Site Investigations at Great Grovehurst Farm

Kelmsley, Kent

Factual Report and Resource Estimation

September 2015

Andy Norton

1.Introduction

Wienerberger were authorised by Mr Doubleday of GH Dean Ltd. to carry out a ground investigation (trial pitting) program on land at Great Grovehurst Farm. It is hoped a sufficient quantity of Brickearth would be intersected to warrant its extraction, which would then supply the Smeed Dean works, located a short distance to the south of the site. It is known that Brickearth has been extracted for brick manufacture from the region for many years and the site has been investigated previously by Ibstock.

It is understood the site is to be developed for residential housing. This would involve the demolition and removal of the existing commercial / residential buildings and any foundation materials. A site investigation report (Ref. 1) has highlighted contamination in the fill material underneath the existing buildings. A further requirement is that the site is to be restored in such a manner to ensure drainage of surface and groundwater is sufficient to not cause problems.

Great Crested Newts are known to be present on site and must be managed appropriately.

2.Site Location

Great Grovehurst Farm is located to the north of Sittingbourne, access to the farm is via Grovehurst Road and Swale Way (B2005). The grid reference for the site is TQ905665.

Figure 1 Site location

3.Site Features

The area under investigation is highlighted in Figure 2. It is understood the land within the red boundary is owned by Mr Doubleday / G.H. Dean Ltd.

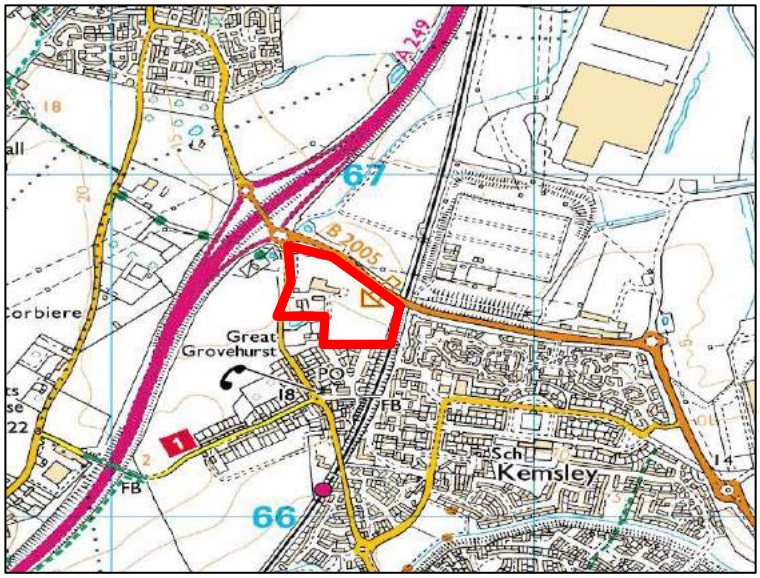


Figure 2 Site features

The ground surface dips gently towards the NW and has a maximum elevation of c.17mAOD in the SW and a minimum elevation of c.8mAOD in the NW.

Great Grovehurst Farm is located within this land, at the time of the investigation it was covered mainly by (recently harvested), agricultural crop and commercial / residential buildings (in the west). Swale Way forms the northern boundary, Grovehurst Road the western boundary and a railway line forms the eastern boundary (see above). There are two access points both lead onto Grovehurst Road and are suitable for large vehicles, overhead power lines are present across the northern end of the site and a gas main is understood to be located alongside the rail line.

No water features were observed at the site.

4.Method

The investigation incorporated three phases:

- Phase 1 - a desk study, in which historical and existing available data were collected
- Phase 2 - 19 trial pits were excavated, samples were collected and tested in Wienerberger Central Lab
- Phase 3 - a bulk sample was taken and then used in a works trial

4.1 Desk study

A web based literature search was completed, websites visited are as follows:

- British Geological Survey (BGS) geological map
- Old maps
- The Coal Authority
- The Environment Agency

From this stage of the investigation, it appears the site:

- has been in agricultural use since 1860s, mainly as an orchard, which was cleared sometime in the 1970s
- is underlain by London Clay

4.1.1 Previous site investigation

Site investigations were completed by Soils Limited in November 2013 for a proposed housing development, it incorporated the excavation of 21 trial pits, in-situ testing and sample testing, to determine the engineering properties and contamination content of the near surface geology. Report 13838 / SGIR (Ref. 1) should be reviewed as it highlights contamination issues within the made ground on site.

4.2 Trial Pitting Program 2014 (current investigation)

Sampling was conducted on 12th and 13th August 2014, a total of 19 holes were excavated using a 360 degree excavator, reaching a maximum depth of 3.6m. The excavated materials were described using BS5930 and BS EN ISO 14688 as a guide, the logs are located in Appendix B. Photographs were taken of the pits and arising's, these are also located in Appendix B. A summary of the trial pits is located in Table 1 below.

