A2292
Geotechnical Report

Ponsharden Cemeteries
Falmouth Road, Falmouth, Cornwall

AGS Ground Solutions Ltd

For

PDP Green Consulting Ltd, Calenick House, Truro Technology Park, Newham, Truro, Cornwall, TR1 2XN

March 2021
Report Number: A2292-1

AGS Ground Solutions Ltd
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1. INTRODUCTION

AGS Ground Solutions (AGS) were commissioned by PDP Green Consulting Ltd (The Client), to undertake a geotechnical site investigation at Ponsharden Cemeteries, Falmouth.

It is understood that the development will comprise the construction of soil nails / rock bolts to help stabilise a retaining wall forming the northern boundary of the site.

The aim of the investigation was to:

- Determine the ground profile.
- Provide information for the design of foundations for the new structures on the site.

Our general Terms and Conditions are applicable to this report.

2. SITE LOCATION AND LAYOUT

The site is located in Falmouth, Cornwall and is centred approximately on Ordnance Survey Grid Reference SW 794 388. See Figure 1 for Site Location Plan.

A walkover survey was undertaken on the 2nd March 2021, details of which are presented below.

Access to the site was via a gate from an unnamed road to the west of Falmouth road. The site was secured with locked gates.

The site is a sensitive monument site containing multiple cemeteries, that previously was open to the public for viewing. At the time of the walkover survey the site comprised of an irregular shape containing the multiple cemeteries with many headstones and grave mounds. Access gates to the north-eastern and north-western boundaries are observed, with tracks to walk around the site. A retaining wall on the northern boundary is seen showing weathered rock, and tree stumps. A small rectangle concrete building is seen to the south-western edge of site.

The site was in poor condition with decaying headstones, overgrown grassed areas and a previous trial pit with pea gravel located in the centre of the northern boundary.

Geomorphically the site was fairly level however there were steep man-made slopes to the north and west and it was clear that the site had been artificially cut into the rock, with the south east part of the site apparently having been raised. The natural ground level sloped steeply to the west.

The following features surrounded the site:

- **To the north**; the site was bound by a steep rockface sloping down to Falmouth road. Commercial building, boats and the sea are found beyond.
- **To the east**; the site was bound Ponsharden Industrial Estate, with North Parade and industrial buildings beyond.
- **To the south**; the site was bound by an unnamed road that lead to Sainsbury supermarket, with residential properties and fields found beyond.
- **To the west**; the site was bound by a steep downward slope, trees and fields, with an industrial estate and fields beyond.

A photographic record of the site walkover survey and siteworks are presented in Appendix 1.

3. ENVIRONMENTAL SETTING

3.1 GEOLOGY

Reference to the British Geological Survey 1:50,000 scale geological map of the area shows the site to be underlain by The Mylor Slate Formation (MRSL)

No superficial deposits were recorded on the site.

Around 50 m to the north-west of site, is shown to be underlain by Superficial deposits of Alluvium – Clay, silt sand, and gravel (ALV), which is underlain by The Mylor Slate Formation (MRSL).

Around 150 m to the north-east of site, is shown to be underlain by Superficial deposits of Tidal Flat Deposits (TFD), which is underlain by The Mylor Slate Formation (MRSL).

The British Geological survey provides the following geological descriptions. Contains British Geological Survey materials © NERC 2021:

Alluvium (ALV)

Description: Alluvium - Clay, Silt, Sand And Gravel. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U).

Setting: rivers (U). These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary (if in a coastal setting).

Tidal Flat Deposits (TFD).

Description: Tidal Flat Deposits - Clay And Silt. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by shorelines (U).

Setting: shorelines (U). These sedimentary deposits are shallow-marine in origin. They are detrital, generally coarse-grained forming beaches and bars in a coastal setting.

Mylor Slate Formation (MRSL).

Description: Mylor Slate Formation - Hornfelsed Slate And Hornfelsed Siltstone. Metamorphic Bedrock formed approximately 359 to 383 million years ago in the Devonian Period. Originally sedimentary rocks formed in open seas by pelagite deposits. Later altered by high temperatures of igneous intrusion.

