PHASE II GEO-ENVIRONMENTAL ASSESSMENT REPORT

Cardiff and Vale College

July 2020

hsp consulting

CIVIL | STRUCTURAL | GEOTECHNICAL & ENVIRONMENTAL | TRAFFIC AND TRANSPORT

Lawrence House | 6 Meadowbank Way | Nottingham | NG16 3SB

01773 535555 | design@hspconsulting.com | www.hspconsulting.com

Cardiff and Vale College Site, Cardiff Airport Business Park

Phase II Geo-Environmental Assessment Report

This report was produced by HSP Consulting Engineers Ltd for Gleeds Management Services Ltd on as the Phase II Geo-environmental Assessment Report for a proposed College to identify possible areas of contamination and provide an assessment of potential ground related development constraints to inform feasibility.

This report may not be used by any person other than Gleeds Management Services Ltd and must not be relied upon by any other party without the explicit written permission of HSP Consulting Engineers Ltd. In any event, HSP Consulting Engineers Ltd accepts no liability for any costs, liabilities or losses arising as a result of the use or reliance upon the contents of this report by any person other than Gleeds Management Services Ltd.

All parties to this report do not intend any of the terms of the Contracts (Rights of Third Party Act 1999) to apply to this report. Please note that this report does not purport to provide definitive legal advice.

Issue & Revision History

Revision	Status	Originated	Checked	Approved	Date
-	FINAL	L.E.Jones B.Sc. (Hons), FGS	J. P. Bridgman BSc (Hons), CGeol, FGS	H.Pratt B.Eng (Hons), C.Eng, F.Cons.E, M.I.C.E, MI Mgt.	24.07.2020
Project Number: C3296				**Document Reference:** C3296/PII	

This document is available in hard copy, please contact the author to obtain a copy.

HSP Consulting Engineers Ltd, Lawrence House, 6 Meadowbank Way, Nottingham, NG16 3SB
T 01773 535 555 **W** www.hspconsulting.com

Contents

Appendices

Appendix I	-	Site Location Plan
Appendix II	-	Site Test to Fit Plan
Appendix III	-	Exploratory Hole Logs
Appendix IV	-	Ground Investigation Layout Plan
Appendix V	-	Geotechnical Testing Results
Appendix VI	-	Chemical Analysis Results
Appendix VII	-	LQM PAH Profiling Tool v1.3
Appendix VIII	-	HazWasteOnline™ Waste Classification Results

Executive Summary

HSP Consulting has been commissioned by Gleeds Management Services Ltd to undertake an intrusive ground investigation at the site to investigate the existing ground conditions and provide information on likely constraints to the development, parameters for design and recommendations for any mitigation measures should they be required to inform a feasibility study for a proposed College at the site.

The site is located immediately east of Cardiff Airport Business Park, approximately 1.85km north east of Rhoose village centre. The approximate National Grid Reference for the centre of the site is (NGR) 307473, 167768.

The physical methods of investigation employed were twelve windowless sample boreholes to a maximum depth of 2.00m beg and eight mechanically excavated trial pits to 0.40m begl.

The ground conditions at the site generally comprise topsoil, overlying deposits belonging to the Porthkerry Member – Limestone and Mudstone. The solid deposits comprised brown grey slightly sandy gravelly CLAY with interbedded mudstone and limestone fragments to a maximum depth of 0.40m begl overlying brown orange grey very slightly sandy gravelly CLAY with fragments of mudstone and limestone and occasional limestone cobbles.

Made ground deposits were encountered locally within WS7 to a maximum depth of 0.65m begl. These deposits comprised brown grey sandy slightly gravelly Clay with brick fragments, masonry and sand and were encountered in a firm condition.

HSP would recommend that all foundations are taken down to bear upon the competent natural deposits that have been encountered across the site. Traditional pad foundations would be considered appropriate and should be at a minimum depth of 1.20m. Relative soft spots were encountered and localised deepening of foundations may be required to ensure they are consistently bearing upon competent strata. Once the layout has been confirmed HSP would recommend rotary coring with SPTs (where possible) and unconfined compressive strength testing of recovered core to determine the competency and strength of the near surface soils to confirm the ABP for design.

The underlying geology consists of very weak weathered interbedded limestone and mudstone (clay near surface). During the intrusive ground investigation, the excavation of the trial pits using a 2tonne machine proved to be difficult. Consideration should be given to using larger machinery for the excavation of foundations and also a breaker or rock ripper for deep service trenches.

A ground bearing slab may be appropriate at the site subject to the likely loadings and locations of the proposed buildings. However, should the development be located within close proximity to trees a suspended floor slab may be required.

The results of sulphate and pH testing carried out on selected soil samples taken during this investigation have been compared with the recommendations outlined in BRE Special Digest 1. On the basis of the above, results associated the soils on site have been considered and it is appropriate

to adopt a basic Design Sulphate Class of DS-1 together with and Aggressive Chemical Environment for Concrete (ACEC) of AC-1s.

The concentrations of potential contaminants recorded at the site indicates an acceptably low risk and therefore mitigation measures are not required as part of the development. It is recommended that any reuse of topsoil on site will likely need to meet the requirements of the landscape architect and topsoil testing to the British Standard will be required to determine if the topsoil is suitable or can be made suitable with amelioration.

Based on the chemical analysis report it is considered that specialist materials are not likely to be required for water supply pipes. However, confirmation of supply pipes should be sought from utility providers.

Plausible sources of ground gas were not identified as part of the Phase I Desktop or during the site works. Therefore, ground gas monitoring was not undertaken as part of the investigation.

The executive summary contains an overview of key findings and conclusions. However, no reliance should be placed on the executive summary until the whole of the report has been read. Other sections of the report may contain information which puts into context the findings noted within the executive summary.

1. Introduction

1.1 Background

A new three storey College with associated hard/soft landscaping is proposed at the site. A site test to fit plan is available in Appendix II.