Drawing GHF-001 contains the location of the trial pits and Brickearth thickness, it is located in Appendix A.

In summary, where agricultural crop is located, approximately 0.5m of topsoil overlies Brickearth. It was observed that Brickearth is commonly sandy near the base of the unit and is clayey in places. London Clay underlies the Brickearth, and a thin discontinuous layer of flint gravel was intersected in between the Brickearth and London Clay. Groundwater was intersected at a small number of pits, commonly resting on London Clay. It appears the site buildings have been built upon made ground up to 1.5m thick.

Trial Pit ID	Total Depth (m)	Groundwater Depth (m)	Made Ground Thickness (m)	Brickearth Thickness (m)
GHTP1	3.1	-	-	1.9
GHTP2	2.7	-	-	2.4
GHTP3	3.6	-	-	2.8
GHTP4	2.8	2.75	-	2.25
GHTP5	3.0	-	-	2.5
GHTP6	2.2	-	-	1.4
GHTP7	2.6	-	-	1.5
GHTP8	2.8	2.3	-	2.2
GHTP9	3.3	-	-	2.8
GHTP10	2.2	-	-	1.6
GHTP11	2.9	-	0.7	2.1
GHTP12	2.8	0.8	1.5	0.9
GHTP13	3.0	-	1.5	1.3
GHTP14	1.9	-	-	1.4
GHTP15	1.7	-	-	1.1
GHTP16	2.4	-	-	0.9
GHTP17	3.4	-	-	2.8
GHTP18	3.4	1.9	-	2.2
GHTP19	3.3	-	-	2.7

Table 1 Test hole summary information

4.3 Works Trial

A trench was excavated by Fox Plant c.40 tonnes of Brickearth were removed for a works trial, the trench was backfilled with Brickearth from Smeed Dean Works. The approximate location of the trench is presented in Drawing GHF-001 in Appendix A. The works trial was conducted to determine if the Brickearth from the site was suitable to make bricks with the required aesthetic and physical properties.

4.4 Laboratory Testing

Representative samples of Brickearth were collected and then tested at the Wienerberger Central Lab in Kingsbury. Generally two samples were collected from each trial pit, an upper and a lower sample, each were tested independently. A summary of the testing is located in Table 2. Detailed results are located in Appendix C.

Test Hole ID	Chemical Data XRF	Chemical Data (Dry Sample)	Ceramic Properties (Fired Discs)
GHTP1	Y	Y	Y
GHTP2	Y	Y	Y
GHTP3		Y	Y
GHTP4		Y	Y
GHTP5		Y	Y
GHTP6		Y	Y
GHTP7		Y	Y
GHTP8		Y	Y
GHTP9		Y	Y
GHTP10			Y
GHTP11			Y
GHTP12			Y
GHTP13			Y
GHTP14			Y
GHTP15			Y
GHTP16			Y
GHTP17			Y
GHTP18			Y
GHTP19			Y

Table 2 Laboratory testing completed

Chemical data testing:-

- Carbon
- Sulphur

Ceramic Properties fired pieces:-

% Dried shrinkage
% Fired Shrinkage
% Overall Shrinkage
% Formed M/C
% Ignition Loss
% Water Absorption

5.Results

All of the trial pit samples were tested in the lab (Table 2), formed into discs and fired. The results of the firing are displayed in Appendix C. Not all the samples were tested using XRF as this was deemed unnecessary.

5.1 Results from the lab tests

The brickearth from Great Grovehurst Farm has a carbon and sulphur content as shown below in Table 3.

	Grovehurst Farm	
	Sulphur wt%	Carbon wt%
Max	0.050688	2.1489
Min	0.000443	0.31555
Average	0.01282	1.316184

Table 3 Summary Carbon and Sulphur test results

5.2 Results from the firing

- All of the fired discs have a good red colour, but it can be seen that the upper sample has a smoother deeper red colour, with the lower sample have a paler and common white spotting
- The white spots were observed on some discs, may be due to the presence of sulphates, (generally deeper than 1m)
- A fired disc from pit 5, 13, 14 and 16 have shrunk more than twice the average amount (Table 4). This suggests a finer particle size, this could due to:
    - An increase in the flux content
    - A small amount of London Clay (this is known to have a finer grain size) in the sample (London Clay underlies the site)
    - Natural variability

Further information related to the fired test results are located on the trial pit logs in Appendix B and photographs of the fired discs is located in Appendix C.

	Overall shrinkage
	%
Max	4.4
Min	0.2
Average	1.1

Overall Shrinkage (%)			
TP5A	TP13B	TP14B	TP16B
2.5	2.5	4.4	2.9

Table 4 Shrinkage data

5.3 Results from the works trial

As part of the works trial 26 loads of bricks (c. 20,000) were made at Smeed Dean Brickworks . A selection of bricks were used for dimension, water absorption and compressive strength testing, the bricks passed all three tests. They were then sent to Central Lab for durability testing, the bricks passed durability testing and a visual quality assessment. The results are located in Table 5, detailed results are located in Appendix C.

