



CONSULTING ENGINEERS

**CIVIL • STRUCTURAL
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MD/13104/VAL

13th January 2016

RL Davies & Sons Ltd
Llys Derwen
Llysfaen
Colwyn Bay
Conwy
LL29 8SS

Att: Mr P Jones

Dear Mr Jones

RE: RESIDENTIAL DEVELOPMENT AT MAELOR PLACE, RUABON, WREXHAM PLOTS 9 - 11, 18 - 19 & LANDSCAPED AREAS

Further to your recent instructions we have now revisited this site to inspect and validate the topsoil and subsoil material within plots 9 – 11, 18 - 19 and landscaped areas identified upon the appended capping validation plan 13104/05.

The remediation proposals presented on the Remediation Drawing 13104/04 were that the original ground within this site should be reduced to expose natural in-situ strata or provide a surface capping layer of validated material extending to a minimum thickness of 0.6m below rear private garden areas, and 0.45m within the front gardens and landscaped areas. A strategy for the remediation of this site has been prepared along with validation criteria which have been agreed with the regulatory authorities. The validation works undertaken to these plots have included sampling of surface topsoil from plots 11, 12 and landscaped area and subsoil from plots 9, 7 and 18.

Whilst the source of the capping material has been identified to us, we have nevertheless visited this site to obtain representative samples of the capping materials actually delivered to the site from in-situ to allow a program of chemical analyses to be undertaken to suitably validate the strata. The remediation strategy proposed a sampling frequency of 1 sample/150m³ of subsoil along with 1 sample/75m³ of topsoil material. Accordingly for the validation of these private garden and landscaped areas, three (3 No.) samples of topsoil and three (3 No.) samples of subsoil have been obtained. The approximate location of the sampling points are indicated upon the attached drawing number 13104/05

All samples were submitted to the laboratories of Exova Limited, who are a UKAS and MCERTS accredited laboratory facility. Each sample has been subject to a wide ranging program of analyses which includes metals, inorganics, organics and PAH (USEPA 16) compounds. The range of determinands considered is in accordance with the specification detailed within the remediation strategy document. The full results of the laboratory chemical analyses are attached to this correspondence for reference. Recently published LQM/CIEH S4UL's (Registration No. S4UL3265) have been adopted for this chemical assessment instead and superseded the previous values utilised within the remediation drawing 13104/04. The full results of the laboratory chemical analyses are attached to this correspondence for reference.

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Assessment of the Exova test results as shown in tables 1 & 2 below has confirmed that the topsoil and subsoil material does not contain determinands at concentrations above the soil guideline values and general assessment criteria.

Table 1: Summary of Contamination Analysis – Metals, Inorganics & Others – TOPSOIL & SUBSOIL					
	No. of Samples	Range of Values (mg/kg)	Assessment Criteria (mg/kg)	No. of Samples Failing	Locations
Arsenic	6	5.0 – 14.0	37 ³	0	0
Cadmium	6	<1.0	11.0 ³	0	0
Chromium (total)	6	17.0 – 21.0	910 ³	0	0
Copper	6	15.0 – 25.0	2400 ³	0	0
Lead	6	36.0 – 43.0	200 ¹	0	0
Mercury	6	<1.0	40 ³	0	0
Nickel	6	11.0 – 17.0	180 ³	0	0
Selenium	6	1.0	250 ³	0	0
Zinc	6	76.0 – 851	3700 ³	0	0
Total Cyanide	6	<1.0	34.0 ²	0	0
Phenol	6	<1.0	200 ³	0	0
pH	6	7.45 – 8.48	-	-	-
SOM (%)	6	1.29 – 3.9	-	-	-
SO ₄ (w/s) – g/l	6	0.02 – 0.06	0.5 ⁴	-	0
¹ DEFRA : SP1010 : Category 4 Screening Levels ² Atkins Atrisk SSV residential with home grown produce (1% SOM) ³ LQM and CIEH S4UL's for Human Health Risk Assessment (Registration No. S4UL 3265) residential with home grown produce (2.5% SOM) ⁴ BRE Special Digest 1:2005 DS-1 (units in g/l) ND – None Detected					

