prepared so that a uniform surface was achieved, as revealed by the survey in Figure 2. The surface was smooth and firm and free of visible objects that may puncture the overlying geosynthetics.

Eight measurements of smoothness and flatness were taken at a rate exceeding the requirement of 5 measurements per hectare as set out in the CQA report. No sharp angles in the subgrade exceeded 10mm under a 1000mm lath and no large rounded irregularity exceeded 50mm under the 3000mm lath. On this basis the subgrade was accepted by the CQA Monitor and Principal Contractor as shown by the records in Appendix 3.

Throughout the deployment of the capping systems, Amgen ensured that a roller was available to smooth any sharp angles caused by the works.

4 LEACHATE BREAKOUT COLLECTION SYSTEM

The leachate breakout collection trenches were constructed to connect the leachate breakout drainage layer beneath the cap to the existing leachate breakout collection system in adjacent phases.

4.1 Materials

The leachate drainage stone was supplied by Hanson's and sourced from Penderyn quarry. A total of 179.98 tonnes were delivered as shown by records provided in Appendix 4. The suitability of the drainage stone was evaluated by undertaking three source evaluation tests with the results presented in Appendix 5 and summarised in Table 4-1. The test data confirms that the stone satisfied the Specification.

Table 4-1 Comparison of Leachate Drainage Stone Properties with Specification

Parameter	Specification		ST01	ST02	ST03	ST04 /
			2576	2577	2578	3508 / 3251
Particle Size Distribution	63mm	98-100%	100	100	100	100
	40mm	80-100%	100	100	98	100
	31.5mm	20-90%	88	83	81	90
	20mm	0-20%	11	15	8	11
	10mm	0-5%	2	1	1	1
10% Fines	>100Kn		200	190	180	190

4.2 Placement and Acceptance

The collection trenches comprised conventional 'french drains' constructed by excavating a 450mm wide 600mm deep trench into the existing waste and regulating layer at the downslope edge of the works. The alignment and levels of the trenches is shown on Figure 2 and the elevation of the top of stone in Figure 3. Each of the trenches were laid to a fall and joined similar trenches beneath previous phases. The trenches were constructed ahead of the main capping works. Prior to backfilling, the pozidrain was placed against the downslope side of the trench. The trench was then backfilled with drainage stone around a 100mm OD perforated twinwall pipe. The exposed pozidrain was then folded back over the filled trench and later connected to the leachate collection pozidrain deployed as part of the main capping works.

5 LEACHATE BREAKOUT DRAINAGE LAYER

As noted in the correspondence in Appendix 2, as Phase 4A comprises the summit of the waste mass and a short section of shallow slope falling to existing capping systems there is limited potential for leachate to be generated, and once the works are complete this potential will be eliminated. In this context, the drainage layer is primarily providing protection for the overlying capping materials.

5.1 Materials

The leachate breakout drainage layer comprised ABG Pozidrain 6S250D/NW8. In addition to enabling leachate breakout to be managed, the pozidrain also provides a protective layer for the overlying LLDPE geomembrane.

5.2 Manufacture and Testing

The leachate breakout drainage layer comprises the same geocomposite as that used for the restoration soil under-drainage layer. Accordingly, this section includes the materials used for both purposes.

The manufacturer's certificates of conformity and quality control data are included in Appendix 6. The conformance testing schedule called for the collection of 1 conformance sample for every 5000 m² delivered to site. In total, 21 rolls (8316 m²) were delivered to site and 3 samples were collected and submitted to BICS laboratories for testing. The results of this conformance testing are presented in Appendix 7 and summarised in Table 5-1. As can be seen, all of the test results meet the Specification.

Table 5-1 Comparison of Conformance Test Results with Specification

Property	Unit	Specification	Allowable Tolerance (in Value)	Conformance test results		
				GCP-04	GCP-14	GCP-21
Static CBR Puncture resistance (geocomposite)	N	3000	-20% (2400)	3880	3770	4240
Static CBR Puncture resistance (geotextile)	N	1300	-	1900	1790	1870
Tensile strength (md) (geocomposite)	kN/m	19	-10% (17.1)	24.6	24.5	25.7
Tensile strength (md) (geotextile)	kN/m	8	-	10.1	11	11.6
Tensile strength (cmd) (geocomposite)	kN/m	19	-10% (17.1)	28.5	23.1	25.1
Tensile strength (cmd) (geotextile)	kN/m	8	-	11.2	11	11.7
In plane Water Flow @ 100 kPa Pressure – Hydraulic Gradient =1.0	l/m/sec	0.5 (min average)		1.41	1.38	1.4
In plane Water Flow @ 200 kPa Pressure – Hydraulic Gradient =1.0	l/m/sec	0.35 (min average)	-	0.98	1.04	1.02
Pore size of geotextile	mm	0.1	+/-30%	0.097	0.097	0.092

NOTE: MD – Machine direction, CMD – Cross machine direction,

5.3 Placement

The leachate breakout geodrain layer was installed in accordance with the manufacturer's recommendations. Geocomposite panels were installed free from tension or stress and without wrinkles or folds. The panels were rolled out into their final position and not dragged into position across the subgrade. Adjacent sheets were lapped to provide a continuous layer suitable for membrane deployment. The CQA Monitor observed all breakout layer deployment and can verify that the entire surface of Phase 4A was covered with a continuous layer.

6 GEOMEMBRANE LINING

6.1 Materials

The geomembrane used in the works comprised Ultraflex Texture manufactured by GSE. This is a 1mm thick, textured, linear low density polyethylene (LLDPE).

6.2 Manufacture and Testing

The geomembrane was manufactured and supplied by GSE Ltd. who also provided the specification sheets for the material and the MQC certificates for each individual roll. Welding rods were provided by Buxoplas. Copies of the manufacturer's specification and quality control data are included in Appendix 8 and these demonstrate that the Manufacturing data indicates the material meets the manufacturers Specification.

Conformance samples were taken from randomly selected rolls of the LLDPE delivered to site at a rate exceeding the testing requirement of 1 sample of every 5000m² delivered. In total, 3 rolls of the textured LLDPE (4380m²) were incorporated into the works. The LLDPE samples were submitted for conformance testing to BICS Laboratories by the Contractor. Details of the rolls delivered, samples collected and conformance test results are presented in Appendix 4 and 9 with a summary provided in Table 6-1. The test results indicate that the conformance samples meet the specification.

Table 6-1 Comparison of Textured LLDPE Conformance Test Results with Specification

Property	Specification	Conformance Test Certificates		
		1/3 IDG/1844	2/3 IDG/1847	3/3 IDG/1848
Thickness	0.95mm (min. ave) 0.90mm (lowest of 8 of 10) 0.85mm (lowest individual of 10)	1.03	1.03	1.04
Density	<0.939 g/cm ³	0.919	0.918	0.919
Asperity height	>0.2mm	0.57	0.58	0.61
Tensile properties				
Break strength	12 N/mm	22.6 (MD)/21.8 (CD)	23.6 (MD)/19.9 (CD)	24.6 (MD)/21.8 (CD)
Elongation at break	250%	519 (MD)/499 (CD)	553 (MD)/485 (CD)	585 (MD)/533 (CD)
Tear Resistance	>100N	140 (MD)/150 (CD)	133 (MD)/139 (CD)	138 (MD)/134 (CD)
Puncture Resistance	>300N	411.7	416.1	432.9
Carbon Black Content- %	2.0 – 3.0%	2.39	2.36	2.56
Carbon Black Dispersion	9 in category 1 or 2 and one in Category 3	1	1	1
Oxidative induction time	100 minutes	154	140	145
NOTE: MD – Machine direction, XD – Cross machine direction				

6.3 Placement

6.3.1 Geomembrane Panel Deployment

The geomembrane was installed in accordance with the requirements set out in the Specification following acceptance of the regulating layer. All of the geomembrane was installed in two phases on 2 September and 25 September 2014 by approved plastic welding personnel from Celtic Lining. Some of the seams welded on 2 September were tested on the 3 September. Approval certificates for each specialist are provided in Appendix 10 along with the Celtic Lining Method Statement.

The geomembrane was installed as a series of panels, numbered sequentially in order of deployment. The rolls were manoeuvred onto site with a 360 degree tracked excavator fitted with a spreader bar. The geomembrane deployment was monitored and inspected, ensuring compliance with the details set out in the CQA plan and Specification. Records relating to the seaming and checking of the geomembrane deployment are included in Appendix 11. The finalised panel layout for the geomembrane is shown on Figure 4.

6.4 Trial Seams

Each seam welding machine carried out a trial seam at the start of each seaming period. Trial seams with a minimum length of 3m were prepared from off-cuts of geomembrane liner. Six sample specimens, 25mm wide, were cut from trial seams and tested in the field for peel and shear strength. Had any of the samples failed then machinery adjustments would have been made and the testing repeated, but every trial seam during these works was successful.

6.5 Fusion Welding

Fusion welding, also known as wedge welding, was the principal technique used to weld the geomembrane for the lining works. All fusion welds were inspected and tested as the works progressed.

6.6 Extrusion Welding

Extrusion welding was used on a small proportion of the seams, primarily at the junction between the new capping and the existing capping as it was not always possible to use fusion welders. It was also necessary to use extrusion welds to form a seal between the LLDPE geomembrane and any site infrastructure required to protrude through the liner, such as existing gas wells. All pipe boots fitted around the gas wells were fabricated on-site by the welding crew by welding a 600mm diameter annulus of geomembrane around the gas infrastructure, typically, 315mm diameter SDR 17 PE80 black pipe, with the annulus welded to the bottom of the pipe. The annulus between the landfill gas extraction pipe and the pipe boot was then filled with bentonite pellets by the gas extraction contractor.

Buxoplas welding rods were used for all extrusion welds as they have a Melt Flow Index (MFI) compatible with the GSE LLDPE. Extrusion welds were also performed for beaded repairs, three way joints and all repair patches. Where extrusion welds were undertaken, the geomembrane was machine ground to enable the extruded weld to adhere effectively. Grinding was carried out carefully by the lining crew and observed by CQA staff to ensure the thickness of the membrane was not compromised.

6.7 LLDPE Walkover Inspection

A walkover inspection of the fitted panels was undertaken by CQA staff prior to the panels being covered with the under-drainage layer.

6.8 LLDPE Repairs

Repairs to the geomembrane were undertaken during the liner installation. All defects were repaired in accordance with the Specification.

A total of 6 patched repairs were undertaken on the LLDPE geomembrane in addition to four small point defects. The location of each repair is shown on Figure 4 and listed in Appendix 11.

6.9 Seam Testing

Three methods of seam testing were used; non-destructive air pressure testing (APT's) and non-destructive vacuum box testing were carried out in-situ and destructive tests were carried out on samples sent to the laboratory. Non-destructive testing ensures the continuity and integrity of the seams is maintained, but provides no indication of the mechanical strength of the seam. Therefore, destructive tests were necessary to quantify strength. Destructive samples were taken at the end of seams, where feasible, in order to avoid creating further holes which would require repair.

6.9.1 Air Pressure Testing

All fusion seams were subjected to air pressure testing in accordance with the Specification.

The CQA staff supervised the air pressure testing of the seams. A record of the air pressure tests is included in the panel deployment sheets in Appendix 11.

6.9.2 Vacuum Box Testing

Extrusion seams were tested using a Vacuum Box. The testing was monitored by CQA staff and is recorded in the panel deployment sheets in Appendix 11. No failures of extruded field seams were recorded.

6.9.3 Destructive Testing

Samples were cut from installed seams to provide a method of obtaining quantitative results for the seam strength. Random seam locations were selected at positions specified by the CQA Engineer. The destructive samples were submitted to BICS Laboratories Ltd and the test results are presented in Appendix 12 and summarised in Table 6-2.

Table 6-2 Destructive Laboratory Test Results

Sample ID	Seam Reference	Weld Type	Welding Machine & Operator	Peel (N/mm)		Shear (N/mm)	
				Mean	Lowest	Mean	Lowest
DS-1	P2/P3	Fusion	CL11 & TH	14.2	12.8	16.8	16.6
DS-2	P12/P13	Fusion	CL11 & TH	14.1	12.1	16.4	16.1
DS-3	P14/P16	Fusion	CL9 & MD	14.3	13.1	16.5	16
DS-4	P18/P19	Fusion	CL9 & MD	14.2	12.3	16	15.9
DS-5	P5/P6/EXIST	Extrusion	CL49 & SJ	12.4	11.1	15.5	14.4
DS-6	P21/P23/P22 (overlapping existing)	Fusion	CL9 & SJ	14.9	13.5	15.9	15.5
DS-7	P23/EXIST	Extrusion	CL41 & SJ	16.5	15.9	16.3	15.9

7 SOIL UNDER-DRAINAGE LAYER

7.1 Materials

The soil under-drainage layer comprised ABG Pozidrain 6S250D/NW8. In addition to enabling infiltration to be managed, the pozidrain also provided a protective layer for the underlying LLDPE geomembrane.

7.2 Manufacture and Testing

The pozidrain used for the soil under-drainage layer is the same as that used for the leachate breakout drainage layer. The Specification and conformance testing requirements for the pozidrain used in both elements of the works is the same and so the reader is referred to Section 5.2 which demonstrates that the pozidrain satisfies the requirements of the Specification.

7.3 Placement

The drainage layer geocomposite was installed in accordance with the manufacturer's recommendations. Geocomposite panels were installed free from tension or stress and without wrinkles or folds. The panels were rolled out into their final position and not dragged into position across the subgrade except where necessary to obtain the correct overlap with adjacent sheets.

8 RESTORATION SOILS

A minimum of 700mm of restoration soil was placed above a 300mm blinding layer of selected finer material in order to offer greater protection to the underlying membrane.

8.1 Materials

The restoration soils comprised on site screened soil from the construction works associated with the new Anaerobic Digester Plant.

Each source was evaluated, prior to the soil being imported to the site stockpile by the collection and analysis of 3 samples, with further samples collected at a rate of 1 sample every 2000 tonnes delivered. All of the soils were free of any visible timber, metal or similar material with the potential to penetrate the capping system. A stockpile of material was maintained on site for use in the works.

Test results relating to the soil used in the works are included in Appendix 13 and a summary provided in Tables 8-1 and 8-2. The test data reveals that the blinding layer met the grading Specification and the chemical leachate characteristics indicate the material is inert, apart from a single marginal exceedance of the antimony threshold.

Table 8-1 Comparison of Blinding Layer Properties with Specification

Parameter	Specification		B01	B02	B03
Particle Size Distribution	40mm	100%	100	100	100
	10mm	50 to 100%	80	75	80
	2mm	30 to 100%	55	53	59
	0.6mm	10-70%	45	44	48

Table 8-2 Comparison of Restoration Soil Leachate Properties with Specification

		Soil Test Results			
		2877755	2877756	2877757	2877758
Parameter	Specification	S1	S2	AD1	AD2
Arsenic	0.5	0.0985	0.1	0.0201	0.0257
Barium	20	0.474	0.368	0.303	0.183
Cadmium	0.04	<0.001	<0.001	<0.001	<0.001
Chromium	0.5	0.00951	0.0178	<0.00645	<0.00851
Copper	2	0.274	0.251	0.0242	0.027
Mercury	0.01	<0.000116	<0.000116	<0.000116	<0.000116
Molybdenum	0.5	0.296	0.162	0.0625	0.0587
Nickel	0.4	0.0512	0.0402	<0.0124	0.0139
Lead	0.5	<0.02	<0.02	<0.02	<0.02
Antimony	0.06	0.0723	0.0577	<0.0109	0.0108
Selenium	0.1	<0.0193	<0.0159	0.0233	0.02
zinc	4	0.0364	<0.0343	<0.0364	<0.0340
Chloride	800	<217	<130	<100	<103
Fluoride	10	9.45	8.2	7.17	6.13
Sulphate	1000	968	756	640	686
Dissolved Organic Carbon (DOC)	500	70.8	81.4	19.2	26.1
Total Dissolved Solids (TDS)	4000	2610	1930	1660	1530
NOTE: All data reported as mg/kg at 10:1 liquid / solid ratio based on two stage leaching as per 12457:3					

8.2 Placement

Suitable soils meeting the requirements of the Specification were placed directly over the upper drainage geocomposite following the placement of a blinding layer which was screened from the stockpile of restoration soils. The restoration soil placement was undertaken in such a way that the material did not damage the underlying capping system.

Soils were placed in a single loose lift with light compaction being achieved by the machine tracks. Compaction plant was not used. Placement typically commenced at the base of the slope and moved progressively uphill once the working edge had first been secured. The total thickness of the restoration soil layer is illustrated by the isopachyte contours in Figure 5.

9 PROBLEMS DURING CONSTRUCTION

There were no problems during construction.

10 CERTIFICATION

10.1 Earthworks

It is confirmed on the basis of the inspection reported that the earthworks were completed in accordance with the Specification.

10.2 Leachate Seepage Drainage Layer

It is confirmed on the basis of the inspection and testing, completed and reported, that the drainage layer has been installed in accordance with the Specification and CQA Plan.

10.3 Geomembrane

It is confirmed on the basis of the inspection and testing, completed and reported, that the LLDPE lining geomembrane has been installed in accordance with the Specification and CQA Plan.

10.4 Soil Under-Drainage Layer

It is confirmed on the basis of the inspection and testing completed and reported, that the under-drainage layer has been installed in accordance with the Specification and CQA plan.

10.5 Restoration Soils

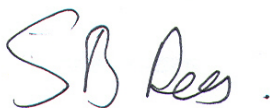
It is confirmed on the basis of the inspection and testing completed and reported, that the restoration soils have been placed in accordance with the Specification and CQA plan.

10.6 Verification

Based on the CQA inspection and testing undertaken at the site and the records available, it is confirmed that the capping works have been completed in accordance with the principles and requirements of the Specification and CQA Plan.

10.7 Signatures

I can confirm that I am satisfied that the Works have been constructed in accordance with the Design Specification and CQA Plan.



