

**MORFA NON HAZARDOUS
LANDFILL PERMIT
BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report
Report Number 2035r3v1d0822

Commissioned by
Tata Steel (UK) Limited
Port Talbot Works
Port Talbot
SA13 2NG



August 2022

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1 INTRODUCTION

Geotechnology Ltd (Geotechnology) has been commissioned by Darlow Lloyd and Sons Ltd. on behalf of Tata Steel (UK) Ltd (Tata Steel) to provide site supervision and CQA validation during key stages of the restoration of Biodegradable Cells A and B, at Morfa Non-Hazardous Landfill.

The restoration has comprised the available and completed (waste deposition) areas of Cells A and B which constitute a plan area of approximately 18400m². This validation report is for this restored area.

The location of the landfill is shown on Figure 1 and details of the constructed cell area on Figure 2.

This report documents and validates the construction of the cell, deployment of geosynthetic materials, an access road, drainage and placement of the restoration sand layer.

1.1 Site Location

The centre of the site is located at National Grid Reference SS781 838, as shown on Figure 1. The site currently comprises a mixture of casually over-tipped land, landfills constructed in accordance with the current Landfill Directive since 2004 (MNHL and MHL), the unlined but capped MCL, partially excavated sand dunes and pristine dune fields.

The site is remote and located at the southern end of the Port Talbot Steel Plant. It is surrounded by land entirely owned by the company. The adjacent Margam Moors as far as the railway line to the east is owned by Tata Steel as is the site as far south as the River Kenfig. KNNR is located to the south of the River Kenfig and is bound by the southern bank of the River Kenfig.

There are no inhabited buildings within 1.9km and the nearest industrial buildings are close to 1km from the site. There are no public roads within 1km of the site and the adjacent beach is also under the private ownership of Tata Steel (UK) Ltd. There are no services crossing the site. One public footpath crosses the moors close to the site. The footprint of Biocells A & B lie entirely within the Non-Hazardous landfill.

1.2 Project Organisation

The Client for the contract was Darlow Lloyd and Sons Ltd (DLS) who were directly commissioned by Tata Steel to complete the works.

The Designer for the Works is Mr Ewan Thomas of Geotechnology Ltd.

The Engineer for the Works is Geotechnology Ltd.

CQA inspectors for the works are Arwel Jones and Keir Thomas of Geotechnology Ltd.

The Contractors involved with the project are listed below:

- Earthworks – DLS Ltd.
- Geomembrane Installer - Celtic Lining Ltd.

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- Earthworks Testing Laboratory – Apex Testing Solutions Ltd. Geosite Testing Services Ltd.
 - Geosynthetic Testing Laboratory - BICS Laboratories Ltd.

The following suppliers were involved with the works:

- GSE Ltd.- HDPE Liner Materials
- Geofabrics Ltd. - Protector Geotextile
- DLS Ltd. – Drainage and Access Road Aggregates
- Keyline Ltd. – Drainage Pipework

1.3 CQA Plan and Specification

The installation of the lining system was carried out in accordance with the principles of the Construction Quality Assurance (CQA) Plan (Geotechnology Ref: 2035r2v1d0221) and Design and Specification (Geotechnology Ref: 2035r1v1d0221). These reports document the approach to be adopted for the approval of material suppliers, conformance testing of the materials supplied, approval of the lining system installer and monitoring of all processes involved with the installation, jointing and testing of the lining system. This report should be read in conjunction with these two documents.

2 OVERVIEW OF THE WORKS

2.1 Timescales

The main construction works for the restoration of Biocell A & B was undertaken during the period March 2022 - July 2022. Earthworks including reshaping of the completed waste surface and placement of the regulating layer took place in March to April 2022. Lining works took place throughout May 2022, with the placement of the restoration (sand) soil and access road in June and July 2022.

2.2 Timings

The construction of the final restored surface commenced in March 2022 with the excavation of wastes to the required gradients. This was completed in April 2022. Lining works commenced on 3 May, were completed on the 20 May and comprised a gas geo-composite, 1mm HDPE and a surface water geo-composite, with final sand restoration soil cover.

The geosynthetic materials were supplied from GSE Ltd and Geofabrics Ltd, through Celtic Lining Ltd. The material as specified comprised a Double Rough and Smooth Sided 1mm HDPE. As per the CQA requirements, the material as delivered was tested under the conformance testing schedule set out in the Specification. All the conformance tests were satisfactory.

Restored soil (sand) placement started during the lining works to secure the geomembrane and protector geotextile. This work continued throughout June and July and was completed on July 15, 2022. Works including an access road and drainage pipe placement were also completed at the same time.

2.3 Design Changes

The design of the restoration cap was indicated to have a total plan footprint of 21600m².

The actual as-built footprint of the restoration cap is only approximately 18400m². The reason for this discrepancy lies with the requirement for a working / access area on the northern side of the cap. Excess acquired materials will be retained and used in subsequent restoration works.

A length of pipe was not installed on the eastern edge of the re-graded cap, as instead, a small formed bund was made to direct water northwards to meet the main cap drain.

2.4 Preparatory Earthworks

The preparatory earthworks commenced in early spring 2022, by excavation and moving of waste materials to the required gradients and profiles.

2.5 Regulating Layers

Regulating layer (dust) placement commenced in April with the placement of the dust to varying thicknesses in preparation for the geosynthetic layers.

2.6 Gas Geo-composite

A gas geo-composite was placed directly onto the dust regulating layer to facilitate long term gas collection and to provide additional underling protection to the HDPE geomembrane placed on top.

ABG Ltd., the gas geo-composite manufacturer, supplied quality control data for the geotextile rolls delivered to site. Samples were also taken by the lining contractor of the received materials and sent to BICS Laboratories Ltd for conformance testing.

The gas geo-composite was installed in accordance with the Specification and CQA Plan.

2.7 Flexible Capping Membrane

A 1mm High Density Polyethylene (HDPE) Geomembrane was installed directly onto the gas geo-composite. The Specification document required the use of 1mm smooth (plateau / flat areas) and double textured (for slopes) HDPE geomembrane.

The HDPE terminates in a toe piped stone perimeter drain to provide anchorage to the geomembrane, and covers the whole of the available area of Cells A and B.

Manufacturers Quality Control data for the lining membrane delivered to site was supplied by Solmax Limited, who manufactured the rolls. Samples of the received materials were taken by Celtic Lining Ltd. The samples were sent to BICS Laboratories Limited for conformance testing.

Each deployed panel was assessed for flaws in the geomembrane and seaming. Non-destructive testing was undertaken on all seams and destructive samples collected from a selection of seams.

2.8 Surface Water Geotextile

A surface water geo-composite was placed directly onto the HDPE geomembrane to provide protection from the overlying drainage soil, but also to facilitate water flow off the cap. The surface water geo-composite terminates in the same toe drain as the geomembrane, and also covers the whole area of the cap.

ABG Ltd., the surface water geo-composite manufacturer, supplied quality control data for the rolls delivered to site. Samples were also taken by the lining contractor of the received materials and sent to BICS Laboratories Ltd for conformance testing.

The surface water geo-composite was installed in accordance with the Specification and CQA Plan.

2.9 Surface Water Drainage Pipework

Surface water drainage pipework was placed on the cap and at the perimeter toe. All pipework comprised 150mm I.D. twinwall HDPE with associated fittings. The surface water off the cap will be diverted either west towards the seaward side, or east into the Margam moors (as part of the recharge drain system).

2.10 Restoration Soil

The restoration soil comprised entirely of natural site won aeolian sand, obtained from agreed sources within the Morfa Landfill site and was placed to a nominal thickness of 400mm.

The nature of sand (from previous capping works at Morfa) makes it highly vulnerable to displacement / movement due to wind. The survey and site observation during the works completed by Geotechnology indicates that sufficient sand was originally placed.

3 SITE PREPARATION

3.1 Preparatory Earthworks

The preparatory waste re-configuration of the biocells commenced in March 2022 with the excavation of waste materials from areas on both the cap and slopes and their relocation within the bio-cell itself. The final waste surface was specified / set out by Geotechnology using a dGPS survey instrument to achieve the correct formation levels.

Upon completion of this operation Geotechnology staff undertook an inspection of the final waste surface in mid-April 2022. A topographic survey of the final formation surface was carried out following reinstatement of the soft spots.

The final waste surface was inspected by Geotechnology and approved for acceptance of the overlying dust regulating layer.

4 AGGREGATES AND REGULATING LAYER

In areas where waste was removed aggregate was used to fill in the voids / volume deficiency. The aggregates used for the infill exercise comprise recovered from the HAA.

The regulating layer comprises a dust material obtained from the HAA within the Tata site works. The dust aggregate was transported from the HAA storage area by A25 Volvo dumpers for immediate placement on the cap. Photographs of the placed regulating layer dust are included in Appendix 1.

The regulating layer at the Biocell comprised a dust material placed to a nominal thickness of between 75mm to 150mm to accept the overlying gas geo-composite. The final regulating layer is shown on Figure 3.

4.1 Placement

Prior to placement of the dust regulating layer the final waste surface was visibly inspected to ensure that it did not contain coarse particles or significant protrusions that could potentially compromise the capping system or soft spots which would result in excessive settlement leading to depressions.

In many parts of the cap, the thickness of the regulating layer greatly exceeds the 75-150mm specification requirement. The final levels of the placed regulating layer are shown on Figure 4. Importantly, the required grades and falls on the cap and slopes were maintained, which was the key requirement.

4.2 Infill Aggregate Testing

In accordance with the specification, conformance testing was completed on the infill aggregate. Conformance testing comprised 3 tests in advance of the infilling. Testing comprised solely of particle size distributions and was completed by Apex Testing Solutions Ltd.

The laboratory test results of the infill aggregate used are included in Appendix 2.

The table below shows the results obtained and the Specification Requirement:

Table 4-1 Aggregate Infill Particle Size Distribution

BS TEST SIEVE(mm)	REQUIRED TYPICAL PERCENTAGE PASSING (%)	Sample Number		
		27336	27339	27340
125	100	100	100	100
0.063	<15	1	0	1

4.3 Dust Regulating Layer Testing

In accordance with the specification, compliance testing was completed on the dust regulating layer material. Compliance testing at a rate of 1 per 1000 tonnes delivered to the project was undertaken. Testing comprised solely of particle size distributions. Testing was completed by Apex Testing Solutions Ltd.

The laboratory test results of the dust regulating layer are included in Appendix 2.

Table 4-2 Dust Regulating Layer Particle Size Distribution

BS TEST SIEVE(mm)	REQUIRED TYPICAL PERCENTAGE PASSING (%)	Sample Number					
		27338	27341	27344	27347	27350	27353
63	100	100	100	100	100	100	100
20	90 - 100	100	100	100	100	100	100
10	50 - 80	88	82	88	86	88	87
2	25 - 40	48	41	50	44	53	49
0.063	<10	10	8	10	9	10	8

A total tonnage of approximately 3300 tonnes of dust regulating material was manufactured and delivered to the cell. A total of 6 compliance tests were completed in accordance with the specification and exceeded the required testing frequency. The laboratory results are included in Appendix 2.

4.4 Test Results Observations

The results of the testing show that the infill aggregate complied with Type 1a material with respect to the Specification for Highway Works and a corresponding method compaction was applied to areas of infill.

The dust material lies outside the specification and with respect to the design, gradings are in parts non-compliant. Specifically, it is slightly too fine with respect to the 2mm down size fraction, though the fines (0.063mm) content is compliant. This does not have a deleterious effect on the end product, as it is only the sand fraction which is too fine.

On-site observation of the dust material once placed (and rolled) showed that it provided a smooth and unyielding surface on which to place the gas geo-composite. Photographs of the dust surface are shown in Appendix 1.

Geotechnology considers that the final regulating layer surface was entirely suitable for deployment of geosynthetic materials.

5 GAS GEO-COMPOSITE LAYER

5.1 Gas Geo-composite Works

The gas geo-composite layer was placed directly onto the dust regulating layer to intercept and collect any landfill gas. It also served to protect the overlying HDPE capping geomembrane.

5.2 Manufacture and Supply

The gas geo-composite used was G4SD which is a geotextile covered HDPE grid, specifically manufactured for gas collection and manufactured by ABG Ltd. The manufacturers' quality control certificates for the delivered G4SD are included in Appendix 3. Four deliveries totalling 52 Rolls was made to site on 14, 16 and 28 February 2022.

A log of the gas geo-composite (inventory) received is also presented in Appendix 3.

5.3 Conformance Testing

Three samples of the as delivered protector geotextile were taken for conformance testing at a rate of 1 per 5000m² for mechanical properties and 1 per 2500m² strength for properties only. Results are included in Appendix 4.

The samples for conformance testing were sent to BICS Laboratories Ltd. in accordance with the Specification. The test certificates provided in Appendix 4 and the summary in Table 5-1 indicate that the samples met the requirements of the Specification.

Table 5-1 Gas Geo-composite Conformance Testing

Property	Unit	Required Mean Value	Allowable tolerance to 95% confidence limits	Roll Sample Number					
				3	6	9	14	15	22
In Plane Water Flow (BS EN ISO 12958-1:2020)	L/m/s (MD) (CD)	0.30	-	0.38 0.36	- -	0.37 0.36	- -	0.38 0.35	- -
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Force	N	3200	-20%	4605	4117	4044	4167	4347	3864
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Displacement	mm	-	-	52	51	49	52	52	50
Thickness @ 2kPa (between Drains)	mm	2.0	-	2.53	-	2.13	-	2.17	-
Thickness @ 2kPa (At drain core)	mm	5.5	-	5.75	-	5.61	-	5.51	-

Property	Unit	Mean Value	Allowable tolerance to 95% confidence limits	Roll Sample Number					
				35	44	47	50	40	52
In Plane Water Flow (BS EN ISO 12958-1:2020)	L/m/s (MD) (CD)	0.30	-	0.38 0.33	- -	0.37 0.36	- -	0.34 0.34	- -
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Force	N	3200	-20%	4347	4315	3998	4257	3915	4156
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Displacement	mm	-	-	54	52	52	52	50	51
Thickness @ 2kPa (between Drains)	mm	2.0	-	2.23	-	2.21	-	2.05	-
Thickness @ 2kPa (At drain core)	mm	5.5	-	5.70	-	5.66	-	5.43	-

A single drain core thickness has been measured as 5.43mm. This is only fractionally below the required 5.5mm and is considered not to have any deleterious effect on the functionality of the gas geo-composite.

5.4 Deployment and Seaming

The gas geo-composite layer was deployed by positioning the rolls (4.4m width) with an excavator then hand rolling down the slopes. The gas geo-composite was installed as a series of panels. Adjacent panels were overlapped and secured by heat seaming. Figure 4 shows the as laid gas geo-composite panel Layout.

5.5 Gas Geo-composite Walkover Inspection

A visual inspection of the gas geo-composite layer was made after deployment. No compliance testing is specified for the placed gas geo-composite other than a detailed inspection during a walk-over. It can be confirmed that all seams were heat fused to the required overlap. Photographs of the as-laid gas geo-composite are presented in Appendix 1.

6 FLEXIBLE MEMBRANE LINER

The capping geomembrane comprised 1mm Double Rough sided (DRS) and Smooth HDPE. In combination, the CQA records provided in Appendix 5 to 8, document the complete deployment and satisfactory testing of the HDPE lining system.

6.1 Geomembrane Materials

The geomembrane used in the works comprised only 1mm double textured High Density Polyethylene (HDPE) on the slopes and a Smooth HDPE on the plateau cap. A total of 15 rolls were delivered for the project, 9 DRS and 6 Smooth. A log of the geomembrane received is presented in Appendix 5.

6.2 Geomembrane Manufacture and Supply

The geomembrane was manufactured and supplied by GSE Ltd. and Solmax who also provided the specification sheets for the material and the relevant reel certificates for each individual roll. Copies of the manufacturer's quality control test data are included in Appendix 5, demonstrating compliance with the Specification.

12 rolls of DRS and Smooth HDPE membrane were used in the Biocell capping.

6.3 Geomembrane Conformance Testing

A total of 5 conformance samples were taken from the textured and smooth rolls delivered to site in March 2022. These results are included in Appendix 5 along with the conformance test results. As the total delivered was 24245m², this testing frequency complies with the required rate of 1 per 5000m² stated in the Specification.

HDPE samples were submitted for conformance testing to BICS Laboratories Ltd, Brighouse, West Yorkshire. Laboratory conformance test certificates are presented in Appendix 6 and a summary of results provided in Tables 6-1 and 6-2. These indicate that the materials delivered met the required performance specification.

Table 6-1 1mm DRS HDPE Conformance Test Results Summary

Property	Test Method	Specif. Req.	Conformance Result - 1001-154471	Conformance Result - 1001-154488	Conformance Result - 1001-154489
Thickness (mm) • Lowest individual for 8 out of 10 values • Lowest individual for any of the 10 values	D5199	nom. 1mm (-5%) - 10% - 15%	1.00	0.99	0.99
Asperity Height mils	GRI/M12	0.25 mm	0.45	0.47	0.46
Density	D1505-10	0.940 g/cc	0.941	0.942	0.941
Tensile Properties • Yield strength • Break strength • Yield elongation • Break elongation	D 6693 Type IV	15 N/mm 10 N/mm 12% 100%	MD/CD 19.8/22.0 27.7/23.9 18/16 586/512	MD/CD 18.7/19.7 23.9/23.0 16/16 532/530	MD/CD 18.7/19.4 25.1/22.0 17/15 572/538
Tear Resistance	D 1004	125 N	197/214	192/184	178/174
Puncture Resistance	D 4833	267 N	521	490	466
Carbon Black Content (range)	D 1603	2.0 – 3.0%	2.49	2.37	2.66
Carbon Black Dispersion	D5596	1-2	1	1	1
Stress Crack 500hrs	D5397-20	No break / failure	Satisfactory	Satisfactory	Satisfactory

NOTE: Machine Direction (MD) / Cross Machine Direction (CMD) *

Table 6-2 1mm Smooth HDPE Conformance Test Results Summary

Property	Test Method	Specif. Req.	Conformance Result - 1002-112456	Conformance Result - 1002-112459
Thickness (mm) • Lowest individual for 8 out of 10 values • Lowest individual for any of the 10 values	D5199	nom. 1mm (-5%) - 10% - 15%	1.02	1.03
Density	D1505-10	0.940 g/cc	0.941	0.942
Tensile Properties • Yield strength • Break strength • Yield elongation • Break elongation	D 6693 Type IV	15 N/mm 27 N/mm 12% 700%	MD/CD 17/18.5 35.3/35.2 21/15 840/912	MD/CD 17.0/18.3 33.3/35.5 20/16 800/918
Tear Resistance	D 1004	125 N	154/159	158/162
Puncture Resistance	D 4833	320 N	447	458
Carbon Black Content (range)	D 1603	2.0 – 3.0%	2.53	2.45
Carbon Black Dispersion	D5596	1-2	1	1
Stress Crack 500hrs	D5397-20	No break / failure	Satisfactory	Satisfactory

NOTE: Machine Direction (MD) / Cross Machine Direction (CMD) *

6.4 Geomembrane Deployment

The geomembrane was installed in accordance with the requirements set out in the Specification following acceptance of the gas geo-composite. The geomembrane was installed between 3 – 20 May 2022, as confirmed by the records in Appendix 7.

The geomembrane was installed as a series of panels, numbered sequentially in order of deployment regardless of being either DRS or Smooth. The rolls were manoeuvred into place with a 360 degree tracked excavator fitted with a spreader bar. The geomembrane deployment was monitored and inspected by the Engineer ensuring compliance with the details set out in both the CQA plan and Specification.

The HDPE CQA data and the lining contractor's daily records for the deployment of the geomembrane are included in Appendix 7. The HDPE panel layout for the geomembrane is shown on Figure 5.

6.5 Geomembrane Seaming

The CQA data for the seaming activities in connection with the installation of the geomembrane is provided in Appendix 6. In combination, the records provided in Appendix 7 confirm that all seams shown on Figure 6 were tested.

6.5.1 Trial Seams

Trial seams were carried out at the start of each seaming period and for each machine used.

Trial seams, with a minimum length of 1.50m were prepared from fragment pieces of geomembrane liner. Sample specimens 25mm wide were cut from trial seams, approximately 200mm apart. The samples were tested in the field for peel and shear strength. If any samples failed, machinery adjustments were made and the testing repeated.

6.5.2 Fusion Welding

Fusion welding was performed on the geomembrane for the lining works.

The Engineer inspected fusion welds in accordance with the CQA Plan. The CQA field seam records for the fusion welds are presented in Appendix 7.

The CQA data for the fusion welds completed are shown in Appendix 6.

6.5.3 Extrusion Welding

Extrusion welding was only undertaken in areas where it was not possible to use fusion welders. These included the tie-in to Biocell A& B, beaded repairs, three way joints and all patched repairs. Extrusion welds and repairs are identified on Figure 6.

The CQA data for the extrusion welds completed are shown in Appendix 8.

6.5.4 HDPE Walkover Inspection

Prior to the panels being covered over by the protector Geotextile, a walkover inspection was undertaken by the Engineer.

6.5.5 HDPE Repairs

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

A total of 45 repairs were undertaken on the HDPE and 16 Pipe Boots around existing gas wells. Photographs of repairs are provided in Appendix 7 and the locations shown on Figure 6. Destructive samples in part, were taken in sacrificial areas where repairs would not be required.

6.6 Seam Testing

6.6.1 Air Pressure Testing

Fusion seams were subjected to air pressure testing in accordance with the Specification. The CQA Data for the air testing of the fusion seams is included in Appendix 7.

6.6.2 Vacuum Box Testing

Extrusion welds were only undertaken in areas that required a repair and on the long extrusion weld joining Sub-Cell C (B) to Biocell A & B, these were vacuum box tested. All vacuum box testing was observed to be satisfactory.

6.6.3 Destructive Testing

Samples were cut from installed seams to provide a method of obtaining quantitative results for the seam strength. Sample locations were selected at a frequency of approximately 1 test per 173m for fusion seams, exceeding the requirement of 1 per 200m. Approximately 120m of extrusion welding was completed, but 3 extrusion seam destructive tests were taken to test the effectiveness of the extrusion welding as dummy welds. This also exceeds the requirement of 1 test per 150m. These tests are included in Appendix 7 and summarised in Table 6-3 below. The destructive samples were completed by BICS Laboratories Ltd.

Table 6-3 Destructive Laboratory Test Results

Sample ID	Seam Reference	Weld Type	Peel (N/mm)		Shear (N/mm)	
			Mean	Lowest	Mean	Lowest
DS-1	P6/P7	Fusion	17.1	16.2	20.9	20.5
DS-2	P18/P19	Fusion	17.3	16.2	21.0	20.7
DS-3	P7/P21	Fusion	15.0	13.6	18.7	17.7
DS-4	P22/P23	Fusion	14.3	13.3	18.4	17.8
DS-5**	Dummy	Extrusion	16.2	15.0	18.3	17.4
DS-6	P28/P29	Fusion	18.6	17.6	22.8	21.6
DS-7	P34/P35	Fusion	14.4	13.8	18.2	17.7
DS-8	P23/P33	Fusion	14.4	13.1	18.5	18.0
DS-9	P37/P38	Fusion	14.2	12.8	17.8	17.5
DS-10	P39/P41	Fusion	15.0	14.3	16.3	16.0
DS-11	Dummy	Extrusion	12.7	11.6	19.0	18.2
DS-12	P43/P44	Fusion	16.6	15.9	20.8	20.4
DS-13	P48/P49	Fusion	15.4/15.6	13.5/13.4	21.0/20.7	20.8/20.3
DS-14	P42/P59	Fusion	13.6	12.0	17.8	17.5
DS-15	P60/P61	Fusion	14.8	14.2	18.8	18.4
DS-16	P62/P63	Fusion	16.1	14.2	20.2	19.7
DS-17	P63/P64	Fusion	16.8	16.1	21.6	21.2
DS-18	P69/P71	Fusion	15.9/13.9	11.0/13.0	21.1/15.6	19.8/15.3
DS-19	P61/P76	Fusion	14.3	12.3	18.3	18.0
DS-20	P76/P78	Fusion	14.8	14.0	18.4	18.1
DS-21	Dummy	Extrusion	16.2	12.6	18.1	

Note: Required Parameters - Peel Value = 8.8N/mm (fusion & extrusion),
Shear Value = 10.5N/mm (fusion and extrusion)

It was noted that of the 10 individual tests completed as part of each destructive test, some 1-2 peel separation failures were noted in DS13 and DS18. The failures did not affect the overall (mean) peel and shear strength requirements for the seam, as these greatly exceeded the requirement. Geotechnology requested that a sub-sample acquired from each seam was re-tested to see if further (and more extensive) failure occurrences were present. The results of the re-testing of DS13 and DS18 indicated that the results were satisfactory. It is considered that, as the sub-sample re-test and the original site field tests were also observed to be satisfactory, no further remedial works are required. This is also based on the location of the seam and design of the capping system.

