APPROVAL SHEET AND FOREWORD

Client:	**Wyn Griffiths & Sons**
Site:	**Ty Mawr Landfill Site**
Project Title:	**Schedule 4 Response**
Document:	**A2058/ Schedule 4**
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	Status Issue for Use		Date	Signature
Original Use	**DRAFT**	**FINAL**		
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Checked by		SV	06/11/06	
Approved by		SV	06/11/06	

FOREWORD

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3. This report shall not be used for engineering or contractual purposes unless signed by the author and approver, and unless the report status is FINAL.

TY MAWR FARM LANDFILL

PPC LANDFILL PERMIT APPLICATION

SCHEDULE 4 RESPONSE

Schedule 4 Response

Appendix 1 - Amended Drawings
Appendix 2 - Site investigation Trial Pit Logs
Appendix 3 - Site Investigation Photographs
Appendix 4 - Laboratory Results
Appendix 5 - Stability Assessment
Appendix 6 - WAC Document.

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THE POLLUTION PREVENTION AND CONTROL (ENGLAND AND WALES) 2000 REGULATIONS (SI2000 NO 1973), AS AMENDED;
THE LANDFILL (ENGLAND AND WALES) REGULATIONS 2000 (SI 2000 NO 1559)
TY MAWR FARM LANDFILL BP3330LS

This report aims to provide further information to that contained within the PPC application for the above site, as requested within your correspondence dated as the 6th August 2006.

With regards to the issues which you raise within your correspondence, please consider the following:

1. Further source term characterisation

As requested, further source term characterisation of the historic waste mass was undertaken. The site owners were consulted to ensure that the trial pits were located so wastes of different ages were encountered. The locations of the trial pits are indicated on Drawing Number 2252.SCH.01, in Appendix 1.

After discussions with yourself, it was agreed by e-mail on the 16th October 2006, that since waste was deposited in strips, each one representing a certain age of waste, it was not necessary to test samples from different depths of the waste (as normally this would be the technique for establishing the variability of waste with age). It was established, that waste deposition was in sections, generally arc shaped, from the site entrance in an approximately north-westerly direction (as indicated by the site owners).

Therefore, five trial pits were dug using a JCB. Those were dug to a maximum depth of 3m, and samples were obtained near the base of each of the trial pits. The borehole logs for the waste encountered are included in Appendix 2.

The waste observed in the trial pits comprised mainly sandy clay with rubble, metal, plastic and in some localised areas, wood. The waste appeared generally inert. Photographs of the arisings and the trial pits are included in Appendix 3.

No uncharacteristic odours were detected in any of the trial pit locations.

The 5 samples were subjected to WAC testing. The results obtained are included in Tables 1 and 2 below. The raw laboratory results are included in Appendix 4.

Table 1 contains the solid results of the WAC testing. It can be seen, that the concentrations of all determinants tested for within the solid suite were within the limits set for the Inert WAC, except mineral oil. Concentrations of mineral oils exceeding the Inert WAC limit of 500mg/kg were recorded in all trial pits except TP.A. There was no indication of the type of organic material detected, but it is likely that the concentration detected results from high organic matter within the waste, i.e. naturally occurring humic acids within peat.

Table 1. Solid WAC results.

	Sample Identity		TP.A	TP.B	TP.C	TP.D	TP.E	Inert WAC
	Depth		3.2	3.5	3.0	2.8	2.5	
	Sample Type		SOLID	SOLID	SOLID	SOLID	SOLID	
	Sample Received Date		19/10/2006	19/10/2006	19/10/2006	19/10/2006	19/10/2006	
Total Organic Carbon	%	<0.01	1.52	1.69	1.53	2.35	2.06	3
Mineral Oil	mg/kg	<1	357	1295	1121	1320	539	500
GRO (C4-C10)	ug/kg	<10	21	<10	<10	45	<10	
GRO (C10-C12)	ug/kg	<10	<10	<10	<10	134	<10	
Benzene	ug/kg	<10	<10	<10	<10	<10	<10	
Toluene	ug/kg	<10	21	<10	<10	<10	<10	
Ethyl benzene	ug/kg	<10	<10	<10	<10	<10	<10	
m & p Xylene	ug/kg	<10	<10	<10	<10	<10	<10	
o Xylene	ug/kg	<10	<10	<10	<10	<10	<10	
Sum of BTEX	ug/kg	<10	21	<10	<10	<10	<10	6000
MTBE	ug/kg	<10	<10	<10	<10	<10	<10	
PAH Total 17 (inc Coronene)	mg/kg	<10	16	58	97	14	11	100

Some concentrations of BTEX have been recorded above the analytical detection limit, but even summed together, the concentrations reflect only trace amounts of the substances, and are significantly below the 6000 ug/kg limit for inert waste. Therefore the solid analysis of the waste samples obtained indicates, that the historic waste mass should be classed as inert.

Table 2 presents the leachate results from the analysis. It can be seen, that all concentrations of the measured parameters remained below the limit for inert waste, except antimony, chloride, sulphate and total dissolved solids (TDS) in some locations.

The concentration of antimony was only slightly above the inert waste limit of 0.06mg/kg in samples obtained from TP.A, TP.B and TP.D (where concentrations of 0.1mg/kg, 0.07mg/kg and 0.11mg/kg were detected respectively). It is not perceived that these concentrations reflect the presence of contamination as it is extremely unusual to encounter contamination comprising solely of antimony. Therefore there is not considered to be significant source term within the historic waste mass.

A concentration of chloride, elevated above the Inert WAC limit of 800mg/kg was detected at TP.D (9168mg/kg were recorded within the sample from this location). This was accompanied by a concentration of TDS (high chloride concentrations often affect TDS results due to interference), which was in excess of the Inert WAC of 400omg/kg (15868mg/kg were recorded). These concentrations are significantly above the inert waste limits, and as such may indicate a localised hotspot of contamination within the historic waste mass in this part of the landfill. However, it should be noted, that these exceedances at TP.D are not associated with exceedances in any other leachate determinants. Chloride is

a List II substance, and it is therefore considered that the recorded concentration does not constitute a significant risk of contamination to receiving waters. Due to the proximity of the site to the coast, it is likely that the source of chloride is due to saline soils.

At TP.B, the concentrations of sulphate (2674mg/kg) and TDS (4206mg/kg) exceeded the inert waste limits for these two determinants (1000mg/kg and 4000mg/kg respectively). These exceedances are considered to be associated with the presence of concrete at this location, as observed by the site engineer and noted within the trial pit log for this location. It should be further noted, that the recorded concentration of sulphate is below 6000mg/kg, and the TDS concentration exceeds the TDS limit for inert waste only slightly, thus indicating, that the concentrations of these determinants do not pose a significant risk to potential receptors.

Table 2. Leachate WAC results.

