

**JONES BROS (RUTHIN) LTD**

**FORMER SEIONT BRICKWORKS AND QUARRY, CAERNARFON, GWYNEDD, LL55 2YL**

**SITE CONDITION REPORT AND GROUND CONTAMINATION INVESTIGATION AND RISK ASSESSMENT**

**REPORT No. E0756.SCRGCRA.R1**

**JANUARY 2016**




**Client :** JONES BROS (RUTHIN) LTD

**Project Title :** FORMER SEIONT BRICKWORKS AND QUARRY, CAERNARFON, GWYNEDD, LL55 2YL

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<b>Prepared by:</b>	Huw Littler-Jones		
<b>Checked by:</b>			
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<b>Signed:</b>			

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## **1. INTRODUCTION.**

### **1.1 Background and Terms of Reference**

- 1.1.1 In November 2015 e-geo Solutions Ltd were commissioned by Jones Bros (Ruthin) Ltd. to undertake a combined Phase 1 and Phase 2 ground contamination investigation and risk assessment on land at a former quarry and brickworks known as Seiont Quarry in Caernarfon, Gwynedd. The objective of the investigation and assessment was to assess the site with respect to potential contamination and the risks that may be presented to use of the site as a temporary construction compound and site offices for a road construction scheme.
- 1.1.2 This report presents the findings of a Phase 1 desk based risk assessment and Phase 2 ground investigation with the chemical analysis of soil samples. The report provides the findings of the desk based assessment and details of the ground conditions encountered and the results of chemical analysis of soil samples.
- 1.1.3 It is proposed to use the site initially as a temporary construction compound and base for site offices for the construction of the new A487 Caernarfon Bypass and the findings of the desk study and intrusive investigation have been assessed against this proposed end use.
- 1.1.4 The report has been prepared by e-geo Solutions Ltd for the sole use of the Client, for the purposes described and no extended duty of care applies to other parties. Any other party using this report for any purpose whatsoever do so at their own risk and any duty of care to that party is specifically excluded.
- 1.1.5 The comments given, and opinions expressed, in this report are based on the information available at the time the report was compiled, however there may be additional information and data which becomes available at a later date which has an impact on the report content. Where data supplied by others has been used it has been assumed that the information is correct. No responsibility can be accepted by e-geo Solutions Ltd for inaccuracies within the data supplied by others.
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### **1.2 Report Contents**

- 1.2.1 The report includes sections on:-
- Present site description, profile and environmental setting including site development history
  - The scope of the investigation, testing and analysis and its justification
  - The geological and hydro-geological conditions encountered in trial holes
  - Chemical analysis results and an assessment of contamination
  - An assessment of risk to future site use as a construction compound and the wider environment.

## 2. SITE LOCATION, DESCRIPTION AND PROFILE.

### 2.1 Site Location

- 2.1.1 The site is located approximately 1.5km southeast of the centre of Caernarfon, Gwynedd between the A487 and A4085. The site location is shown on Figure 1 and is centred at Grid Reference 248855,361481.



Figure 1 – Site Location

- 2.1.2 The extent of the site is shown on Figure 2.

