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14316/AG

25 June 2024

Dyfed Steel
Tube Works
Maescanner Road
Dafen
Llanelli SA14 8NS

For the attention of David Thomas

Dear Sirs,

BRE 365 Soil Infiltration Testing, Dyfed Steel, Dafen, Llanelli

Further to your recent instruction, we have now completed the BRE 365 compliant soil infiltration testing at the above site and enclose for your attention a copy of the results.

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Background

Dyfed Steel are proposing the construction of a new industrial unit within the eastern area of their existing premises.

The site is located within the wider Dyfed Steel ownership boundary on the southern edge of Dafen in Llanelli. The boundaries of the site are defined by existing commercial/industrial land and the River Dafen to the north, existing commercial/industrial land to the west and the A4138 road to the southeast. The site location is presented in Figure 1 and a site plan is presented in Figure 2.

The site is situated on relatively level ground with some localised undulations at an approximate elevation of 18m AOD.

The site comprises commercial/industrial buildings surrounding an open area utilised predominantly for the storage of steel hauling lorries and flat bed trucks, as well as access roads around the site. It has a varied surface coving of concrete hardstanding and granular made ground.

Towards the eastern side of the open area, there is a raised section containing stockpiles of steel, other scrap metals, plastic containers, broken concrete and other industrial/commercial waste. This raised section has a surface covering of granular made ground with sparse vegetation.

Fieldworks

Intégral Géotechnique (Wales) Limited attended site on the 13th and 14th June 2024, to undertake BRE 365 compliant soil infiltration testing at three locations (referenced TP01 to TP03).

The soil infiltration locations and depths were provided by CB3 Consult Limited. The approximate locations of the trial pits are shown in Figure 2.

At each test location, a trial pit was excavated using an JCB3CX.

The trial pits were excavated to depths of between 2.30m and 3.00m below existing ground level (bgl).

Upon reaching the final excavation depth, each trial pit was rapidly filled with water from a 2500-gallon tractor towed tanker and the water level monitored over a period of time in accordance with BRE 365.

The fieldworks were supervised by a qualified geotechnical engineer from Intégral Géotechnique (Wales) Limited who logged the trial pits and monitored the soil infiltration tests.

The trial pit logs are presented in Appendix A and the soil infiltration test calculation sheets are presented in Appendix B.

Ground Conditions

The BGS geology map indicates that the site is underlain by superficial deposits consisting of glacial till. This overlies the Swansea Member which consists of mudstones, siltstones and sandstones.

The ground conditions encountered beneath the site typically comprised of highly variable made ground over glacial till deposits consisting of sandy gravel and/or gravelly clay.

Made Ground

The made ground was highly variable and encountered from ground level.

The made ground typically comprised of loose to medium dense, medium dense, locally dense brown to light brown, locally dark grey slightly silty sandy gravel with a low to high cobble content and low to moderate boulder content.

The gravel, cobble and boulder constituents included angular concrete, charcoal, brick and sandstone, with inclusions of scrap metal, plastic and timber etc.

Local to TP02, the made ground further graded into firm dark grey slightly silty sandy slightly gravelly clay with a low cobble content of sub-angular sandstone. The gravels included angular to sub-angular sandstone and rare brick, with inclusions of scrap metal.

The made ground was encountered to depths of between 1.4m at TP03 to 2.3m at TP02 below existing ground level.

Natural Ground
The made ground was underlain by superficial deposits consisting of variable glacial deposits.

The superficial deposits typically comprised of soft or firm light grey, brown silty slightly to very sandy, locally slightly gravely clay.

The cohesive deposits further graded into granular deposits comprising of medium dense sandy gravel with a low cobble content.

The granular deposits were encountered at a depth of 1.8m bgl within trial pit TP01 and the granular deposits were not encountered within TP02, with the trial pit terminating within the cohesive deposits.

The cohesive deposits were absent within TP03, with the granular deposits encountered beneath the made ground.

The superficial deposits were proven to depths of between 2.3m and 3.0m bgl, with the trial pits terminating at the depths requested by CB3 Consult Limited.

Groundwater
Groundwater was encountered at the base of trial pits TP01 and TP02, rising to 2.45m and 2.98m bgl after 15 mins respectively.