Setting: Originally sedimentary rocks formed in open seas by pelagite deposits. These rocks were sedimentary in origin, possibly in a deep-marine (pelagic) environment, but have subsequently undergone metamorphism.

4. INTRUSIVE INVESTIGATION

4.1 FIELDWORK

Site works were carried out on the 2nd and 3rd March 2021 and comprised the following:

- Excavation of 5 no. Window Sample Holes to depths of 4.00 m.

The positions of the above works on the site are indicated on Figures 2, Exploratory Hole Location Plans.

Window Sample Holes

Six Window Sample Holes were excavated on the site on 2nd and 3rd March 2021.

Window sample holes WS1 to WS6 were excavated on the site using an hand-portable cut down windowless sample rig.

The window sample holes were excavated to examine the ground, and to establish the thickness of each of the soil horizons. The resulting cores were examined by an engineer.

Standard Penetration Tests (SPTs) were performed every 1.0 m intervals in all of the window sample holes.

An hand shear vane was used to gather information on mass shear strength within the window sample arisings.

Samples were recovered for laboratory analysis.

Window Sample Hole Logs are presented in Appendix 2.

4.2 GROUNDWATER

Groundwater was not encountered in any of the window sample holes.

It should be noted that the absence of groundwater is not necessarily indicative of the absence of a groundwater table in view of the short period the trial excavations remained open. Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term can be affected by antecedent weather conditions or other causes.

5. LABORATORY TESTING

5.1 GEOTECHNICAL TESTING

The following range of laboratory tests was scheduled:

Moisture Content of soil	12 no.
Liquid and Plastic Limits of soil	12 no.
Particle Size Distribution (Wet Sieve)	12 no.
Sedimentation	12 no.

The results of geotechnical testing are presented in Appendix 3.

6. EVALUATION OF GROUND CONDITIONS AND ENGINEERING PROPERTIES

6.1 SOIL PROFILE

During the site investigation, three main soil / rock layers were identified on the site. An upper layer of Made Ground (MGR) was encountered which was found to overlay Weathered Mylor Slate Formation (MRSL) and The Mylor Slate Formation (MRSL).

Made Ground (MGR)

Made Ground (MGR) was the uppermost layer encountered on the site. The layer comprised a layer of concrete over sandy gravelly clay.

The Made Ground (MGR) was encountered in all excavations and was found to be between 0.30 m deep in Window Sample Hole WS1, WS2, WS3, WS5, and WS6, and 0.75 m in window sample hole WS4.

Weathered Mylor Slate Formation (MRSL)

The Weathered Mylor Slate Formation (MRSL) was situated immediately beneath the Made Ground (MGR).

The layer comprised a stiff brown, grey gravelly clay, transitioning to a moderately weak to moderatey strong grey brown metamudstone. Very thin laminae (1 – 4 mm) and rare quartz gravelly observed. Arising as clayey gravel at depth.

The Weathered Mylor Slate Formation was encountered in all locations and varied in thickness from 1.70 m in window sample hole WS2 to 3.70 m in window sample hole WS1.

Mylor Slate Formation (MRSL)

The Mylor Slate Formation (MRSL) was the layer on which all of the window sample holes refused. Although not observed, observations of the drill suggest that the material is intact rock.

A summary of the strata, as discussed above, is presented in the table below.