	Sample Identity	TP.A	TP.B	TP.C	TP.D	TP.E	Inert WAC
	Depth	3.2	3.5	3.0	2.8	2.5	
	Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	
	Sampled Date	19/10/2006	19/10/2006	19/10/2006	19/10/2006	19/10/2006	
	Units						
Antimony Dissolved	mg/kg	0.10	0.07	<0.04	0.11	0.06	0.06
Arsenic Dissolved	mg/kg	0.048	0.052	0.042	0.126	0.048	0.5
Barium Dissolved	mg/kg	2.014	2.536	1.960	2.050	2.202	20
Boron Dissolved	mg/kg	1.67	1.13	0.98	1.27	1.07	
Cadmium Dissolved	mg/kg	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	0.04
Chromium Dissolved	mg/kg	0.008	<0.008	0.010	0.020	0.016	0.5
Copper Dissolved	mg/kg	0.086	0.120	0.046	0.280	0.086	2
Lead Dissolved	mg/kg	0.038	0.070	0.012	0.078	0.034	0.5
Molybdenum Dissolved	mg/kg	0.226	0.198	0.120	0.188	0.214	0.5
Nickel Dissolved	mg/kg	<0.008	0.034	0.014	0.040	0.008	0.4
Selenium Dissolved	mg/kg	0.010	<0.008	<0.008	0.030	0.024	0.1
Zinc Dissolved	mg/kg	0.300	0.510	0.186	0.570	0.320	4
Mercury Dissolved	mg/kg	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.01
Chloride	mg/kg	152	694	118	9168	310	800
Sulphate	mg/kg	424	2674	310	440	496	1000
Dissolved Organic Carbon	mg/kg	96	142	64	192	86	500
Total Dissolved Solids	mg/kg	1486	4206	1080	15860	1732	4000
Phenols Monohydric	mg/kg	<0.08	<0.08	<0.08	<0.08	<0.08	1
Fluoride	mg/kg	3.8	4.4	3.4	3.2	3.0	10

2. Question B2.1.8.

A copy of this document has been provided to yourselves previously, please see Appendix 6.

3. Location of GW2A

During the installation of groundwater monitoring location GW2, to the west of the ravine, shallow perched groundwater was encountered. GW2A was installed about 2m east of GW2, to enable monitoring of this water body. The locations of all groundwater monitoring points are presented on Drawing ESID 4 in Appendix 1. Please note that within the original application documents, the locations of GW2 and GW3 were swapped by mistake. The locations of the boreholes, as indicated by the grid references on the borehole logs, are correct.

4. Borehole log for GW1

Borehole GW1 was the original water well, which was drilled at the site. As such, only limited information about the layers encountered is available from the site owners. This has been used to construct a borehole log, which is contained within Appendix 3.

5. Location of weighbridge, site offices, waste inspection bay and site security measures.

The site security measures are indicated on the amended SRA 01 drawing. (The site offices are to the south of the site).

However, please note, that there is no weighbridge at the site and the Site Office comprises a room within the Farm premises. Additionally, there is no waste inspection bay. Every load is subject to visual and olfactory assessment immediately prior and during tipping. If any problems with the quality of waste are encountered, any tipped waste is loaded back on the delivering vehicle, and sent offsite.

6. Table HRA9 – monitoring of all boreholes.

The monitoring presented in Table HRA9, indicates, that monitoring should be undertaken at all boreholes. This refers to GW1, which is up-gradient, and GW2, GW2A and GW3, which are down-gradient monitoring boreholes. Monitoring of leachate and surface water have been addressed elsewhere. The table below is an amended version of HRA9, which specifies at which locations groundwater monitoring will be taking place.

Table HRA 9: Groundwater Monitoring Requirements

Determinands	Monitoring Frequencies	Normal Reporting Limits and Units	Monitoring locations
Level	Monthly	+/- 0.01m	GW1, GW2, GW2A, GW3
pH	Monthly	+/- 0.1 pH units	GW1, GW2, GW2A, GW3
Electrical Conductivity	Monthly	10 µS/cm	GW1, GW2, GW2A, GW3
Ammoniacal Nitrogen	Monthly	0.04 mg/l	GW1, GW2, GW2A, GW3
Chloride	Monthly	2 mg/l	GW1, GW2, GW2A, GW3
Dissolved Oxygen	Monthly	0.5 mg/l	GW1, GW2, GW2A, GW3
Sulphate	Quarterly	5 mg/l	GW1, GW2, GW2A, GW3
Total Alkalinity (as $CaCO_3$ at pH4.5)	Quarterly	5 mg/l	GW1, GW2, GW2A, GW3
TOC	Quarterly	0.3 mg/l	GW1, GW2, GW2A, GW3
TON	Quarterly	0.5 mg/l	GW1, GW2, GW2A, GW3
BOD	Quarterly	1 mg/l	GW1, GW2, GW2A, GW3
COD	Quarterly	20 mg/l	GW1, GW2, GW2A, GW3
Na	Quarterly	1 mg/l	GW1, GW2, GW2A, GW3
K	Quarterly	1 mg/l	GW1, GW2, GW2A, GW3
Ca	Quarterly	1 mg/l	GW1, GW2, GW2A, GW3
Mg	Quarterly	1 mg/l	GW1, GW2, GW2A, GW3
Fe	Quarterly	50 µg/l	GW1, GW2, GW2A, GW3
Mn	Quarterly	20 µg/l	GW1, GW2, GW2A, GW3
Cd	Quarterly	0.1 µg/l	GW1, GW2, GW2A, GW3
Cr	Quarterly	5 µg/l	GW1, GW2, GW2A, GW3
Cu	Quarterly	20 µg/l	GW1, GW2, GW2A, GW3
Hg	Quarterly	1 µg/l	GW1, GW2, GW2A, GW3
Ni	Quarterly	7 µg/l	GW1, GW2, GW2A, GW3
Pb	Quarterly	10 µg/l	GW1, GW2, GW2A, GW3
Zn	Quarterly	30 µg/l	GW1, GW2, GW2A, GW3
PAH	Annually	0.003 µg/l	GW1, GW2, GW2A, GW3
TPH	Annually	50 µg/l	GW1, GW2, GW2A, GW3
Phenol	Annually	60 µg/l	GW1, GW2, GW2A, GW3

7. Leachate monitoring

Leachate monitoring was referred to within the ESID, in order to characterise the source term at the site. It should be noted, that leachate monitoring was undertaken once at the site. A sample was obtained from the leachate well at the site, and the results of the analysis were included within the HRA, submitted as part of the PPC application for the site. The interpretation of the potential presence of a source term was based on the above-mentioned monitoring of the leachate well.

8. Monitoring at SW1 and SW2.

Monitoring of surface water at the site was proposed to be carried out at SW1 and SW2. The location of these monitoring points is upstream and downstream on the water course, which runs along the eastern side of the landfill, between the waste mass and the road.

Please note, that the location of SW2 is meant to be to the immediately to the north of the waste mass, as close to it as possible. This will ensure that the surface water monitoring at the site is targeting the contributions of the waste mass to the water course, without the influence of any surface water runoff from the adjacent agricultural land. Therefore, the location of SW2 will alter as more waste is deposited at the site. The location will continue to be immediately downstream of the waste mass, at the first available location north of the waste.

There are other water courses lying downstream of the landfill. The Application documents refer to the stream running along the eastern edge of the landfill as a ditch. There is a ditch in the middle of the ravine, which joins the surface water stream, which runs to the north of the site. However, it was not considered appropriate to monitor this surface water feature, as it would be impossible to gauge the effect of the landfill on the quality of the water course, since it is a collection ditch for the surface water from the slopes of the site, which do not have any waste deposited on them, but are used for agriculture.

Additionally, according to the site owners, the quality of the stream to the north-most of the site is monitored at present, as part of their WML. It is considered sufficient to monitor the effect of the waste on receiving waters at the point immediately below the waste mass (SW2), rather than further down the valley as other sources of chemicals would make it impossible the gauge the contribution of the landfill.

9. Discharge into the low point of the valley

At present, the waste mass is sitting on exposed clay (which forms the natural liner). The site visit was conducted after rain, and so there was a significant amount of standing water over the clay (as can be seen on photographs in Appendix 3). It was not possible to ascertain if any of the water was flowing, or if any was originating from underneath the waste, and in which place. It must be assumed that as water infiltrates the waste during rain, some water does flow through the waste mass, but there was no clear location where any such water escapes the waste mass.

