CAULMERT LIMITED

Engineering, Environmental & Planning

Consultancy Services

Adra

FOREMER RHOS STREET SCHOOL,
RHOS STREET, RUTHIN
LL15 1DY
PHASE II GEO-ENVIRONMENTAL REPORT

Prepared by: David Kitching

Caulmert Limited
Intec,
Parc Menai,
Bangor,
Gwynedd,
LL57 4FG.

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APPROVAL RECORD

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Project Manager: David Kitching

Caulmert Limited: Intec, Parc Menai, Bangor, LL57 4FG

Tel: 01248 672666

Author	Amy Pritchett/David Kitching	**Date**	November 2021
Reviewer	David Kitching	**Date**	November 2021
Approved	Alan Jones	**Date**	November 2021

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1 INTRODUCTION

1.1 Details of Commission

1.1.1 Caulmert Ltd were commissioned by Atticus Planning on behalf of Adra ("the Client") to undertake a Phase II Geo-environmental appraisal of the former Rhos Street School, Ruthin ("the Site").

1.1.2 Caulmert Ltd have previously been commissioned to undertake a Phase 1 Desk Study of the site and this appointment follows the recommendations within that report, which recommended an intrusive investigation to be undertaken at the former school.

1.1.3 While a summary of the pertinent points of the Phase 1 Desk Study are included within this report it is recommended that the Phase 1 Desk Study is read in its entirety:

- Phase 1 Geoenvironmental Desk Study, For the Development of the Former Rhos Street School Ruthin, January 2021 (Report Ref:4863-XX-XX-RP-O-0300.S0.P0.)

1.1.4 This report is intended to support a planning application for the proposed development while also providing due diligence information prior to the purchase of the site, along with providing preliminary design information.

1.1.5 This report constitutes a geotechnical assessment of the ground conditions and a geo-environmental appraisal of the site including a contamination risk assessment of the Site. This includes the derivation of a provisional Conceptual Site Model in accordance with the staged procedure outlined in "*Model Procedures for the Management of Land Contamination*" (CLR11).

1.2 Limitations of this Study

1.2.1 This report is solely for the use of the Client and should not be relied upon by third parties without prior written consent from Caulmert.

1.2.2 Information used within this report has been gathered from data sets compiled by third party organisations and purchased on behalf of the Client. The validity and accuracy of this third-party information is outside the control of Caulmert.

1.2.3 Interpretation and recommendations contained within this report should not be assumed valid for adjacent areas of land or alternative land uses and are based upon the proposed layout provided to Caulmert at the time of compiling this report.

1.3 Objectives of Report

1.3.1 The objective of this report is to complete an assessment of potential environmental and geotechnical liabilities associated with the proposed redevelopment of the site. while providing preliminary recommendations including geotechnical parameters to allow design of sub-structures.

1.4 Scope of Report

1.4.1 The scope of works consists of the following:

- An assessment of ground conditions given the Site's planned development, its construction phase and the foundation requirements.
- Identification of any significant environmental or geotechnical constraints to the development of the site.
- Confirmation of the ground conditions recorded in the desk study report.
- Investigate potential contamination sources identified in the desk study report.
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- Updating the preliminary conceptual site model (CSM) identifying potential sources, pathways and receptors of contaminants from the previous Phase I Desk Study and current ground investigation data; and
- Recommendations for further investigations (as necessary).

1.5 Previous Investigations

1.5.1 Caulmert has not undertaken any previous investigations on the site and is not aware of any investigations carried out by others.

2 PROPOSED DEVELOPMENT

2.1.1 A development layout is yet to be finalised; however, it is anticipated the development will comprise of approximately twenty residential detached and semi-detached two storey houses, with associated access roads, private driveways, gardens and public open space.

2.1.2 An indicative development layout is presented as Figure 1; an extract is provided below.

2.1.3 No construction details, structural loads or site wide elevations have been received to date. It is assumed the building will be of traditional load bearing masonry wall construction.

Figure 1 – Proposed Development Area

3 Preliminary Investigation

3.1 Site Location and Description

3.1.1 The Site is located approximately 300m southeast of Ruthin town centre, at National Grid Reference of 312867, 358208 .

3.1.2 A Site location plan is provided as Figure 2, with red line boundary around the site area.

Figure 2: Location plan of site with red line boundary

3.1.3 The Site is roughly rectangular in shape and occupies an area of 0.55Ha. The Site is accessed from Rhos Street to the north of the site.

3.1.4 The boundaries of the Site are defined by residential dwellings to the east, Rhos Street and residential dwellings to the north, residential dwellings and hospital car park to the west and Ruthin Community Hospital to the south.

3.1.5 The Site area has been developed through the creation of level development platforms within the surrounding sloping ground which has created height differences in the region of c. 0.7m-1.6m. Therefore, there are a number of retaining walls present onsite.

3.1.6 A summary of the Site's current uses, and that of its surroundings, from available information is presented in the Phase 1 Report, and summarised below in Table 2.1.

Table 2.1: Site Description

Site Location		
OS Map Reference	312867, 358208	
Site Area	0.55Ha	
Site Setting / Description	Current Land Use	Unused (former school)
	Surrounding Area	North: Rhos Street and residential housing
		East: Residential housing and school
		South: Ruthin Community Hospital
		West: Residential housing.

3.2 Site Walkover Survey

3.2.1 A site walkover survey was completed by a Caulmert Engineer on the 24th December 2020. The site walkover comprised of an external inspection of the site and buildings, no access to the buildings was available at the time, subsequently access to the buildings was provided during the ground investigations and the observations below have been updated.

3.2.2 A summary of the observations made during the site visits are presented in Table 2.2 below. Photographs of the former 'Coke Store' are included in Appendix 2.

Table 2.2: Summary of Observations from the Site Walkover Survey

Observations	Comments
Buildings and Structures	The main school building occupies the centre of the site and appears to comprise a 19th century stone building with a pitched roof, with a later 20th century extension. A playground surrounds the school building to the south, west and north. A further single storey brick 'community' building is located in the east of the site with a small brick substation. The majority of the site is covered in asphalt hardstanding. A car park is located in the south of the site accessed via an asphalt road in the east. A retaining wall supports the playground above Rhos Street in

	the north, with three shuttered/boarded 'window' type openings noted. These lead into a basement/under croft feature approximately 6m in length and stretching back approximately 4m from the retaining wall and approximately 2.2m in height. It is understood that this feature was originally accessed from the playground via steps which have now been infilled. Anecdotal evidence suggests it was used as a 'coke/coal' store for the school.
Topography	The general topography slopes down from east to west by approximately 2m. The site also slopes from the north up to the south by approximately the same. However, the site itself is generally level, development platforms have been created and the site is supported by a number of small retaining walls.
Site Access and Security	The site is currently accessed of Rhos Street via a locked gate from a shared access road with the adjacent residential dwellings. The site is generally surrounded by a mixture of low stone walling or wooden fencing. However, temporary 'herras' type security fencing currently secures the site.
Services	A foul drainage system appears to link into the main sewer within Rhos Street along with a surface water drainage system. A substation is located in the east of the site, and it is understood that the site is connected to the potable water supply.
Vegetation	Limited vegetation onsite, peripheral grass around car parking. No invasive species identified.
Surface Water Features	None identified.
Potential Contaminative Sources (on-site and offsite)	None.
Other Information	None.

3.3 Site History

3.3.1 It is understood that the site was acquired in 1845 with an 'iron' (assumed to be a corrugated iron clad building) school building erected, this was replaced in 1848 by a stone building, which forms the main school building today. Subsequent extensions were added in the 19th century, mid and late 20th century. A summary of potentially contaminating historical land uses both on and off site that could potentially impact upon the proposed development is presented in Table 2.3 below.

Table 3.3 – Potentially Contaminating Land Uses

On-site History (activities within the red-line Site boundary)		
Potentially Contaminative Past Uses	**Map Date**	
	From	**To**
Made Ground used to raise site levels	Unknown	Present
Made Ground construction of school buildings	Pre 1875	Present
Non-Contaminative Past Uses		
Playing fields	Pre-1875	Pre 1969
Primary School	Pre-1875	Present
Off-site History (activities within 500m of the red-line Site boundary)		
Potentially Contaminative Past Uses		
Construction materials from surrounding buildings and roads	Pre 1875	Present
Filling in of sand pit	Post 1912	Pre 1969
Gas Works (later a depot)	Pre 1875	Pre 1994

3.4 Geology

3.4.1 The British Geological Survey (BGS) online geological maps (1:50,000) indicates that there is no superficial deposit cover in the area of the site. However, the north of the site is shown as

'Artificial Ground- Made Ground'. It is assumed that this is associated with the creation of the development platforms for the construction of the school.

3.4.2 The bedrock underlying the Site is that of the Kinnerton Sandstone Formation, generally consisting of fine to medium grained cross-stratified sandstone (predominantly aeolian). It is likely that this stratum has been exploited by the historical sand pit located to the northeast.

3.5 Mining

3.5.1 The site lies outside the coal mining area and there are no non-coal mining activities recorded onsite. The risk from historical mining features onsite is therefore negligible.

3.6 Hydrogeology & Hydrology

3.6.1 The nearest mapped surface water feature is the River Clwyd approximately 655m west of the site boundary.

3.6.2 The bedrock has been classified as a 'medium vulnerability Principal Aquifer' which has been stated by the Environment Agency as being "layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer".

3.6.3 The site is not within a source protection zone.

3.7 Ground Gas

3.7.1 No significant ground gas sources have been identified within the vicinity of the site or within the proximity of the site. In addition to this the site is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). No radon protective measures are necessary in the construction of new dwellings or extensions.

4 PRELIMINARY RISK ASSESSMENT

4.1 Qualitative Risk Assessment

4.1.1 A qualitative risk assessment has been undertaken for these potential source-pathway-receptor linkages. This is based on consideration of both:

- The likelihood of an event (takes into account both the presence of the hazard and receptor and the integrity of the pathway).
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

4.1.2 The risk assessment has been based on development of the site with a proposed 'Residential with plant up take' end-use (Table 4.1).

Table 4.1 – Summary of Potential Pollutant Linkages (Preliminary Conceptual Site Model)

Source	Pollutant / Hazard	Receptors	Pathways to Receptor	Associated Hazard [Potential severity]	Likelihood of Occurrence	Potential Risk
On-site Made Ground - relic foundations, coke storage and waste ash, asbestos, demolition rubble	PAH, Heavy metals, Sulphate, Asbestos.	Construction workers	Contact, ingestion, inhalation	Effect on human health [Low-Severe]	Any risks can be mitigated by appropriate site management during construction stage. Asbestos awareness training and suitable PPE provided for construction staff.	Low
		Future Site Occupiers			Pre-demolition asbestos survey and appropriate removal prior to demolition further reduce risk. Any contaminated Made Ground likely to be removed or isolated beneath hardstanding and/or a clean cover system/growing medium minimising risk to future site users.	Low
		New in ground services and construction materials.	Direct contact	Degradation [Slight]	Any potential risks can be mitigated by use of appropriate construction materials, chemical resistant supply pipes and use of oversized service trenches and clean fill.	Low
		Controlled Waters Groundwater	Leaching via ground water	Pollution of controlled waters [Slight]	No significant mobile contaminants anticipated however this should be confirmed through intrusive investigations.	Low
On-site: Ground Gas from Made Ground.	Ground Gas.	Future Site Occupiers	Migration through soils or groundwater to indoor air.	Asphyxiation or explosion [Severe]	Limited Made Ground anticipated (generally <1m), and likely to comprise inert type materials with low gas generation potential.	Low
		Buildings		Explosion [Severe]		Low
Offsite Ground Gas migrating from historic infilled sand pit to the northeast of site.	Ground Gas	Future Site Occupiers	Migration through soils or groundwater. Migration through service trenches,	Asphyxiation or explosion [Severe]	The historic sand pit is small in plan area suggesting limited ground gas generation potential. The site is located 'up gradient' of the Site and therefore ground gas is unlikely to migrate to the site. In addition to this given the time since backfilling any potential ground gas generation potential should	Negligible to Low.
		Buildings		Explosion [Severe]		Negligible to Low.

		Neighbouring Properties	pipework to indoor air.	Asphyxiation or explosion [Severe]	have peaked.	Negligible to Low.
Offsite sources – Historic Gasworks/Depot located to the northwest.	Spillages and leaks may have resulted in migration through ground of inorganic/organic contaminants.	Construction workers Future Site Users	Direct contact, inhalation, ingestion	Effect on human health [Moderate to Low]	The site is 'up gradient' from source and a significant distance from site. Migration of contamination is very unlikely. Any risks can be mitigated by appropriate site management during construction stage.	Negligible to Low
		New in ground services and construction materials.	Direct contact	Degradation [Slight]	The site is 'up gradient' from source and a significant distance from site. Migration of contamination is very unlikely. Any potential risks can be mitigated by use of appropriate construction materials/ and chemical resistant supply pipes.	Negligible to Low

5 GROUND INVESTIGATION

5.1 Previous Reports

5.1.1 No information relating to previous ground investigations carried out at the Site has been provided to Caulmert.

5.2 Current Ground Investigation

5.2.1 An intrusive site investigation was completed between the 18th and 19th October 2021. The ground investigation comprised:

- 11no. window sample boreholes to max. 2.45m bgl; and
- 3 no. falling head tests within three of the boreholes.