Stephen Benjamin Rees

Figure 1 Extent of Capping Scheme

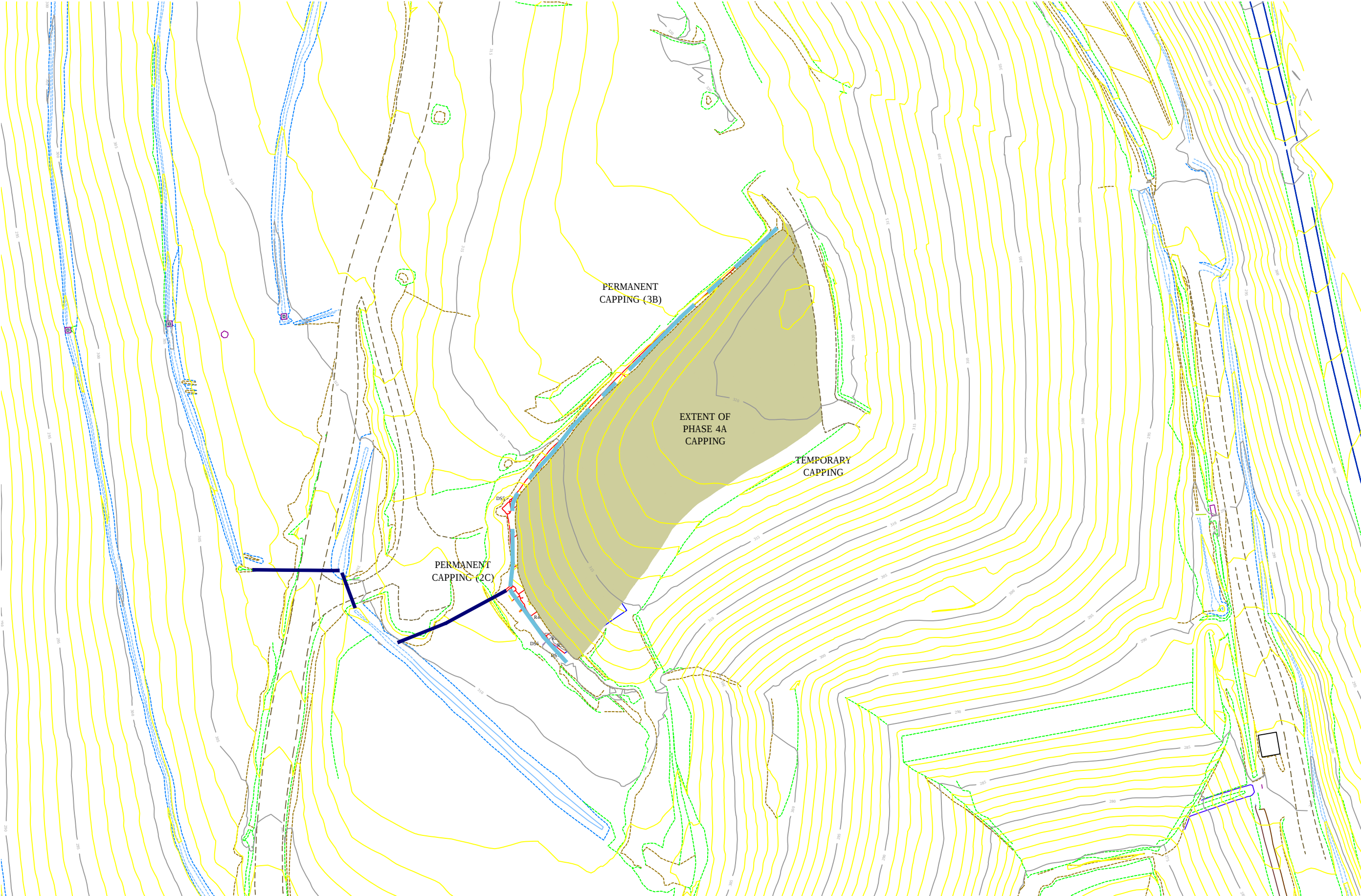


Figure 2 Regulating Layer and Leachate Drainage Pipework



Figure 3 Regulating Layer and Leachate Drainage Stone

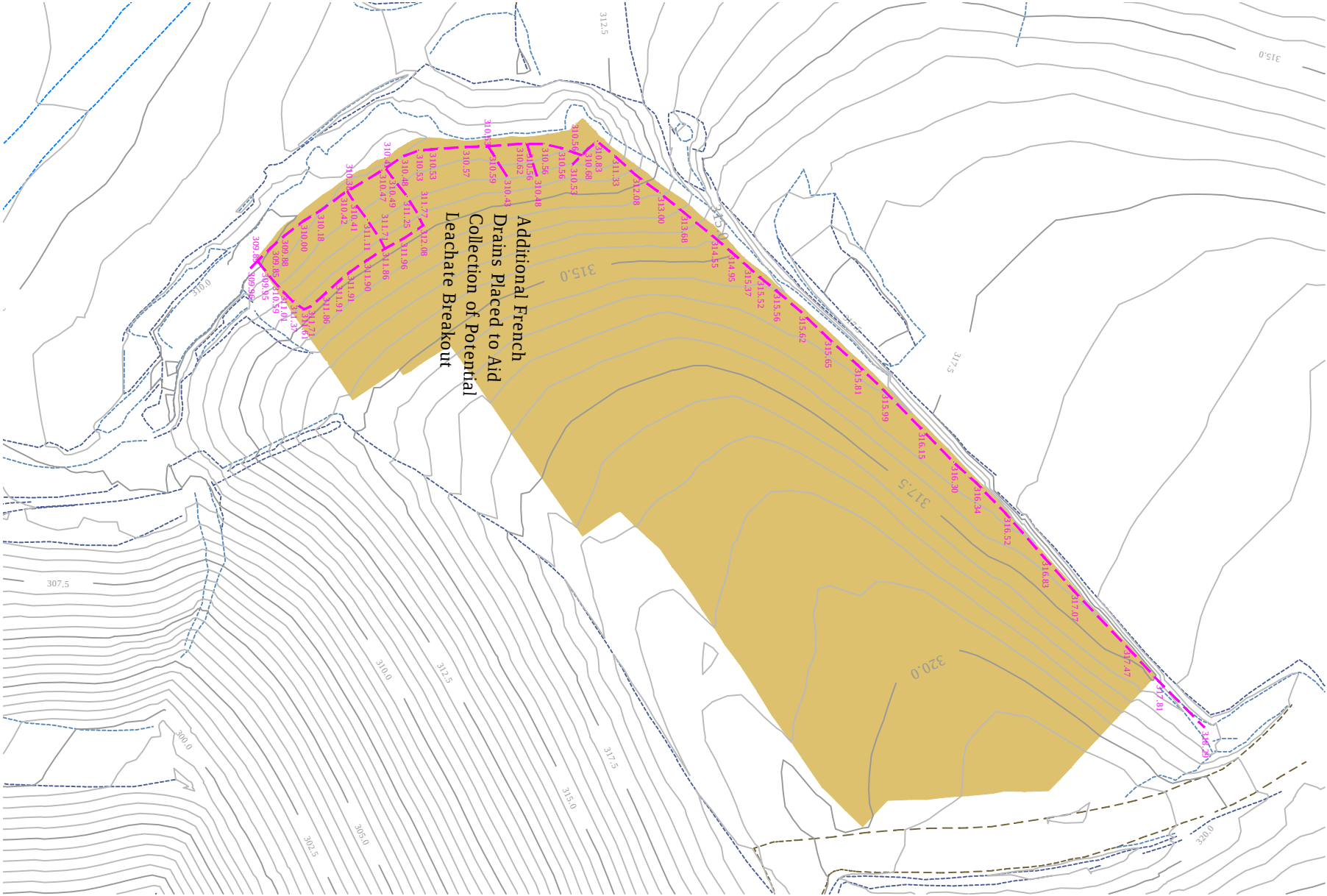
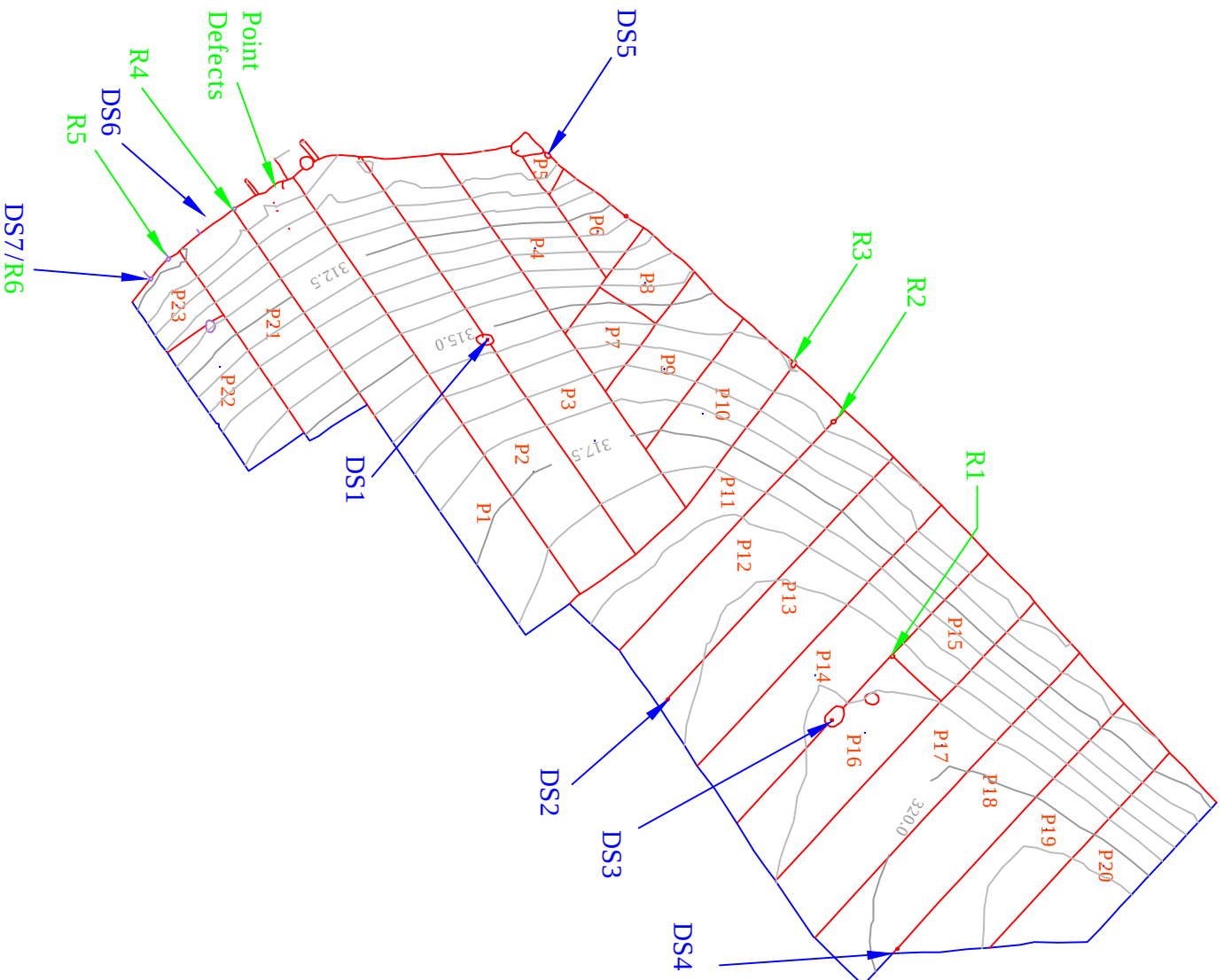


Figure 4 HDPE Panel Layout



**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 2
Communication with
NRW**

Report Number 1384r1v1d1014



Geotechnology Limited, Ty Coed, Cefn-yr-Allt, Aberdulais, Neath, SA10 8HE
Telephone 01639 775293 Fax 01639 779173

Natural Resources Wales
Ty Cambria
29 Newport Road
Cardiff
CF24 0TP

File Name: 1384ltresponse

15 August 2014

FAO: Peter Stanley

Dear Peter,

Re: CQA Method Statement and Quality Plan Phase 4A Capping Works

Having received your comments on the above document I see that your review has identified 2 aspects that require further consideration: the composition of the regulating layer and the placement of the geocomposite.

Ceri has identified where the details of the contractors panel layout and method of working have been discussed and I understand that you are satisfied with this.

1. Regulating Layer

The proposed capping system does not rest directly on the completed waste surface but rests on a regulating layer placed with the principal objective of protecting the geosynthetic elements from damage. The regulating layer comprises a soil type material which can be compacted to a firm smooth surface ready to accept the overlying geosynthetic layers. It has to be smooth, contain no abrupt changes in level and it must be sufficiently firm to allow earthmoving plant to move over it to deploy the capping system.

Where required, the regulating layer may need to transmit leachate breakout from the waste mass to the lower geosynthetic drainage layer. On significant slopes, there may be multiple and significant breakouts and it is desirable to collect these into the lower geocomposite drainage layer.

The capping works proposed for Phase 4A do not contain any steep or significant slopes. The works area comprises the summit of the waste mass and a short section of shallow slope falling to previous capping works. When completed, the works will be bounded on three sides by existing capping systems and therefore the potential for leachate to be generated in this part of the site will be eliminated. For this reason, the secondary drainage function of the regulating layer is not important for these works. As a result, the grading acceptability window has been widened to allow fines and cohesive materials to be used. In the event that cohesive materials are used, then



Geotechnical and Environmental Engineering, Geophysics and Geochemistry
Geotechnology Limited is registered in England and Wales Number 6497727



Ewan Thomas 01639 775293 Arwel Jones 01792 414294 Jo Thomas 01639 775293 Ben Rees 01269 596737
ewanthomas@geotechnology.net arweljones@geotechnology.net jothomas@geotechnology.net benrees@geotechnology.net

the requirement for a firm surface with a stated shear strength will ensure that the material performance is suitable. Given the very shallow slopes (12.5 degrees) over a small proportion of the footprint of these works the presence of clay materials with shear strengths exceeding 50 kPa is not considered detrimental to stability in any way.

On the 2 July 2014 I carried out an inspection of the works area and I can confirm that at the time there were no visible leachate seepages. The capping works are likely to be undertaken in the near future and therefore I do not expect leachate breakout beneath the cap to be an issue of any consequence.

The cross section which shows waste material placed over restoration soils has been included to show how a small, limited area of accidental over-tipping is to be addressed. By using this detail, the excavation of a block of waste and restoration soil can be avoided. As the area of over-tipping is very small and the capping system will completely cover it there is little prospect of leachate pressure developing at the interface location identified on your diagram.

2. Placement of Lower Geocomposite

I can confirm that the lower geocomposite shingling is as shown on the design drawings. The text referring to overlaps should refer to underlaps for the lower geocomposite (and overlaps only for the upper geocomposite). The relevant page will be amended.

The first cross section on Figure 3 shows that the lower drainage composite for the current works drains into the leachate collection drain for the current works and to ensure that this is the case, a flap of geocomposite is brought up the downslope side of the trench and laps over the lower geocomposite. For clarity, the geomembrane in the existing anchor trench has been omitted; the existing geomembrane is shown to terminate just above the left hand edge of the anchor trench as this is where it has been cut. The existing lower geocomposite from the previous phase is then underlapped by a filler piece which covers the anchor trench and laps over the new leachate collection trench. This ensures that the toe of the new membrane is protected and is under-drained.

I hope these further details clarify our intentions. If you need further details, please do not hesitate to contact me.

Yours faithfully,
GEOTECHNOLOGY

A handwritten signature in black ink, appearing to read 'Ewan Thomas', with a horizontal line drawn underneath the name.

Ewan Thomas
Director

Amgen Cymru Ltd
Bryn Pica
Llwycoed
Aberdare
CF44 0BX

Ebost/Email:
peter.stanley@cyfoethnaturiolcymru.gov.uk
Ffôn/Phone: 03000 654482

FAO Ceri Evans

11th August 2014

Re: CQA Method Statement & Quality Plan Phase 4A Capping Works

Many thanks for providing the following document:-

Geotechnology. July 2014. CQA Method Statement and Quality Plan. Phase 4A Capping Works. Bryn Pica Landfill Site. Rep N°. 1384r1v1d0714

Having reviewed the document there are two key aspects that would aid clarity, prior to agreement of the proposed works. I also didn't pick up on agreement with the Contractors proposed panel layout design or method of working, which I would have anticipated.

1. Regulating Layer

This element is intended to provide a smooth unyielding surface on which to place the lower geocomposite layer. It is also noted (Section 2, paragraph 6) that the purpose of the lower geocomposite is to aid discharge of perched leachate.

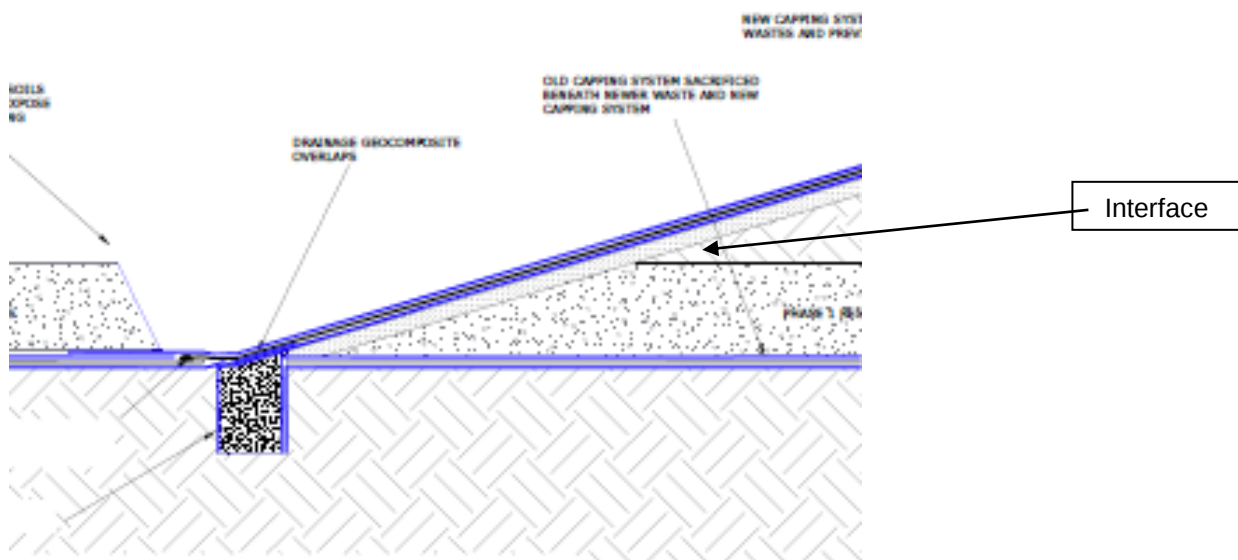
The lower geocomposite will discharge any perched leachate beneath the cap into the leachate drainage infrastructure, whilst the upper geocomposite will discharge percolating rainwater into the surface water collection system. The lower geocomposite will be placed upon a compacted smooth regulating layer comprising imported screened soil whilst the

If this is the case, one would expect perhaps less fines (silt and clay) upper limit in the regulating layer than the 70% identified in Table 2. This could easily enable classifying soils as silts or clays. Within section 3.3.3 there is reference to clays

surface. For clays the shear strength of the clay should be $>50\text{kN/m}^2$ to ensure that no movement will occur during or after placement of the restoration soils

The previous Phase 3B capping works had a different specification of less than 20% passing the 0.6mm sieve. That would enable the material to have a coarser composition and allowing easier transfer of leachate. I appreciate that some of the previous CQA actual PSD sampling analysis had indicated broadly 50% not achieving this value, but only one sample that was in excess of 30%. Bearing in mind the protection afforded by the proposed geocomposite and a wish to allow leachate breakout layers to be captured to drain, could the engineer qualify this slight change and confirm compliance with the SRA?

The cross sections in Figure 3 (below) indicate waste placed on restoration soils. If the regulating layer is a silt/clay at the waste/Phase 1 restoration layer/regulating layer interface (below), leachate pressure may start to increase. I would welcome explanation or discussion here.



2. Placement of Lower Geocomposite

Bearing in mind the intention of this medium to help facilitate leachate drainage, I am surprised in 3.4.3 that it is intended to either lap the up gradient lower geocomposite on top of the down gradient lower geocomposite.

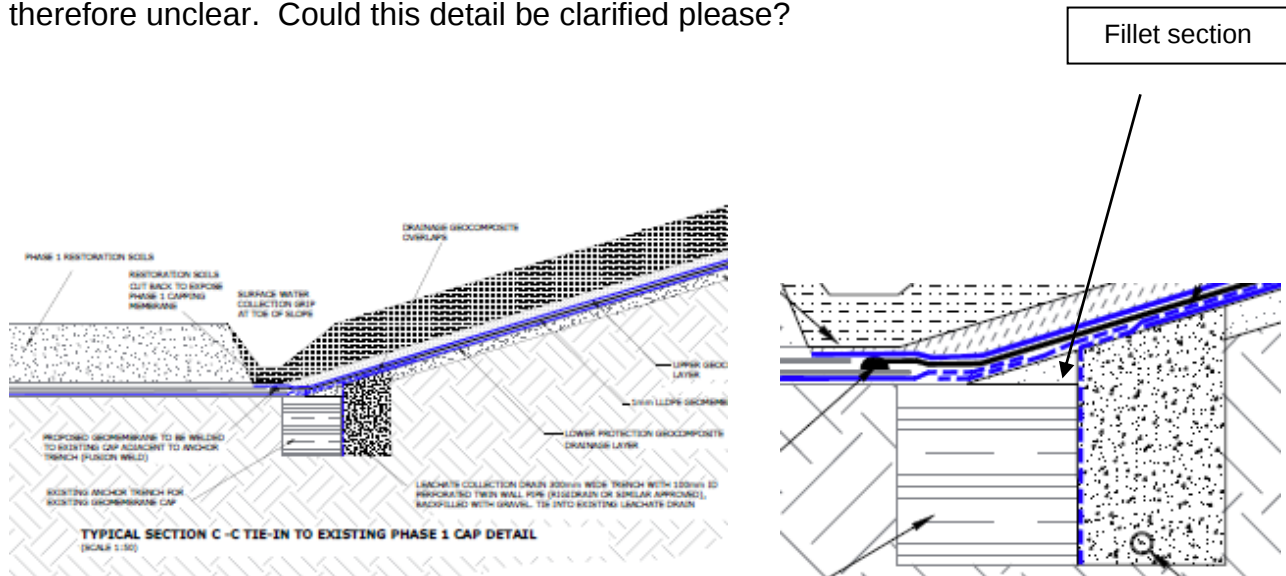
restoration soil layer. The lower edge shall be lapped onto the leachate drainage geocomposite from previous phases.