It was not considered appropriate to obtain a water sample from the water standing over the exposed clay barrier, as the correct origin of the water could not be ascertained (whether it is intercepted precipitation, surface water runoff, or water, which has percolated through the waste and discharged over the clay, or a mixture of the above).

The waste form has been shaped in such a way as to shed water away from the waste, thus minimising infiltration. It is possible, that a large amount of the rainfall is intercepted in this way.

10. Stability Risk Assessment

The revised Stability Risk Assessment is included in Appendix 5 of this letter.

11. Landfill gas monitoring boreholes

The application submitted detailed gas monitoring boreholes BH1A, BH1B, BH2A, BH2B, BH3A, BH3B, BH4A, BH4B, BH5A, BH6A and BH7A as gas monitoring installations. These monitoring locations boreholes however no installation details are available. Anecdotal evidence suggests that these boreholes are 3m deep and located in natural ground adjacent to the perimeter of the site.

12. Installing of further gas monitoring boreholes within completed phases of the landfill.

The proposed gas monitoring focuses around the existing gas/leachate monitoring well located within the waste mass. Since the landfill comprises inert waste, it is not anticipated that significant landfill gas will be generated by the site. The routine monitoring of the existing gas borehole and the perimeter monitoring borehole are considered appropriate to assess if significant gas migration is occurring at the site. Therefore currently there is no proposal for any additional permanent boreholes within the waste mass.

I hope the information contained within this correspondence addresses your concerns in sufficient detail, and provides the information, which you require. Should you wish to discuss any of the above, please do not hesitate to contact me.

APPENDIX 1

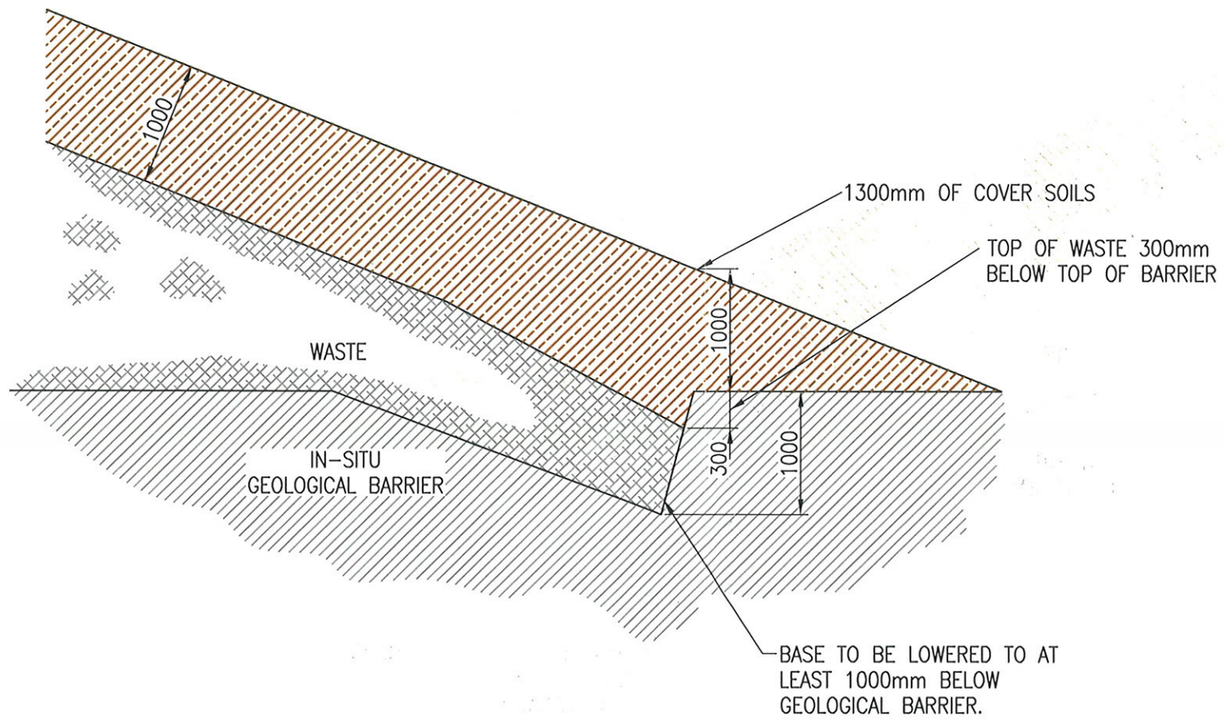
Drawings

SRA01

SRA.02

2058.SCH.01

2058.ESID.04



NOTES

WYN GRIFFITHS & SONS

TY-MAWR FARM,
ABERGELE

ENGINEERING &
INSTALLATION DETAILS

DRAWN BY	DATE
EW	06.11.2006
CHECKED BY	SCALE @ A3
MP	1:50
APPROVED BY	ISSUING OFFICE
SV	ALFRETON

DRAWING NUMBER	ISSUE	REVISION
2058.SRA.02	Fn	-

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CAD FILE REF: 2058.SRA.02.DWG

APPENDIX 2

Trial pit and borehole logs

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: GW1**
Site: Ty Mawr	Easting:		
Site Engineer: D. Kountcheva		Job Number: A2058	
Contractor: North West Drilling	Elevation: 122 mAOD	Drill Date: 20/03/2006	

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.00			
				0.40		Stiff CLAY	
				0.80			
				1.20			
				1.60			
				2.00			
				2.40			
				2.80			
				3.20			
				3.60			
				4.00			
				4.40		Shale (excavation terminated)	
				4.80			
				5.20			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: TP.A**
Site: Ty Mawr	Easting:		
Site Engineer: D. Kountcheva		Job Number: A2058	
Contractor: North West Drilling	Elevation:	Drill Date: 20/03/2006	

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.0		Soft, yellow-brown, silty, clayey SAND with some grass roots, and pebbles.	
				0.2			
				0.4			
				0.6			
				0.8			
				1.0			
				1.2			
				1.4			
				1.6		Soft to firm, dark brown to black, moderately sandy, slightly damp CLAY with angular cobble-sized pieces of dark grey coloured rock, and brick (approx 30%), some wood and little plastic (<5%)	
				1.8			
				2.0			
				2.2			
				2.4			
				2.6			
				2.8			
				3.0			
				3.2			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: TP.B**
Site: Ty Mawr	Easting:	Job Number: A2058	
Site Engineer: D. Kountcheva	Elevation:	Drill Date: 18/10/2006	
Contractor: North West Drilling			

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.0		Soft, brown silty SAND with fragments of brick and concrete.	
				0.2			
				0.4			
				0.6			
				0.8		Soft to firm, dark brown slightly organic, moderately sandy CLAY with cobble sized pieces of grey rock, concrete and little tarmac (single piece of 20cm diameter)	
				1.0			
				1.2			
				1.4			
				1.6		Firm, dark brown to black slightly sandy, very organic CLAY with some angular rock fragments, rubble and concrete and some wood (10%).	
				1.8			
				2.0			
				2.2			
				2.4			
				2.6			
				2.8			
				3.0			
				3.2			
				3.4			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: TP.C**
Site: Ty Mawr	Easting:		
Site Engineer: D. Kountcheva		Job Number: A2058	
Contractor: North West Drilling	Elevation:	Drill Date: 18/10/2006	