5.2.2 The principal objectives of the study were to examine the ground conditions, provide a preliminary assessment of the environmental liabilities and to determine whether the site is suitable for the proposed development. No specific historical contamination features have been identified in the desk study review. Therefore, the site investigation layout was designed to provide general site coverage. Site access was restricted by existing buildings/structures and services.

5.2.3 The position of the exploratory holes is presented on the Exploratory Hole Plan in Appendix 1.

5.2.4 The window sample boreholes were continuously inspected during drilling to check for indications of contamination and were logged by an experienced Caulmert representative. The exploratory hole logs are presented as Appendix 3.

5.2.5 In total 3no. window sample boreholes were installed with combined ground gas and groundwater monitoring installations. The remaining boreholes were infilled with arisings and a concrete plug and cap.

5.2.6 The falling head test records are presented in Appendix 4.

5.3 Geotechnical Laboratory Testing

5.3.1 A suite of physical laboratory testing was undertaken on representative soil samples. The laboratory tests comprised:

- 1 no. particle size distribution (PSD) tests; and
- 3 no. 2:1 Water Soluble Sulphate and pH.

5.3.2 Testing was scheduled by Caulmert and carried out at out at Celtest Limited and ALS Environmental Limited, both UKAS accredited testing laboratories. The geotechnical laboratory testing results are presented in Appendix 5.

5.4 Chemical Laboratory Testing

5.4.1 Eight (6no. Made Ground, 1no. Topsoil and 1no. natural soil) representative soil samples were collected from the window sample boreholes across the site and submitted to ALS Environmental Limited, a UKAS accredited environmental analytical laboratory.

5.4.2 The soil samples were submitted for an analytical suite comprising:

- Heavy Metals,
- Boron,
- Beryllium,
- Chromium,
- Polyaromatic Hydrocarbons (PAH),
- Total Petroleum Hydrocarbons (TPH) screen,
- Asbestos,
- pH, And
- Water Soluble Sulphate.

5.4.3 The chemical laboratory test results are presented in Appendix 6.

6 GROUND CONDITIONS

6.1 General Stratigraphy

6.1.1 The general stratigraphy at the site comprised of Asphalt hardstanding over hardcore or locally topsoil within former landscaped areas, overlying a thin layer of residual soils over the Kinnerton Sandstone Formation. This generally reflected the published geology.

6.2 Hardstanding

6.2.1 Hardstanding covers the majority of the site outside the building footprint and comprises Asphalt from ground surface to depths of between 0.1 to 0.2m below ground surface. In the south of the site, where the more recent school buildings have been constructed on a development platform (cut into the slope) the asphalt is underlain by hardcore comprising light grey to pinkish grey fine to coarse sandy gravel of limestone and/or light grey and light brown slightly clayey in places sandy gravel of limestone.

6.2.2 In the north of the site around the original school buildings the asphalt is underlain by an old 'tarmac' hardcore typically only 100mm thick or less with no hardcore beneath.

6.3 Topsoil

6.3.1 Topsoil was recorded within the limited landscaped areas present across the site to depths of between 0.2m to 0.4m and generally comprised dark brown very slightly silty fine sandy topsoil with rootlets.

6.4 Made Ground

6.4.1 Made Ground comprising dark brown sand with rare gravel size fragment of ash and brick was encountered locally across the site at depths of between 0.2-0.4m and recorded to depths of between 0.3-1.0m. These deposits probably represent reworked residual soils where site levels may have been raised in the past as part of the creation of development platforms.

6.5 Kinnerton Sandstone Formation (Residual Soil and Bedrock)

6.5.1 The Kinnerton Sandstone Formation was found across the site and was found to generally have a weathering profile of residual soils comprising of brown fine sand grading into extremely weak fine to medium sandstone bedrock.

6.5.2 Residual soils were recorded at depths of between 0.2m and 0.4m across the site where the base of the Made Ground or hardcore was proven.

6.5.3 The Kinnerton Sandstone bedrock was proven in the majority of boreholes where the Made Ground/Residual soils were penetrated and beyond the residual soils had a shallow weathering profile grading from reddish brown or orangish brown to light creamy brown fine sand to extremely weak SANDSTONE. Typically, the boreholes refused at 1.45m, although locally within WS4 and WS10 the weathering profile/residual soil were observed to be deeper and allowed the boreholes to penetrate to 2.45m and 1.8m respectively.

6.5.4 Standard Penetration Test (SPT) 'N' values >50 were typically recorded at 1.45m bgl, although locally within two boreholes in the east of the site, where the natural topography remains and the weathering profile is deeper, N values of 6 and 31 were recorded, indicating loose and dense residual soils respectively. However, within both these boreholes N values >50 were recorded at around 2.0m bgl, where the boreholes refused.

6.5.5 A Particle Size Distribution test was carried out on one samples of the residual soil and confirmed the sand to be fine to medium grained.

6.5.6 The relationship between SPT N values and the angle of shearing resistance was established by Peck et al (Ref. 1.) and indicates a Phi of between 28°and 42°, but typically greater than 40°.

6.6 Installations

6.6.1 The following boreholes were installed with groundwater and gas monitoring standpipes:

- WS3 to 1m (0.5m plain and 0.5m slotted).
- WS5 (0.5m plain and 0.5m slotted).
- WS7 (0.5m plain and 0.5m slotted); and
- WS10 to 1.8 (0.8m plain and 1m slotted).

6.7 Groundwater

6.7.1 Groundwater was not observed in any of the boreholes during the ground investigation.

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

6.8 Falling Head Tests

6.8.1 Falling head tests were undertaken on the 19th October 2021 within WS3, WS5 and W10. A

summary of the results is presented Table 6.1.

Table 6.1 – Summary of Falling Head Tests

TP Ref.	Response Zone (m bgl))	Response Zone Strata	Infiltration Rate (m/s)
WS3	0.5-1.0	Residual Soils/Kinnerton Sandstone	7.6×10^{-6}
WS5	0.5-1.0	Residual Soils/Kinnerton Sandstone	1.60×10^{-6}
WS10	0.8-1.8	Residual Soils/Kinnerton Sandstone	2.4×10^{-5}

6.8.2 Falling Head tests indicate that infiltration rates within the Residual Soils and Kinnerton Sandstone Formation would support the use of soakaways. It is recommended that once a development layout is confirmed, BRE 365 Infiltration tests are undertaken at the location of proposed soakaway locations to confirm they are viable and to provide infiltration rates for detailed drainage design by a specialist.

7 CONTAMINATION ASSESSMENT

7.1 Methodology for Contamination Risk Assessment

7.1.1 This section assesses the likely potential contamination to be present, and the risk it may pose to human health, the natural environment and the built environment.

7.1.2 In the United Kingdom, the legislative regime for identifying and dealing with contaminated land is set out in Part IIA of the Environmental Protection Act 1990. The Act, together with associated Regulations and Guidance (published separately for England, Wales, Scotland and Northern Ireland), describe the regulatory functions and actions aimed at identifying contaminated land, and defining the persons liable for voluntary or enforced remediation.

7.1.3 The methodology recommended for identifying contaminated land is outlined in the DEFRA / EA published guidance document, CLR11 "Model Procedures for the Management of Land Contamination" (2004). The methodology takes the form of the identification of potential contaminant sources, pathways and sensitive receptors and their likely predilection to be linked. Under the guidance, this is termed a "pollutant linkage".

7.1.4 For there to be a potential risk from contamination, a complete-source-pathway-receptor pollutant linkage must exist, or potentially exist, during and after development of the Site. Risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. Each aspect of the pollutant linkage is defined below:

i) Source (contaminant): A substance that is in or under the land that has the potential to cause harm to the receptor.

ii) Pathway: The route(s) or means via which a receptor can be exposed to, or affected by, a contaminant.

iii) Receptor: The factor (person, built environment or ecosystems) that might adversely be affected by the source.

7.1.5 The potential sources, pathways and receptors for each site are encapsulated into a conceptual site model (CSM). A CSM is the means by which the sources, pathways and receptors are systematically considered; and either discounted, or else earmarked as potentially valid and warranting further investigation.

7.1.6 In accordance with the approach advocated in CLR11, a CSM has therefore been derived for the Site using information obtained during the desk study and site walkover, as reported earlier in this document, as well as the results from the ground investigation and from the laboratory chemical analyses of the samples collected from Site.

7.2 Human Health - Generic Assessment Criteria (GAC)

7.2.1 No visual or olfactory evidence of chemical contamination was encountered during the investigation.

7.2.2 All the samples submitted for testing also underwent asbestos screening, no fibres were identified within any samples.

7.3 Human Health - Generic Assessment Criteria (GAC)

7.3.1 Six samples of Made Ground and one sample of residual soil and one of topsoil were selected for laboratory chemical testing. A table showing the comparison of soil analytical results against generic assessment criteria (GAC) for Residential with plant uptake end use is presented in Appendix 7.

7.3.2 The data set for each chemical determinant has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed. The data set has been assessed with and without the present of the Tarmac sample from WS9 0.1-0.2m.

7.3.3 The pH values of the samples ranged between 7.67 and 9.01.

7.3.4 The soil organic matter content of the samples ranged between <0.35% and 6.34%. The results have been compared to 1% soil organic matter content values, in the first instance, as the most conservative value.

7.3.5 The results of the laboratory testing confirmed that all of the analysed metals, and all poly aromatic hydrocarbons (PAH) are generally present at concentrations below the appropriate GAC threshold value for residential with plant uptake values.

7.3.6 The exception was a sample of Tarmac taken from WS9 0.1m-0.2m which recorded exceedances for all speciation's and a sample of made ground/relic topsoil from 0.4m-0.6m WS4 , which recorded a slight exceedance for Benz (a)anthracene. The exceedances are summarised and highlighted in yellow in the table below:

Table 8.1: Summary of Chemical Exceedances

Chemical of Concern	Generic Criterion Residential Plant Uptake 1% SOM (mg/kg)	Generic Criterion Public Open Space 1% SOM (mg/kg)	WS9 (0.1m-0.2m)	WS4 (0.4m-0.6m)
Benz(a)anthracene	3.1	89	170	3.74
Benzo(a)pyrene	5	5	122	3.29
Benzo(b)fluoranthene	5.6	92	152	3.86
Benzo(ghi)perylene	44	590	51.9	1.94
Benzo(k)fluoranthene	8.5	130	64.3	1.61
Chrysene	6	130	151	3.46
Dibenz(a,h)anthracene	0.76	12	12.4	0.344
Fluoranthene	260	8100	486	8.73
Indeno(1,2,3,cd)pyrene	3.2	56	75.7	2.31
Naphthalene	1.5	13000	7.36	0.045
Phenanthrene	92	8100	320	5.52
Notes.	yellow highlight indicates exceedance of residential SOM red text indicates exceedance of Public Open Space SOM			

7.3.7 The Tarmac sample from WS9 (0.1m-0.2m) was found to have PAHs speciation's in exceedances with respect to GAC residential with plant uptake (1% SOM) and GAC Public Open Space (1% SOM) these PAH chemicals are typically a component within binding agents in Tarmac of a certain age.

7.3.8 The Made Ground/relic topsoil deposit within WS4 0.4m-0.6m was found to have a slight exceedance in Benz(a)anthracene with respect to GAC residential with plant uptake (1% SOM). When the WS9 0.1-0.2 sample is removed from the data set the 95th percentile is below the GAC and therefore the Made Ground/Relic Topsoil at WS4 and is unlikely to be a significant risk to end users and no further action is required.

7.3.9 Given that the site has only been developed with a school, a 3-band TPH screen was undertaken, the worst-case concentrations within each band have been assessed against the TPH CWG banding as a conservative assessment. All bandings are generally present at concentrations below the appropriate GAC threshold value with the exception of one sample (WS9 0.1-0.2m), which exceeded the GAC value for C10-C40.

7.3.10 A slight hydrocarbon odour was noted within the underlying Tarmac present in the south of the site. No other visual or olfactory evidence of chemical contamination was encountered during the investigation.

7.3.11 It is anticipated that the hardstanding will be broken out as part of demolition works prior to redevelopment of the site. Removing the Tarmac present beneath the northern playground area from residential areas and therefore breaking the source-pathway-receptor linkage. Asphalt and Tarmac are likely to be classified as 'non-hazardous/hazardous' and therefore may be costly to dispose of to landfill It may be possible to reuse both the asphalt and tarmac beneath roads either as inclusion in a hot mix, unbound aggregate or cold mix asphalt subject to further geotechnical and chemical laboratory testing and regulatory approval and an appropriate materials management plan.