All results are included in Appendix 8.

7 SURFACE WATER GEO-COMPOSITE

7.1 Surface Water Geo-composite Works

The surface water geo-composite layer was placed directly onto the geomembrane to protect it from the overlying restoration soils (sand).

7.2 Manufacture and Supply

The gas geo-composite used was 7S250D/NW8 which is a geotextile covered cusped HDPE core, specifically manufactured for water collection and is manufactured by ABG Ltd. Three deliveries to site totalling 64 Rolls were made on the 21 and 23 February 2022.

A log of the surface water geo-composite (inventory) received is also presented in Appendix 9.

7.3 Conformance Testing

Four samples of the as-delivered surface water geo-composite were taken for conformance testing at a rate of 1 per 10000m², greatly exceeding the required rate. Results are included in Appendix 9.

The samples for conformance testing were sent to BICS Laboratories Ltd. in accordance with the Specification. The test certificates provided in Appendix 10 and the summary in Table 7-1 indicate that the samples met the requirements of the Specification.

Table 7-1 Surface Water Geo-composite Conformance Testing Results

Property	Unit	Mean Value	Allowable tolerance to 95% confidence limits	Roll Sample Number			
				16168/04	16168/06	16168/07	16135/61
In Plane Water Flow (BS EN ISO 12958-1:2020)	L/m/s (MD) (CD)	1.9	+/-30%	1.51	1.63	1.73	1.83
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Force	N	3900	-20%	3524	3459	4044	4181
Static CBR Puncture resistance (BS EN 12236:2006) – Puncture Displacement	mm	-	-	46	46	49	44
Thickness @ 2kPa (between Drains)	mm	8.8	+/-20%	8.32	8.63	8.22	8.52

7.4 Deployment and Seaming

The surface water geo-composite layer was deployed by positioning the rolls (4.4m width) with an excavator then hand rolling down the slopes. The surface water geo-composite was installed as a series of panels. Adjacent panels were overlapped and secured by heat seaming.

Figure 6 shows the as-laid Surface Water Geo-composite Panel Layout.

7.5 Geotextile Walkover Inspection

A visual inspection of the Surface Water Geo-composite layer was made after deployment. No compliance testing is specified for the placed geotextile other than a detailed inspection during a walk-over. It can be confirmed that all seams were heat fused to the required overlap. Photographs of the as-laid Surface Water Geo-composite are presented in Appendix 1.

8 RESTORATION SOILS

8.1 Supply and Importation

The restoration sand for the biocell cap restoration was obtained from a small area within the proposed Sub-cell 3 of the proposed new hazard landfill, and also from the borrow pit located on the western edge of the Non-Hazardous Landfill permit area. Both areas were accepted by NRW and NPTBC for sand extraction in advance of the works.

8.2 Conformance and Compliance Testing

None required.

8.3 Placement

The restoration sand was placed in a single layer onto the surface water geo-composite. Markers were set to allow the correct thickness to be placed. The final as-built levels of the restoration sand are shown on Figure 7.

This drainage layer was placed by backhoe excavator to a nominal thickness of 400mm though CQA monitoring revealed this was variable and typically exceeded. When placing the restoration sand onto the fabric the machine swivelled as little as possible.

An isopachyte of the restoration sand thickness is shown on Figure 8. It should be noted that considerable differences in elevation is observed, and this is entirely due to wind movement of the placed sand. Geotechnology can confirm that the correct sand thickness was originally placed. Experience with other parts of the closed landfill suggests that importation of new sand is futile until vegetation has been established, due to its removal by the wind.

9 SURFACE WATER DRAINAGE PIPE

During the placement of the restoration sand, drainage pipe was placed in the trench located at the toe surrounding the biocells. The drainage pipe used was a twinwall 150mm i.d. with appropriate fittings. The pipe was encased in 10mm diameter clean aggregate and where slotted pipe was used, a filter geotextile in accordance with the Specification was wrapped around the pipe and stone to prevent long term clogging.

Two discharges off the restored biocell were made, though have yet to be finalised as they form part of the recharge trench system currently under construction. One is located to the west, the seaward side, and one out eastwards to the moors.

A small length of pipe on the cap was omitted from the construction in-lieu of a small raised bund, in order to deflect the water northwards to the main cap collection drain. Periods of precipitation have shown that the drainage system works in accordance with the as-built details described.

The drainage layout is shown on figure 9.

10 CERTIFICATION

10.1 Earthworks

It is confirmed on the basis of the inspection reported that the earthworks, including the removal of soft spots and placement of the infill and dust regulating layers were completed in accordance with the principles of the Specification.

10.2 Gas Geo-composite

It is confirmed on the basis of the inspection and testing completed and reported that the gas geo-composite has been installed in accordance with the Specification and CQA plan.

10.3 Flexible Membrane Liner

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

10.4 Surface Water Geo-composite

It is confirmed on the basis of the inspection and testing completed and reported that the surface water geo-composite has been installed in accordance with the Specification and CQA plan.

10.5 Restoration Soils

It is confirmed based on the testing that the restoration soil layer is acceptable and has been placed in accordance with the Specification and CQA Plan.

10.6 Drainage Pipeworks

The drainage system on and around the footprint of the biocell has been completed in accordance with the specification. The discharge points will connect to an existing discharge to the west and to the new recharge system to the east.

10.7 Verification

Based on the CQA inspection and testing undertaken at the site and the records available, it is confirmed that the development and associated capping works at Biocell A&B has been completed in accordance with the principles of the Specification and CQA Plan.

Signatures

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

A handwritten signature in black ink, appearing to read 'A.W. Jones', with a stylized, cursive script.

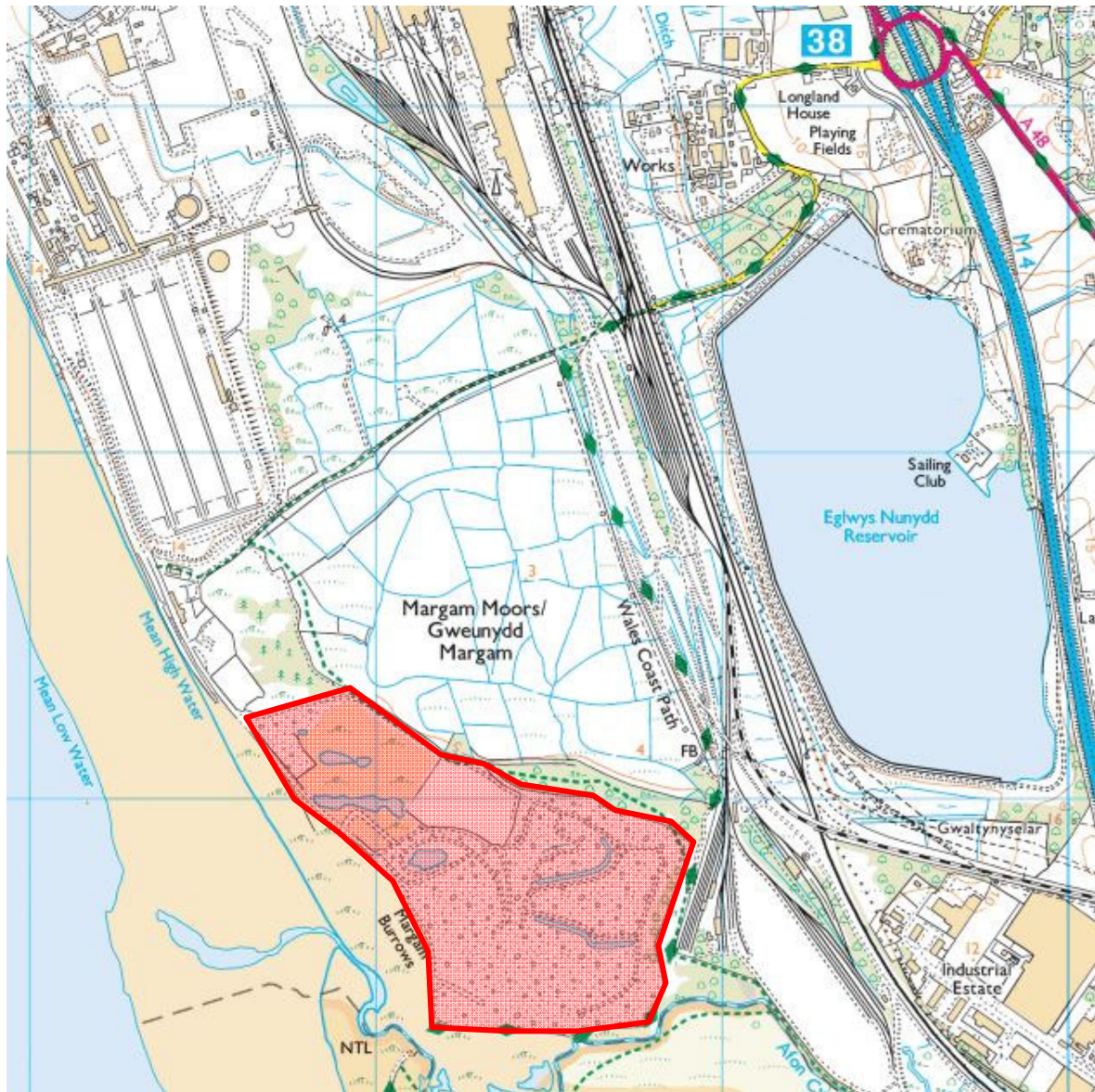
A.W Jones, CQA Consultant

I can confirm that on the basis of the records within this report and my site visits I am satisfied that the Works have been constructed in accordance with the Design Specification and CQA Plan.

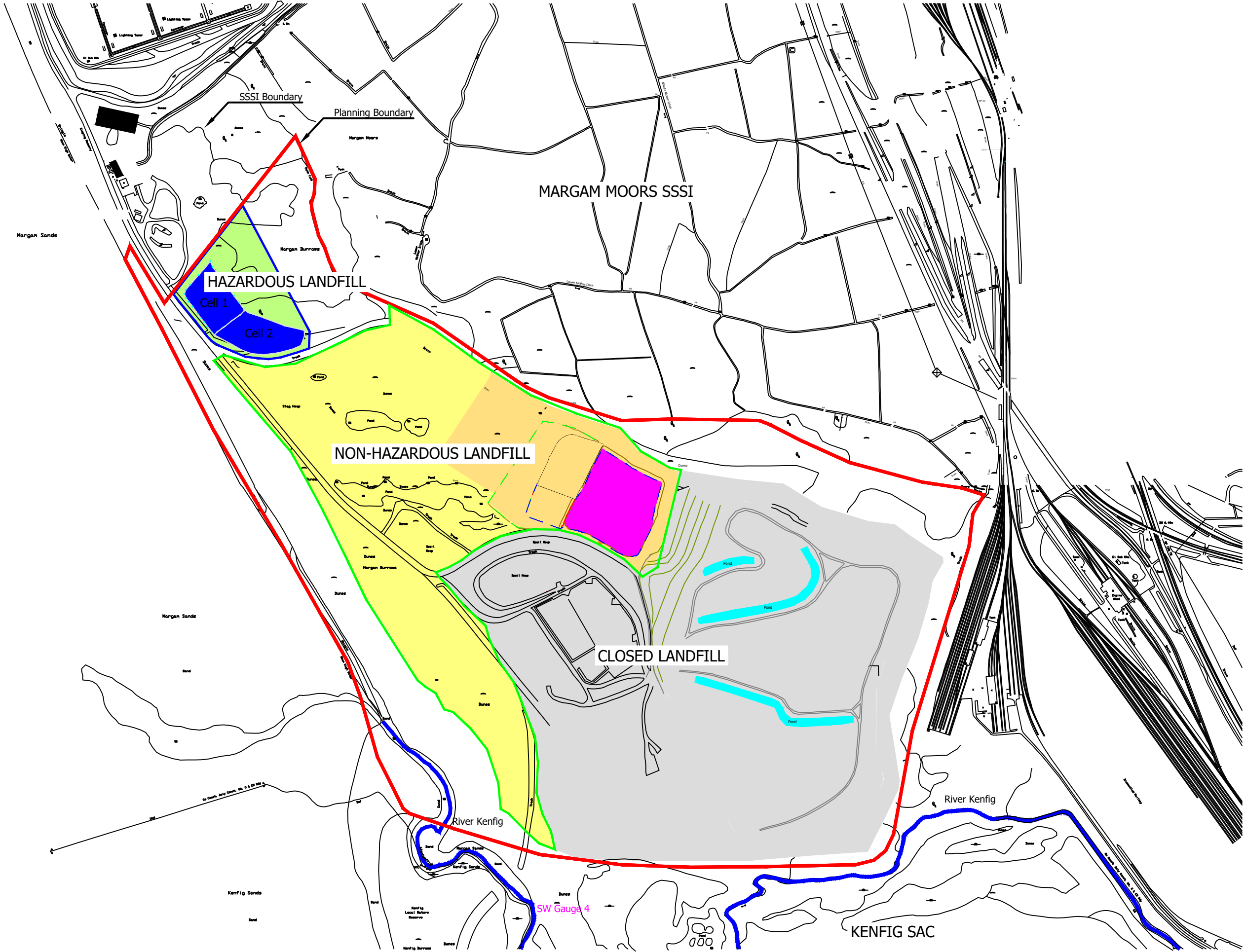
A handwritten signature in black ink, appearing to read 'E. Thomas', with a stylized, cursive script.

E. Thomas, Designer

Figure 1 Site Location Plan



Reproduced from the Ordnance Survey Land Ranger Map
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Drawing Number 2035r3/2

Legend

- Undeveloped Part of MHL
- Developed Part of MHL
- Developed Part of MNHL
- Undeveloped Part of MNHL
- Restored MCL
- BioCell Restoration Area
- 1973 Planning Permission Boundary

Notes

Rev	Date	Status/Ammendments
-----	------	--------------------

CLIENT
Tata Steel (UK) Ltd.

PROJECT
Morfa Non-Hazardous Landfill
Biocell Restoration

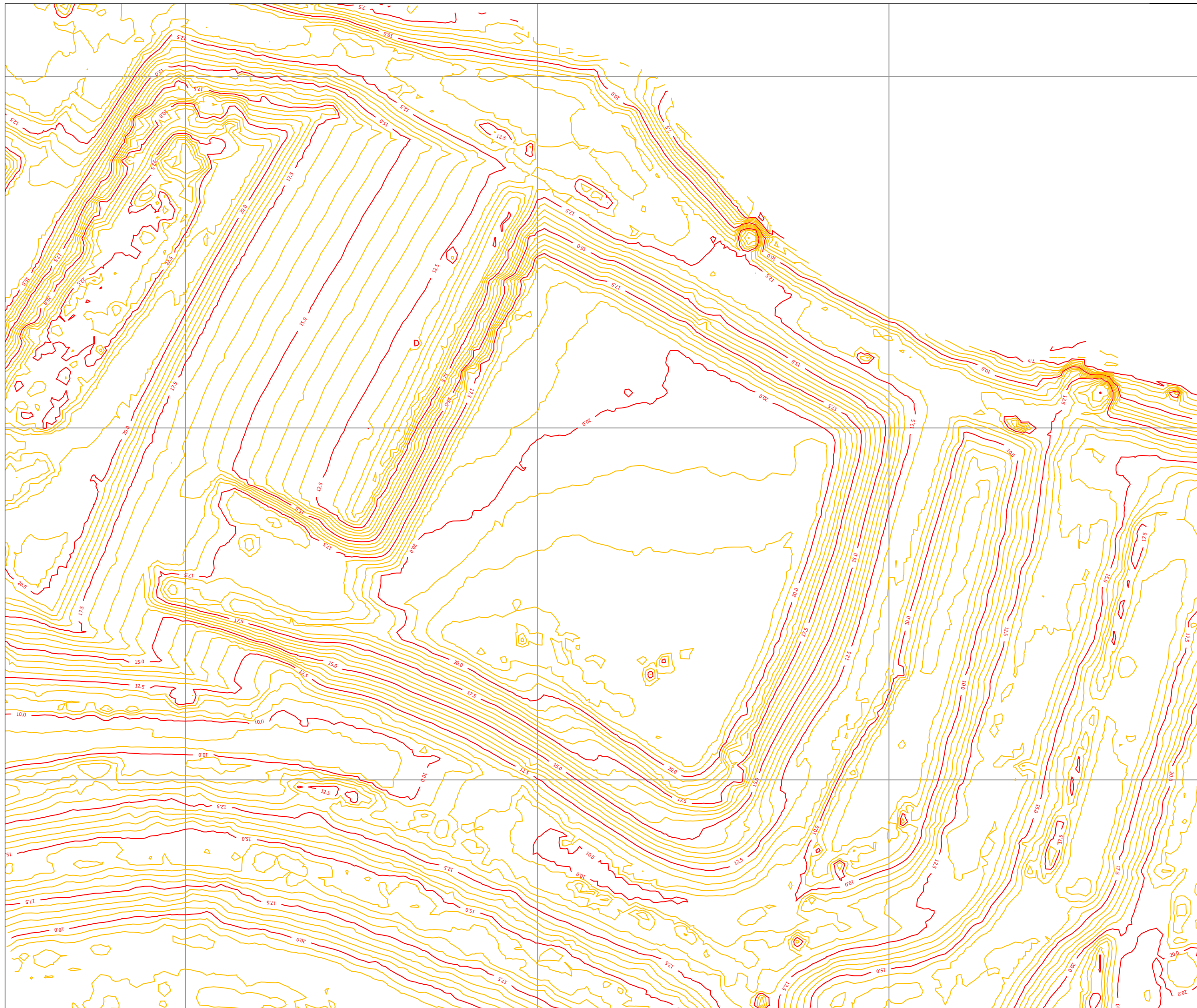
TITLE
Morfa Non-Hazardous
Landfill Location

DRAWING NUMBER	REVISION
2035r3/2	0

DATE	DRAWN	CHECKED	SCALE AT A3
08.22	AWJ		NTS

Geotechnology Limited
Ty Coed, Cefn-yr-Allt,
Aberdulais, Neath
SA10 8HE
01639 775293
www.geotechnology.net





Drawing Number 2035r3/3

Legend

23.8

Primary Contour Line

Secondary Contour Line

Notes

Digital survey model generated using Pix4D image processing software.

Imagery acquired by DJI Phantom 4 pro RTK photogrammetry survey on 22 April 2022.

Survey control installed using Topcon Hiper SR
dGPS Network Rover.

OS Grid spacing at 100m

All elevations are mAOD

Rev	Date	Status/Ammendments
CLIENT Tata Steel (UK) Ltd.		
PROJECT Morfa Non-Hazardous Landfill Biocell Restoration		
TITLE Biocell Restoration - As-Built Regulating Layer Levels		
DRAWING NUMBER 2035r3/3		REVISION 0
DATE 08.22	DRAWN AWJ	CHECKED
		SCALE AT A3 1:1000
Geotechnology Limited Ty Coed, Cefn-yr-Allt, Aberdulais, Neath SA10 8HE 01639 775293 www.geotechnology.net		

Drawing Number 2035r3/4

Legend

G51-16140/3042/38 Panel / Roll Number

Note

Rev	Date	Status/Ammendments

CLIENT

Tata Steel (UK) Ltd.

PROJEC

Morfa Non-Hazardous Landfill Biocell Restoration

TITLE

Biocell Restoration - As-Built Gas Geocomposite Panel Layout

DRAWING NUMBER

2035r3/4

REVISION

0

DATE _____

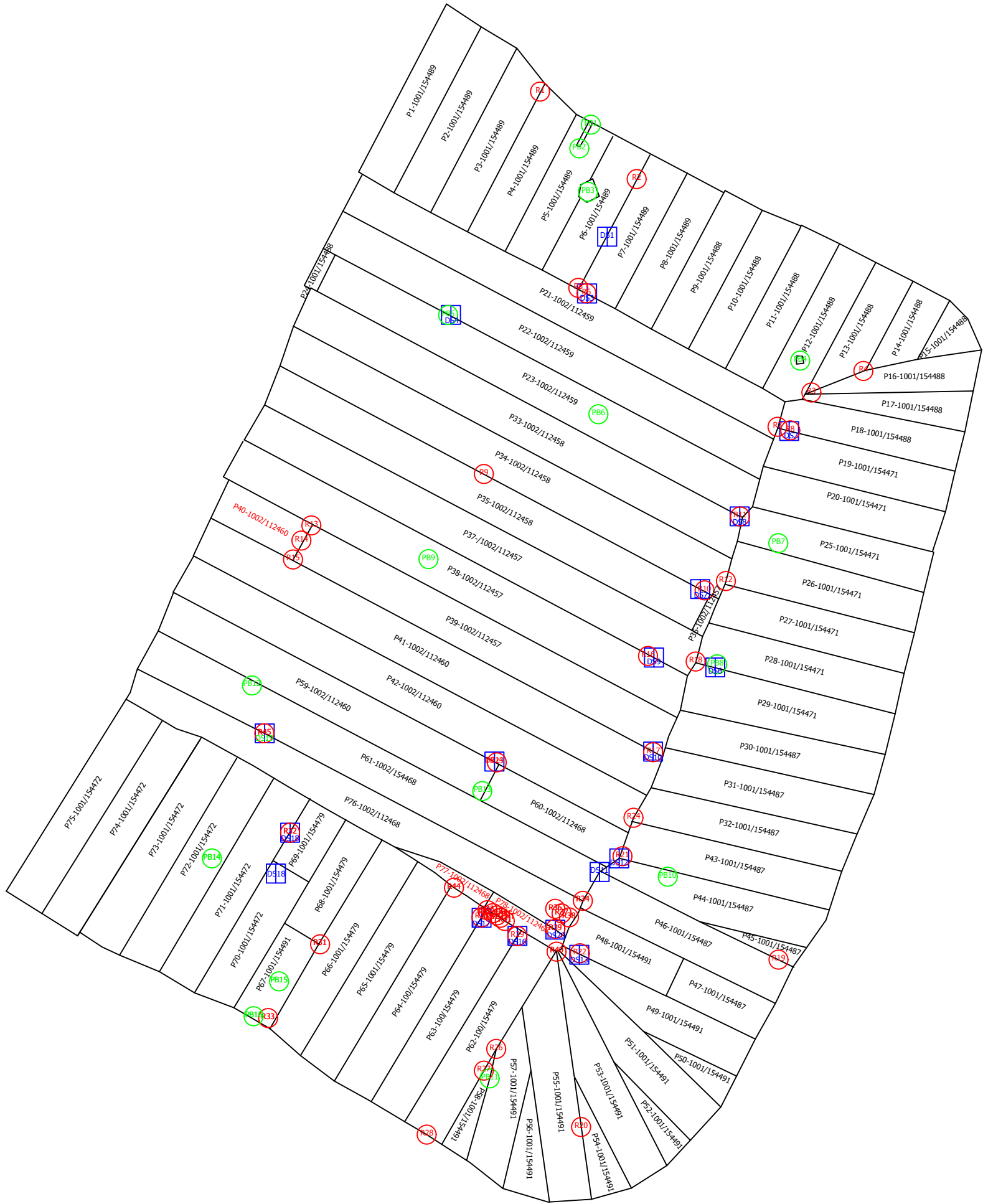
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CHECKED

SCALE AT A3

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Aberdulais, Neath
SA10 8HE
01639 775293
www.geotechnology.net





Drawing Number 2035r3/5

Legend

- P15B-048075

Panel / Roll Number
- Repair
- Destructive Sample
- Location of Destructive Sample and Repair
- Pipe Boot

Notes

RevDateStatus/Ammendments

CLIENT

Tata Steel (UK) Ltd.