Stratum	Depth to top of Layer (m)	Thickness (m) – Where proven	Depth to base of Layer (m) – Where encountered
Made Ground (MGR)	0.00	0.30 – 0.75	0.30 – 0.75
Weathered Mylor Slate Formation (MRSL)	0.30 – 0.75	1.70 – 3.70	2.00 – 4.00
Mylor Slate	Not Encountered	Not proven	Not Encountered

Formation (MRSL)			

FIGURES:

APPENDICES:

Figure 1

Site Location Plan

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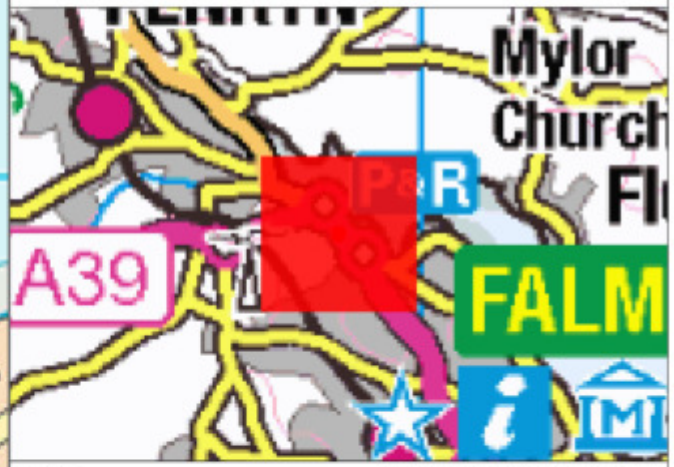


Project	Ponsharden Cemeteries
Project Number	A2292
Location	Falmouth, Cornwall
Client	PDP Green Consulting Ltd
Drawing Title	Site Location Plan