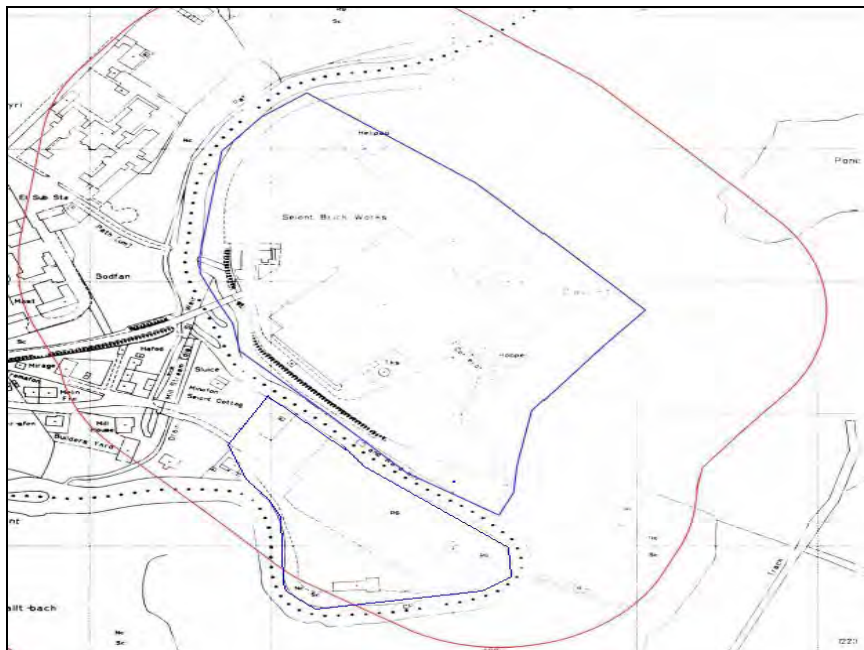


Figure 2 – Site Extent

## 2.2 Site Description and Topography

- 2.2.1 The area of investigation comprises a former brick factory and brick storage yard that was previously the Seiont Brickworks and a separate brick storage area to the south of the main factory and Afon Seiont. All buildings and structures associated with the brick factory have been now been demolished and only the concrete floor slab from the former brickworks factory remains. There are some small mounds of bricks and larger mounds of demolition rubble, brick and unused clay material on the concrete slab and at the northern and eastern side of the former brickworks factory. To the south of the Afon Seiont in the brick stockpile area there are very large mounds of discarded bricks which cover much of the area.
- 2.2.2 Overall the site is situated in a rural setting, with some by residential properties to the west. The Afon Seiont flows past the main brickworks site on the west and south side and almost completely around the southern brick stockpile area. There are no permanent structures remaining on either of the site areas. Site photographs are presented in Appendix 1.
- 2.2.3 The overall ground topography within the site is very flat and level but at a low point in the surrounding area which places the site in a 'bowl'. To the north-east is the former clay pit which is now a lake surrounded by steep quarry face slopes which show significant evidence of instability on the northeast and north sides. An aerial photograph of the site is shown as Figure 3.



**Figure 3 -Aerial Photograph**

## 2.3 Site Profile

- 2.3.1 A desk based study of the site has been undertaken. Full details of the site history with historical Ordnance Survey maps are presented in Appendix 2. Details of the geological and environmental setting are presented in Appendix 3 and 4. A summary of the findings and site profile are presented below:



Profile Item	Former Seiont Brickworks, Caernarfon
<b>Site Status:</b> (Site photographs are presented in Appendix 1)	The site comprises a former brickworks factory and quarry with an additional area used as a brick stockpile and storage site. The site is flat and level and surrounded by rising ground on all sides, and is immediately adjacent to the Afon Seiont. There are no structures on site but the concrete floor slab to the brickworks factory remains and covers much of the northern portion of the site.
<b>Site History:</b> (Historical OS Maps presented in Appendix 2)	<p><b>1889:</b> The main brickworks site (north) is undeveloped agricultural land but there is a single track railway line (Caernarfon and Llanberis) crossing the northwest portion of the site from the present day access bridge. The southern portion of the site is occupied by the Seiont Brickworks (disused). Surrounding the site there is a 'Workhouse' (west), 'Cornmill' (southwest) and 'Tannery' ((northeast) surrounding land is predominantly agricultural land with some residential properties to the west and east.</p> <p><b>1900:</b> The area is as in 1889.</p> <p><b>1918:</b> There is no change from 1900 but there is a small 'claypit' to the southeast</p> <p><b>1964:</b> The main brickworks site (north) remains undeveloped but the Seiont Brickworks in the southern portion has been expanded to include larger buildings and a connection to a 'mineral railway' onto the area. The tannery and corn mill no longer exist and the workhouse is the 'Eryri Hospital'.</p> <p><b>1974:</b> The main brickworks (north) has been constructed and comprises a structure which occupies the central portion of the northern area. There is an extensive 'quarry' to the east and northeast.</p> <p><b>1977:</b> The main brickworks (north) remains as in 1974 but the brickworks to the south of the Afon Seiont has been demolished.</p> <p><b>1987:</b> The area remains as in 1977. There is a 'clay pit' and 'ponds' to the northeast of the area.</p> <p><b>1995:</b> The site remains as in 1987.</p>
<b>Services:</b>	There are presently no known live services within the site.
<b>Geology:</b> (Geological maps and data are presented in Appendix 3)	<p>Information from the British Geological Survey Map No.118 indicates that the geological sequence below the site comprises alluvium and glacial deposits overlying sedimentary rocks of mudstone.</p> <p>The alluvial deposits will be found only immediately adjacent to the river as thin deposits of silt, sand and gravel. The glacial deposits comprise a coarse sand and gravel with cobbles and a gravely sandy silty clay.</p> <p>The bedrock below the site will comprise fine grained sedimentary rocks of siltstone and mudstone.</p> <p>There is no record of any made ground within the site, however considering the sites previous use as a brickworks the presence of made up ground particularly along the edge of the river can not be discounted.</p> <p>There are no faults within 100m of the site.</p> <p>Both the northern and southern portion of the site are indicated as being historical surface workings features, with a clay pit and quarry indicated on and to the northeast of the site.</p> <p>There is a high risk of landslides associated with the former clay pit and quarry to the northeast of the site.</p> <p>There is a very low risk of shrinkage and swelling clay at the site.</p> <p>There is a negligible risk of ground dissolution of soluble rocks below the site.</p> <p>There is a low risk of compressible deposits below the site.</p> <p>There is a very low risk of collapsible deposits below the site.</p> <p>There is a very low to low risk of running sand at the site.</p>