It should be noted that the groundwater conditions are based on observations made at the time of the fieldwork and groundwater levels may vary due to seasonal and other effects.

Soil Infiltration Testing Results

Soil infiltration testing was undertaken within each trial pit (TP01 to TP03).

The results of the soil infiltration are included within Appendix B and a summary is provided below.

Table 1: Summary of Soil Infiltration Testing

Trial Pit Location	Strata	Infiltration Rate (m/s)			Design Infiltration Rate
		Cycle 1	Cycle 2	Cycle 3	
TP01	Glacial Deposits	Limited infiltration observed			-
TP02	Glacial Deposits	Rise in water level due to groundwater ingress			-
TP03	Glacial Deposits	$1.3x10^{-5}$	$1.2x10^{-5}$	-	$1.2x10^{-5}$

Within trial pit TP01, an initial infiltration was observed to a depth of approximately 2.15m bgl. Below 2.15m, negligible/no infiltration was observed and therefore an infiltration rate could not be calculated.

Within trial pit TP02, a rise in water level was observed due to ingress of groundwater and therefore an infiltration rate could not be calculated.

Within trial pit TP03, a Design Infiltration Rate of 1.2 x 10^{-5} m/s has been calculated, based on the two completed cycles.

Note that the soakaway test results are specific to the location and depth of the tests undertaken.

The soil infiltration test results should be provided to a suitably qualified drainage engineer.

We trust the above and enclosed are to your satisfaction. However, if you have any queries or require any further information, please do not hesitate to contact us.

Yours faithfully,

Aidan Gamble
For
Intégral Géotechnique (Wales) Limited

Enc.
Appendix A – Trial Pit Logs
Appendix B – Soil Infiltration Test Results

Figures
Figure 1 – Site Location
Figure 2 – Site Plan

APPENDIX A

TRIAL PIT LOGS

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Project Name:	Project No.:	Trial Pit No.:
Dyfed Steel	**14316**	**TP01** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Dafen, Llanelli	Dyfed Steel	AG	1:25

Equipment:	Coordinates:	**Dimensions**
JCB 3CX		3.10m
Date Excavated: 13/06/2024	Level:	Depth : 2.60m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						Loose to medium dense brown and light brown slightly silty sandy GRAVEL with a low cobble and boulder (0.4m x 0.3m) content of angular concrete and rare brick. Gravel is fine to coarse angular to sub-angular of brick, concrete and sandstone. Also contains inclusions of scrap metal (MADE GROUND).
			1.10			Medium dense dark grey/black clayey sandy GRAVEL. Gravel is fine to coarse angular to sub-angular of brick, concrete, charcoal and rare sandstone (MADE GROUND).
			1.40			Firm light grey and orangish brown silty slightly sandy CLAY.
			1.80			Medium dense brown sandy GRAVEL with a low cobble content of sub-rounded sandstone. Gravel is fine to coarse sub-rounded to rounded of sandstone.
			2.60			End of Trialpit at 2.60 m

1
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Remarks:
1. Terminated at 2.6m bgl.
2. Soil infiltration test undertaken.

Groundwater: 1. Groundwater encountered at the base of pit at 2.6m bgl.
2. Groundwater standing at 2.45m bgl after 15 mins.

Stability: 1. Minor pit wall instability above 0.5m associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

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Project Name:	Project No.:	Trial Pit No.:
Dyfed Steel	**14316**	**TP02** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Dafen, Llanelli	Dyfed Steel	AG	1:25

Equipment: JCB 3CX

Coordinates:

Dimensions 2.10m

Depth : 3.00m

0.70m

Date Excavated: 13/06/2024

Level:

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						Dense dark grey clayey slightly silty sandy GRAVEL with a low cobble and boulder (0.3m x 0.5m) content of angular concrete. Gravel is fine to coarse angular to sub-angular of concrete, brick and sandstone. Also contains inclusions of plastic and scrap metal (MADE GROUND).
			0.80			Firm dark grey silty slightly sandy slightly gravelly CLAY with a low cobble content of angular to sub-angular sandstone. Gravel is fine to coarse angular to sub-angular of sandstone and rare brick. Also contains inclusions of scrap metal (MADE GROUND).
			2.30			Soft light grey slightly silty very sandy slightly gravelly CLAY with a low cobble content of sub-angular sandstone. Gravel is fine to coarse angular to sub-rounded of sandstone.
			3.00			End of Trialpit at 3.00 m

Remarks:
1. Terminated at 3.0m bgl.
2. Soil infiltration test undertaken.