7.3.12 All the samples submitted for testing also underwent asbestos screening, no fibres were identified within any samples.

7.4 Plant Life

7.4.1 There is limited topsoil present onsite, and it is anticipated that clean topsoil will need to be imported onto site to provide a growing medium within landscaped areas. However, as a preliminary risk assessment all chemical data has been assessed against GAC for determinands which can influence plant life. The data set for each chemical determinand has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed. No outliers have been removed.

7.4.2 All samples were below the GAC threshold criteria contaminant species assessed. Where there is no exceedance of a GAC, the risks are deemed to be insignificant, and the site is suitable for use without further consideration. A summary of the statistical assessment is included in Appendix 7.

7.4.3 Further advice from a landscape architect should be sought with regards to reusing the limited existing topsoil onsite and depth of a clean growing medium within proposed landscaped areas.

7.5 Groundwater

7.5.1 The European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives establish a consolidated way of controlling water quality. The Environment Agency (July 2008) has issued a revised Groundwater Protection Policy (known as GP3). The UK Government has set out a timetable for the adoption of the WFD which formalises the way in which the quality of surface water and groundwater are to be assessed. This is set out in 'The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions' 2017.

7.5.2 A groundwater body is defined as groundwater in an aquifer capable of supporting an abstraction of 10m^3/day or 50 people over a sustained period under the WFD. Groundwater bodies are a strategic resource, even if there is no current abstraction. Lesser amounts of groundwater in an aquifer are not considered as receptors in their own right but may still be pathways to other receptors such as surface water bodies or aquatic ecosystems.

7.5.3 No potentially contaminative sources have been identified onsite and the soil testing indicates that there are no elevated concentrations of Chemicals of Concern within the soils. Caulmert believe that the site does not pose a significant risk to Controlled Waters and no mitigation measures are required.

7.6 Ground Gas

7.6.1 The risks associated with the ground gases methane (CH4) and carbon dioxide (CO2) are assessed using BS 8485:2015 (Ref.2) and guidelines from CIRIA 665 (Ref. 3) and the NHBC (Ref.4).

7.6.2 Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development. In the above guidance:

- 'Situation A' covers all forms of development (residential and industrial/commercial developments), other than low rise residential development; and
- 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.

7.6.3 The development proposals require consideration of Situation B.

7.6.4 The sensitivity of the development is high on account of the development comprising residential dwellings.

7.6.5 It is judged from the available evidence that the gas generation potential at the site is very low to low. as the ground conditions comprise Sands and Sandstone, with no ground gas generation sources recorded on or within the vicinity of the site.

7.6.6 Ground gas monitoring was outside the scope of this investigation however in accordance with CL:AIRE RB17, given the ground model no ground gas monitoring or ground gas protection measures are required.

7.7 Conceptual Site Model (CSM)

An updated CSM has been derived from the desk study, site walkover and ground investigation and is presented in Table 7.1 below.

Table 7.1 – Summary of Updated Potential Pollutant Linkages (Conceptual Site Model)

Source	Pollutant / Hazard	Receptors	Pathways to Receptor	Associated Hazard [Potential severity]	Likelihood of Occurrence	Potential Risk
On-site Tarmac (northern playground)	PAHs and TPHs.	Construction workers	Contact, ingestion, inhalation	Effect on human health [Low-Severe]	It is anticipated that the asphalt and tarmac hardstanding will be broken out as part of the demolition works and removed from beneath residential plots. Any risks can be mitigated by appropriate site management during construction stage ensuring materials are stockpiled separately. The Tarmac is only approximately 0.1m thick.	Low
		Future Site Occupiers				Low
		New in ground services and construction materials.	Direct contact	Degradation [Slight]	It is anticipated that the asphalt and tarmac hardstanding will be broken out as part of the demolition works and removed from beneath residential plots. It was only observed locally in the north of the site between 0.1-0.2m bgl and new services will be laid below this level.	Negligible to Low
		Controlled Waters Groundwater	Leaching via ground water	Pollution of controlled waters [Slight]	It is anticipated that the asphalt and tarmac hardstanding will be broken out as part of the demolition works and removed from beneath residential plots.	Negligible to Low
On-site: Ground Gas from Made Ground.	Ground Gas.	Future Site Occupiers	Migration through soils or groundwater to indoor air.	Asphyxiation or explosion [Severe]	Limited Made Ground encountered no significant ground gas sources identified on site. Existing school has had no ground gas issues. No special precautions required.	Negligible to Low
		Buildings		Explosion [Severe]		Negligible to Low
Offsite Ground Gas migrating from historic infilled sand pit to the northeast of site.	Ground Gas	Future Site Occupiers	Migration through soils or groundwater. Migration through service trenches, pipework to indoor air.	Asphyxiation or explosion [Severe]	The historic sand pit is small in plan area suggesting limited ground gas generation potential. The site is located 'up gradient' of the Site and therefore ground gas is unlikely to migrate to the site. In addition to this given the time since backfilling any potential ground gas generation potential should have peaked. Residential housing has been constructed between the subject site and the feature.	Negligible to Low.
		Buildings		Explosion [Severe]		Negligible to Low.
		Neighbouring Properties		Asphyxiation or explosion [Severe]		Negligible to Low.

Offsite sources – Historic Gasworks/Depot located to the northwest.	Spillages and leaks may have resulted in migration through ground of inorganic/organic contaminants.	Construction workers Future Site Users	Direct contact, inhalation, ingestion	Effect on human health [Moderate to Low]	The site is 'up gradient' from source and a significant distance from site. Migration of contamination is very unlikely. Any risks can be mitigated by appropriate site management during construction stage. No elevated contamination has been identified onsite.	Negligible to Low
		New in ground services and construction materials.	Direct contact	Degradation [Slight]	The site is 'up gradient' from source and a significant distance from site. Migration of contamination is very unlikely. No elevated contamination has been identified onsite.	Negligible to Low

8 ENVIRONMENTAL ASSESSMENT AND RECOMMENDATIONS

8.1 Human Health

8.1.1 The risk assessment undertaken in Section 8 indicates that there are no contaminants of concern with respect to the proposed Residential end –use. The site is suitable for the proposed end use subject to the break-out and removal of the asphalt and tarmac from beneath residential plots.

8.1.2 However, should unforeseen contamination be encountered during the ground works/construction then works should be ceased in that area until it has been assessed by an Environmental Engineer.

8.1.3 At this stage, the CSM constitutes a risk assessment which determines only the likelihood of a linkage being present. The CSM should be refined and revised if during site works ground conditions are found to differ and potential contamination is encountered.

8.1.4 The identification of a potential pollutant linkage does not necessarily mean that there is a risk, or that the linkage is present, but that further investigation is required to establish whether or not that risk exists. Whereby a risk is identified and verified, the potential consequence of harmful effect and the likelihood of its occurrence should then be established in order to determine whether the risk is acceptable or unacceptable.

8.2 Plant Life

8.2.1 The risk assessment undertaken in Section 8 indicates that there are no contaminants of concern in concentrations which may be harmful to plant life present on-site. The results indicate that the limited topsoil onsite is chemically suitable, however it is recommended that a landscape architect is contacted for further advice regarding the requirements for any growing medium associated with landscaped areas.

8.3 Controlled Waters

8.3.1 No contamination sources have been identified and therefore it is concluded that the site is currently unlikely to pose a significant risk to controlled waters.

8.4 Precautions Against Ground Gas

8.4.1 The site is located in an area where Radon Protection measures are not required.

8.4.2 No ground gas generation sources have been identified onsite or within the close

proximity of the site, with either residual soils derived from the Kinnerton Sandstone Group and/or shallow bedrock recorded beneath the site. In general accordance with CL:AIRE RB17 no ground gas monitoring was undertaken, and no ground gas protection measures are required for the proposed dwellings.

8.4.3 While risks to construction workers are not generally discussed in this report, all contractors and maintenance workers should be made aware of the possible presence of Carbon Dioxide and depleted oxygen levels within excavations and confined spaces and should take all necessary Health and Safety precautions when working in trenches or confined spaces.

8.5 Water Supply Pipes

8.5.1 Permeation and accelerated deterioration of pipe material can occur due to chemical reactions between the pipe and contaminants in the ground in which it is laid. This can lead to premature failures resulting in leakage and loss of water quality.

8.5.2 No contaminants of concern have been identified and standard PPE water supply pipes are anticipated to be appropriate at the site however water supply pipes should be specified and laid in accordance with the regional water supply company's specifications.

8.6 Waste Management

8.6.1 The handling, re-use or disposal of waste is regulated by The Environment Agency. Any material excavated on-site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. One of the ways this can be achieved is set out in the Development Industry Code of Practice (CoP; Ref. 5). This builds on the Environment Agency guidance document Definition of waste: developing greenfield and brownfield sites (2006). The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the CoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development.

8.6.2 All material proposed for off-site disposal (e.g., during future construction works) should be given a proper description and waste classification assessment as required by the Environmental Protection Duty of Care Regulations (Ref. 6), and in accordance with WM3 and the Environment Agency Technical Guidance on the assessment and classification of Hazardous Waste.

8.7 Outline Remedial Measures

8.7.1 No specific risks have been identified which require remedial action at this stage, other than the breakout and removal of asphalt/tarmac from beneath the residential plots.

9 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

9.1 Geotechnical Categorization of the Proposed Development

9.1.1 Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structure(s) to establish the design requirements. Initial categorisation can be made before site investigation and can be used to define the scope and extent of geotechnical investigation required. For the purposes of this investigation, the proposed structures have been classed as follows:

- Geotechnical Category 1.

9.2 Site Preparation, Earthworks, Groundworks and Landscaping

9.2.1 There are several services which supply the former school including gas, electricity, water, telecoms and both surface and foul sewers. It appears as though the gas has been disconnected at the substation in the east of the site.

9.2.2 Excavation in close proximity to other mains services (sewers) will need to ensure that the excavation walls are stable or appropriately battered to a safe angle, where these are to be kept live. Temporary slope stability works may be required in any deep excavations.

9.2.3 A former basement has been identified in the north of the site, beneath the playground it is estimated that this is 6m in length and stretching back approximately 4m from the retaining wall fronting Rhos Street and approximately 2.2m in height. However, this will need to be confirmed through a detailed survey. It is anticipated that this will require filling to allow the proposed development to progress. However, altering the lateral loading on the retaining wall will need careful consideration and it is recommended that a structural survey is undertaken on the basement and the rest of the retaining wall.

9.2.4 Other than the basement feature, no other relic structures or obstructions were recorded other than weak bedrock at shallow depth. It is anticipated the any shallow (1.5m bgl) excavations into the weak bedrock should not present any difficulty for conventional plant and equipment. However, excavations beyond this depth may require the use of pneumatic breaker.

9.2.5 There is minimal Topsoil present on site however where present a topsoil strip should be undertaken at the start of the groundworks and appropriately stockpiled.

9.2.6 No groundwater was encountered during the ground investigation, and it is anticipated that groundwater will be at depth and therefore any minor groundwater seepages will

generally be minor to moderate and may be controlled by sump pumping methods. Care should be taken to ensure no significant loss of fines.

9.2.7 It should be noted that groundwater levels may vary from the time of the investigation, due to seasonal variations.

9.2.8 While it is anticipated that shallow excavations will generally be stable in the short term, It is recommended that no site personnel enter any trenches unless there is adequate support, and this has been assessed by a competent person.

9.2.9 Where entry to trenches is unavoidable, gas monitoring should be undertaken, and entry should be made if safe to do so. In addition, entry should be restricted to the absolute minimum time necessary depending on the monitoring and assessment by a competent person.

9.2.10 At this stage, Caulmert is not aware of proposals for significant reuse of existing soils as part of redevelopment proposals. Should earthworks be required, an earthworks specification along with earthworks testing of targeted soils will be necessary to ensure the appropriate management and reuse of the existing soils.

9.3 Foundations

9.3.1 It is understood that the development will principally comprise two storey residential houses. Although no loadings are known at this stage it is anticipated that loadings will generally be light to moderate.

9.3.2 The preliminary foundation designs in this section are based on the parameters given in Section 6. It is recommended that a detailed foundation assessment is undertaken on a plot-by-plot basis once a development layout is confirmed and site levels have been set.

9.3.3 It is anticipated that standard shallow foundations can be adopted across the site, any new foundations should be taken down through any Topsoil and Made Ground into the residual soils (brown fine sand) at a minimum depth of 0.5m bgl where an allowable bearing capacity of up to 175kN/m^2 can be assumed for foundation design of strip or small pads, which should limit the total foundation settlement to less than 25mm and differential settlement to half this value.

9.3.4 The depth of foundations should be designed, and the formations inspected, by a competent geotechnical engineer. Any sub-formation materials deemed as unsuitable, such as soft or loose zones, should be excavated and replaced with well compacted suitable granular fill or lean mix concrete.

9.3.5 Foundation excavations should be protected from water and inclement weather including frost and any water should be removed by pumping from a sump in the base of the excavation. Care should be taken to prevent the removal of fines when controlling groundwater. Further guidance should be sought if further groundwater control measures are required.