<b>Radon :</b>	<p>The site is not in a radon affected area with less than 1% of properties above the action level.</p> <p>No radon protection measures are required.</p>
<b>Ground Permeability :</b>	<p>The glacial till deposits will be of low to high permeability.</p> <p>The bedrock will be of low to medium permeability with permeability governed predominantly by fractures and fissures.</p>
<b>Hydrogeology: (Environmental data is presented in Appendix 4)</b>	<p>There is no information on the aquifer in the superficial deposits but it is likely to be an unproductive or secondary aquifer. These are deposits that have been defined as minor or non-aquifers. The bedrock below the site is classed as a secondary (B) aquifer. This is defined as geology of lower permeability layers, which yield limited amounts of groundwater and were formerly the water bearing parts of non-aquifers.</p> <p>There are no Groundwater Abstraction Licence within 2000m of the site but there is a Surface Water Abstraction Licence point on site.</p>
<b>Hydrology:</b>	<p>According to the Aquifer and Abstractions Map the Afon Seiont flows around the northwest, south and southwest portion of the site. The Afon Seiont has an A (very good) chemical quality grade and B biological quality grade.</p>
<b>Sensitive Land Uses:</b>	<p>The Afon Seiont is designated a Sites of Special Scientific Interest 388m northwest and 594m west of the site</p>
<b>Landfills:</b>	<p>There are no Environment Agency registered landfill sites within 1000m of the site. The nearest historic landfill is 238m northeast of the site.</p>
<b>Historical Industrial Sites:</b>	<p>The site itself is designated as having a potentially contaminative past land use due to its use as a brickworks and clay pit.</p> <p>A number of tanks (unspecified) have been identified as being on site.</p>
<b>Pollution Incidents:</b>	<p>There are 1 recorded Environment Agency pollution incident (No. 265918) which originates at the site. The incident in September 2004 was due to contaminated water (suspended solids) and had a significant impact on water quality.</p>
<b>Potential Contamination:</b>	<p>The site has had a historical use as a brick making factory and there are a number of potential sources of contamination which include:</p> <ul style="list-style-type: none"> <li>• Presence of made up ground and fills</li> <li>• Spilt heating fuels at storage tanks</li> <li>• Spent fuel residues deposited on site</li> <li>• Kiln wastes deposited on site</li> <li>• Residues and wastes associated with rail lines</li> </ul>



### 3. GROUND INVESTIGATION WORKS.

#### 3.1 Previous Investigations

3.1.1 No known previous ground investigations have been undertaken at the site.

#### 3.2 Scope of Work – Exploratory Holes

3.2.1 A geo-environmental ground investigation was undertaken to provide information on the ground conditions at the site. The works were carried out by e-geo Solutions Ltd with the field work element undertaken on 25<sup>th</sup> November 2015. The investigation was designed, supervised and administered by e-geo Solutions Ltd and undertaken in accordance with BS5930 (1999) – code of Practice for Site Investigations (Amendment 1).