Groundwater: 1. Groundwater encountered at the base of pit at 3.0m bgl.
2. Groundwater standing at 2.98m bgl after 15 mins.

Stability: 1. Generally stable in the short term.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

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Project Name:	Project No.:	Trial Pit No.:
Dyfed Steel	**14316**	**TP03** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Dafen, Llanelli	Dyfed Steel	AG	1:25

Equipment:	Coordinates:	**Dimensions**
JCB 3CX		2.10m
Date Excavated: 13/06/2024	Level:	Depth : 2.30m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						Medium dense light brown slightly silty sandy GRAVEL with a high cobble and moderate boulder (0.6m x 0.4m) content of angular concrete and brick. Gravel is fine to coarse angular to sub-angular of concrete, brick and sandstone. Also contains inclusions of plastic, scrap metal and timber (MADE GROUND).
			0.60			Medium dense dark grey/black sandy GRAVEL with a high cobble content of angular to sub-angular concrete and brick. Gravel is fine to coarse angular to sub-angular of concrete, brick, sandstone and charcoal (MADE GROUND)
			1.40			Medium dense brown sandy GRAVEL with a low cobble content of sub-rounded sandstone. Gravel is fine to coarse sub-rounded to rounded of sandstone.
			2.30			End of Trialpit at 2.30 m

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Remarks:
1. Terminated at 2.3m bgl.
2. Soil infiltration test undertaken.

Groundwater: 1. No groundwater encountered.

Stability: 1. Moderate pit wall instability above 1.4m associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

APPENDIX B

SOIL INFILTRATION TEST RESULTS

BRE365 SOIL INFILTRATION RATE TEST - TP01

14316 Dyfed Steel, Dafen, Llanelli

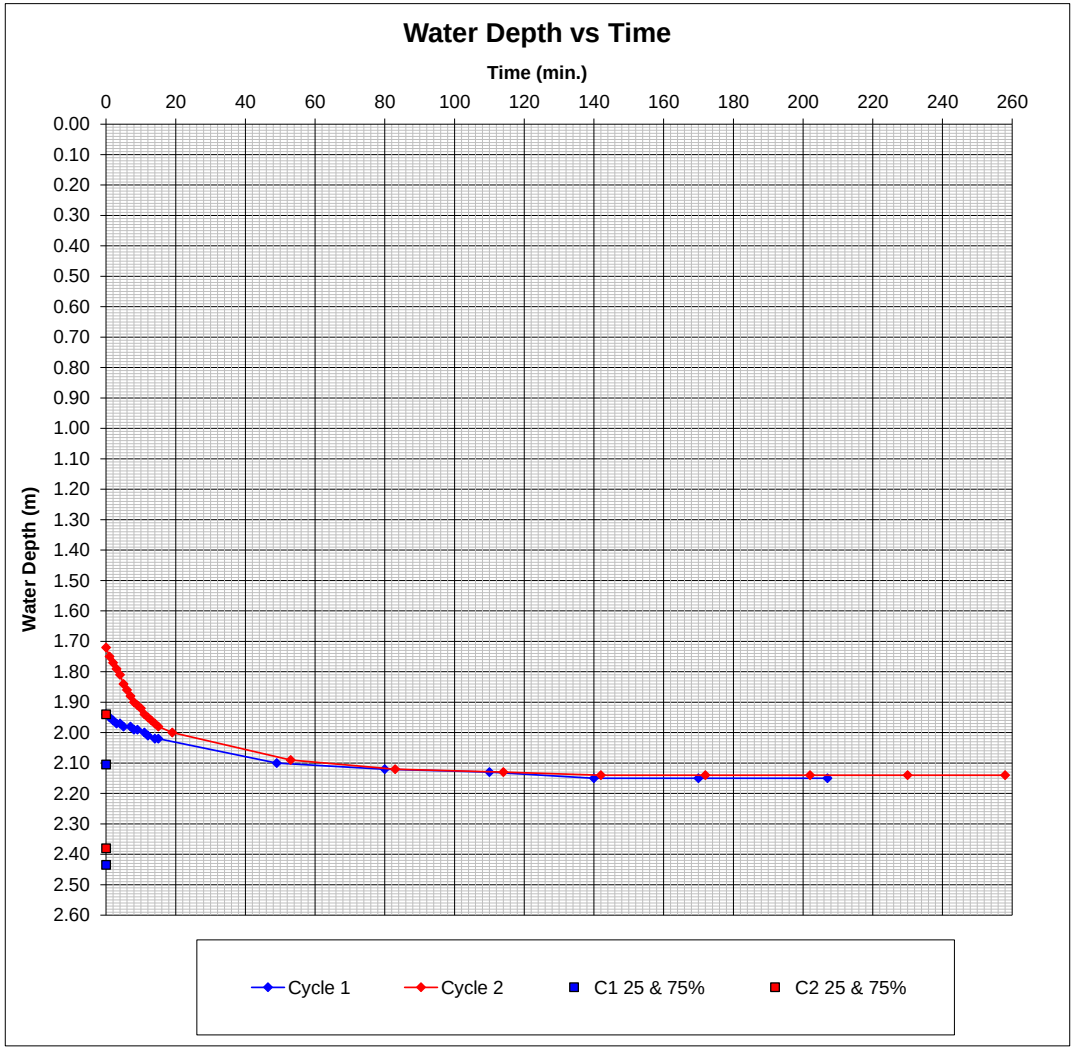
Trial Pit Information	
Length (m)	3.10
Width (m)	0.70
Depth (m)	2.60
Groundwater	2.45
Weather Conditions	Rain/Sunny
Date	13-Jun-24