9.3.6 Soils non shrinkable

9.4 Ground Floor Slabs

9.4.1 Granular, non-plastic soils were recorded across the site and therefore ground bearing floor slabs can be designed to accommodate a bearing pressure of 50kPa. subject to the following criteria being satisfied:

- The Topsoil/made ground is excavated and removed and replaced with well-compacted granular material to an agreed engineering specification.
- It is demonstrated that the soils are non-shrinkable, and desiccation is not present in sub-formation soils.

9.4.2 Prior to the placement of the founding materials and the construction of the ground bearing floor slab, the sub-formation and formation will need to be inspected and checked by a geotechnical engineer to ensure the ground conditions are as expected.

9.4.3 If low bearing and soft strata are identified at the formation, this should be reported to the Geotechnical Engineer immediately and remedial actions agreed.

11.6 Roads and Pavements

9.4.4 Based on the observations during intrusive site works it is considered that a minimum CBR of 5% will be achievable over the majority of the site where granular soils are present and can be used for preliminary design, subject to insitu testing during construction. Furthermore, CBR values >10% may be achievable across large areas of the site.

9.4.5 Proof rolling of the formation level will be required and any loose or soft spots to be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration.

9.4.6 Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable Specification to ensure the ground conditions are as

expected. All testing should be carried out in accordance with the strategy outlined in DMRB IAN 73/06 and confirm that the ground conditions at time of construction are consistent with the previous design parameters.

9.5 Protection of Buried Concrete

9.5.1 Three samples submitted for chemical and geotechnical testing were tested for pH and sulphate content (2:1 water soluble extraction). The testing results were as follows:

Table 10.1 – Assessment of Aggressive Chemical Environment for Concrete

	Results Range
pH (units)	7.4-7.8
Water soluble sulphate (SO_4) (g/l)	0.014-0.02

9.5.2 The results have been compared to the guidance contained in BRE Special Digest 1, Concrete in aggressive ground, 2005**.** Based on Greenfield conditions and a mobile groundwater regime, in the range of proposed foundations, the site is classed as follows:

Table 10.2 – Assessment of Concrete Classification

Design Sulphate class	DS-1
ACEC Class	AC-1

9.5.3 Concrete below ground must comply with the requirements of Parts D to F of Special Digest 1, as appropriate.

10 FURTHER WORK

The infiltration tests undertaken to date indicate that soakaways would provide a viable drainage solution at the site. However, it is recommended that Infiltration tests are undertaken in accordance with BRE365 at the locations and depths of proposed soakaways once a development layout is finalised to confirm suitability and provide infiltration rates for detail design.

A structural survey of the existing retaining walls where these are to be retained and the basement feature, followed by a geotechnical assessment for the backfilling of the basement and around existing retaining walls.

Given the size of the footprint of the existing school building which prevented access into these areas, it is recommended that either a watching brief is undertaken during the demolition works or some limited trial pitting is undertaken post demolition to confirm the ground conditions beneath the building footprints are as anticipated.

11 REFERENCES

[1] Phase 1 Geoenvironmental Desk Study – Caulmert Ltd December 2020 – 4863-XX-XX-RP-O-0300.S0.P0

[2] Peck et al. 1974. Correlation of SPT N Values.

[3] British Standards Institution (2015): *Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings* BS8485:2015

[4] CIRIA C665:2007 - *Assessing the risk posed by hazardous ground gases to buildings.*

[5] NHBC – Ground Gas Guidance 2007

[6] CL:AIRE (2008): *Definition of Waste: Development Industry Code of Practice* (September 2008).

[7] Environmental Protection (Duty of care Regulations 2009).

APPENDICES

APPENDIX 1

Figures and Drawings

Accommodation Schedule				
House Type	Unit No's	Unit area ft^2	Unit area m^2	Plot No's
Open Market Dwellings				
6P4B house with integral single garage	2	1260 (inc. garage)	117 (inc. garage)	7, 10.
5P3B house (dual aspect)	3	1000	93	3, 11, 18.
5P3B house (facing front)	9	956	89	4, 5, 6, 8, 9, 12, 13, 14, 17
4P2B house	4	775	72	1, 2, 15, 16.
Affordable Dwellings				
3P2B Apartment (first floor)	1	700	65	20.
2P1B Apartment (ground floor)	1	700	65	19.
Total:				**20 Units**

0m 10m 20m 30m 40m 50m

REV	DESCRIPTION	DATE	BY

PROJECT

NEW HOUSING:
RHOS STREET, RUTHIN.
For MEDRA and ADRA

DRAWING TITLE

SKETCH SITE LAYOUT
(OPTION 2)

SCALE	DATE	DRAWN	CHECKED
APPROX. 1:500@A3	20/10/21	SV	-

DRAWING STATUS: PRELIMINARY

JOB No	DRAWING No	REVISION
C1083	002	-

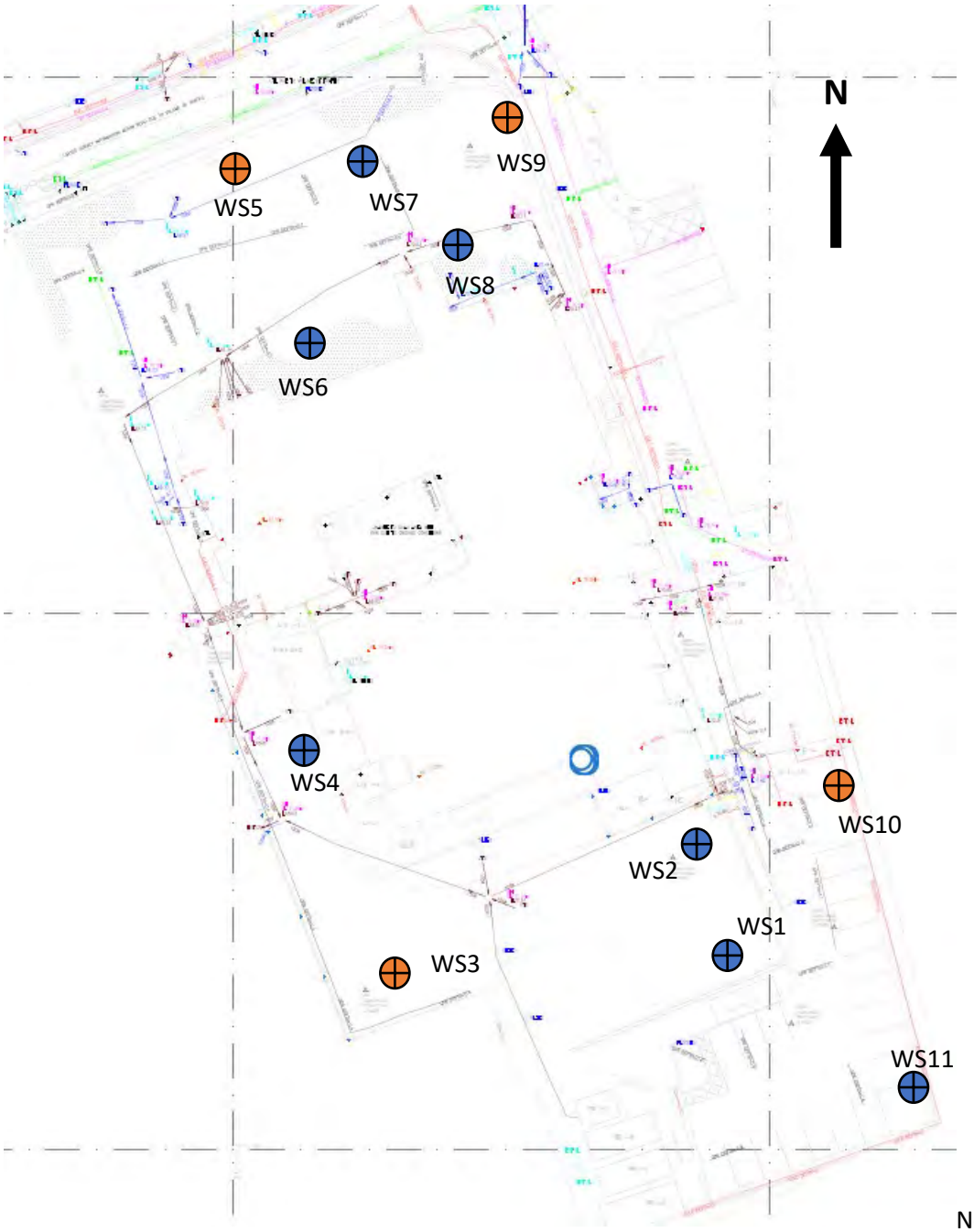
AINSLEY GOMMON ARCHITECTS
THE OLD POLICE STATION, 15 GLYNNE WAY, HAWARDEN, CH5 3NS
Tel: 01244 537 100 | wales@agarchitects.co.uk | www.agarchitects.co.uk
Ainsley Gommon Architects Ltd. Registered in England & Wales No.4187948
Registered Office: 1 Price Street, Hamilton Square, Birkenhead CH41 6JN

PRINTED: 22/10/2021 10:48:22

A3

4863 – Former Rhos Street School, Ruthin

Exploratory Borehole Plan



Not to scale

Key:-

- Installed Window Sample Borehole
- Window Sample Borehole

APPENDIX 2

'Coke Store' Photographs

Caulmert engineering environmental planning	Project: Rhos Street, School, Ruthin	Photo: **1**

Site Walkover Photographs:

Existing Rhos Street retaining wall with three openings, with original school building in the background.

Caulmert engineering environmental planning	Project: Rhos Street, School, Ruthin	Photo: **2a &2b**

Site Walkover Photographs:

One of the sealed up openings within retaining wall along northern boundary (Rhos Street).

Playground above Rhos Street Retaining wall, no evidence of infilled basement, although playground has been resurfaced.

Caulmert engineering environmental planning	Project: Rhos Street, School, Ruthin	Photo: **3**

Site Walkover Photographs:

View looking east into the basement feature (Coke Store).

Caulmert engineering environmental planning	Project: Rhos Street, School, Ruthin	Photo: **4**

Site Walkover Photographs:

Possible former steps into basement feature, filled with lean mix/aggregate.

APPENDIX 3

Exploratory Hole Logs

Caulmert		Project: **Former Rhos Street School, Ruthin**	Ref: **WS1**
Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.2	Asphalt [HARDSTANDING].
0.2	0.4	Light grey fine to coarse sandy gravel. Gravel fine to coarse subangular of limestone. [HARDCORE]
0.4	1.45	Light grey slightly clayey fine to coarse sandy gravel. Gravel fine to coarse subangular of limestone. [HARDCORE]
Refused at 1.45m		
Samples: Env 0.5m-0.7m		

Notes.	
	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	4,5; - 48,2 (0mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS2**

Boring date:	Logged by:	Client:	Project ID:
18.10.2021	DK	**ADRA**	4863

Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.2	Asphalt [HARDSTANDING].
0.2	1.45	Light grey to pinkish grey fine to coarse sandy gravel. Gravel fine to coarse subangular of limestone. [HARDCORE]
Refused at 1.45m		
Samples: -		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	6,6; -5,45 (10mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS3**

Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.2	Asphalt [HARDSTANDING].
0.2	0.4	Light grey fine to coarse sandy gravel. Gravel fine to coarse subangular of limestone. [HARDCORE]
0.4	1.00	Dark brown fine SAND [MADE GROUND/RELIC TOPSOIL]
1.00	1.45	Light brown fine SANDSTONE or Cobble? [KINNERTON SANDSTONE FORMATION]
Refused at 1.45m		
Env: 0.5-0.8 (m)		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
0-0.45	4,6: - 8,39,3 9(0mm)	50+	Refused
	6		

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS4**

Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.4	Light grey fine to coarse sandy gravel. Gravel fine to coarse subangular of limestone. [HARDCORE]
0.4	0.6	Brown silty Sand with rare gravel. Gravel medium subangular of limestone. [MADE GROUND/RELIC TOPSOIL]
1.00	2.45	Red brown fine SAND. Below 1.60m grading into extremely weak fine SANDSTONE. [KINNERTON SANDSTONE FORMATION]
Refused at 2.45m		
Samples: Env 0.4-0.6m, Small Bulk 0.5-1.0m		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	
1	2	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	2,2: - 1,2,1,2,	6	
2-2.45	4,6: - 7,27,16(50mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS5**

Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	507592.1864 347301.4804 11.414

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.2	Tarmac [HARDSTANDING]
0.2	0.4	Dark brown fine sand with rare fine gravel size fragment of ash and rare medium sized gravel of brick. [MADE GROUND]
0.4	0.6	Brown fine SAND. [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
0.6	1.45	Orangish brown fine SAND grading into extremely weak SANDSTONE. [KINNERTON SANDSTONE FORMATION]
Refused at 1.45m		
Sampling: Env 0.2-0.4m, Small Bulk 0.6-1.0m		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	5,4: - 7,6,8,29(10mm)	50+	Refused