1.2 Client Brief & Scope

HSP Consulting has been commissioned by Gleeds Management Services Ltd to undertake an intrusive ground investigation at the site to investigate the existing ground conditions and provide information on likely constraints to the development, parameters for design and recommendations for any mitigation measures.

The report presents the following information:

- a summary of the previous Geo-environmental Reports (Section 1.5 below).
- details of the ground investigation undertaken and the ground conditions encountered.
- details and results of the geotechnical testing and contamination analysis.
- recommendations for mitigating constraints to the proposed redevelopment where appropriate and providing parameters for foundation design.

Where applicable, the fieldwork was undertaken in accordance with BS5930:2015 Code of Practice for Site Investigations (Ref 6) and BS10175:2011+A1:2013 Investigation of Potentially Contaminated Sites (Ref 8).

1.3 Report Objectives

The objectives of this report are to:

- establish the geological and hydrogeological conditions using existing available/published information;
- summarise available information and identify site specific geotechnical and environmental hazards which may place a constraint upon the proposed site use;
- produce an updated Conceptual Site Model identifying potential pollution linkages between sources of contamination, pathways and receptors.

1.4 Limitations

The recommendations made in this report are based on the findings of the intrusive ground investigation undertaken by HSP Consulting Ltd on 10th and 11th June and 1st July 2020.

1.5 Previous Reports

HSP Consulting Engineers Ltd has previously produced a Phase I Desk Study report for the site, details of which can be found below:

- HSP Consulting Engineers Limited – Cardiff and Vale College Site - Phase I Geo-Environmental Desk Study Report, June 2020, Ref: C3296/PI. (Ref 1.)

2. Review of Existing Information & Geoenvironmental Setting

2.1 The Site

2.1.1 Location

The site is located immediately east of Cardiff Airport Business Park, approximately 1.85km north east of Rhoose village centre. The approximate National Grid Reference for the centre of the site is (NGR) 307473, 167768. A Site Location Plan is included in Appendix I.

2.1.2 Description

The site is irregular in shape and approximately 9.05Ha in area. The majority of the site comprises agricultural land accessed off Blackton Lane to the north. The fields have a range of semi mature and mature trees/hedgerows at the boundaries and during the May walkover the vegetation was dense, making it difficult to determine if there are other viable access points to the fields. At the time of the walkover the fields had recently been planted with maize crop that was beginning to germinate. The northern two thirds of the site generally falls towards the north from a low ridge which strikes east west, within the southern third of the site levels fall slightly adjacent to Port Road.

The most southerly field has been left fallow and is overgrown with the exception of the boundaries. The southeast, southwest, and north western boundaries of this area have been landscaped with bunds which vary in height with a number of sparse semi mature trees adjacent to the highway (airport / business park access).

2.1.3 Surrounding Land Use

The main features of interest identified are:

North:	Residential dwellings, the A4226 and agricultural land beyond.
East:	Agricultural land, hotel, caravan park and airport parking.
South:	Cardiff Airport parking, hotel and Agricultural land beyond.
West:	Cardiff Airport.

2.1.4 Proposed End Use

A three storey college development is proposed for the site alongside car parking, sports area and hard and soft landscaping.

2.2 Geology

2.2.1 Made Ground

The BGS mapping does not indicate any made ground on the site. However, a development is shown in the east of the site on historical mapping from the 1940's to the 1960's. Therefore it is likely that limited Made Ground will be present in this area of the site, any Made Ground encountered would be of an unknown composition.

2.2.2 Superficial Deposits

The BGS mapping does not indicate any superficial deposits on the site.

2.2.3 Bedrock Geology

BGS bedrock mapping indicates the site is underlain by the Porthkerry Member – Limestone and Mudstone, Interbedded of the Jurassic Period, there is no current BGS description of the unit. The BGS description of the Blue Lias Parent Unit is as follows '*Thinly interbedded limestone (laminated, nodular, or massive and persistent) and calcareous mudstone or siltstone (locally laminated). Individual limestones are typically 0.10-0.30m thick. In some areas, intervening mudstone units with relatively few limestone beds. Also includes littoral limestone facies of the Radstock Shelf - Mendip area and South Wales.'*

2.2 Pertinent Site Sensitivity Information

Based on the information collated for the desk study, the geo-environmental setting of the site is summarised as follows:

- The site is recorded as part of five fields on the 1st Edition mapping (1884), with a small development noted in the east of the site from 1938 until the mid 1960's where it is no longer present. With no significant changes noted to the present day.
- Historically, the surrounding land use is predominantly agricultural. With limited development until the mid 1960's where the airport is recorded to the west of the site, with moderate expansion noted through the 1970's and 1980's until the 1990's where the Business Park immediately adjacent to the west of the site is noted.
- The bedrock geology is designated as a Secondary A Aquifer.

Based on the above, the environmental sensitivity of the site can be considered to be Low at this stage.

3. Fieldwork & Factual Information

Site work was carried out between the 10th and 11th June and 1st July 2020. Where applicable, the fieldwork was undertaken in accordance with BS5930:2015 Code of Practice for Ground Investigations (Ref. 6) and BS10175:2011+A1:2013 Investigation of Potentially Contaminated Sites (Ref. 8).

The exploratory holes were positioned to provide spatial coverage across the site, to provide information for foundation design and obtain representative soil samples for geotechnical and geo-environmental analysis.

3.1 Exploratory Methods

The exploratory methods are detailed in the table below.

Type	Quantity	Maximum Depth (m)	Details
Windowless Sampling Borehole	12	2.00	WS01 to WS11
Mechanically excavated Trial Pit	8	0.40	TP01 – TP08

The exploratory holes were logged and sampled by an Engineer from HSP Consulting Ltd and the logs are presented in Appendix III. The exploratory hole locations are shown on the Ground Investigation Layout Plan presented in Appendix IV.