Remarks

1. Minor pit wall instability above 0.5m.
2. Groundwater ingress at base of pit at 2.6m bgl.
3. Groundwater standing at 2.45m bgl after 15 mins.
4. Insufficient infiltration in order to calculate a design rate.

Cycle 1		Cycle 2		Cycle 3	
Time (min)	Depth (m)	Time (min)	Depth (m)	Time (min)	Depth (m)
0	1.94	0	1.72		
1	1.95	1	1.75		
2	1.96	2	1.77		
3	1.97	3	1.79		
4	1.97	4	1.81		
5	1.98	5	1.84		
7	1.98	6	1.86		
8	1.99	7	1.88		
9	1.99	8	1.90		
11	2.00	9	1.91		
12	2.01	10	1.92		
14	2.02	11	1.94		
15	2.02	12	1.95		
49	2.10	13	1.96		
80	2.12	14	1.97		
110	2.13	15	1.98		
140	2.15	19	2.00		
170	2.15	53	2.09		
207	2.15	83	2.12		
		114	2.13		
		142	2.14		
		172	2.14		
		202	2.14		
		230	2.14		
		258	2.14		

Final Excavation Depth (m)	Cycle 1	Cycle 2	Cycle 3
At end of testing cycle	2.60	2.60	
Water Depths (m)			
Water depth at start of test	1.94	1.72	
Water depth at end of test	2.15	2.14	
Effective depth (measured)	0.21	0.42	
% Effective storage depth	0.32	0.48	
Effective Storage Depths (m)			
Effective storage depth (100%)	0.66	0.88	
Effective storage depth (75%)	0.50	0.66	
Effective storage depth (50%)	0.33	0.44	
Effective storage depth (25%)	0.17	0.22	
Outflow Time (min)			
Time for measured outflow	207	258	
Time for 100% outflow			
Time for 75-25% outflow			
Volume of Outflow (m^3)			
Over measured effective depth	0.46	0.91	
Over 100% effective depth	1.43	1.91	
From 75% - 25% effective depth	0.72	0.95	
Surface Area (m^2)			
For 100% effective storage	7.19	8.86	
For 50% effective storage	4.68	5.51	
Over measured depth	3.77	5.36	
Soil Infiltration Rate (m/s)	**Cycle 1**	**Cycle 2**	**Cycle 3**
Over 100% effective depth	#DIV/0!	#DIV/0!	
Over measured depth	9.7E-06	1.1E-05	
Over 75% - 25% effective depth	**#DIV/0!**	**#DIV/0!**	