Table 2 : Summary of Contamination Analysis: Organics: PAH USEPA 16 Suite - TOPSOIL & SUBSOIL					
	No. of Samples	Range of Values (mg/kg)	Assessment Criteria¹ (mg/kg)	No. of Samples Failing	Locations
Acenaphthene	6	<0.1	510	0	-
Acenaphthylene	6	<0.1	420	0	-
Anthracene	6	<0.1	5400	0	-
Benzo[a]anthracene	6	<0.1	11.0	0	-
Benzo[a]pyrene	6	<0.1	5.0 ²	0	-
Benzo[b]fluoranthene	6	<0.1	3.3	0	-
Benzo[ghi]perylene	6	<0.1	340	0	-
Benzo[k]fluoranthene	6	<0.1	93	0	-
Chrysene	6	<0.1	22.0	0	-
Dibenz[ah]anthracene	6	<0.1	0.28	0	-
Fluoranthene	6	<0.1	560	0	-
Fluorene	6	<0.1	400	0	-
Indeno[123-cd]pyrene	6	<0.1	36.0	0	-
Naphthalene	6	<0.1	5.6	0	-
Phenanthrene	6	<0.1	220	0	-
Pyrene	6	<0.1	1200	0	-
¹ LQM & CIEH S4UL's for human health risk assessment (Registration No. S4UL 3265) – Residential with home grown produce (2.5% SOM) ² DEFRA : SP1010 : Category 4 Screening Levels					

Whilst the remediation strategy has proposed the adoption of a suitable capping material to plots 9 – 11, 18 - 19 and landscaped areas, it has also recommended that the capping to the rear gardens should extend to a minimum thickness of 0.6m and a maximum thickness of 0.45m to landscaped areas. To verify this trial hole has been excavated through the topsoil and subsoil material to a minimum depth of 0.6m below finished ground level within the rear gardens and to 0.45m within landscaped areas. The capping layer within the rear garden areas to plots 9 – 11, 18 & 19 have proven to comprise of a minimum of 150mm topsoil underlain by 450mm of subsoil. The landscaped areas have proven to comprise of 150mm of topsoil underlain by 300mm of subsoil in accordance with the remediation strategy.

In conclusion we can advise that the topsoil and subsoil material has not recorded elevated concentrations that pose a hazard to the long term end users of the site and that the material used are suitable for use within the private garden areas of plots 9 -11, 18 - 19 and the landscaped areas. Trial pit excavations have also confirmed that at least 0.15m of clean topsoil has been applied over at least 0.45m of subsoil within the rear garden areas and at least 0.3m of subsoil within the landscaped areas.

We trust that this information meets with your requirements at this time and would recommend that copies of this correspondence along with the relevant attachments should be provided to the various regulatory authorities for their consent and approval. Should you require any further assistance, then please do not hesitate to contact us directly.

Yours sincerely



M DAVIES B.Sc. (Hons),
R E FRY & ASSOCIATES LTD

Enc: Exova Test Results
REFA Drawing No. 13104/05
Site Photographs

Test Certificate

Client: Robert E Fry & Associates Ltd
45 Bridgeman Terrace, Wigan, Lancashire, WN1 1TT

Site: Maelor Place, Ruabon - Soil samples

Date Tested: 18/12/15

Date Reported: 24 December, 2015

Date Received: 17 December, 2015

Sample Type: Solid

Certificate No: 15/6343/RG/S/C1

File No: 15/6343/RG/S

Client Ref: 13104

Lab sample ref:	C229192	C229193	C229194	C229195	C229196
Client sample ref:	Plot 9	Plot 11	Plot 12	Plot 17	Plot 18
	Subsoil	Topsoil	Topsoil	Subsoil	Subsoil
Date sampled:	14/12/15	14/12/15	14/12/15	14/12/15	14/12/15
Sample matrix:	S	S	S	S	S