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.0		Soft, spongy, black sandy CLAY with fragments of concrete and brick (up to 30%) with little tarmac.	
				0.2			
				0.4			
				0.6			
				0.8			
				1.0			
				1.2			
				1.4			
				1.6			
				1.8			
				2.0			
				2.2			
				2.4			
				2.6			
				2.8			
				3.0			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: TP.D**
Site: Ty Mawr	Easting:		
Site Engineer: D. Kountcheva		Job Number: A2058	
Contractor: North West Drilling	Elevation:	Drill Date: 18/10/2006	

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.0		Soft, damp, spongy, black, sandy organic CLAY with some rock and brick fragments and little plastic.	
				0.2			
				0.4			
				0.6			
				0.8			
				1.0			
				1.2			
				1.4			
				1.6			
				1.8			
				2.0			
				2.2			
				2.4			
				2.6			
				2.8			
				3.0			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

Egniol Engineering and Environmental Consultancy Services

Client: Wyn Griffiths	Northing:	Sheet: 1 of 1	**Borehole ID: TP.E**
Site: Ty Mawr	Easting:		
Site Engineer: D. Kountcheva		Job Number: A2058	
Contractor: North West Drilling	Elevation:	Drill Date: 18/10/2006	

Samples & Tests			Water	Strata			Instrument/ Backfill
Depth	Type	Test Result		Depth (m)	Legend	Description	
				0.0		Soft, brown to dark brown, sandy SILT and CLAY with some grey rock fragments, concrete and brick.	
				0.2			
				0.4			
				0.6			
				0.8			
				1.0			
				1.2			
				1.4			
				1.6			
				1.8			
				2.0			
				2.2			
				2.4			
				2.6			
				2.8			
				3.0			

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
27/09/2005		4.00	4.00	150	3.10	3.60 3.80	3.80 4.00	0.5 0.5			

APPENDIX 3

Photographs

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo Number	Description
1	TP.A
2	Arisings from TP.A
3	TP.B
4	Arisings from TP.B
5	TP.C
6	Arisings from TP.C
7	TP.D
8	Arisings from TP.D
9	TP.E
10	Arisings from TP.E
11	Standing water over clay to the north of the waste mass
12	Standing water over clay to the north of the waste mass, looking north
13	Edge of the waste mass, and standing water, or surface water runoff, collected over the clay
14	Small ravine to the north of the site, where surface water runoff collects

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 1

Photo 2

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 3

Photo 4

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 5

Photo 6

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 7

Photo 8

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 9

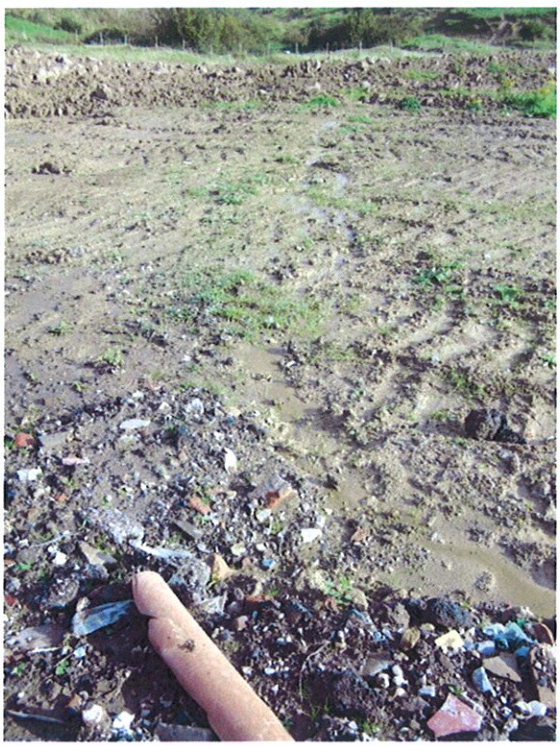
Photo 10

Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 11

Photo 12



Ty Mawr Landfill Site BP3330LS
Site investigation and waste characterisation
November 2006

PHOTO LOG

Photo 13

Photo 14

APPENDIX 4

Raw Laboratory Results

ALcontrol Geochem Analytical Services
Sample Descriptions

Job Number: 06/18340/02/01
Client: Egniol Ltd.
Client Ref :

Grain sizes

<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

Sample Identity	Depth (m)	Colour	Grain Size	Description	Batch
TP.A	3.2	Dark Brown	0.1mm - 0.063mm	Silty Clay with some Brick	1
TP.B	3.5	Dark Grey	0.1mm - 0.063mm	Silty Clay with some Stones	1
TP.C	3.0	Dark Grey	0.1mm - 0.063mm	Silty Clay with some Stones	1
TP.D	2.8	Dark Grey	0.1mm - 0.063mm	Silty Clay with some Vegetation	1
TP.E	2.5	Dark Grey	0.1mm - 0.063mm	Silt with some Stones	1

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.
Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
[1] Sample Description supplied by client

Validated [ ]
Preliminary [ ]

ALcontrol Geochem Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/18340/02/01 **Matrix:** SOLID
Client: Egniol Ltd. **Location:** TY MAWR
Client Ref. No.: **Client Contact:** Dr Kountcheva

Sample Identity	TP.A	TP.B	TP.C	TP.D	TP.E					Method Code	LoD/Units
Depth (m)	3.2	3.5	3.0	2.8	2.5						
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID						
Sampled Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Sample Received Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Batch	1	1	1	1	1						
Sample Number(s)	1	2	3	4	5						
Total Organic Carbon	1.52	1.69	1.53	2.35	2.06					TM050#	<0.01 %
Mineral Oil	357	1295	1121	1320	539					TM061#	<1 mg/kg
GRO (C4-C10)	21	<10	<10	45	<10					TM089#M	<10 ug/kg
GRO (C10-C12)	<10	<10	<10	134	<10					TM089#M	<10 ug/kg
Benzene	<10	<10	<10	<10	<10					TM089#M	<10 ug/kg
Toluene	21	<10	<10	<10	<10					TM089#M	<10 ug/kg
Ethyl benzene	<10	<10	<10	<10	<10					TM089#M	<10 ug/kg
m & p Xylene	<10	<10	<10	<10	<10					TM089#M	<10 ug/kg
o Xylene	<10	<10	<10	<10	<10					TM089#M	<10 ug/kg
Sum of BTEX	21	<10	<10	<10	<10					TM089#M	<10 ug/kg
MTBE	<10	<10	<10	<10	<10					TM089#	<10 ug/kg
PAH Total 17 (inc Coronene)	16	58	97	14	11					TM154	<10 mg/kg
PCB 7 Congeners											
PCB congener 28	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 52	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 101	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 118	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 153	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 138	<2	<5	<5	<5	<5					TM070	<1 ug/kg
PCB congener 180	<2	<5	<5	<5	<5					TM070	<1 ug/kg
Total of 7 Congener PCBs	<2	<5	<5	<5	<5					TM070	<1 ug/kg

All results expressed on a dry weight basis.