3.2.2 The main scope of work involved:

- The excavation of 11 Nr. trial pits
- The examination of ground strata by a geo-environmental engineer with the photographing of exposed strata and the careful description of soil types. Detailed descriptions of the ground strata are presented trial hole records in Appendix 5
- Collection of 11 Nr. ground samples from near the ground surface across the site
- Collection of 2 Nr. Surface water samples from the Afon Seiont at points upstream and downstream of the site.

#### 3.3 Scope of Work – Testing and Analysis

3.3.1 A total of 11 ground samples were collected from the trial pits and 2 surface water samples from the Afon Seiont. All samples were submitted for chemical analysis at an accredited analytical laboratory. The analytical results are presented in Appendix 6. Samples were tested for:

Suite	Chemical Determinants	No. of Samples
Suite 1	pH, arsenic, cadmium, chromium, lead, mercury, selenium, copper, nickel, zinc, cyanide (total), phenol, sulphide, sulphur, sulphate. PAH (speciated)	9
Suite 2	TPH (Aliphatic/aromatic split)	3
Suite 3	Asbestos screen	6
Suite w	pH, arsenic, cadmium, chromium, lead, mercury, selenium, copper, nickel, zinc, cyanide (total), sulphate. PAH (speciated)	2

#### 3.4 Trial Hole Locations

3.4.1 Trial pit locations are indicated on Figure 5 below.

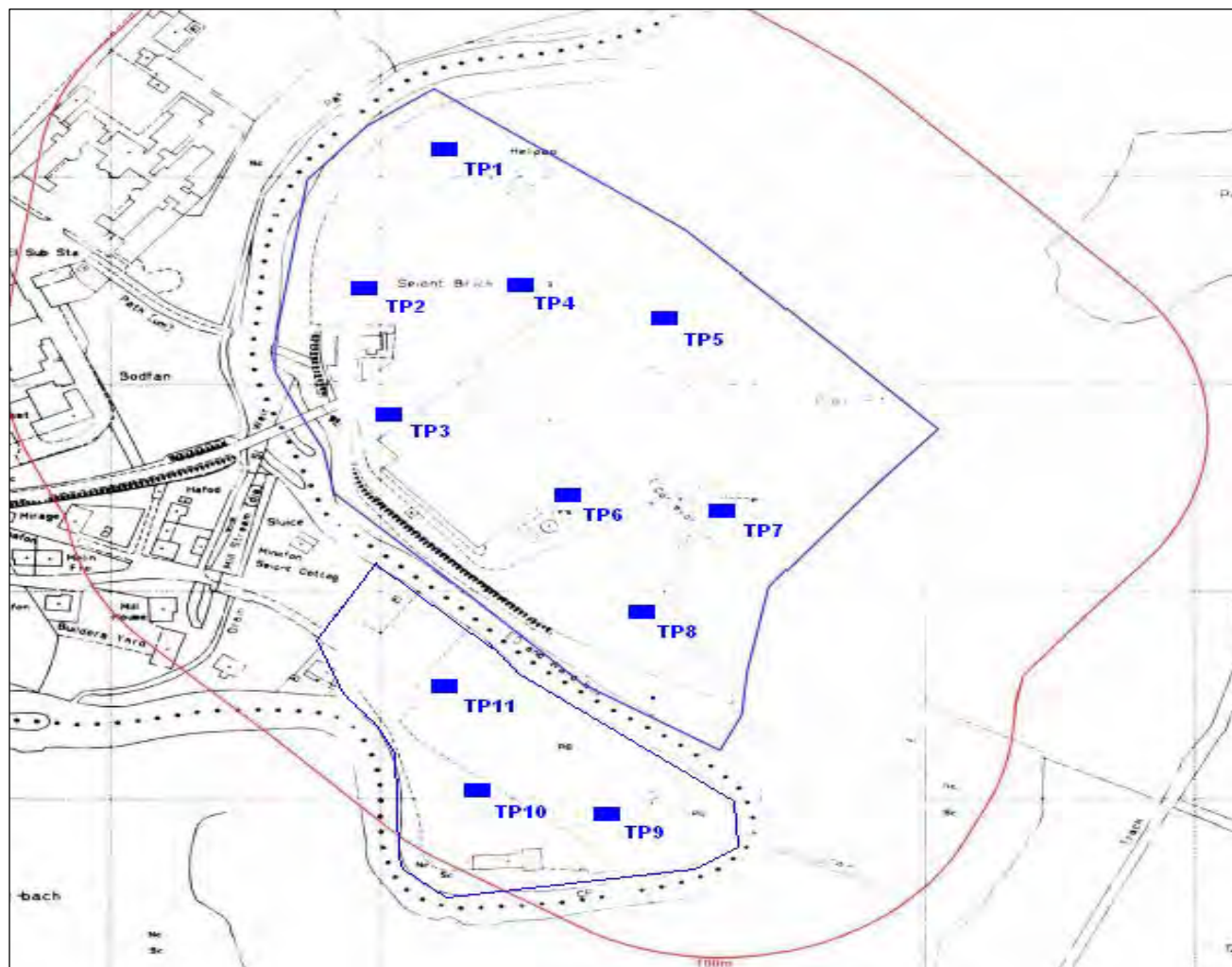


Figure 5 – Trial Pit Locations

#### 4. GROUND CONDITIONS AND GEOLOGY.

##### 4.1 General

- 4.1.1 Details of the ground strata and depths are presented on the trial pit records in Appendix 5. A summary of the findings are presented below.

##### 4.2 Stratigraphy

- 4.2.1 The general stratigraphic sequence was:

Made Ground 1 – Crushed brick and crushed brick and slate  
Made Ground 2 – Silty SAND and GRAVEL of crushed brick  
Made Ground 3 – Gravely sandy CLAY with brick gravel and brick cobbles  
Made Ground – Clayey sandy coarse GRAVEL of brick  
Clay – Firm gravely sandy silty CLAY with cobbles and boulders  
Gravel – Coarse gravel of quartz, quartzite and siltstone

- 4.2.2 The strata and depths encountered during the investigation was:

Stratum	Description	Depth to base m range (average)
Made Ground 1 – Crushed brick	(Medium dense) reddish brown silty gravel and cobbles of crushed brick and slate	0.30
Made Ground 2 – Sand and Gravel	(Dense) light brown silty fine to coarse SAND and GRAVEL of brick	0.50
Made Ground 3 – Clay	Stiff medium grey brown to brown very gravely sandy silty CLAY with some brick cobbles. Gravel is subangular fine to coarse siltstone and brick	1.50 – 3.00 (Av 2.00)
Made Ground 2 – Gravel (TP7 & TP8) (TP9 & TP10)	(Dense) orangish red and some medium grey clayey sandy coarse GRAVEL of crushed brick with very occasional rubber sheet and plastic pipe	3.00+
CLAY	Soft to firm light brown to light grey brown slightly gravely silty CLAY	3.00+
GRAVEL (TP11)	Dense light brown and light grey brown silty sandy fine to coarse GRAVEL and many cobbles and occasional boulder. Gravel is subrounded quartz, quartzite and rhyolite	2.30+

##### 4.3 Groundwater

- 4.3.1 No groundwater was encountered in any of the trial pits. Water did flow into some of the trial pits (period of heavy rain prior to pit excavation) from within the surface layer of crushed brick. Also in TP5 and TP6 where a concrete base was found at depth there was perched and trapped water.