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BRE365 SOIL INFILTRATION RATE TEST - TP02

14316 Dyfed Steel, Dafen, Llanelli

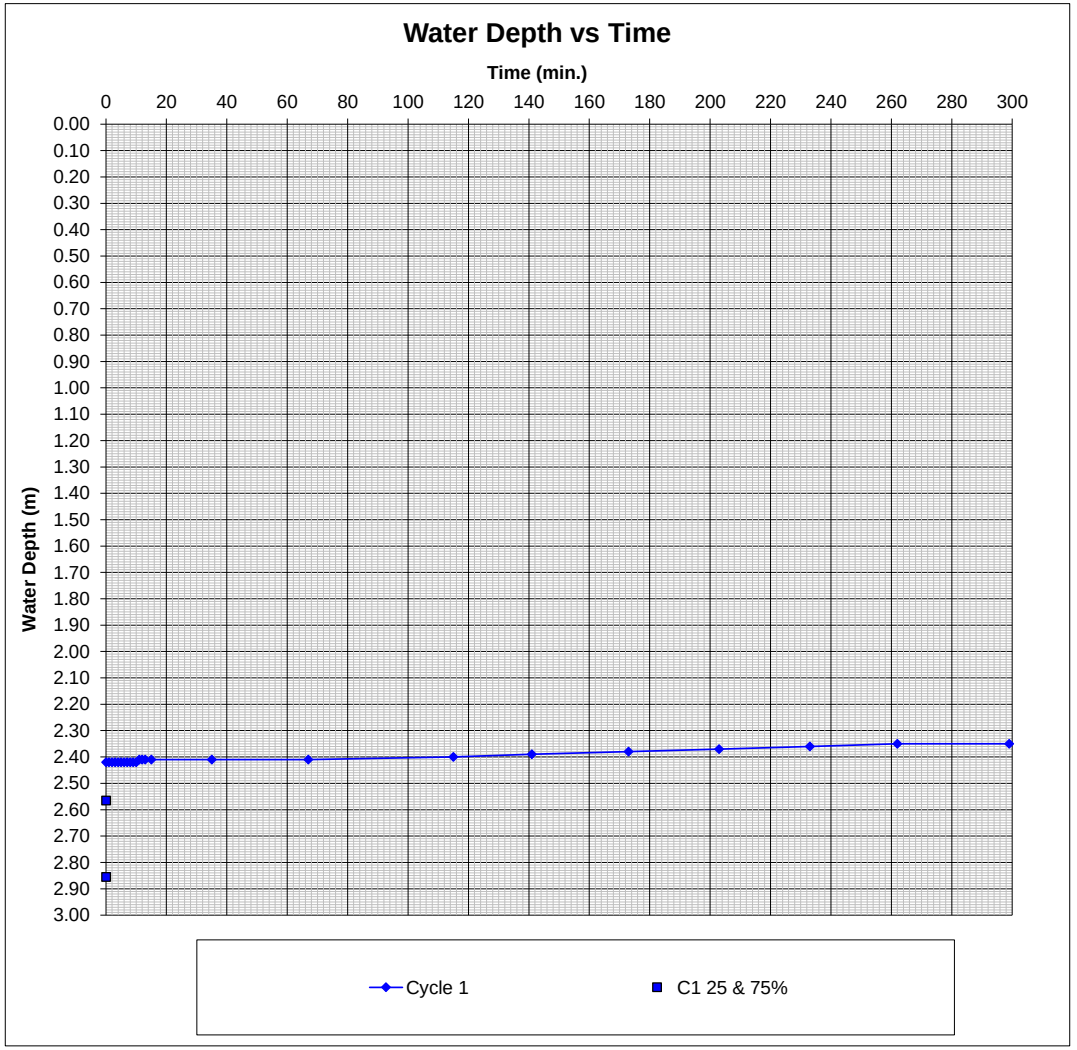
Trial Pit Information	
Length (m)	2.10
Width (m)	0.70
Depth (m)	3.00
Groundwater	2.98
Weather Conditions	Rain
Date	13-Jun-24

Remarks

1. Generally stable in the short term.
2. Groundwater seepage at base of pit at 3.0m bgl.
3. Groundwater standing at 2.98m bgl after 15 mins.
4. Groundwater seepage at base of trial pit resulting in a rise in water level.
5. Negligible infiltration observed.
6. Insufficient infiltration in order to calculate design rate.