Average brick dimensions	215.5mm x 102mm x 65mm
Average water absorption	14.8%
Average compression strength (BS3921)	16.75N/mm^2

Table 5

5.4 Brickearth comparison

Tests were completed on Brickearth samples taken from Great Grovehurst Farm and compared against the results of a day's normal mix (31st October 2014). The results of the tests are located in Table 6. It can be seen the Brickearth used in the trial is similar to the material taken from the stockpile at Smeed Dean Brickworks. Detailed results are located in Appendix C.

	Trial (Grovehurst) %	Normal (current production) %
Brick Mix $CaCO_3$	13.6	14.5
Brick Earth $CaCO_3$	2.3	1.9
Brick Mix LOI	10.9	11.9
Brick Earth LOI	4.4	4.2
Brick Mix Moisture	28.9	28.2
Brick Earth Moisture	24.1	23.5

Table 6 Note LOI = Loss on ignition

5.5 Brick Earth Distribution and Thickness

Drawing GHF-001 (located in Appendix A) displays Brickearth distribution and thickness. It can be seen that the Brickearth thickens towards the edge of the site, and thins near the centre of the site. The average thickness is 1.9m with a maximum of 2.8m and a minimum of 0.9m.

5.6 Made Ground Distribution, Thickness and Volume

Drawing GHF-001 (located in Appendix A) displays Made Ground distribution and thickness. It can be seen that the Made Ground is present as a foundation base underneath the current site buildings. The average thickness is 1.0m with a maximum of 1.5m and a minimum of 0.7m. It is composed of a mix of materials including chalk rubble, ash, bricks, concrete blocks, rope, cloth, oil cans and glass. A rough volume estimate of 10,000m^3 has been calculated (assuming it covers an area of 10,000m^3 and is 1.0m thick). This figure does not take into consideration the extraction area, it is purely an estimate of the materials on site. Made ground thicknesses listed in the Soils Report (Ref. 1) were used in the process of delineating the made ground limit of extent.

6. Brickearth Resource Estimation

The topographic survey supplied was in 2D, using the ground elevation annotation a 3D surface was constructed manually in LSS (a 3D modelling software package), this will be less accurate and will have an effect on the volumes produced. Based on a discussion with a soil specialist, it was recommended that a thin layer of material underneath the topsoil should be collected, stored and used as a subsoil, even though this material is Brickearth. Topsoil thicknesses listed in the Soils Report (Ref. 1) were used in the modelling process.

No standoff distance, either side of the overhead electricity lines has been used, precise information should be sought from UK Power Networks before works commence. It is not known if any activity is possible near and underneath the cables.

6.1 Assumptions

- The average thickness of Topsoil is 0.35m
- The thickness of Subsoil is 0.25m (the minimum thickness of material an excavator can strip)
- The average thickness of Manmade fill is 1.0m
- The area of extraction is c.29500m^2
- Overburden is composed from topsoil and subsoil
- The maximum height of a topsoil bund is 3m
- The maximum height of a subsoil bund is 4m
- Earthmoving activity is possible (vehicles can travel) underneath the electricity cables

The extraction area was split into two zones, one zone containing made ground and the other not, this is illustrated on drawing GHF-007.

The results of the 3D modelling exercise are listed in Table 7, and illustrated on drawings GHF-007 and GHF-007a in Appendix D.

6.2 Screening Mounds and Stockpiles

The topsoil and subsoil materials from underneath any screening / stockpile bunds will have to be removed before the bunds can be constructed. It is estimated the volume of soils to be excavated is

- Topsoil = 1400m^3
- Subsoil = 1000m^3

This is assuming the footprint of the screening bund is 400m long and 10m wide (earthmoving activity possible underneath overhead electricity cables).

6.3 Demolition Materials

It is not known with any confidence the volume of materials that will be generated when all the buildings have been demolished. Formulas that estimate the volume of materials produced from the demolition of a building are commonly used, one such formula is:

General Building Debris Estimation Formula (Per FEMA, Debris Estimating Field Guide, FEMA Publication No. 329, September 2010):

Debris volume estimation = Length x width x height x 0.33 / 27

Using the topographic information supplied by Tibbalds an estimate of the total perimeter of the buildings could be made. It has been assumed the buildings are 10m high. Preliminary estimates are in the region of 200m^3, due to the lack of confidence in the figure, a much larger volume of 1000m^3 will be used.