Date 03.11.2006

Validated [x]
Preliminary [ ]

ALcontrol Geochem Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/18340/02/01 **Matrix:** LEACHATE
Client: Egniol Ltd. **Location:** TY MAWR
Client Ref. No.: **Client Contact:** Dr Kountcheva

Sample Identity	TP.A	TP.B	TP.C	TP.D	TP.E					Method Code	LoD/Units
Depth (m)	3.2	3.5	3.0	2.8	2.5						
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID						
Sampled Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Sample Received Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Batch	1	1	1	1	1						
Sample Number(s)	1	2	3	4	5						
Antimony Dissolved (CEN 10:1C) (ICP-MS)	0.10	0.07	<0.04	0.11	0.06					TM152	mg/kg
Arsenic Dissolved (CEN 10:1C) (ICP-MS)	0.048	0.052	0.042	0.126	0.048					TM152	mg/kg
Barium Dissolved (CEN 10:1C) (ICP-MS)	2.014	2.536	1.960	2.050	2.202					TM152	mg/kg
Boron Dissolved (CEN 10:1C) (ICP-MS)	1.67	1.13	0.98	1.27	1.07					TM152	mg/kg
Cadmium Dissolved (CEN 10:1C) (ICP-MS)	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032					TM152	mg/kg
Chromium Dissolved (CEN 10:1C) (ICP-MS)	0.008	<0.008	0.010	0.020	0.016					TM152	mg/kg
Copper Dissolved (CEN 10:1C) (ICP-MS)	0.086	0.120	0.046	0.280	0.086					TM152	mg/kg
Lead Dissolved (CEN 10:1C) (ICP-MS)	0.038	0.070	0.012	0.078	0.034					TM152	mg/kg
Molybdenum Dissolved (CEN 10:1C) (ICP-MS)	0.226	0.198	0.120	0.188	0.214					TM152	mg/kg
Nickel Dissolved (CEN 10:1C) (ICP-MS)	<0.008	0.034	0.014	0.040	0.008					TM152	mg/kg
Selenium Dissolved (CEN 10:1C) (ICP-MS)	0.010	<0.008	<0.008	0.030	0.024					TM152	mg/kg
Zinc Dissolved (CEN 10:1C) (ICP-MS)	0.300	0.510	0.186	0.570	0.320					TM152	mg/kg
Mercury Dissolved (CEN 10:1C) (CVAA)	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004					TM127	mg/kg
Chloride (CEN 10:1C)	152	694	118	9168	310					TM097	mg/kg
Sulphate (CEN 10:1C)	424	2674	310	440	496					TM098	mg/kg
Dissolved Organic Carbon (CEN 10:1C)	96	142	64	192	86					TM090	mg/kg
Total Dissolved Solids (CEN 10:1C)	1486	4206	1080	15860	1732					TM123	mg/kg
Phenols Monohydric (CEN 10:1C)	<0.08	<0.08	<0.08	<0.08	<0.08					TM062	mg/kg
Fluoride (CEN 10:1C)	3.8	4.4	3.4	3.2	3.0					TM019	mg/kg

Date 03.11.2006

Validated [ ]
Preliminary [ ]

ALcontrol Geochem Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/18340/02/01 **Matrix:** LEACHATE
Client: Egniol Ltd. **Location:** TY MAWR
Client Ref. No.: **Client Contact:** Dr Kountcheva

Sample Identity	TP.A	TP.B	TP.C	TP.D	TP.E					Method Code	LoD/Units
Depth (m)	3.2	3.5	3.0	2.8	2.5						
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID						
Sampled Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Sample Received Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Batch	1	1	1	1	1						
Sample Number(s)	1	2	3	4	5						
Antimony Dissolved (CEN 2:1) (ICP-MS)	17	11	6	11	<5					TM152	<5 ug/l
Antimony Dissolved (CEN 8:1) (ICP-MS)	8	6	<5	11	7					TM152	<5 ug/l
Antimony Dissolved (CEN 10:1C) (ICP-MS)	0.10	0.07	<0.04	0.11	0.06					TM152	mg/kg
Arsenic Dissolved (CEN 2:1) (ICP-MS)	8	6	5	7	4					TM152	<1 ug/l
Arsenic Dissolved (CEN 8:1) (ICP-MS)	4	5	4	14	5					TM152	<1 ug/l
Arsenic Dissolved (CEN 10:1C) (ICP-MS)	0.048	0.052	0.042	0.126	0.048					TM152	mg/kg
Barium Dissolved (CEN 2:1) (ICP-MS)	211	360	328	557	277					TM152	<1 ug/l
Barium Dissolved (CEN 8:1) (ICP-MS)	199	227	163	117	206					TM152	<1 ug/l
Barium Dissolved (CEN 10:1C) (ICP-MS)	2.014	2.536	1.960	2.050	2.202					TM152	mg/kg
Boron Dissolved (CEN 2:1) (ICP-MS)	329	205	204	209	189					TM152	<10 ug/l
Boron Dissolved (CEN 8:1) (ICP-MS)	126	90	72	106	86					TM152	<10 ug/l
Boron Dissolved (CEN 10:1C) (ICP-MS)	1.67	1.13	0.98	1.27	1.07					TM152	mg/kg
Cadmium Dissolved (CEN 2:1) (ICP-MS)	<0.4	<0.4	<0.4	0.7	<0.4					TM152	<0.4 ug/l
Cadmium Dissolved (CEN 8:1) (ICP-MS)	<0.4	<0.4	<0.4	<0.4	<0.4					TM152	<0.4 ug/l
Cadmium Dissolved (CEN 10:1C) (ICP-MS)	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032					TM152	mg/kg
Chromium Dissolved (CEN 2:1) (ICP-MS)	<1	<1	1	2	<1					TM152	<1 ug/l
Chromium Dissolved (CEN 8:1) (ICP-MS)	1	<1	1	2	2					TM152	<1 ug/l
Chromium Dissolved (CEN 10:1C) (ICP-MS)	0.008	<0.008	0.010	0.020	0.016					TM152	mg/kg
Copper Dissolved (CEN 2:1) (ICP-MS)	15	44	11	20	15					TM152	<1 ug/l
Copper Dissolved (CEN 8:1) (ICP-MS)	7	4	3	30	7					TM152	<1 ug/l
Copper Dissolved (CEN 10:1C) (ICP-MS)	0.086	0.120	0.046	0.280	0.086					TM152	mg/kg
Lead Dissolved (CEN 2:1) (ICP-MS)	3	31	2	3	1					TM152	<1 ug/l
Lead Dissolved (CEN 8:1) (ICP-MS)	4	1	1	9	4					TM152	<1 ug/l
Lead Dissolved (CEN 10:1C) (ICP-MS)	0.038	0.070	0.012	0.078	0.034					TM152	mg/kg
Molybdenum Dissolved (CEN 2:1) (ICP-MS)	81	67	44	62	59					TM152	<1 ug/l
Molybdenum Dissolved (CEN 8:1) (ICP-MS)	8	8	4	8	12					TM152	<1 ug/l
Molybdenum Dissolved (CEN 10:1C) (ICP-MS)	0.226	0.198	0.120	0.188	0.214					TM152	mg/kg
Nickel Dissolved (CEN 2:1) (ICP-MS)	3	9	3	8	4					TM152	<1 ug/l
Nickel Dissolved (CEN 8:1) (ICP-MS)	<1	2	1	3	<1					TM152	<1 ug/l
Nickel Dissolved (CEN 10:1C) (ICP-MS)	<0.008	0.034	0.014	0.040	0.008					TM152	mg/kg
Selenium Dissolved (CEN 2:1) (ICP-MS)	5	<1	<1	3	<1					TM152	<1 ug/l

Supplemental Report

Date 03.11.2006

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/18340/02/01 **Matrix:** LEACHATE
Client: Egniol Ltd. **Location:** TY MAWR
Client Ref. No.: **Client Contact:** Dr Kountcheva