Caulmert		Project: **Former Rhos Street School, Ruthin**	Ref: **WS6**
Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.2	Tarmac [HARDSTANDING]
0.2	0.3	Dark brown fine sand with rare fine gravel size fragment of ash and rare medium sized gravel of brick. [MADE GROUND]
0.4	1.45	Brown fine SAND. [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
Refused at 1.45m		

Notes.	
	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	4,5: - 5,6,8,12	31	

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS7**

Boring date: 18-20.05.2020	Logged by: DK	Client: Telford & Wrekin Services Ltd	Project ID: 4497
Elevation		Coordinates	507531.3285 347203.5383 11.4873

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.2	Tarmac [HARDSTANDING]
0.2	0.4	Brown fine sand with thin laminae of dark brown silty sand with rare fine gravel size fragment of brick. [MADE GROUND]
0.4	0.8	Brown fine SAND [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
0.8	1.45	Reddish brown fine SAND grading into extremely weak fine SANDSTONE [KINERTON SANDSTONE FORMATION]

Refused at 1.45

Sampling: Small Bulk 0.5m-0.8m

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	2,2: - 5,13,21,11(10mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS8**

Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.2	Tarmac [HARDSTANDING]
0.2	1.45	Brown slightly silty fine sand with rare gravel and very rare gravel size fragment of ash/charcoal interbedded with reddish brown fine to medium sand. [MADE GROUND]
Refused at 1.45m		
Sampling: Env 0.4m-0.6m		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	5,9: - 13,19,18 (20mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, Ruthin**	Ref: **WS9**

Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.1	Asphalt [HARDSTANDING].
0.1	0.2	Tarmac [HARDSTANDING]
0.2	0.80	Brown fine SAND [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
0.80	1.00	Orangish brown fine SAND grading into extremely weak fine SANDSTONE [KINERTON SANDSTONE FORMATION]
Refused 1.45m		
Sampling: Env 0.1m-0.2m, Small Bulk 0.8-1.0m		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	3,7: - 14,22,14(20mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School, School**	Ref: **WS10**
Boring date: 18.10.2021	Logged by: DK	Client: **ADRA**	Project ID: 4863
Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.4	Dark brown very slightly silty fine sandy Topsoil with rootlets and rare fine to coarse gravel size fragment of brick. [TOPSOIL].
0.4	1.50	Brown fine SAND [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
1.50	1.85	Light creamy brown fine to medium SAND. Below 1.8m reddish brown to light reddish brown. [KINERTON SANDSTONE FORMATION]
Refused at 1.85m		
Sampling: Env: 0.1m-0.3m Small Bulk 1.5m-2.0m		

Notes.	
	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	
1	1.8	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	4,5: - 5,7,8,8	28	
1.8-2.45	14,11:-21,24,5 (0mm)	50+	Refused

Caulmert	Project: **Former Rhos Street School,Ruthin**	Ref: **WS11**

Boring date:	Logged by:	Client:	Project ID:
18.10.2020	DK	**ADRA**	4863

Elevation		Coordinates	

Depth (m) from	Depth (m) to	Description
0	0.2	Grass over dark brown very slightly silty fine sandy Topsoil with rootlets. [TOPSOIL].
0.2	0.70	Brown fine SAND with rare rootlet. [RESIDUAL SOIL – TOTALLY WEATHERED KINERTON SANDSTONE FORMATION]
0.70	1.00	Dark orangish brown fine SAND. [KINERTON SANDSTONE FORMATION]
Refused at 1.45m		
Samples: Env: 0.4-0.6m Small Bulk 0.8-1.0m		

Notes.	Borehole scanned with CAT prior to drilling
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited
	Groundwater – No groundwater encountered.

Sampling & Recovery Details (m)

Depth (m) from	Depth (m) to	Recovery (%)	comments
0	1	100	

SPT test details

Depth (m)	Blow count	N	Comment
1-1.45m	25(50mm), 28,22(30mm)	50+	Refused

APPENDIX 4

Falling Head Tests

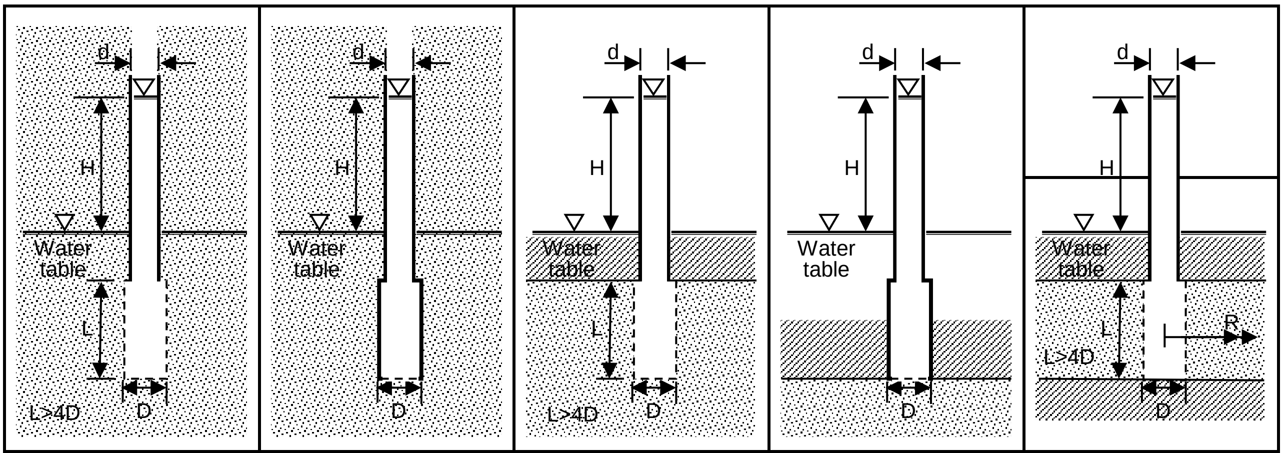
FALLING/RISING HEAD FIELD PERMEABILITY CALCULATIONS | 9-A

October 2007 | APPENDIX TO CHAPTER 3 | Sheet 1 of 1

Project:		Project no.:	
Borehole:	Test date:	Calc. by:	Checked by:

Note: input data only into yellow-highlighted cells: do not amend any other cell, even if it appears blank.

Select test conditions, 1 to 5, from the list below: 1



1. Well in uniform soil	2. Flush bottom in uniform soil	3. Well at impervious boundary	4. Flush bottom at impervious boundary	5. Well with confined flow

READINGS

Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	1.00
1	0.28	0.73
2	0.49	0.52
4	0.66	0.35
9	0.85	0.17
20	1.02	0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
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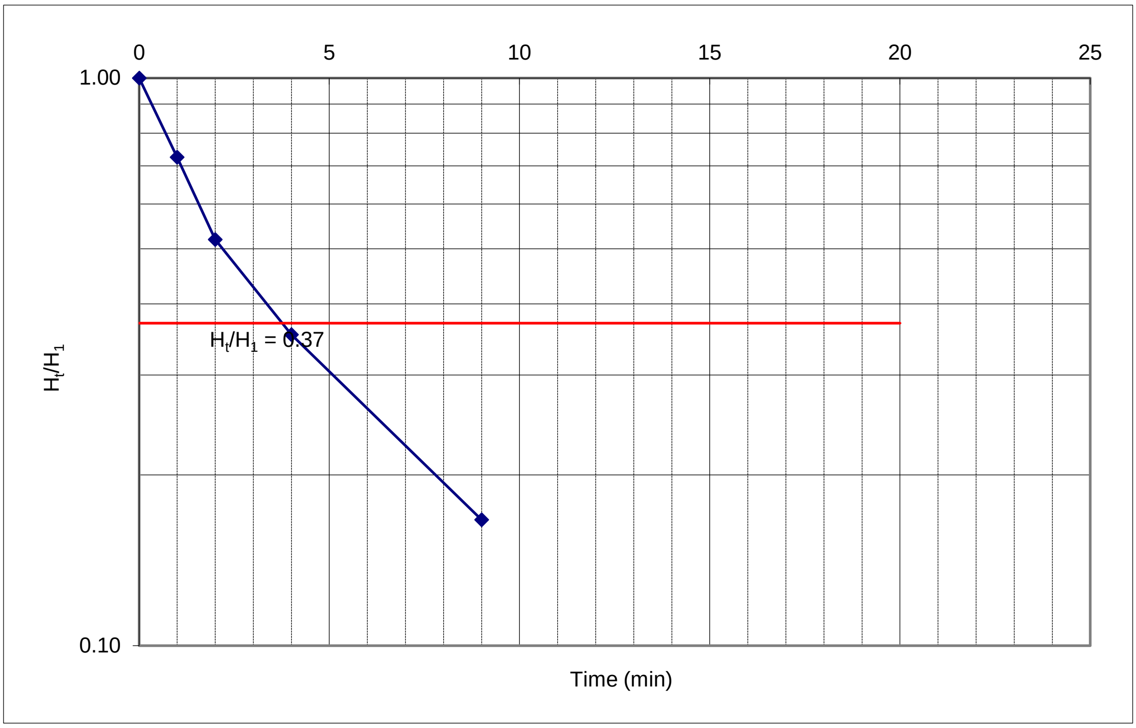
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00

RESPONSE ZONE DETAILS

Top of test section (m bgl)	Bottom of test section (m bgl)	Ht. of casing/standpipe above ground (m)	Casing or standpipe diameter, d (m)	Test section diameter, D (m)	Depth to water table (m bgl)	Dist. to water source (m) - condition 5 only
0.50	1.02	0.00	0.05	0.05	1.02	

ERROR MESSAGES



TIME LAG VALUE (FROM GRAPH)

BASIC TIME LAG, T (min to reach Ht/H_0=0.37) - from graph	4
BASIC TIME LAG (seconds)	240

CALCULATED VALUES

Length of test section, L	0.52
Initial head of water, H_0	1.02

WARNING: water level has fallen below top of test section during test so permeability value may be incorrect

PERMEABILITY (m/s)	7.60E-06

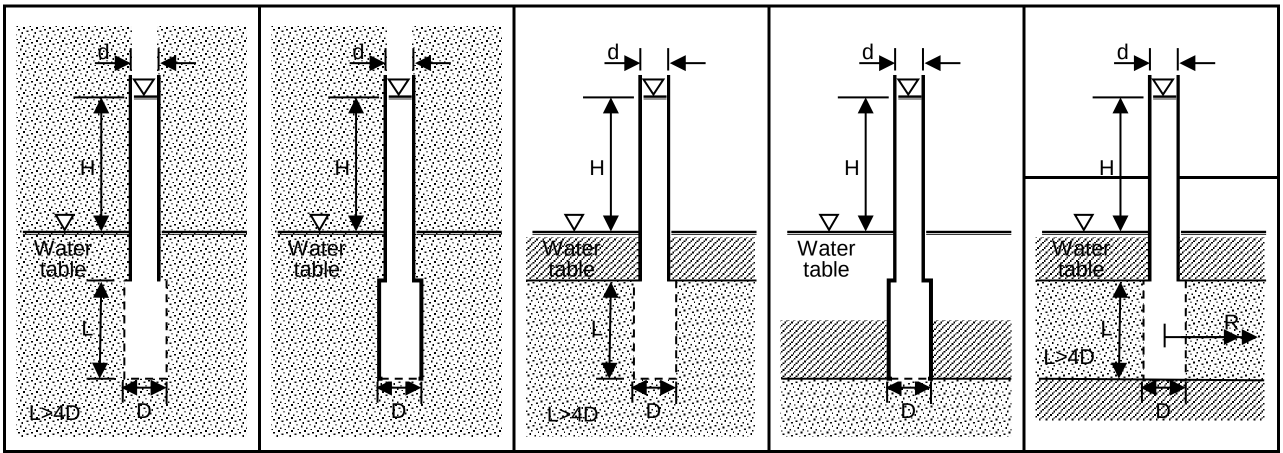
FALLING/RISING HEAD FIELD PERMEABILITY CALCULATIONS — 9-A

October 2007 — APPENDIX TO CHAPTER 3 — Sheet 1 of 1

Project:	Rhos Street School			Project no.:	4863
Borehole:	wS05	Test date:		Calc. by:	Checked by:

Note: input data only into yellow-highlighted cells: do not amend any other cell, even if it appears blank.