Fragmentary bulk and disturbed samples were recovered from materials revealed within all the exploratory holes. Geo-environmental samples, placed in plastic tubs and glass jars supplied by the laboratory, were also obtained specifically for chemical analysis. The samples were taken to UKAS accredited laboratories for further examination and testing.

3.2 In-situ Testing

3.2.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) were carried out at 1.00m intervals in the boreholes. The SPTs were undertaken in accordance with BS 1377:1990 and the results are included on the appended borehole logs (Appendix III).

3.3 Laboratory Testing

The laboratory testing schedules were prepared by HSP Consulting Ltd.

3.3.1 Geotechnical Testing

Geotechnical testing has been undertaken by a UKAS accredited laboratory as part of the works at the site:

- Natural moisture content
- Particle size distribution

The laboratory testing was carried out by Apex Testing Solutions (UKAS accredited, laboratory No.7771) in accordance with BS1377:1990 using calibrated equipment specifically for the British Standard. The testing certificates can be found within Appendix V.

3.3.2 Chemical Analysis

The geo-environmental samples retained specifically for chemical analysis were stored in cooled containers until delivery to the laboratory by courier.

Chemical analysis was scheduled on twenty-one samples for the presence of a selected suite of potential contaminants as outlined in the tables below:

Table 1 – Chemical Analysis

Exploratory Hole Location & Depth	Sample Description
WS01: 0.55m	CLAY[1,3]
WS02: 0.50m	CLAY[1]
WS03: 0.40m	CLAY[1]
WS04: 0.35m	CLAY[1,3]
WS06: 0.25m	TOPSOIL[1,3]
WS07: 0.40m	MADE GROUND[1,2,3]
WS09: 0.30m	CLAY[1,3]
WS011: 0.35m	CLAY[1,3]

[1] HSP Standard Suite, [2]Asbestos Screen [3] BRE Sulphate Suite.

Table 1a – HSP Standard Chemical Analysis Suite

Metals	Cadmium	Chromium (III & VI)	Copper
	Lead	Mercury	Nickel
	Zinc		
Semi Metals and Non-metals	Arsenic	Boron	Selenium
Others	pH	Asbestos (Screen & ID)	
Inorganic Chemicals	Cyanide	Sulphate	Sulphide
Organic Chemicals	PAH (US EPA 16)	TPH (CWG)	

The contamination analysis was carried out by Chemtest Ltd (UKAS accredited, laboratory No. 2183) during the period 15th to 19th June 2020. The results are presented in Appendix VI.

3.4 Ground Conditions

3.4.1 Published Geology

The published geology indicates the site is underlain by bedrock geology of the Porthkerry Member – Limestone and Mudstone, as described in Sections 2.2.3. No superficial deposits are expected upon the site.

3.4.2 Ground Conditions on site or General Geology & Revealed Strata

The exploratory hole data confirms the published information. The strata generally comprises:

Table 2 – Encountered Ground Conditions

Strata		Depth Range (mbegl)	Max. Thickness (m)	Description
—	TOPSOIL	G.L - 0.40	0.40	Brown slightly sandy clayey TOPSOIL with fine coarse mudstone and limestone gravels and occasional brick, concrete, glass and ceramic fragments.
—	MADE GROUND	0.30 – 0.65	0.35	MADE GROUND - Brown grey sandy gravelly clay with gravels of mudstone and limestone with occasional brick fragments, masonry and sand. (WS7 Only).
Bedrock	PORTHKERRY MEMBER – LIMESTONE AND MUDSTONE	0.20 -0.60	0.40	Brown grey slightly sandy gravelly CLAY with interbedded mudstone and limestone fragments.
		0.25 – 2.00	1.75	Brown orange grey very slightly sandy gravelly CLAY with fragments of mudstone and limestone and occasional limestone cobbles.

3.5 Groundwater Levels

No groundwater was encountered during the drilling of the window sample boreholes or excavation of the trial pits.

3.6 Ground Gas Monitoring

No plausible sources of ground gas were identified within the Phase I Desktop Study (Ref. 1) or as part of the intrusive works. Therefore ground gas monitoring has not been included as part of this investigation.

3.7 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was observed during the intrusive investigation.

4. Geotechnical Assessment

4.1 Detailed Ground Model

For the purpose of this foundation assessment the information gained from the window sample boreholes and trial pits has been included. The exploratory logs are presented in Appendix III.

4.1.1 Topsoil

The surface cover across the site comprised brown slightly sandy clayey topsoil with occasional fragments of brick, glass, ceramic and mixed lithologies to a maximum depth of 0.40m begl. The depth of the topsoil and anthropogenic inclusions encountered are considered to be a results of recent farming activities and ploughing depths.

A trial pit (TP08) was undertaken within a landscaping bund located to the western boundary of the site. It was found to generally comprise topsoil deposits.

4.1.2 Made Ground

Made ground deposits were only encountered within WS07 to a maximum depth of 0.65m begl. These deposits comprised brown grey sandy slightly gravelly Clay with brick fragments and masonry sand and were encountered in a firm condition.

4.1.3 Porthkerry Member – Limestone and Mudstone

Bedrock deposits belonging to the Porthkerry Member were encountered within all exploratory locations to a maximum depth of 2.00m begl. The deposits generally comprised brown grey slightly sandy gravelly CLAY with interbedded mudstone and limestone fragments to a maximum depth of 0.40m begl overlying brown orange grey very slightly sandy gravelly CLAY with fragments of mudstone and limestone and occasional limestone cobbles.

The base of the Porthkerry Member was not fully penetrated in any of the exploratory locations.

4.1.4 In-situ Testing and Assessment

A series of Standard Penetration Tests (SPT's) have been undertaken within all the boreholes. The following table summarises the N values at depth across the site.

Table 3 – SPT N Values

Depth (m)	Range of 'N' Values	Mean 'N' Value	Description
1.00	16 - 50	44	CLAY
2.00	50	50	

Four Plasticity Index tests and Moisture Content tests have been undertaken to confirm the visual description and engineering behaviour of the soils. The results are included in Appendix V.

