

17/2/16

Please find detailed report
as requested

Regards

G.P. Jones

Private & Confidential
Planning Service
Wrexham County Borough Council,
The Guildhall
Wrexham
LL11 1AY

Dear Sir/Madam,

By email only: -
planning@wrexham.gov.uk

Wrexham County Borough Council - Planning Service
Land at Queens Road, Brymbo, LL11 5DY.

Further to your request to provide a report regarding the structural stability and adequacy of the retaining walls at this new build development site. I write to you to report as follows;

Site Particulars

Size of Site: 830m²
Road Frontage: 25-30m
Slope Gradient: 1m:4m (14 degrees)

Details of Sub Soil

I refer you to the enclosed report by Sirius, specifically point 2.3 which confirms that the superficial geology as being a mix of brown clay and grey shale with underlying strata as carboniferous westphalian rocks and coal seams.

Details of Land Surrounding the Plot

Land to north of site: Detached properties at Llys Gwyrdd. I draw the reader's attention to the enclosed photo 'Gabion Basket Retaining Wall to North of Site - Llys Gwyrdd' showing a retaining wall behind the detached properties at Llys Gwyrdd which are in an almost exact arrangement to the gabion baskets and masonry retaining wall installed on this site.

Land to east of site: The land consists exclusively of dense protected, deciduous woodland. The trees have, and continue to provide stability to the top level of clay sub soil, the root network and desiccation of the soil restricts any ground movement or land slip. The canopy of the trees also has the affect of dispersing rainwater and controls volume of ground water, ensuring that ground water levels remain at a stable level. The slope to the plot above is at a consistent angle of repose at 1:4 with no major changes in gradient. There is no overburdening of the land or localised excess filling that would cause increased loading on the slope and increase potential for land slippage. These factors together mean that the likelihood of sheer land slip, overburden or any other ground movement that could pose as a risk to this site and its retaining walls is negligible.

There is no water course adjacent to or above the site; a walk over site investigation has established no furrows of rainwater run off which could potentially undermine the stability of gabion baskets.

Land to south of site: Site of former dwellings with an existing retaining wall. The retaining wall was built approximately 100 years ago and of brick/stone construction. It is 2.400m in height and built on the existing slope on the same line and relative position as the retaining wall in the plot being developed. I refer you to C-D on enclosure 3) Location Plan (Showing ABCD) which gives the locations of the retaining wall in the neighbouring plot. The retaining wall on this site is shown A-B.

The retaining wall (C-D) is of simple construction using deadweight retention. The existing wall, although some 100 years old, does not show any sign of structural cracking, any significant horizontal movement or settlement as a result of movement forces in the sub soil, hydrostatic pressure or otherwise. This is a very good indication of the long term stability of this slope and the adequacy of the wall to retain the land mass behind it. I refer you to the first 2No enclosures accompanying this letter 'Retaining Wall at Plot to South of Site', photo 1&2.

Land to west of site: Queens Road Frontage.

Site Investigation and Structural Design

The nature of the sub soil was taken into consideration by the Engineer when designing the retaining wall proposals. In support of the full geotechnical report by Sirius, I refer you to '4 - Retaining Wall Cross Section (As Built)' which is an as built drawing showing the gabion basket retaining wall and masonry built retaining wall in relation to the layers of brown clay, grey shale and underlying coal seam. As you can see, the gabion baskets are founded on grey shale and the masonry built retaining wall built directly off the coal seam.

The make up of the sub soil is confirmed by the Borehole Plan Drawing completed by Sirius and associated 'Drill Grout Summary' demonstrating that the 3No borehole positions, A01, C01 and E01 are all founded on coal. It is above these borehole positions that the gabion baskets have been built.

Slope Retention

The natural slope at the north end of the site boundary is 1m:5m. This increases towards the southern end of the side where the slope is 1m:4m. I refer you to the drawing completed by Structural Solutions showing details of the gabion basket and reinforced concrete wall to the rear of plot 2.