PROJECT

Morfa Non-Hazardous Landfill
Biocell Restoration

TITLE

Biocell Restoration - As-Built
HDPE Panel Layout and Repairs

DRAWING NUMBER

2035r3/5

REVISION

0

DATE

08.22

DRAWN

AWJ

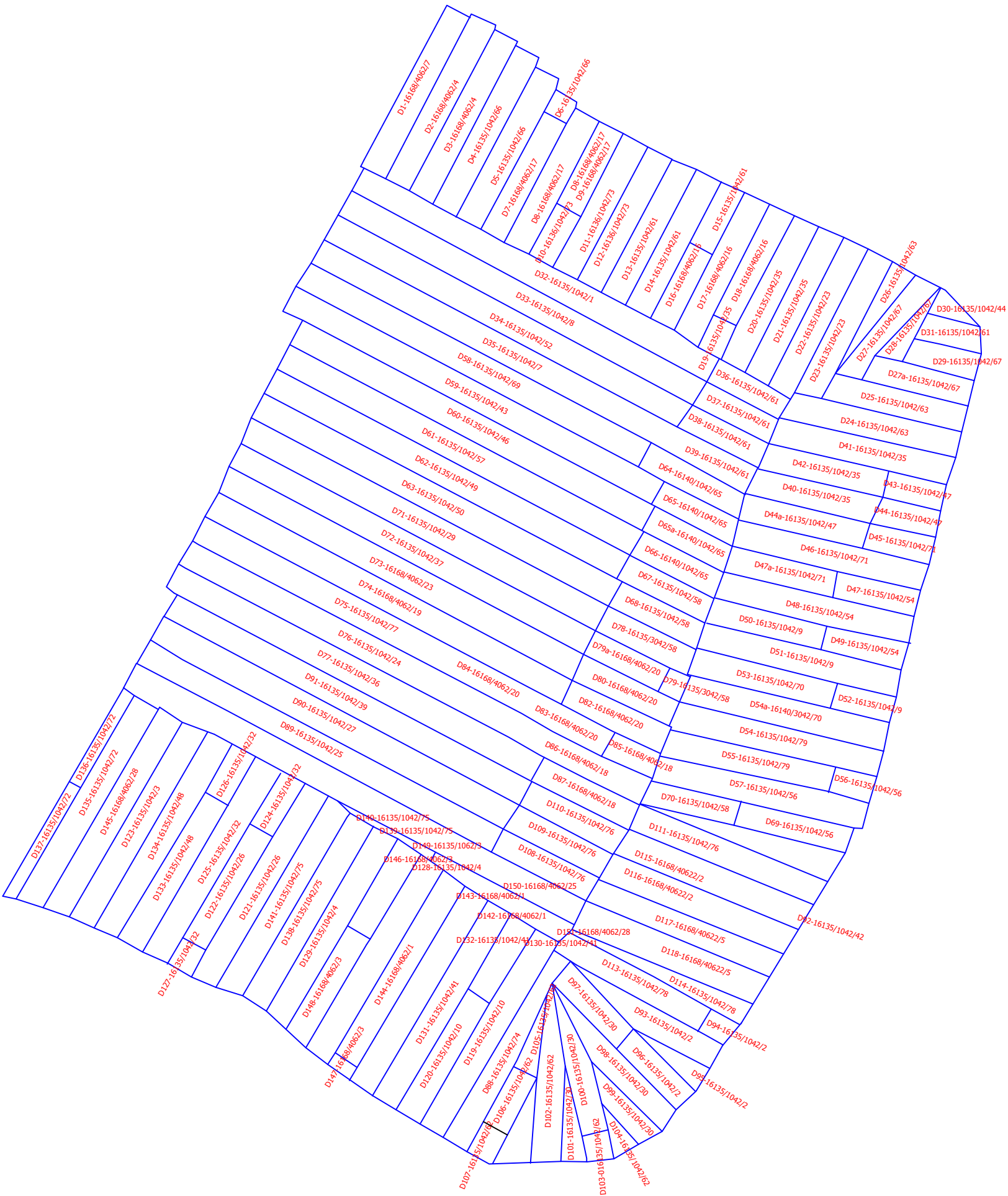
CHECKED

SCALE AT A3

1:750

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Drawing Number 2035r3/6

Legend

D31-16135/1042/61 Panel / Roll Number

Notes

Rev	Date	Status/Ammendments

CLIENT

Tata Steel (UK) Ltd.

PROJECT

Morfa Non-Hazardous Landfill
Biocell Restoration

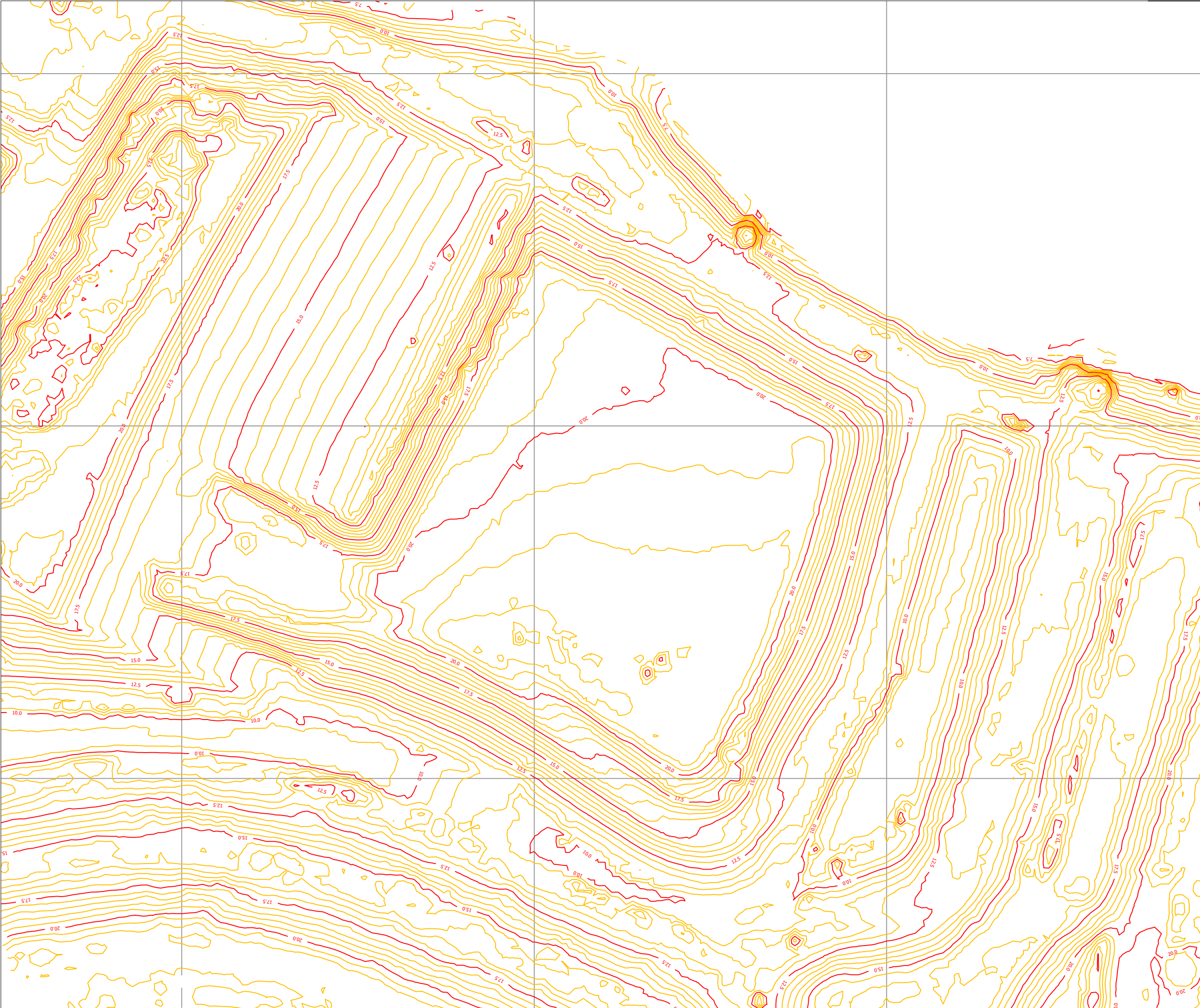
TITLE

Biocell Restoration - As-Built
Surfacewater Geocomposite
Panel Layout

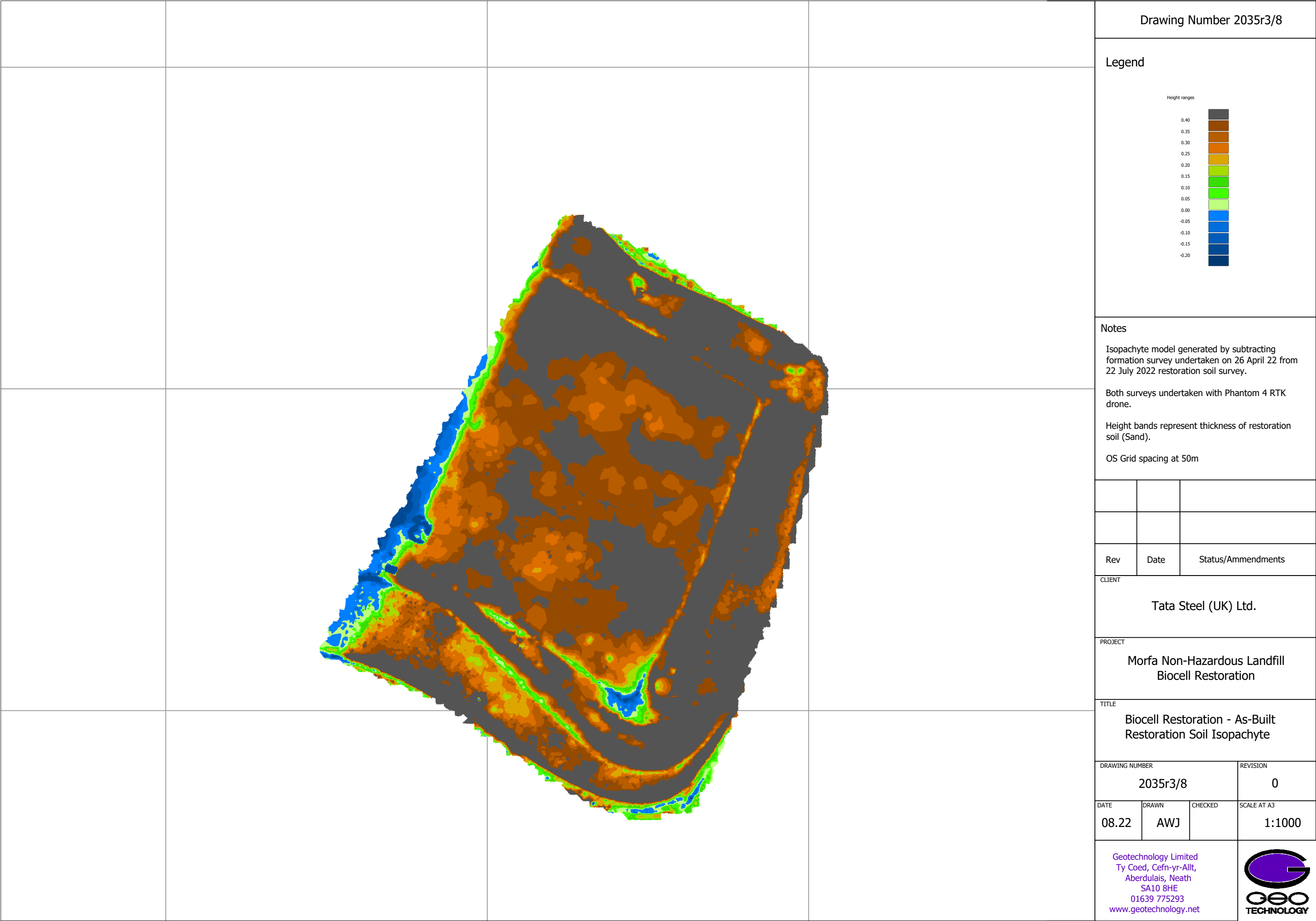
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2035r3/6			0
DATE	DRAWN	CHECKED	SCALE AT A3
08.22	AWJ		1:750

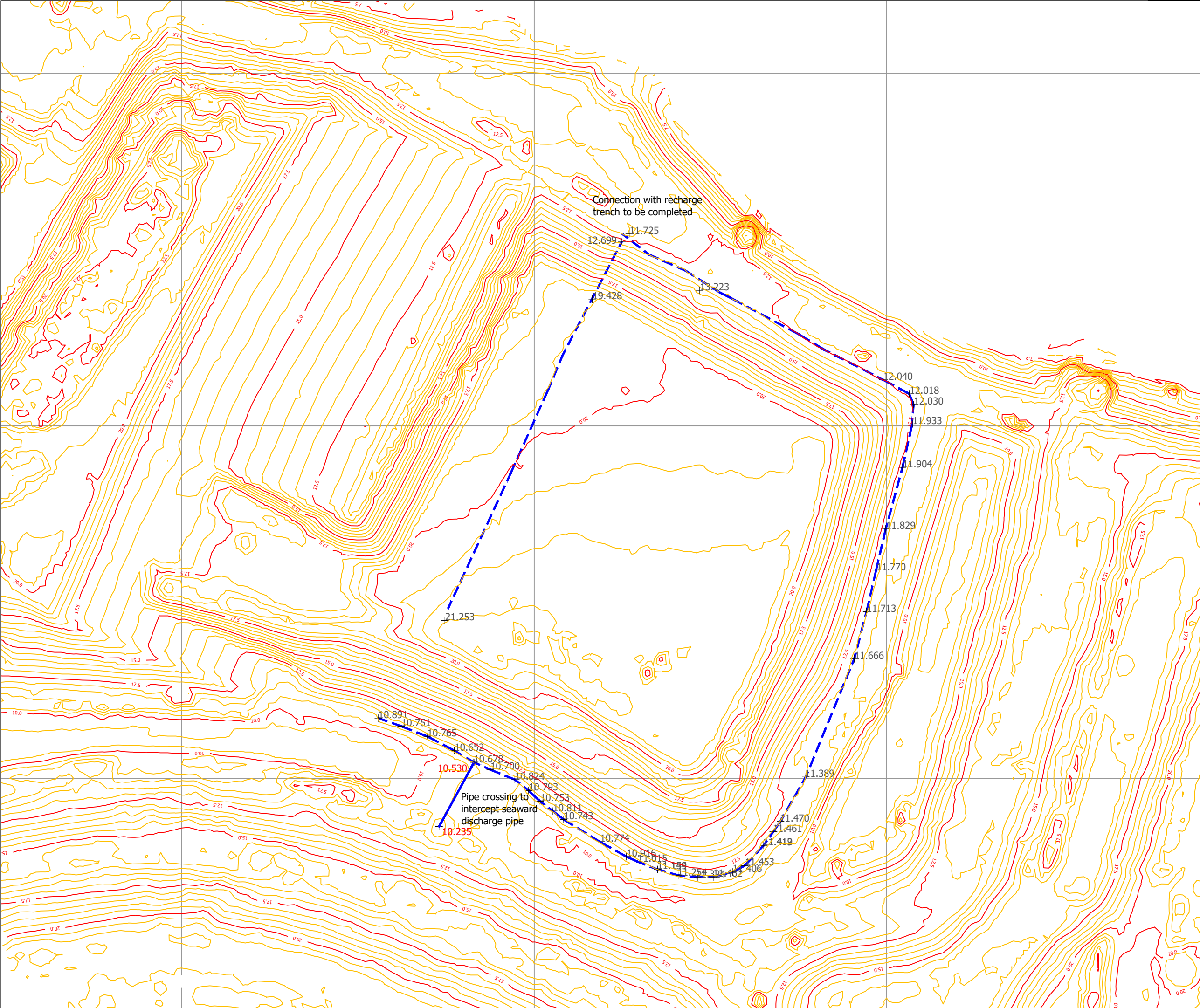
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01639 775293
www.geotechnology.net





Drawing Number 2035r3/7			
Legend Primary Contour Line Secondary Contour Line			
Notes			
Rev	Date	Status/Ammendments	
CLIENT			
Tata Steel (UK) Ltd.			
PROJECT			
Morfa Non-Hazardous Landfill Biocell Restoration			
TITLE			
Biocell Restoration - As-Built Restoration Soil Levels			
DRAWING NUMBER			REVISION
2035r3/7			0
DATE	DRAWN	CHECKED	SCALE AT A3
08.22	AWJ		1:1000
Geotechnology Limited Ty Coed, Cefn-yr-Allt, Aberdulais, Neath SA10 8HE 01639 775293 www.geotechnology.net			





Drawing Number 2035r3/9			
Legend  Solid 150mm ID pipe  Slotted 150mm ID pipe - with 10mm aggregate surround and filter geotextile  +10.743 Crown Pipe Level mAOD  +10.743 Invert Pipe Level mAOD			
Notes			
Rev	Date	Status/Ammendments	
CLIENT			
Tata Steel (UK) Ltd.			
PROJECT			
Morfa Non-Hazardous Landfill Biocell Restoration			
TITLE			
Biocell Restoration - As-Built Drainage Layout			
DRAWING NUMBER			REVISION
2035r3/9			0
DATE	DRAWN	CHECKED	SCALE AT A3
08.22	AWJ		1:1000
Geotechnology Limited Ty Coed, Cefn-yr-Allt, Aberdulais, Neath SA10 8HE 01639 775293 www.geotechnology.net			

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 1
Site Photographs
Report Number 2035r3v1d0822



Placement of regulating layer



Placement of Dust Regulating Layer



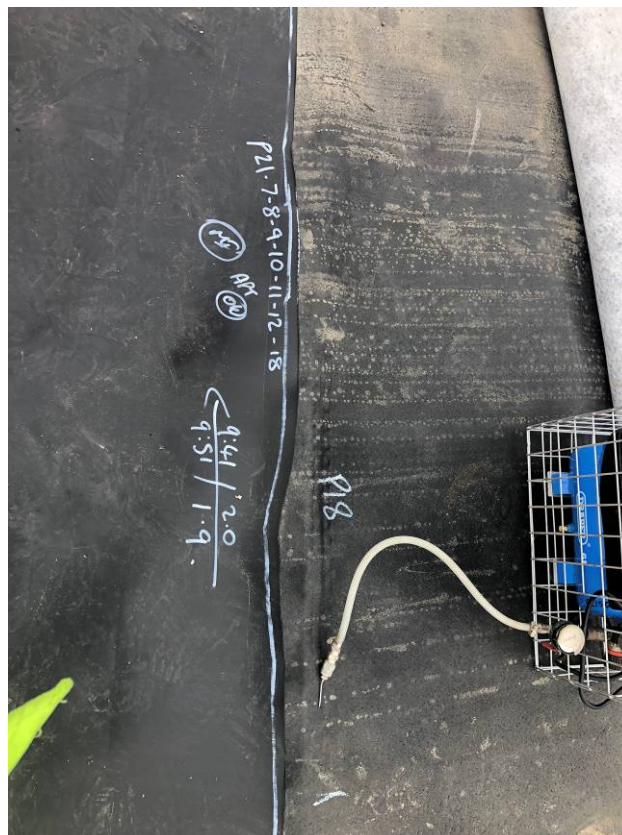
Placement of Gas Geocomposite on Eastern Flank



Placement of Gas Geocomposite around leachate extraction chamber



Vacuum Box Testing



HDPE APT testing



Surfacewater Geocomposite Placement



Surfacewater Geocomposite secured by restoration soils



Biocell covered in restoration soil (sand)

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 2
Regulating Layer Records
Report Number 2035r3v1d0822

TEST REPORT
Classification of Constituents
BS EN 933-11 2009

Project No.: D22027	Client: Darlow Lloyd & Sons Ltd
Project Name: TATA Aggregates	Address: Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
Sample No.: 27354	

Site Reference: HAA-RW-Jan-CoC-R1	Sample Type: Bulk
Location in works: HAA (Rockwool)	Material Description: Dark GREY GRAVEL
Date Sampled: 11 March 2022	Material Source: Site Generated
Sampled By: Client	Material Supplier: Site Generated
Sampling Certificate Received: No	Specification: EN 933-11
Date Received: 17 March 2022	Date Tested: 18 March 2022

TEST RESULTS

Code	Percentage	Specification
Rc	0.0%	
Ru	100.0%	
Rb	0.0%	
Ra	0.0%	
Rg	0.0%	
FL	0.0%	≤10cm ³ /kg unbound, ≤5cm ³ /kg aggregates for concrete
X	0.0%	max 1% by mass

Code	Constituent
Rc	Concrete, concrete products, mortar, concrete masonry units
Ru	Unbound aggregate, natural stone, hydraulically bound aggregate
Rb	Clay masonry units (i.e. bricks & tiles), calcium silicate masonry units, aerated non-floating concrete
Ra	Bituminous materials
Rg	Glass
FL	Floating material in volume
X	Cohesive (e.g. clay & soils), metals, wood, plastic, rubber, gypsum plaster

Remarks:

QA Ref.	 Apex Testing Solutions Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	Approver <i>G Llewellyn</i>	Date 18/03/2022	Fig.
EN 933-11 Rev. 1.0		G Llewellyn, Senior Technician		

TEST REPORT
Classification of Constituents
BS EN 933-11 2009

Project No.: D22027	Client: Darlow Lloyd & Sons Ltd
Project Name: TATA Aggregates	Address: Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
Sample No.: 27356	

Site Reference: HAA-RW-Mar-CoC-1	Sample Type: Bulk
Location in works: HAA (Rockwool)	Material Description: Dark GREY GRAVEL
Date Sampled: 11 March 2022	Material Source: Site Generated
Sampled By: Client	Material Supplier: Site Generated
Sampling Certificate Received: No	Specification: EN 933-11
Date Received: 17 March 2022	Date Tested: 18 March 2022

TEST RESULTS

Code	Percentage	Specification
Rc	1.1%	
Ru	98.9%	
Rb	0.0%	
Ra	0.0%	
Rg	0.0%	
FL	0.0%	≤10cm ³ /kg unbound, ≤5cm ³ /kg aggregates for concrete
X	0.0%	max 1% by mass

Code	Constituent
Rc	Concrete, concrete products, mortar, concrete masonry units
Ru	Unbound aggregate, natural stone, hydraulically bound aggregate
Rb	Clay masonry units (i.e. bricks & tiles), calcium silicate masonry units, aerated non-floating concrete
Ra	Bituminous materials
Rg	Glass
FL	Floating material in volume
X	Cohesive (e.g. clay & soils), metals, wood, plastic, rubber, gypsum plaster

Remarks:

QA Ref.	 Apex Testing Solutions Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	Approver  G Llewellyn, Senior Technician	Date 18/03/2022	Fig.
EN 933-11 Rev. 1.0				

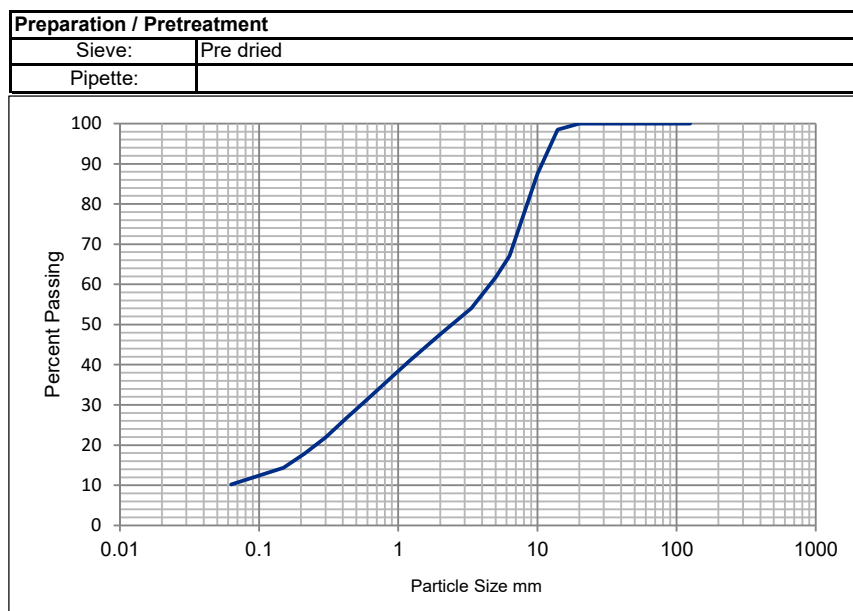
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27338		

Site Ref / Hole ID:	HAA-RW-12-02-22-10-0	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	11 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	99	
10	88	
6.3	67	
5.0	62	
3.35	54	
2.00	48	
1.18	41	
0.600	31	
0.425	27	
0.300	22	
0.212	18	
0.150	14	
0.063	10	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	52		
Sand	37	Dry mass of sample, kg	
Silt / Clay	10	0.8	73

Remarks: Sample complies with 1A grading specification.