The results indicate compliance with the definition of soils of intermediate to high plasticity (CI and CH) after the classification system of BS5930: 2015. These soils are generally considered

to be medium to high volume change potential in accordance with the National House Building Council (NHBC) Standards, Chapter 4.2: 2007.

Table 4 - Plasticity Index Values

Sample Ref:	Laboratory Material Descriptions	LL (%)	PL (%)	PI (%)	% passing 425µm	Modified PI (%)*	Soil Class	MC (%)
WS02 – 1.45m	*Yellowish brown slightly gravelly CLAY*	45	19	26	87	23	CI	19.2
WS05 – 1.70m	*Yellowish brown CLAY*	53	23	30	100	30	CH	23.3
WS07 – 1.50m	*Yellowish brown slightly gravelly CLAY*	43	22	21	81	17	CI	19.4
WS08 – 1.00m	*Brownish grey slightly gravelly CLAY*	48	21	27	90	24	CI	18.5

* Rounded up

4.2 Earthworks

At the time of writing, no detailed plans indicating likely levels have been provided. An indicative site test to fit plan has been made available (Appendix II). The site varies in level and therefore it is likely that some earthworks operations may be required to provide a level development platform towards the north western corner of the site.

It should be noted that the near surface soil materials will be susceptible to softening during periods of wet weather and will be easily damaged by site traffic and deterioration at times of heavy rainfall.

Therefore should any earthworks be required, further investigation, sampling and testing will be necessary to allow an assessment of the materials suitability for re-use as engineered fill to be made.

4.3 Excavations

Excavations to proposed formation levels for new foundations and infrastructure should be achievable using standard plant. The underlying geology consists of very weak weathered interbedded limestone and mudstone (clay near surface). During the intrusive ground investigation, the excavation of the trial pits using a 2tonne machine proved to be difficult. Consideration should be given to using larger machinery for the excavation of foundations and also a breaker or rock ripper for deep service trenches.

Random and potentially severe falls are anticipated from the faces of near vertically sided unsupported excavations carried out at the site. Therefore, where personnel are required to enter near vertically sided excavations, it is considered that support should be provided to the full depth of all excavations.

It is recommended that all support systems are continually assessed by fully trained or experienced personnel.

4.4 Foundations

At the time of writing, an indicative test to fit plan was made available, this can be found within Appendix II. The plan proposes the construction of a three-storey educational facility on the site with associated car parking, sports areas and soft landscaping.

For the purpose of this foundation assessment the information gained from the window sample boreholes and trial pits has been included.

The table below shows the indicative allowable bearing pressure (ABP) that could be achieved using strip or pad foundations across the site. The ground conditions were generally consistent across the site, however the SPTs varied significantly at 1m begl. Therefore, an ABP has been calculated using the lowest SPT data at this stage with the average in brackets.

Table 4 – Allowable Bearing Capacity

Depth (m)	SPT $(N_1)_{60}$ Value	Eurocode 7 Soil Strength Description	Consistency (BS5930) Description	Approximate ABP (k/Nm^2) – 0.60m wide strip footing (Average)	Approximate ABP (kN/m^2) – 2x2m pad footing (Average)
1.00	21->50	Very High	Very Stiff	225 (~500*)	250 (~500*)
2.00	>50	Very Weak	Very Weak	~500*	~500*

*Subject to rotary coring and compressive strength testing, see paragraph below.

HSP would recommend that all foundations are taken down to bear upon the competent natural deposits that have been encountered across the site. Traditional pad foundations would be considered appropriate and should be at a minimum depth of 1.20m begl with local deepening by up to 2m where soft spots are encountered.

Relative soft spots were encountered at 1.00m begl depth in the areas of WS02, WS05 and WS07. To confirm the ABP for design we would recommend rotary coring (with SPT where possible) and unconfined compressive strength testing of any rock core to determine the competency and strength of the near surface soils and rock within the influence of foundation loads and to prove the depth to rock head across the building footprint, once the layout is more certain.

Foundations (and ground floor slabs) should be designed in accordance with NHBC Standards Chapter 4.2 Building near Trees (Ref 9).

4.5 Ground Floor Slab

A ground bearing slab may be appropriate at the site subject to the likely loadings and locations of the proposed buildings.

A suspended floor slab may be required for the development should the building be located within close proximity to trees due to the medium volume change potential of the underlying soils.

4.6 Concrete Classification

The results of sulphate and pH testing carried out on selected soil samples taken during this investigation have been compared with the recommendations outlined in BRE Special Digest 1, Part 1: 2005 (Ref 12).

The guidelines given in BRE Special Digest 1 are based upon a site classification relating to its previous usage. It is considered appropriate to define this site as a 'natural ground' location for the purposes of concrete classification.

On the basis of the above, it is considered appropriate to adopt a basic Design Sulphate Class of DS-1 together with and Aggressive Chemical Environment for Concrete (ACEC) of AC-1s.

4.7 Further Investigation Recommendations

In-situ CBRs to confirm pavement design

It is recommended that in-situ CBR testing should be undertaken on site once the final design layout has been confirmed in order to inform design.

Confirmation of Allowable Bearing Pressure for design

To confirm the ABP for design we would recommend rotary coring with SPTs (where possible) and unconfined compressive strength testing of recovered core to determine the competency and strength of the near surface soils within the influence of foundation loads and prove the rock head across the building footprint, once the layout is more certain.

Infiltration drainage analysis for design

Once the location of the building has been confirmed HSP would recommend undertaking a series of infiltration drainage tests at pertinent locations on the site to assess the suitability of soakaway drainage on the site.