The north end of the gabion basket retaining wall is 1No basket in height (1.00m) and the slope is 1:5. This section of retaining wall is shown in pink. The south end section is 2No baskets in height (2.00m) and the slope is 1:4. This section of retaining wall is shown in blue.

As Built

A firm of Chartered Structural Engineers (Structural Solutions) designed the arrangement of the retaining walls confirming that they have been competently designed with due consideration of geotechnical factors. I refer you to the drawing by Structural Solutions which shows the retaining wall of hollow block (150mm) and concrete with steel reinforcement and concrete ties in front of the gabion baskets for further stability. The distance of this wall from the front face of this basket varies from 1500mm to 2100mm.

There are a total of 35 gabion baskets installed to retain the land to the rear (east) of the site, each 1.500m(l), 1.00m(w) and 1.00m(h) filled with aggregate and grey limestone. The deadloads from the baskets are approximately 200 tonnes and set directly on greyshale. Backfill to the baskets is complete using graded stone and brick hard core.

The firm of geotechnical engineers have carried out several investigations to the site and have worked in collaboration with the Structural Engineer to design a solution with the required structural integrity and stability for a site like this. Although design liability rests with the respective engineers involved (Str.Solutions, Sirius), in my 40 years as a structural engineer and architectural designer and having designed retaining walls of this size on several previous occasions, I am confident that the retaining wall design solution is adequate for this site. Similar applications in 2No neighbouring sites have proven that this kind of application can retain land adequately; moreover, the retaining wall arrangement at this site is far greater in mass and dimension than the neighbouring applications.

If you would like to discuss my letter in greater details, please feel free to call me directly.

Yours Faithfully

Robert Edwards BSc (Hons)
Architectural Designer
07960 527 421

Encl.

- 1) Retaining Wall at Plot to South of Site (Photo 1)
- 2) Retaining Wall at Plot to South of Site (Photo 2)
- 3) Location Plan (Showing ABCD)
- 4) Retaining Wall Cross Section (As Built)
- 5) Structural Solutions - Gabion Basket Retaining Wall Cross Section
- 6) Sirius - Borehole Plan
- 7) Sirius - Drill Grout Summary
- 8) Sirius - Extract from Geotechnical Engineer's Report
- 9) Gabion Basket Retaining Wall to North of Site - Llys Gwyrdd

cc.

Jill Jones, Owner of Land at Queens Road, Brymbo.



Throughout the treatment area, boreholes / grout injection points were drilled in accordance with the layout as shown on Drawing No SDS3285/CS/02 within Appendix A.

The ground conditions encountered in each borehole are detailed within SDS's daily drill log sheets, included within Appendix C of this report.

3.4 Ground Conditions Encountered

A total of 33 boreholes were drilled amounting to a total of 419.90 of drilling. The borehole locations and strata encountered are recorded on Drawing No SDS3285/CS/02.

The rotary probe holes typically encountered intact coal or evidence of workings at depths of between 5.50m and 11.20m bgl, the coal was found in two leaves in places. The thickness of the soft and broken strata encountered in places is indicative of migrated workings

- Solid Coal (inc weak coal) was encountered in 29 holes (approx. 88%)
- Broken Ground was encountered in 3 holes (approx. 9%)
- Soft Push was encountered in 1 holes (approx. 3%)

3.5 Grouting Procedure

Boreholes were injected with a grout comprising a 12:1 ratio mixture of Pulverised Fuel Ash (PFA) and Ordinary Portland Cement (OPC) respectively with 40 to 45% water.

Grout was injected into all boreholes utilising a tremie pipe placed to the base of each hole. Grout was injected under static head until grout appeared at the surface.

A total of 14.43 tonnes of grout was injected into these boreholes with the grout acceptance varying between 0.13 tonnes to 3.90 tonnes with an arithmetical average of 0.44 tonnes per hole.

2. SITE DETAILS AND DESCRIPTION

2.1. Site Location

The site is located, off Queens Road, Brymbo, approx. 5.2 km north west of Wrexham at an approximate National Grid Reference of NGR 329768, 353864

A site location plan is included as Drawing No. SDS3285/CS/01 within Appendix A.