Sample Identity	TP.A	TP.B	TP.C	TP.D	TP.E					Method Code	LoD/Units
Depth (m)	3.2	3.5	3.0	2.8	2.5						
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID						
Sampled Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Sample Received Date	19.10.06	19.10.06	19.10.06	19.10.06	19.10.06						
Batch	1	1	1	1	1						
Sample Number(s)	1	2	3	4	5						
Selenium Dissolved (CEN 8:1) (ICP-MS)	<1	<1	<1	3	3					TM152	<1 ug/l
Selenium Dissolved (CEN 10:1C) (ICP-MS)	0.010	<0.008	<0.008	0.030	0.024					TM152	mg/kg
Zinc Dissolved (CEN 2:1) (ICP-MS)	34	71	37	101	56					TM152	<3 ug/l
Zinc Dissolved (CEN 8:1) (ICP-MS)	29	46	14	46	26					TM152	<3 ug/l
Zinc Dissolved (CEN 10:1C) (ICP-MS)	0.300	0.510	0.186	0.570	0.320					TM152	mg/kg
Mercury Dissolved (CEN 2:1) (CVAA)	<0.05	<0.05	<0.05	<0.05	<0.05					TM127	<0.05 ug/l
Mercury Dissolved (CEN 8:1) (CVAA)	<0.05	<0.05	<0.05	<0.05	<0.05					TM127	<0.05 ug/l
Mercury Dissolved (CEN 10:1C) (CVAA)	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004					TM127	mg/kg
Chloride (CEN 2:1)	60	299	3	4148	131					TM097	<1 mg/l
Chloride (CEN 8:1)	4	12	14	109	6					TM097	<1 mg/l
Chloride (CEN 10:1C)	152	694	118	9168	310					TM097	mg/kg
Sulphate (CEN 2:1)	68	937	63	24	128					TM098	<3 mg/l
Sulphate (CEN 8:1)	36	100	23	49	30					TM098	<3 mg/l
Sulphate (CEN 10:1C)	424	2674	310	440	496					TM098	mg/kg
Dissolved Organic Carbon (CEN 2:1)	24	31	16	40	19					TM090	<1 mg/l
Dissolved Organic Carbon (CEN 8:1)	6	10	4	14	6					TM090	<1 mg/l
Dissolved Organic Carbon (CEN 10:1C)	96	142	64	192	86					TM090	mg/kg
Total Dissolved Solids (CEN 2:1)	303	1391	212	6770	450					TM123	<5 mg/l
Total Dissolved Solids (CEN 8:1)	110	178	82	290	104					TM123	<5 mg/l
Total Dissolved Solids (CEN 10:1C)	1486	4206	1080	15860	1732					TM123	mg/kg
Phenols Monohydric (CEN 2:1)	<0.01	<0.01	<0.01	0.01	<0.01					TM062	<0.01 mg/l
Phenols Monohydric (CEN 8:1)	<0.01	<0.01	<0.01	<0.01	<0.01					TM062	<0.01 mg/l
Phenols Monohydric (CEN 10:1C)	<0.08	<0.08	<0.08	<0.08	<0.08					TM062	mg/kg
Fluoride (CEN 2:1)	0.7	0.6	0.5	<0.1	0.3					TM019	<0.1 mg/l
Fluoride (CEN 8:1)	0.3	0.4	0.3	0.4	0.3					TM019	<0.1 mg/l
Fluoride (CEN 10:1C)	3.8	4.4	3.4	3.2	3.0					TM019	mg/kg

Supplemental Report

Date 03.11.2006

ALcontrol Geochem Analytical Services
Table Of Results - Appendix

Job Number: 06/18340/02/01
Client: Egniol Ltd.
Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture content and description			WET	
TM019	Modified: US EPA Method 9056	Determination of anions using ion chromatography			NA	
TM050	Method 5310B, AWWA/APHA, 20th Ed., 1999 / DIN EN 13137	Total Organic Carbon determination by combustion method	□		DRY	
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	□		DRY	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection			NA	
TM070	Modified: US EPA Method 8250 & 625	Determination of Total Polychlorinated Biphenyls (PCB's) as Aroclor 1254 and the ICE 7 Congeners by GC-MS			DRY	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	□		WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	□	□	WET	
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water			NA	
TM097	Modified: US EPA Method 325.1 & 325.2	Determination of Chloride using the Kone Analyser			NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser			NA	
TM123	BS 2690: Part 121:1981	The Determination of Total dissolved Solids in Water			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy			NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS			NA	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

ALcontrol Geochem Analytical Services
Table Of Results - Appendix

Job Number: 06/18340/02/01
Client: Egniol Ltd.
Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
TM154	In - house Method	Determination of Petroleum Hydrocarbons by EZ Flash GC-FID in the Carbon range C6- C40			WET	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

ALcontrol Geochem Analytical Services
Table Of Results - Appendix

Job Number: 06/18340/02/01
Client: Egniol Ltd.
Client Ref. No.:

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	14

ALcontrol Geochem

Extractable Petroleum Hydrocarbons (EPH) By GC-FID

Mineral Oil - Carbon Range C10-C40

Job Number : 06/18340/02/01

Client : Egniol Ltd.

Client Ref :

Matrix [Units] : SOLID [mg/kg]

All results expressed on a dry weight basis.

Sample No	Sample Identity	Depth	Mineral Oil	Interpretation
1	TP.A	3.2	357	
2	TP.B	3.5	1295	
3	TP.C	3.0	1121	
4	TP.D	2.8	1320	
5	TP.E	2.5	539	

Mineral Oil :- Aliphatic compounds in the range C10-C40 which are not retained on Silica.

APPENDIX 5

Stability Risk Assessment

STABILITY RISK ASSESSMENT

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

2.0 SITE DETAILS **2**
Geology
Hydrogeology
Existing Construction Details

3.0 STABILITY RISK ASSESSMENT **4**
General Considerations
Shear Strength Parameters
Pore Water Pressures
Analysis of Slope
Groundwater Controls

4.0 CONCLUSIONS **6**

1.0 INTRODUCTION

1.1 The Operators of the Site are Wyn Griffiths and Sons. The Site is situated within a void within a steeply incised stream valley, within which landfilling operations have taken place.

1.2 The Site lies within a valley. It is understood that landfilling commenced around 1987 in the south of the Site and has since progressed northwards, down the valley. Phase 1 has been restored, and Phase 2 is currently operational. The remaining waste required to complete the site to the proposed pre-settlement contours is contained within Phase 2 as detailed on Plan 2058.ESID.04. The side slopes of the area to be infilled are typically less than 1 in 5 and less than 15m in vertical height.

1.3 This risk assessment has been revised to consider the potential instability of the waste and restoration soils which could be caused by pooling of water in the trough formed at the perimeter of the fill, the concern being that the trough, combined with the probable high run-off and low infiltration of surface water gives potential for saturation of the toe of the landfill. This could lead to a spring being formed at the interface with the restoration soils. The stability of the restoration profile has been considered under normal and saturated conditions.

1.4 Engineering requirements for surface water management and discharge from any low permeability area at the toe of the slope will be considered.

2.0 SITE DETAILS

Geology

2.1 The geology of the site is understood to comprise a horizon of boulder clay to a depth of at least 5m below the site above grey clay and silty and striped mudstones of the Elwy group which are exposed in the vicinity of the site and is visible within the part of the site which remains to be infilled.

2.2 The geology beneath the site has been proven by intrusive site investigations (Ref 1).

Hydrogeology

2.3 Groundwater monitoring data has been assessed and indicates a maximum water table of approximately 2 m below the base of the waste mass.

Existing Construction Details

2.4 Drawings 2058.SRA.01 and 2058.SRA.02 show the existing construction details for the site as presented in drawings 2058.HRA.02 and 2058.ESID.06 included within the PPC application.