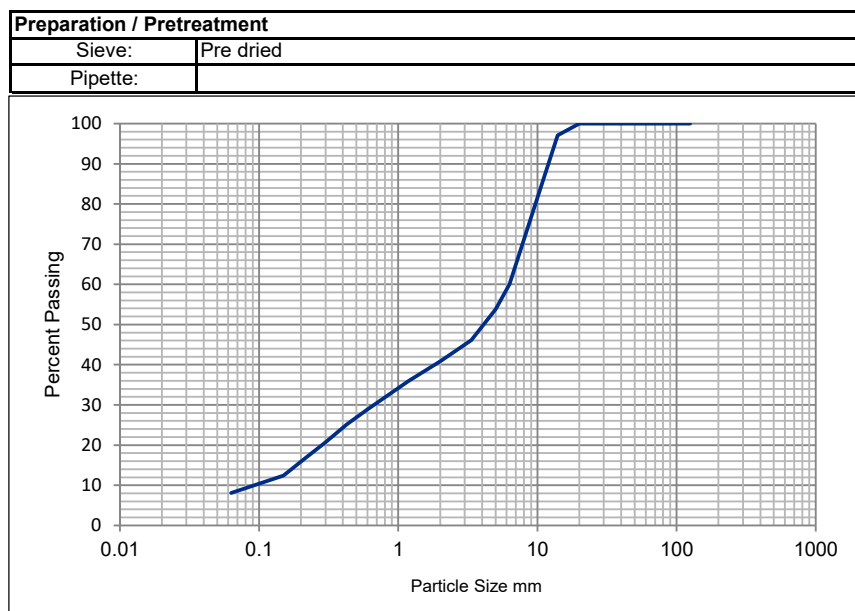
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27341		

Site Ref / Hole ID:	HAA-RW-19-02-22-22-10	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	18 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	97	
10	82	
6.3	60	
5.0	54	
3.35	46	
2.00	41	
1.18	36	
0.600	29	
0.425	25	
0.300	21	
0.212	17	
0.150	12	
0.063	8	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	59		
Sand	33	Dry mass of sample, kg	
Silt / Clay	8	0.8	59

Remarks: Sample complies with 1A grading specification.

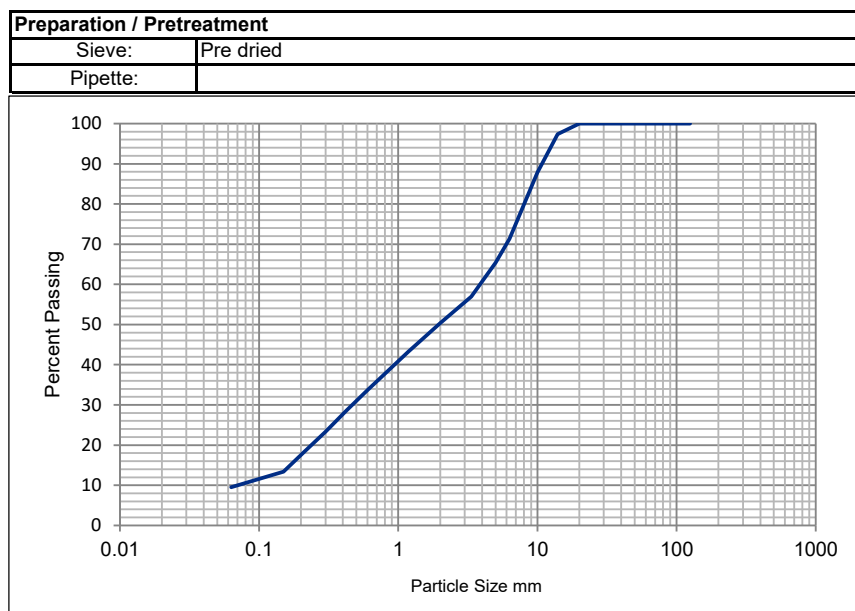
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27344		

Site Ref / Hole ID:	HAA-RW-26-02-22-10-0	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	25 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	97	
10	88	
6.3	71	
5.0	65	
3.35	57	
2.00	50	
1.18	43	
0.600	34	
0.425	29	
0.300	23	
0.212	18	
0.150	13	
0.063	10	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	50		
Sand	41	Dry mass of sample, kg	
Silt / Clay	10	1.1	63

Remarks: Sample complies with 1A grading specification.

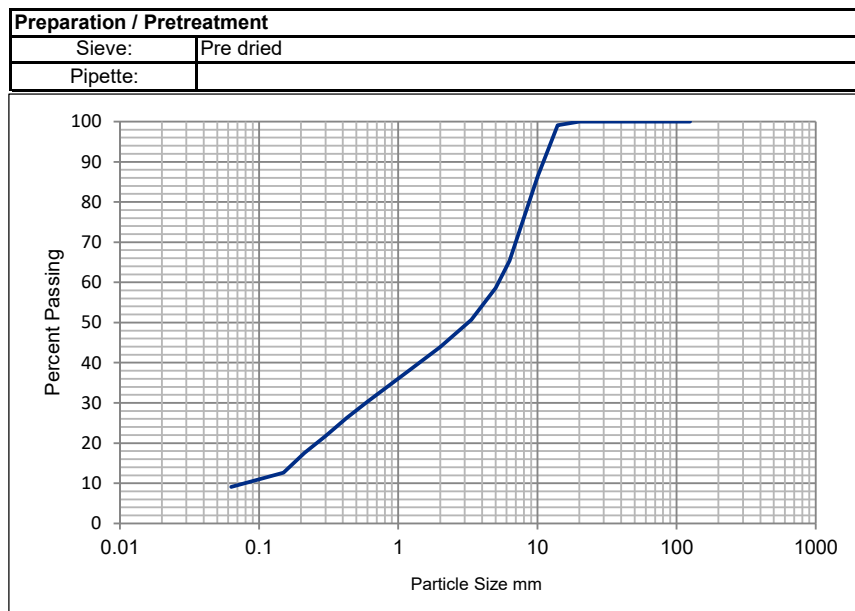
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27347		

Site Ref / Hole ID:	HAA-RW-05-03-22-10-0	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	04 March 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	99	
10	86	
6.3	65	
5.0	59	
3.35	51	
2.00	44	
1.18	38	
0.600	30	
0.425	26	
0.300	22	
0.212	18	
0.150	13	
0.063	9	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	56		
Sand	35	Dry mass of sample, kg	
Silt / Clay	9	2.2	62

Remarks: Sample complies with 1A grading specification.

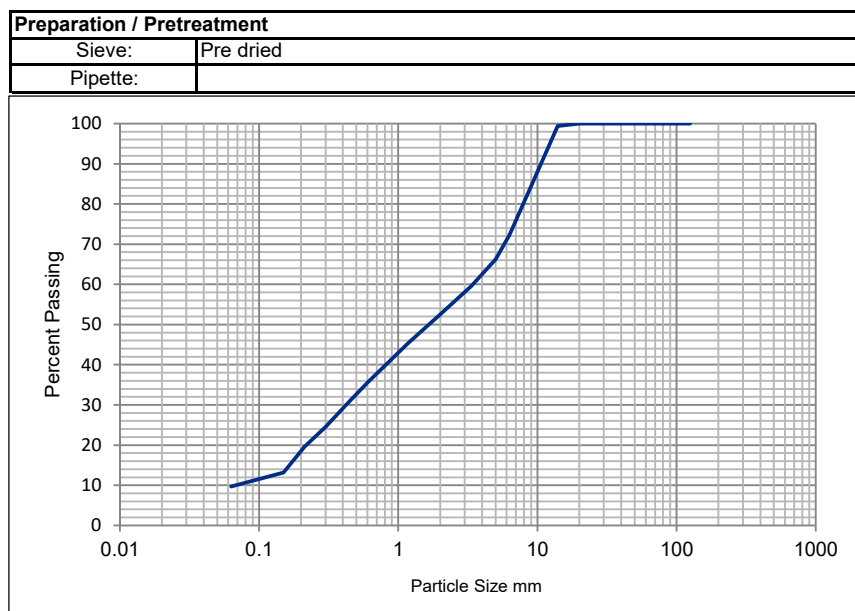
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27350		

Site Ref / Hole ID:	HAA-RW-12-03-22-10-0	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	11 March 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	99	
10	88	
6.3	72	
5.0	66	
3.35	60	
2.00	53	
1.18	45	
0.600	36	
0.425	30	
0.300	25	
0.212	20	
0.150	13	
0.063	10	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	47		
Sand	43	Dry mass of sample, kg	
Silt / Clay	10	1.9	53

Remarks: Sample complies with 1A grading specification.

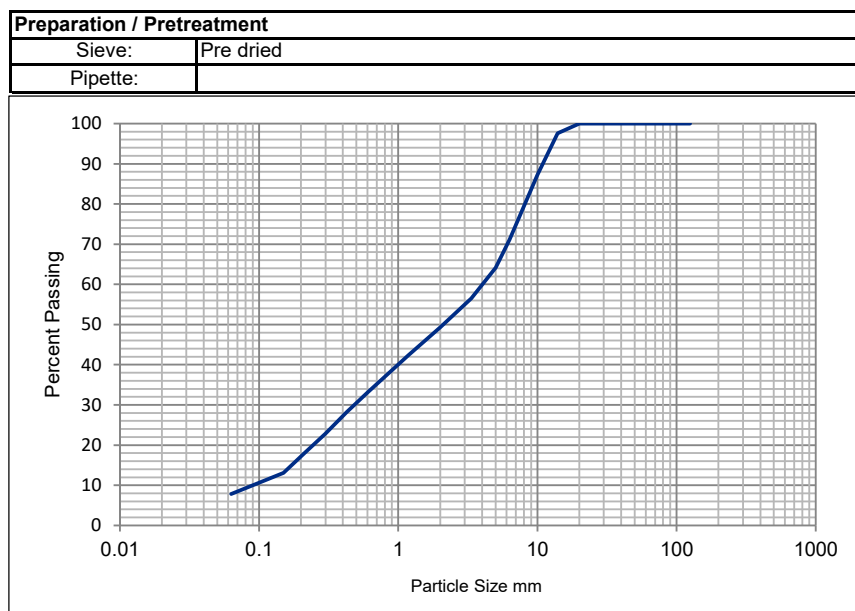
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27353		

Site Ref / Hole ID:	HAA-RW-19-03-22-10-0	Depth (m):	-
Sample No:	10-0	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY silty sandy GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	17 March 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	98	
10	87	
6.3	71	
5.0	64	
3.35	56	
2.00	49	
1.18	42	
0.600	33	
0.425	28	
0.300	23	
0.212	18	
0.150	13	
0.063	8	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	51		
Sand	41	Dry mass of sample, kg	
Silt / Clay	8	1.6	43

Remarks: Sample complies with 1A grading specification.

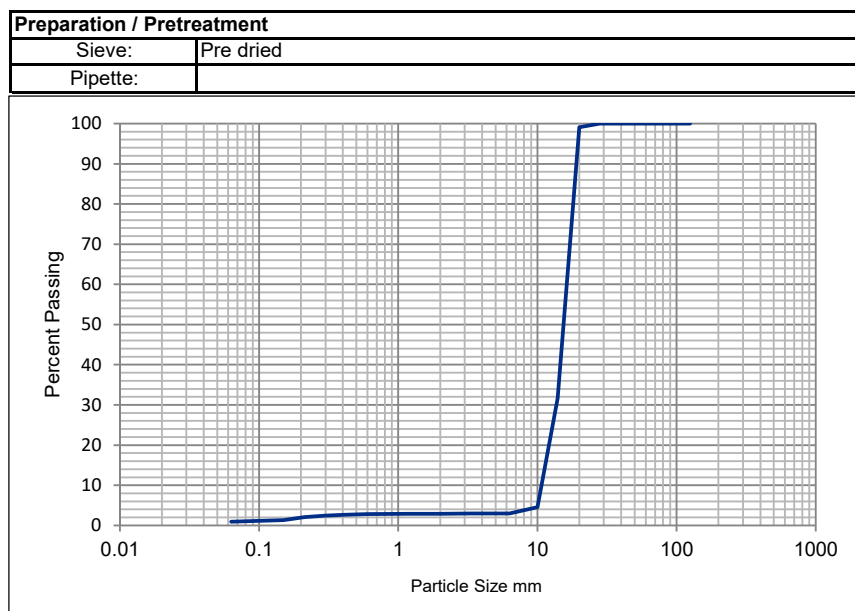
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27340		

Site Ref / Hole ID:	HAA-RW-19-02-22-22-10	Depth (m):	-
Sample No:	22-10	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Grey GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	18 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	99	
14	32	
10	5	
6.3	3	
5.0	3	
3.35	3	
2.00	3	
1.18	3	
0.600	3	
0.425	3	
0.300	2	
0.212	2	
0.150	1	
0.063	1	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	97		
Sand	2	Dry mass of sample, kg	
Silt / Clay	1	3.9	2

Remarks: Sample complies with 1B grading specification.

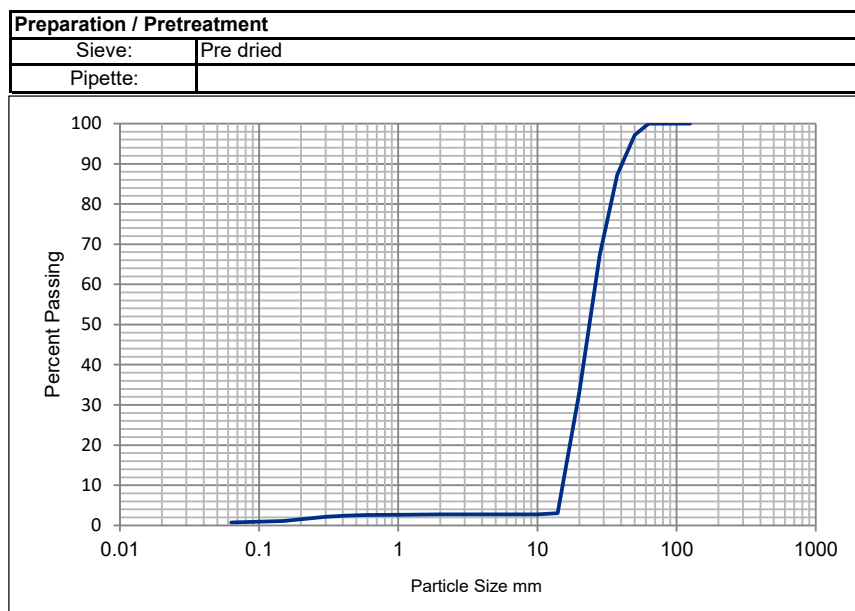
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27336		

Site Ref / Hole ID:	HAA-RW-12-02-22-120-2	Depth (m):	-
Sample No:	120-22	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Dark GREY GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	11 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	100	
50	97	
37.5	87	
28	67	
20	33	
14	3	
10	3	
6.3	3	
5.0	3	
3.35	3	
2.00	3	
1.18	3	
0.600	3	
0.425	2	
0.300	2	
0.212	2	
0.150	1	
0.063	1	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	97		
Sand	2	Dry mass of sample, kg	
Silt / Clay	1	13.5	2

Remarks: Sample complies with 1B grading specification.

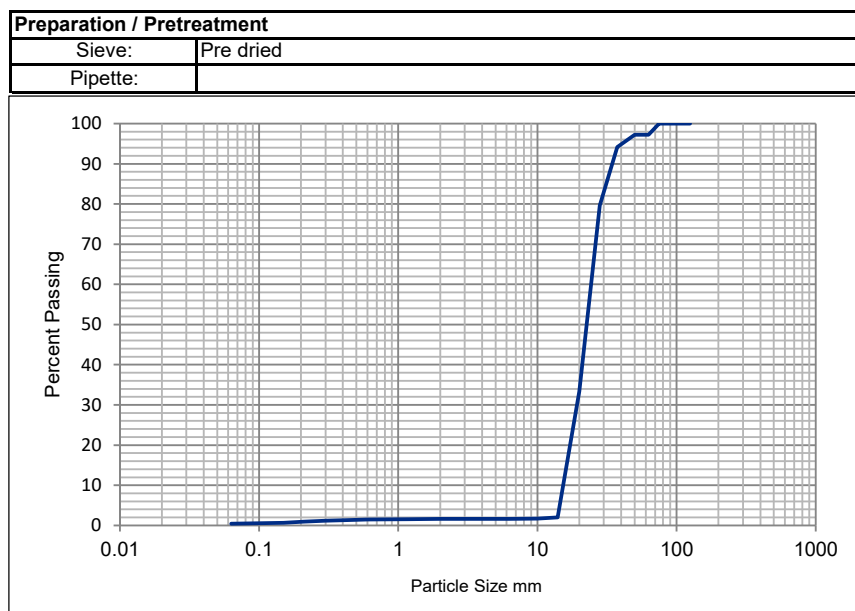
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS 1377:Part 2:1990: Clause 9.2 / 9.4

Project No:	D22027	Client:	Darlow Lloyd & Sons Ltd
Project Name:	TATA Aggregates	Address:	Corneldu Mawr Farm, Heol Y Cym, Bridgend CF36 6HL
ATS Sample No:	27339		

Site Ref / Hole ID:	HAA-RW-19-02-22-122-2	Depth (m):	-
Sample No:	120-22	Sample Type:	Bulk
Sampling Certificate Received:	Yes	Material Description:	Grey GRAVEL
Location in Works:	HAA (Rockwool Slag)	Material Source:	Site Generated
Date Sampled:	18 February 2022	Material Supplier:	Site Generated
Sampled By:	CLIENT	Specification:	SHW Series 600
Date Received:	17 March 2022	Date Tested:	22 March 2022

Test Results

Sieving		
Particle Size mm	% Passing	Specification
125	100	100
90	100	
75	100	
63	97	
50	97	
37.5	94	
28	80	
20	33	
14	2	
10	2	
6.3	2	
5.0	2	
3.35	2	
2.00	2	
1.18	2	
0.600	1	
0.425	1	
0.300	1	
0.212	1	
0.150	1	
0.063	0	<15



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	3	N/A	
Gravel	96		
Sand	1	Dry mass of sample, kg	
Silt / Clay	0	14.7	2

Remarks: Sample complies with 1B grading specification.

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 3
Gas Geo-composite
Manufacturers Delivery and
QC Data

Report Number 2035r3v1d0822



Geosynthetic Materials Inventory

CQA11

Site	Morfa Biocell Restoration	Manufacturer & Material Type	G4SD Gas Geocomposite
-------------	----------------------------------	---	-----------------------

Date	Batch No	Roll No	Length	Width	MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved
14/02/2022	16140/3042	1	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	3	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	4	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	5	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	7	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	9	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	11	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	16	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	18	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	19	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	21	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	22	100	4.4	Y	Y		Y	Y	Y

14/02/2022	16140/3042	30	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	31	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	32	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	34	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	6	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	8	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	10	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	12	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	15	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	17	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	20	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	23	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	24	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	27	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	28	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	29	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	33	100	4.4	Y	Y		Y	Y	Y

14/02/2022	16140/3042	36	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	43	100	4.4	Y	Y		Y	Y	Y
14/02/2022	16140/3042	44	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	13	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	14	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	25	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	26	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	35	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	37	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	38	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	39	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	41	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	42	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	45	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	47	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	49	100	4.4	Y	Y		Y	Y	Y
16/02/2022	16140/3042	50	100	4.4	Y	Y		Y	Y	Y

16/02/2022	16140/3042	51	100	4.4	Y	Y		Y	Y	Y
28/02/2022	16140/3042	40	100	4.4	Y	Y		Y	Y	Y
28/02/2022	16140/3042	48	100	4.4	Y	Y		Y	Y	Y
28/02/2022	16140/3042	52	100	4.4	Y	Y		Y	Y	Y
28/02/2022	16140/3042	2	100	4.4	Y	Y		Y	Y	Y

Scheme: Morfa LFS, SA13 2NG
 Product: Pozidrain G4SD Rev – 4.4m x 100m
 Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
 Meltham, HD9 4DS, Yorkshire, UK
 Date of manufacture: January 2022
 Date of dispatch: 14th February 2022
 Consignment number: 1
 Delivery note number: 104007
 Number of rolls: 16

Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16140	1, 3, 4, 5, 7, 9,				
	11, 16, 18, 19,				
	21, 22, 30, 31,				
	32, 34,				

Product conforms to datasheet reference: ABG POZIDRAIN GSD [CE] Rev 1.02 DATASHEET.
 Additional test details: None

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

Signed for and on behalf of the manufacturer by:

Name and title: Peter van Ruiten – Operations Director
 Date: 14th February 2022
 Certificate issued by: ABG Ltd

Certificate of conformity

Scheme: Morfa LFS, SA13 2NG
Product: Pozidrain G4SD Rev – 4.4m x 100m
Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK
Date of manufacture: January 2022
Date of dispatch: 14th February 2022
Consignment number: 2
Delivery note number: 104008
Number of rolls: 16
Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16140	6, 8, 10, 12, 15, 17, 20, 23, 24, 27, 28, 29, 33, 36, 43, 44				

Product conforms to datasheet reference: ABG POZIDRAIN GSD [CE] Rev 1.02 DATASHEET.
Additional test details: None

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

Signed for and on behalf of the manufacturer by:

Name and title: Peter van Ruiten – Operations Director
Date: 14th February 2022
Certificate issued by: ABG Ltd

Certificate of conformity

Scheme: Morfa LFS, SA13 2NG
 Product: Pozidrain G4SD Rev – 4.4m x 100m
 Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
 Meltham, HD9 4DS, Yorkshire, UK
 Date of manufacture: January 2022
 Date of dispatch: 16th February 2022
 Consignment number: 3
 Delivery note number: 104116
 Number of rolls: 16

Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16140	13, 14, 25, 26,				
	35, 37, 38, 39,				
	41, 42, 45, 46,				
	47, 49, 50, 51,				

Product conforms to
datasheet reference: **ABG POZIDRAIN GSD [CE] Rev 1.02 DATASHEET.**
 Additional test details: **None**

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

Signed for and on behalf of the manufacturer by:

Name and title:  **Peter van Ruiten – Operations Director**
 Date: **16TH February 2022**
 Certificate issued by: **ABG Ltd**

Certificate of conformity

Scheme: Morfa LFS, SA13 2NG
Product: Pozidrain G4SD Rev – 4.4m x 100m
Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK
Date of manufacture: January 2022
Date of dispatch: 28th February 2022
Consignment number: 8
Delivery note number: 104156
Number of rolls: 4

Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16140	40, 48, 52				
W16140	2				

Product conforms to
datasheet reference: ABG POZIDRAIN 7S250D.NW8 [CE] Rev 1.00 DATASHEET
Additional test details: None

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

Signed for and on behalf of the manufacturer by:

Name and title: Peter van Ruiten – Operations Director
Date: 28th February 2022
Certificate issued by: ABG Ltd

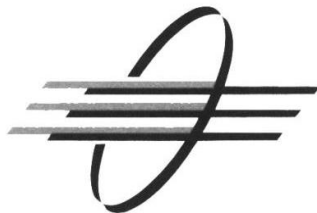
Certificate of conformity

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 4
Gas Geo-composite
Conformation Test Results
Report Number 2035r3v1d0822



BICS Laboratories Ltd

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U141/a

Report Date 28/03/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested G45D Geocomposite

Date Received 28/02/2022

Sample IDs See Test Report

Tests Requested In Plane Water Flow - BS EN ISO 12958-1:2020
Static Puncture CBR - BS EN ISO 12236:2006
Thickness - BS EN ISO 9863-1:2016+A1:2019 {Between Drains}
Thickness - BS EN ISO 9863-1:2016+A1:2019 {Drain Core}

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked ** are not 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.