##### 4.4 Contamination Observations

- 4.4.1 During the examination of the ground strata no obvious indications of contamination were noted. There was no indication of hydrocarbons or unusual odours. All readings with a hand held pid for volatile vapours gave results of 0ppm. Monitoring was carried at the following locations and depths:

Location	Depth (m)	Volatiles (ppm)
TP1	0.50/2.50	0 ppm
TP2	0.50/2.00	0 ppm
TP3	0.50	0 ppm
TP4	0.75	0 ppm
TP5	1.00	0 ppm
TP6	0.50	0 ppm
TP7	0.75	0 ppm
TP8	1.00	0 ppm
TP9	0.75	0 ppm
TP10	1.00	0 ppm
TP11	0.75	0 ppm

## 5. CONTAMINATION ASSESSMENT

### 5.1 General

- 5.1.1 The results of the chemical analysis of soils samples are presented in Appendix 6. An assessment of the results of the analysis on samples has been undertaken to determine the presence and extent of any ground contamination. The assessment of contamination undertaken is a 'Tier 1 Generic Risk Assessment' which requires the comparison of contaminant concentrations to a set of generic Tier 1 Screening Values (TSV) risk based screening concentrations.
- 5.1.2 Contaminant concentrations below the TSVs are considered not to warrant further risk assessment. It should be noted that exceeding the TSVs does not necessarily mean there is a risk and the site should be remediated.

### 5.2 Soils Reference Values

- 5.2.1 TSVs for soil derived to be protective of human health are defined for standard end use situations in accordance with UK CLR framework. The values chosen are dependant on the site use or proposed development. For assessment purposes the proposed use of the site has been taken as 'Commercial'. The TSVs selected to assess soils in relation to human health over the whole site are therefore 'commercial'.
- 5.2.2 The applicable TSVs for assessment of the analytical results are based on the following guideline criteria:

Ref	Guideline Criteria
1	(CLEA 2009) Soil Guideline Values (SGVs) for 'commercial' end-use. (where available)
2	Tier 1 screening criteria for general soil contaminants not addressed by CLEA such as: 2.1 – LQM CIEH Generic Assessment Criteria – 2 <sup>nd</sup> Edition 2009 2.2 - Welsh Assembly Government C4SL

### 5.3 Soils Analysis Assessment

- 5.3.1 The results of the screening against guideline criteria values are presented in the tables below. Where values exceed the relevant TSVs they are highlighted in the tables.

PROJECT		Former Seiont Brickworks, Caernarfon							
BH/TP				TP1	TP2	TP3	TP4	TP5	TP6
SAMPLE DEPTH				0.8	0.5	0.5	0.75	1.00	0.5
SAMPLE TYPE				MG	MG	MG	MG	MG	MG
DATE SAMPLED				25/11/15	25/11/15	25/11/15	25/11/15	25/11/15	25/11/15
		Ref 1:	Ref 2:						
Arsenic	mg/kg	640	6000 (2.2)	32	22	32	19	20	
Cadmium	mg/kg	230		0.4	0.3	0.2	0.3	0.6	
Chromium (total)	mg/kg	8840		37	27	27	30	60	
Lead	mg/kg			56	30	22	28	16	
Mercury	mg/kg	26		0.13	0.06	< 0.05	< 0.05	< 0.05	
Selenium	mg/kg	13,000	71700	2.5	0.9	< 0.5	1.7	< 0.5	
Copper	mg/kg			29	29	21	30	110	
Nickel	mg/kg	1800		23	26	27	30	52	
Zinc	mg/kg		665000	110	87	83	100	67	
PAH (sum of 17)	mg/kg		50	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Phenols	mg/kg		1000	0.6	< 0.3	< 0.3	< 0.3	< 0.3	
Cyanide (total)	mg/kg			0.7	0.3	< 0.1	< 0.1	< 0.1	
EPH	mg/kg				< 10				
Sulphide	mg/kg			12	12	< 10	< 10	< 10	
Sulphur	%			0.06	0.02	0.01	0.01	0.14	
Asbestos	mass %			NAD	NAD	NAD	NAD	0.006	0.033
pH				6.9	6.9	7.5	7.5	9.4	
				Exceeds Guideline Criteria Ref 1 SGV					
				Exceeds Guideline Criteria Ref 2.1,2.2 TSV					