	Volume in the field (Zone 1) m^3	Volume near the buildings (Zone 2) m^3
Topsoil	10,000	-
Subsoil	7,000	-
Fill (made ground)	-	3,000
Brickearth	50,000	3,000
Demolition Materials	-	1,000

Table 7 Volumes of Brickearth and Overburden

7.Conclusions and Recommedation

Every trial pit has intersected Brickearth, it has an average thickness of 1.9m. The fired samples have a good red colour with minor white spotting from the deeper (lower) samples. A limited number of samples (4) displayed an overall shrinkage that was more than double the average. Both the spotting and shrinkage results are not thought to be a concern especially as Brickearth materials taken from the full thickness of the deposit will be mixed together (along with chalk), any effect should be diluted in the mix.

Approximately 40 tonnes of material were excavated and used in a works trial at Smeed Dean Works. The results were positive, the bricks produced did not have durability issues, they passed a visual quality assessment, water absorption, compressive strength and dimension testing.

Brickearth from Great Grovehurst Farm was compared to the material in the current stockpile at Smeed Dean Brickworks, the moisture content, Loss on ignition and lime ($CaCO_3$) content of the materials compared well.

Based on the results of the lab tests and most importantly the works trial, the technical department are confident the Brickearth materials at Great Grovehurst Farm are usable.

7.1 Material Volumes

An estimated volume of c.20,000m^3 of topsoil and subsoil is located at the site, bunding and screening around the extraction perimeter should enable storage of c.7000m^3. All other soil materials will have to be stored in the extraction area. Phases of extraction will have to take place where soils will be stripped and moved into an area in which Brickearth has been removed.

There is an estimated total of c.53,000m^3 of Brickearth within the extraction area, of which 3,000m^3 is located underneath manmade fill.

To develop the site fully (for housing) the existing buildings must be demolished, the volume of debris that will be created has been estimated to be 1,000m3, the author does not have a high level of confidence in this amount.

Underneath the site buildings is a body of made ground, it appears a mix of fill, man-made and unspecified materials have been tipped to level this part of the site. A previous investigation (see reference 1) has highlighted items of concern in relation to contamination. An estimated 10,000m^3 of fill materials may be present on site. But due to the newt habitat area (in which extraction is not possible), the actual volume of fill within the extraction boundary is estimated to be c.3000m^3

7.2 Recommendations

Overhead power lines are present across the northern end of the site it is not known if earthmoving vehicles can operate near / underneath the lines. **The estimated volumes of materials have been produced assuming a standoff is not necessary. It is therefore highly recommended that the power company, UK Power Networks is contacted and a site visit is arranged to determine if earthmoving machines can pass underneath the cables.** If it is not possible it will reduce the Brickearth resources (by an estimated 7,000m^3) that can be extracted, and reduce the amount of soils that can be stored in the screening bund (by an estimated 3,500m^3). If there is insufficient storage space around the extraction area to store an adequate volume of soils (from the first phase), soils will have to be stored temporarily in an area that has not been extracted, (therefore double handling of soils will be required). It is recommended phasing plans using 3D modelling software should be produced to determine if this is the case. If the power company insist that only small / limited reach machines can pass underneath the power lines this may increase the cost of extraction, it is recommended this should be investigated to determine the feasibility of the project.

8. Reference

1.Soils limited, Report 13838 / SIGR, Phase 2 Scoping Ground Investigation Report at Great Grovehurst Farm, Sittingbourne, Kent ME9 8RB, for PFA Consulting Ltd. November 2013, Roland Galinski and R.B. Higginson

Appendix A

Trial Pit Location Plan, Brickearth Thickness and Summary Geology (Drawing GHF-001)

LEGEND

- Trial Pit Location
- Works Trial Trench Location (approx.)
- Interpreted Area of Thinner Brickearth
- Assumed Site Boundary
- Interpreted Area of Made Ground

GL Ground Level

BOB Base of Brickearth

166850

166800

166750

590450

590550

590450.0mE
166500.0mN

Slip Road from A249

SWALE WAY

Overhead Cables

GROVEHURST ROAD

GHTP17
0.5m Topsoil
2.8m Brickearth
GL 11.5mAOD
BOB 8.6mAOD

Field under Cultivation

GHTP16
0.4m Topsoil
0.9m Brickearth
GL 13.1mAOD
BOB 11.8mAOD

GHTP15
0.4m Topsoil
1.1m Brickearth
GL 13.1mAOD
BOB 11.6mAOD

GHTP18
0.5m Topsoil
2.2m Brickearth
GL 13mAOD
BOB 10.3mAOD

Works Trial trench, approximate location

Field under Cultivation

30.58 (Cables)

41.95 (Pylon)

30.66 (Cables)