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



BICS Laboratories Ltd

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: G45D Geocomposite

Report Ref No: BS-U141/a
Dates Tested: 25-28/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: W16140/3042/3

BICS Sample Ref: 1

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20 kPa L/m/s MD	0.38	0.36	0.38								0.38	0.01
20 kPa L/m/s CD	0.36	0.35	0.36								0.36	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4907	4726	4978	4136	4277						4605	378
Puncture Displacement mm	54	54	57	53	42						52	6

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.57	2.67	2.54	2.47	2.64	2.47	2.68	2.63	2.35	2.30	2.53	0.13
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	6.19	5.92	6.05	5.93	5.67	5.56	5.62	5.61	5.50	5.50	5.75	0.25
----	------	------	------	------	------	------	------	------	------	------	------	------

Sample ID: W16140/3042/6

BICS Sample Ref: 2

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4067	3890	4605	4120	3903						4117	291
Puncture Displacement mm	53	51	54	48	48						51	3

Sample ID: W16140/3042/9

BICS Sample Ref: 3

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20 kPa L/m/s MD	0.37	0.36	0.37								0.37	0.01
20 kPa L/m/s CD	0.37	0.35	0.36								0.36	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	3891	4045	4010	4001	4273						4044	140
Puncture Displacement mm	50	46	49	50	51						49	2

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.26	2.20	2.12	2.09	2.11	2.06	2.12	2.04	2.04	2.24	2.13	0.08
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	5.52	5.50	5.81	5.60	5.50	5.64	5.86	5.53	5.58	5.55	5.61	0.13
----	------	------	------	------	------	------	------	------	------	------	------	------

Atmospheric Conditions at Test: 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) tested.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: G45D Geocomposite

Report Ref No: BS-U141/a
Dates Tested: 25-28/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: W16140/3042/14

BICS Sample Ref: 4

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	3951	4527	4064	4182	4110						4167	218
Puncture Displacement mm	51	54	54	51	51						52	2

Sample ID: W16140/3042/15

BICS Sample Ref: 5

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20 kPa L/m/s MD	0.37	0.39	0.38								0.38	0.01
20 kPa L/m/s CD	0.34	0.36	0.34								0.35	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4243	4009	4663	4378	4440						4347	242
Puncture Displacement mm	50	49	56	54	51						52	3

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.03	2.08	2.22	2.14	2.11	2.24	2.26	2.31	2.24	2.02	2.17	0.10
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	5.32	5.50	5.83	5.35	5.34	5.62	5.33	5.55	5.52	5.73	5.51	0.18
----	------	------	------	------	------	------	------	------	------	------	------	------

Sample ID: W16140/3042/22

BICS Sample Ref: 6

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	3919	3884	3930	3826	3761						3864	70
Puncture Displacement mm	53	52	48	50	47						50	3

Atmospheric Conditions at Test: 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) tested.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT



BICS Laboratories Ltd

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: G45D Geocomposite

Report Ref No: BS-U141/a
Dates Tested: 25-28/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: W16140/3042/35

BICS Sample Ref: 7

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20 kPa L/m/s MD	0.38	0.38	0.37								0.38	0.01
20 kPa L/m/s CD	0.33	0.32	0.34								0.33	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4304	4204	4158	4419	4650						4347	197
Puncture Displacement mm	55	53	51	53	56						54	2

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.26	2.32	2.25	2.40	2.16	2.31	2.12	2.15	2.24	2.12	2.23	0.09
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	5.79	5.65	5.84	5.73	5.51	5.60	5.85	5.78	5.73	5.53	5.70	0.12
----	------	------	------	------	------	------	------	------	------	------	------	------

Sample ID: W16140/3042/44

BICS Sample Ref: 8

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4593	3881	4644	3943	4515						4315	372
Puncture Displacement mm	53	53	51	50	53						52	1

Sample ID: W16140/3042/47

BICS Sample Ref: 9

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20 kPa L/m/s MD	0.37	0.38	0.37								0.37	0.01
20 kPa L/m/s CD	0.37	0.35	0.37								0.36	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4324	3642	3952	3911	4112						3988	253
Puncture Displacement mm	54	50	51	51	54						52	2

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.23	2.16	2.36	2.19	2.12	2.27	2.07	2.40	2.17	2.10	2.21	0.11
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	5.81	5.58	5.73	5.57	5.71	5.54	5.62	5.84	5.61	5.60	5.66	0.10
----	------	------	------	------	------	------	------	------	------	------	------	------

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: G45D Geocomposite

Report Ref No: BS-U141/a
Dates Tested: 25-28/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
-------------	----------------------	--	--	--	--	--	--	--	--	--	------	---------

	1	2	3	4	5	6	7	8	9	10		
--	---	---	---	---	---	---	---	---	---	----	--	--

Sample ID: W16140/3042/50

BICS Sample Ref: 10

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4353	4000	4015	4462	4456						4257	232
Puncture Displacement mm	54	50	52	52	54						52	2

Atmospheric Conditions at Test: 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) tested.
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CONFIDENTIAL TEST REPORT



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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U295/a

Report Date 20/05/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested G45D Geocomposite

Date Received 16/05/2022

Sample IDs Roll Nos: W16140/40 & W16140/52

Tests Requested In Plane Water Flow - BS EN ISO 12958-1:2020
Static Puncture CBR - BS EN ISO 12236:2006
Thickness - BS EN ISO 9863-1:2016+A1:2019

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not 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.

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: G45D Geocomposite

Report Ref No: BS-U295/a
Dates Tested: 17-19/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Roll No: W16140/40

BICS Sample Ref: 1

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

20kPa L/m/s (MD)	0.34	0.33	0.34								0.34	0.01
20kPa L/m/s (CD)	0.33	0.34	0.34								0.34	0.01

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	3875	3915	3863	4144	3778						3915	137
Puncture Displacement mm	48	51	51	51	49						50	1

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Between Drains}

mm	2.02	2.03	2.17	2.15	2.02	2.03	2.00	2.03	2.04	2.05	2.05	0.06
----	------	------	------	------	------	------	------	------	------	------	------	------

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {At Drain Core}

mm	5.36	5.53	5.37	5.49	5.37	5.49	5.47	5.49	5.43	5.34	5.43	0.07
----	------	------	------	------	------	------	------	------	------	------	------	------

Sample ID: Roll No: W16140/52

BICS Sample Ref: 2

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4189	4228	4210	3899	4256						4156	146
Puncture Displacement mm	51	53	51	50	50						51	1

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

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CONFIDENTIAL TEST REPORT

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 5
HDPE Manufacturers QC
Data

Report Number 2035r3v1d0822



Geosynthetic Materials Inventory

CQA11

Site	Morfa Biocell Restoration		Manufacturer & Material Type	1mm HDPE DRS
-------------	----------------------------------	--	---	--------------

Date	Batch No	Roll No	Length	Width		MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved
14/02/2022	1054108	1001-154470	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1054108	1001-154471	237.7	6.8	1616.36	Y	Y	1	Y	Y	Y
14/02/2022	1054108	1001-154472	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1054108	1001-154479	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1054108	1001-154481	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1054108	1001-154487	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1054108	1001-154488	237.7	6.8	1616.36	Y	Y	2	Y	Y	Y
14/02/2022	1054108	1001-154489	237.7	6.8	1616.36	Y	Y	3	Y	Y	Y
14/02/2022	1054108	1001-154491	237.7	6.8	1616.36	Y	Y		Y	Y	Y



Geosynthetic Materials Inventory

CQA11

Site	Morfa Biocell Restoration		Manufacturer & Material Type	1mm HDPE Smooth
-------------	----------------------------------	--	---	-----------------

Date	Batch No	Roll No	Length	Width		MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved
14/02/2022	1047812	1002-112456	237.7	6.8	1616.36	Y	Y	4	Y	Y	Y
14/02/2022	1047812	1002-112457	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1047812	1002-112458	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1047812	1002-112459	237.7	6.8	1616.36	Y	Y	5	Y	Y	Y
14/02/2022	1047812	1002-112460	237.7	6.8	1616.36	Y	Y		Y	Y	Y
14/02/2022	1047812	1002-112468	237.7	6.8	1616.36	Y	Y		Y	Y	Y

NUMBER: UK-105549

DATE: 14-Feb-2022

SOLD TO:
CELTIC LINING Ltd.

Forest View | Banalog Terrace Hollybush Blackwood
Gwent, NP12 0SF
United Kingdom

CONTACT: Mel Jones

TELEPHONE:
EMAIL:
SHIP TO:
CELTIC LINING Ltd.

c/o Tata Steel, Port Talbot. South Wales. SA13 2NG
United Kingdom

CONTACT:
TELEPHONE:
EMAIL:

CUSTOMER REFERENCE	SOLMAX ORDER	PROJECT NAME	FREIGHT MODE
Order 21/01	SO-121500	Port Talbot	TRUCK

PART DESCRIPTION	ROLL NUMBER	CONTAINER	DIMENSIONS		SURFACE	U/M	WEIGHT	WEIGHT
			WIDTH	LENGTH	QUANTITY		(LBS)	(KG)
1047812, HDPE 1.00 mm Black Smooth HS Code: 3920.10								
	1002-112456	N/A	6,80	237,70	1.616,36	SQMT	3.506,01	1.590,30
	1002-112457	N/A	6,80	237,70	1.616,36	SQMT	3.501,99	1.588,48
	1002-112458	N/A	6,80	237,70	1.616,36	SQMT	3.498,00	1.586,67
	1002-112459	N/A	6,80	237,70	1.616,36	SQMT	3.496,99	1.586,21
	1002-112460	N/A	6,80	237,70	1.616,36	SQMT	3.496,00	1.585,76
	1002-112468	N/A	6,80	237,70	1.616,36	SQMT	3.557,00	1.613,43
TOTAL PART CODE:			6	Pieces	9.698,16	SQMT	21.055,99	9.550,85
Net Weight							20.629,97	9.357,59

1054108, HDPE 1.00 mm Black Textured
HS Code: 3920.10

	1001-154470	N/A	6,80	237,70	1.616,36	SQMT	4.409,00	1.999,89
	1001-154471	N/A	6,80	237,70	1.616,36	SQMT	4.370,00	1.982,20
	1001-154472	N/A	6,80	237,70	1.616,36	SQMT	4.367,00	1.980,84
	1001-154479	N/A	6,80	237,70	1.616,36	SQMT	4.031,99	1.828,88
	1001-154481	N/A	6,80	237,70	1.616,36	SQMT	4.053,99	1.838,86
	1001-154487	N/A	6,80	237,70	1.616,36	SQMT	4.072,99	1.847,48
	1001-154488	N/A	6,80	237,70	1.616,36	SQMT	4.058,99	1.841,13
	1001-154489	N/A	6,80	237,70	1.616,36	SQMT	4.050,99	1.837,50
	1001-154491	N/A	6,80	237,70	1.616,36	SQMT	4.025,00	1.825,71
TOTAL PART CODE:			9	Pieces	14.547,24	SQMT	37.439,95	16.982,49
					Net Weight		36.800,90	16.692,60

NUMBER: UK-105549

DATE: 14-Feb-2022

SOLD TO:**CELTIC LINING Ltd.**

Forest View | Banalog Terrace Hollybush Blackwood
Gwent, NP12 0SF
United Kingdom

CONTACT: Mel Jones**TELEPHONE:****EMAIL:****SHIP TO:****CELTIC LINING Ltd.**

c/o Tata Steel, Port Talbot. South Wales. SA13 2NG
United Kingdom

CONTACT:**TELEPHONE:****EMAIL:****NOTICE:** Every roll must be individually unloaded with two (2) slings to prevent any risk of injury to the operator or equipment.

Dimensions May Vary +/- 1%

	PIECES	WEIGHT (LBS)	WEIGHT (KG)
Gross of Material	15	58.495,94	26.533,34
Gross		58.495,94	26.533,34



QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION			RESIN INFORMATION		
ROLL NUMBER: 1002-112456			RESIN LOT NUMBER: P111005		
PACKING SLIP NUMBER: VS-000003442					
PRODUCT CODE: 1047812 HDPE 1.00 mm Black Smooth			PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE: 13 Dec 2021			Density (g/cc)	ASTM D 1505	0.935
			Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) : 237.74 m			ESCR (hrs)	ASTM D 5397	> 500
WIDTH: 6.80 m			OIT (min.)	ASTM D 3895	136
SHEET AREA: 1,616.6 sqmt			HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT : 1,590 kg					
PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5199	Every roll	1.00	39.36
	Minimum			0.90	36.9
ASPERITY(MM)	Average(In/Out)				
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	95.2
	MD				90.7
Yield elongation (%)	TD			13	16.9
	MD				22.8
Break strength KN/m	TD			28	192
	MD				204
Break elongation (%)	TD			700	876
	MD				857
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	125	33.5
	MD				30.3
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	356	100.17
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.29
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION			RESIN INFORMATION		
ROLL NUMBER: 1002-112457			RESIN LOT NUMBER: P111005		
PACKING SLIP NUMBER: VS-000003442					
PRODUCT CODE: 1047812 HDPE 1.00 mm Black Smooth			PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE: 13 Dec 2021			Density (g/cc)	ASTM D 1505	0.935
			Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) : 237.74 m			ESCR (hrs)	ASTM D 5397	> 500
WIDTH: 6.80 m			OIT (min.)	ASTM D 3895	136
SHEET AREA: 1,616.6 sqmt			HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT : 1,588 kg					
PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5199	Every roll	1.00	39.94
	Minimum			0.90	39
ASPERITY(MM)	Average(In/Out)				
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	95.2
	MD				90.7
Yield elongation (%)	TD			13	16.9
	MD				22.8
Break strength KN/m	TD			28	192
	MD				204
Break elongation (%)	TD			700	876
	MD				857
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	125	33.5
	MD				30.3
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	356	100.17
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.29
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1002-112458		RESIN LOT NUMBER:		P111005
PACKING SLIP NUMBER:		VS-000003442				
PRODUCT CODE: 1047812 HDPE 1.00 mm Black Smooth				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		13 Dec 2021		Density (g/cc)	ASTM D 1505	0.935
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	136
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT :		1,587 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5199	Every roll	1.00	39.85
		Minimum			0.90	38.9
ASPERITY(MM)		Average(In/Out)				
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	97.8
		MD				88
Yield elongation	(%)	TD			13	16.3
		MD				20.2
Break strength	KN/m	TD			28	203
		MD				214
Break elongation	(%)	TD			700	933
		MD				906
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	125	33.5
		MD				30.3
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	356	100.17
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION			RESIN INFORMATION		
ROLL NUMBER: 1002-112459			RESIN LOT NUMBER: P111005		
PACKING SLIP NUMBER: VS-000003442					
PRODUCT CODE: 1047812 HDPE 1.00 mm Black Smooth			PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE: 13 Dec 2021			Density (g/cc)	ASTM D 1505	0.935
			Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) : 237.74 m			ESCR (hrs)	ASTM D 5397	> 500
WIDTH: 6.80 m			OIT (min.)	ASTM D 3895	136
SHEET AREA: 1,616.6 sqmt			HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT : 1,586 kg					
PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5199	Every roll	1.00	39.67
	Minimum			0.90	39
ASPERITY(MM)	Average(In/Out)				
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	97.8
	MD				88
Yield elongation (%)	TD			13	16.3
	MD				20.2
Break strength KN/m	TD			28	203
	MD				214
Break elongation (%)	TD			700	933
	MD				906
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	125	32.477469
	MD				30.89094
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	356	95.35
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.944
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION			RESIN INFORMATION		
ROLL NUMBER: 1002-112460			RESIN LOT NUMBER: P111005		
PACKING SLIP NUMBER: VS-000003442					
PRODUCT CODE: 1047812 HDPE 1.00 mm Black Smooth			PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE: 14 Dec 2021			Density (g/cc)	ASTM D 1505	0.935
			Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) : 237.74 m			ESCR (hrs)	ASTM D 5397	> 500
WIDTH: 6.80 m			OIT (min.)	ASTM D 3895	136
SHEET AREA: 1,616.6 sqmt			HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT : 1,586 kg					
PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5199	Every roll	1.00	39.99
	Minimum			0.90	39.4
ASPERITY(MM)	Average(In/Out)				
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	96.1
	MD				88
Yield elongation (%)	TD			13	16.6
	MD				20.6
Break strength KN/m	TD			28	200
	MD				202
Break elongation (%)	TD			700	910
	MD				855
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	125	32.477469
	MD				30.89094
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	356	95.35
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.944
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.29
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION			RESIN INFORMATION		
ROLL NUMBER:	1002-112468		RESIN LOT NUMBER:	P111005	
PACKING SLIP NUMBER:	VS-000003442				
PRODUCT CODE:	1047812 HDPE 1.00 mm Black Smooth		PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:	14 Dec 2021		Density (g/cc)	ASTM D 1505	0.935
			Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.15
LENGTH(± 1%) :	237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:	6.80 m		OIT (min.)	ASTM D 3895	136
SHEET AREA:	1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	1,554
WEIGHT :	1,613 kg				
PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5199	Every roll	1.00	40.09
	Minimum			0.90	38.4
ASPERITY(MM)	Average(In/Out)				
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	95.2
	MD				88.7
Yield elongation (%)	TD			13	16.1
	MD				22.8
Break strength KN/m	TD			28	201
	MD				220
Break elongation (%)	TD			700	912
	MD				917
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	125	32.672788
	MD				29.689635
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	356	100.25
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.944
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154471		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		12 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,982 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	42.33
		Minimum			0.85	39.4
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.8/19.1
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength KN/m		TD			15	105.4
		MD				104
Yield elongation (%)		TD			12	15.9
		MD				18.1
Break strength KN/m		TD			15	119
		MD				150
Break elongation (%)		TD			150	451
		MD				556
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	39.9
		MD				39.536735
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	112.02
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.946
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154479		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		12 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,829 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	40.46
		Minimum			0.85	38.2
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	19.8/19.3
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	98.6
		MD				97
Yield elongation	(%)	TD			12	16.1
		MD				19.0
Break strength	KN/m	TD			15	114
		MD				142
Break elongation	(%)	TD			150	479
		MD				571
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	37.519998
		MD				35.42478
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	102.21
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.946
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.39
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154481		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		12 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,839 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	38.85
		Minimum			0.85	37
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.8/19.1
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	98.6
		MD				97
Yield elongation	(%)	TD			12	16.1
		MD				19.0
Break strength	KN/m	TD			15	114
		MD				142
Break elongation	(%)	TD			150	479
		MD				571
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	37.519998
		MD				35.42478
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	102.21
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.946
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.39
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154487		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		13 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,847 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	40.48
		Minimum			0.85	36.8
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.35/18.95
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	97.6
		MD				97.7
Yield elongation	(%)	TD			12	14.9
		MD				20.2
Break strength	KN/m	TD			15	106
		MD				135
Break elongation	(%)	TD			150	408
		MD				534
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	38.633863
		MD				36.289047
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	105.09
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.13
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154488		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		13 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,841 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	40.04
		Minimum			0.85	36.1
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	19.05/19.15
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD				15	99.2
	MD					95
Yield elongation (%)	TD				12	15.1
	MD					20.4
Break strength KN/m	TD				15	112
	MD					141
Break elongation (%)	TD				150	483
	MD					564
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	38.633863
		MD				36.289047
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	105.09
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.27
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154489		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		13 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:		6.80 m		OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,838 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	40.28
		Minimum			0.85	37.5
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.6/19.7
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	99.2
		MD				95
Yield elongation	(%)	TD			12	15.1
		MD				20.4
Break strength	KN/m	TD			15	112
		MD				141
Break elongation	(%)	TD			150	483
		MD				564
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	38.633863
		MD				36.289047
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	105.09
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.945
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.27
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION				RESIN INFORMATION		
ROLL NUMBER:		1001-154491		RESIN LOT NUMBER:		P108019
PACKING SLIP NUMBER:		VS-000003443				
PRODUCT CODE: 1054108 HDPE 1.00 mm Black Textured				PROPERTY	TEST METHOD	RESULTS
PRODUCTION DATE:		13 Dec 2021		Density (g/cc)	ASTM D 1505	0.934
				Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
LENGTH(± 1%) :		237.74 m		ESCR (hrs)	ASTM D 5397	> 500
WIDTH:	6.80 m			OIT (min.)	ASTM D 3895	116
SHEET AREA:		1,616.6 sqmt		HP-OIT (min.)	ASTM D 5885	
WEIGHT :		1,826 kg				
PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)		Average	ASTM D5994	Every roll	0.95	39.61
		Minimum			0.85	37.6
ASPERITY(MM)		Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.5/19.3
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			15	98.4
		MD				97
Yield elongation	(%)	TD			12	12.4
		MD				17.6
Break strength	KN/m	TD			15	114
		MD				145
Break elongation	(%)	TD			150	502
		MD				580
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	135	37.696052
		MD				34.882305
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	400	104.69
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.944
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				



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ROLL CERTIFICATION

ROLL IDENTIFICATION		RESIN INFORMATION		
ROLL NUMBER:	1001-154470	RESIN LOT NUMBER:	P108019	
PACKING SLIP NUMBER:	VS-000003444			
PRODUCT CODE:	1054108 HDPE 1.00 mm Black Textured			
PRODUCTION DATE:	12 Dec 2021			
LENGTH(± 1%) :	237.74 m	PROPERTY	TEST METHOD	RESULTS
WIDTH:	6.80 m	Density (g/cc)	ASTM D 1505	0.934
SHEET AREA:	1,616.6 sqmt	Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
WEIGHT :	2,000 kg	ESCR (hrs)	ASTM D 5397	> 500
		OIT (min.)	ASTM D 3895	116
		HP-OIT (min.)	ASTM D 5885	

PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5994	Every roll	0.95	41.67
	Minimum			0.85	39.5
ASPERITY(MM)	Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	20/20
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	110.7
	MD				105.6
Yield elongation (%)	TD			12	13.2
	MD				16.2
Break strength KN/m	TD			15	114
	MD				142
Break elongation (%)	TD			150	434
	MD				519
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	135	39.9
	MD				39.536735
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	400	112.02
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.946
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.86
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



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QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION		RESIN INFORMATION		
ROLL NUMBER:	1001-154472	RESIN LOT NUMBER:	P108019	
PACKING SLIP NUMBER:	VS-000003444			
PRODUCT CODE:	1054108 HDPE 1.00 mm Black Textured			
PRODUCTION DATE:	12 Dec 2021			
LENGTH(± 1%) :	237.74 m	PROPERTY	TEST METHOD	RESULTS
WIDTH:	6.80 m	Density (g/cc)	ASTM D 1505	0.934
SHEET AREA:	1,616.6 sqmt	Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.13
WEIGHT :	1,981 kg	ESCR (hrs)	ASTM D 5397	> 500
		OIT (min.)	ASTM D 3895	116
		HP-OIT (min.)	ASTM D 5885	

PHYSICAL PROPERTY		TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average	ASTM D5994	Every roll	0.95	41.65
	Minimum			0.85	39.7
ASPERITY(MM)	Average(In/Out)	ASTM D7466	Every roll	0.40/0.40	18.2/19.9
TENSILE PROPERTIES		ASTM D6693	Every 2 rolls		
Yield strength KN/m	TD			15	105.4
	MD				104
Yield elongation (%)	TD			12	15.9
	MD				18.1
Break strength KN/m	TD			15	119
	MD				150
Break elongation (%)	TD			150	451
	MD				556
TEAR RESISTANCE (N)	TD	ASTM D1004	Every 5 rolls	135	39.9
	MD				39.536735
PUNCTURE RESISTANCE(N)		ASTM D4833	Every 5 rolls	400	112.02
DENSITY (G/CC)		ASTM D792	Every 10 rolls	≥ 0.940	0.946
CARBON BLACK CONTENT(%)		ASTM D4218	Every 2 rolls	2.0 - 3.0	2.36
CARBON BLACK DISPERSION		ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)	TD				
	MD				



Solmax is not a design professional and has not performed any design services to determine if Solmax’s goods comply with any project plans or specifications, or with the application or use of Solmax’s goods to any particular system, project, purpose, installation or specification.