It is appreciated in 3.4.5 that an allowance is made to butt the cores against each other at the down gradient join, however it is also mentioned that they are allowed to overlap like roof slates/shingle. This area remains a concern for the lower geocomposite layer as in theory, while allowing the safe collection of generated gas, it has the potential to allow leachate to be conveyed onto the upper face of the geocomposite. I expect the geocomposite to be Pozidrain or equivalent and the manufacturers recommendations (Goran Erak confirmed this) is to butt the core sections and not overlap them down

gradient. There is a potential for leachate to flow in a planar motion on this down gradient surface, as the free draining cusped surface is on the lower side.

It is feasible this is a cut and paste error as the cross sections above and below appear to show underlapping lower geocomposite layers.

The first cross section in Figure 3 (Section C-C' below LHS), is also a little confusing with the location of the down gradient geomembrane in the existing anchor trench. The means of leachate drainage in the lower geocomposite around the fillet and top of anchor trench is therefore unclear. Could this detail be clarified please?



I do hope the details expressed are clearly and that these issues can be easily resolved, however should you wish to discuss, please contact me.

Yours sincerely

Peter Stanley
Geotechnical Engineer
Geoscience

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 3
Regulating Layer
Assessment and
Test Results**

Report Number 1384r1v1d1014



Surface Condition Record

CQA2

Site:	Bryn Pica 4A	Surface:	Regulating Layer	Material:	
-------	--------------	----------	------------------	-----------	--

Date	Location	1m Lath	3m Lath	Strength	Pass/Fail	Comment	Non-Con No
02/09/2014	L1_1	7		N/A	Pass	Amgen rolling area	
02/09/2014	L1_2	6		N/A	Pass		
02/09/2014	L1_3	8		N/A	Pass		
02/09/2014	L1_4	9		N/A	Pass		
02/09/2014	L3_1		28	N/A	Pass		
02/09/2014	L3_2		31	N/A	Pass		
02/09/2014	L3_3		18	N/A	Pass	Amgen rolling area	
02/09/2014	L3_4		26	N/A	Pass		



Subgrade Acceptance Record

CQA3

Site:	Bryn Pica Phase 4A	Date:	2/9/14.
-------	--------------------	-------	---------

Area of Subgrade Under Consideration

A Whole area prepared following identification of soft spots last week.

The subgrade for the geosynthetic elements has been prepared in accordance with the Specification and its surface has been inspected visually. Testing has confirmed that this part of the subgrade has an acceptably smooth finish and survey work has shown the surface has been prepared to the correct line and level. There is no evidence of soft spots, ponded water, ice, snow, frozen ground, peat, vegetation, stones, rocks or any protrusions.

Both the CQA Engineer and the Contractors Representative consider that the area is suitable for lining works to proceed and the Contractor accepts responsibility to maintain the subgrade in this condition until covered with lining materials.

Engineer	Den Rees	Signature	S.D. Rees
----------	----------	-----------	-----------

Contractor	CON 6/1/14	Signature	C. D. Rees
------------	------------	-----------	------------



Subgrade Acceptance Record

CQA3

Site:	Bryn Pica Phase 4A	Date:	25/9/14
-------	--------------------	-------	---------

Area of Subgrade Under Consideration

South eastern corner.

The subgrade for the geosynthetic elements has been prepared in accordance with the Specification and its surface has been inspected visually. Testing has confirmed that this part of the subgrade has an acceptably smooth finish and survey work has shown the surface has been prepared to the correct line and level. There is no evidence of soft spots, ponded water, ice, snow, frozen ground, peat, vegetation, stones, rocks or any protrusions.

Both the CQA Engineer and the Contractors Representative consider that the area is suitable for lining works to proceed and the Contractor accepts responsibility to maintain the subgrade in this condition until covered with lining materials.

Engineer	SB BEN REES	Signature	SB Ben
----------	-------------	-----------	--------

Contractor	C. H. L.	Signature	CSU DUA
------------	----------	-----------	---------

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14
Project Name: Bryn Pica
ATS Sample No: 3075

Client: Amgen Cymru
Address: Bryn Pica
 Llwydcoed
 Aberdare
 CF44 0BX

Site Ref / Hole ID: R01

Depth (m):

Sample No:

Sample Type: Bulk

Sampling Certificate Received: No

Material Description: Brown grey very clayey very sandy GRAVEL

Location in Works: Unknown

Material Source: N/A

Date Sampled: Unknown

Material Supplier: N/A

Sampled By: Client

Specification: BS1377

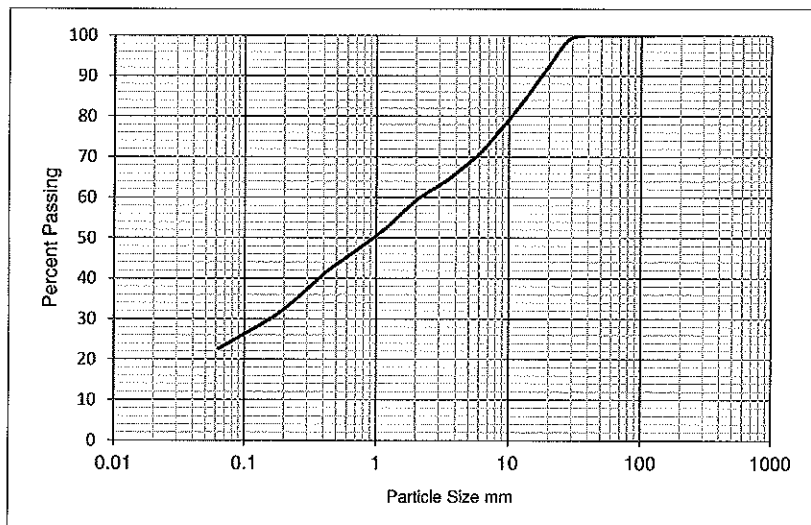
Date Received: 19 June 2014

Date Tested: 09 July 2014

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	92
14	85
10	79
6.3	71
5.0	69
3.35	64
2.00	59
1.18	52
0.600	45
0.425	42
0.300	37
0.212	33
0.150	30
0.063	23

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	41	Dry mas of sample, kg	N/A
Sand	36		
Silt / Clay	23	8.5	

Remarks: Material does not comply with Table 2 of clients specification due to the amount of material passing the 0.6mm sieve.

QA Ref. BS1377 - 2 Rev 3.0	 Apex Testing Solutions Slurri Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver <i>K. Maiden</i>	Date 11/07/2014	Fig PSD
L Maiden, Laboratory Supervisor					

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14
Project Name: Bryn Pica
ATS Sample No: 3076

Client: Amgen Cymru
Address: Bryn Pica
 Llwydcoed
 Aberdare
 CF44 0BX

Site Ref / Hole ID: R02

Depth (m):

Sample No:

Sample Type: Bulk

Sampling Certificate Received: No

Material Description: Brown grey very clayey very sandy GRAVEL

Location in Works: Unknown

Material Source: N/A

Date Sampled: Unknown

Material Supplier: N/A

Sampled By: Client

Specification: BS1377

Date Received: 19 June 2014

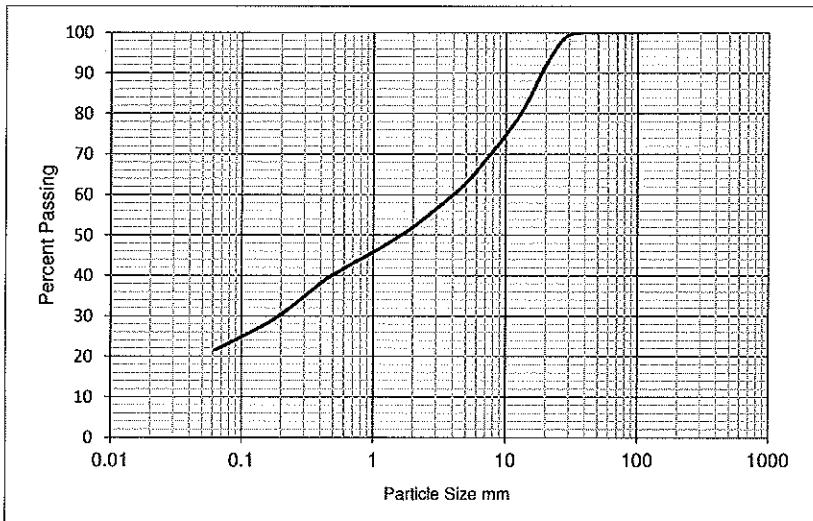
Date Tested: 09 July 2014

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	92
14	82
10	75
6.3	66
5.0	63
3.35	58
2.00	52
1.18	47
0.600	42
0.425	39
0.300	35
0.212	31
0.150	28
0.063	22

Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	48	Dry mas of sample, kg	N/A
Sand	30		
Silt / Clay	22	11.1	N/A

Remarks: Material does not comply with Table 2 of clients specification due to the amount of material passing the 0.6mm sieve.

QA Ref. BS1377 - 2 Rev 3.0	 Apex Testing Solutions Storm Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver  L Maiden, Laboratory Supervisor	Date 11/07/2014	Fig PSD
----------------------------------	---	---	---	--------------------	------------

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14	Client: Amgen Cymru	
Project Name: Bryn Pica	Address: Bryn Pica Llwydcoed Aberdare CF44 0BX	
ATS Sample No: 3250		

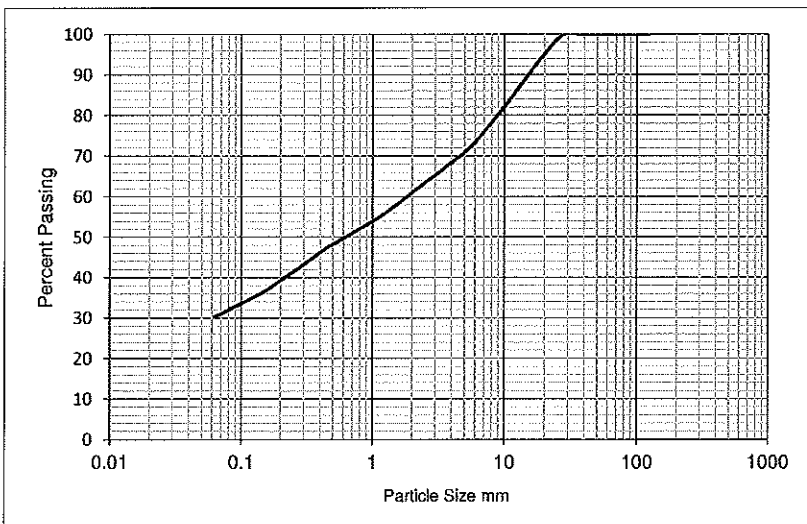
Site Ref / Hole ID: RØ3	Depth (m):	
Sample No:	Sample Type: Bulk	
Sampling Certificate Received: No	Material Description: Brown very silty very sandy GRAVEL	
Location in Works: Unknown	Material Source: N/A	
Date Sampled: Unknown	Material Supplier: N/A	
Sampled By: Client	Specification: BS1377	
Date Received: 14 July 2014	Date Tested: 25 July 2014	

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	95
14	88
10	82
6.3	74
5.0	71
3.35	66
2.00	61
1.18	55
0.600	50
0.425	47
0.300	43
0.212	40
0.150	37
0.063	30

Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	39	Dry mas of sample, kg	N/A
Sand	36		
Silt / Clay	30	8.3	

Remarks:

QA Ref. BS1377 - 2 Rev 3.0		Apex Testing Solutions Sturml Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver L Maiden, Laboratory Supervisor	Date 04/08/2014	Fig PSD
---	--	--	----------	---	---------------------------	-------------------



Subgrade Acceptance Record

CQA3

Site:	Bryn Pica Phase 4A	Date:	2/9/14.
-------	--------------------	-------	---------

Area of Subgrade Under Consideration

A White area prepared following identification of soft spots last week.

The subgrade for the geosynthetic elements has been prepared in accordance with the Specification and its surface has been inspected visually. Testing has confirmed that this part of the subgrade has an acceptably smooth finish and survey work has shown the surface has been prepared to the correct line and level. There is no evidence of soft spots, ponded water, ice, snow, frozen ground, peat, vegetation, stones, rocks or any protrusions.

Both the CQA Engineer and the Contractors Representative consider that the area is suitable for lining works to proceed and the Contractor accepts responsibility to maintain the subgrade in this condition until covered with lining materials.

Engineer	Den Rea	Signature	S.D. Rea.
----------	---------	-----------	-----------

Contractor	CEM 6/10/14	Signature	C.D. W.
------------	-------------	-----------	---------



Subgrade Acceptance Record

CQA3

Site:	Bryn Pica Phase 4A	Date:	2/9/14.
-------	--------------------	-------	---------

Area of Subgrade Under Consideration

A Whole area prepared following identification of soft spots last week.

The subgrade for the geosynthetic elements has been prepared in accordance with the Specification and its surface has been inspected visually. Testing has confirmed that this part of the subgrade has an acceptably smooth finish and survey work has shown the surface has been prepared to the correct line and level. There is no evidence of soft spots, ponded water, ice, snow, frozen ground, peat, vegetation, stones, rocks or any protrusions.

Both the CQA Engineer and the Contractors Representative consider that the area is suitable for lining works to proceed and the Contractor accepts responsibility to maintain the subgrade in this condition until covered with lining materials.

Engineer	Den Rea	Signature	S.D. Rea
----------	---------	-----------	----------

Contractor	CEM Evans	Signature	C.E. Evans
------------	-----------	-----------	------------



Subgrade Acceptance Record

CQA3

Site:	Bryn Pica Phase 4A	Date:	25/9/14
-------	--------------------	-------	---------

Area of Subgrade Under Consideration

South eastern corner.

The subgrade for the geosynthetic elements has been prepared in accordance with the Specification and its surface has been inspected visually. Testing has confirmed that this part of the subgrade has an acceptably smooth finish and survey work has shown the surface has been prepared to the correct line and level. There is no evidence of soft spots, ponded water, ice, snow, frozen ground, peat, vegetation, stones, rocks or any protrusions.

Both the CQA Engineer and the Contractors Representative consider that the area is suitable for lining works to proceed and the Contractor accepts responsibility to maintain the subgrade in this condition until covered with lining materials.

Engineer	S. B. BEN ROSE	Signature	S. B. BEN ROSE
----------	----------------	-----------	----------------

Contractor	C. H. LEE	Signature	C. H. LEE
------------	-----------	-----------	-----------

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 4
Delivery Records**

Report Number 1384r1v1d1014



Geosynthetic Materials Inventory

CQA4

Bryn Pica Phase 4A											Manufacturer & Material Type			ABG Pozidrain		
Site	Batch No	Roll No	Length	Width	MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved						
26/03/2014	W10646	1	90	44	Y	Y			Y							
26/03/2014	W10646	2	90	44	Y	Y			Y							
26/03/2014	W10646	3	90	44	Y	Y			Y							
26/03/2014	W10646	4**	90	44	Y	Y	GCP-04	Edge damaged	Y	Damaged edge excluded from works						
26/03/2014	W10646	5	90	44	Y	Y			Y							
26/03/2014	W10646	6	90	44	Y	Y			Y							
26/03/2014	W10646	7	90	44	Y	Y			Y							
26/03/2014	W10646	8	90	44	Y	Y			Y							
26/03/2014	W10646	9	90	44	Y	Y			Y							
26/03/2014	W10646	10	90	44	Y	Y			Y							
26/03/2014	W10646	11	90	44	Y	Y			Y							
26/03/2014	W10646	12	90	44	Y	Y			Y							
26/03/2014	W10646	13	90	44	Y	Y			Y							
26/03/2014	W10646	14*	90	44	Y	Y	GCP-14		Y							
26/03/2014	W10646	15	90	44	Y	Y			Y							
26/03/2014	W10646	16	90	44	Y	Y			Y							
26/03/2014	W10646	17	90	44	Y	Y			Y							
26/03/2014	W10646	18	90	44	Y	Y			Y							
26/03/2014	W10646	19	90	44	Y	Y			Y							
26/03/2014	W10646	20	90	44	Y	Y			Y							
26/03/2014	W10646	21*	90	44	Y	Y	GCP-21		Y							



CQA4

Site	Bryn Pica Phase 4A	Manufacturer & Material Type	GSE Ultraflex
------	--------------------	------------------------------	---------------

[illegible]



Shipping Order – Packing List – Original – Not Negotiable

Page 1 of 1

GSE Lining Technology GmbH Warboys, HUNTINGDON

Number VKL+106465
Voucher VKL+106465

Received at Warboys, HUNTINGDON from GSE Lining Technology GmbH the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to the rates and contract agreed to in writing by GSE Lining Technology GmbH and Carrier. GSE Lining Technology GmbH's obligation to pay freight charges for the shipment is conditioned on (1) the existence of a separate written contract with the Carrier transporting the freight and (2) the Carrier's name appearing on this Bill of Lading, and other carriers must look solely to a party other than GSE Lining Technology GmbH for payment.