Select test conditions, 1 to 5, from the list below: 1



1. Well in uniform soil	2. Flush bottom in uniform soil	3. Well at impervious boundary	4. Flush bottom at impervious boundary	5. Well with confined flow

READINGS

Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0.11	1.00
5	0.26	0.83
9	0.3	0.79
14	0.38	0.70
21	0.47	0.60
29	0.47	0.60
46	0.47	0.60
86	0.71	0.33
130	0.83	0.19
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
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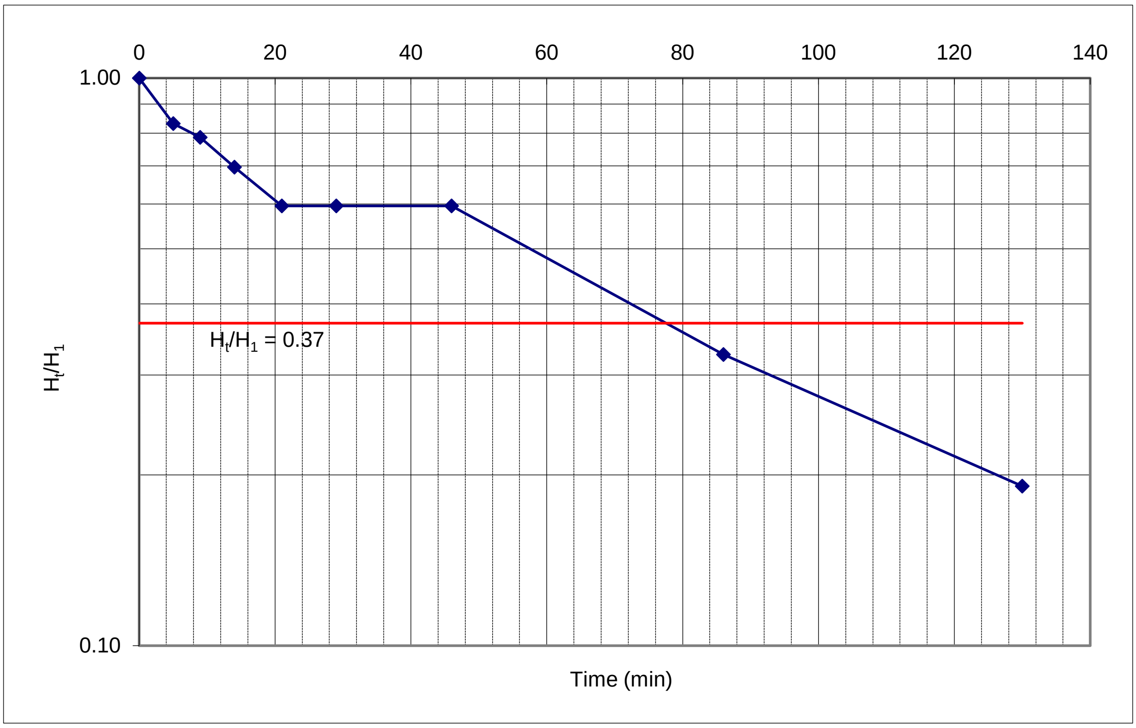
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00

RESPONSE ZONE DETAILS

Top of test section (m bgl)	Bottom of test section (m bgl)	Ht. of casing/standpipe above ground (m)	Casing or standpipe diameter, d (m)	Test section diameter, D (m)	Depth to water table (m bgl)	Dist. to water source (m) - condition 5 only
0.50	1.00	0.00	0.10	0.05	1.00	

ERROR MESSAGES



TIME LAG VALUE (FROM GRAPH)

BASIC TIME LAG, T (min to reach Ht/H_0=0.37) - from graph	78
BASIC TIME LAG (seconds)	4680

CALCULATED VALUES

Length of test section, L	0.50
Initial head of water, H_0	0.89

WARNING: water level has fallen below top of test section during test so permeability value may be incorrect

PERMEABILITY (m/s)	1.60E-06

FALLING/RISING HEAD FIELD PERMEABILITY CALCULATIONS | 9-A

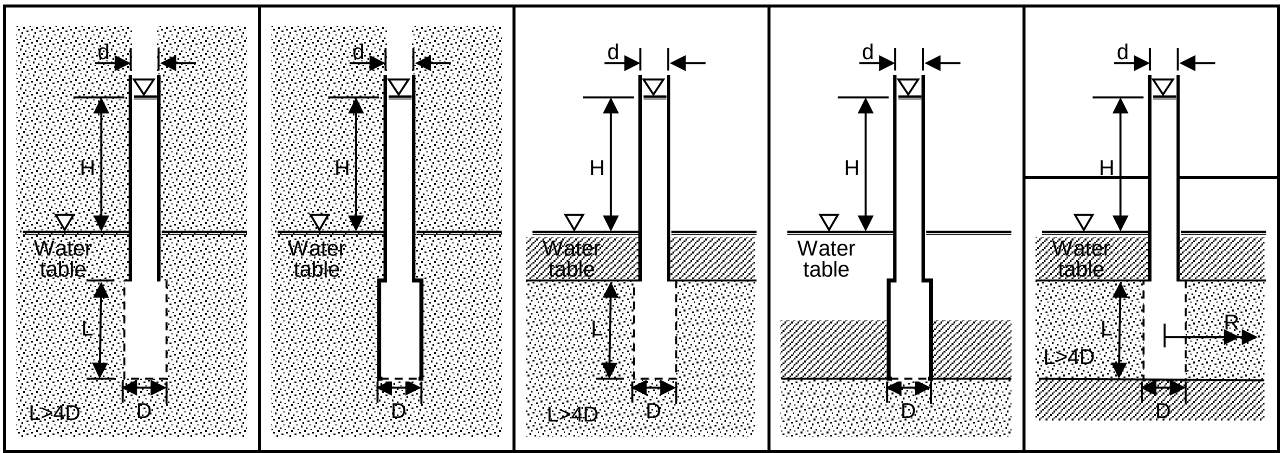
October 2007

APPENDIX TO CHAPTER 3 | Sheet 1 of 1

Project:	Rhos Street School					Project no.:	4863
Borehole:	WS10	Test date:		Calc. by:		Checked by:	

Note: input data only into yellow-highlighted cells: do not amend any other cell, even if it appears blank.

Select test conditions, 1 to 5, from the list below: 1



1. Well in uniform soil	2. Flush bottom in uniform soil	3. Well at impervious boundary	4. Flush bottom at impervious boundary	5. Well with confined flow

READINGS

Time (minutes)	Water depth (m from top of casing)	Proportional head, H_t/H_0
0	0	1.00
2	1.65	0.08
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
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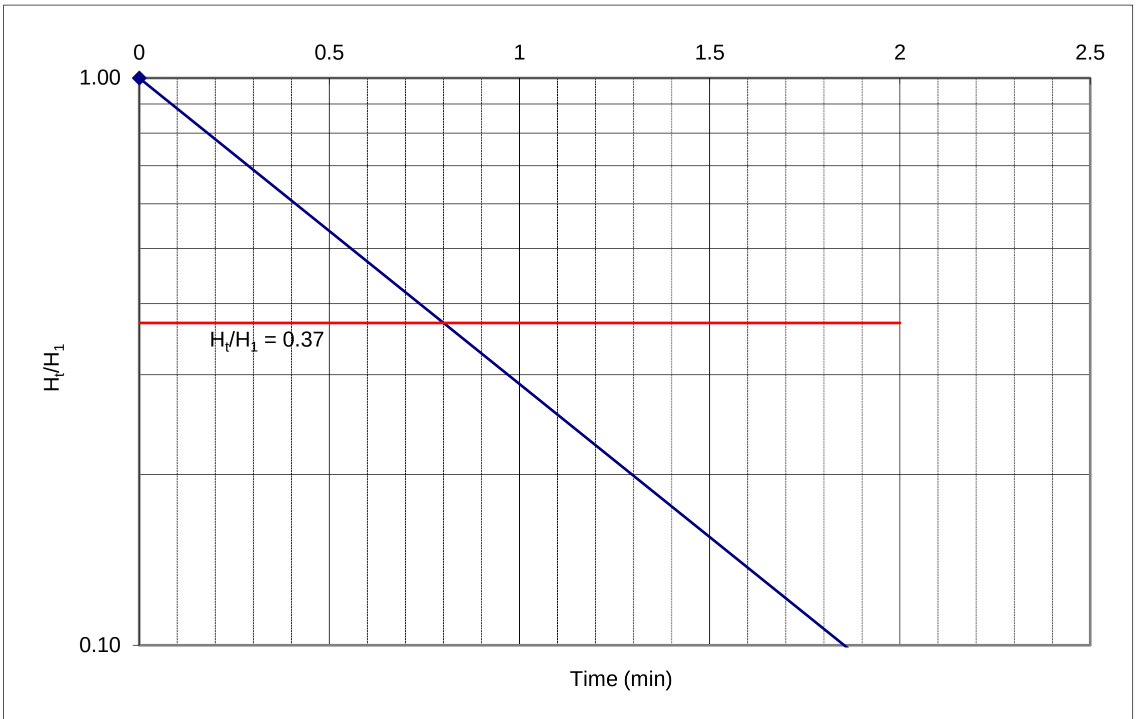
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00

RESPONSE ZONE DETAILS

Top of test section (m bgl)	Bottom of test section (m bgl)	Ht. of casing/standpipe above ground (m)	Casing or standpipe diameter, d (m)	Test section diameter, D (m)	Depth to water table (m bgl)	Dist. to water source (m) - condition 5 only
0.80	1.80	0.00	0.05	0.05	1.80	

ERROR MESSAGES



TIME LAG VALUE (FROM GRAPH)

BASIC TIME LAG, T (min to reach Ht/H_0=0.37) - from graph	0.8
BASIC TIME LAG (seconds)	48

CALCULATED VALUES

Length of test section, L	1.00
Initial head of water, H_0	1.80

WARNING: water level has fallen below top of test section during test so permeability value may be incorrect

PERMEABILITY (m/s)	2.40E-05

APPENDIX 5

Laboratory Testing Results - Geotechnical

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 01 November 2021
Test Report Ref: TR 841795

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the pH Value of Soils in accordance with **BS 1377:Part 3:2018 - Clause 12, Electrometric Method.**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS04 @ 0.5 - 1.0m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**28/10/2021**
Sampling Location:	**WS04 @ 0.5 - 1.0m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as received)**
Tested By:	**CH**
Material Description:	**Sand**
Target Specification:	**N/A**

RESULTS:

pH Value =		**7.8**
*95% Confidence limit**	=	*7.6% - 8%*

These results relate only to the items tested.

Comments	Report checked and approved by:
95% confidence limit calculation:- Test Result ± expanded uncertainty. *Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*	Meical Owen Soils Team Manager

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 11 November 2021
Test Report Ref: TR 841796

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Sulphate Content of in accordance with **BS 1377: Part 3: 2018: Clause 7.6.5.2 (Gravimetric Method)**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS04 @ 0.5 - 1.0m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**05/11/2021**
Sampling Location:	**WS04 @ 0.5 - 1.0m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as receiv**
Tested By:	**DW**
Material Description:	**Sand**
Target Specification	**N/A**

RESULTS:

	Results	*95% Confidence limit**
Mass of soil passing 2.0mm test sieve	**73%**	
Water Soluble Sulphate as SO_4	**20 mg/L**	*18.6% - 21.4%*

These results relate only to the items tested.

Comments	Report checked and approved by:
95% confidence limit calculation:- Test Result ± expanded uncertainty. *Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*	Meical Owen Soils Team Manager

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 01 November 2021
Test Report Ref: TR 841797

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the pH Value of Soils in accordance with **BS 1377:Part 3:2018 - Clause 12, Electrometric Method.**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS07 @ 0.5 - 0.8m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**28/10/2021**
Sampling Location:	**WS07 @ 0.5 - 0.8m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as received)**
Tested By:	**CH**
Material Description:	**Sand**
Target Specification:	**N/A**

RESULTS:

pH Value =		**7.4**
*95% Confidence limit**	=	*7.21% - 7.59%*

These results relate only to the items tested.

Comments
95% confidence limit calculation:- Test Result ± expanded uncertainty.
Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.

Report checked and approved by:

Meical Owen
Soils Team Manager

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 12 November 2021
Test Report Ref: TR 841798

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Sulphate Content of in accordance with **BS 1377: Part 3: 2018: Clause 7.6.5.2 (Gravimetric Method)**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS07 @ 0.5 - 0.8m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**09/11/2021**
Sampling Location:	**WS07 @ 0.5 - 0.8m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as receiv**
Tested By:	**DW**
Material Description:	**Sand**
Target Specification	**N/A**

RESULTS:

	Results	*95% Confidence limit**
Mass of soil passing 2.0mm test sieve	**59%**	
Water Soluble Sulphate as SO_4	**15 mg/L**	*13.95% - 16.05%*

These results relate only to the items tested.

Comments	Report checked and approved by:
95% confidence limit calculation:- Test Result ± expanded uncertainty. *Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*	Meical Owen Soils Team Manager

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 01 November 2021
Test Report Ref: TR 841800

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the pH Value of Soils in accordance with **BS 1377:Part 3:2018 - Clause 12, Electrometric Method.**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS11 @ 0.8 - 1.0m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**28/10/2021**
Sampling Location:	**WS11 @ 0.8 - 1.0m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as received)**
Tested By:	**CH**
Material Description:	**Sand**
Target Specification:	**N/A**

RESULTS:

pH Value =		**7.8**
*95% Confidence limit**	=	*7.6% - 8%*

These results relate only to the items tested.