2.2. Site Description

The site area is irregular in shape and occupies an area of approx. 830m². Historically the site was steep unmanaged grassland occupied only by a garage at road. At the time of works the site had been terraced with gabion and blockwork retaining wall. The treatment area occupies an area of approximately 300m² below the two proposed plots.

2.3. Geology

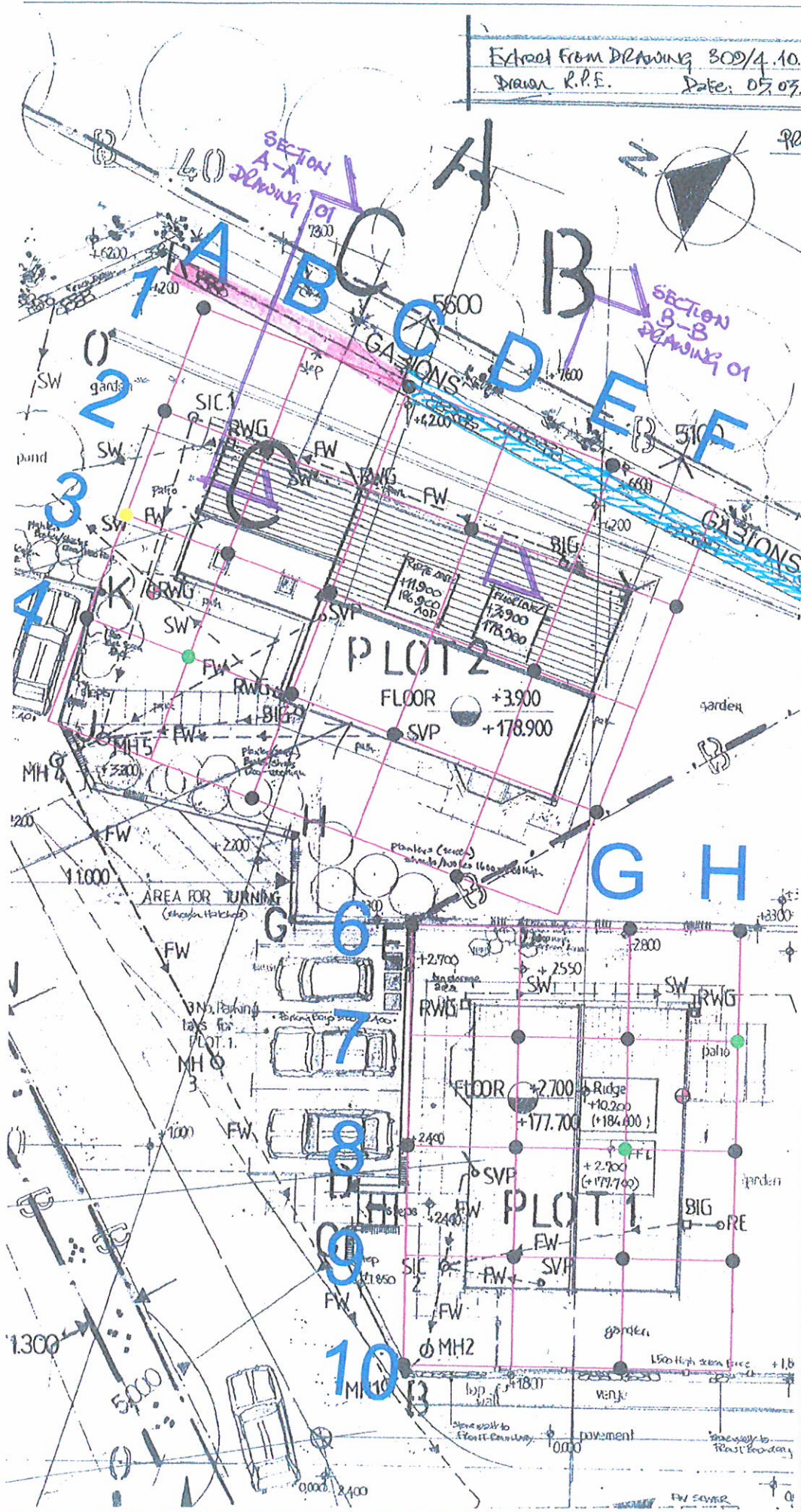
A summary of available published geological information is provided in Table 2.1.