5. Environmental Assessment

5.1 Introduction

The approach to the human health risk assessment reported here follows the principals given in CLR 11, i.e. application of the following assessment hierarchy:

- Tier 1 risk screening by establishment of potential pollutant linkages, i.e. the preliminary conceptual site model (PCSM), or
- Tier 2 generic quantitative assessment using generic assessment criteria (GACs) that represent 'acceptably low' risk, or
- Tier 3 quantitative risk assessment using site specific assessment criteria (SSACs) that represent 'unacceptable risk', or where generic assessment criteria are not available or they are not applicable to the CSM.

The results of laboratory analysis have been screened against GACs including the Defra Category 4 Screening Levels (C4SL) and LQM and CIEH S4ULs for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3180. All rights reserved). (Refs 10 and 11 respectively).

In the absence of a standard scenario for a school environment the standard exposure scenario of residential without home grown produce has been used to identify potential exposure pathways for human health receptors. Controlled water, flora and fauna and property receptors have also been included within the CSM. Our Tier 2 HHRAs for school sites are screened against the GACs representative of minimal risk for residential without home grown produce end use, we believe this to be appropriate based on the precautionary principle the CLR guidance advocates.

It should be noted that organic contamination (PAH, TPH and BTEX) have been screened against the GAC for 1% Soil Organic Matter (SOM).

The assessment of PAHs is undertaken using the surrogate marker approach; recommended by Health Protection Agency (2010) guidance, providing the PAH profile is sufficiently similar to the coal tars tested by Culp et al (1998). Where PAH profile is not sufficiently coal tar like the TEF method is adopted using the LQM and CIEH S4ULs. Prior to assessment a PAH profile is generated for all samples analysed for PAH using the LQM PAH Profiling Tool v1.3 (Ref 14), the graphical output is presented in Appendix VII.

5.2 Assessment of Soil Analysis Results

Eight samples, as detailed in section 3.3.2, were scheduled for analysis from the development area. These provide a basis for characterising the soils to outline the potential impacts on human health and any environmental receptors from any contamination found.

The screening process for on-site human health receptors show that the GACs for a residential without home grown produce setting were not exceeded.

5.3 Human Health Mitigation

The concentrations of potential contaminants recorded at the site indicates an acceptably low risk and therefore mitigation measures are not required as part of the development.

It is recommended that any reuse of topsoil on site will likely need to meet the requirements of the landscape architect and topsoil testing to the British Standard (BS: 3882:2015 Specification for Topsoil - Ref 23) will be required to determine if the topsoil is suitable or can be made suitable with amelioration.

Should any obvious evidence of unexpected contamination be encountered during the redevelopment works it should be reported to HSP so that an inspection can be made and appropriate sampling and assessment work be carried out.

Appropriate health and safety precautions should be adopted during any excavation works to avoid exposure to potentially contaminated soils and dust.

5.4 Water Supply

The environmental analysis for the site has been compared to the following document in order to assess the most appropriate pipe material that should be used upon the site for mains water supply:

> 'Guidance for the selection of water supply pipes to be used in Brownfield sites – UK Water Industry Research – Ref: 10/WM/03/21' (Ref. 16).

Based on the chemical analysis report it is considered that specialist materials are not likely to be required for water supply pipes. However, confirmation of supply pipes should be sought from utility providers.

5.5 Waste Classification

The results of the chemical testing have been assessed using web-based software for classifying hazardous waste, using HazWasteOnline™. The majority of materials tested have been classified as non-hazardous. One sample collected from WS06 at 0.25m begl has been classified as Hazardous. The results are included in Appendix VIII.

5.6 Updated Conceptual Site Model

The PCSM and Summary of plausible pollutant linkages was produced by undertaking a Source-Pathway-Receptor analysis of the site and is present in the Desk Study (Ref. 1). Based on the findings of this and the previous investigation the updated conceptual site model has been updated and is presented in the table below.

Table 5 – Updated Conceptual Site Model

Source	Pathway	Receptor	Consequence	Probability	Risk	Comments
On site **S1:** Historical and Contemporary land use: Agricultural land. Historical development in the east of the site.	**P1:** Human uptake pathways	**R1:** End Users **R2:** Construction and maintenance workers	Mild	Unlikely	Very Low	Concentrations of contaminants of concern are below the relevant GACs within soils across the site and therefore the risk is considered to be VERY LOW.
	P2: Horizontal and vertical migration of contaminants through potentially permeable soils and rocks. **P3:** Migration of contaminants along preferential pathways (man- made). **P4:** Surface runoff.	**R3:** Controlled Water: Groundwater & Surface Water	Mild	Unlikely	Very Low	The bedrock deposits are classified as a Secondary A Aquifer. No exceedances were encountered within soils on site and therefore the risk is to controlled waters is considered to be VERY LOW.
Off Site (within 250m) **S2:** Historical and Contemporary land use: Agricultural land, Nearby quarries	**P2:** Horizontal and vertical migration of contaminants through potentially permeable soils and rocks. **P3:** Migration of contaminants along preferential pathways (man- made). **P4:** Surface runoff.	**R1:** End Users **R2:** Construction and maintenance workers	Mild	Low	Low	Testing indicates the soils are unlikely to be aggressive to concrete and it is considered appropriate to adopt a basic Design Sulphate Class of DS-1 together with an Aggressive Chemical Environment for Concrete (ACEC) of AC-1s. At this stage the risk is considered to be LOW. The chemical analysis of the soils indicates specialist materials are unlikely be required for water supply pipes at the site.
	P2: Horizontal and vertical migration of contaminants through potentially permeable soils and rocks. **P3:** Migration of contaminants along preferential pathways (man- made). **P4:** Surface runoff. **P5:** Vertical and lateral migration of ground gases and/or vapour.	**R4:** Property, services and substructures **R5:** Adjacent Residential Properties	Medium	Unlikely	Low	Plausible sources of ground gas were not identified as part of the Phase I Desktop or during the site works. Therefore, ground gas monitoring was not undertaken as part of the investigation. Therefore, no ground gas protection measures should be required within any new development upon the site and the risk is considered to be LOW.
	P6: Root uptake.	**R6:** Proposed Flora and fauna	Mild	Unlikely	Very Low	Contamination above the relevant GACs was not identified across the site, therefore the risk associated with root uptake from proposed flora and fauna is considered to be VERY LOW.