Comments	Report checked and approved by:
95% confidence limit calculation:- Test Result ± expanded uncertainty. *Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*	Meical Owen Soils Team Manager

Caulmert Ltd.
Unit F13
InTec
Parc Menai
Bangor
LL57 4FG

Date: 11 November 2021
Test Report Ref: TR 841801

Contract: Rhos Street School, Ruthin

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Sulphate Content of in accordance with **BS 1377: Part 3: 2018: Clause 7.6.5.2 (Gravimetric Method)**

SAMPLE DETAILS:

Certificate of sampling received:	**No**
Laboratory Ref. No:	**S98586**
Client Ref. No:	**WS11 @ 0.8 - 1.0m**
Date and Time of Sampling:	**20/10/2021**
Date of Receipt at Lab:	**25/10/2021**
Date of Start of Test:	**05/11/2021**
Sampling Location:	**WS11 @ 0.8 - 1.0m**
Name of Source:	**Site Won**
Method of Sampling:	**Disturbed Bulk Sample**
Sampled By:	**Caulmert CQA Engineer (Test results apply to sample as receiv**
Tested By:	**DW**
Material Description:	**Sand**
Target Specification	**N/A**

RESULTS:

	Results	*95% Confidence limit**
Mass of soil passing 2.0mm test sieve	**67%**	
Water Soluble Sulphate as SO_4	**14 mg/L**	*13.02% - 14.98%*

These results relate only to the items tested.

Comments	Report checked and approved by:
95% confidence limit calculation:- Test Result ± expanded uncertainty. *Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*	Meical Owen Soils Team Manager

APPENDIX 6

Laboratory Testing Results - Contamination

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Caulmert Ltd
St. Asaph Office
Unit 14,
St. Asaph Business Park
St. Asaph
Denbighshire
LL17 0LJ

Attention: David Kitching

CERTIFICATE OF ANALYSIS

Date of report Generation:	26 October 2021
Customer:	Caulmert Ltd
Sample Delivery Group (SDG):	211019-86
Your Reference:	
Location:	Rhos Street School Ruthin
Report No:	618670
Order Number:	16666

We received 8 samples on Tuesday October 19, 2021 and 8 of these samples were scheduled for analysis which was completed on Tuesday October 26, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
25179009	WS1		0.50 - 0.70	18/10/2021
25179010	WS3		0.50 - 0.80	18/10/2021
25179011	WS4		0.40 - 0.60	18/10/2021
25179012	WS5		0.20 - 0.40	18/10/2021
25179013	WS8		0.40 - 0.60	18/10/2021
25179014	WS9		0.10 - 0.20	18/10/2021
25179016	WS10		0.10 - 0.30	18/10/2021
25179017	WS11		0.40 - 0.60	18/10/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
			25179009	WS1		0.50 - 0.70	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179010	WS3		0.50 - 0.80	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179011	WS4		0.40 - 0.60	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179012	WS5		0.20 - 0.40	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179013	WS8		0.40 - 0.60	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179014	WS9		0.10 - 0.20	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179016	WS10		0.10 - 0.30	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
			25179017	WS11		0.40 - 0.60	1kg TUB with Handle (ALE260)	S
							250g Amber Jar (ALE210)	S
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 8					X	
Boron Water Soluble	All	NDPs: 0 Tests: 8						X
Chromium III	All	NDPs: 0 Tests: 8						X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 8						X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 8						X
Metals in solid samples by OES	All	NDPs: 0 Tests: 8						X
PAH by GCMS	All	NDPs: 0 Tests: 8						X
pH	All	NDPs: 0 Tests: 8						X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 8						X
Sample description	All	NDPs: 0 Tests: 8						X
Total Organic Carbon	All	NDPs: 0 Tests: 8						X
TPH c6-40 Value of soil	All	NDPs: 0 Tests: 8						X

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
25179009	WS1	0.50 - 0.70	Light Brown	Loamy Sand	Stones	None
25179010	WS3	0.50 - 0.80	Dark Brown	Sandy Loam	Stones	None
25179011	WS4	0.40 - 0.60	Light Brown	Loamy Sand	Stones	None
25179012	WS5	0.20 - 0.40	Beige	Loamy Sand	Stones	None
25179013	WS8	0.40 - 0.60	Dark Brown	Sandy Clay Loam	Stones	Vegetation
25179014	WS9	0.10 - 0.20	Black	Stone/Soil	Stones	Vegetation
25179016	WS10	0.10 - 0.30	Dark Brown	Loamy Sand	Stones	Vegetation
25179017	WS11	0.40 - 0.60	Dark Brown	Sandy Loam	Vegetation	None

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

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**

Client Ref.: **Location:** Rhos Street School Ruthin

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	WS1	WS3	WS4	WS5	WS8	WS9
			Depth (m)	0.50 - 0.70	0.50 - 0.80	0.40 - 0.60	0.20 - 0.40	0.40 - 0.60	0.10 - 0.20
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	18/10/2021	18/10/2021	18/10/2021	18/10/2021	18/10/2021	18/10/2021
			Sample Time	.	.	.	.	.	.
			Date Received	19/10/2021	19/10/2021	19/10/2021	19/10/2021	19/10/2021	19/10/2021
			SDG Ref	211019-86	211019-86	211019-86	211019-86	211019-86	211019-86
			Lab Sample No.(s)	25179009	25179010	25179011	25179012	25179013	25179014
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		3.8	11	7.1	7.7	8.9	1.2
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.1 #
Cresols	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.01 M	<0.1 #
Xylenols	<0.015 mg/kg	TM062 (S)		<0.015 M	<0.015 M	<0.015 M	<0.015 M	<0.015 M	<0.15 #
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)		<0.035 M	<0.035 M	<0.035 M	<0.035 M	<0.035 M	<0.35 #
Soil Organic Matter (SOM)	<0.35 %	TM132		<0.35 #	3.65 #	1.11 #	2.02 #	1.53 #	5.79 #
pH	1 pH Units	TM133		9.01 M	7.75 M	8.55 M	8.04 M	8.32 M	8.7 #
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #
Cyanide, Free	<1 mg/kg	TM153		<1 M	<1 M	<1 M	<1 M	<1 M	<1 #
TPH >C21-C40	<10 mg/kg	TM154		45.6	19.5	100	31.2	20.9	11400
TPH >C6-C40	<10 mg/kg	TM154		51.1	24.7	112	46.3	31.9	17100
TPH >C6-C10	<10 mg/kg	TM154		<10	<10	<10	<10	<10	<20
TPH >C10-21	<10 mg/kg	TM154		<10	<10	12.3	15.1	11	5690
Chromium, Trivalent	<0.9 mg/kg	TM181		14.1	5.23	7.97	3.59	6.18	5.3
Arsenic	<0.6 mg/kg	TM181		5 M	6.92 M	5.33 M	4.63 M	4.72 M	1.75 #
Beryllium	<0.01 mg/kg	TM181		0.248 M	0.623 M	0.411 M	0.419 M	0.366 M	0.113 #
Cadmium	<0.02 mg/kg	TM181		0.376 M	0.236 M	0.326 M	0.208 M	0.4 M	0.27 #
Chromium	<0.9 mg/kg	TM181		14.1 M	5.23 M	7.97 M	3.59 M	6.18 M	5.3 #
Copper	<1.4 mg/kg	TM181		4.16 M	27.8 M	8.4 M	17 M	54.9 M	6.48 #
Lead	<0.7 mg/kg	TM181		2.97 M	83.2 M	24.6 M	50.8 M	87.5 M	4.79 #
Mercury	<0.1 mg/kg	TM181		<0.1 M	0.342 M	<0.1 M	<0.1 M	<0.1 M	<0.1 #
Nickel	<0.2 mg/kg	TM181		5.43 M	10.7 M	6.61 M	7.86 M	12.4 M	5.62 #
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Vanadium	<0.2 mg/kg	TM181		12.6 #	12.1 #	10 #	7.67 #	8.49 #	14.2 #
Zinc	<1.9 mg/kg	TM181		17.3 M	47.8 M	38 M	59.7 M	143 M	20 #
Boron, water soluble	<1 mg/kg	TM222		<1 M	<1 M	<1 M	<1 M	1.03 M	<1 #

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- (F) Trigger breach confirmed
- 1-4+$@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	WS10	WS11				
			Depth (m)	0.10 - 0.30	0.40 - 0.60				
			Sample Type	Soil/Solid (S)	Soil/Solid (S)				
			Date Sampled	18/10/2021	18/10/2021				
			Sample Time	.	.				
			Date Received	19/10/2021	19/10/2021				
			SDG Ref	211019-86	211019-86				
			Lab Sample No.(s)	25179016	25179017				
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		0	7.9				
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M				
Cresols	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 M				
Xylenols	<0.015 mg/kg	TM062 (S)		<0.015 M	<0.015 M				
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)		<0.035 M	<0.035 M				
Soil Organic Matter (SOM)	<0.35 %	TM132		6.34 #	0.841 #				
pH	1 pH Units	TM133		7.67 M	7.81 M				
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #				
Cyanide, Free	<1 mg/kg	TM153		<1 M	<1 M				
TPH >C21-C40	<10 mg/kg	TM154		58.2	21.1				
TPH >C6-C40	<10 mg/kg	TM154		68.2	24.1				
TPH >C6-C10	<10 mg/kg	TM154		<10	<10				
TPH >C10-21	<10 mg/kg	TM154		<10	<10				
Chromium, Trivalent	<0.9 mg/kg	TM181		5.71	2.66				
Arsenic	<0.6 mg/kg	TM181		8.25 M	2.2 M				
Beryllium	<0.01 mg/kg	TM181		0.765 M	0.178 M				
Cadmium	<0.02 mg/kg	TM181		0.301 M	0.106 M				
Chromium	<0.9 mg/kg	TM181		5.71 M	2.66 M				
Copper	<1.4 mg/kg	TM181		24 M	11.6 M				
Lead	<0.7 mg/kg	TM181		78.8 M	23.6 M				
Mercury	<0.1 mg/kg	TM181		0.114 M	<0.1 M				
Nickel	<0.2 mg/kg	TM181		13.8 M	3.66 M				
Selenium	<1 mg/kg	TM181		<1 #	<1 #				
Vanadium	<0.2 mg/kg	TM181		13.1 #	5.33 #				
Zinc	<1.9 mg/kg	TM181		71.1 M	17.3 M				
Boron, water soluble	<1 mg/kg	TM222		<1 M	<1 M				

Validated

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**

Client Ref.: **Location:** Rhos Street School Ruthin

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	WS1	WS3	WS4	WS5	WS8	WS9
			Depth (m)	0.50 - 0.70	0.50 - 0.80	0.40 - 0.60	0.20 - 0.40	0.40 - 0.60	0.10 - 0.20
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	18/10/2021	18/10/2021	18/10/2021	18/10/2021	18/10/2021	18/10/2021
			Sample Time	.	.	.	.	.	.
			Date Received	19/10/2021	19/10/2021	19/10/2021	19/10/2021	19/10/2021	19/10/2021
			SDG Ref	211019-86	211019-86	211019-86	211019-86	211019-86	211019-86
			Lab Sample No.(s)	25179009	25179010	25179011	25179012	25179013	25179014
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		89.7	88.7	89.2	92	89.7	81.2
Acenaphthene-d10 % recovery**	%	TM218		89.7	89.7	91.8	93.2	91.2	87.4
Phenanthrene-d10 % recovery**	%	TM218		93.5	91.3	94.1	96.7	92.9	91
Chrysene-d12 % recovery**	%	TM218		98.8	89.1	98	95.4	93.1	105
Perylene-d12 % recovery**	%	TM218		106	90.3	94.5	94.8	93.6	74.8
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<45 M	38.1 M	27.7 M	7360 #
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	632 M	189 M	<12 M	8560 #
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	150 M	164 M	80.1 M	66200 #
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	461 M	217 M	80.9 M	57800 #
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	5520 M	1980 M	438 M	320000 #
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	1610 M	577 M	152 M	124000 #
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	8730 M	2220 M	509 M	486000 #
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	7280 M	1740 M	421 M	386000 #
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	3740 M	935 M	208 M	170000 #
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	3460 M	873 M	186 M	151000 #
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	3860 M	997 M	215 M	152000 #
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	1610 M	376 M	85.1 M	64300 #
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	3290 M	733 M	178 M	122000 #
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	2310 M	474 M	118 M	75700 #
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	344 M	84.5 M	<23 M	12400 #
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	1940 M	381 M	99.6 M	51900 #
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		<118	<118	44900	12000	2800	2250000