Table 2.1 Geological Summary

Sources of Information	NKC Geotech Ltd – Mining Investigation Report
Superficial Geology/Made Ground	Brown clay and grey shale
Solid Geology	Carboniferous Westphalian rocks that form the North Wales Coalfield, dipping to the east at 1 in 7. These rocks are predominately shales and sandstones containing coal seams up to 3.0m in thickness at vertical intervals typically varying from 4.0m to 20.0m.

SDS3285 Queens Road, Brymbo
Drill Grout Summary

Borehole ID	Drilled by	Date Drilled	Superficials	Upper Leaf	From (m bgl)	To (m bgl)	Thickness (m)	Lower Leaf	From (m bgl)	To (m bgl)	Thickness (m)	BH Depth (m bgl)	Grout Take (T)	Comments
A01	Ri Edwards	18/11/2015	1.60					C	10.80	12.50	1.70	13.50	0.13	
A02	Ri Edwards	19/11/2015	1.80					C	10.50	12.00	1.50	13.00	0.13	
A03	Ri Edwards	17/11/2015	1.80					S	10.00	12.30	2.30	13.30	3.90	
A04	Ri Edwards	18/11/2015	1.50					C	10.40	12.20	1.80	13.20	0.13	
B02	Ri Edwards	18/11/2015	1.50					C	10.50	12.20	1.70	13.20	0.13	
B03	Ri Edwards	17/11/2015	1.80					C	10.50	12.00	1.50	13.00	0.13	
B04	Ri Edwards	17/11/2015	3.00					B/G	9.00	12.00	3.00	13.00	2.60	
C01	Ri Edwards	18/11/2015	1.60					C	11.00	12.70	1.70	13.70	0.13	
C03	Ri Edwards	19/11/2015	1.80					C	10.70	12.20	1.50	13.20	0.13	
C04	Ri Edwards	17/11/2015	3.00					C	11.00	12.40	1.40	13.40	0.13	
C05	Ri Edwards	17/11/2015	3.20					C	11.20	12.50	1.30	13.50	0.13	Angled
D02	Ri Edwards	19/11/2015	1.50					C	10.70	12.50	1.80	13.50	0.13	
D04	Ri Edwards	17/11/2015	3.00					C	11.00	12.60	1.60	13.60	0.13	
E01	Ri Edwards	19/11/2015	1.80					C	11.00	12.70	1.70	13.70	0.13	Angled
E03	Ri Edwards	19/11/2015	2.00					C	10.50	12.20	1.70	13.20	0.13	
E05	Ri Edwards	17/11/2015	3.00					C	10.80	12.40	1.60	13.40	0.13	16 degrees
E06	Ri Edwards	16/11/2015	4.80	C	7.00	9.20	2.20	C	10.20	10.40	0.20	12.00	0.13	Angled
E08	Ri Edwards	16/11/2015	5.00	C	7.00	9.00	2.00	C	10.00	10.50	0.50	12.00	0.13	
E10	Ri Edwards	16/11/2015	5.00	C	6.00	8.00	2.00	C	10.00	10.30	0.30	12.00	0.13	Angled
F02	Ri Edwards	19/11/2015	1.50					C	10.80	12.50	1.70	13.50	0.13	
F04	Ri Edwards	17/11/2015	3.50					C	10.40	11.80	1.40	12.80	0.13	
F07	Ri Edwards	16/11/2015	4.50	C	7.00	9.00	2.00	C	10.00	10.30	0.30	12.00	0.13	
F08	Ri Edwards	16/11/2015	4.50	C	7.00	9.00	2.00	C	10.00	10.50	0.50	12.00	0.13	
F09	Ri Edwards	16/11/2015	5.00	C	5.50	7.50	2.00	C	10.20	10.50	0.30	12.00	0.13	
G06	Ri Edwards	16/11/2015	4.50	C	7.80	10.00	2.20	C	11.20	11.40	0.20	13.00	0.13	Angled
G07	Ri Edwards	16/11/2015	4.80	C	7.50	9.50	2.00	C	10.60	11.00	0.40	12.00	0.13	
G08	Ri Edwards	16/11/2015	4.70	B/G	6.50	9.50	3.00					10.50	3.25	
G09	Ri Edwards	16/11/2015	5.00	C	6.50	8.50	2.00	C	9.60	10.00	0.40	11.00	0.13	
G10	Ri Edwards	16/11/2015	4.80	C	6.50	8.80	2.30	C	10.00	10.50	0.50	12.00	0.13	Angled
H06	Ri Edwards	17/11/2015	3.00					C	10.50	12.00	1.50	13.00	0.13	
H07	Ri Edwards	16/11/2015	4.50	B/G	5.50	9.50	4.00					10.50	0.91	
H08	Ri Edwards	16/11/2015	5.00	C	7.00	9.00	2.00	C	9.80	10.20	0.40	11.20	0.13	
H09	Ri Edwards	16/11/2015	5.00	C	6.00	8.00	2.00	C	9.70	10.00	0.30	12.00	0.13	
Total												419.90	14.43	