6. References

1. HSP Consulting Engineers Limited – Cardiff and Vale College Site - Phase I Geo-Environmental Desk Study Report, June 2020, Ref: C3296/PI.
2. BRITISH GEOLOGICAL SURVEY. 1996. Cardiff. England and Wales Sheet 263. Solid and Drift. 1:50 000 (Keyworth, Nottingham: British geological Survey).
3. British Geological Survey Lexicon Search - http://www.bgs.ac.uk/lexicon/
4. Department of the Environment Industry Profiles.
5. Site Investigation in Construction, Volume 3, Specification for Ground Investigation 2nd Edition.
6. BS 5930:2015 Code of Practice for Ground Investigations.
7. BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)
8. BS10175:2011 +A1:2013 Investigation of Potentially Contaminated Sites - Code of Practice.
9. NHBC Standards, Chapter 4.2, Building near trees.
10. Department for Environment, Food and Rural Affairs and Contaminated Land: Applications in Real Environments (CL:AIRE) (December 2013). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.
11. Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
12. BRE Special Digest 1:Concrete in Aggressive Ground, 2005, Building Research Establishment.
13. CL:AIRE The definition of Waste: Development Industry Code of Practice, 2008.
14. Department for Environment, Food and Rural Affairs and Contaminated Land: Applications in Real Environments (CL:AIRE) (December 2013). SP1010: Appendix E Provisional C4SLs for Benzo(a)pyrene as a surrogate marker for PAHs.
15. www.environment-agency.gov.uk
16. HMSO, Water Supply (Water Quality) Regulations, 2002.
17. UK Water Industry Research, Guidance for the selection of water supply pipes to be used in Brownfield sites, Ref:10/WM/03/21.

Appendix I

DO NOT SCALE

NOTES:

N

hsp consulting
Lawrence House, Meadowbank Way,
Eastwood, Nottingham, NG16 3SB
Tel: 01773 535 555 Fax: 0870 600 6091
www.hspconsulting.com

CLIENT:
Gleeds Management Services Ltd

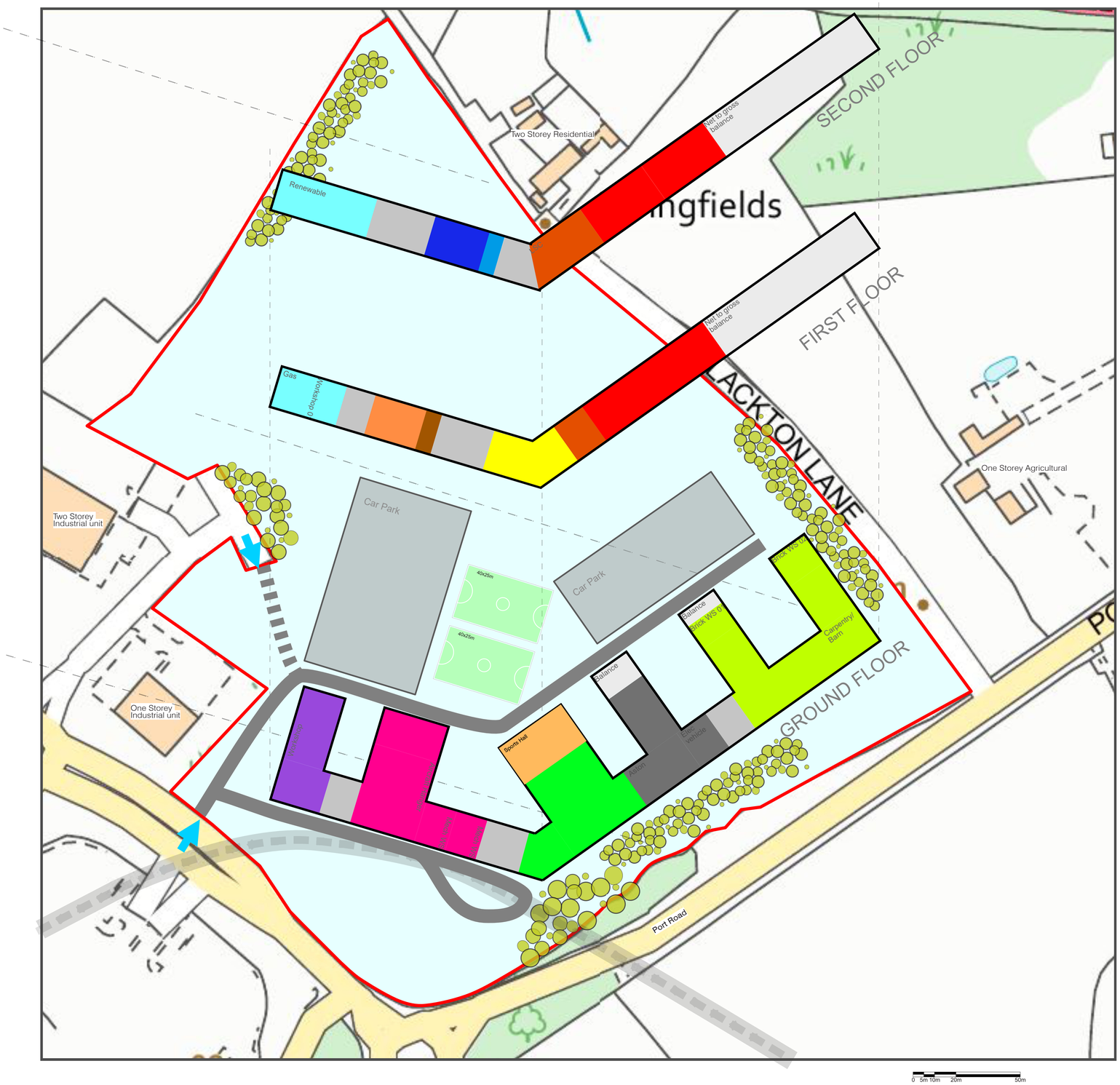
PROJECT:
Cardiff Airport Business Park

TITLE:
Site Investigation Layout Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN:	DATE:
DRS	June 2020
PROJECT No:	DRAWING No:
CABP	502