2.5 The drawing details a slope of approximately 1 in 5 at its steepest.

2.6 Due to the inert nature of the waste the landfill will not be capped, other than being covered with soils as required for restoration.

2.7 The existing waste mass comprises of "solid inert wastes" as detailed below:

- Top/sub soil, sand, clay and similar excavated materials from the construction industry;
- Brick, hardcore, stone concrete free from any plastic, timber metal, or material as described in condition 3.7.

2.8 All future wastes to be accepted at the site will meet the inert waste acceptance criteria issued in Schedule 1 of the Landfill Regulations 2002. The site will be permitted as an inert facility, as these wastes are classed as inert in accordance with Table 1 of the draft Waste Acceptance Criteria.

2.9 The total remaining void for the site as of 2006 is approximately 460,000 m^3 with Site completion is projected to be by approximately 2019.

2.10 The waste will be tipped and spread in layers not exceeding 2m in thickness, and trafficked using the delivery / site plant.

3.0 STABILITY RISK ASSESSMENT

General Considerations

3.1 Analyses of the stability of the overall completed slope were carried out using a commercially available Windows based program, SLOPE/W. In carrying out the analysis two principal sets of data input were required; material shear strength and pore water pressures, and these will be discussed before the output from the analyses are presented.

Shear Strength Parameters

3.2 The peak effective shear strength parameters used in the analyses are summarised in Table 1. The parameters given in Table 1 were conservatively assumed as the below values based upon Egniols experience of similar materials.

Table 1 – Summary of Peak Effective Shear Strength Parameters

Material	Shear Strength Parameters	
	c' (kPa)	Ø' (°)
Restoration Soils	0	30
Waste	1	28
Gravely Clay	2	30
Grey Clay	2	33

Pore Water Pressures

3.3 Groundwater observations at the site has indicated the piezometric surface in the vicinity of the site is present at levels as shown in drawing 2058.SRA.01. These levels will be used to model the piezometric surface in the analysis of normal groundwater conditions.

3.4 Under saturated conditions the piezometric surface will be modelled to represent a scenario of pooling of water in the trough formed at the perimeter of the site.

Analysis of Slope

3.5 Stability calculations of the completed slope have been carried out using SLOPE/W for the existing design as shown on drawing 2058.SRA.02 in both normal and saturated groundwater conditions. The calculated factors of safety, Fs, from the analyses are summarised in Table 2 and the SLOPE/W output files are enclosed in Appendix 1.

Table 2 – Summary of SLOPE/W Stability Assessment

Situation	Factor of Safety (Fs)
Normal Conditions	2.859
Saturated Conditions	2.496

3.6 In both cases the calculated Fs values are considered acceptable. The critical slip surface under normal conditions is confined to the restoration soil layer above the waste mass with the slip surface being approximately 6m in length approximately half way down the slope, whereas the critical slip surface under saturated conditions extends through the waste mass and into the gravely clay below, the slip surface extends over approximately two thirds of the length of the slope with the toe of the slip surface daylighting past the toe of the restoration soils.

Groundwater Controls

3.7 Groundwater control options may be considered if observations indicate seepage patterns at variance with those expected. Options include a well point system installed within the slope to control pore water pressures and/or a counterfort drain installed in the toe of the slope would achieve an adequate drawdown of groundwater. However, there may be stability problems associated with cutting the slots for the drains through granular material with flowing groundwater.

4. CONCLUSIONS

4.1 The Fs that have been presented in this report have been calculated using conservative inputs into the SLOPE/W model to present 'worst case' scenarios.

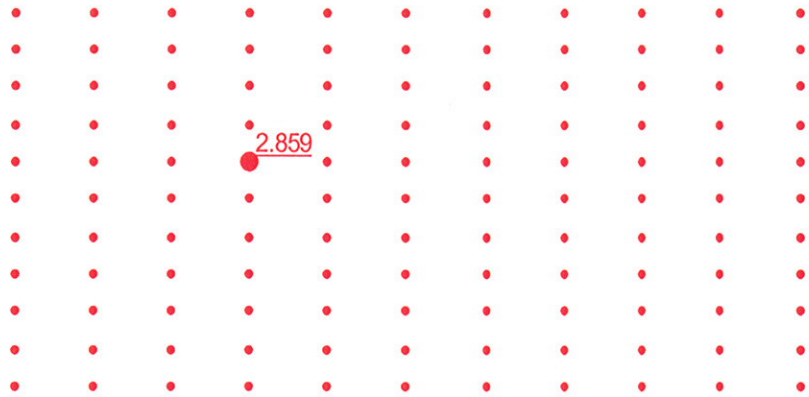
4.2 The existing engineering design of the site as presented in drawings 2058.SRA.01 and 2058.SRA.02 result in acceptable Fs under both normal and saturated groundwater conditions and therefore it is not considered necessary to change the design of the site in lieu of these results.

Drawings

Drawing No	**Title**
2058.SRA.01	Hydrogeological Cross Section
2058.SRA.02	Engineering and Installation Details