Drawing Number	Revision	Date	Approximate Scale
A2292-1	1	02/03/2021	1:5000 @ A4

Key

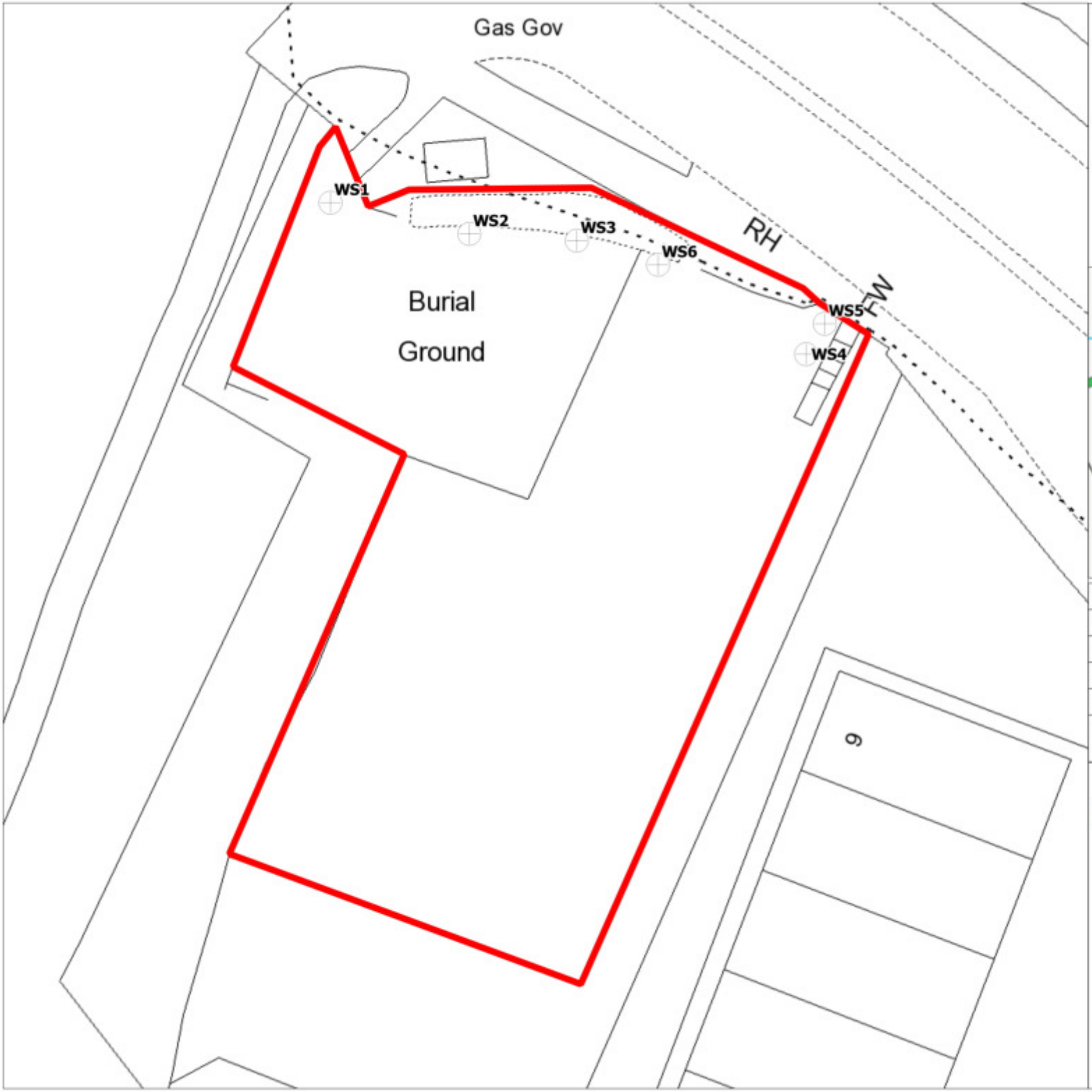
Site Boundary

0 50 100 150 m

N

Figure 2

Exploratory Hole Location Plan



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Project	Ponsharden Cemeteries
Project Number	A2292
Location	Falmouth, Cornwall
Client	PDP Green Consulting Ltd
Drawing Title	Exploratory Hole Location Plan

Drawing Number	Revision	Date	Approximate Scale
A2292-02	1	02/03/2021	1:350 @ A4

Key

- Site Boundary
- Window Sample Hole Locations

0 10 m

N

Appendix 1

Site Photographs

Photograph 1 – Window Sample Hole WS6

Photograph 2 – Window Sample Hole WS5

Photograph 3 – Window Sample Hole WS4

Photograph 4 – Window Sample Hole WS3

Photograph 5 – Window Sample Hole WS2

Photograph 6 – Window Sample Hole WS1

Photograph 7 – General view of southern entrance of access to site, facing north.

Photograph 8 – General view of the southern boundary of site, facing north.

Photograph 9 – General view of the north-western boundary of site, facing north.

Photograph 10 – General view of access to the north-western boundary of site, facing north.

Photograph 11 – General view of the eastern boundary of site, facing south.

Photograph 12 – General view of the western boundary of site, facing west. The geomorphology slopes moderately down to the west.

Photograph 13 – General view of the access of the north-western boundary of site, facing south.

Photograph 14 – General view of the northern boundary of site, facing south. Note the retaining wall showing weathered rock and tree stumps.

Appendix 2

Window Sample Hole Logs

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Window Sampler Log No. WS1

Sheet: 1 of 1

Equipment & Methods. Modular window sampleSupport Used:None Backfill: Bentonite and arisings	Project Name: Ponsharden Cemetery Project Location: Falmouth Client: PDP Green Consulting Ltd	Job No: A2292
Co-ordinates: E: N:	Ground Level (m):	Date Started:02/03/2021 Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND brown gravelly topsoil with tree roots **(Made Ground)**			(0.30)
						-0.30		0.30
0.50- 0.70	WS1	D			Stiff brown/grey gravelly CLAY. Gravel is in abundance sub-rounded to sub-angular slate **(Mylor Slate Formation)**			
0.80- 1.00	WS1	D						(1.20)
1.20- 1.40	WS1	D			...from 1.20 Quartz cobble			
						-1.50		1.50
1.50- 1.70	WS1	D			Moderately weak to moderately strong brown/grey METAMUDSTONE. Very weak thin laminae 1 to 4 mm. Arising as a silty gravel **(Mylor Slate Formation)**			
1.80- 2.00	WS1	D						
2.20- 2.40	WS1	D						
2.50- 2.70	WS1	D						(2.50)
2.80- 3.00	WS1	D			...from 2.70 Quartz gravel			
3.10- 3.30	WS1	D						
3.40- 3.60	WS1	D						
3.80- 4.00	WS1	D						
						-4.00		4.00
					End of W/S 4.00 m (Thickness of basal layer not proven)			

Remarks:
Core recovery:

0 - 1m 65%
1 - 2m 90%
2 - 3m 100%
3 - 4m 100%

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Logged By: CS	Checked By:
Scale: 1:25	Approved By:
FIG No.	