NOTES

- Coal
- Broken Ground
- Soft
- ⊕ Test Borehole

GABION BASKET HEIGHT

TYPE 1

TYPE 2

GABION BASKET HEIGHT.

Development layout taken from R.P.
Edwards Drawing No. 300/4.03.015

REVISION

0	''
A	''
B	''
C	''
D	''

SIRIUS
REMEDICATION LTD
4245 Park Approach
Thorpe Park
LE10 9H
£515 858
www.siriusremed.com
TEL: 0115 254 8900
FAX: 0115 254 9992



CLIENT

GJONES

SITE
QUEENS ROAD
BRYMBODRAWING TITLE
AS BUILT DRILL
AND GROUT PLAN

DRAWING NO. 809285/CAN2	REVISION NO. ''
DRAWN BY JCC	APPROVED BY AGT
DATE DEC 2015	SCALE 1:100
	PAPER SIZE A3

PLANNING 04 - STRUCTURAL SOLUTIONS

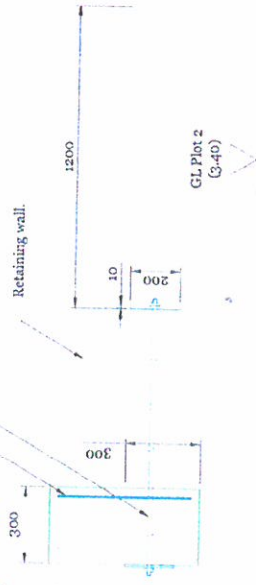
Top of gabions

Gabions sit on shale so there is no direct loading on the retaining wall.

Layer of A142 mesh in front face of concrete with 35mm cover.

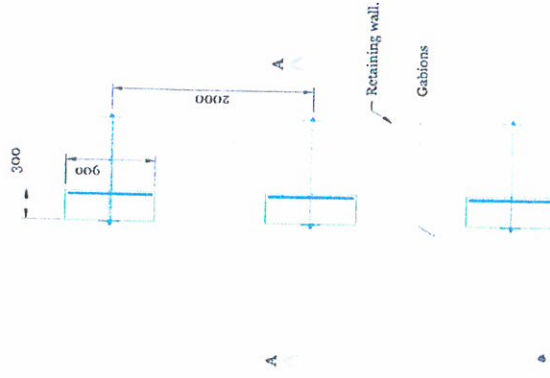
H16 threaded bar with 200mm square x 10mm thick keeper plate on each end.