GHTP19
0.5m Topsoil
2.7m Brickearth
GL 14.1mAOD
BOB 10.9mAOD

Barn

Bund

GHTP13
1.5m Fill
1.3m Brickearth
GL 14.3mAOD
BOB 11.5mAOD

GHTP14
0.4m Topsoil
1.4m Brickearth
GL 14mAOD
BOB 12.1mAOD

GHTP7
0.4m Topsoil
1.5m Brickearth
GL 13.5mAOD
BOB 12.0mAOD

New House

Sub Stn

Conc

Barn

Brick Building (retail)

Store

Hardstanding

Workshop

GHTP12
1.5m Fill
0.9m Brickearth
GL 15.5mAOD
BOB 13.1mAOD

Grass (not maintained)

GHTP10
0.4m Topsoil
1.6m Brickearth
GL 15.2mAOD
BOB 13.2mAOD

GHTP6
0.5m Topsoil
1.4m Brickearth
GL 14.7mAOD
BOB 12.8mAOD

GHTP1
0.5m topsoil
1.9m Brickearth
GL 14mAOD
BOB 11.6mAOD

Field under Cultivation

Spoil

Conifer Hedgerow

Overgrown
(Fallen Conifers)

Conifer Hedgerow
30.25 (Hedge Top)

GHTP11
0.7m Fill
2.1m Brickearth
GL 16mAOD
BOB.13.2mAOD

Grass (not maintained)

GHTP9
0.4m Topsoil
2.8m Brickearth
GL 16.1mAOD
BOB 13.0mAOD

GHTP5
0.4m Topsoil
2.5m Brickearth
GL 15.5mAOD
BOB 12.6mAOD

GHTP2
0,3m Topsoil
2.4m Brickearth
GL 15.1mAOD
BOB 12.4mAOD

Field under Cultivation

GHTP3
0.4m Topsoil
2.8m Brickearth
GL 15.4mAOD
BOB 11.85mAOD

Overgrown

GHTP8
0.5m Topsoil
2.2m Brickearth
GL 16.7mAOD
BOB 14.0mAOD

Overgrown

GHTP4
0.5m Topsoil
2.25m Brickearth
GL 15.9mAOD
BOB 13.15mAOD

GODWIN CLOSE

GAS MAIN assumed location

Rail line, approximate location

N
INDICATIVE ONLY

Survey by Multi LIMN July 2014

Great Grovehurst Farm

Site Survey and Features Plan

Trial Pit Locations with Geological Summary and Brick earth Thickness Indication

Dwg. Number GHF-001

AN	August 2014

Scale 1:500@A1

Appendix B

Trial Pit Logs and Photographs

Wienerberger

Trial Pit No.	GHTP1

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	14 mAOD 590652 166620	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft, crumbly, dark brown, sandy, clayey, silt (TOPSOIL), with occasional gravel of flint.		13.50	
0.50	2.4	1.90	Firm, buff yellow brown, slightly sandy (fine) clayey silt (BRICK EARTH) . From 1.5m becomes soft, is moist and very sandy (fine).		11.60	GOOD
2.40	3	0.60	Flint rich layer. Common rounded to sub rounded (FLINT GRAVEL), up to 60mm diameter within sticky yellow brown silty clay.		11.00	
3.00	3.1	0.10	Stiff, pale greyish green silty clay (LONDON CLAY).		10.90	

EOH 3.1m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
			Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP2

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level	15.1 mAOD	Contractor	Ovendens
		Easting	590642	Excavation	Trial Pit
		Northing	166570		
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.3	0.30	Soft, crumbly, dark brown, slightly sandy, slightly clayey, silt (TOPSOIL)		14.80	
0.30	2.7	2.40	Soft, crumbly, buff yellow brown, slightly sandy (fine) silty clay (CLAYEY BRICK EARTH), moist.		12.40	GOOD
2.70	2.75	0.05	Flint rich layer. Common rounded to sub rounded (FLINT GRAVEL), up to 80mm		12.35	

EOH 2.75m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

		Flint Rich		Weathered LondonClay	
	Made Ground			Brick Earth	
		Topsoil		London Clay	

Wienerberger

Trial Pit No.	GHTP3

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	15.4 mAOD 590627 166539	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, sandy, clayey, silt (TOPSOIL).		15.00	
0.40	3.55	3.15	Firm, orangy brown, sandy, clayey silt (BRICKEARTH). From 0.8-1.5m dry, stiff. From 1.5m soft, moist. From 3.2m with a moderate amount of flint gravel, rounded to sub angular, up to 50mm diameter, with an increasing amount of gravel with depth.		11.85	GOOD
3.55	3.6	0.05	Flint rich layer. Common rounded to sub rounded (FLINT GRAVEL), within yellow brown silty clay.		11.80	
			EOH 3.6m			

Comments:

GAS MAIN NEARBY Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
			Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP4