Cycle 1		Cycle 2		Cycle 3	
Time (min)	Depth (m)	Time (min)	Depth (m)	Time (min)	Depth (m)
0	2.42				
1	2.42				
2	2.42				
3	2.42				
4	2.42				
5	2.42				
6	2.42				
7	2.42				
8	2.42				
9	2.42				
10	2.42				
11	2.41				
12	2.41				
13	2.41				
15	2.41				
35	2.41				
67	2.41				
115	2.4				
141	2.39				
173	2.38				
203	2.37				
233	2.36				
262	2.35				
299	2.35				

Final Excavation Depth (m)	Cycle 1	Cycle 2	Cycle 3
At end of testing cycle	3.00		
Water Depths (m)			
Water depth at start of test	2.42		
Water depth at end of test	2.42		
Effective depth (measured)	0.00		
% Effective storage depth	0.00		
Effective Storage Depths (m)			
Effective storage depth (100%)	0.58		
Effective storage depth (75%)	0.44		
Effective storage depth (50%)	0.29		
Effective storage depth (25%)	0.15		
Outflow Time (min)			
Time for measured outflow	299		
Time for 100% outflow			
Time for 75-25% outflow			
Volume of Outflow (m^3)			
Over measured effective depth	0.00		
Over 100% effective depth	0.85		
From 75% - 25% effective depth	0.43		
Surface Area (m^2)			
For 100% effective storage	4.72		
For 50% effective storage	3.09		
Over measured depth	1.47		
Soil Infiltration Rate (m/s)	**Cycle 1**	**Cycle 2**	**Cycle 3**
Over 100% effective depth	#DIV/0!		
Over measured depth	0.0E+00		
Over 75% - 25% effective depth	**#DIV/0!**		



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BRE365 SOIL INFILTRATION RATE TEST - TP03

14316 Dyfed Steel, Dafen, Llanelli

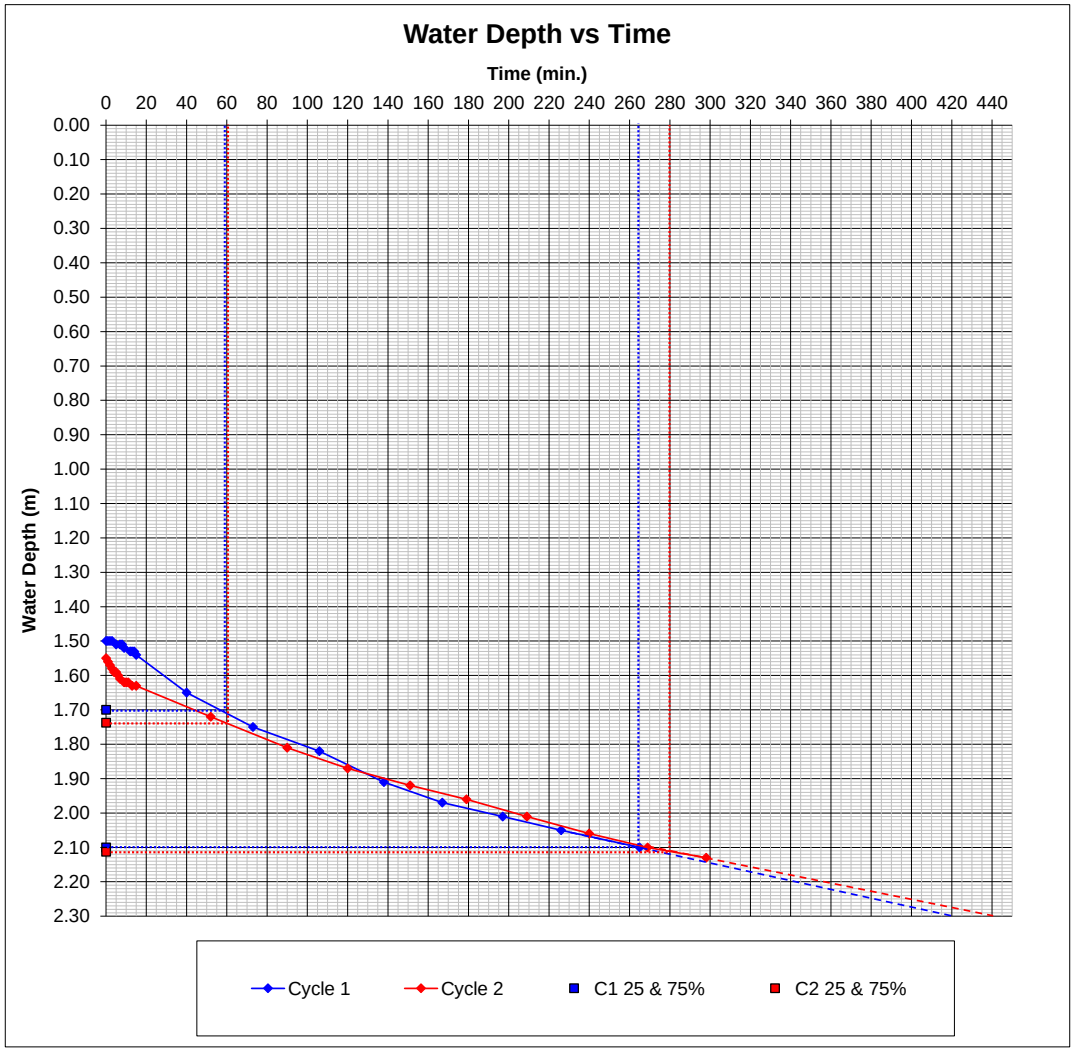
Trial Pit Information	
Length (m)	2.10
Width (m)	0.70
Depth (m)	2.30
Groundwater	0
Weather Conditions	Rain/Sunny
Date	13-Jun-24