PROJECT		Former Seiont Brickworks, Caernarfon							
BH/TP									
SAMPLE DEPTH									
SAMPLE TYPE									
DATE SAMPLED									
		Ref 1:	Ref 2:						
Arsenic	mg/kg	640	6000 (2.2)	24	37	45	110		
Cadmium	mg/kg	230		0.3	0.4	0.4	1.5		
Chromium (total)	mg/kg	8840		27	41	25	24		
Lead	mg/kg			27	38	51	92		
Mercury	mg/kg	26		< 0.05	< 0.05	< 0.05	< 0.05		
Selenium	mg/kg	13,000	71700	0.9	2.2	1.9	1.4		
Copper	mg/kg			41	42	52	120		
Nickel	mg/kg	1800		33	48	41	88		
Zinc	mg/kg		665000	190	160	110	180		
PAH (sum of 17)	mg/kg			< 0.10	< 0.10	0.19	< 0.10		
Phenols	mg/kg			3.0	< 0.3	< 0.3	< 0.3		
Cyanide (total)	mg/kg		1000	0.3	0.2	< 0.1	0.6		
EPH	mg/kg			1400		340			
Sulphide	mg/kg			< 10	< 10	< 10	20		
Sulphur	%			0.06	0.09	0.09	0.04		
Asbestos				NAD	0.006	NAD	NAD		0.006
pH				8.1	7.7	7.8	6.6		
		Exceeds Guideline Criteria Ref 1 SGV							
		Exceeds Guideline Criteria Ref 2.1,2.2 TSV							

- 5.3.2 Comparison of the analytical results for metals and non-metals using maximum concentrations as a means of assessment with the Tier 1 TSVs for 'commercial end use' indicates that the made ground strata do not contain any significant concentrations of contaminants above available respective trigger concentrations.
- 5.3.3 Concentrations of cadmium and chromium were significantly below the guideline concentrations.
- 5.3.4 Concentrations of arsenic were significantly below the guideline concentration.
- 5.3.5 Concentrations of mercury were below the detection limits.
- 5.3.6 Concentrations of lead were significantly below the guideline concentration.
- 5.3.7 Concentrations of copper, nickel, zinc and selenium were significantly below the guideline concentrations.
- 5.3.8 No elevated concentrations of sulphide or sulphur were found in the ground. Phenol and cyanide concentrations were generally below the detection limits.
- 5.3.9 Very slightly elevated concentrations of hydrocarbons were detected in the sample from TP7 at 0.75m but when the aliphatic/aromatic fractions are compared to the guideline concentrations for the fractions, there are no elevated concentrations and the hydrocarbon is not considered to present a contamination source.
- 5.3.10 Concentrations of polyaromatic hydrocarbons were below the detection limits.

- 5.3.11 All 11 samples were screened for the presence of asbestos fibres. Asbestos was detected in 4 of the 11 samples. The results of the screening analysis reported bundles or clumps of chrysotile asbestos.
- 5.3.12 Quantification analysis indicated only 0.006% mass of asbestos on samples at TP5, TP8 and TP11. In TP6 the mass of asbestos was 0.033%.

#### 5.4 Water Analysis Assessment

- 5.4.1 The results of analysis of surface water samples have been compared with the EQS values for freshwater and UK drinking water standards are presented in the table below:

PROJECT		Former Seiont Brickworks, Caernarfon			
BH/TP SAMPLE DEPTH SAMPLE TYPE DATE SAMPLED				SW1	SW2
				SW	SW
				SW	SW
				01/12/15	01/12/15
		EQS FW	UK DW		
pH				7.7	7.8
Dissolved Arsenic	ug/l	50	10	0.22	< 0.16
Dissolved Cadmium	ug/l	5	5	< 0.03	< 0.03
Total Dissolved Chromium	ug/l	50 (5-50)	50	7.2	7.9
Dissolved Copper	ug/l	112	2000	5.4	2.5
Dissolved Lead	ug/l	20(4-20)	25 (10)	0.50	0.41
Dissolved Mercury	ug/l	1	1	< 0.01	< 0.01
Dissolved Nickel	ug/l	200(50-200)	20	1.1	0.7
Dissolved Zinc	ug/l	300-500	5000	9.94	7.64
Dissolved Selenium	ug/l			< 0.25	< 0.25
Dissolved Cyanide	ug/l		0.01	< 40	< 40
PAH	ug/l		0.1	< 0.20	< 0.20
Sulphate	mg/l		0.1	6.9	62



Exceeds Guideline Criteria UKDW

Exceeds Guideline Criteria EQS FW (salmonoid) - Hardness 250

- 5.4.2 Comparison of the analytical results from analysis of surfacewaters taken from the adjacent Afon Seiont indicates that there are no elevated concentrations of any of the chemical parameters analysed for (with the exception of sulphate and the drinking water standards).
- 5.4.3 There is no noticeable difference between the upstream sample SW1 and downstream sample SW2, indicating that there is no impact from the site on water quality.