Ship to: CELTIC LINING Ltd. Bryn Pica Landfill Site Amgen Cymru/Cynon Valley Waste Disposal Llwydcoed Aberdare CF44 0BX Rhondda Cynon Taf	Ship date: Jan 22, 2014 Branch plant: 1815 Sales order: VK104359
---	---

Shipping instructions: Great Britain

Line no.	Shipped quantity	Product code	Unit	Kind of Package, Description of Articles, Special Marks and Exceptions	Weight kg	Project
	16.054,50	LDT-100AM-BBB-V-00	sqm	GSE UltraFlex Textured 1.0 mm HS Code: 39201089	17.902,00	Freight charges are prepaid unless marked collect.
1				420051761 GSE UltraFlex Textured 1.0 mm	1.646,00	Check box if collect ☐
2				420051763 GSE UltraFlex Textured 1.0 mm	1.642,00	
3				420051766 GSE UltraFlex Textured 1.0 mm	1.646,00	
4				420051774 GSE UltraFlex Textured 1.0 mm	1.646,00	
5				420051775 GSE UltraFlex Textured 1.0 mm	1.644,00	
6				420051780 GSE UltraFlex Textured 1.0 mm	1.646,00	Customer PO number
7				420051844 GSE UltraFlex Textured 1.0 mm	1.646,00	Bryn Pica LFS
8				420051847 GSE UltraFlex Textured 1.0 mm	1.640,00	If this shipment is to be delivered to consignee, consignor shall sign the following statement. Carrier may decline to deliver this shipment without payment of freight and all other lawful charges.
9				420051848 GSE UltraFlex Textured 1.0 mm	1.638,00	
10				420051875 GSE UltraFlex Textured 1.0 mm	1.652,00	
11				420051877 GSE UltraFlex Textured 1.0 mm	1.654,00	
						Signature of Consignor
						Local Verification Signed
						X
						PRO Number
						UK101060
						Seal numbers
						Truckers P.O. #
						PO640

Total quantity: 16.054,50

Total weight: 18.100,00

Carrier name: Manchett's Transport LTD

Carrier signature: _____

Date: _____



ABG Limited
E7 • Meltham Mills Road • Meltham
West Yorkshire • HD9 4DS
Tel: +44 (0) 1484 852992
Fax: +44 (0) 1484 854048
E-Mail: admin@abgltd.com

VAT Reg. No. 516 3755 43

DELIVERY NOTE

No. DH 33538

Account To: Celtic Lining Ltd
Forest View
Banalog Terrace
Hollybush
Blackwood
Newport
NP12 0SF

Deliver To: Celtic Lining Ltd
Bryn Pica Landfill Site
Llwydcoed
Abberdare
CF44 0BX

Reference MEL JONES

Tel: 01495 227 477

Despatch Date 26 Mar 2014

Your Order No. TBC

Our Order No. 32470

Carrier *Sublime*

Special Instructions:

Site contact Mel Jones 07974 374390

Quantity Ordered	Quantity Delivered	Description
8316.000	8316.000	Pozidrain 6S250D/NW8 4.4m x 90m 21 rolls. Delivered Price <i>2124 / W10646 / 1-5 1,2,3,4,5 ✓</i> <i>3124 / W10646 / 6-9 6,7,8,9 ✓</i> <i>1134 / W10646 / 10-14 10,11,12,13,14 ✓</i> <i>2134 / W10646 / 15-21</i> <i>15,16,17,18,19,20,21 ✓</i> <i>Actually:</i> <i>3134.</i> UNLOADING SLINGS • Slings are supplied for the safe off loading of ABG Ltd rolls. • The slings are designed for single use for removing rolls from the delivery vehicle to an appropriate site storage location. • The slings are <u>not</u> for use in transporting the product around the site. • ABG Ltd will not be liable for any failure of the slings after initial unloading. ABG LTD, E7 MELTHAM MILLS ROAD, MELTHAM, HOLMEIRTH HD9 4DS

Received, in sound condition - **All boxes MUST be completed**

Signed:

Print Name:

CERI EVANS

Date:

26/3/2014

Time:

16:20



Geosynthetic Materials Inventory

CQA4

Site	Bryn Pica Phase 4A				Manufacturer & Material Type	ABG Pozidrain			
------	--------------------	--	--	--	------------------------------	---------------	--	--	--

Date	Batch No	Roll No	Length	Width	MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved
26/03/2014	W10646	2	90	44						
"	"	16	90	44						
"	"	11	90	44						
"	"	8	90	44						
"	"	9	90	44						
"	"	6	90	44						
"	"	19	90	44						
"	"	20	90	44						
"	"	21*	90	44						

* Sample

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 5
Leachate Drainage
Stone Test Results**

Report Number 1384r1v1d1014

TEST REPORT
PARTICLE SIZE DISTRIBUTION
BS EN 933-1

Project No.: **D4055-14**
Project Name: **Bryn Pica Phase 4B**
Sample No.: **2576**

Client: **Amgen Cymru**
Address: **Bryn Pica,
Llwydcoed, Aberdare,
Rhondda Cynon Taf,
CF44 0BX**

Site Reference: **ST01**
Location in works: **Unknown**

Sample Type: **Bulk**
Material Description: **Grey slightly silty
slightly sandy GRAVEL**

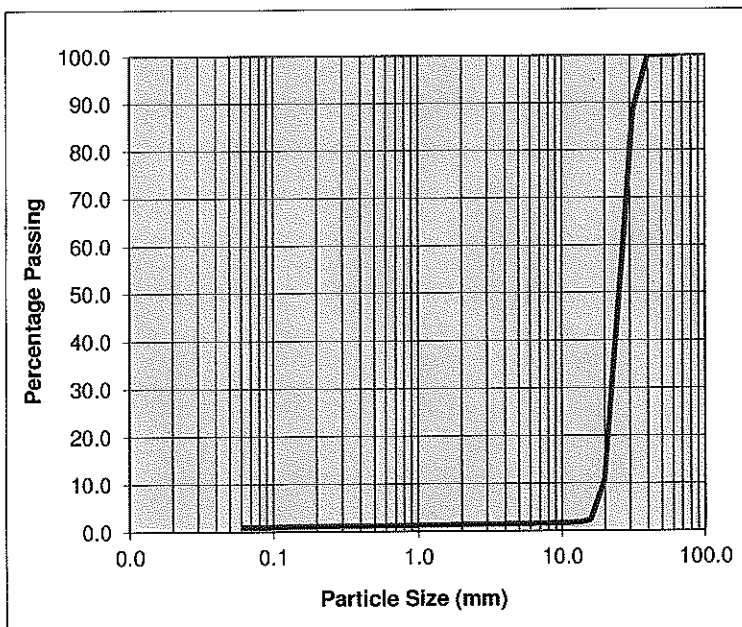
Date Sampled: **24 March 2014**
Sampled By: **Client**
Sampling Certificate
Received: **No**
Date Received: **25 March 2014**

Material Source: **Unknown**
Material Supplier: **Unknown**
Specification: **BS EN 13242**
Date Tested: **09 April 2014**

TEST RESULTS

Particle Size (mm)	Percentage Passing	Specification
63.0	100	
40.0	100	
31.5	88	
28.0	67	
20.0	11	
16.0	2	
14.0	2	
10.0	2	
8.0	2	
6.3	2	
4.0	1	
2.0	1	
1.0	1	
0.5	1	
0.250	1	
0.125	1	
0.063	1	

Moisture Content (%)	0.4
-----------------------------	------------



Remarks:

QA Ref.

EN 933-1
Rev. 1.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est,
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



Approver

R. Anstee

Date

10/04/2014

Fig.

R Anstee, Laboratory Manager

TEST REPORT

PARTICLE SIZE DISTRIBUTION

BS EN 933-1

Project No.: **D4055-14**
 Project Name: **Bryn Pica Phase 4B**
 Sample No.: **2577**

Client: **Amgen Cymru**
 Address: **Bryn Pica,
 Llwydcoed, Aberdare,
 Rhondda Cynon Taf,
 CF44 0BX**

Site Reference: **ST02**
 Location in works: **Unknown**

Sample Type: **Bulk**
 Material Description: **Grey slightly silty
 slightly sandy GRAVEL**

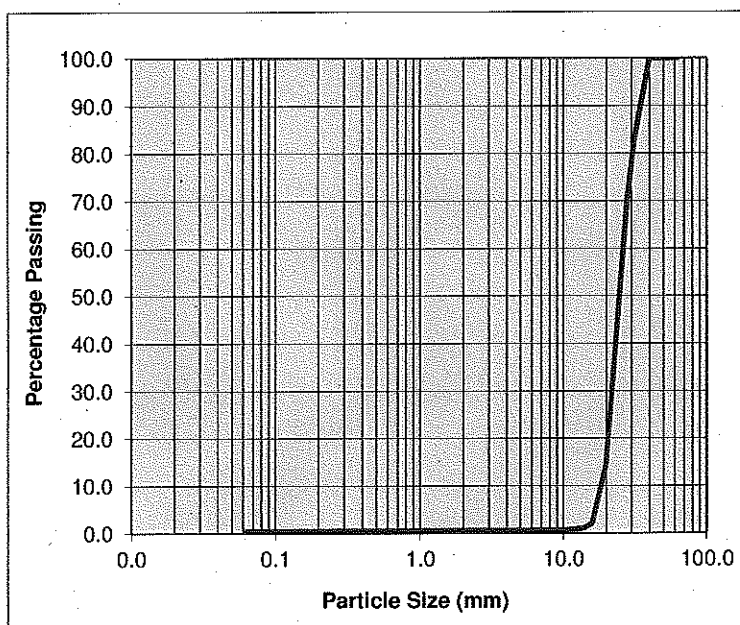
Date Sampled: **24 March 2014**
 Sampled By: **Client**
 Sampling Certificate Received: **No**
 Date Received: **25 March 2014**

Material Source: **Unknown**
 Material Supplier: **Unknown**
 Specification: **BS EN 13242**
 Date Tested: **09 April 2014**

TEST RESULTS

Particle Size (mm)	Percentage Passing	Specification
63.0	100	
40.0	100	
31.5	83	
28.0	70	
20.0	15	
16.0	2	
14.0	1	
10.0	1	
8.0	1	
6.3	1	
4.0	1	
2.0	1	
1.0	1	
0.5	1	
0.250	0	
0.125	0	
0.063	0	

Moisture Content (%)	0.4
----------------------	-----



Remarks:

QA Ref.

EN 933-1
Rev. 1.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est,
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



Approver

R. Anstee

Date

10/04/2014

Fig.

R Anstee, Laboratory Manager

TEST REPORT
PARTICLE SIZE DISTRIBUTION
BS EN 933-1

Project No.: **D4055-14**
Project Name: **Bryn Pica Phase 4B**
Sample No.: **2578**

Client: **Amgen Cymru**
Address: **Bryn Pica,
Llwydcoed, Aberdare,
Rhondda Cynon Taf,
CF44 0BX**

Site Reference: **ST03**
Location in works: **Unknown**

Sample Type: **Bulk**
Material Description: **Grey slightly silty
slightly sandy GRAVEL**

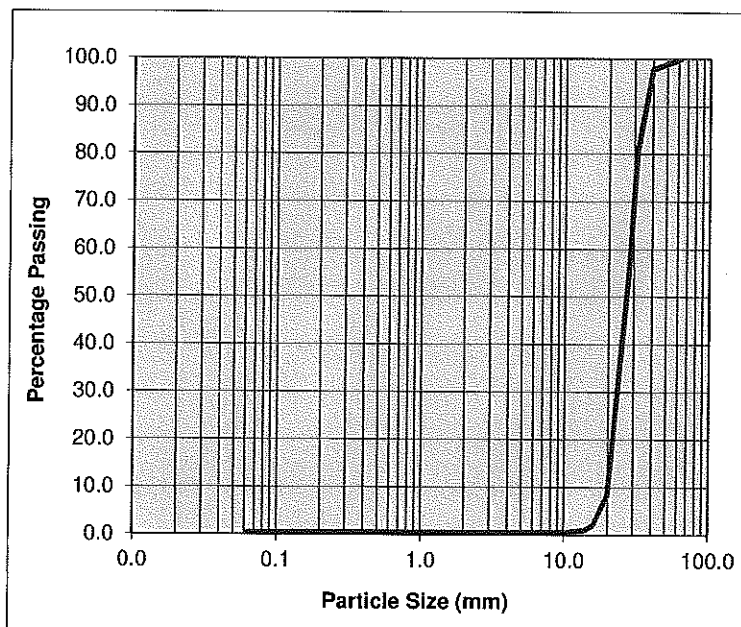
Date Sampled: **24 March 2014**
Sampled By: **Client**
Sampling Certificate
Received: **No**
Date Received: **25 March 2014**

Material Source: **Unknown**
Material Supplier: **Unknown**
Specification: **BS EN 13242**
Date Tested: **09 April 2014**

TEST RESULTS

Particle Size (mm)	Percentage Passing	Specification
63.0	100	
40.0	98	
31.5	81	
28.0	57	
20.0	8	
16.0	2	
14.0	1	
10.0	1	
8.0	0	
6.3	0	
4.0	0	
2.0	0	
1.0	0	
0.5	0	
0.250	0	
0.125	0	
0.063	0	

Moisture Content (%)	0.3
-----------------------------	------------



Remarks:

QA Ref.	 Apex Testing Solutions Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver	Date	Fig.
EN 933-1 Rev. 1.0			 R Anstee, Laboratory Manager	10/04/2014	

TEST REPORT
PARTICLE SIZE DISTRIBUTION
BS EN 933-1

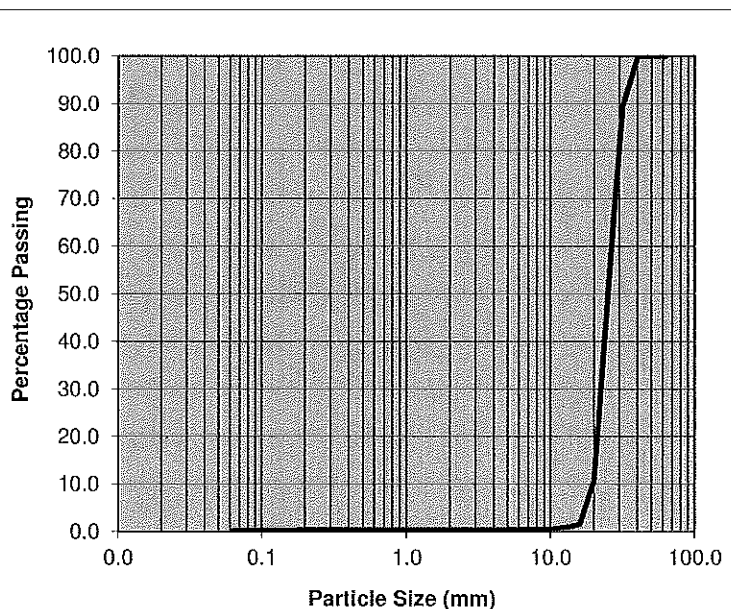
Project No.: D4114-14	Client: Amgen Cymru
Project Name: Bryn Pica Phase 4B	Address: Bryn Pica, Llwydcoed, Aberdare, Rhondda Cynon Taf, CF44 0BX
Sample No.: 3508	

Site Reference: ST04	Sample Type: Bulk
Location in works: Unknown	Material Description: Grey slightly silty GRAVEL
Date Sampled: Unknown	Material Source: Unknown
Sampled By: Client	Material Supplier: Unknown
Sampling Certificate Received: No	Specification: BS EN 13242
Date Received: 21 August 2014	Date Tested: 28 August 2014

TEST RESULTS

Particle Size (mm)	Percentage Passing	Specification
63.0	100	
40.0	100	
31.5	90	
28.0	71	
20.0	11	
16.0	2	
14.0	1	
10.0	1	
8.0	1	
6.3	0	
4.0	0	
2.0	0	
1.0	0	
0.5	0	
0.250	0	
0.125	0	
0.063	0	

Moisture Content (%)	0.2
----------------------	-----



Remarks:

QA Ref.

EN 933-1
Rev. 1.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est,
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



Approver

R. Anstee

Date

28/08/2014

Fig.

R Anstee, Laboratory Manager

LABORATORY TEST CERTIFICATE



Edinburgh Road
Springhill
Shotts
ML7 5DT

Tel: 01501 822 244
Fax 01501 825 044

email: info@mattest.org
Website: www.mattest.org

Certificate No : 14/352 - 01
To : Richard Anstee
Client : Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
CF33 6BZ

Dear Sirs,

TEN PER CENT FINES VALUE (TFV) - BS 812 : PART 111 : 1990

Introduction

We refer to a bulk sample taken from Bryn Pica Phase 4B and delivered to our laboratory on 02nd May 2014.

Material & Source

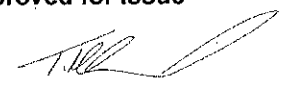
Sample Reference : 2576
Sampled By : Client
Sampling Certificate : Yes
Location : Not Supplied
Designation (d/D) : Not Supplied
Description : Grey slightly silty slightly sandy GRAVEL.
Date Sampled : 24th March 2014
Date Tested : 02nd May 2014 Onwards
Source : Not Supplied
Test Condition : Soaked

Test Results;

TEN PER CENT FINES VALUE (SOAKED) 200 kN

Remarks

Approved for Issue


T McLelland (Quality Manager)

Date 12/05/2014



LABORATORY TEST CERTIFICATE



Edinburgh Road
Springhill
Shotts
ML7 5DT

Tel: 01501 822 244
Fax 01501 825 044

email: info@mattest.org
Website: www.mattest.org

Certificate No : 14/352 - 02
To : Richard Anstee
Client : Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
CF33 6BZ

Dear Sirs,

TEN PER CENT FINES VALUE (TFV) - BS 812 : PART 111 : 1990

Introduction

We refer to a bulk sample taken from Bryn Pica Phase 4B and delivered to our laboratory on 02nd May 2014.

Material & Source

Sample Reference : 2577
Sampled By : Client
Sampling Certificate : Yes
Location : Not Supplied
Designation (d/D) : Not Supplied
Description : Grey slightly silty slightly sandy GRAVEL.
Date Sampled : 24th March 2014
Date Tested : 02nd May 2014 Onwards
Source : Not Supplied
Test Condition : Soaked

Test Results;

TEN PER CENT FINES VALUE (SOAKED) 190 kN

Remarks

Approved for Issue


T McLelland (Quality Manager)

Date 12/05/2014



LABORATORY TEST CERTIFICATE



Edinburgh Road
Springhill
Shotts
ML7 5DT

Certificate No : 14/352 - 03
To : Richard Anstee
Client : Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
CF33 6BZ

Tel: 01501 822 244
Fax 01501 825 044

email: info@mattest.org
Website: www.mattest.org

Dear Sirs,

TEN PER CENT FINES VALUE (TFV) - BS 812 : PART 111 : 1990

Introduction

We refer to a bulk sample taken from Bryn Pica Phase 4B and delivered to our laboratory on 02nd May 2014.

Material & Source

Sample Reference : 2578
Sampled By : Client
Sampling Certificate : Yes
Location : Not Supplied
Designation (d/D) : Not Supplied
Description : Grey slightly silty slightly sandy GRAVEL.
Date Sampled : 24th March 2014
Date Tested : 02nd May 2014 Onwards
Source : Not Supplied
Test Condition : Soaked

Test Results;

TEN PER CENT FINES VALUE (SOAKED) 180 kN

Remarks

Approved for Issue


T McLelland (Quality Manager)

Date 12/05/2014



LABORATORY TEST CERTIFICATE



Certificate No : 14/769 - 01
To : Richard Anstee
Client : Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
CF33 6BZ

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032
Fax: 0141 774 3552

email: info@mattest.org
Website: www.mattest.org

Dear Sirs,

TEN PER CENT FINES VALUE (TFV) - BS 812 : PART 111 : 1990

Introduction

We refer to a bulk sample taken from Bryn Pica Phase 4B and delivered to our laboratory on 04th September 2014.

Material & Source

Sample Reference : 3251
Sampled By : Client
Sampling Certificate : Yes
Location : Not Supplied
Designation (d/D) : Not Supplied
Description : Grey slightly sandy GRAVEL.
Date Sampled : Not Supplied
Date Tested : 04th September 2014 Onwards
Source : Not Supplied
Test Condition : Soaked

Test Results;

TEN PER CENT FINES VALUE (SOAKED) 190 kN

Remarks

Approved for Issue

C Ferrie (Laboratory Manager)

Date 18/09/2014



2643

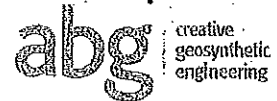
**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 6
Pozidrain
Manufacturers QC Data**
Report Number 1384r1v1d1014

Certificate of Conformity



Scheme:	Bryn Pica Landfill Site		
Product:	Pozidrain 6S250D/NW8 4.4m x 90m		
Manufacturer:	ABG Ltd, E7 Meltham Mills Road, Meltham, Holmfirth, HD9 4DS		
Date of manufacture:	Mar 14	Date of dispatch:	26 Mar 14
Consignment No:	01	Delivery note no:	DH33536
Number of rolls	21		
Batch Information — Date/Job/Roll No:	2124/10646/1-5 3134/10646/6-9 1134/10646/10-14 2134/10646/15-21		
Product conforms to datasheet reference (attached)	POZI 6S250D.NW8-G.CE		
Additional test data details	None		

I certify that the above information is a true and correct statement relating to the goods supplied.

Signed by:

Name and title : Peter van Ruiten, Operations Director

Date: 27/3/14

Certificate issued by: ABG Ltd



INVESTORS
IN PEOPLE



abg Ltd 67-69, New Street, Leeds, West Yorkshire LS2 8PL United Kingdom
sales +44 (0)113 255 1001 export sales +44 (0)113 255 1002
www.abgltd.com

Pozidrain 6S250D/NW8

POZIDRAIN 6S250D/NW8 is a geocomposite drainage layer comprising a high performance second generation single cusped HDPE (High Density Polyethylene) core with a geotextile filter thermally bonded on both sides. The textile filters have flap extending beyond the core on both edges. The major application is its use instead of stone drainage layers in landfill containment systems.