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	15.9 mAOD 590627 166539	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.5	0.50	Firm, crumbly, dark brown, sandy, clayey, silt (TOPSOIL).		15.40	
0.50	2.75	2.25	Soft, orangy brown, moist, slightly sandy, silty clay (CLAYEY BRICKEARTH). With occasional flint gravel. Minor water strike at 2.75m.		13.15	GOOD
2.75	2.8	0.05	Soft, greenish, orangy brown, very silty SAND (THANET SAND?)		13.10	

EOH 2.8m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP5

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	16.5 mAOD 590689 166587	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, sandy, clayey, silt (TOPSOIL).		16.10	
0.40	2.9	2.50	Soft, crumbly, orangy brown, slightly clayey, slightly sandy, silt (BRICKEARTH). From 1.3m moist.		12.60	GOOD
2.90	3	0.10	Firm, orangy brown, mottled pale grey, slightly sandy silty clay. (just touched) LONDON CLAY		12.50	

EOH 3.0m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from OS maps 148 and 149. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP6

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	14.7 mAOD 590591 166627	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft, crumbly, dark brown, slightly sandy, clayey, silt (TOPSOIL).		14.20	
0.50	1.9	1.40	Soft, crumbly, orangy brown, silty, slightly sandy, clay (CLAYEY BRICKEARTH).		12.80	GOOD
1.90	2.1	0.20	(FLINT GRAVEL), rounded, up to 60mm diameter, coated with a wet clay.		12.60	
2.10	2.2	0.10	Firm to stiff, shiney, pale greyish green, silty clay. (LONDON CLAY)		12.50	

EOH 2.2m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP7

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	13.9 mAOD 590598 166683	Contractor Excavation	Ovendens Trial Pit
Date	12/06/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)	Description	Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, slightly sandy, clayey, silt (TOPSOIL).		13.60	
0.40	1.9	1.50	Soft, crumbly, orangy brown, slightly sandy, slightly clayey, silt (BRICKEARTH). Clay pipe drain intersected.		12.00	GOOD
1.90	2.4	0.50	Brickearth as above but with common (FLINT GRAVEL), rounded to sub angular, up to 60mm diameter.		11.50	
2.40	2.6	0.20	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY)		11.30	

EOH 2.6m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP8

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	16.7 mAOD 590521 166527	Contractor Excavation	**Ovendens** Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft to firm, crumbly, dark brown, sandy, silty clay (TOPSOIL).		16.20	
0.50	2.7	2.20	Soft, crumbly, orangy brown, sandy, silty clay (CLAYEY BRICKEARTH). Softer increasingly silty and moist with depth. Minor water strike at 2.3m.		14.00	GOOD
2.70	2.8	0.10	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY) with occasional white chalk gravel (c.10mm diam.)		13.90	
			EOH 2.8m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP9

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	16.1 mAOD 590533 166573	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft to firm, crumbly, dark brown, sandy, clayey silt (TOPSOIL).		15.70	
0.40	3.1	2.70	Soft, crumbly, orangy brown, sandy, silty clay (CLAYEY BRICKEARTH). Moist, from 1.5m clayey silt (BRICKEARTH). Becoming a silty fine (SAND) near the base . Water strike at the base of this unit.		13.00	GOOD
3.10	3.3	0.20	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY).		12.80	
			EOH 3.3m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP10

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	15.2 mAOD 590534 166633	Contractor Excavation	Ovendens Trial Pit
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft to firm, crumbly, dark brown, sandy, clayey silt (TOPSOIL).		14.80	
0.40	2	1.60	Soft, crumbly, orangy brown, slightly sandy, clayey silt (BRICKEARTH).		13.20	GOOD
2.00	2.2	0.20	Firm to stiff, shiney, pale greyish green, silty clay. (LONDON CLAY).		13.00	

EOH 2.2m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP11

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level	16 mAOD	Contractor	Ovendens
		Easting	590484	Excavation	Trial Pit
		Northing	166594		
Date	12/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.7	0.70	Black ash mixed with soil, gravel, bricks, flint gravel and chalk gravel (MADE GROUND)		15.30	
0.70	2.8	2.10	Soft, crumbly, orangy brown, sandy, clayey silt (BRICKEARTH). Moist with depth, VERY SANDY at base.		13.20	GOOD
2.80	2.9	0.10	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY).		13.10	
			EOH 2.9m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

		Flint Rich		Weathered LondonClay	
	Made Ground			Brick Earth	
	Thanet Sand		Topsoil		London Clay

Wienerberger

Trial Pit No.	GHTP12

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level	15.5 mAOD	Contractor	Ovendens
		Easting	590475	Excavation	Trial Pit
		Northing	166625		
Date	12/06/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	1.5	1.50	Black ash mixed with soil, gravel, bricks, flint gravel and chalk gravel (MADE GROUND). Layers of black ashy gravel and white chalky gravel. Water strike at 0.8m, sitting on chalk layer.		14.00	
1.50	2.4	0.90	Soft, orangy brown, sandy, clayey silt (BRICKEARTH). Moist.		13.10	GOOD
2.40	2.8	0.40	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY).		12.70	
			EOH 2.8m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.-0.5m) was not sampled to avoid any contamination from the topsoil