Determinand	Method	Units	ISO17025	MCERTS	LOD					
Deviation Assessment										
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
pH	AN5a	Units	Y	Y	0.1	8.48	7.65	7.45	8.03	8.35
Sulphate (water soluble)	CTP 29	g/l	Y	Y	0.01	0.04	0.02	0.03	0.06	0.03
Sulphide _{SM}	AN45b	mg/kg	N	N	2	<2	<2	<2	<2	<2
Cyanide (total) _{SM}	AN45a	mg/kg	Y	Y	1	<1	<1	<1	<1	<1
Phenols (screen) _{SM}	AN45a	mg/kg	Y	Y	1	<1	<1	<1	<1	<1
Arsenic	AN8b	mg/kg	Y	Y	2	6	12	14	5	7
Cadmium	AN8a	mg/kg	Y	Y	1	<1	<1	<1	<1	<1
Chromium (total)	AN8b	mg/kg	Y	Y	2	20	21	17	18	21
Copper	AN8b	mg/kg	Y	Y	2	16	25	25	15	18
Lead	AN8b	mg/kg	Y	Y	2	36	36	41	43	42
Mercury	AN8a	mg/kg	Y	Y	1	<1	<1	<1	<1	<1
Nickel	AN8b	mg/kg	Y	Y	2	17	13	11	13	17
Selenium	AN8a	mg/kg	Y	Y	1	<1	1	1	<1	<1
Zinc	AN8b	mg/kg	Y	Y	2	851	125	84	76	91
EMR	EMR	%	N	N/A	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
% Stones	Stones	% w/w	N	N/A	0.1	15.5	13.6	13.1	8.5	13.2
Moisture Content @ <30°C	AN1	% w/w	Y	N/A	0.1	17.3	20.7	18.4	15.3	17.3
Moisture Content @ 105°	AN1	% w/w	Y	N/A	0.1	17.9	19.1	22.7	18.2	18.9
Sample Description	MCERTS ver4.	N/A	N	N/A	N/A	6A	6A	2A	6A	6A
Misc										
TOC	AN48b	%	N	N	0.1	1.08	2.11	2.27	0.75	0.84
PAH (USEPA16)										
Acenaphthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benz(a)anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(a,h)anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene (PAH) _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (USEPA16) Total _M	GCM501	mg/kg	Y	Y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Test Certificate

Client: Robert E Fry & Associates Ltd
45 Bridgeman Terrace, Wigan, Lancashire, WN1 1TT
Site: Maelor Place, Ruabon - Soil samples

Date Tested: 18/12/15
Date Reported: 24 December, 2015
Date Received: 17 December, 2015
Sample Type: Solid

Certificate No: 15/6343/RG/S/C1
File No: 15/6343/RG/S
Client Ref: 13104

Lab sample ref: C229197
Client sample ref: POS Topsoil
Date sampled: 14/12/15
Sample matrix: S

Determinand	Method	Units	ISO17025	MCERTS	LOD	
Deviation Assessment						
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A
pH	AN5a	Units	Y	Y	0.1	7.82
Sulphate (water soluble)	CTP 29	g/l	Y	Y	0.01	0.02
Sulphide _{SM}	AN45b	mg/kg	N	N	2	<2
Cyanide (total) _{SM}	AN45a	mg/kg	Y	Y	1	<1
Phenols (screen) _{SM}	AN45a	mg/kg	Y	Y	1	<1
Arsenic	AN8b	mg/kg	Y	Y	2	11
Cadmium	AN8a	mg/kg	Y	Y	1	<1
Chromium (total)	AN8b	mg/kg	Y	Y	2	19
Copper	AN8b	mg/kg	Y	Y	2	25
Lead	AN8b	mg/kg	Y	Y	2	39
Mercury	AN8a	mg/kg	Y	Y	1	<1
Nickel	AN8b	mg/kg	Y	Y	2	12
Selenium	AN8a	mg/kg	Y	Y	1	<1
Zinc	AN8b	mg/kg	Y	Y	2	84
EMR	EMR	%	N	N/A	0.1	<0.1
% Stones	Stones	% w/w	N	N/A	0.1	13.0
Moisture Content @ <30°C	AN1	% w/w	Y	N/A	0.1	18.6
Moisture Content @ 105°	AN1	% w/w	Y	N/A	0.1	25.0
Sample Description	MCERTS ver4.	N/A	N	N/A	N/A	6A
Misc						
TOC	AN48b	%	N	N	0.1	1.88
PAH (USEPA16)						
Acenaphthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Acenaphthylene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1
Anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Benz(a)anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Benzo(a)pyrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Benzo(b)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Benzo(ghi)perylene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Benzo(k)fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Chrysene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Dibenz(a,h)anthracene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Fluoranthene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Fluorene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Indeno(1,2,3-cd)pyrene _M	GCM501a	mg/kg	Y	Y	0.1	<0.1
Naphthalene (PAH) _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Phenanthrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
Pyrene _M	GCM501	mg/kg	Y	Y	0.1	<0.1
PAH (USEPA16) Total _M	GCM501	mg/kg	Y	Y	0.1	<0.1