Geocomposite Properties

Thickness at 2kPa	(mm)	7.3	±10%	EN ISO 9863-1
Mass per unit area	(g/m ²)	840	approx	EN ISO 9864
Tensile strength MD / CMD	(kN/m)	22 / 19	-10%	EN ISO 10319
Elongation at peak MD / CMD	(%)	45 / 45	nominal	EN ISO 10319
CBR puncture resistance	(N)	3 750	-20%	EN ISO 12236
<u>Perpendicular Water Inflow</u> (dimple side only)				
Water flow at 50mm head	(l/m ² ·s)	103	±30%	EN ISO 11058
At 2kPa permeability (coefficient)	(m/s)	2.5 x 10 ⁻³	±30%	EN ISO 11058
Breakthrough head	(mm)	0		BS 6906 part 3

<u>In-plane water flow MD and CMD</u>		<u>HG = 1.0</u>		<u>HG = 0.1</u>	<u>Hydraulic gradient</u>
at 20kPa confining pressure	(l/m·s)	1.60	±0.15	0.48	±0.05 EN ISO 12958
at 100kPa confining pressure	(l/m·s)	1.35	±0.15	0.38	±0.05 EN ISO 12958
at 200kPa confining pressure	(l/m·s)	1.10	±0.15	0.29	±0.05 EN ISO 12958

with soft foam contact surfaces to simulate textile intrusion into the core due to soil pressure

Resistance to weathering	To be covered in 14 days	EN 12224
Resistance to chemicals	Excellent	EN 14030
Design life	120 years (manufacturer's declaration)	

Geotextile Properties

Thickness at 2kPa	(mm)	1.2	±20%	EN ISO 9863-1
Tensile strength MD/CMD	(kN/m)	9.5 / 9.5	-13%	EN ISO 10319
Pore size O ₉₀	(µm)	120	±30%	EN ISO 12956
CBR puncture resistance	(N)	1600	-20%	EN ISO 12236
Dynamic perforation cone drop	(mm)	32	+20%	EN ISO 13433

Type and material Non-woven needle-punched and heat-treated long staple fibre polypropylene

Product Dimensions

Standard roll dimensions 4.4 x 90 m. Other sizes on request.

Notes

1. The values given are indicative and correspond to nominal results obtained in our laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes without notice at any time.
2. The tolerance on roll length is 1.5% and on roll width is 1.0%; in multi-core products this may manifest itself between core elements.
3. Guidance on interface shear strength, creep and certain other parameters is available. Site specific tests are strongly recommended.
4. Final determination of the suitability of any information is the sole responsibility of the user. ABG will be pleased to discuss the use of this or any other product but responsibility for selection of a material and its application in any specific project remains with the user.
5. Please refer to separate sheets for fixing instructions. A CESH certificate is available on request.



0799-CPD-30

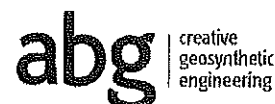
POZIDRAIN 6S250D/NW8-GCE

abg ltd, E7 Meltham Mills Rd, Meltham, West Yorkshire, HD9 4DS
UK t 01484 852096 e geo@abgltd.com Export t +44(0)1484 852250 e export@abgltd.com
www.abgltd.com



Pozidrain

6S250D/NW8 DOP JANUARY 2014



- 1) Unique identification code of the product-type: Pozidrain 6S250D/NW8
- 2) Type, batch or serial number or any other element allowing identification of the construction product: Pozidrain 6S250D/NW8
- 3) Intended uses of the construction product: EN 13252:2000 + A1:2005 F + S + D
Geocomposite for drainage applications.
- 4) Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK
01484 852096
geo@abgltd.com
- 5) System of assessment and verification of constancy of performance: System 2+
- 6) In case of the declaration of performance concerning a construction product covered by a harmonised standard: KIWA tBU 0799 performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control under System 2+.
Certificate: 0799-CPD-30

7) Declared performance:

Essential Characteristics	Test Standard	Performance	Unit	Tolerance	Harmonised Standards
Tensile strength MD / CMD	EN ISO 10319	22.0 / 19.0	(kN/m)	(-3.0kN/m) / (-3.0kN/m)	
Dynamic perforation resistance *	EN ISO 13433	32.0	(mm)	(+8.0mm)	
Resistance to static puncture *	EN ISO 12236	1.60	(kN)	(-0.32kN)	
Characteristic opening size *	EN ISO 12956	120	(µm)	(±36µm)	
Water permeability *	EN ISO 11058	115	(mm/s)	(-35mm/s)	EN 13252:2000 + A1:2005
Water flow capacity in the plane	EN ISO 12958	160 x 10 ⁻⁵	(m ² /s)	(-40 x 10 ⁻⁵ m ² /s)	
Durability		To be covered within 2 weeks - Predicted to be durable for a minimum of 25 years in natural soils with 4 < pH < 9 and soil temperatures < 25°C			
Dangerous Materials		NPD			

* Values represent the filter textile only

- 8) The performance of the product identified in point 1 and 2 is in conformity with the declared performance in point 7. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

Peter van Ruiten – Operations Director 02/01/2014 Meltham

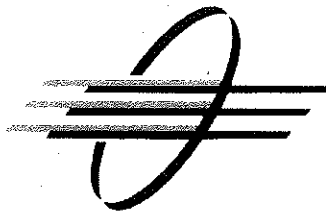
**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 7
Pozidrain Conformance
Test Results**

Report Number 1384r1v1d1014



BICS Laboratories Ltd

Reliable testing, Superior service

T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk

REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-J799/a

Report Date 28/04/2014
Client Amgen Cymru/Amgen Rhondda Ltd, Bryn Pica, Aberdare, CF44 0BX
Contact Ceri Evans
Contract Reference Bryn Pica Landfill Site {Phase 4A Perm Cap}
Client PO/Ref No 10969

Material Tested Geocomposite
Date Received 11/04/2014
Sample ID GCP-04, GCP-14 & GCP-21

Tests Requested Tensile Properties - BSEN ISO 10319:2008
Puncture Resistance - BSEN ISO 12236:2006
In Plane Water Flow - BSEN ISO 12958:2010
Characteristic Opening Size - BSEN ISO 12956:2010

If you have any questions or require additional information, please do not hesitate to contact us.

Report Authorisation:

Ryan Hackney
Laboratory Manager
28/04/2014



4438

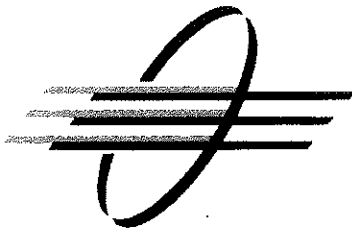
Page 1 of 4

Tests Marked with an asterisk (*) in this report are not UKAS accredited, and therefore are not included in the UKAS Accreditation Schedule for our laboratory.

Tests marked # have been subcontracted and are UKAS accredited. Tests marked F are accredited under the company's UKAS Flexible Scope.

This test report is in a condensed format, complete test details available upon request.

This test report may not be reproduced other than in full, except with prior written approval.



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 10969

Contract Ref: Bryn Pica Landfill Site {Phase 4A Perm Cap}
Material: Geocomposite
Sample ID: GCP-04

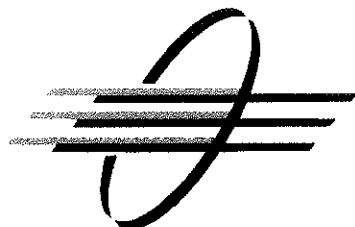
Report Ref No: BS-J799/a
BICS Labs ID: 01
Dates Tested: 11-25/04/2014

PARAMETER	TEST SPECIMEN NUMBER					MEAN	Std Dev
	1	2	3	4	5		
Tensile Properties (BSEN ISO 10319:2008)							
GC Tensile Strength kN/m (MD)	24.3	22.6	24.4	26.1	25.3	24.6	1.3
GC Tensile Strength kN/m (CD)	31.8	29.7	28.2	26.1	26.4	28.5	2.4
GC Tensile Strain % (MD)	36.1	35.4	42.6	42.3	36.2	38.5	3.6
GC Tensile Strain % (CD)	48.0	42.8	46.4	54.6	46.9	47.7	4.3
GT Tensile Strength kN/m (MD)	11.8	10.5	8.5	9.5	10.0	10.1	1.2
GT Tensile Strength kN/m (CD)	11.7	11.9	12.2	9.9	10.3	11.2	1.0
GT Tensile Strain % (MD)	51.0	41.9	44.7	48.7	37.5	44.7	5.4
GT Tensile Strain % (CD)	48.9	44.9	44.4	41.5	40.6	44.1	3.3
Puncture Resistance (BSEN ISO 12236:2006)							
GC Puncture Force kN	3.70	4.19	3.95	3.93	3.62	3.88	0.22
GC Puncture Displacement mm	44.5	44.0	44.2	46.5	42.4	44.3	1.5
GT Puncture Force kN	2.12	1.97	1.69	1.74	1.99	1.90	0.18
GT Puncture Displacement mm	46.5	44.3	43.3	41.4	43.2	43.7	1.9
In Plane Water Flow (BSEN ISO 12958:2010)							
{i=1.0, 100kPa, Soft to Soft Platens}							
l/m/sec (MD)	1.35	1.43	1.46			1.41	0.06
{i=1.0, 200kPa, Soft to Soft Platens}							
l/m/sec (MD)	1.03	0.95	0.97			0.98	0.04
Characteristic Opening Size (BSEN ISO 12956:2010)							
O ₉₀ µm	97					97	-

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



4438

GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 10969

Contract Ref: Bryn Pica Landfill Site {Phase 4A Perm Cap}
Material: Geocomposite
Sample ID: GCP-14

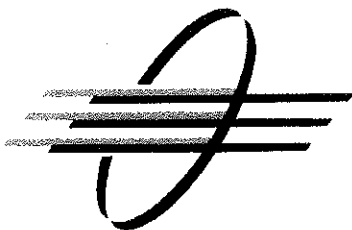
Report Ref No: BS-J799/a
BICS Labs ID: 02
Dates Tested: 11-25/04/2014

PARAMETER	TEST SPECIMEN NUMBER					MEAN	Std Dev
	1	2	3	4	5		
Tensile Properties (BSEN ISO 10319:2008)							
GC Tensile Strength kN/m (MD)	24.0	23.2	23.4	27.3	24.7	24.5	1.7
GC Tensile Strength kN/m (CD)	24.3	20.5	25.4	21.9	23.5	23.1	1.9
GC Tensile Strain % (MD)	37.5	37.5	39.4	42.2	36.8	38.7	2.2
GC Tensile Strain % (CD)	42.0	35.1	42.0	39.8	51.4	42.1	5.9
GT Tensile Strength kN/m (MD)	10.5	10.7	11.3	10.6	11.8	11.0	0.6
GT Tensile Strength kN/m (CD)	12.1	11.1	10.6	11.3	10.1	11.0	0.8
GT Tensile Strain % (MD)	37.4	40.5	43.0	38.3	41.8	40.2	2.3
GT Tensile Strain % (CD)	39.3	40.0	44.4	41.2	37.4	40.5	2.6
Puncture Resistance (BSEN ISO 12236:2006)							
GC Puncture Force kN	3.29	3.85	3.89	3.90	3.93	3.77	0.27
GC Puncture Displacement mm	40.7	47.6	45.4	47.6	44.9	45.2	2.8
GT Puncture Force kN	1.69	1.79	1.44	1.96	2.06	1.79	0.24
GT Puncture Displacement mm	42.1	41.5	39.2	44.0	44.7	42.3	2.2
In Plane Water Flow (BSEN ISO 12958:2010)							
{i=1.0, 100kPa, Soft to Soft Platens}							
l/m/sec (MD)	1.37	1.35	1.42			1.38	0.04
{i=1.0, 200kPa, Soft to Soft Platens}							
l/m/sec (MD)	1.04	1.02	1.05			1.04	0.02
Characteristic Opening Size (BSEN ISO 12956:2010)							
O ₉₀ µm	97					97	-

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 10969

Contract Ref: Bryn Pica Landfill Site {Phase 4A Perm Cap}
Material: Geocomposite
Sample ID: GCP-21

Report Ref No: BS-J799/a
BICS Labs ID: 03
Dates Tested: 11-25/04/2014

PARAMETER	TEST SPECIMEN NUMBER					MEAN	Std Dev
	1	2	3	4	5		
Tensile Properties (BSEN ISO 10319:2008)							
GC Tensile Strength kN/m (MD)	32.9	26.6	21.0	24.5	23.6	25.7	4.5
GC Tensile Strength kN/m (CD)	22.4	21.8	24.6	26.3	30.5	25.1	3.5
GC Tensile Strain % (MD)	34.0	38.5	36.4	42.1	42.9	38.8	3.7
GC Tensile Strain % (CD)	55.7	42.0	42.7	43.6	46.0	46.0	5.6
GT Tensile Strength kN/m (MD)	11.7	10.8	10.7	12.2	12.9	11.6	0.9
GT Tensile Strength kN/m (CD)	11.5	12.6	10.2	12.1	12.2	11.7	0.9
GT Tensile Strain % (MD)	39.9	40.5	43.7	45.1	41.6	42.2	2.2
GT Tensile Strain % (CD)	42.0	41.4	35.0	39.7	40.2	39.7	2.8
Puncture Resistance (BSEN ISO 12236:2006)							
GC Puncture Force kN	4.07	4.76	4.17	4.19	3.99	4.24	0.30
GC Puncture Displacement mm	47.4	49.6	30.4	48.9	47.3	44.7	8.1
GT Puncture Force kN	1.66	2.07	1.94	1.96	1.70	1.87	0.18
GT Puncture Displacement mm	40.2	44.5	43.5	44.7	41.7	42.9	1.9
In Plane Water Flow (BSEN ISO 12958:2010)							
{i=1.0, 100kPa, Soft to Soft Platens}							
l/m/sec (MD)	1.37	1.46	1.36			1.40	0.05
{i=1.0, 200kPa, Soft to Soft Platens}							
l/m/sec (MD)	0.98	0.98	1.10			1.02	0.07
Characteristic Opening Size (BSEN ISO 12956:2010)							
O ₉₀ µm	92					92	-

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 8
LLDPE Manufacturers
QC Data**

Report Number 1384r1v1d1014



ROLL TEST DATA REPORT

Inspection Certificate 3.1 (DIN EN 10204)

GSE Lining Technology GmbH

Roll No 420051844
Bill of Lading VKL+106465

ENVIRONMENTAL™

Roll Identification

Roll Number	420051844				
Product Name	LDT-100AM-BBB-V-00	Length	210 meters	Sheet Area	1.460 m²
Production Date	Oct 25, 2013	Width	6,95 meters	Weight	1.646 kilograms

Resin Information

Batch number CO13074-2400004300

Physical Properties

Test Method

Test Result

Core Thickness Average [mm]	ASTM D5994 MW	1,04
Core Thickness Minimum [mm]	ASTM D5994 MI	0,98
Core Thickness Maximum [mm]	ASTM D5994 MA	1,08
Carbon Black Content [%]	ASTM D1603	2,4
Carbon Black Dispersion [Cat]	ASTM D5596	1
MFR (190/2,16) [g/10min]	ASTM D1238(190/2,16)	0,2
Density [g/cm³]	ASTM D792	0,933
Dimensional Stability [%] MD	ASTM D1204	-0,3
Dimensional Stability [%] CMD	ASTM D1204	0,2
Break Strength [N/mm] MD	ASTM D6693 ZF	24
Break Strength [N/mm] CMD	ASTM D6693 ZF	24
Break Elongation [%] MD	ASTM D6693 BD	565
Break Elongation [%] CMD	ASTM D6693 BD	491
Tear Resistance [N] MD	ASTM D1004	140
Tear Resistance [N] CMD	ASTM D1004	143
Asperity Height [mm]	ASTM D7466 /A	0,53
Puncture Resistance [N]	ASTM D4833	411
IT [min]	ASTM D3895	124

Sales VK104359

Customer Name CELTIC LINING Ltd.

Project Name Bryn Pica Landfill Site

Location CF44 0BX Rhondda Cynon Taf

* Modified





ROLL TEST DATA REPORT

Inspection Certificate 3.1 (DIN EN 10204)

GSE Lining Technology GmbH

Roll No 420051847
Bill of Lading VKL+106465

ENVIRONMENTAL™

Roll Identification

Roll Number	420051847	Length	210 meters	Sheet Area	1.460 m²
Product Name	LDT-100AM-BBB-V-00	Width	6,95 meters	Weight	1.640 kilograms
Production Date	Okt 25, 2013				

Resin Information

Batch number CO13081-2400007383

Physical Properties

Test Method

Test Result

Core Thickness Average [mm]	ASTM D5994 MW	1,05
Core Thickness Minimum [mm]	ASTM D5994 MI	0,90
Core Thickness Maximum [mm]	ASTM D5994 MA	1,10
Carbon Black Content [%]	ASTM D1603	2,4
Carbon Black Dispersion [Cat]	ASTM D5598	1
MFR (190/2,16) [g/10min]	ASTM D1238(190/2,16)	0,2
Density [g/cm³]	ASTM D792	0,933
Dimensional Stability [%] MD	ASTM D1204	-0,3
Dimensional Stability [%] CMD	ASTM D1204	0,2
Break Strength [N/mm] MD	ASTM D6693 ZF	25
Break Strength [N/mm] CMD	ASTM D6693 ZF	22
Break Elongation [%] MD	ASTM D6693 BD	570
Break Elongation [%] CMD	ASTM D6693 BD	524
Tear Resistance [N] MD	ASTM D1004	140
Tear Resistance [N] CMD	ASTM D1004	143
Asperity Height [mm]	ASTM D7466 /A	0,53
Puncture Resistance [N]	ASTM D4833	411
OIT [min]	ASTM D3895	124

Sales VK104359

Customer Name CELTIC LINING Ltd.

Project Name Bryn Pica Landfill Site

Location CF44 0BX Rhondda Cynon Taf

* Modified





ROLL TEST DATA REPORT

Inspection Certificate 3.1 (DIN EN 10204)

GSE Lining Technology GmbH

Roll No 420051848
Bill of Lading VKL+106465

ENVIRONMENTAL™

Roll Identification

Roll Number	420051848	Length	210 meters	Sheet Area	1.460 m ²
Product Name	LDT-100AM-BBB-V-00	Width	6,95 meters	Weight	1.638 kilograms
Production Date	Okt 25, 2013				

Resin Information

Batch number CO13081-2400007383

Physical Properties

Test Method

Test Result

Core Thickness Average [mm]	ASTM D5994 MW	1,02
Core Thickness Minimum [mm]	ASTM D5994 MI	0,95
Core Thickness Maximum [mm]	ASTM D5994 MA	1,09
Carbon Black Content [%]	ASTM D1803	2,4
Carbon Black Dispersion [Cat]	ASTM D5596	1
MFR (190/2,16) [g/10min]	ASTM D1238(190/2,16)	0,2
Density [g/cm ³]	ASTM D792	0,933
Dimensional Stability [%] MD	ASTM D1204	-0,3
Dimensional Stability [%] CMD	ASTM D1204	0,2
Break Strength [N/mm] MD	ASTM D6693 ZF	25
Break Strength [N/mm] CMD	ASTM D6693 ZF	22
Break Elongation [%] MD	ASTM D6693 BD	570
Break Elongation [%] CMD	ASTM D6693 BD	524
Tear Resistance [N] MD	ASTM D1004	140
Tear Resistance [N] CMD	ASTM D1004	143
Asperity Height [mm]	ASTM D7466 /A	0,51
Puncture Resistance [N]	ASTM D4833	411
OIT [min]	ASTM D3895	124

Sales VK104359

Customer Name CELTIC LINING Ltd.

Project Name Bryn Pica Landfill Site

Location CF44 0BX Rhondda Cynon Taf

* Modified



GSE UltraFlex Textured Geomembrane

GSE UltraFlex Textured is a co-extruded linear low density polyethylene (LLDPE) geomembrane available on one or both sides. It is manufactured from the highest quality resin specifically formulated for flexible geomembranes. This product is used in applications that require increased frictional resistance, flexibility and elongation properties where differential or localized subgrade settlements may occur such as in landfill closure application.



AT THE CORE:

An LLDPE geomembrane that is used in applications requiring increased frictional resistance, flexibility, and elongation properties, such as landfills, and mining applications.

Product Specifications

These product specifications meet or exceed GRI GM17.