Flint Rich		Weathered LondonClay	
Made Ground		Brick Earth	
Thanet Sand	Topsoil	London Clay	

Wienerberger

Trial Pit No.	GHTP13

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	14.3 mAOD 590530 166685	Contractor Excavation	Ovendens Trial Pit
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	1.5	1.50	Black ash mixed with gravel, bricks, concrete blocks, cables, rope, rubble, metal barrel, glass, fill (MADE GROUND). Ground level raised.		12.80	
1.50	2.8	1.30	Soft, orangy brown, sandy, silty clay (CLAYEY BRICKEARTH). Moist, with occasional flint gravel, 20mm diameter. Becoming stickier and stiffer with depth.		11.50	GOOD
2.80	2.9	0.10	Common (FLINT GRAVEL) up to 60mm diameter, sub rounded, within the brickearth above.		11.40	
2.90	3	0.10	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY). With common flint gravel.		11.30	

EOH 3.0m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP14

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level	14 mAOD	Contractor	Ovendens
		Easting	580567	Excavation	Trial Pit
		Northing	166682		
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, sandy, clayey silt (TOPSOIL).		13.60	
0.40	1.8	1.40	Firm, orangy brown, slightly sandy, clayey, silty (BRICKEARTH). Dry, with occasional flint gravel, 20mm diameter.		12.20	GOOD
1.80	1.9	0.10	Becoming clayey and stiffer with depth (CLAYEY BRICKEARTH).		12.10	Good / Spotted
1.90	1.95	0.05	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY). With occasional flint gravel.		12.05	
			EOH 1.95m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP15

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	13.1 mAOD 590567 166682	Contractor Excavation	Ovendens Trial Pit
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, slightly sandy, silty clay (TOPSOIL), moist.		12.70	
0.40	1.5	1.10	Soft, orangy brown, slightly sandy, clayey, silty (BRICKEARTH).		11.60	GOOD
1.50	1.7	0.20	Firm to stiff, shiney, pale greyish green, mottled orangy brown, silty clay. (LONDON CLAY). With occasional flint gravel.		11.40	
			EOH 1.7m			

Comments:

OVER HEAD CABLES NEARBY Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP16

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	13.1 mAOD 590493 166745	Contractor Excavation	Ovendens Trial Pit
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.4	0.40	Soft, crumbly, dark brown, slightly sandy, silty clay (TOPSOIL).		12.70	
0.40	1.3	0.90	Soft, orangy brown, slightly sandy, silty, clay (CLAYEY BRICKEARTH).		11.80	GOOD
1.30	1.7	0.40	Becoming sticky, stiffer, orangy brown mottled pale grey, silty clay with occasional flint gravel (BRICKEARTH / LONDON CLAY MIX)		11.40	
1.70	2.4	0.70	Frequent FLINT GRAVEL up to 90mm diameter, rounded - sub rounded coated in a orangy brown wet silty clay that becomes pale grey with depth. Just touched LONDON CLAY at base of hole.		10.70	

EOH 2.4m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP17

Site	Grovehurst Farm	Ground Level	11.9 mAOD	Contractor	Ovendens
	Grovehurst Road	Easting	590449	Excavation	Trial Pit
	On arable land	Northing	168781		
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft, crumbly, dark brown, slightly sandy, silty clay (TOPSOIL).		11.40	
0.50	3.3	2.80	Soft, orangy brown, slightly sandy, silty, clay (CLAYEY BRICKEARTH). Moist with depth. From 2.7m Much sandier (fine sand), becoming orangy brown, very sandy, clayey silt (brickearth).		8.60	GOOD
3.30	3.4	0.10	Stiff, pale greenish grey, mottled orangy brown, silty clay (LONDON CLAY)		8.50	

EOH 3.4m

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP18

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	13 mAOD 590444 156724	Contractor Excavation	Ovendens Trial Pit
Date	13/08/2014	Excavator	Bobcat 160		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft, crumbly, dark brown, sandy, clayey silt (TOPSOIL).		12.50	
0.50	2.7	2.20	Soft, orangy brown, moist, slightly sandy, silty, clay (CLAYEY BRICKEARTH). Increasingly moist, clayey and sticky with depth. Water strike at 1.9m.		10.30	GOOD
2.70	3.1	0.40	As above with common flint gravel. Gravel is up to 80mm diameter, sub rounded.		9.90	
3.10	3.4	0.30	FLINT GRAVEL rick layer within a moist pale grey green silty clay. Gravel is sub rounded and up to 60mm diameter.		9.60	
			EOH 3.4m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Wienerberger