Retaining wall



GL Plot 2 (3.40)

Coal



Gladstone House
Main Road
Broughton
Chester
CH4 6NR
Tel: 01244-526020
Fax: 01244-241258
Email: info@structural.solutions
Web: www.structural.solutions

Queens Road, Brymbo

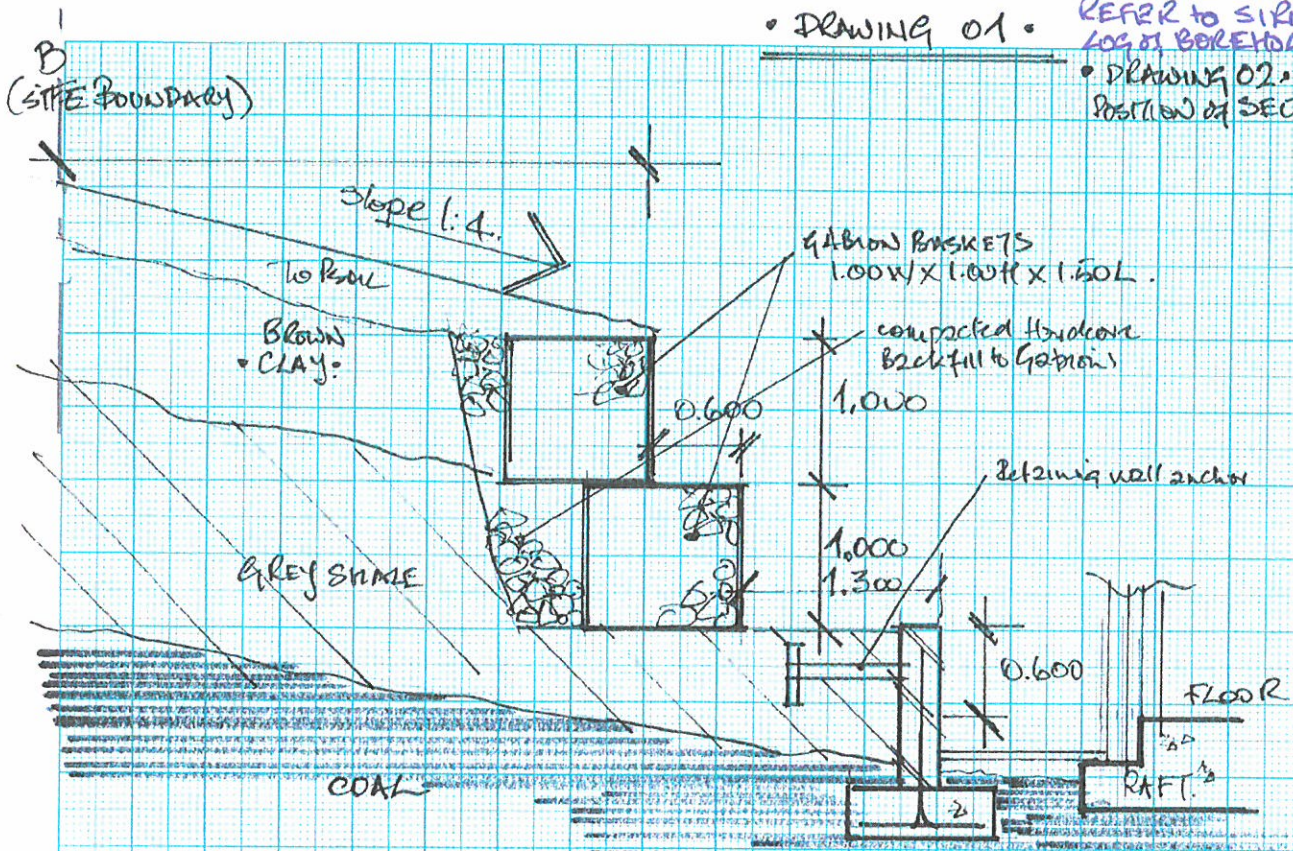
Detail showing ties to retaining wall.