AGS-GS STANDARD WINDOW SAMPLER LOG V2 A2292 PONSHARDEN.GPJ GSG-AGS3-STD TEMPLATE.GDT 3/8/21

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Window Sampler Log No. WS2

Sheet: 1 of 1

Equipment & Methods. Modular window sampleSupport Used:None Backfill: Bentonite and arisings	Project Name: Ponsharden Cemetery Project Location: Falmouth Client: PDP Green Consulting Ltd	Job No: A2292
Co-ordinates: E: N:	Ground Level (m):	Date Started:02/03/2021 Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20- 0.40	WS2	D			MADE GROUND turf over dark brown topsoil **(Made Ground)**	-0.30		(0.30)
0.50- 0.70	WS2	D			Stiff brown/grey gravelly CLAY. Gravel is fine - medium sub-rounded to sub-angular slate **(Mylor Slate Formation)**			0.30 (0.80)
0.80- 1.00	WS2	D						
1.00- 1.20	WS2	D				-1.10		1.10
1.40- 1.60	WS2	D			Moderately weak to moderately strong brown/grey METAMUDSTONE. Arising as weathered rock **(Mylor Slate Formation)**			(0.90)
1.80- 2.00	WS2	D				-2.00		2.00

End of W/S 2.00 m
(Thickness of basal layer not proven)

Remarks:
Core recovery:

0 - 1m 75%
1 - 2m 100%

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Logged By: CS	Checked By:
Scale: 1:25	Approved By:
FIG No.	

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Window Sampler Log No. WS3

Sheet: 1 of 1

Equipment & Methods.
Modular window sampleSupport Used:None
Backfill: Bentonite and arisings

Project Name: Ponsharden Cemetery
Project Location: Falmouth
Client: PDP Green Consulting Ltd

Job No: A2292

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:02/03/2021
Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND turf over dark brown gravely clayey topsoil with rootlets **(Made Ground)**			(0.30)
						-0.30		0.30
0.30- 0.50	WS3	D			Stiff brown/grey slightly gravelly CLAY. Gravel is fine - coarse subangular - subrounded slate **(Mylor Slate Formation)**			
0.70- 1.00	WS3	D						(1.30)
1.10- 1.30	WS3	D						
1.50- 1.70	WS3	D				-1.60		1.60
1.80- 2.00	WS3	D			Moderately weak to moderately strong grey MUDSTONE. Very rare thin laminae observed **(Mylor Slate Formation)**			
2.10- 2.30	WS3	D						
2.40- 2.60	WS3	D						(1.70)
					...from 2.50 Behaving as intact rock in moderately strong slate			
2.80- 3.00	WS3	D						
						-3.30		3.30

End of W/S 3.30 m
(Thickness of basal layer not proven)

Remarks:
Core recovery:

0 - 1m 70%
1 - 2m 90%
2 - 3m 80%

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Scale: 1:25
Approved By:
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Window Sampler Log No. WS4