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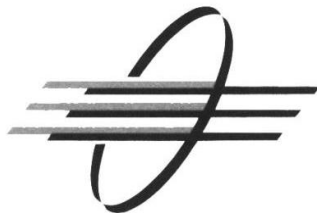
**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 6
HDPE Conformance Test
Results

Report Number 2035r3v1d0822



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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U140/a {Supplementary¹}

Report Date 23/03/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Textured & Smooth HDPE Geomembrane

Date Received 28/02/2022

Sample IDs See Test Report

Tests Requested Stress Crack Resistance - ASTM D5397-20

This supplementary report includes the 'data pending' results as referenced in BS-U140/a

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



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Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
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This test report is in a condensed format, complete test details available upon request.
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Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a {Supplementary¹}
Dates Tested: 02-23/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Roll No: 1001-154471

BICS Sample Ref: 1

Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

Sample ID: Roll No: 1001-154488

BICS Sample Ref: 2

Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

Sample ID: Roll No: 1001-154489

BICS Sample Ref: 3

Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

Sample ID: Roll No: 1002-112456

BICS Sample Ref: 4

Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

Sample ID: Roll No: 1002-112459

BICS Sample Ref: 5

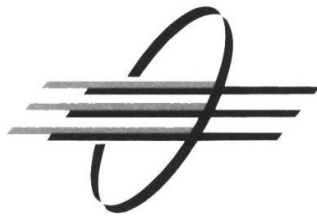
Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

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

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U294/a {Supplementary¹}

Report Date 07/06/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Textured HDPE Geomembrane

Date Received 16/05/2022

Sample IDs Roll No: 154475

Tests Requested Stress Crack Resistance - ASTM D5397-20

This supplementary report includes the 'data pending' results as referenced in BS-U294/a

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



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Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured HDPE Geomembrane

Report Ref No: BS-U294/a {Supplementary¹}
Dates Tested: 17/05-07/06/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
-------------	----------------------	--	--	--	--	--	--	--	--	--	------	---------

	1	2	3	4	5	6	7	8	9	10		
--	---	---	---	---	---	---	---	---	---	----	--	--

Sample ID: Roll No: 154475

BICS Sample Ref: 1

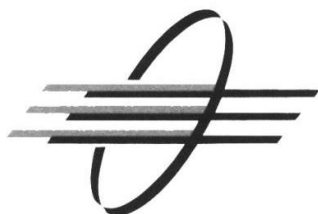
Stress Crack (ASTM D5397-20)

hrs	>500	>500	>500	>500	>500	Note: Test terminated without break, no failure					>500	-
-----	------	------	------	------	------	---	--	--	--	--	------	---

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

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U294/a

Report Date 17/05/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Textured HDPE Geomembrane

Date Received 16/05/2022

Sample IDs Roll No: 154475

Tests Requested Asperity Height - ASTM D7466/D7466M-10(2015)e1
Carbon Black Content - ASTM D1603-20
Carbon Black Dispersion - ASTM D5596-03(2021)
Density - ASTM D1505-18
Puncture Resistance - ASTM D4833/D4833M-07(2020)
Tear Resistance - ASTM D1004-21
Tensile Properties - ASTM D6693/D6693M-20
Thickness - ASTM D5994/D5994M-10(2021)

Data Pending → Stress Crack Resistance - ASTM D5397-20

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



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Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured HDPE Geomembrane

Report Ref No: BS-U294/a
Dates Tested: 16-17/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Roll No: 154475

BICS Sample Ref: 1

Asperity Height (ASTM D7466/D7466M-10(2015)e1)

Side A mm	0.63	0.64	0.67	0.69	0.62	0.68	0.64	0.58	0.63	0.58	0.64	0.0
Side B mm	0.52	0.67	0.59	0.65	0.58	0.61	0.64	0.63	0.52	0.63	0.60	0.0

Carbon Black Content (ASTM D1603-20)

%	2.83	2.89									2.86	0.04
---	------	------	--	--	--	--	--	--	--	--	------	------

Carbon Black Dispersion (ASTM D5596-03(2021))

Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0

Density (ASTM D1505-18)

g/ml	0.943	0.944	0.943								0.943	0.001
------	-------	-------	-------	--	--	--	--	--	--	--	-------	-------

Puncture Resistance (ASTM D4833/D4833M-07(2020))

N	535	483	483	527	504						506	24
---	-----	-----	-----	-----	-----	--	--	--	--	--	-----	----

Tear Resistance (ASTM D1004-21)

N (MD)	180	177	184	202	179	199	182	180	171	186	184	10
N (CD)	199	204	187	174	193	195	199	180	189	176	190	10

Tensile Properties (ASTM D6693/D6693M-20)

Yield Strength N/mm (MD)	20.2	20.5	19.9	20.6	20.1						20.3	0.3
Yield Strength N/mm (CD)	19.7	20.3	19.0	19.4	19.3						19.5	0.5
Yield Elongation % (MD)	17	17	17	17	16						17	0
Yield Elongation % (CD)	13	15	15	15	14						14	1
Break Strength N/mm (MD)	25.1	24.3	24.4	28.1	23.6						25.1	1.8
Break Strength N/mm (CD)	25.1	24.9	25.4	21.7	23.5						24.1	1.5
Break Elongation % (MD)	540	510	530	600	480						532	44
Break Elongation % (CD)	610	600	640	530	570						590	42

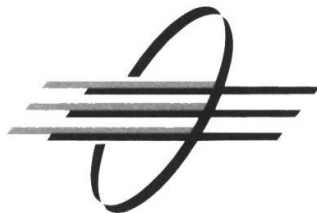
Thickness (ASTM D5994/D5994M-10(2021))

mm	1.08	1.05	1.09	1.14	1.10	1.09	1.09	1.09	1.12	1.05	1.09	0.03
----	------	------	------	------	------	------	------	------	------	------	------	------

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

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U140/a

Report Date 03/03/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Textured & Smooth HDPE Geomembrane

Date Received 28/02/2022

Sample IDs See Test Report

Tests Requested Asperity Height - ASTM D7466/D7466M-10(2015)e1
Carbon Black Content - ASTM D1603-20
Carbon Black Dispersion - ASTM D5596-03(2021)
Density - ASTM D1505-18
Puncture Resistance - ASTM D4833/D4833M-07(2020)
Tear Resistance - ASTM D1004-21
Tensile Properties - ASTM D6693/D6693M-20
Thickness - ASTM D5199-12(2019)
Thickness - ASTM D5994/D5994M-10(2021)

Data Pending → Stress Crack Resistance - ASTM D5397-20

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a
Dates Tested: 01-02/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: Roll No: 1001-154471						BICS Sample Ref: 1						
Asperity Height (ASTM D7466/D7466M-10(2015)e1)												
Side A mm	0.44	0.47	0.47	0.46	0.43	0.47	0.44	0.45	0.42	0.44	0.45	0.0
Side B mm	0.46	0.49	0.46	0.49	0.47	0.48	0.47	0.46	0.45	0.46	0.47	0.0
Carbon Black Content (ASTM D1603-20)												
%	2.49	2.47									2.48	0.01
Carbon Black Dispersion (ASTM D5596-03(2021))												
Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0
Density (ASTM D1505-18)												
g/ml	0.941	0.941	0.941								0.941	0.000
Puncture Resistance (ASTM D4833/D4833M-07(2020))												
N	524	502	541	532	504						521	17
Tear Resistance (ASTM D1004-21)												
N (MD)	189	214	218	200	191	187	189	191	190	196	197	11
N (CD)	223	240	213	192	196	228	194	209	210	238	214	17
Tensile Properties (ASTM D6693/D6693M-20)												
Yield Strength N/mm (MD)	20.9	19.4	20.3	19.2	19.3						19.8	0.8
Yield Strength N/mm (CD)	22.2	22.3	22.5	21.3	22.0						22.0	0.5
Yield Elongation % (MD)	18	17	17	18	18						18	1
Yield Elongation % (CD)	15	16	15	15	17						16	1
Break Strength N/mm (MD)	26.7	24.8	30.4	31.1	25.5						27.7	2.9
Break Strength N/mm (CD)	23.5	26.4	23.6	22.2	23.9						23.9	1.5
Break Elongation % (MD)	540	520	640	670	560						586	65
Break Elongation % (CD)	490	580	500	470	520						512	42
Thickness (ASTM D5994/D5994M-10(2021))												
mm	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.01

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a
Dates Tested: 01-02/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: Roll No: 1001-154488						BICS Sample Ref: 2						
Asperity Height (ASTM D7466/D7466M-10(2015)e1)												
Side A mm	0.47	0.45	0.48	0.48	0.49	0.48	0.45	0.48	0.48	0.43	0.47	0.0
Side B mm	0.48	0.48	0.49	0.47	0.49	0.45	0.46	0.43	0.48	0.49	0.47	0.0
Carbon Black Content (ASTM D1603-20)												
%	2.68	2.70									2.69	0.01
Carbon Black Dispersion (ASTM D5596-03(2021))												
Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0
Density (ASTM D1505-18)												
g/ml	0.942	0.942	0.941								0.942	0.000
Puncture Resistance (ASTM D4833/D4833M-07(2020))												
N	493	536	482	431	507						490	39
Tear Resistance (ASTM D1004-21)												
N (MD)	215	218	180	177	190	180	211	186	182	181	192	16
N (CD)	191	196	160	170	189	217	197	168	185	170	184	17
Tensile Properties (ASTM D6693/D6693M-20)												
Yield Strength N/mm (MD)	18.7	19.1	19.6	18.8	17.1						18.7	0.9
Yield Strength N/mm (CD)	19.5	20.2	19.7	20.2	19.0						19.7	0.5
Yield Elongation % (MD)	16	16	16	19	15						16	2
Yield Elongation % (CD)	15	15	16	15	17						16	1
Break Strength N/mm (MD)	24.1	24.0	24.2	23.5	23.8						23.9	0.3
Break Strength N/mm (CD)	22.0	23.8	21.0	22.0	26.2						23.0	2.1
Break Elongation % (MD)	540	530	530	510	550						532	15
Break Elongation % (CD)	520	570	480	480	600						530	54
Thickness (ASTM D5994/D5994M-10(2021))												
mm	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	0.99	0.99	0.99	0.00

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a
Dates Tested: 01-02/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: Roll No: 1001-154489						BICS Sample Ref: 3						
Asperity Height (ASTM D7466/D7466M-10(2015)e1)												
Side A mm	0.41	0.49	0.42	0.47	0.46	0.48	0.46	0.47	0.46	0.48	0.46	0.0
Side B mm	0.48	0.45	0.48	0.48	0.46	0.46	0.43	0.48	0.47	0.48	0.47	0.0
Carbon Black Content (ASTM D1603-20)												
%	2.61	2.70									2.66	0.06
Carbon Black Dispersion (ASTM D5596-03(2021))												
Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0
Density (ASTM D1505-18)												
g/ml	0.941	0.942	0.941								0.941	0.001
Puncture Resistance (ASTM D4833/D4833M-07(2020))												
N	472	458	487	458	456						466	13
Tear Resistance (ASTM D1004-21)												
N (MD)	178	184	181	175	176	185	174	169	185	172	178	6
N (CD)	170	178	166	170	167	179	176	176	176	181	174	5
Tensile Properties (ASTM D6693/D6693M-20)												
Yield Strength N/mm (MD)	19.1	18.2	18.5	19.1	18.5						18.7	0.4
Yield Strength N/mm (CD)	19.7	19.2	19.1	19.7	19.3						19.4	0.3
Yield Elongation % (MD)	16	18	17	18	18						17	1
Yield Elongation % (CD)	14	15	13	16	16						15	1
Break Strength N/mm (MD)	24.7	23.0	25.3	25.6	27.1						25.1	1.5
Break Strength N/mm (CD)	18.6	22.7	23.6	23.2	22.0						22.0	2.0
Break Elongation % (MD)	540	530	590	570	630						572	40
Break Elongation % (CD)	450	560	590	560	530						538	54
Thickness (ASTM D5994/D5994M-10(2021))												
mm	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	0.99	0.99	0.99	0.00

Atmospheric Conditions at Test: 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



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a
Dates Tested: 01-02/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Roll No: 1002-112456

BICS Sample Ref: 4

Carbon Black Content (ASTM D1603-20)

%	2.55	2.51									2.53	0.03
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Carbon Black Dispersion (ASTM D5596-03(2021))

Category Rating - 1st Rf	1	1	1	1	1						1	0
Category Rating - 2nd Rf	1	1	1	1	1						1	0

Density (ASTM D1505-18)

g/ml	0.941	0.942	0.942								0.941	0.000
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Puncture Resistance (ASTM D4833/D4833M-07(2020))

N	436	453	438	454	455						447	9
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Tear Resistance (ASTM D1004-21)

N (MD)	146	169	158	145	150	158	160	157	144	148	154	8
N (CD)	164	168	167	153	154	151	159	162	159	156	159	6

Tensile Properties (ASTM D6693/D6693M-20)

Yield Strength N/mm (MD)	17.3	16.5	16.3	17.1	17.7						17.0	0.6
Yield Strength N/mm (CD)	19.4	18.3	18.6	17.7	18.8						18.5	0.6
Yield Elongation % (MD)	19	22	21	20	21						21	1
Yield Elongation % (CD)	16	15	15	15	16						15	1
Break Strength N/mm (MD)	36.0	35.7	31.8	37.0	36.2						35.3	2.1
Break Strength N/mm (CD)	36.7	33.3	36.2	32.8	36.7						35.2	1.9
Break Elongation % (MD)	840	860	780	880	840						840	37
Break Elongation % (CD)	940	880	940	870	930						912	34

Thickness (ASTM D5199-12(2019))

mm	1.00	1.02	1.04	1.03	1.01	1.01	1.00	1.00	1.00	1.04	1.02	0.02
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Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured & Smooth HDPE Geomembrane

Report Ref No: BS-U140/a
Dates Tested: 01-02/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Roll No: 1002-112459

BICS Sample Ref: 5

Carbon Black Content (ASTM D1603-20)

%	2.44	2.46										2.45	0.01
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Carbon Black Dispersion (ASTM D5596-03(2021))

Category Rating - 1st Rf	1	1	1	1	1							1	0
Category Rating - 2nd Rf	1	1	1	1	1							1	0

Density (ASTM D1505-18)

g/ml	0.942	0.942	0.943									0.942	0.000
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Puncture Resistance (ASTM D4833/D4833M-07(2020))

N	460	456	454	463	456							458	3
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Tear Resistance (ASTM D1004-21)

N (MD)	155	177	157	149	149	159	156	149	162	163		158	8
N (CD)	160	166	168	158	155	164	170	153	167	156		162	6

Tensile Properties (ASTM D6693/D6693M-20)

Yield Strength N/mm (MD)	16.9	17.0	17.1	16.4	17.4							17.0	0.4
Yield Strength N/mm (CD)	18.6	17.7	18.2	18.1	19.1							18.3	0.5
Yield Elongation % (MD)	19	19	21	20	20							20	1
Yield Elongation % (CD)	16	15	16	15	16							16	1
Break Strength N/mm (MD)	32.7	35.4	30.8	34.6	32.8							33.3	1.8
Break Strength N/mm (CD)	34.5	33.7	34.8	36.4	38.2							35.5	1.8
Break Elongation % (MD)	800	840	730	850	780							800	48
Break Elongation % (CD)	900	890	900	940	960							918	30

Thickness (ASTM D5199-12(2019))

mm	1.00	1.00	1.00	1.05	1.01	1.07	1.05	1.06	1.02	1.05		1.03	0.03
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Atmospheric Conditions at Test: 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.
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CONFIDENTIAL TEST REPORT

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 7
HDPE Deployment Records
Report Number 2035r3v1d0822



Geosynthetic Panel Deployment

CQA12

Site	Morfa Biocell Restoration	Material	HDPE 1mm	Installer	Celtic Lining Ltd.
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Date	Roll No	Panel No	Thickness L	Thickness R	Thickness F	Thickness B	Length	Width	Visual Check	Non-Con No
03/05/2022	154489	P1	-	-	-	-	32	6.8	OK	
03/05/2022	154489	P2	-	-	-	-	32	6.8	OK	
03/05/2022	154489	P3	-	-	-	-	28	6.8	OK	
03/05/2022	154489	P4	-	-	-	-	28	6.8	OK	
03/05/2022	154489	P5	-	-	-	-	26	6.8	OK	
03/05/2022	154489	P6	-	-	-	-	26.5	6.8	OK	
03/05/2022	154489	P7	-	-	-	-	26.5	6.8	OK	
03/05/2022	154489	P8	-	-	-	-	26.5	6.8	OK	
04/05/2022	154488	P9	-	-	-	-	28	6.8	OK	
04/05/2022	154488	P10	-	-	-	-	28	6.8	OK	
04/05/2022	154488	P11	-	-	-	-	28	6.8	OK	
04/05/2022	154488	P12	-	-	-	-	28	6.8	OK	

04/05/2022	154488	P13	-	-	-	-	28	6.8	OK	
04/05/2022	154488	P14	-	-	-	-	19	6.8	OK	
04/05/2022	154488	P15	-	-	-	-	9	6.8	OK	
04/05/2022	154488	P16	-	-	-	-	22	6.8	OK	
04/05/2022	154488	P17	-	-	-	-	31	6.8	OK	
04/05/2022	154488	P18	-	-	-	-	31.5	6.8	OK	
04/05/2022	154471	P19	-	-	-	-	31.5	6.8	OK	
04/05/2022	154471	P20	-	-	-	-	31.5	6.8	OK	
05/05/2022	112459	P21	-	-	-	-	79	6.8	OK	
05/05/2022	112459	P22	-	-	-	-	79	6.8	OK	
05/05/2022	112459	P23	-	-	-	-	77	6.8	OK	
05/05/2022	112459	P24	-	-	-	-	80	6.8	OK	
05/05/2022	154471	P25	-	-	-	-	33	6.8	OK	
05/05/2022	154471	P26	-	-	-	-	33	6.8	OK	
05/05/2022	154471	P27	-	-	-	-	33.5	6.8	OK	
05/05/2022	154471	P28	-	-	-	-	34	6.8	OK	
05/05/2022	154471	P29	-	-	-	-	35	6.8	OK	

05/05/2022	154487	P30	-	-	-	-	37	6.8	OK	
05/05/2022	154487	P31	-	-	-	-	37	6.8	OK	
05/05/2022	154487	P32	-	-	-	-	37	6.8	OK	
06/05/2022	112458	P33	-	-	-	-	80	6.8	OK	
06/05/2022	112458	P34	-	-	-	-	80	6.8	OK	
06/05/2022	112458	P35	-	-	-	-	77.5	6.8	OK	
06/05/2022	112457	P36	-	-	-	-	2.5	6.8	OK	
06/05/2022	112457	P37	-	-	-	-	81	6.8	OK	
09/05/2022	112457	P38	-	-	-	-	82.5	6.8	OK	
09/05/2022	112457	P39	-	-	-	-	66	6.8	OK	
09/05/2022	112460	P40	-	-	-	-	15	6.8	OK	
09/05/2022	112460	P41	-	-	-	-	80	6.8	OK	
09/05/2022	112460	P42	-	-	-	-	81	6.8	OK	
10/05/2022	154487	P43	-	-	-	-	37	6.8	OK	
10/05/2022	154487	P44	-	-	-	-	37	6.8	OK	
10/05/2022	154487	P45	-	-	-	-	23	6.8	OK	
12/05/2022	154487	P46	-	-	-	-	37	6.8	OK	

12/05/2022	154487	P47	-	-	-	-	18	6.8	OK	
12/05/2022	154491	P48	-	-	-	-	19.7	6.8	OK	
12/05/2022	154491	P49	-	-	-	-	37.3	6.8	OK	
12/05/2022	154491	P50	-	-	-	-	1.2	6.8	OK	
12/05/2022	154491	P51	-	-	-	-	37.3	6.8	OK	
12/05/2022	154491	P52	-	-	-	-	23	6.8	OK	
12/05/2022	154491	P53	-	-	-	-	40.8	6.8	OK	
12/05/2022	154491	P54	-	-	-	-	23	6.8	OK	
12/05/2022	154491	P55	-	-	-	-	37.3	6.8	OK	
12/05/2022	154491	P56	-	-	-	-	23	6.8	OK	
12/05/2022	154491	P57	-	-	-	-	40.4	6.8	OK	
12/05/2022	154491	P58	-	-	-	-	23	6.8	OK	
12/05/2022	112460	P59	-	-	-	-	59	6.8	OK	
12/05/2022	112468	P60	-	-	-	-	22.6	6.8	OK	
13/05/2022	112468	P61	-	-	-	-	81	6.8	OK	
16/05/2022	112479	P62	-	-	-	-	38.8	6.8	OK	
16/05/2022	112479	P63	-	-	-	-	38.8	6.8	OK	

16/05/2022	112479	P64	-	-	-	-	38.8	6.8	OK	
17/05/2022	112479	P65	-	-	-	-	38.8	6.8	OK	
17/05/2022	112479	P66	-	-	-	-	38.8	6.8	OK	
18/05/2022	154491	P67	-	-	-	-	17.5	6.8	OK	
18/05/2022	112479	P68	-	-	-	-	20.14	6.8	OK	
18/05/2022	112479	P69	-	-	-	-	11.7	6.8	OK	
18/05/2022	112472	P70	-	-	-	-	26.3	6.8	OK	
18/05/2022	112472	P71	-	-	-	-	38	6.8	OK	
18/05/2022	112472	P72	-	-	-	-	39	6.8	OK	
18/05/2022	112472	P73	-	-	-	-	39	6.8	OK	
19/05/2022	112472	P74	-	-	-	-	39	6.8	OK	
19/05/2022	112472	P75	-	-	-	-	39	6.8	OK	
19/05/2022	112468	P76	-	-	-	-	79.8	6.8	OK	
20/05/2022	112468	P77	-	-	-	-	10.5	3	OK	
20/05/2022	112468	P78	-	-	-	-	10.5	3	OK	



Geomembrane Seam Construction

CQA13

Site	Morfa Biocell Restoration	Membrane	1mm HDPE	Installer	Celtic Lining Ltd.
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Date	Seam No	Panel Nos	Length	Machine	Operator	DS Number	NDT Type	APT Start	APT Finish	Approved
03/05/2022	1	P1/P2	32	CL2377	EJ		APT	16:08-2.0	16:18-1.9	Y
03/05/2022	2	P2/P3	32	CL2377	EJ		APT	16:20:00 - 2.0	16:30-2.0	Y
03/05/2022	3	P3/P4	28	CL2377	EJ		APT	16:33-2.0	16:43-1.90	Y
03/05/2022	4	P4/P5	28	CL2377	EJ		APT	16:44-2.0	16:54-1.8	Y
03/05/2022	5	P5/P6	28	CL2377	EJ		APT	a)16:57-2.0 b)17:08-2.0	a)17:07-1.90 b)17:18-1.90	Y
03/05/2022	6	P6/P7	26.5	CL2377	EJ	DS1	APT	a)17:46-2.0 b)17:35-2.0	a)17:56-1.90 b)17:45-1.90	Y
03/05/2022	7	P7/P8	26.5	CL2377	EJ		APT	8:15 - 2.0	8:25 - 1.90	Y
04/05/2022	8	P8/P9	26.5	CL2377	EJ		APT	9:14-2.0	9:24 - 2.0	Y
04/05/2022	9	P9/P10	28	CL2377	EJ		APT	9:29-2.0	9:39 1.90	Y
04/05/2022	10	P10/P11	28	CL2377	EJ		APT	9:50 - 2.0	10:00 - 1.90	Y
04/05/2022	11	P11/P12	28	CL2377	EJ		APT	13:02-2.0	13:12-1.90	Y
04/05/2022	12	P12/P13	28	CL2377	EJ		APT	13:12-2.0	13:22-1.90	Y

04/05/2022	13	P13/P14	19	CL2377	EJ		APT	13:22-2.0	13:32-1.90	Y
04/05/2022	14	P15/P16	9	CL2377	EJ		APT	13:32-2.0	13:42-1.90	Y
04/05/2022	15	P16/P17	22	CL2377	EJ		APT	13:43-2.0	13:53-1.90	Y
04/05/2022	16	P13/P14-P17	31	CL2377	EJ		APT	a)14:04-2.0 b)14:15-2.0	a)14:14-1.90 b)14:25-1.90	Y
04/05/2022	17	P17/P18	31.5	CL2377	EJ		APT	14:26-2.0	14:36-2.0	Y
04/05/2022	18	P18/P19	31.5	CL2377	EJ	DS2	APT	9:19-2.0	9:29 - 2.0	Y
04/05/2022	19	P19/P20	31.5	CL2377	EJ		APT	9:30-2.0	9:40 - 2.0	Y
05/05/2022	20	P1-P12/P21	79	CL2377	EJ	DS3	APT	9:41-2.0	9:51-1.90	Y
05/05/2022	21	P21/P22	79	CL2377	EJ		APT	9:53-2.0	10:03-1.90	Y
05/05/2022	22	P23/P24	6.8	CL2377	EJ		APT	10:10-2.0	10:20-1.90	Y
05/05/2022	23	P22/P23/P24	80	CL2377	EJ	DS4	APT	10:35-2.0	10:45-2.0	Y
05/05/2022	24	P24/P25	33	CL2377	EJ		APT	11:54-2.0	12:04-1.90	Y
05/05/2022	25	P25/P26	33	CL2377	EJ		APT	a)12:06-2.0 b)12:25-2.0	a)12:16-1.90 b)12:35-1.90	Y
05/05/2022	26	P26/P27	33.5	CL2377	EJ		APT	12:36-2.0	12:46-1.90	Y
05/05/2022	27	P27/P28	34	CL2377	EJ		APT	12:47-2.0	12:57-1.90	Y
05/05/2022	28	P28/P29	35	CL2377	EJ	DS6	APT	a)12:58-2.0 b)13:10-2.0	a)13:08-1.90 b)13:20-1.90	Y
05/05/2022	29	P29/P30	37	CL2377	EJ		APT	17:13-2.0	17:23-2.0	Y