Appendix II

CAVC: RHOOSE SITE Site: Test to Fit Scale: 1:1000 @ A1; 1:2000 @ A3



CAVC Rhoose Advanced Technology Centre	
College Specifics:	
No. of pupils	TBC
FTE staff	TBC
Total Building Area / m2	
General teaching	1,633
IT & CAD teaching	330
HE/Business	562
Non-Curriculum	1068
Student Services	95
Engineering	757
Motor vehicle	933
Building Services	991
Construction	1901
Aerospace Engineering	1319
Cabin crew	95
Math & labs	341
LSC	626
Sports Hall	594
Net Total	11227
Circulation	2,000
Net to Gross Balance	2,519
Gross Total	15,996
External Spaces	
Spaces	TBC
Parking	
No. of Spaces	TBC

Points of Note.

- Adjacencies to be developed with CAVC - test to fit is indicative.
- 50% of building programme is required to be on ground floor. Some spaces may need to be multi-story.
- Three storey fit on site.
- Building shown facing the roundabout on Port Road for maximum visibility with central entrance and prominent street frontage.
- Maximum depth for teaching spaces considered for daylight penetration (deeper spaces may require natural top light).
- Aerospace Engineering department oriented towards Cardiff Airport.
- Currently no external spaces have been defined - massing allows for maximum outdoor space.
- 350-400 car parking spaces

Site Access.

- Multiple options for site access - to be reviewed once car parking and out door space requirements are established.
- Vehicular access required to rear of Engineering, Aerospace & Construction

Phasing and Delivery.

- No existing buildings on the site.

Utilities:

- Not currently known.

Appendix III

Trial Pit Log

Trialpit No **TP01** Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

1 2 3 4 5

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP04**

Sheet 1 of 1

Project Name:	Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location:	Cardiff Airport Business Park, Wales	Dimensions (m): Depth 0.40		Scale 1:25
Client:	Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

1
2
3
4
5

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP05**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

1
2
3
4
5

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

AGS

Trial Pit Log

Trialpit No **TP06**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP07** Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
				0.40			Very weak brown orange slightly sandy very gravelly weathered LIMESTONE.
							End of pit at 0.40 m

1
2
3
4
5

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Trial Pit Log

Trialpit No **TP08**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: - Level:	Date 01/07/2020
Location: Cardiff Airport Business Park, Wales		Dimensions (m): Depth 0.40	Scale 1:25
Client: Gleeds Management Services Ltd			Logged LAB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to coarse. Gravel is sub angular to sub rounded of mudstone, limestone and occasional brick, glass ceramic and concrete.
							End of pit at 0.40 m

1
2
3
4
5

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 0.40m depth due refusal.

Stability: Sides stable

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.55	ES		0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		0.85 1.00	ES	50 (15,9/50 for 190mm)	1.00			Very weak brown orange grey weathered MUDSTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone. *....with a limestone cobbles content.* End of borehole at 1.00 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES		0.40			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		1.00		N=38 (3,4/4,15,11,8)				Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
		1.45 1.50	B	50 (25 for 60mm/50 for 115mm)				*...with interbedded mudstone / limestone and clay.*
					2.00			End of borehole at 2.00 m

Remarks

1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 2.00m depth due refusal.

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40 0.40	ES	50 (9,6/50 for 200mm)	0.25 0.40			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete. Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone. End of borehole at 0.40 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 0.40m depth due refusal.

Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.35	ES		0.25			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		0.70		N=50 (8,10/50 for 290mm)	0.60			Very weak brown grey slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to sub angular of mudstone and limestone.
		0.70 - 1.00	B		1.00			Very weak brown orange grey weathered LIMESTONE. Recovered as a slightly sandy very gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
								End of borehole at 1.00 m

1 2 3 4 5 6 7 8 9 10

Remarks

1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

AGS

Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES		0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		0.70		N=24 (7,7/4,10,6,4)	0.55			Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is angular to sub angular of mudstone and limestone.
		0.90	TJ					Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
		1.50		N=50 (25 for 75mm/50 for 240mm)				
		1.70	B		2.00			End of borehole at 2.00 m

Remarks

1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 2.00m depth due refusal.

Borehole Log

Borehole No. **WS06**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 10/06/2020 - 10/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.25	ES		0.25			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		1.00		50 (3,6/50 for 200mm)	1.00			Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
								End of borehole at 1.00 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

Borehole Log

Borehole No. **WS07**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 11/06/2020 - 11/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES		0.30			MADE GROUND - Brown slightly sandy slightly gravelly clayey topsoil. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		0.60	ES		0.65			MADE GROUND - Brown grey sandy slightly gravelly clay. Sand is fine to medium. Gravel is angular to sub angular of brick fragments, crushed brick, masonry and sand.
		1.00		N=16 (8,5/3,4,4,5)				Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
		1.50	B					End of borehole at 2.00 m
		2.00		50 (7,9/50 for 105mm)	2.00			

Remarks

1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 2.00m depth due refusal.

Borehole Log

Borehole No. **WS08**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 11/06/2020 - 11/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00 1.00	B	50 (6,10/50 for 175mm)	0.30 0.65 1.00			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete. Firm brown slightly gravelly CLAY. Gravel is angular to sub angular of limestone and mudstone. Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone. End of borehole at 1.00 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

Borehole Log

Borehole No. **WS09**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 11/06/2020 - 11/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.20			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
		0.50		50 (25 for 75mm/50 for 90mm)	0.50			Firm brown slightly gravelly CLAY. Gravel is angular to sub angular of limestone and mudstone.
					0.55			Limestone obstruction.
								End of borehole at 0.55 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 0.55m depth due obstruction.