Property	Unit	Test Method	1.0	1.5	2.0
Thickness ^(a) (Core Thickness)	mm	ASTM D 5994	1.0	1.5	2.0
Density	g/cm ³	DIN EN ISO 1183-1/A	≤ 0.939	≤ 0.939	≤ 0.939
Tensile Properties (each Direction) (Minimum Average)		DIN EN ISO 527-3 (Type 5; 100 mm/min; lo = 50 mm)			
Stress at Break	MPa		12	12	12
Elongation at Break	%		250	250	250
Tear Resistance (Minimum Average)	N	DIN ISO 34-1/B (a)	110	165	220
Puncture Resistance (Minimum Average)	N	DIN EN ISO 12236	1,350	2,050	2,750
Carbon Black Content	%	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	Category	ASTM D 5596	1/2 ^(b)	1/2 ^(b)	1/2 ^(b)
Dimensional Stability (each Direction)	%	DIN 53377 (100°C/1 h)	± 2	± 2	± 2
Melt Flow Index ^(c)	g/10 min	DIN EN ISO 1133 (190°C / 5.0 kg) (190°C / 2.16 kg)	≤ 3.0 ≤ 1.0	≤ 3.0 ≤ 1.0	≤ 3.0 ≤ 1.0
Oxidative Induction Time (OIT)	min	ASTM D 3895 (200°C; Pure O ₂ ; 1 atm)	≥ 100	≥ 100	≥ 100
Performance Properties					
Multiaxial Elongation at Break	%	similar to ASTM D 5617; Ø = 500 mm	≥ 30	≥ 30	≥ 30
Low Temperature Brittleness	°C	ASTM D 746	- 77	- 77	- 77
UV Resistance ^(d) HP-OIT retained after 1,600 hours ^(e)	%	GRI-GM 11 ASTM D 5885	≥ 35	≥ 35	≥ 35
Asperity Height (each Side) (Minimum Average)	mm	GRI-GM 12	0.25 ^(f)	0.25 ^(f)	0.25 ^(f)
Roll Width (approx.) ^(g)	m	—	6.95		
Surface	—	—	single-sided or double-sided coextruded textured		

NOTES:

- (a): Minimum average: - 5%, lowest individual for 8 out of 10: - 10%, lowest individual: - 15% - Special thickness available upon request.
 (b): Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be category 1 or 2. No more than 1 view from category 3.
 (c): Standard test conditions: 190°C / 5.0 kg.
 (d): Test conditions: 20 hours UV cycle at 75°C followed by 4 hours condensation at 60°C; total: 1,600 hours.
 (e): UV Resistance is based on percent retained value regardless of the original High Pressure - OIT value.
 (f): 8 out of 10 readings must be ≥ 0.18 mm and lowest individual reading must be ≥ 0.13 mm.
 (g): Roll widths and lengths have a tolerance of ± 1%.

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.



DURABILITY RUNS DEEP

For more information on this product and other, please visit us at GSEworld.com, call 49.40.767420 or contact your local sales office.



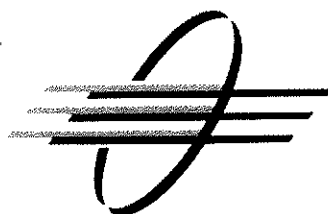
**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 9
LLDPE Conformance
Test Results**

Report Number 1384r1v1d1014



BICS Laboratories Ltd

Reliable testing, Superior service

T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk

REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-J762/a

Report Date 21/03/2014
Client Amgen Cymru/Amgen Rhondda Ltd, Bryn Pica, Aberdare, CF44 0BX
Contact Ceri Evans
Contract Reference Bryn Pica Landfill Site {Phase 4A Cap}
Client PO/Ref No 10866

Material Tested 1mm LLDPE Geomembrane
Date Received 17/03/2014
Sample IDs See Test Report

Tests Requested

- Thickness - ASTM D5994-10
- Density - ASTM D1505-10
- Carbon Black Content - ASTM D1603-12
- Carbon Black Dispersion - ASTM D5596-03
- Tensile Properties - ASTM D6693-04
- Puncture Resistance - ASTM D4833-07
- Tear Resistance - ASTM D1004-13
- Asperity Height - GRI GM12
- Oxidative Induction Time - ASTM D3895-07

If you have any questions or require additional information, please do not hesitate to contact us.

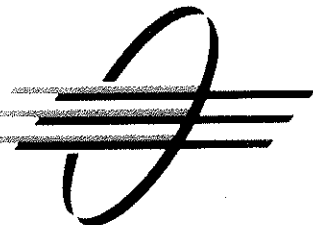
Report Authorisation:

Ryan Hackney
Laboratory Manager
21/03/2014



Page 1 of 4

Tests Marked with an asterisk (*) in this report are not UKAS accredited, and therefore are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted and are UKAS accredited. Tests marked F are accredited under the company's UKAS Flexible Scope.
This test report is in a condensed format, complete test details available upon request.
This test report may not be reproduced other than in full, except with prior written approval.



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 10866

Contract Ref: Bryn Pica Landfill Site {Phase 4A Cap}
Material: 1mm LLDPE Geomembrane
Sample ID: 1/3 IDG/1844

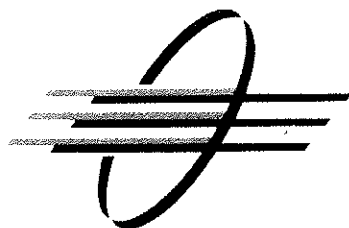
Report Ref No: BS-J762/a
BICS Sample Ref: 01
Dates Tested: 17-21/03/2014

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D5994-10) mm	1.06	1.03	1.08	1.06	1.04	0.99	1.00	1.03	0.99	1.07	1.03	0.03
Density (ASTM D1505-10) g/cm ³	0.919	0.919	0.918								0.919	0.001
Carbon Black Content (ASTM D1603-12) %	2.39	2.39									2.39	0.00
Carbon Black Dispersion (ASTM D5596-06) Category Rating - 1st R/ Category Rating - 2nd R/	1 1	1 1	1 1	1 1	1 1						1 1	0 0
Tensile Properties (ASTM D6693-04) Break Strength N/mm (MD) Break Strength N/mm (CD) Break Elongation % (MD) Break Elongation % (CD)	23.1 22.0 509 515	19.3 19.7 446 469	24.9 24.5 561 553	22.1 18.6 515 415	23.9 24.1 562 541						22.6 21.8 519 499	2.1 2.6 47 57
Puncture Resistance (ASTM D4833-07) N	433.8	422.4	416.9	379.6	406.0						411.7	20.6
Tear Resistance (ASTM D1004-13) N (MD) N (CD)	125 146	134 142	142 150	132 149	174 167	135 146	128 157	143 149	143 146	147 147	140 150	14 7
Asperity Height (GRI GM12) mm	0.62	0.86	0.45	0.68	0.43	0.65	0.43	0.65	0.44	0.51	0.57	0.1
Oxidative Induction Time (ASTM D3895-07) min	155	153									154	2

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD

P.O NO: 10866

Contract Ref: Bryn Pica Landfill Site {Phase 4A Cap}
Material: 1mm LLDPE Geomembrane
Sample ID: 2/3 IDG/1847

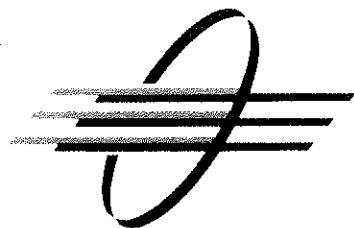
Report Ref No: BS-J762/a
BICS Sample Ref: 02
Dates Tested: 17-21/03/2014

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D5994-10) mm	1.09	0.99	1.02	1.05	1.01	1.00	1.00	1.02	1.05	1.06	1.03	0.03
Density (ASTM D1505-10) g/cm ³	0.918	0.918	0.918								0.918	0.000
Carbon Black Content (ASTM D1603-12) %	2.38	2.34									2.36	0.03
Carbon Black Dispersion (ASTM D5596-06) Category Rating - 1st R _f	1	1	1	1	1						1	0
Category Rating - 2nd R _f	1	1	1	1	1						1	0
Tensile Properties (ASTM D6693-04) Break Strength N/mm (MD)	19.7	23.1	25.0	26.3	24.1						23.6	2.5
Break Strength N/mm (CD)	21.5	18.1	22.7	19.4	17.6						19.9	2.2
Break Elongation % (MD)	482	552	577	595	559						553	43
Break Elongation % (CD)	549	445	552	464	413						485	63
Puncture Resistance (ASTM D4833-07) N	428.8	424.1	446.6	405.7	375.1						416.1	27.1
Tear Resistance (ASTM D1004-13) N (MD)	122	123	145	138	135	126	147	130	125	137	133	9
N (CD)	134	144	123	137	128	123	159	150	138	151	139	12
Asperity Height (GRI GM12) mm	0.54	0.58	0.49	0.61	0.57	0.67	0.59	0.47	0.75	0.52	0.58	0.1
Oxidative Induction Time (ASTM D3895-07) min	140	140									140	0

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



4438

GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD

P.O NO: 10866

Contract Ref: Bryn Pica Landfill Site (Phase 4A Cap)
Material: 1mm LLDPE Geomembrane
Sample ID: 3/3 IDG/1848

Report Ref No: BS-J762/a
BICS Sample Ref: 03
Dates Tested: 17-21/03/2014

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D5994-10) mm	1.00	1.04	1.02	1.01	1.06	1.07	1.04	1.07	1.03	1.04	1.04	0.02
Density (ASTM D1505-10) g/cm ³	0.920	0.919	0.918								0.919	0.001
Carbon Black Content (ASTM D1603-12) %	2.53	2.58									2.56	0.04
Carbon Black Dispersion (ASTM D5596-06) Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0
Tensile Properties (ASTM D6693-04) Break Strength N/mm (MD)	26.1	27.9	23.2	22.1	23.7						24.6	2.4
Break Strength N/mm (CD)	21.6	22.0	22.9	20.5	21.9						21.8	0.9
Break Elongation % (MD)	596	628	577	525	598						585	38
Break Elongation % (CD)	513	538	564	499	552						533	27
Puncture Resistance (ASTM D4833-07) N	444.8	421.5	420.7	451.1	426.4						432.9	14.1
Tear Resistance (ASTM D1004-13) N (MD)	145	128	138	142	139	139	138	131	142	140	138	5
N (CD)	135	131	123	134	129	134	141	136	133	139	134	5
Asperity Height (GRI GM12) mm	0.51	0.71	0.71	0.52	0.65	0.59	0.48	0.71	0.56	0.66	0.61	0.1
Oxidative Induction Time (ASTM D3895-07) min	143	147									145	3

Atmospheric Conditions at Test / Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 10
Lining Contractor
Certificates and
Method Statement**

Report Number 1384r1v1d1014

**METHOD STATEMENT
FOR THE TRANSPORTATION, DEPLOYMENT,
WELDING AND TESTING OF
LLDPE GEOMEMBRANE LINER SYSTEMS
FOR THE WORKS AT
BRYN PICA LANDFILL SITE**

CELTIC LINING LIMITED

PPE REQUIREMENTS

Gloves, safety helmets, high visibility coats or vests, safety footwear.

SPECIFIC RISKS

Risks to personnel are present during the following :-

Lifting and handling stages of operations.

Risks at this stage will be minimised by ensuring that the equipment used is capable of carrying the load (*ie* rolls of material) in a safe manner. To this end purpose made lifting bars are used on machines of sufficient size to ensure an adequate safety margin and the lifting plan will be used.

Welding of the sheets is carried out at very high temperatures. Guards are provided on the welding equipment and these must be kept in place and in good condition.

Cutting of sheets involves the use of extremely sharp knives. Operatives are instructed as to the correct methods of cutting sheets.

Gas Odours.

Risk of fires whilst welding in progress from build up of gas beneath LLDPE liner. Technicians to wear H2s Gas monitors at all times and fire extinguishers to be kept close by whilst welding is in progress.

STORAGE OF MATERIALS

The materials are to be stored on smooth prepared area where there are no sharp objects to cause any damage to the lining materials.

The materials will be inspected prior to deployment and any damaged materials will be cut off and discarded.

CELTIC LINING LIMITED

HANDLING

The LLDPE geomembrane is manufactured in flat wound rolls. No external packaging is required.

Approximate weight of each roll is 1 tonnes.

To assist in handling two (2) lifting straps are supplied with each roll. Rolls will be handled and lifted using a 360° excavator. The SWL of the 360° excavator must be clearly marked on the lifting boom of the machine and must exceed the weight of the roll being handled.

Extreme care must be used in handling so that damage to the edges of the rolls does not occur.

Any damage to the geomembrane after examination of the rolls may be repaired in accordance with repair section of this procedure.

The materials to be stored as directed in the specification.

SUB-GRADE PREPARATION

The surfaces to receive the LLDPE should be prepared to ensure that damage to the lining would not occur. The surface should be to a smooth clean finish, with all roots, debris and sharp objects removed. The surface and subgrade must provide a firm unyielding foundation for the lining. The surfaces to be lined will be examined, and accepted in writing to the Engineer. Submittal of written acceptance may proceed in stages according to the site programme, if required.

CELTIC LINING LIMITED

LLDPE DEPLOYMENT

This is carried out to a Panel Installation plan, which details the location and sequence of installation of each panel.

No smoking on liner or wearing shoes that could cause damage to the liner.
Generator not to be allowed on the geomembrane.

- (1) LLDPE rolls are transported from the storage area by the 360° excavator and positioned according to the installation layout plan with approximately 150mm overlap to the adjacent panel, and then unrolled by the excavator and geomembrane lifting equipment or manually and in direct contact with the subgrade with no wrinkles.
- (2) On side slopes the LLDPE is lowered from the top of the slope using the excavator and the lifting equipment. Once unrolled the LLDPE is anchored temporarily into the crest bund.
- (3) Where continuous high winds are experienced the sequence and direction of the panel layout may need to be adjusted to reduce the risk to unprotected LLDPE.
- (4) Sandbags are utilised to protect against wind load on the horizontal and roped sandbags on side slopes.

SEAM WELDING OF LLDPE

All welding equipment and names of the welding technicians to be logged down on the CQA daily logs.

Two methods of seam welding are used :-

- (a) **Fusion Wedge Welding** A seam produced by self propelled wedge welding apparatus. The machine is equipped with gauges to monitor weld temperature. The weld consists of two parallel welds in an overlap with a pneumatic testing channel. With this method preheating and grinding of the LLDPE sheet is not required.
- (b) **Surface Extrusion Welding.** This method of welding is used for detailing work, repairs and cross seams. This extrusion equipment provides a surface joint between overlapped sections of the LLDPE sheet to a minimum of 30mm width. It is equipped with temperature controllers with gauges to monitor preheat temperature. The LLDPE sheet is preheated by hot air. The extruder is purged of all heat degraded or cooled extrudate prior to the commencement of each welding sequence. The weld area to be joined is prepared to remove any surface oxidation or contamination by grinding.

CELTIC LINING LIMITED

WELDING PROCEDURES

After positioning and visual inspection of the sheet, welding of the LLDPE lining is carried out. Seam welding is a continuous process with minimum interruptions along any given seam length. Adjacent sheets must be aligned to provide a minimum of 100mm overlap, and smooth, level surface in the overlap area. Continuous checking of the machine operation and work process parameters take place during this welding procedure. It is ensured prior to welding that all surfaces to be seamed are clean and dry, and in the case of surface extrusion welding, grinding of the weld area takes place to remove surface oxidation and remove no more than 10% of the thickness of the material and 12% either side of the weld. Welding by either method is to be carried out as per specification.

INSPECTION AND TESTING OF WELD SEAMS

Both destructive and non-destructive methods of testing of all welded seams are carried out, as detailed below :-

DESTRUCTIVE TESTING

Each day before any field welding is carried out and after any change of operator or machinery stoppage a test weld is made and after every 4 hours, allowed to cool naturally to ambient temperature. Then 5 No. 25mm wide by 200mm long samples are taken from the test seam and tested to ultimate break elongation on a field tensiometer in both peel and shear tensile modes. All testing to be carried out as per specification.

Samples tested must not fail in the seam. This method of testing is carried out for every 200m length of seam weld or as directed by the CQA engineer. Destructive weld samples will be sent to the laboratory and tested as per specification.

NON DESTRUCTIVE TESTING

Three methods of non-destructive testing are used for welding methods

- (1) Air pressure testing for fusion wedge welding
- (2) Vacuum box testing for surface extrusion welding

The air pressure testing will be carried out at the pressure stated in the specification and maintained during which time the pressure should not decrease by more than 10% over 5 minutes following initial 2 minutes to stabilise.

CELTIC LINING LIMITED

For vacuum box testing a soap solution is applied for min 10 seconds to an area 150mm larger in area than the vac box.

REPAIRS

Any faulty welds or damaged area of LLDPE sheeting either established by weld testing or visual inspection are repaired using the surface extrusion welder and then retested vacuum box testing.

Any areas of defective weld or damage are repaired by patching with LLDPE sheet with all corners radiused to provide an uninterrupted extrusion weld. All repair patches shall extend beyond the edge of any defect by a minimum of 150mm in all directions.

Pipe Boot Detail.

Pipe boot details will be carried out as per drawings and specification.

Geotextile/Geocomposite drainage Deployment.

The geotextile/geocomposite drainage shall be deployed as the geomembrane proposed panel layout drawing.

Geotextile/geocomposite drainage rolls are transported from the storage area by the excavator and positioned accordingly with the overlap as per specification and unrolled by either the excavator and lifting equipment or manually to the adjacent panel, this procedure shall be carried out for all geotextile/geocomposite drainage deployment and the seams will be heat bonded together as per specification.

Where continuous high winds are experienced the sequence and direction of the panels may need to be adjusted to reduce the risk of wind uplift. Sandbags are utilised on the open edges of the geotextile.

SITE ORGANISATION

The site is controlled by a fully qualified Site Manager who is responsible for all site preparations, including liaising with the Main Contractors Representative, the CQA engineer and the Client. A visiting Contracts Manager provides additional technical support and monitors progress, materials and equipment and attends site meetings. The director at the Company offices can provide any additional assistance or technical information required.

CELTIC LINING LIMITED

SITE SPECIFIC SAFETY ISSUES

The Main Contractor are carrying out substantial earthworks activities on site including preparation layers and backfill operations. Geomembrane works will involve interfacing with the Main Contractor, High visibility jackets/vests/gloves and hard hats are to be worn at all times by Celtic Lining personnel.

CELTIC LINING LIMITED

RISK ASSESSMENT FOR GEOMEMBRANE AND GEOTEXTILES BRYN PICA LANDFILL SITE

HEALTH AND SAFETY PROCEDURE
Prepared by : M G Jones

HAZARD	RISK	CONTROL	REVIEW FREQUENCY	REVIEWED BY
Handling of rolls by excavator Injury to personnel	Medium	(1) Machine operator to be CITB trained (2) Chains and lifting to be checked regularly (3) Full PPE to be worn by all personnel	Weekly Weekly Daily	Celtic Lining Site Manager Celtic Lining Site Manager Celtic Lining Site Manager
Injury caused by excavator slewing	Medium	Minimum 1m clearance for personnel when machine slewing	Daily	Celtic Lining Site Manager
Windy weather causing geomembrane uplift	Medium	Deployment of geomembrane not to be carried out	Continual	Celtic Lining Site Manager
Welding equipment	Medium	Only trained Technicians to use equipment	Daily	Celtic Lining Site Manager
Steep slopes on cell	Medium	Rope ladders and hand ropes provided. Personnel not to stand below geomembrane	Daily	Celtic Lining Site Manager
Cuts from knives	Medium	Only trained Technician to use equipment	Daily	Celtic Lining Site Manager
Gas	High	Technicians to wear H2S gas monitors, Fire extinguishers, Hot works permit, Briefing.		