ISF 1:50,20 1-2-16 15075122/05

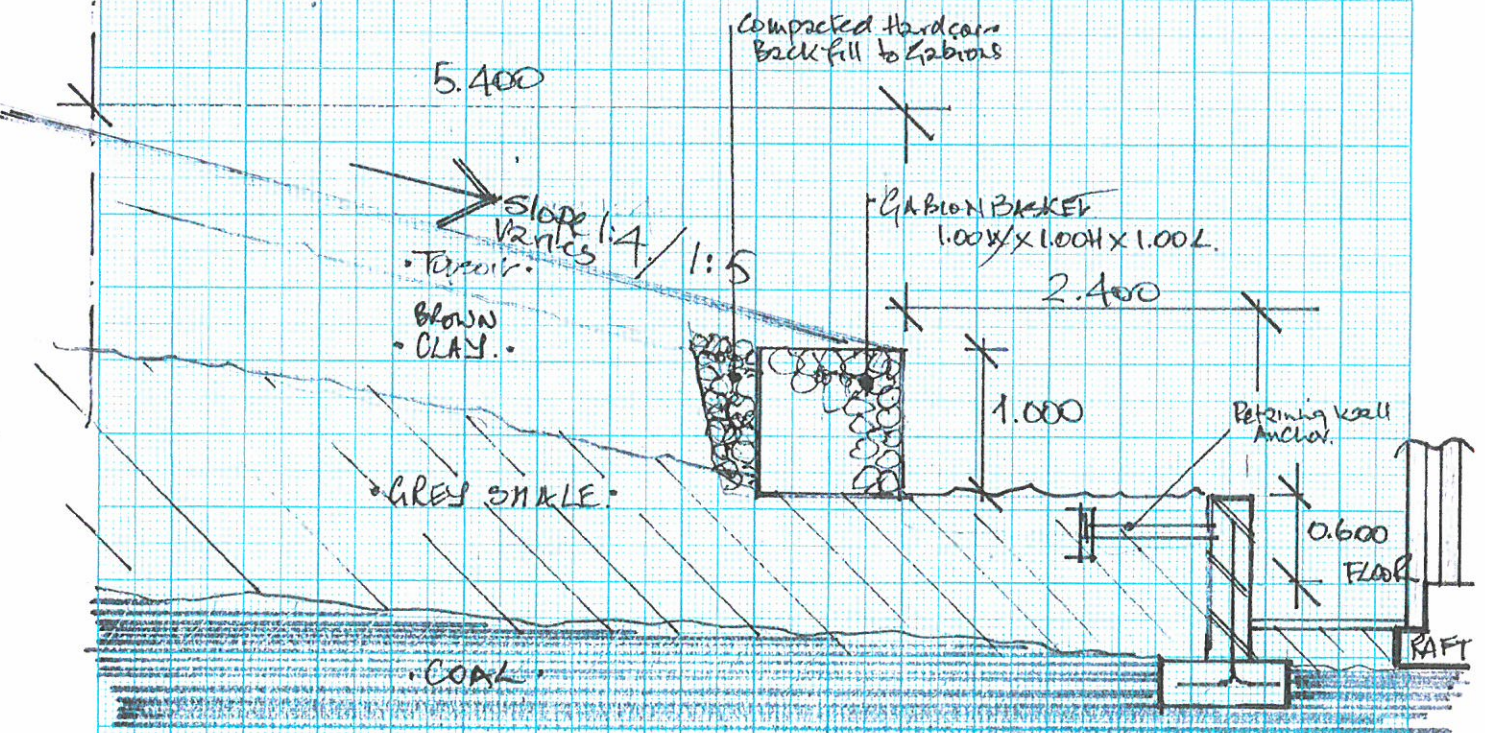
• DRAWING 01 •

REFER TO S1RUS LOG #1 BOREHOLE PLAN

• DRAWING 02 • FOR POSITION OF SECTIONS A & B.