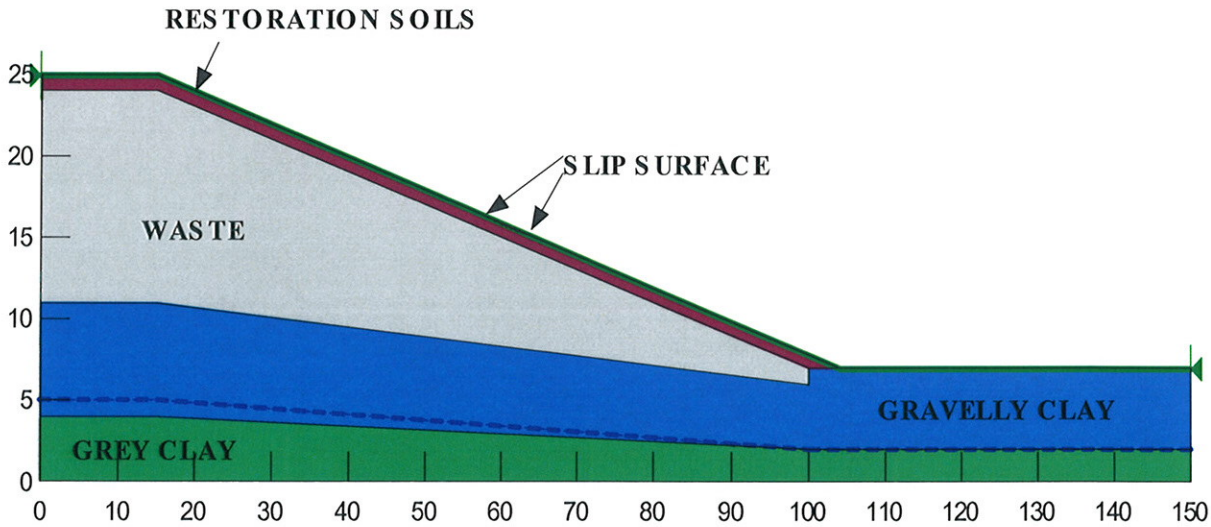
Appendix 1

Output from SLOPE/W

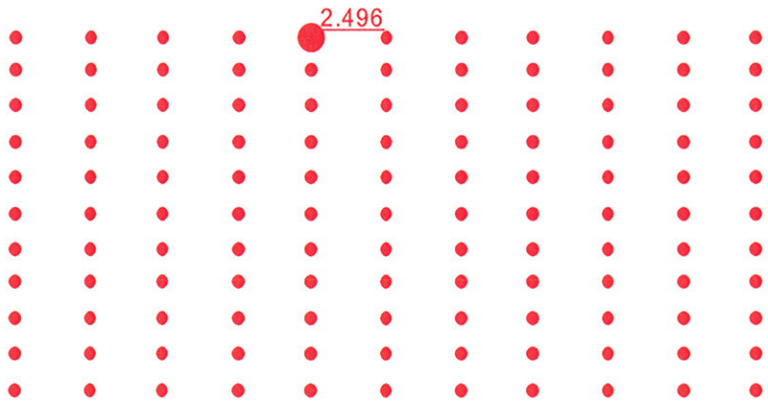


TY MAWR LANDFILL
WYN GRIFFITHS AND SONS

STABILITY ASSESSMENT

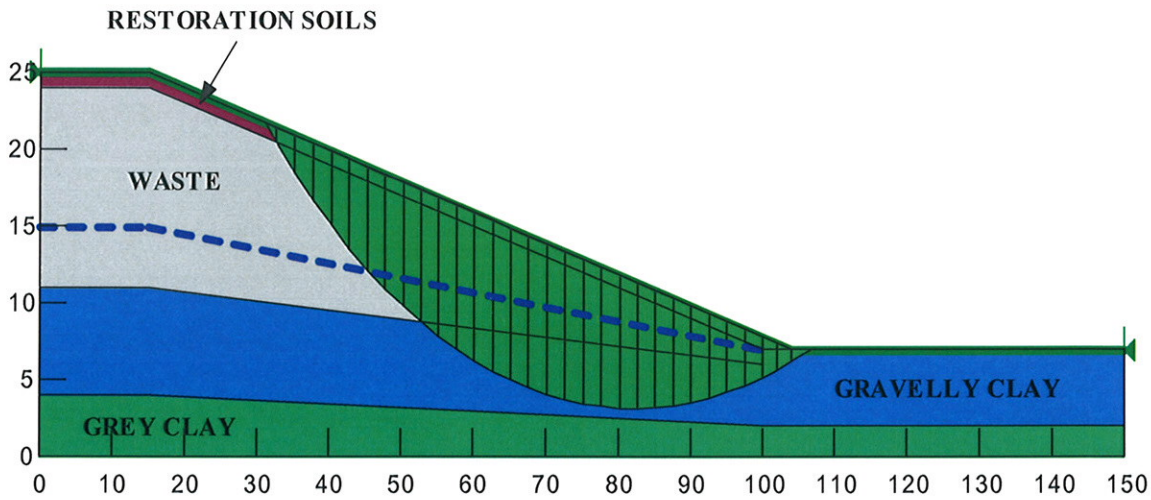


NORMAL GROUNDWATER CONDITIONS



TY MAWR LANDFILL
WYN GRIFFITHS AND SONS

STABILITY ASSESSMENT



SATURATED GROUNDWATER CONDITIONS

Appendix 6

WAC document

Ty Mawr Farm Landfill
Waste Acceptance Criteria and Procedure

Waste Acceptance Criteria for Ty Mawr Farm Landfill

Only waste materials satisfying the Directive definition of inert waste, repeated at Regulation 7(4) of the 2002 Regulations will be accepted at the site.

Characteristics of these wastes are that they:

- will not undergo any significant physical, chemical or biological transformations;
- will not dissolve;
- will not burn;
- will not physically or chemically react;
- will not biodegrade;
- will not adversely affect other matter with which they come into contact in a way likely to give rise to environmental pollution or harm human health;
- have insignificant total leachability and pollutant content;
- produce a leachate with an ecotoxicity that is insignificant (if they produces a leachate).

Waste types proposed to be accepted at the site are attached and follow the definitions of the European Waste Catalogue.

Wastes accepted will be from a single stream and source, although different wastes types may be accepted together, provided they are from the same source.

Waste acceptance will be in accordance with the Company operating procedures

In case of suspicion of contamination (either visual or from knowledge of the origin of the waste) testing will be applied or the waste refused in accordance with the above operating procedures.

If the listed wastes are contaminated or contain other material or substances such as metals, asbestos, plastics, chemicals, etc. to an extent which increases the risk associated with the waste sufficiently to justify their disposal in other classes of landfills, they will not be accepted.

If there is a doubt that the waste fulfills the definition of inert waste according to Regulation 7(4), or about the lack of contamination of the waste, testing will be carried out.

Wastes types contained within the table below will be accepted without testing but will undergo duty of care checks as detailed in the Companies operating procedures

Table 1

EWC Code	Description	Restrictions
10 11 03	Waste glass based fibrous materials	Only without organic binders
15 01 07	Glass packaging	
17 01 01	Concrete	Selected C&D waste only
17 01 02	Bricks	Selected C&D waste only
17 01 03	Tiles and ceramics	Selected C&D waste only
17 01 07	Mixtures of concrete, bricks, tiles and ceramics	Selected C&D waste only
17 02 02	Glass	
17 05 04	Soil and stones*	excluding topsoil, peat; excluding soil and stones from contaminated sites
19 12 05	Glass	
20 01 02	Glass	separately collected glass only
20 02 02	Soil and stones*	only from garden and parks waste; excluding top soil, peat

* soil includes naturally occurring sands and clays.

In order to be accepted at the site, wastes not included on the above list will be subjected to draft CEN standard two part batch test for inorganic constituents PrEN12457-3.

Only wastes not exceeding the limit values provided in Table 2 at the given liquid to solid ratio will be accepted at the site.

Leaching limit values for inert waste

Table 2

Component	L/S = 2 l/kg	L/S = 10 l/kg
	mg/kg	mg/kg
As	0.1	0.5
Ba	7	20

Cd	0.03	0.04
Cr $_{total}$	0.2	0.5
Cu	0.9	2
Hg	0.003	0.01
Mo	0.3	0.5
Ni	0.2	0.4
Pb	0.2	0.5
Sb	0.02	0.06
Se	0.06	0.1
Zn	2	4
Cl	550	800
F	4	10
SO_4 *	560	1,000
TDS **	2,500	4,00
Phenol index	0.47	1
DOC ***	240	500

If the waste does not meet these values for sulphate, it will still be considered for acceptance if the leaching does not exceed either of the following values: 1500 mg/l as Co at L/S = 0.1 l/kg and 6000 mg/kg at L/S = 10 l/kg. Percolation test (prEN 14405) will be used to determine the limit value at L/S = 0.1 l/kg under initial equilibrium conditions, whereas the value at L/S = 10 l/kg will be determined either by a batch leaching test (EN 12457-2 or EN 12457-3) or by the percolation test (prEN 14405) under conditions approaching local equilibrium.

** The values for TDS (Total Dissolved Solids) may be used alternatively to the values for Sulphate, Fluoride and Chloride.

*** If the waste does not meet these values for dissolved organic carbon (DOC) at its own pH value, it may alternatively be tested at L/S = 10 l/kg and a pH between 7.5 and 8.0. The waste will be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 500 mg/kg.

For inorganic parameters of concern not listed in the table the maximum leachable value obtained from the percolation test (prEN 14405) will be used as the source term for those parameters in the risk assessment.

In addition to the leaching limit values above, inert wastes to be accepted will also meet the following additional limit values.

Table 3

Additional limit values for inert waste

Parameter	Value
	mg/kg
TOC	30000*
BTEX	6
PCBs	1
Mineral oil (C10 to C40)	500

In the case of soils a higher limit value will be admitted, provided the Dissolved Organic Carbon at value of 500 mg/kg is achieved at L/S 10 at its own pH or pH7.