Remarks

1. Moderate pit wall instability above 1.4m.
2. No groundwater encountered.

Cycle 1		Cycle 2		Cycle 3	
Time (min)	Depth (m)	Time (min)	Depth (m)	Time (min)	Depth (m)
0	1.50	0	1.55		
1	1.50	1	1.56		
2	1.50	2	1.57		
3	1.50	3	1.58		
5	1.51	4	1.59		
7	1.51	5	1.59		
8	1.51	6	1.60		
9	1.52	7	1.61		
12	1.53	9	1.62		
13	1.53	10	1.62		
14	1.53	11	1.62		
15	1.54	13	1.63		
40	1.65	15	1.63		
73	1.75	52	1.72		
106	1.82	90	1.81		
138	1.91	120	1.87		
167	1.97	151	1.92		
197	2.01	179	1.96		
226	2.05	209	2.01		
265	2.1	240	2.06		
		269	2.1		
		298	2.13		

Final Excavation Depth (m)	Cycle 1	Cycle 2	Cycle 3
At end of testing cycle	2.30	2.30	
Water Depths (m)			
Water depth at start of test	1.50	1.55	
Water depth at end of test	2.10	2.13	
Effective depth (measured)	0.60	0.58	
% Effective storage depth	0.75	0.77	
Effective Storage Depths (m)			
Effective storage depth (100%)	0.80	0.75	
Effective storage depth (75%)	0.60	0.56	
Effective storage depth (50%)	0.40	0.38	
Effective storage depth (25%)	0.20	0.19	
Outflow Time (min)			
Time for measured outflow	265	298	
Time for 100% outflow	420	440	
Time for 75-25% outflow	205	220	
Volume of Outflow (m^3)			
Over measured effective depth	0.88	0.85	
Over 100% effective depth	1.18	1.10	
From 75% - 25% effective depth	0.59	0.55	
Surface Area (m^2)			
For 100% effective storage	5.95	5.67	
For 50% effective storage	3.71	3.57	
Over measured depth	4.83	4.72	
Soil Infiltration Rate (m/s)	**Cycle 1**	**Cycle 2**	**Cycle 3**
Over 100% effective depth	7.8E-06	7.4E-06	
Over measured depth	1.1E-05	1.0E-05	
Over 75% - 25% effective depth	**1.3E-05**	**1.2E-05**	