05/05/2022	30	P30/P31	37	CL2377	EJ		APT	17:30-2.0	17:40-1.9	Y
05/05/2022	31	P31/P32	37	CL2377	EJ		APT	17:43-2.0	17:53-1.9	Y
05/05/2022	32	P17-P25/P21-P23	22	CL2377	EJ		APT	14:00-2.0	14:10-2.0	Y
06/05/2022	33	P23/P33	80	CL2377	EJ	DS8	APT	9:00-2.0	9:10 - 1.9	Y
06/05/2022	34	P33/P34	80	CL2377	EJ		APT	9:32-2.0	9:42 - 1.9	Y
06/05/2022	35	P35/P36	6.8	CL2377	EJ		APT	9:45-2.0	9:55 - 1.9	Y
06/05/2022	36	P34/P35/P36	81	CL2377	EJ	DS7	APT	a)10:29-2.0 b)11:01-2.0	a)10:39-2.0 b)11:11-2.0	Y
06/05/2022	37	P35/P36/P37	81	CL2377	EJ		APT	11:55-2.0	12:05-2.0	Y
06/05/2022	38	P37-/P22/P2-P35	28	CL2377	EJ	DS9	APT	12:11-2.0	12:21-2.0	Y
09/05/2022	39	P37/P38	82.5	CL2377	EJ		APT	a)11:38-2.0 b)12:42-2.0	a)12:48-2.0 b)12:52-1.90	Y
09/05/2022	40	P39/40	6.8	CL2377	EJ		APT	12:00-2.0	12:10-1.90	Y
09/05/2022	41	P38/P39/P40	82	CL2377	EJ		APT	12:52-2.0	13:02-1.80	Y
09/05/2022	42	P39/P40/P41	82	CL2377	EJ	DS10	APT	13:50-2.0	14:00-2.0	Y
09/05/2022	43	P41/P42	83	CL2377	EJ		APT	14:34-2.0	14:44-2.0	Y
09/05/2022	44	P28--P32/P24-P37	37	CL2377	EJ		APT	14:34-2.0	14:44-2.0	Y
10/05/2022	45	P32/P43	37.5	CL2377	EJ		APT	9:30-2.0	9:40 - 1.9	Y
10/05/2022	46	P43/P44	37	CL2377	EJ	DS12	APT	a)9:39-2.0 b)10:30-2.0	a)9:49-2.0 b)10:40-2.00	Y

10/05/2022	47	P44/P45	18.5	CL2377	EJ		APT	a)9:39-2.0 b)10:30-2.0	a)9:49-2.0 b)10:40-2.00	Y
12/05/2022	48	P44/P45/P46	37.8	CL2377	EJ		APT	8:38-2.0	8:48-2.0	Y
12/05/2022	49	P47/P48	6.8	CL2377	EJ		APT	8:50-2.0	9:00 -2.0	Y
12/05/2022	50	P44/P47/P48	38	CL2377	EJ		APT	9:05-2.0	9:15 -2.0	Y
12/05/2022	51	P47/P48/P49	38	CL2377	EJ	DS13	APT	9:41-2.0	9:51-2.0	Y
12/05/2022	52	P49/P50	19	CL2377	EJ		APT	9:30-2.0	9:40 -2.0	Y
12/05/2022	53	P49/P50/P51	38	CL2377	EJ		APT	9:55-2.0	10:05 -1.90	Y
12/05/2022	54	P51/P52	19	CL2377	EJ		APT	10:10-2.0	10:20 -2.0	Y
12/05/2022	55	P51/P52/P53	41.5	CL2377	EJ		APT	10:40-2.0	10:50 -2.0	Y
12/05/2022	56	P53/P54	20.75	CL2377	EJ		APT	11:35-2.0	11:40 -2.0	Y
12/05/2022	57	P53/P54/P55	40	CL2377	EJ		APT	12:33-2.0	12:43 -2.0	Y
12/05/2022	58	P55/P56	20	CL2377	EJ		APT	12:45-2.0	12:55 -1.90	Y
12/05/2022	59	P55/P56/P57	41	CL2377	EJ		APT	13:00-2.0	13:10 -1.90	Y
12/05/2022	60	P57/P58	20.5	CL2377	EJ		APT	a)13:15-2.0 b)13:22-2.0	a)13:25-2.0 b)13:32-2.00	Y
12/05/2022	61	P59/P60	6.8	CL2377	EJ		APT	16:20-2.0	16:30 -2.0	Y
13/05/2022	62	P42/P59/P60	83	CL2377	EJ		APT	8:00-2.0	8:10-2.0	Y
13/05/2022	63	P59/P60/P61	82	CL2377	EJ	DS15	APT	10:00-2.0	10:10-1.90	Y

16/05/2022	64	P57/P58/P62	39.5	CL2377	EJ	DS14	APT	a)15:46-2.0 b)16:06-2.0	a)15:56-2.0 b)16:16-2.00	Y
16/05/2022	65	P62/P63	39.5	CL2377	EJ	DS16	APT	16:16-2.0	16:26-1.90	Y
16/05/2022	66	P63/P64	39.5	CL2377	EJ	DS17	APT	17:35-2.0	17:45-1.90	Y
17/05/2022	67	P64/P65	39.5	CL2377	EJ		APT	10:42-2.0	10:52-1.90	Y
17/05/2022	68	P65/P66	39.5	CL2377	EJ		APT	11:02-2.0	11:12-2.0	Y
18/05/2022	69	P67/P68	6.8	CL2377	EJ		APT	11:20-2.0	11:30-1.9	Y
18/05/2022	70	P66/P67/P68	39	CL2377	EJ		APT	a)12:31-2.0 b)12:42-2.0	a)12:41-2.0 b)12:52-2.00	Y
18/05/2022	71	P69/P70	6.8	CL2377	EJ		APT	10:15-2.0	10:25-2.0	Y
18/05/2022	72	P67/P68/P69/P 70	39	CL2377	EJ		APT	11:40-2.0	11:50-2.0	Y
18/05/2022	73	P69/P70/P71	38.7	CL2377	EJ	DS18	APT	a)13:36-2.0 b)13:48-2.0	a)13:46-2.0 b)13:58-2.00	Y
18/05/2022	74	P71/P72	39	CL2377	EJ		APT	a)14:25-2.0 b)14:31-2.0	a)14:35-2.0 b)14:41-2.00	Y
18/05/2022	75	P72/P73	39	CL2377	EJ		APT	14:47-2.0	14:57-2.0	Y
19/05/2022	76	P73/P74	39.6	CL2377	EJ		APT	10:07-2.0	10:17-1.90	Y
19/05/2022	77	P74/P75	39.6	CL2377	EJ		APT	10:20-2.0	10.30-1.90	Y
19/05/2022	78	P61/P76	81	CL2377	EJ	DS19	APT	8:40-2.0	8:50-2.0	Y
20/05/2022	79	P77/P78	3	CL2377	EJ		APT	9:03-2.0	9:13-1.90	Y
20/05/2022	80	P76/P77/P78	20	CL2377	EJ	DS20	APT	9:30-2.0	9:40-2.0	Y

20/05/2022	81	P65- P76/P77/P78	81	CL2377	EJ		APT	10:40-2.0	10:50-1.90	Y
20/05/2022	82	P62/P63/P78	14	CL2377	EJ		APT	10:16-2.0	10:26-2.0	Y
20/05/2022	83	P64/P77	8	CL2377	EJ		APT	10:28-2.0	10:38-1.90	Y



Geosynthetic Repair Record

CQA14

Site	Morfa Biocell Restoration	Material	1mm HDPE	Installer	Celtic Lining Ltd.
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Date	Repair No	Location	Defect Type	Repair Type	Machine	Operator	NDT	Test Time	Pass/Fail	Approved
04/05/2022	1	P3/P4	Weld Burn	Patch	7118	EJ	Vacc		Pass	Y
04/05/2022	2	P6/P7	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
04/05/2022	3	P13/P17/P18	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
04/05/2022	4	P13/P17	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
05/05/2022	5	P7/P21	DS Location	Patch	7118	EJ	Vacc		Pass	Y
05/05/2022	6	P7/P21	Weld Join	Patch	7118	EJ	Vacc		Pass	Y
05/05/2022	7	P18/P19/P21	Weld Join	Patch	7118	EJ	Vacc		Pass	Y
05/05/2022	8	P18/P19/P21	DS Location	Patch	7118	EJ	Vacc		Pass	Y
06/05/2022	9	P34/P35	DS Location	Patch	7118	GE	Vacc		Pass	Y
06/05/2022	10	P34/P35	DS Location	Patch	7118	GE	Vacc		Pass	Y
06/05/2022	11	P23/P33/P28	Weld Burn	Patch	7118	GE	Vacc		Pass	Y
06/05/2022	12	P34/P26	Weld Burn	Patch	7118	GE	Vacc		Pass	Y

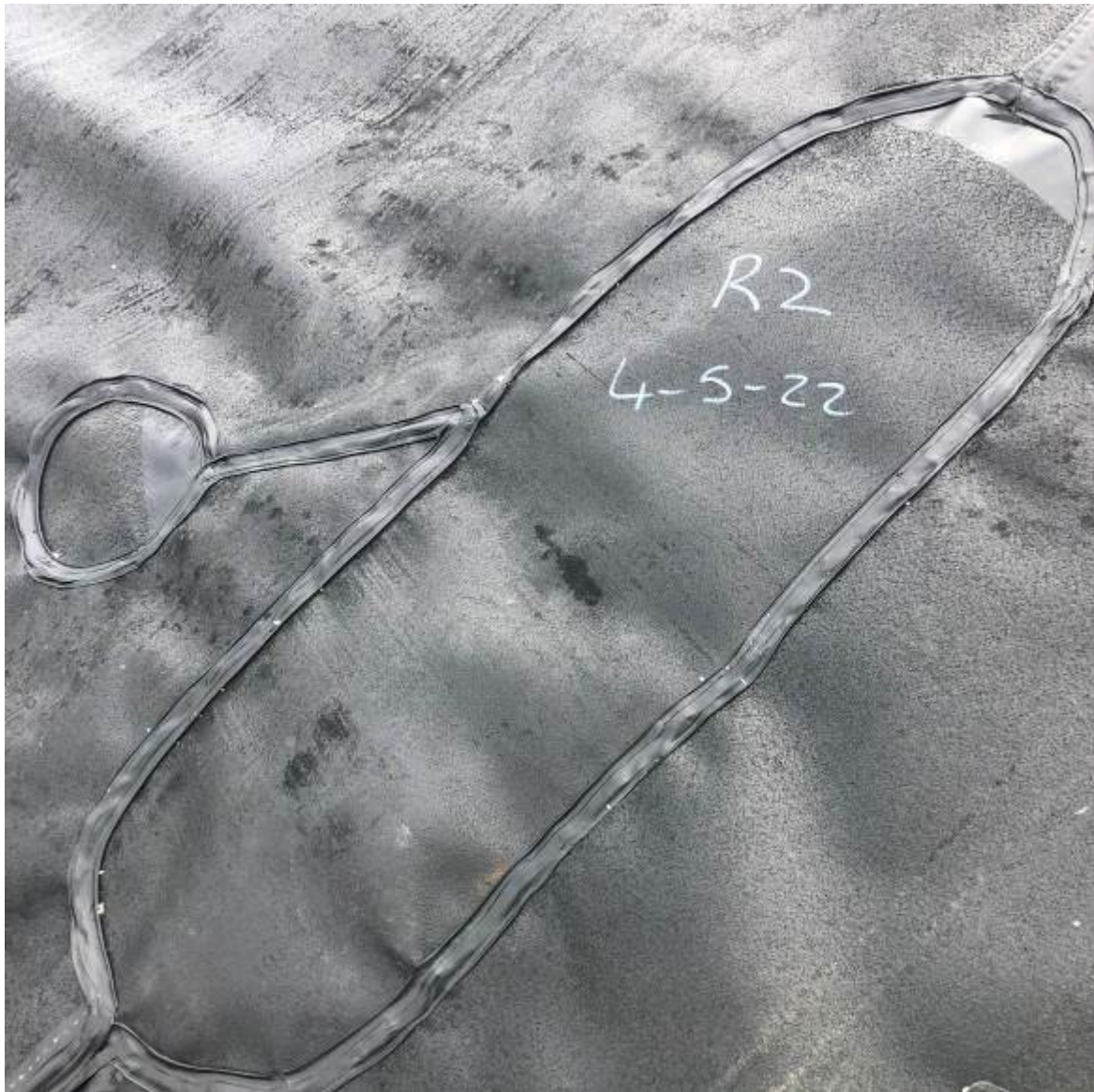
09/05/2022	13	P38/P39/P40	Weld Burn	Patch	7118	GE	Vacc		Pass	Y
09/05/2022	14	P39/P40	Damaged Liner	Patch	7118	DJ	Vacc		Pass	Y
09/05/2022	15	P39/P40/P41	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y
09/05/2022	16	P37/P38	DS Location	Patch	7118	EJ	Vacc		Pass	Y
09/05/2022	17	P39/P41	DS Location	Patch	7118	DJ	Vacc		Pass	Y
09/05/2022	18	P28/P29/P37	3 way Join	Patch	7118	DJ	Vacc		Pass	Y
12/05/2022	19	P45/P46	Weld Burn	Patch	7118	EJ	Vacc		Pass	Y
12/05/2022	20	P54/P55	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y
13/05/2022	21	P43/P44	DS Location	Patch	7118	DJ	Vacc		Pass	Y
13/05/2022	22	P48/P49	DS Location	Patch	7118	EJ	Vacc		Pass	Y
13/05/2022	23	P47/P59/P60	DS Location	Patch	7118	DJ	Vacc		Pass	Y
13/05/2022	24	P42/P32/P43	3 way Join	Patch	7118	DJ	Vacc		Pass	Y
13/05/2022	25	P60/P61	DS Location	Patch	7118	EJ	Vacc		Pass	Y
17/05/2022	26	P57/P62	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y
17/05/2022	27	P58/P62	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y
17/05/2022	28	P62	Damaged Liner	Patch	7118	EJ	Vacc		Pass	Y
17/05/2022	29	P62/P63	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y

17/05/2022	30	P63/P64	Weld Burn	Patch	7118	DJ	Vacc		Pass	Y
18/05/2022	31	P64/P67/P68	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
19/05/2022	32	P69/P71	DS Location	Patch	7118	DJ	Vacc		Pass	Y
19/05/2022	33	P67	Damaged Liner	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	34	P46/P61/P76	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
20/05/2022	35	P36/P78	Extrusion Bead	Extrusion Bead	7118	DJ	Vacc		Pass	Y
20/05/2022	36	P76	Damaged Liner	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	37	P76	Damaged Liner	Patch	7118	EJ	Vacc		Pass	Y
20/05/2022	38	P76	Damaged Liner	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	39	P76/P78	DS Location	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	40	P57/P62/P78	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
20/05/2022	41	P63/P78	Weld Join	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	42	P63/P78	Extrusion Bead	Extrusion Bead	7118	DJ	Vacc		Pass	Y
20/05/2022	43	P62/P63/P78	3 way Join	Patch	7118	EJ	Vacc		Pass	Y
20/05/2022	44	P64/P77	Weld Join	Patch	7118	DJ	Vacc		Pass	Y
20/05/2022	45	P61/P76	Weld Join	Patch	7118	DJ	Vacc		Pass	Y
02/12/2021	PB1	P5	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y

08/02/2022	PB2	P5/P6	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB3	P6/P7	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
02/12/2021	PB4	P12	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB5	P22/P23	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB6	P23/P33/P28	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
02/12/2021	PB7	P25	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB8	P25	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB9	P38/P39/P40	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
02/12/2021	PB10	P44	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB11	P57/P58	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB12	P61/P76	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
02/12/2021	PB13	P59	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB14	P72	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
08/02/2022	PB15	P67	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y
02/12/2021	PB16	P71	Pipe Boot	Patch	7118	GE	Vacc		Pass	Y



Repair 1



Repair 2



Repair 3



Repair 4



Repair 5



Repair 6



Repair 7



Repair 8



Repair 9



Repair 10



Repair 11



Repair 12



Repair 13



Repair 14



Repair 15



Repair 16



Repair 17



Repair 18



Repair 19



Repair 20



Repair 21



Repair 22



Repair 23



Repair 24



Repair 25



Repair 26



Repair 27



Repair 28



Repair 29



Repair 30



Repair 31



Repair 32



Repair 33



Repair 34



Repair 35



Repair 36



Repair 37



Repair 38



Repair 39



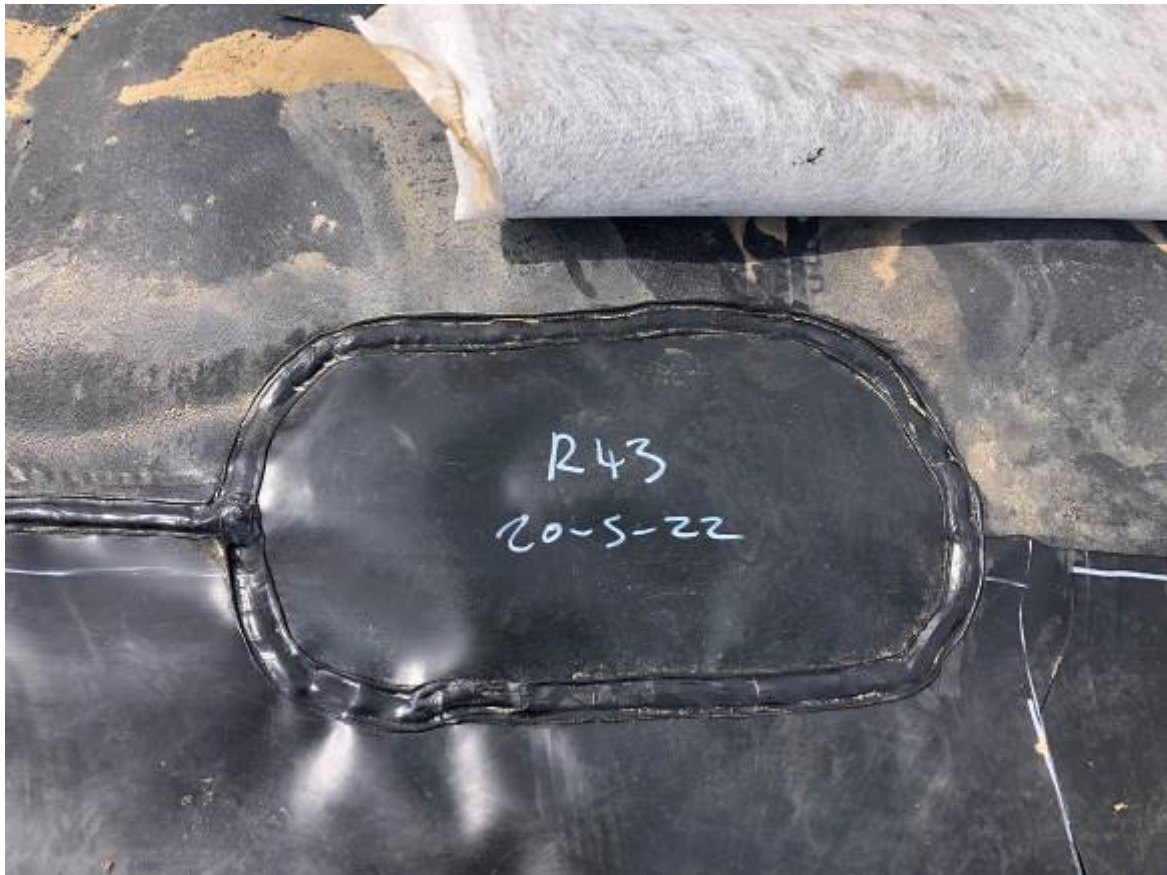
Repair 40



Repair 41



Repair 42



Repair 43



Repair 44



Repair 45



Pipe Boot Repair 1



Pipe Boot Repair 2



Pipe Boot Repair 3



Pipe Boot Repair 4



Pipe Boot Repair 5



Pipe Boot Repair 6



Pipe Boot Repair 7



Pipe Boot Repair 8



Pipe Boot Repair 9



Pipe Boot Repair 10



Pipe Boot Repair 11



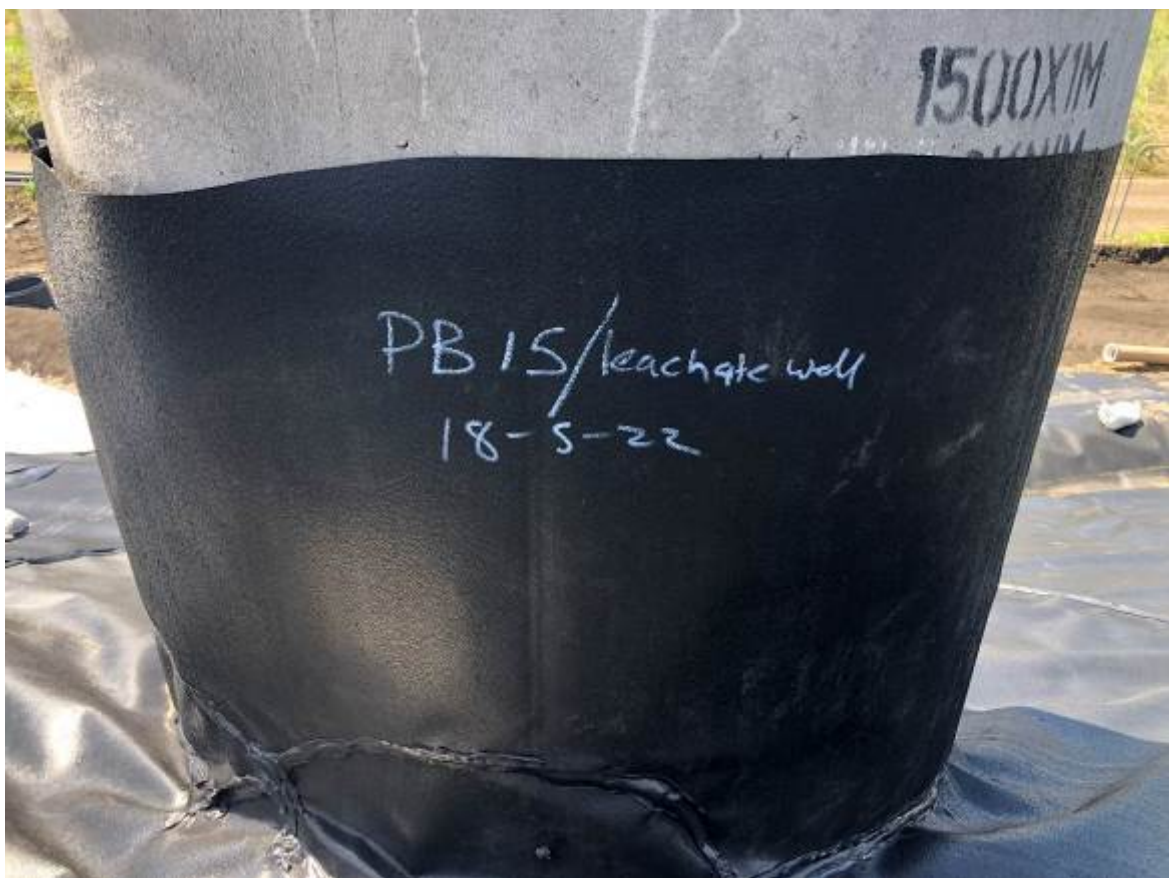
Pipe Boot Repair 12



Pipe Boot Repair 13



Pipe Boot Repair 14



Pipe Boot Repair 15



Pipe Boot Repair 16

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 8
HDPE Destructive Test
Results

Report Number 2035r3v1d0822



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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U296/a

Report Date 16/05/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Smooth & Textured HDPE Geomembrane

Date Received 16/05/2022

Sample IDs DS-1 through to DS-11 {Fusion & Extrusion Welds}

Tests Requested Seam Integrity (Peel & Shear) - ASTM D6392-12(2018)

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not 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.