## **5 RISK ASSESSMENT, DISCUSSION AND REMEDIATION REQUIREMENTS.**

### **6.1 Introduction**

- 6.1.1 The assessment of risk undertaken follows a 'Tier 1 Generic Risk Assessment' approach which follows a source-pathway-target model prior to considering the need for a 'Tier 2 Pathway Specific Risk Assessment'. The process of risk assessment is an evaluation of the probability of harm, and comprises the identification of sources of contamination (toxic substances), receptors that may be affected by the contamination and pathways for contamination to come into contact with receptors.
- 6.1.2 For a risk to exist there must be a contamination source at concentrations which potentially could present a risk to human health or controlled waters, a realistic exposure pathway and identified receptors.

### **6.2 Contamination Source**

- 6.2.1 The main data source for the hazard identification is the site development history and use and information on the presence of existing waste materials at the site. From the assessment of this data, information on the potential source, type and location of contamination hazard has been identified.
- 6.2.2 The information indicates that the only use of the site after agricultural land has been as a brick making factory and associated quarry. Brick making itself does not involve materials or large scale activities that will produce any significant contamination and the only possible identified sources of contamination include:
- Presence of made up ground and fills
  - Spilt heating fuels at storage tanks
  - Spent fuel residues deposited on site
  - Kiln wastes deposited on site
  - Residues and wastes associated with rail lines
- 6.2.3 However the results of the site investigation and analysis of ground samples has not identified any significant contamination within the ground materials at the site. No elevated concentrations of metals, inorganics or hydrocarbons were found in the near surface soils that were predominantly made up ground and fills.
- 6.2.4 The only potential contamination issue of note was the presence of asbestos fibres in 4 of the 11 samples, however only in TP6 was the amount of any significance. In TP6 the ground material comprised demolition material and appeared to be contained within a tank base.

### **6.3 Potential Receptors and Sensitivity**

- 6.3.1 The site is to be used as a temporary construction compound and site offices for a road construction scheme and the only principal receptors are:
- Humans – Future site visitors and construction personnel
  - Controlled Waters – Adjacent Afon Seiont

### **6.4 Potential Pathways and Exposure Scenarios**

- 6.4.1 The following potential pathways may exist at the site during and following development.
- Human health exposure via Ingestion, inhalation and dermal contact with identified solid contaminants in near surface ground strata
  - Leaching and migration

## **6.5 Risk Assessment**

- 6.5.1 In order for any risk to exist, a "Source - Pathway - Receptor" linkage must be established. This linkage requires:
- A source of contamination in the ground which has the potential to cause harm or to cause pollution of controlled waters.
  - A pathway by or through which a receptor is being exposed to or affected by a contaminant or, could be so exposed or affected by a contaminant.
  - A receptor that could be harmed by exposure to a contaminant.
- 6.5.2 The identification of each of these three elements is linked to the identification of the others. A pathway can only be present if it is capable of exposing an identified receptor to an identified contaminant. That particular contaminant should likewise be capable of harming or, in the case of controlled waters, be capable of polluting that particular receptor. If a pollutant source, pathway and receptor are found to be present then there could be a risk to the identified receptor. If there is an absence of any part of the source, pathway or receptor process, there is no risk.
- 6.5.3 The results of sampling and analysis have not identified any contamination within the ground strata at the site that could be a risk to human health other than very low quantities of asbestos. However the majority of the site is already covered with a concrete slab, which will remain, and other areas of the site not surfaced will be capped with a sealed surface or aggregate to allow vehicle movement in the site compound. The risk of human exposure to the ground strata is therefore negligible.
- 6.5.4 No elevated concentrations of contaminants were identified and therefore there is no source to leach. In the absence of any leached contaminants there can be no risk to controlled waters.
- 6.5.5 In the absence of any contamination source there is no risk to the use of the site for commercial purposes, or to the wider environment.