Notes

1. All analyses performed on the sample dried at <30°C, except analyses suffixed with 'M'.
2. Analyses suffixed 'M' were performed on the sample as received and corrected for '% moisture at <30°C' where applicable.
3. All results are expressed as dry weight.
4. MCERTS accreditation applicable to Sample Matrix 'S' only.
5. Natural stones (pebbles, gravels etc.) which do not pass a 4mm sieve are excluded from dried analyses.
6. Tests marked * indicate subcontracted analyses.
7. The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements.
8. ^Sample Description key: 1. - Sand, 2. Loam, 3. Clay, 4. Sand/loam mix, 5. Sand/clay mix, 6. Clay/loam mix, 7. Other.
suffixed with: A - Stones, B - Construction rubble, C - Visible Hydrocarbons, D - Vegetation, E - Glass/metal, F - Strong odour, G - Other.
9. Leachate preparation is not included in our UKAS accreditation.
10. Dates of testing for all parameters are available upon request.
11. EMR denotes Extraneous material.
12. Sampling location details and sample information were supplied with the sample.
13. Bulk Analysis carried out in accordance with DIHM ASB/01 which is based on Health & Safety Executive procedure
Appendix 2: Asbestos in Bulk Materials: Sampling and identification by polarised light microscopy (PLM) set out in HSG248.
14. Asbestos material identification is based on visual examination only. Comments are not covered by UKAS accreditation.
15. NAD denotes - 'No Asbestos Detected'.

Signed for, and on behalf of Exova (UK) Ltd.

Prepared by:

Claire McLaughlin

C McLaughlin
Administrator

Approved by:

Julie McElery

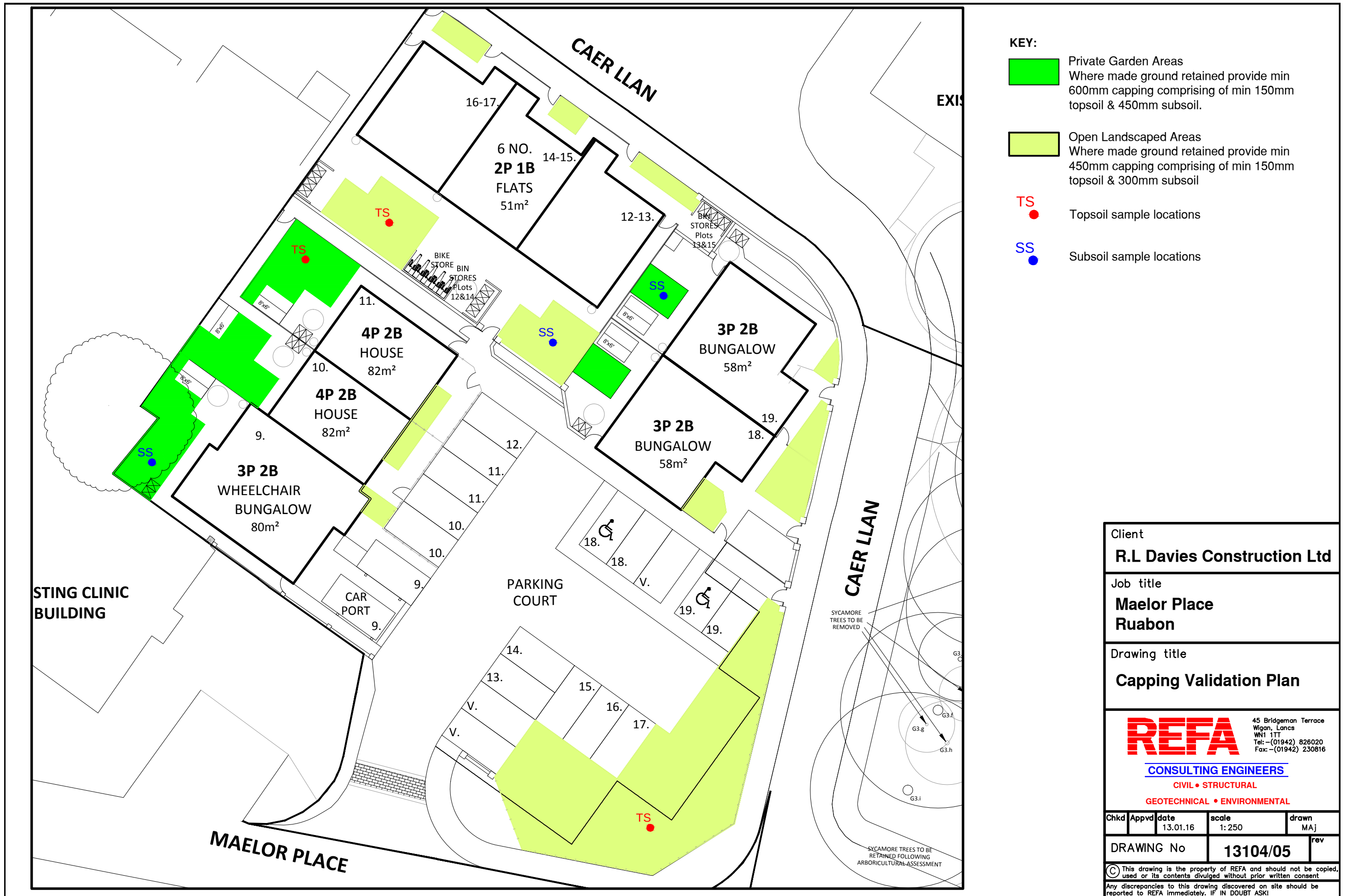
J McElery
Laboratory Manager



0568

The contents of this document are governed by the terms and conditions overleaf.

Registered Office: Exova (UK) Ltd. Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL United Kingdom. Reg No. SC 70429



- KEY:**
- Private Garden Areas
Where made ground retained provide min 600mm capping comprising of min 150mm topsoil & 450mm subsoil.
 - Open Landscaped Areas
Where made ground retained provide min 450mm capping comprising of min 150mm topsoil & 300mm subsoil
 - TS Topsoil sample locations
 - SS Subsoil sample locations

Client
R.L Davies Construction Ltd

Job title
**Maelor Place
Ruabon**

Drawing title
Capping Validation Plan

REFA
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Chkd	Appvd	date	scale	drawn
		13.01.16	1:250	MAj
DRAWING No		13104/05		rev

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Any discrepancies to this drawing discovered on site should be reported to REFA immediately. IF IN DOUBT ASK!

Photographs for Validation of Plots 9 – 11, 18 & Landscaped Areas

Photo 1 – Rear garden to plot 9



Photo 2 – Plot showing capping thickness >0.60m at Plot 9



Photo 3 – Rear garden area to Plot 10



Photo 4 – Plot showing capping thickness $>0.60\text{m}$ at Plot 10



Photo 5 – Rear garden area to Plot 11



Photo 6 – Plot showing capping thickness $>0.60\text{m}$ at Plot 11



Photo 7 – Landscaped area south west of flats 12 - 17



Photo 8 – Capping thickness $>0.45\text{m}$ within landscaped area



Photo 9 – Rear garden areas to Plot 18



Photo 10 – Plot showing capping thickness $>0.60\text{m}$ at Plot 18



Photo 11 – Rear garden areas to Plot 19



Photo 12 – Plot showing capping thickness $>0.60\text{m}$ at Plots 19



Photo 13 – General photographs of landscaped areas completed



Photo 14 – General photographs of landscaped areas completed