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Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U296/a
Dates Tested: 16/02/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: DS-1, P6/P7

BICS Sample Ref: 1

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	17.3	16.7	17.5	17.9	16.3	16.2	17.1	16.5	17.4	17.7	17.1	0.6
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	20.5	20.9	20.9	21.3	20.9						20.9	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	BRK	NOBRK	NOBRK	BRK	SE1							

Sample ID: DS-2, P18/P19

BICS Sample Ref: 2

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	17.9	16.6	16.6	17.2	16.1	18.5	18.0	18.9	16.8	16.2	17.3	1.0
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	20.8	20.8	20.7	21.3	21.4						21.0	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	SE1							

Sample ID: DS-3, P7/P21

BICS Sample Ref: 3

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.5	15.3	13.9	15.0	16.3	14.1	15.7	16.2	13.6	15.2	15.0	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	19.3	19.1	18.8	18.6	17.7						18.7	0.6
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	NOBRK							

Atmospheric Conditions at Test: 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) tested.
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CONFIDENTIAL TEST REPORT



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U296/a
Dates Tested: 16/02/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
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	1	2	3	4	5	6	7	8	9	10		
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Sample ID: DS-4, P22/P23

BICS Sample Ref: 4

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	13.8	14.2	13.7	13.7	14.7	15.2	13.3	15.5	14.1	15.2	14.3	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	18.9	18.6	18.3	18.4	17.8						18.4	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	BRK							

Sample ID: DS-5, EXT

BICS Sample Ref: 5

Seam Integrity (ASTM D6392-12(2018)) {Extrusion Weld}

Peel Strength N/mm	17.1	17.2	14.2	15.0	17.4						16.2	1.5
Peel Separation %	0	0	0	0	0							
Peel Break Classification	NOBRK	NOBRK	SE3	SE3	NOBRK							

Shear Strength N/mm	18.6	18.4	18.4	18.5	17.4						18.3	0.5
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-6, P28/P29

BICS Sample Ref: 6

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	18.1	18.8	18.3	19.7	18.2	19.1	19.1	19.4	17.6	17.9	18.6	0.7
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	23.8	22.7	23.2	22.6	21.6						22.8	0.8
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U296/a
Dates Tested: 16/02/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: DS-7, P34/P35

BICS Sample Ref: 7

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.4	14.0	14.3	14.6	14.4	14.7	13.8	14.3	14.9	14.9	14.4	0.4
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	18.8	18.4	18.2	18.2	17.7						18.2	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	NOBRK	SE1	SE1							

Sample ID: DS-8, P23/P33

BICS Sample Ref: 8

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	13.1	14.8	14.7	14.8	14.8	14.3	14.7	14.3	14.1	14.0	14.4	0.6
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	18.3	18.5	18.8	18.7	18.0						18.5	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-9, P37/P38

BICS Sample Ref: 9

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.6	14.5	13.7	15.0	14.3	13.8	14.6	12.8	13.7	15.0	14.2	0.7
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	17.7	18.0	18.1	17.5	17.7						17.8	0.2
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	SE1							

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U296/a
Dates Tested: 16/02/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
-------------	----------------------	--	--	--	--	--	--	--	--	--	------	---------

	1	2	3	4	5	6	7	8	9	10		
--	---	---	---	---	---	---	---	---	---	----	--	--

Sample ID: DS-10, P39/P41

BICS Sample Ref: 10

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.3	14.7	14.6	15.1	15.7	15.2	15.4	14.9	15.1	14.9	15.0	0.4
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	16.7	16.4	16.3	16.3	16.0						16.3	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-11, EXT

BICS Sample Ref: 11

Seam Integrity (ASTM D6392-12(2018)) {Extrusion Weld}

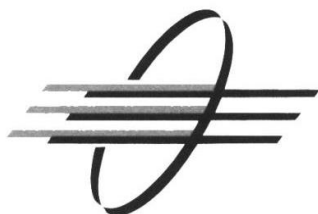
Peel Strength N/mm	13.8	11.6	14.1	12.1	11.8						12.7	1.2
Peel Separation %	0	0	0	0	0							
Peel Break Classification	SE3	SE3	SE3	SE3	SE3							

Shear Strength N/mm	19.2	19.4	18.2	19.3	19.0						19.0	0.5
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

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

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U317/a

Report Date 25/05/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Smooth & Textured HDPE Geomembrane

Date Received 25/05/2022

Sample IDs DS-12 through to DS-21 {Fusion & Extrusion Welds}

Tests Requested Seam Integrity (Peel & Shear) - ASTM D6392-12(2018)

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not 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.

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U317/a
Dates Tested: 25/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: DS-12, P43/P44

BICS Sample Ref: 1

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	17.0	18.0	17.0	16.1	16.4	16.1	15.9	17.4	16.2	16.2	16.6	0.7
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	20.6	21.0	21.1	21.1	20.4						20.8	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	SE1							

Sample ID: DS-13, P48/P49

BICS Sample Ref: 2

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	15.4	17.5	15.9	16.9	14.0	15.2	13.5	16.3	14.0	15.7	15.4	1.3
Peel Separation %	20	0	0	0	0	0	0	0	60	0		
Peel Break Classification	AD-BRK	SE1	SE1	SE1	SE1	SE1	AD-BRK	AD-BRK	AD-BRK	SE1		
Shear Strength N/mm	21.0	21.2	20.9	20.8	21.0						21.0	0.1
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-14, P42/P59

BICS Sample Ref: 3

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.1	12.7	12.4	12.0	12.3	14.5	15.3	14.9	12.5	14.9	13.6	1.3
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	18.1	17.9	17.5	18.1	17.7						17.8	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Atmospheric Conditions at Test: 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) tested.
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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U317/a
Dates Tested: 25/05/2022

TEST METHOD TEST SPECIMEN NUMBER MEAN Std Dev

1 2 3 4 5 6 7 8 9 10

Sample ID: DS-15, P60/P61

BICS Sample Ref: 4

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	15.1	14.8	15.4	14.2	15.4	14.9	14.4	14.2	14.6	15.0	14.8	0.4
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	18.9	19.1	18.4	18.9	18.8						18.8	0.2
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	NOBRK	SE1	SE1	NOBRK							

Sample ID: DS-16, P62/P63

BICS Sample Ref: 5

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	17.1	16.5	17.0	16.1	16.1	16.3	15.5	15.5	14.2	16.7	16.1	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	19.7	20.8	20.6	19.7	20.2						20.2	0.5
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-17, P63/P64

BICS Sample Ref: 6

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	16.2	17.4	16.1	17.1	16.6	17.2	16.7	16.6	16.7	17.4	16.8	0.5
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	21.9	21.9	21.6	21.6	21.2						21.6	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	BRK	NOBRK							

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

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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U317/a
Dates Tested: 25/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: DS-18, P69/P71

BICS Sample Ref: 7

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	16.3	15.8	19.0	18.3	14.9	16.7	18.2	17.8	11.0	11.2	15.9	2.8
Peel Separation %	0	0	0	0	0	0	30	60	0	50		
Peel Break Classification	AD-BRK	SE1	SE1	SE1	SE1	SE1	AD-BRK	AD-BRK	SE1	AD-BRK		
Shear Strength N/mm	21.8	21.7	21.0	21.4	19.8						21.1	0.8
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Sample ID: DS-19, P61/P76

BICS Sample Ref: 8

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	15.3	14.7	15.0	14.0	15.3	12.3	13.8	14.8	14.5	13.7	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	18.4	18.0	18.5	18.4	18.1						18.3	0.2
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	SE1	SE1	SE1	NOBRK							

Sample ID: DS-20, P76/P78

BICS Sample Ref: 9

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.7	14.2	16.5	14.0	15.5	14.6	15.1	15.0	14.8	13.9	14.8	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	18.1	18.6	18.5	18.1	18.5						18.4	0.2
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	NOBRK	NOBRK	NOBRK							

Atmospheric Conditions at Test: 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.
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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Smooth & Textured HDPE Geomembrane

Report Ref No: BS-U317/a
Dates Tested: 25/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
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	1	2	3	4	5	6	7	8	9	10		
--	---	---	---	---	---	---	---	---	---	----	--	--

Sample ID: DS-21

BICS Sample Ref: 10

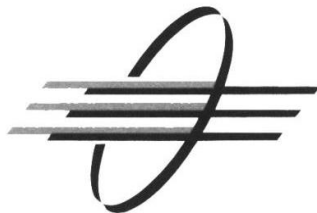
Seam Integrity (ASTM D6392-12(2018)) {Extrusion Weld}

Peel Strength N/mm	12.6	15.1	17.6	18.3	17.5						16.2	2.3
Peel Separation %	0	0	0	0	0							
Peel Break Classification	BRK2	BRK2	NOBRK	SE3	BRK2							
Shear Strength N/mm	17.4	19.2	18.2	18.3	17.5						18.1	0.7
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE2	NOBRK	NOBRK	SE2	NOBRK							

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

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U317/b

Report Date 01/06/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested 1mm Textured HDPE Geomembrane

Date Received 25/05/2022

Sample IDs DS13, P48/P49 & DS18, P69/P71 {Fusion Welds}

Tests Requested Seam Integrity (Peel & Shear) - ASTM D6392-12(2018) {Retest}

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not 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.
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10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: 1mm Textured HDPE Geomembrane

Report Ref No: BS-U317/b
Dates Tested: 01/06/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: DS13, P48/P49

BICS Sample Ref: 11

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	15.4	17.0	16.2	15.7	13.4	16.3	15.1	14.4	16.2	16.4	15.6	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	20.7	21.2	20.3	20.8	20.3						20.7	0.4
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	SE1	NOBRK	NOBRK	NOBRK	SE1							

Sample ID: DS18, P69/P71

BICS Sample Ref: 12

Seam Integrity (ASTM D6392-12(2018)) {Fusion Weld}

Peel Strength N/mm	14.2	14.5	14.0	14.2	13.9	13.7	14.3	13.2	13.7	13.0	13.9	0.5
Peel Separation %	0	0	0	0	0	0	0	0	0	0		
Peel Break Classification	SE1	NOBRK	SE1	SE1	SE1	SE1	SE1	SE1	SE1	SE1		
Shear Strength N/mm	15.9	16.0	15.3	15.4	15.7						15.6	0.3
Shear Elongation %	>50	>50	>50	>50	>50							
Shear Break Classification	NOBRK	NOBRK	SE1	SE1	NOBRK							

Atmospheric Conditions at Test: 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) tested.
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CONFIDENTIAL TEST REPORT

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 9
Surface Water Geo-
composite Manufacturers
Delivery and QC Data
Report Number 2035r3v1d0822

Scheme: Morfa LFS, SA13 2NG

Product: Pozidrain 7S250D/NW8 – 4.4m x 65m

Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK

Date of manufacture: January 2022

Date of dispatch: 21st February 2022

Consignment number: 5 & 6

Delivery note number: 104122

Number of rolls: 32

Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16135	1, 7, 8, 9, 15,				
	24, 25, 29, 36,				
	37, 43, 46, 47,				
	49, 50, 52, 54,				
	55, 56, 57, 58,				
	65, 69, 70, 71,				
	75, 77, 79				
W16168	18, 19, 20, 23,				

Product conforms to datasheet reference: ABG POZIDRAIN GSD [CE] Rev 1.02 DATASHEET.

Additional test details: None

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

Signed for and on behalf of the manufacturer by:

Name and title: Peter van Ruiten – Operations Director

Date: 21st February 2022

Certificate issued by: ABG Ltd

Certificate of conformity

Scheme: Morfa LFS, SA13 2NG
Product: Pozidrain 7S250D/NW8 – 4.4m x 65m
Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK
Date of manufacture: January 2022
Date of dispatch: 23rd February 2022
Consignment number: 8
Delivery note number: 104148
Number of rolls: 16
Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16168	16, 17				
W16135	3, 4, 10, 23, 26, 32, 35, 44, 61, 62, 63, 66, 67, 73				

Product conforms to datasheet reference: **ABG POZIDRAIN 7S250D.NW8 [CE] Rev 1.00 DATASHEET**
Additional test details: **None**

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

Signed for and on behalf of the manufacturer by:

Name and title: **Peter van Ruiten – Operations Director**
Date: **23rd February 2022**
Certificate issued by: **ABG Ltd**

Certificate of conformity

Scheme: Morfa LFS, SA13 2NG

Product: Pozidrain 7S250D/NW8 – 4.4m x 65m

Manufacturer: ABG Ltd, Unit E7, Meltham Mills Road
Meltham, HD9 4DS, Yorkshire, UK

Date of manufacture: January 2022

Date of dispatch: 23rd February 2022

Consignment number: 7

Delivery note number: 104148

Number of rolls: 16

Batch Information:

Job Number:	Roll Number(s):	Job Number:	Roll Number(s):	Job Number:	Roll Number(s):
W16135	28, 31, 33, 34, 48, 60, 68, 72, 80.				
W16168	21, 22, 24, 25, 26, 27, 28				

Product conforms to
datasheet reference: ABG Pozidrain 7S250D.NW8 [CE] Rev 1.00 DATASHEET

Additional test details: None

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

Signed for and on behalf of the manufacturer by:

Name and title: Peter van Ruiten – Operations Director

Date: 23rd February 2022

Certificate issued by: ABG Ltd

Certificate of conformity

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 10
Surface Water Geo-
composite Conformance
Test Results

Report Number 2035r3v1d0822



Geosynthetic Materials Inventory

CQA11

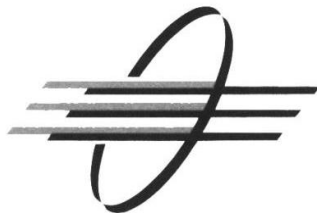
Site	Morfa Biocell Restoration	Manufacturer & Material Type	Pozidrain 7S250D/NW8
-------------	----------------------------------	---	----------------------

Date	Batch No	Roll No	Length	Width	MQC Received?	MQC Pass?	Sample Number	Handle Store	Visual Check	Approved
21/02/2022	16135/1042	1	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	7	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	8	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	9	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	15	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	24	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	25	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	29	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	36	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	37	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	43	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	46	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	47	65	4.4	Y	Y		Y	Y	Y

21/02/2022	16135/1042	49	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	50	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	52	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	54	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	55	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	56	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	57	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	58	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	65	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	69	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	70	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	71	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	75	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	77	65	4.4	Y	Y		Y	Y	Y
21/02/2022	16135/1042	79	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	18	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	19	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	20	65	4.4	Y	Y		Y	Y	Y

23/02/2022	16168/4062	23	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	28	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	31	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	33	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	34	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	48	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	60	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	68	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	72	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	80	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	21	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	22	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	24	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	25	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	26	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	27	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	28	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16168/4062	16	65	4.4	Y	Y		Y	Y	Y

23/02/2022	16168/4062	17	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	3	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	4	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	10	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	23	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	26	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	32	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	35	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	44	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	61	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	62	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	63	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	66	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	67	65	4.4	Y	Y		Y	Y	Y
23/02/2022	16135/1042	73	65	4.4	Y	Y		Y	Y	Y



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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U142/a

Report Date 09/03/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested Geocomposite {7D250D/NW8}

Date Received 28/02/2022

Sample IDs Roll-04, Roll-06 & Roll-07

Tests Requested In Plane Water Flow - BS EN ISO 12958-1:2020
Static Puncture CBR - BS EN ISO 12236:2006(2016)
Thickness - BS EN ISO 9863-1:2016+A1:2019

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked ** are not 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.

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Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030



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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: Geocomposite {7D250D/NW8}

Report Ref No: BS-U142/a
Dates Tested: 09/03/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: W16168, 4062, Roll No: 04

BICS Sample Ref: 1

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens
100 kPa L/m/s

1.44 1.45 1.67

1.52 0.13

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N 3607 3561 3476 3653 3321
Puncture Displacement mm 47 47 46 47 46

3524 131
46 1

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019)

mm 8.68 8.77 8.50 8.41 8.14 7.89 7.89 8.83 7.95 8.13

8.32 0.37

Sample ID: W16168, 4062, Roll No: 06

BICS Sample Ref: 2

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens
100 kPa L/m/s

1.70 1.63 1.57

1.63 0.07

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force kN 3756 3373 3122 3843 3201
Puncture Displacement mm 47 47 45 46 45

3459 325
46 1

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019)

mm 8.37 9.00 8.56 8.38 8.31 8.61 8.83 8.56 8.90 8.82

8.63 0.24

Sample ID: W16168, 4062, Roll No: 07

BICS Sample Ref: 3

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens
100 kPa L/m/s

1.72 1.66 1.81

1.73 0.08

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force kN 3921 3728 3444 3381 3467
Puncture Displacement mm 50 48 44 44 45

3588 228
46 3

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019)

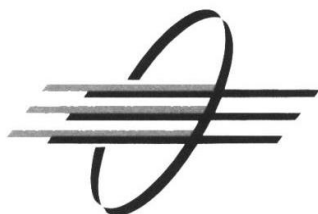
mm 8.24 8.26 8.70 8.23 8.07 8.14 8.17 8.10 8.00 8.27

8.22 0.19

Atmospheric Conditions at Test: 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.

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U297/a

Report Date 20/05/2022

Client Celtic Lining Ltd

Address Unit 16 Crown Avenue Industrial Estate, Tredegar, Gwent, NP22 4EE

Contact Dyfed Jones

Contract Reference Port Talbot {Tata Steel}

Client PO/Ref No Dyfed Jones

Material Tested Geocomposite {7S250D/NW8}

Date Received 16/05/2022

Sample IDs W16135/61

Tests Requested In Plane Water Flow - BS EN ISO 12958-1:2020
Static Puncture CBR - BS EN ISO 12236:2006
Thickness - BS EN ISO 9863-1:2016+A1:2019

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director



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Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not 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.
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GEOSYNTHETICS TEST RESULTS CELTIC LINING LTD

Contract Ref: Port Talbot {Tata Steel}
Material: Geocomposite {7S250D/NW8}

Report Ref No: BS-U297/a
Dates Tested: 17-19/05/2022

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
-------------	----------------------	--	--	--	--	--	--	--	--	--	------	---------

	1	2	3	4	5	6	7	8	9	10		
--	---	---	---	---	---	---	---	---	---	----	--	--

Sample ID: W16135/61

BICS Sample Ref: 1

In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens

100 kPa L/m/s (MD)	1.82	1.83	1.85								1.83	0.02
--------------------	------	------	------	--	--	--	--	--	--	--	-------------	-------------

Static Puncture CBR (BS EN ISO 12236:2006)

Puncture Force N	4363	4154	4332	4045	4012						4181	161
Puncture Displacement mm	44	42	44	43	45						44	1

Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019)

mm	8.59	8.54	8.51	8.23	8.52	8.38	8.49	8.43	8.86	8.66	8.52	0.17
----	------	------	------	------	------	------	------	------	------	------	-------------	-------------

Atmospheric Conditions at Test: 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) tested.
The company also observes and maintains client confidentiality.

CONFIDENTIAL TEST REPORT

**MORFA NON
HAZARDOUS LANDFILL
PERMIT BV7311Ie**

BIOCELL RESTORATION

Construction Quality
Assurance Validation Report

Appendix 11
Daily Site Records
Report Number 2035r3v1d0822



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	03/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	DLS & Celtic Lining			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Clear, cold, dry	cold, dry	8	1	
Plant / Equipment	Hours of Operation	Comments		
20 Tracked Backhoe	0800 - 1800	With Celtic Lining Ltd.		
Visitors				
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas Geomposite and HDPE panels 1-8 placed				
DS Sample 1 recovered				
Outside edge secured with sand bags.				
All field testing completed.				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	04/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	DLS & Celtic Lining			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Overcast, Dry	Overcast, Dry	16	14	None
Plant / Equipment	Hours of Operation	Comments		
20 Tracked Backhoe	0800 - 1800	With Celtic Lining Ltd.		
Visitors				
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite and HDPE panels 9-20 placed, start surface water geocomposite placement				
DS Sample 2 recovered				
Pipe boots 1-4 completed, including main leachate chamber on BioCell A				
All field testing completed.				
Outside edge secured with sand bags.				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	05/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	DLS & Celtic Lining			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Overcast, Misty	Overcast, Dry	16	14	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1800	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries	Drainage Stone			
Work Undertaken				
Gas geocomposite, HDPE panels 21-32 placed and surface water geocomposite placement to and around SE corner				
DS Sample 3-6 recovered				
Pipe boots 5-8 completed				
All field testing completed.				
Commence placement of toe drain pipe				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	06/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	DLS & Celtic Lining			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Overcast, Misty	Overcast, Dry	16	14	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1800	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand / drainage stone		
Visitors	None			
Health and Safety	No Issues			
Deliveries	Drainage Stone			
Work Undertaken				
Gas geocomposite, HDPE panels 33-37 placed on plateau cap and surface water geocomposite on southern flank				
DS Sample 7-8 recovered				
Pipe boots 5-8 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	09/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Overcast, Misty	Overcast, Dry	16	14	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries	Drainage Stone			
Work Undertaken				
Gas geocomposite, HDPE panels 38-42 placed on plateau cap and surface water geocomposite on southern flank				
DS Sample 9-10 recovered				
Pipe boot 9 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	10/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Overcast	Sunny intervals, Dry	20	15	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 43-45 placed on southern flank and surface water geocomposite on plateau and southern flank				
DS Sample 11-12 recovered				
Pipe boot 10 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe and sand spotting				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	12/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny	23	16	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 46-60 placed on southern and western flank also on plateau, and surface water geocomposite on plateau and southern flank				
DS Sample 13-14 recovered				
Pipe boot 11 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe and sand spotting				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	13/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny intervals, Dry	20	16	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand / drainage stone		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 61 placed on southern and western flank also on plateau, and surface water geocomposite on plateau and southern flank				
DS Sample 15 recovered				
Pipe boot 12 - 13 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe and sand placement on cap				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	16/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny intervals, Dry	20	16	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 62 - 64 placed on western flank , and surface water geocomposite on plateau and southern flank				
DS Sample 16 - 17 recovered				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe and sand placement on cap				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	17/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny intervals, Dry	24	18	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 65-66 placed on western flank , and surface water geocomposite on plateau and southern flank				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern toe and sand placement on cap				
Prepared by	Arwel Jones	Signed		



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	18/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny intervals, one shower	22	17	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 67 - 73 placed on western flank , and surface water geocomposite on plateau and western flank				
DS Sample 18 recovered				
Pipe Boot 15 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern / western toe and sand placement on cap				
Prepared by	Arwel Jones		Signed	



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	19/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Sunny intervals	22	17	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand / drainage stone		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 74 - 76 placed on western flank and plateau , and surface water geocomposite on plateau and western flank				
DS Sample 19 recovered				
Pipe Boot 16 completed				
All field testing and survey completed.				
Continue placement of toe drain pipe on southern / western toe and sand placement on cap				
Prepared by	Arwel Jones		Signed	



Daily Site Record Sheet

CQA1

Site	Morfa Biocell Restoration	Date	20/05/2022
-------------	----------------------------------	-------------	-------------------

CQA Staff	Arwel Jones			
Contractors	Celtic Lining and DLS			
Weather AM	Weather PM	Temp Max	Temp Min	Rainfall
Sunny intervals, Dry	Cloudy - rain at 3	22	17	None
Plant / Equipment	Hours of Operation	Comments		
20tonne backhoe	0800 - 1730	With Celtic Lining Ltd.		
A25 Dumper	0800 - 1700	Bringing sand from borrow pit		
16tonne backhoe	0800 - 1700	Spreading sand / drainage stone		
Visitors	None			
Health and Safety	No Issues			
Deliveries				
Work Undertaken				
Gas geocomposite, HDPE panels 77 - 78 placed on plateau , and surface water geocomposite on plateau and western flank. Lining works completed				
DS Sample 20 - 21 recovered				
All field testing and survey completed.				
Continue placement of toe drain pipe on western toe and sand placement on cap				
Prepared by	Arwel Jones		Signed	



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