Borehole Log

Borehole No. **WS10**

Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 11/06/2020 - 11/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70		N=50 (25 for 135mm/50 for 261mm)	0.25			Brown slightly sandy slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete.
					1.00			Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone.
								End of borehole at 1.00 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

Borehole Log

Borehole No. **WS11**

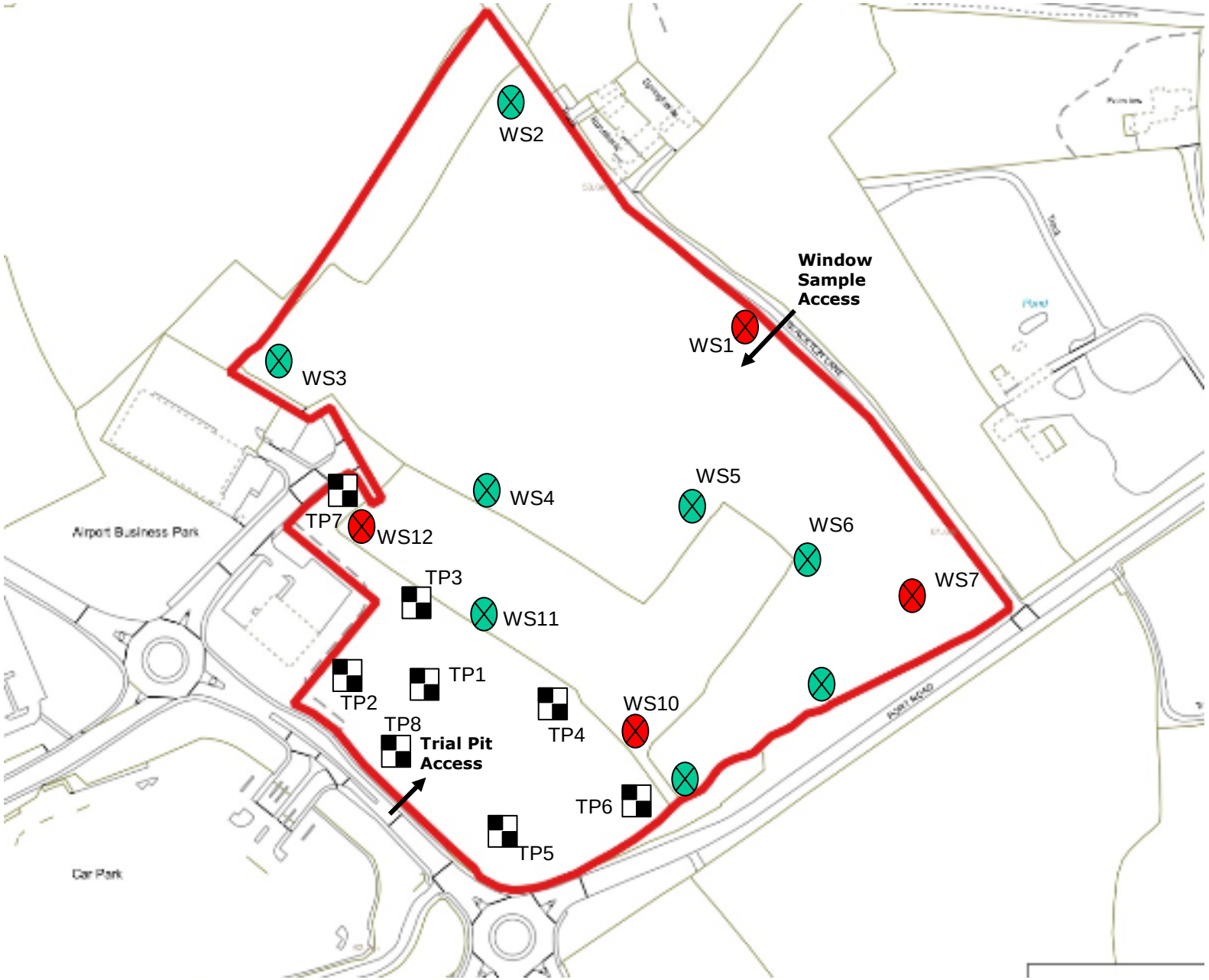
Sheet 1 of 1

Project Name: Cardiff & Vale College Site	Project No. C3296	Co-ords: -	Hole Type WS
Location: Cardiff Airport Business Park, Wales		Level:	Scale 1:50
Client: Gleeds Management Services Ltd		Dates: 11/06/2020 - 11/06/2020	Logged By LAB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70		50 (10,6/50 for 125mm)	0.35 0.50 1.00			Brown slightly sandy very slightly gravelly clayey TOPSOIL. Sand is fine to medium. Gravel is angular to sub angular of mudstone, limestone with occasional brick, ceramic, glass and concrete. Firm brown slightly gravelly CLAY. Gravel is angular to sub angular of limestone and mudstone. Very weak brown orange grey weathered LIMESTONE. Recovered as a very slightly sandy gravelly clay. Sand is fine to medium. Gravel is sub angular to sub rounded of mudstone and limestone. End of borehole at 1.00 m

Remarks
1. No groundwater was encountered during the excavation process.
2. Borehole was terminated at 1.00m depth due refusal.

Appendix IV



DO NOT SCALE

NOTES:

- Window Sample Location
- Window Sample Location with Gas Monitoring Install
- Trial Pit Location

hsp consulting
Lawrence House, Meadowbank Way,
Eastwood, Nottingham, NG16 3SB
Tel: 01773 535 555 Fax: 0870 600 6091
www.hspconsulting.com

CLIENT:
Gleeds Management Services Ltd

PROJECT:
Cardiff Airport Business Park

TITLE:
Site Investigation Layout Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN:	DATE:
DRS	July 2020
PROJECT No:	DRAWING No:
C3296 -CABP	502