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 63705/3

This is to certify that:

Alun Bryn Williams

Date of birth 18 June 1980

has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 3 February 2014

Date of expiry 6 February 2015

EXAMINER

Signed

(For CSWIP)

SIGNATURE OF HOLDER
(Person named above)

Date

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

CSWIP CERT NO 88203

This is to certify that:

Thomas Hancock

Date of birth 21 December 1992

has demonstrated proficiency as a Plastics Welder Entry Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 14 July 2014

Date of expiry 13 April 2015

EXAMINER

Signed (For CSWIP)

SIGNATURE OF HOLDER
(Person named above)

Date

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

CSWIP CERT NO 88202

This is to certify that:

Mark Anthony Davies

Date of birth 9 April 1980

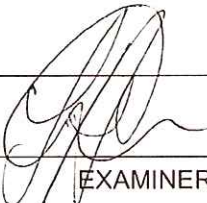
has demonstrated proficiency as a Plastics Welder Entry Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 14 July 2014

Date of expiry 13 April 2015


EXAMINER

Signed 
(For CSWIP)

SIGNATURE OF HOLDER
(Person named above) _____ Date _____

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 63701/3

This is to certify that:

Dyfed Wyn Jones

Date of birth 11 May 1981

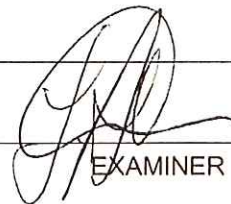
has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

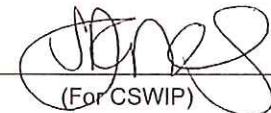
Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 3 February 2014

Date of expiry 6 February 2015


EXAMINER

Signed 
(For CSWIP)

SIGNATURE OF HOLDER
(Person named above)

Date

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 88200

This is to certify that:

Richard Vaughan Roberts

Date of birth 24 September 1987

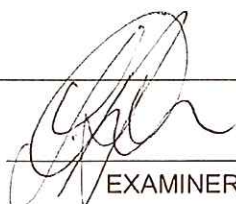
has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 14 July 2014

Date of expiry 24 March 2015


EXAMINER

Signed  _____
(For CSWIP)

SIGNATURE OF HOLDER
(Person named above) _____

Date _____

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 88198

This is to certify that:

Eifion Wyn Jones

Date of birth 20 March 1984

has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 14 July 2014

Date of expiry 24 March 2015

EXAMINER

Signed
(For CSWIP)

SIGNATURE OF HOLDER
(Person named above) _____ Date _____

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 88197

This is to certify that:

Elgan Jones

Date of birth 14 March 1980

has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 14 July 2014

Date of expiry 24 March 2015

EXAMINER

Signed (For CSWIP)

SIGNATURE OF HOLDER
(Person named above)

Date

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request



Approval Certificate

EN 13067 Plastic Welding Personnel - Approval Testing of Welders - Thermoplastic Welded Assemblies

CSWIP CERT NO 67818/3

This is to certify that:

Sion Watkin Jones

Date of birth 31 December 1972

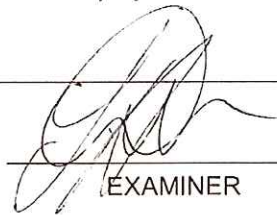
has demonstrated proficiency as a Plastics Welder Standard Level in accordance with the CSWIP requirements published in Document CSWIP-PW-6-96, 6th Edition, April 2007 and amendments in force on the examination date. This certificate is valid for the special categories mentioned below:

Geomembrane welding

- 7.4 Machine Hot Wedge welding of PE lining membrane (electric heated wedge)
- 7.5 Extrusion welded PE lining membrane lap joint.

Date of issue 17 June 2014

Date of expiry 17 May 2015


EXAMINER

Signed 
(For CSWIP)

SIGNATURE OF HOLDER
(Person named above)

Date

PLEASE READ THE NOTES OVERLEAF

Photocopies are unauthorised by
TWI Certification Ltd

Issued by:
TWI Certification Ltd, Granta Park
Great Abington, Cambridge CB21 6AL, UK

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by Accreditation Certificate No. 025
This certificate is the property of TWI Certification Ltd and must be surrendered on request

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

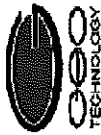
**Appendix 11
LLDPE Panel
Deployment Records**
Report Number 1384r1v1d1014



Geomembrane Seam Construction

CQA6

Site:	Bryn Pica Phase 4A					Membrane:	LLDPE	Installer:	Celtic		
Date	Welding Time	Seam No	Panel Nos	Length	Machine	Operator	DS Number	NDT Type	APT Start	APT Finish	Approved
02/09/2014	Test @ 7:30 at start of shift				CL11						✓
02/09/2014	Test @ 10:30 after breakfast break				CL11						✓
02/09/2014	10:59-11:36		P1/P2	51.6	CL11	TH		APT	13:50	13:55	✓
02/09/2014	11:39-12:10		P2/P3	49.8	CL11	TH	DS1	APT	13:43 14:01	13:49 14:02	✓
02/09/2014	12:16-12:20		P5/P6	3.3	CL11	TH		APT	12:21	12:26	✓
02/09/2014	Test @ 12:15				CL9	MD		APT			✓
02/09/2014	12:21-12:23		P7/P8	7	CL11	TH		APT	12:39 2.0	12:44 2.0	✓
02/09/2014	12:28-12:38		P7/P8/P9	16.3	CL11	TH		APT	12:56	13:01 2.0	✓
02/09/2014	12:29-12:38		P4/P6/P5	15.7	CL9	MD		APT	12:45 2.0	12:50 2.0	✓
02/09/2014	12:40-12:52		P9/P10	16.9	CL11	TH		APT	13:05 2.0	13:10 2.0	✓
02/09/2014	12:41-12:50		P4/P7/P8/P6	14.2	CL9	MD		APT	12:50 2.0	12:55 2.0	✓
02/09/2014	12:52-13:13		P3/4/7/9/10	44.8	CL9	MD		APT	13:14 2.0	13:19 2.0	✓
02/09/2014	14:00		Test		CL11	TH					✓
02/09/2014	14:02-14:13		P1/2/3/10/11	33.7	CL11	TH		APT	15:52 2.0	15:57 2.0	✓
02/09/2014	14:10-14:27		P11/P12	33.4	CL9	MD		APT	16:00 2.0	16:05 2.0	✓
02/09/2014	14:13-14:38		P12/P13	35.5	CL11	TH	DS2	APT	16:07 2.0	16:12 2.0	✓
02/09/2014	14:48-14:58		P13/P14	36.5	CL9	MD		APT	16:15 2.0	16:20 2.0	✓
02/09/2014	15:05-15:11		P15/P16	7	CL11	TH		APT	15:15 2.0	15:20 2.0	✓
02/09/2014	15:08-15:21		A 16/14 from Gas Well	14.4	CL9	MD	DS3	APT	16:22 2.0	16:27 2.0	✓



Geomembrane Seam Construction

CQA6

Site:	Bryn Pica Phase 4A			Membrane:	LLDPE	Installer:	Celtic
-------	--------------------	--	--	-----------	-------	------------	--------

Date	Welding Time	Seam No	Panel Nos	Length	Machine	Operator	DS Number	NDT Type	APT Start	APT Finish	Approved
02/09/2014	15:19-15:28		B 14/15/16 to Gas Well	22.5	CL11	TH		APT	16:30 2.0	16:35 2.0	✓
02/09/2014	15:35-15:55		15/16/17	38.6	CL9	MD		APT	16:38 2.0	16:43 2.0	✓
02/09/2014	16:01-16:12		17/18	39.8	CL9	MD		APT	16:47 2.0	16:52 2.0	✓
02/09/2014	16:14-16:35		18/19	35.1	CL9	MD	DS4	APT	17:00 2.0	17:05 2.0	✓
02/09/2014	16:37-16:53		19/20	25.3	CL9	MD		APT	17:10 2.0	17:15 2.0	✓
02/09/2014	17:01 - 17:28		Tie in 20/19/18/17/15/14/13/12/11	60.5	CL9	RR		APT	17:50 2.0	17:55 2.0	✓
02/09/2014	17:30 - 17:49		Tie in 10/9/8/6/5	33.2	CL9	RR		APT	18:00 2.0	18:05 2.0	✓
02/09/2014	17:30-19:10		Tie in Extrusion Weld		CL49	SJ	DS5	Vax Box	17:00 2.0	17:05 2.0	✓
25/09/2014			1/21	25	CL9	SJ		APT	8.50 2.0	9.55 2.0	✓
25/09/2014			22/23 (either side of gas vent)	7	CL9	SJ		APT	9.10 2.0	9.22 2.0	✓
25/09/2014			21/22/23	25	CL9	SJ	DS-6	APT	9.25 2.0	9.30 2.0	✓
25/09/2014			21/23/Exist		CL9	SJ		APT	9.42 2.0	9.47 2.0	✓
25/09/2014			23 / Exist (seam split to T Jnct)		CL9	SJ		APT	9.50 2.0	9.55 2.0	✓
25/09/2014									09:58 2.0	10:03 2.0	✓

Date: 2/9/14

1. QA Eng	2. Head Office	3. Client
-----------	----------------	-----------

Project: CADPINC
Rep.: Bob

Location: Bryn Picot
Q/A Client: K. Richards

Date: 2/9/14

[illegible]

Celtic Lining Ltd.

Project: CAPPING Location: BOYD VILA Date: 3/9/14
Rep: [Signature] Q/A Client: _____

[illegible]

Project: CAPPINCA Location: BRYA PCA Date: 25-9-14
Rep: K. Richards Q/A Client: _____

1. QA Eng	2. Head Office	3. Client
-----------	----------------	-----------



Date	Repair No	Location	Defect Type	Repair Type	Machine	Operator	NDT	Pass/Fail	Approved
03/09/2014	R1	14/15/16 T	T Junction	Patch	CL116	SJ	VAC Box	Pass	✓
03/09/2014	R2	11/12	Welding Burn	Patch	CL116	"	"	Pass	✓
03/09/2014	R3	10/11/Tie in	T Junction	Patch	CL116	"	"	Pass	✓
03/09/2014		P1	Point Defect	Extrudate	CL116	"	"	Pass	✓
03/09/2014		P1	Point Defect	Extrudate	CL116	"	"	Pass	✓
03/09/2014		P1	Point Defect	Extrudate	CL116	"	"	Pass	✓
25/09/2014	Start up welds passed for extrusion machine CL41								
25/09/2014	R4	21/1/Exist	T Junction	Patch	CL41	SJ	VAC Box	Pass	✓
25/09/2014	R5	23/Exist	"	"	"	"	"	Pass	✓
25/09/2014	R6	"	"	"	"	"	"	Pass	✓
25/09/2014		Bead on P1. Small hole						Pass	✓

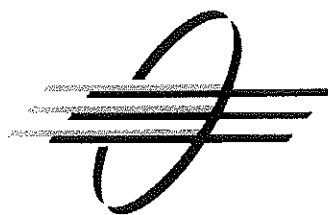
**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 12
LLDPE Destructive
Test Results**

Report Number 1384r1v1d1014



BICS Laboratories Ltd

Reliable testing, Superior service

T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk

REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-K182/a

Report Date 04/09/2014
Client Amgen Cymru/Amgen Rhondda Ltd, Bryn Pica, Aberdare, CF44 0BX
Contact Ceri Evans
Contract Reference Bryn Pica Landfill Site
Client PO/Ref No 11424

Material Tested 1mm LLDPE Geomembrane
Date Received 04/09/2014
Sample IDs DS-01 Through to DS-05 {Fusion & Extrusion Welds}

Tests Requested Seam Integrity (Peel & Shear) - ASTM D6392-12

If you have any questions or require additional information, please do not hesitate to contact us.

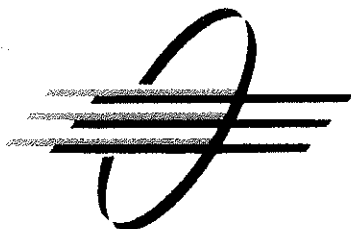
Report Authorisation:

Shazeena Iqbal
Technical Director
04/09/2014



Page 1 of 3

Tests Marked with an asterisk (*) in this report are not UKAS Accredited, and therefore are not included in the UKAS Accreditation Schedule for our laboratory. Any opinions and interpretations expressed within this report are outside the scope of our UKAS Accreditation. This test report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. Test marked # have been subcontracted out.



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD

P.O NO: 11424

Contract Ref: Bryn Pica Landfill Site
Material: 1mm LLDPE Geomembrane
Test Method: Seam Integrity (ASTM D6392-12)

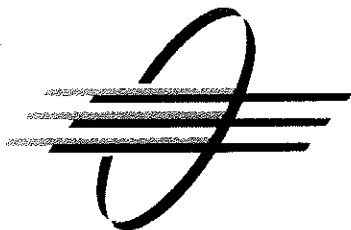
Report Ref No: BS-K182/a
Dates Tested: 04/09/2014

PARAMETER	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1A	2A	3A	4A	5A	1B	2B	3B	4B	5B		
Sample ID: DS-1, P2/P3 {Fusion Weld}										BICS Sample Ref: 01		
Peel Strength N/mm	12.8	14.1	14.5	15.3	13.8	13.9	14.1	15.5	14.1	13.8	14.2	0.8
Peel Separation %	0	0	0	0	0	0	0	0	0	0		
Peel Break Classification	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	16.7	17.1	17.1	16.6	16.7						16.8	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							
Sample ID: DS-2, P12/P13 {Fusion Weld}										BICS Sample Ref: 02		
Peel Strength N/mm	14.2	14.0	15.6	15.4	14.0	12.1	13.4	14.5	14.4	13.8	14.1	1.0
Peel Separation %	0	0	0	40	0	0	0	0	0	0		
Peel Break Classification	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	16.6	16.1	17.0	16.1	16.1						16.4	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							
Sample ID: DS-3, P14/P16 {Fusion Weld}										BICS Sample Ref: 03		
Peel Strength N/mm	14.7	15.1	15.1	14.6	14.9	13.1	13.2	15.3	13.5	13.3	14.3	0.9
Peel Separation %	0	0	0	0	0	0	0	0	0	0		
Peel Break Classification	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	16.0	16.6	16.8	16.8	16.2						16.5	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							
Sample ID: DS-4, P18/P19 {Fusion Weld}										BICS Sample Ref: 04		
Peel Strength N/mm	14.6	15.4	16.2	14.7	15.3	12.3	12.7	14.7	12.9	12.8	14.2	1.4
Peel Separation %	0	0	0	0	0	0	0	0	0	0		
Peel Break Classification	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	15.9	16.0	16.5	15.9	15.9						16.0	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							

Atmospheric Conditions at Test / Minimum 1 hour Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 11424

Contract Ref: Bryn Pica Landfill Site
Material: 1mm LLDPE Geomembrane
Test Method: Seam Integrity (ASTM D6392-12)

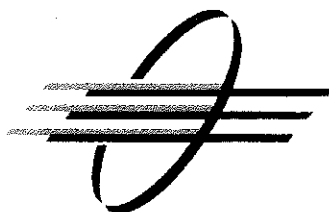
Report Ref No: BS-K182/a
Dates Tested: 04/09/2014

PARAMETER	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1A	2A	3A	4A	5A	1B	2B	3B	4B	5B		
Sample ID: DS-5, P5/P6 {Extrusion Weld}										BICS Sample Ref: 05		
Peel Strength N/mm	12.6	11.9	11.1	12.5	14.1						12.4	1.1
Peel Separation %	0	0	0	0	0							
Peel Break Classification	SE3	SE3	SE3	SE3	SE3							
Shear Strength N/mm	15.6	16.1	14.4	16.1	15.3						15.5	0.7
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							

Atmospheric Conditions at Test / Minimum 1 hour Conditioning : $21 \pm 2^{\circ}\text{C}$, Relative Humidity : $65 \pm 5\% \text{ RH}$

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

Reliable testing, Superior service

T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk

REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-K254/a

Report Date 29/09/2014
Client Amgen Cymru/Amgen Rhondda Ltd, Bryn Pica, Aberdare, CF44 0BX
Contact Ceri Evans
Contract Reference Bryn Pica Landfill Site {Phase 4A}
Client PO/Ref No 11516

Material Tested 1mm LLDPE Geomembrane
Date Received 29/09/2014
Sample IDs DS-06 {Fusion Weld}
DS-07 {Extrusion Weld}

Tests Requested Seam Integrity (Peel & Shear) - ASTM D6392-12

If you have any questions or require additional information, please do not hesitate to contact us.

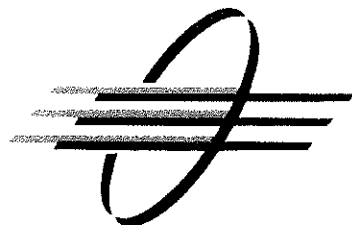
Report Authorisation:

Ryan Hackney
Laboratory Manager
29/09/2014



Page 1 of 2

Tests Marked with an asterisk (*) in this report are not UKAS Accredited, and therefore are not included in the UKAS Accreditation Schedule for our laboratory. Any opinions and interpretations expressed within this report are outside the scope of our UKAS Accreditation. This test report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. Test marked # have been subcontracted out.



BICS Laboratories Ltd

Unit 2, Little John Mill, Oak Hill Road, Brighouse, West Yorkshire HD6 1SN
T +44 (0) 1484 717776 F +44 (0) 1484 717757
E info@bics-labs.co.uk W www.bics-labs.co.uk



GEOSYNTHETICS TEST RESULTS AMGEN CYMRU/AMGEN RHONDDA LTD P.O NO: 11516

Contract Ref: Bryn Pica Landfill Site
Material: 1mm LLDPE Geomembrane
Test Method: Seam Integrity (ASTM D6392-12)

Report Ref No: BS-K254/a
Dates Tested: 29/09/2014

PARAMETER	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1A	2A	3A	4A	5A	1B	2B	3B	4B	5B		
Sample ID: DS-6, {Fusion Weld}										BICS Sample Ref: 01		
Peel Strength N/mm	15.6	14.1	14.4	13.5	13.6	16.7	14.9	15.6	15.8	14.8	14.9	1.1
Peel Separation %	0	0	0	0	0	0	0	0	0	0		
Peel Break Classification	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	15.8	15.5	16.1	16.2	16.0						15.9	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							
Sample ID: DS-7, {Extrusion Weld}										BICS Sample Ref: 02		
Peel Strength N/mm	17.5	15.9	16.8	16.0	16.2						16.5	0.7
Peel Separation %	0	0	0	0	0							
Peel Break Classification	SE3	SE3	NOBRK	NOBRK	SE3							
Shear Strength N/mm	15.9	16.1	17.0	16.3	16.4						16.3	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							

Atmospheric Conditions at Test / Minimum 1 hour Conditioning : 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

BICS Laboratories Ltd. neither accepts responsibility for nor makes claim as to the final use and purpose of the material.
Unless otherwise detailed sample sizes and related test items comply with the listed test method. Test results relate only to the sample(s) supplied.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT

**CQA VALIDATION
REPORT**

**PHASE 3B
CAPPING WORKS**

Bryn Pica Landfill Site

**Appendix 13
Restoration Soils
Testwork**

Report Number 1384r1v1d1014

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14 **Client:** Amgen Cymru
Project Name: Bryn Pica **Address:** Bryn Pica
 Llwydcoed
 Aberdare
 CF44 0BX
ATS Sample No: 3247

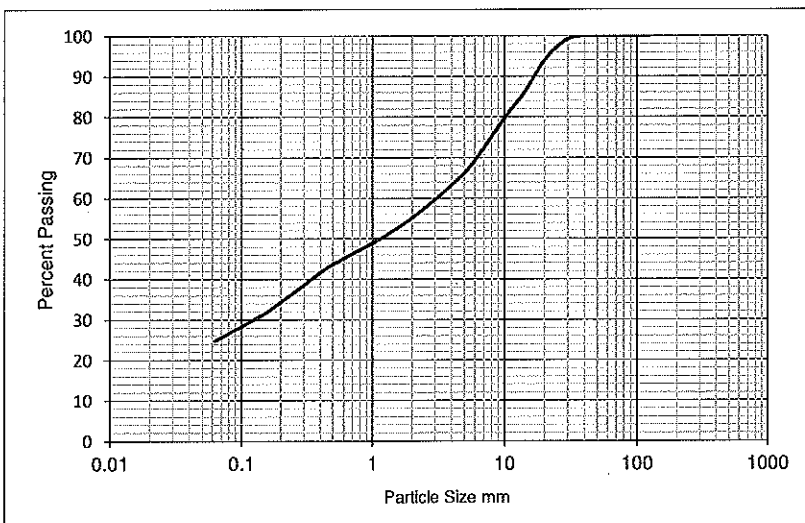
Site Ref / Hole ID: BØ1 **Depth (m):**
Sample No: **Sample Type:** Bulk
Sampling Certificate Received: No **Material Description:** Brown very silty very sandy GRAVEL
Location in Works: Unknown **Material Source:** N/A
Date Sampled: Unknown **Material Supplier:** N/A
Sampled By: Client **Specification:** BS1377
Date Received: 14 July 2014 **Date Tested:** 23 July 2014

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	94
14	86
10	80
6.3	70
5.0	66
3.35	61
2.00	55
1.18	50
0.600	45
0.425	42
0.300	38
0.212	35
0.150	32
0.063	25

Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	45	Dry mas of sample, kg	N/A
Sand	36		
Silt / Clay	25	6.4	

Remarks:

QA Ref.	 Apex Testing Solutions Sturml Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver	Date	Fig PSD
BS1377 - 2 Rev 3.0			 L Maiden, Laboratory Supervisor	04/08/2014	

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14 **Client:** Amgen Cymru
Project Name: Bryn Pica **Address:** Bryn Pica
 Liwydcoed
 Aberdare
 CF44 0BX
ATS Sample No: 3248

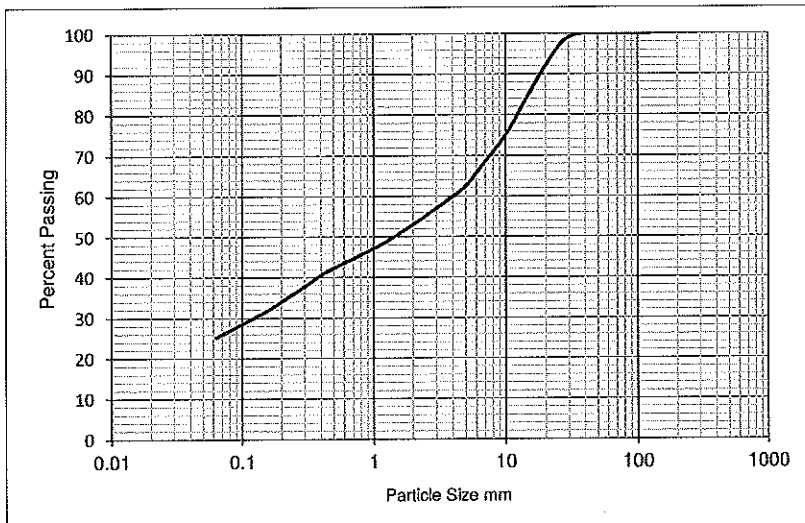
Site Ref / Hole ID: B02 **Depth (m):**
Sample No: **Sample Type:** Bulk
Sampling Certificate Received: No **Material Description:** Brown very silty very sandy GRAVEL
Location in Works: Unknown **Material Source:** N/A
Date Sampled: Unknown **Material Supplier:** N/A
Sampled By: Client **Specification:** BS1377
Date Received: 14 July 2014 **Date Tested:** 23 July 2014

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	98
20	92
14	83
10	75
6.3	67
5.0	62
3.35	58
2.00	53
1.18	48
0.600	44
0.425	41
0.300	38
0.212	35
0.150	32
0.063	25

Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	47	Dry mas of sample, kg	N/A
Sand	36		
Silt / Clay	25	8.5	

Remarks:

QA Ref.