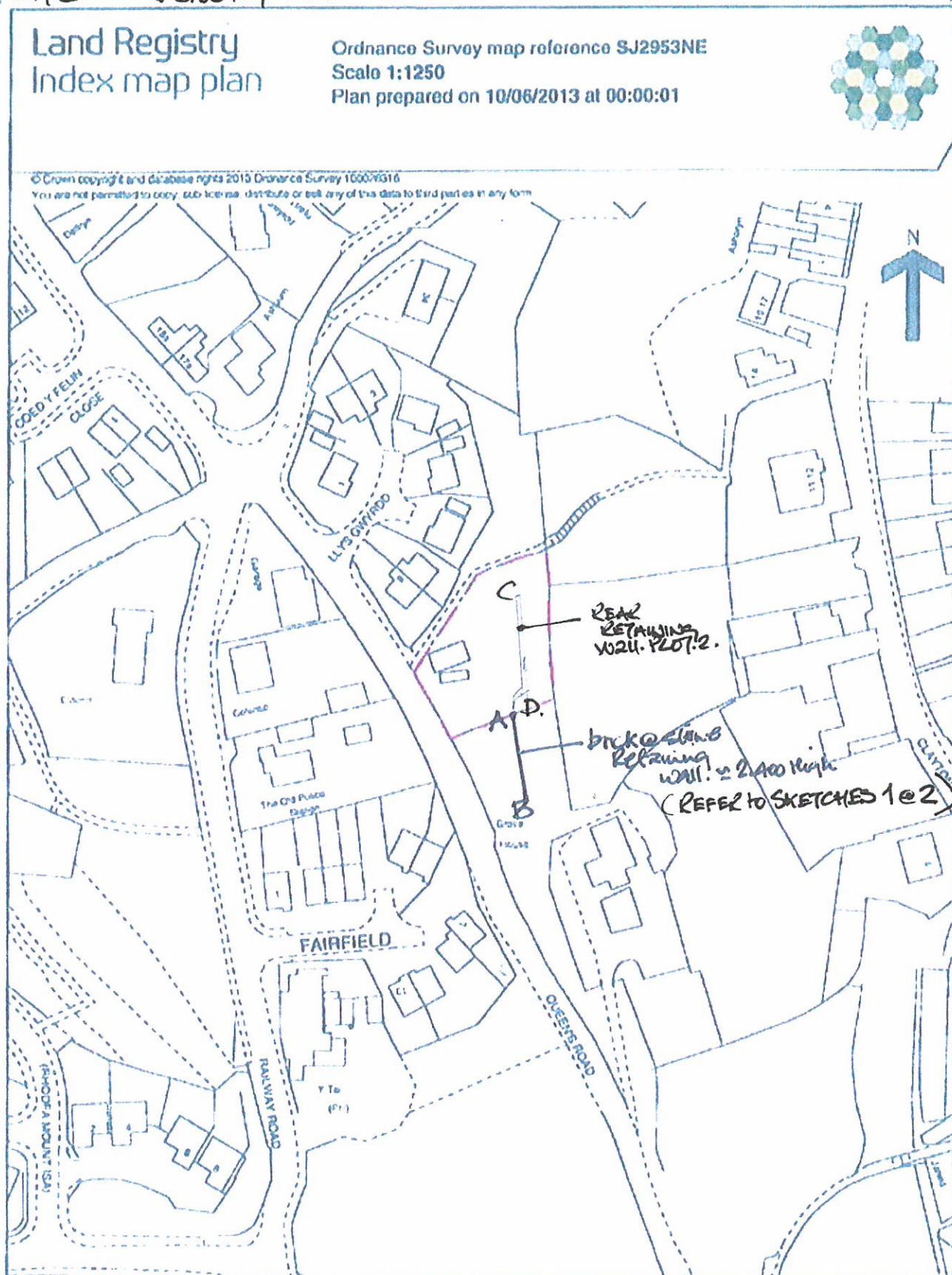


B (SITE BOUNDARY)



- DRAWING SHOWING EXISTING RETAINING WALL A→B ON LAND ADJACENT TO QUEEN'S RD SITE • DRAWING 03.

H/Scons 0606



This plan should be read in conjunction with result U82TWKB.

This plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale. Measurements scaled from this plan may not match measurements between the same points on the ground. See Land Registry Public Guide 19 - Title Plans and Boundaries.



Boundary.



James
10/6.

Sketch 2. HP Scans 0605
Showing Existing Retaining Wall
A to B / stone @ brick.
on existing land. Boundary marked

2.400m

2.000m

1.000m

FL 2.

Sketch. 1. HVS scans 0605
showing Existing Retaining
Wall A → B / Stone & Brick.
on LAND ADJOINING

HVS scans