Sheet: 1 of 1

Equipment & Methods. Modular window sampleSupport Used:None Backfill: Bentonite and arisings	Project Name: Ponsharden Cemetery Project Location: Falmouth Client: PDP Green Consulting Ltd	Job No: A2292
Co-ordinates: E: N:	Ground Level (m):	Date Started:02/03/2021 Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50- 0.70	WS4	D			MADE GROUND brown gravelly topsoil with tree roots. Gravel is fine - medium subrounded imported granitic **(Made Ground)**			(0.75)
0.80- 1.00	WS4	D			Stiff brown/grey gravelly CLAY. Gravel is fine - coarse subangular - subrounded slate and flint **(Mylor Slate Formation)**	-0.75		0.75
1.30- 1.50	WS4	D						(1.55)
1.50- 1.70	WS4	D						
1.80- 2.00	WS4	D			...from 1.70 Increased in weathered gravel			
2.10- 2.30	WS4	D				-2.30		2.30
2.40- 2.60	WS4	D			Moderately weak - moderately strong grey/brown METAMUDSTONE. Very thin laminae 1 - 4 mm. Rare quartz gravel. Arising as a clayey gravel **(Mylor Slate Formation)**			
2.70- 3.00	WS4	D						(1.10)
						-3.40		3.40
					End of W/S 3.40 m (Thickness of basal layer not proven)			

Remarks:
Core recovery:

0 - 1m 80%
1 - 2m 80%
2 - 3m 90%

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Scale: 1:25	Approved By:
FIG No.	

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Window Sampler Log No. WS5

Sheet: 1 of 1

Equipment & Methods. Modular window sampleSupport Used:None Backfill: Bentonite and arisings	Project Name: Ponsharden Cemetery Project Location: Falmouth Client: PDP Green Consulting Ltd	Job No: A2292
Co-ordinates: E: N:	Ground Level (m):	Date Started:02/03/2021 Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND brown gravelly topsoil with tree roots **(Made Ground)**			(0.30)
						-0.30		0.30
0.30- 0.50	1	D			Stiff brown/grey gravelly CLAY. Gravel is in abundance subrounded to subangular slate **(Mylor Slate Formation)**			
0.70- 1.00	1	D						(1.50)
1.10- 1.30	1	D						
1.50- 1.70	2	D						
1.80- 2.00	2	D				-1.80		1.80
2.10- 2.30	2	D			Moderately weak to moderately strong brown/grey METAMUDSTONE. Very weak thin laminae 1 to 4 mm. Arising as a silty gravel **(Mylor Slate Formation)**			
2.40- 2.60	3	D						(1.50)
2.80- 3.00	3	D						
						-3.30		3.30

End of W/S 3.30 m
(Thickness of basal layer not proven)

Remarks:

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Scale: 1:25	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Window Sampler Log No. WS6

Sheet: 1 of 1

Equipment & Methods. Modular window sample rigSupport Used:None Backfill: Bentonite and arisings	Project Name: Ponsharden Cemetery Project Location: Falmouth Client: PDP Green Consulting Ltd	Job No: A2292
Co-ordinates: E: N:	Ground Level (m):	Date Started:02/03/2021 Date Completed:02/03/2021

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.10- 0.30	WS6	D			MADE GROUND brown gravelly topsoil with tree roots **(Made Ground)**			(0.30)
						-0.30		0.30
0.40- 0.60	WS6	D			Stiff brown/grey gravelly CLAY. Gravel is in abundance subrounded to subangular slate **(Mylor Slate Formation)**			
0.80- 1.00	WS6	D						(1.00)
1.10- 1.30	WS6	D						
						-1.30		1.30
1.40- 1.60	WS6	D			Moderately weak to moderately strong brown/grey METAMUDSTONE. Very weak thin laminae 1 to 4 mm. Arising as a silty gravel **(Mylor Slate Formation)**			
1.80- 2.00	WS6	D						
2.10- 2.30	WS6	D						(2.00)
2.40- 2.60	WS6	D						
2.70- 3.00	WS6	D						
						-3.30		3.30

End of W/S 3.30 m
(Thickness of basal layer not proven)

Remarks:
Core recovery:

0 - 1m 100% (0m - 1m)
1 - 2m 80% (1.2 - 2m)
2 - 3m 100% (2 - 3m)

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Logged By: CS	Checked By:
Scale: 1:25	Approved By:
FIG No.	

AGS-GS STANDARD WINDOW SAMPLER LOG V2 A2292 PONSHARDEN.GPJ GSG-AGS3-STD TEMPLATE.GDT 3/8/21

Appendix 3

Geotechnical Laboratory Test Results