Validated

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**

Client Ref.: **Location:** Rhos Street School Ruthin

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	WS10	WS11				
			Depth (m)	0.10 - 0.30	0.40 - 0.60				
			Sample Type	Soil/Solid (S)	Soil/Solid (S)				
			Date Sampled	18/10/2021	18/10/2021				
			Sample Time	.	.				
			Date Received	19/10/2021	19/10/2021				
			SDG Ref	211019-86	211019-86				
			Lab Sample No.(s)	25179016	25179017				
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		88.9	90.3				
Acenaphthene-d10 % recovery**	%	TM218		89.5	90.8				
Phenanthrene-d10 % recovery**	%	TM218		91.2	93.7				
Chrysene-d12 % recovery**	%	TM218		87.7	91.6				
Perylene-d12 % recovery**	%	TM218		84.2	92.8				
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M				
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M				
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M				
Fluorene	<10 µg/kg	TM218		<10 M	<10 M				
Phenanthrene	<15 µg/kg	TM218		32.3 M	<15 M				
Anthracene	<16 µg/kg	TM218		<16 M	<16 M				
Fluoranthene	<17 µg/kg	TM218		63 M	<17 M				
Pyrene	<15 µg/kg	TM218		62.5 M	<15 M				
Benz(a)anthracene	<14 µg/kg	TM218		45 M	<14 M				
Chrysene	<10 µg/kg	TM218		52 M	<10 M				
Benzo(b)fluoranthene	<15 µg/kg	TM218		77.4 M	<15 M				
Benzo(k)fluoranthene	<14 µg/kg	TM218		27.7 M	<14 M				
Benzo(a)pyrene	<15 µg/kg	TM218		56.7 M	<15 M				
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		50.2 M	<18 M				
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M				
Benzo(g,h,i)perylene	<24 µg/kg	TM218		48.9 M	<24 M				
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		516	<118				

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Asbestos Identification - Solid Samples

Results Legend
ISO17025 accredited.
M *m*CERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&♦§@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS1 0.50 - 0.70 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179009 TM048	26/10/2021	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS3 0.50 - 0.80 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179010 TM048	26/10/2021	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS4 0.40 - 0.60 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179011 TM048	26/10/2021	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS5 0.20 - 0.40 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179012 TM048	26/10/2021	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS8 0.40 - 0.60 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179013 TM048	26/10/2021	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS9 0.10 - 0.20 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179014 TM048	26/10/2021	Agnieszka Chelmowska	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS10 0.10 - 0.30 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179016 TM048	26/10/2021	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS11 0.40 - 0.60 SOLID 18/10/2021 00:00:00 19/10/2021 10:15:00 211019-86 25179017 TM048	26/10/2021	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM154	In - house Method	Determination of Petroleum Hydrocarbons by EZ Flash GC-FID in the Carbon range C6-C40
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:Soil) by ICP OES.

NA = not applicable.
Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

CERTIFICATE OF ANALYSIS

SDG: 211019-86 **Report Number:** 618670 **Superseded Report:**
Client Ref.: **Location:** Rhos Street School Ruthin

Test Completion Dates

Lab Sample No(s)	25179009	25179010	25179011	25179012	25179013	25179014	25179016	25179017
Customer Sample Ref.	WS1	WS3	WS4	WS5	WS8	WS9	WS10	WS11
AGS Ref.								
Depth	0.50 - 0.70	0.50 - 0.80	0.40 - 0.60	0.20 - 0.40	0.40 - 0.60	0.10 - 0.20	0.10 - 0.30	0.40 - 0.60
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Asbestos ID in Solid Samples	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021
Boron Water Soluble	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	25-Oct-2021
Chromium III	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021
Cyanide Comp/Free/Total/Thiocyanate	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021
Hexavalent Chromium (s)	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021
Metals in solid samples by OES	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	25-Oct-2021	26-Oct-2021
PAH by GCMS	22-Oct-2021	22-Oct-2021	22-Oct-2021	22-Oct-2021	22-Oct-2021	22-Oct-2021	22-Oct-2021	22-Oct-2021
pH	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021
Phenols by HPLC (S)	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021
Sample description	21-Oct-2021	21-Oct-2021	21-Oct-2021	21-Oct-2021	21-Oct-2021	21-Oct-2021	21-Oct-2021	21-Oct-2021
Total Organic Carbon	26-Oct-2021	26-Oct-2021	26-Oct-2021	26-Oct-2021	25-Oct-2021	26-Oct-2021	25-Oct-2021	26-Oct-2021
TPH c6-40 Value of soil	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021	25-Oct-2021

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX 7

–GAC Assessment

Human Health	Residential with plant uptake (1%SOM)						
Chemical of Potential Concern	**Generic Criterion (mg/kg)**	**Basis for Generic Criterion**	**No. Samples**	**Min. (mg/kg)**	**Max. (mg/kg)**	**No. Samples Equal to, or Greater Than, Generic Criterion**	**US95 (mg/kg)**
Arsenic	37	C4SL	8	1.75	6.92	0	7.14
Beryllium	51	LQM/CIEH + CLEA 1.06	8	0.113	0.765	0	0.73
Boron	290	LQM/CIEH + CLEA 1.06	8	1	1.03	0	1.02
Cadmium	26	C4SL	8	0.106	0.4	0	0.42
Chromium (III)	630	LQM/CIEH + CLEA 1.06	8	2.66	14.1	0	11.77
Chromium (VI)	21	C4SL	8	0.6	0.6	0	0.60
Copper	2300	LQM/CIEH + CLEA 1.06	8	4.16	54.9	0	44.95
Lead	200	C4SL	8	2.97	87.5	0	98.87
Mercury, inorganic	170	SGV report + CLEA 1.06	8	0.1	0.342	0	0.26
Nickel	130	SGV report + CLEA 1.06	8	3.66	13.8	0	13.87
Selenium	350	SGV report + CLEA 1.06	8	1	1	0	1.00
Vanadium	74	LQM/CIEH + CLEA 1.06	8	5.33	14.2	0	15.18
Zinc	3700	LQM/CIEH + CLEA 1.06	8	17.3	143	0	116.52
Cyanide (free)	750	Caulmert + CLEA 1.06	0	0	0	0	#DIV/0!
Phenol (total)	180	SGV report + CLEA 1.06	8	0.035	0.035	0	0.04
Acenaphthene	210	LQM/CIEH + CLEA 1.06	8	0.008	66.2	0	44.37
Acenaphthylene	170	LQM/CIEH + CLEA 1.06	8	0.012	8.56	0	5.79
Anthracene	2300	LQM/CIEH + CLEA 1.06	8	0.016	124	0	83.20
Benz(a)anthracene	3.1	LQM/CIEH + CLEA 1.06	8	0.014	170	2	114.16
Benzo(a)pyrene	5	C4SL	8	0.015	122	1	81.97
Benzo(b)fluoranthene	5.6	LQM/CIEH + CLEA 1.06	8	0.015	152	1	102.11
Benzo(ghi)perylene	44	LQM/CIEH + CLEA 1.06	8	0.024	51.9	1	34.91
Benzo(k)fluoranthene	8.5	LQM/CIEH + CLEA 1.06	8	0.014	64.3	1	43.19
Chrysene	6	LQM/CIEH + CLEA 1.06	8	0.01	151	1	101.41
Dibenz(a,h)anthracene	0.76	LQM/CIEH + CLEA 1.06	8	0.023	12.4	1	8.34
Fluoranthene	260	LQM/CIEH + CLEA 1.06	8	0.017	486	1	326.21
Fluorene	160	LQM/CIEH + CLEA 1.06	8	0.01	57.8	0	38.76
Indeno(1,2,3,cd)pyrene	3.2	LQM/CIEH + CLEA 1.06	8	0.018	75.7	1	50.88
Naphthalene	1.5	LQM/CIEH + CLEA 1.06	8	0.009	7.36	1	4.94
Phenanthrene	92	LQM/CIEH + CLEA 1.06	8	0.015	320	1	214.80
Pyrene	560	LQM/CIEH + CLEA 1.06	8	0.015	386	0	259.11
Plant Life							
Chemical of Potential Concern	**Generic Criterion (mg/kg)**	**Basis for Generic Criterion**	**No. Samples**	**Min. (mg/kg)**	**Max. (mg/kg)**	**No. Samples Equal to, or Greater Than, Generic Criterion**	**US95 (mg/kg)**
Arsenic	250	MAFF 1998	8	1.75	6.92	0	7.14
Boron	3	New Zealand timber 1997	8	1	1.03	0	1.02
Chromium (III)	400	MAFF 1998 (Cr(T))	8	2.66	14.1	0	11.77
Chromium (VI)	25	ICRCL 70/90 1990	8	0.6	0.6	0	0.60
Copper	135	BS3882 2007	8	4.16	54.9	0	44.95
Nickel	75	BS3882 2007	8	3.66	13.8	0	13.87
Zinc	300	BS3882 2007	8	17.3	143	0	116.52

Human Health	Residential with plant uptake (1%SOM)		WS9 0.1-0.2m removed				
Chemical of Potential Concern	**Generic Criterion (mg/kg)**	**Basis for Generic Criterion**	**No. Samples**	**Min. (mg/kg)**	**Max. (mg/kg)**	**No. Samples Equal to, or Greater Than, Generic Criterion**	**US95 (mg/kg)**
Arsenic	37	C4SL	7	2.66	6.92	0	7.12
Beryllium	51	LQM/CIEH + CLEA 1.06	7	0.178	0.765	0	0.77
Boron	290	LQM/CIEH + CLEA 1.06	7	1	1.03	0	1.02
Cadmium	26	C4SL	7	0.106	0.4	0	0.45
Chromium (III)	630	LQM/CIEH + CLEA 1.06	7	2.66	14.1	0	12.71
Chromium (VI)	21	C4SL	7	0.6	0.6	0	0.60
Copper	2300	LQM/CIEH + CLEA 1.06	7	4.16	54.9	0	49.27
Lead	200	C4SL	7	2.97	87.5	0	106.06
Mercury, inorganic	170	SGV report + CLEA 1.06	7	0.1	0.342	0	0.29
Nickel	130	SGV report + CLEA 1.06	7	3.66	13.8	0	14.83
Selenium	350	SGV report + CLEA 1.06	7	1	1	0	1.00
Vanadium	74	LQM/CIEH + CLEA 1.06	7	5.33	13.1	0	14.67
Zinc	3700	LQM/CIEH + CLEA 1.06	7	17.3	143	0	127.50
Cyanide (free)	750	Caulmert + CLEA 1.06	0	0	0	0	#DIV/0!
Phenol (total)	180	SGV report + CLEA 1.06	7	0.035	0.035	0	0.04
Acenaphthene	210	LQM/CIEH + CLEA 1.06	7	0.008	0.164	0	0.18
Acenaphthylene	170	LQM/CIEH + CLEA 1.06	7	0.012	0.632	0	0.51
Anthracene	2300	LQM/CIEH + CLEA 1.06	7	0.016	1.61	0	1.32
Benz(a)anthracene	3.1	LQM/CIEH + CLEA 1.06	7	0.014	3.74	1	2.98
Benzo(a)pyrene	5	C4SL	7	0.015	3.29	0	2.60
Benzo(b)fluoranthene	5.6	LQM/CIEH + CLEA 1.06	7	0.015	3.86	0	3.08
Benzo(ghi)perylene	44	LQM/CIEH + CLEA 1.06	7	0.024	1.94	0	1.53
Benzo(k)fluoranthene	8.5	LQM/CIEH + CLEA 1.06	7	0.014	1.61	0	1.28
Chrysene	6	LQM/CIEH + CLEA 1.06	7	0.01	3.46	0	2.76
Dibenz(a,h)anthracene	0.76	LQM/CIEH + CLEA 1.06	7	0.023	0.344	0	0.27
Fluoranthene	260	LQM/CIEH + CLEA 1.06	7	0.017	8.73	0	6.96
Fluorene	160	LQM/CIEH + CLEA 1.06	7	0.01	0.461	0	0.40
Indeno(1,2,3,cd)pyrene	3.2	LQM/CIEH + CLEA 1.06	7	0.018	2.31	0	1.82
Naphthalene	1.5	LQM/CIEH + CLEA 1.06	7	0.009	0.045	0	0.05
Phenanthrene	92	LQM/CIEH + CLEA 1.06	7	0.015	5.52	0	4.54
Pyrene	560	LQM/CIEH + CLEA 1.06	7	0.015	7.28	0	5.79
Plant Life							
Chemical of Potential Concern	**Generic Criterion (mg/kg)**	**Basis for Generic Criterion**	**No. Samples**	**Min. (mg/kg)**	**Max. (mg/kg)**	**No. Samples Equal to, or Greater Than, Generic Criterion**	**US95 (mg/kg)**
Arsenic	250	MAFF 1998	7	2.66	6.92	0	7.12
Boron	3	New Zealand timber 1997	7	1	1.03	0	1.02
Chromium (III)	400	MAFF 1998 (Cr(T))	7	2.66	14.1	0	12.71
Chromium (VI)	25	ICRCL 70/90 1990	7	0.6	0.6	0	0.60
Copper	135	BS3882 2007	7	4.16	54.9	0	49.27
Nickel	75	BS3882 2007	7	3.66	13.8	0	14.83
Zinc	300	BS3882 2007	7	17.3	143	0	127.50

Caulmert
Engineering, Environmental and Planning

Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672666

Fax: 01248 672601

Email: contact@caulmert.com

Web: www.caulmert.com