BS1377 - 2
Rev 3.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend,
 CF33 6BZ
 Tel: 01656 746762 Fax: 01656 749096



7771

Approver

K Maid

Date

04/08/2014

Fig

PSD

L. Maiden, Laboratory Supervisor

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No: D4114-14
Project Name: Bryn Pica
ATS Sample No: 3249

Client: Amgen Cymru
Address: Bryn Pica
 Llwydcoed
 Aberdare
 CF44 0BX

Site Ref / Hole ID: B03

Depth (m):

Sample No:

Sample Type: Bulk

Sampling Certificate Received: No

Material Description: Brown very silty very sandy GRAVEL

Location in Works: Unknown

Material Source: N/A

Date Sampled: Unknown

Material Supplier: N/A

Sampled By: Client

Specification: BS1377

Date Received: 14 July 2014

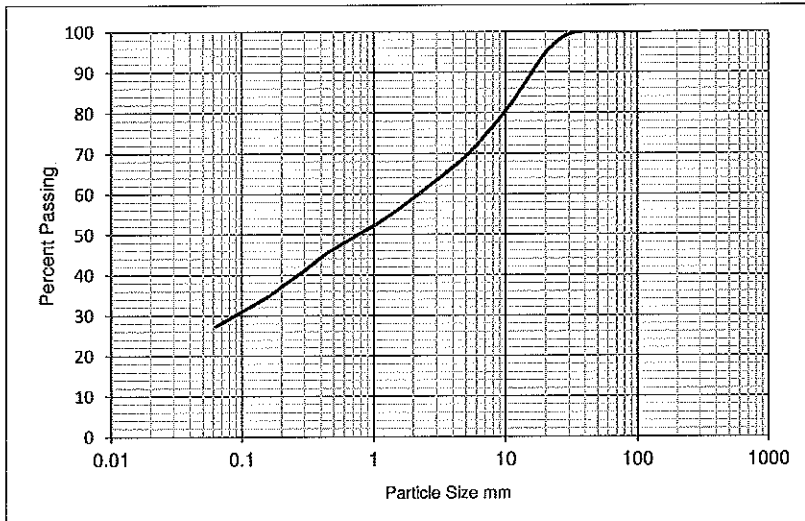
Date Tested: 23 July 2014

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	95
14	87
10	80
6.3	73
5.0	69
3.35	65
2.00	59
1.18	54
0.600	48
0.425	45
0.300	41
0.212	38
0.150	34
0.063	27

Sedimentation	
Particle Size mm	% Passing
0.0201	
0.0060	
0.0020	

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	0	N/A	
Gravel	41	Dry mas of sample, kg	N/A
Sand	36		
Silt / Clay	27	9.4	

Remarks:

QA Ref.

BS1377 - 2
Rev 3.0



Apex Testing Solutions

Sturml Way, Village Farm Industrial Est, Pyle, Bridgend,
 CF33 6BZ
 Tel: 01656 746762 Fax: 01656 749096



7771

Approver

K Maid

Date

04/08/2014

Fig

PSD

L Maiden, Laboratory Supervisor

Waste Acceptance Criteria BS EN 12457-3
2 Stage Leaching Test (Granular Waste)

Report No: 002877755

Generated: 30-SEP-14

Sample Details		Test Values		
Batch Number	20067080	Mass of Raw Test Portion (kg)		0.193
NLS Folder No.	2877755	Moisture Content Ratio (%)		0
Sample Point Code	21889-061	Dry Matter Content Ratio (%)		100
Sample Point Name	CC Amgen Cymru	Leachant Volume stage 1 (litre)		0.385
Sampling Date	02 07 2014	Leachant Volume Stage 2 (litre)		1.54

Solid Waste Analysis		Results	Landfill Waste Acceptance Criteria		
			Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste
Total Organic Carbon w/w %	¶ and non hazardous wastes in the same cell.	3.59	3	5	6*
Loss on Ignition %	* either TOC or LOI must be used for haz. wastes	14.5			10*
BTEX mg/kg	# if SO4 does not meet the inert limit, a percolation may be used to demonstrate compliance	<0.00757	6		
PCBs (7 congeners) mg/kg		<0.00900	1		
Mineral Oil (C10 - C40) mg/kg	** TDS may be used instead of Cl and SO4	346	500		
PAHs mg/kg	*** DOC at pH 7.5 and 8.0 can be determined if limit value at own pH is not met	67.5	100		
pH		10.9		>6	
Acid Neutralisation Capacity (pH4) mol/kg		1.09		To be evaluated	To be evaluated
Acid Neutralisation Capacity (pH7) mol/kg		-		To be evaluated	To be evaluated

Eluate Analysis	Concentration in Eluate		Amount Leached		Landfill Waste Acceptance Criteria		
Liquid : Solid Ratio	2:1	8:1	2:1	10:1	Limit Values (mg/kg) at L:S 10:1		
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste
pH	8.84	9.71					
Conductivity uS/cm	922	169					
	ug/l	ug/l	mg/kg	mg/kg			
Arsenic as As	8.58	10.1	0.0172	0.0985	0.5	2	25
Barium as Ba	109	35.4	0.218	0.474	20	100	300
Cadmium as Cd	<0.100	<0.100	<0.000200	<0.001	0.04	1	5
Chromium as Cr (total)	2.59	0.631	0.00518	0.00951	0.5	10	70
Copper as Cu	95.9	14.1	0.192	0.274	2	50	100
Mercury as Hg	<0.0100	<0.0100	<0.0000400	<0.000116	0.01	0.2	2
Molybdenum as Mo	102	15.5	0.204	0.296	0.5	10	30
Nickel as Ni	20.8	2.06	0.0416	0.0512	0.4	10	40
Lead as Pb	<2.00	<2.00	<0.00400	<0.02	0.5	10	50
Antimony as Sb	11.1	6.47	0.0222	0.0723	0.06	0.7	5
Selenium as Se	6.73	<1.00	0.0135	<0.0193	0.1	0.5	7
Zinc as Zn	6.33	3.11	0.0127	0.0364	4	50	200
Chloride as Cl	82000	<10000	164	<217	800	15,000	25,000
Fluoride as F	1140	907	2.28	9.45	10	150	500
# Sulphate as SO4	409	36	818	968	1,000	20,000	50,000
Phenol Index	<40.0	<40.0	<0.0800	<0.4	1		
Dissolved Organic Carbon (DOC) ***	24600	3670	49.2	70.8	500	800	1,000
Total Dissolved Solids (TDS)**	880000	140000	1760	2610	4,000	60,000	100,000

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are correct as of 14/08/2008 and are taken from the Environment Agency document 'Guidance for Waste Destined for Disposal in Landfills' version 2 June 2006.

Sample Comments	S1
-----------------	----

Waste Acceptance Criteria BS EN 12457-3
2 Stage Leaching Test (Granular Waste)

Report No: 002877756

Generated: 30-SEP-14

Sample Details		Test Values		
Batch Number	20067080	Mass of Raw Test Portion (kg)		0.193
NLS Folder No.	2877756	Moisture Content Ratio (%)		0
Sample Point Code	21889-061	Dry Matter Content Ratio (%)		100
Sample Point Name	CC Amgen Cymru	Leachant Volume stage 1 (litre)		0.385
Sampling Date	02 07 2014	Leachant Volume Stage 2 (litre)		1.54

Solid Waste Analysis			Results		Landfill Waste Acceptance Criteria					
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste			
Total Organic Carbon w/w %	¶ and non hazardous wastes in the same cell. * either TOC or LOI must be used for haz. wastes # if SO4 does not meet the inert limit, a percolation may be used to demonstrate compliance ** TDS may be used instead of Cl and SO4 *** DOC at pH 7.5 and 8.0 can be determined if limit value at own pH is not met		4.63		3	5	6*			
Loss on Ignition %			4.99			10*				
BTEX mg/kg			<0.00822	6						
PCBs (7 congeners) mg/kg			<0.00900	1						
Mineral Oil (C10 - C40) mg/kg			227	500						
PAHs mg/kg			54.2	100						
pH			11.4							>6
Acid Neutralisation Capacity (pH4) mol/kg			1.02		To be evaluated					To be evaluated
Acid Neutralisation Capacity (pH7) mol/kg	-		To be evaluated	To be evaluated						
Eluate Analysis		Concentration in Eluate		Amount Leached		Landfill Waste Acceptance Criteria				
Liquid : Solid Ratio	2:1	8:1	2:1	10:1	Limit Values (mg/kg) at L:S 10:1					
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste			
pH	9.1	9.92								
Conductivity uS/cm	708	144								
	ug/l	ug/l	mg/kg	mg/kg						
Arsenic as As	7.2	10.6	0.0144	0.1	0.5	2	25			
Barium as Ba	108	22.9	0.216	0.368	20	100	300			
Cadmium as Cd	<0.100	<0.100	<0.000200	<0.001	0.04	1	5			
Chromium as Cr (total)	6.95	0.772	0.0139	0.0178	0.5	10	70			
Copper as Cu	77.4	14.9	0.155	0.251	2	50	100			
Mercury as Hg	<0.0100	<0.0100	<0.0000400	<0.000116	0.01	0.2	2			
Molybdenum as Mo	62.2	7.21	0.124	0.162	0.5	10	30			
Nickel as Ni	11.7	2.52	0.0234	0.0402	0.4	10	40			
Lead as Pb	<2.00	<2.00	<0.00400	<0.02	0.5	10	50			
Antimony as Sb	9.02	5.14	0.018	0.0577	0.06	0.7	5			
Selenium as Se	4.64	<1.00	0.00928	<0.0159	0.1	0.5	7			
Zinc as Zn	5.63	<3.00	0.0113	<0.0343	4	50	200			
Chloride as Cl	28200	<10000	56.4	<130	800	15,000	25,000			
Fluoride as F	1240	738	2.48	8.2	10	150	500			
# Sulphate as SO4	316	28.8	632	756	1,000	20,000	50,000			
Phenol Index	<40.0	<40.0	<0.0800	<0.4	1					
Dissolved Organic Carbon (DOC) ***	23100	5230	46.2	81.4	500	800	1,000			
Total Dissolved Solids (TDS)**	648000	104000	1300	1930	4,000	60,000	100,000			

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are correct as of 14/08/2008 and are taken from the Environment Agency document 'Guidance for Waste Destined for Disposal in Landfills' version 2 June 2006.

Sample Comments	S2

Waste Acceptance Criteria BS EN 12457-3
2 Stage Leaching Test (Granular Waste)

Report No: 002877757
Generated: 30-SEP-14

Sample Details		Test Values		
Batch Number	20067080	Mass of Raw Test Portion (kg)		0.193
NLS Folder No.	2877757	Moisture Content Ratio (%)		0
Sample Point Code	21889-061	Dry Matter Content Ratio (%)		100
Sample Point Name	CC Amgen Cymru	Leachant Volume stage 1 (litre)		0.385
Sampling Date	02 07 2014	Leachant Volume Stage 2 (litre)		1.54

Solid Waste Analysis		Results		Landfill Waste Acceptance Criteria				
				Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste		
Total Organic Carbon w/w %	¶ and non hazardous wastes in the same cell * either TOC or LOI must be used for haz. wastes # if SO4 does not meet the inert limit, a percolation may be used to demonstrate compliance ** TDS may be used instead of Cl and SO4 *** DOC at pH 7.5 and 8.0 can be determined if limit value at own pH is not met	1.34	3	5	6*			
Loss on Ignition %		11.8			10*			
BTEX mg/kg		<0.00750	6					
PCBs (7 congeners) mg/kg		<0.0107	1					
Mineral Oil (C10 - C40) mg/kg		<50	500					
PAHs mg/kg		1.42	100					
pH		8.85		>6				
Acid Neutralisation Capacity (pH4) mol/kg		1.04		To be evaluated	To be evaluated			
Acid Neutralisation Capacity (pH7) mol/kg	-		To be evaluated	To be evaluated				
Eluate Analysis		Concentration in Eluate		Amount Leached		Landfill Waste Acceptance Criteria		
Liquid : Solid Ratio	2:1	8:1	2:1	10:1	Limit Values (mg/kg) at L:S 10:1			
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste	
pH	8.34	9.1						
Conductivity uS/cm	540	135						
	ug/l	ug/l	mg/kg	mg/kg				
Arsenic as As	1.21	2.17	0.00242	0.0201	0.5	2	25	
Barium as Ba	32.2	29.9	0.0644	0.303	20	100	300	
Cadmium as Cd	<0.100	<0.100	<0.000200	<0.001	0.04	1	5	
Chromium as Cr (total)	1.39	<0.500	0.00278	<0.00645	0.5	10	70	
Copper as Cu	4.02	2.11	0.00804	0.0242	2	50	100	
Mercury as Hg	<0.0100	<0.0100	<0.0000400	<0.000116	0.01	0.2	2	
Molybdenum as Mo	12.4	5.05	0.0248	0.0625	0.5	10	30	
Nickel as Ni	2.46	<1.00	0.00492	<0.0124	0.4	10	40	
Lead as Pb	<2.00	<2.00	<0.00400	<0.02	0.5	10	50	
Antimony as Sb	<1.00	1.11	<0.00200	<0.0109	0.06	0.7	5	
Selenium as Se	3.26	2.15	0.00652	0.0233	0.1	0.5	7	
Zinc as Zn	6.96	<3.00	0.0139	<0.0364	4	50	200	
Chloride as Cl	<10000	<10000	<20.0	<100	800	15,000	25,000	
Fluoride as F	1060	650	2.12	7.17	10	160	500	
# Sulphate as SO4	240	29.8	480	640	1,000	20,000	50,000	
Phenol Index	<40.0	<40.0	<0.0800	<0.4	1			
Dissolved Organic Carbon (DOC) ***	3950	1520	7.9	19.2	500	800	1,000	
Total Dissolved Solids (TDS)**	464000	108000	928	1660	4,000	60,000	100,000	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are correct as of 14/08/2008 and are taken from the Environment Agency document 'Guidance for Waste Destined for Disposal in Landfills' version 2 June 2006.

Sample Comments	AD1
-----------------	-----

Waste Acceptance Criteria BS EN 12457-3
2 Stage Leaching Test (Granular Waste)

Report No: 002877758

Generated: 30-SEP-14

Sample Details		Test Values		
Batch Number	20067080	Mass of Raw Test Portion (kg)		0.193
NLS Folder No.	2877758	Moisture Content Ratio (%)		0
Sample Point Code	21889-061	Dry Matter Content Ratio (%)		100
Sample Point Name	CC Amgen Cymru	Leachant Volume stage 1 (litre)		0.385
Sampling Date	02 07 2014	Leachant Volume Stage 2 (litre)		1.54

Solid Waste Analysis			Results		Landfill Waste Acceptance Criteria		
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste
Total Organic Carbon w/w %	¶ and non hazardous wastes in the same cell. * either TOC or LOI must be used for haz. wastes # if SO4 does not meet the inert limit, a percolation may be used to demonstrate compliance ** TDS may be used instead of Cl and SO4 *** DOC at pH 7.5 and 8.0 can be determined if limit value at own pH is not met		1.61		3	5	6*
Loss on Ignition %			12.9				10*
BTEX mg/kg			<0.00750		6		
PCBs (7 congeners) mg/kg			<0.00959		1		
Mineral Oil (C10 - C40) mg/kg			<50		500		
PAHs mg/kg			<2.06		100		
pH			8.92			>6	
Acid Neutralisation Capacity (pH4) mol/kg			0.185			To be evaluated	To be evaluated
Acid Neutralisation Capacity (pH7) mol/kg			-			To be evaluated	To be evaluated
Eluate Analysis	Concentration in Eluate		Amount Leached		Landfill Waste Acceptance Criteria		
Liquid : Solid Ratio	2:1	8:1	2:1	10:1	Limit Values (mg/kg) at L:S 10:1		
					Inert Waste	SNRHW in non Haz Landfill ¶	Hazardous Waste
pH	8.46	9.29					
Conductivity uS/cm	598	132					
	ug/l	ug/l	mg/kg	mg/kg			
Arsenic as As	2.51	2.58	0.00502	0.0257	0.5	2	25
Barium as Ba	36	14.8	0.072	0.183	20	100	300
Cadmium as Cd	<0.100	<0.100	<0.000200	<0.001	0.04	1	5
Chromium as Cr (total)	2.65	<0.500	0.0053	<0.00851	0.5	10	70
Copper as Cu	6.55	1.95	0.0131	0.027	2	50	100
Mercury as Hg	<0.0100	<0.0100	<0.0000400	<0.000116	0.01	0.2	2
Molybdenum as Mo	14.5	4.19	0.029	0.0587	0.5	10	30
Nickel as Ni	3.34	1.01	0.00668	0.0139	0.4	10	40
Lead as Pb	<2.00	<2.00	<0.00400	<0.02	0.5	10	50
Antimony as Sb	1.36	1.03	0.00272	0.0108	0.06	0.7	5
Selenium as Se	3.59	1.69	0.00718	0.02	0.1	0.5	7
Zinc as Zn	5.43	<3.00	0.0109	<0.0340	4	50	200
Chloride as Cl	11900	<10000	23.8	<103	800	15,000	25,000
Fluoride as F	942	549	1.88	6.13	10	150	500
# Sulphate as SO4	266	30.1	532	686	1,000	20,000	50,000
Phenol Index	<40.0	<40.0	<0.0800	<0.4	1		
Dissolved Organic Carbon (DOC) ***	7310	1690	14.6	26.1	500	800	1,000
Total Dissolved Solids (TDS)**	488000	88000	976	1530	4,000	60,000	100,000

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are correct as of 14/08/2008 and are taken from the Environment Agency document 'Guidance for Waste Destined for Disposal in Landfills' version 2 June 2006.

Sample Comments	AD2