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FIGURES

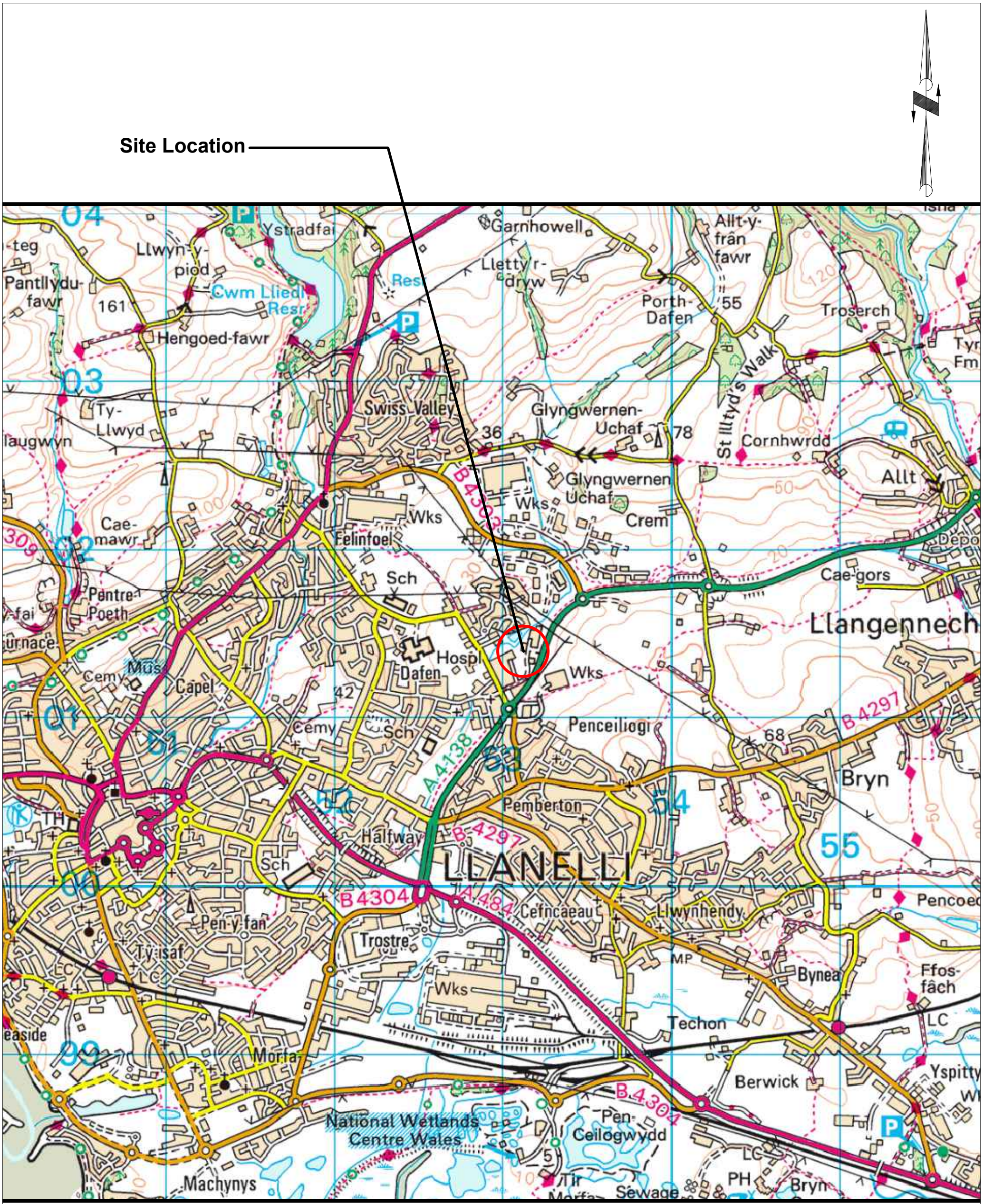

Figure 1: Site Location

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Client: Dyfed Steel	Scale: 1 : 50,000		

Figure 2: Site Plan

Project: Dyfed Steel, Dafen	Job No.: 14316	**Intégral** Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
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