Trial Pit No.	GHTP19

Site	Grovehurst Farm Grovehurst Road On arable land	Ground Level Easting Northing	14.1 mAOD 590445 166689	Contractor Excavation	Ovendens Trial Pit
Date	13/08/2014	Excavator	Bobcat 180		
Logged by	Andy Norton				

From (m)	To (m)	Thickness (m)		Log	mAOD	Fired Colour
0.00	0.5	0.50	Soft, crumbly, dark brown, sandy, clayey silt (TOPSOIL).		13.60	
0.50	3.2	2.70	Soft to firm, orangy brown, slightly sandy, silty, clay (CLAYEY BRICKEARTH), slightly moist. At 2.0 - 2.1m very sandy silty clayey brickearth. From 2.1 - 3.2m Stickier, stiffer, moist clay, moist brickearth? From 2.8m with occasional flint gravel.		10.90	GOOD
3.20	3.3	0.10	Stiff, pale greenish grey mottled orangy brown, with occasional black spots (organic matter/ carbon) (LONDON CLAY).		10.80	
			EOH 3.3m			

Comments:

Eastings and northing have not been surveyed, are accurate to 6m using a handheld GPS. The elevation was taken from a survey plan given by Mr Doubleday. The uppermost part of this interval (0.- 0.5m) was not sampled to avoid any contamination from the topsoil

			Flint Rich		Weathered LondonClay		
	Made Ground				Brick Earth		
	Thanet Sand		Topsoil		London Clay		

Appendix C

Lab Test Results, Fired Discs Photographs and Durability Test Results

Nearly all of the bricks grew in width after they had been fired.
They are marked down as the dry weight.

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WORKS: Grovehurst Farm
MATERIAL: Trial Pits
FIRED TEMP:

DATE ISSUED :-
LAB REPORT No :- 7329

Sample No.	MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
A			50.23	9.95	42.5	49.81	9.94	39.3	49.81	9.87	35.3	41.1
B	TP 1A		50.32	10.23	43.4	49.90	10.22	40.6	49.90	10.11	36.3	42.2
C			50.20	9.91	41.9	49.93	9.90	39.5	49.93	9.76	35.4	41.1
A			50.08	11.66	50	49.85	11.65	47.2	49.85	11.31	42.4	48.6
B	TP 1B		50.25	12.05	53	49.90	12.04	49.4	49.90	11.83	44.2	50.8
C			50.17	11.86	51	49.90	11.73	48.2	49.90	11.60	43.2	49.3
A			50.04	11.74	49	49.49	11.73	45.4	49.07	11.29	42.6	47.3
B	TP 2A		50.08	10.66	45	49.73	10.65	42.5	49.46	10.42	39.9	44.3
C			50 14	11 49	48	49.78	11.48	45.6	49.48	11.34	42.7	47.3
A			50.12	10.85	47	49.85	10.75	45.3	49.85	10.53	40.1	45.6
B	TP 2B		50.09	10.59	47	49.80	10.58	44.3	49.80	10.42	39.0	44.5
C			50.06	12.41	53	49.47	17.40	49.4	49.47	11.96	43.4	50.1
A			50.11	9.31	40.8	49.16	9.30	37.0	49.11	8.82	34.5	38.5
B	TP 3A		50.14	10.69	45.6	49.68	10.65	42.1	49.35	10.34	39.2	43.6
C			50.39	10.43	44.3	49.53	10.38	40.6	49.15	9.98	37.6	42.2
A			50.28	11.54	50	49.88	11.53	47.3	49.88	11.49	41.4	47.6
B	TP 3B		50.04	11.51	50	49.83	11.50	47.3	49.83	11.41	41.4	47.3
C			50.09	11.02	48	49.88	10.98	45.4	49.88	10.98	39.7	45.4
A			50.08	10.94	45.4	49.42	10.88	40.5	49.30	10.58	38.1	43.3
B	TP 4A		50.16	10.99	46.5	49.71	10.88	42.5	49.71	10.84	39.7	45.2
C			50.20	10.17	43.3	49.78	10.06	39.8	49.75	10.01	37.2	42.1

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WOI KS : Grovehurst Farm
MAT ERIAL: Trial Pits
FIRE D TEMP:

DATE ISSUED :-
LAB REPORT No :- 73251

Sa ple No.	MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
A			50.08	11.04	48	49.87	11.03	45.5	49.87	10.91	40.1	46.0
B	TP 4B		49.97	11.05	47	49.73	11.04	44.1	49.73	10.75	39.1	44.9
C			50.05	10.81	46	49.77	10.74	42.5	49.77	10.50	37.6	43.5
A			50.14	10.48	44.3	49.47	10.47	39.8	49.36	10.13	37.2	41.8
B	TP 5A		50.04	10.81	44.9	49.42	10.70	40.3	49.09	10.43	37.5	42.3
C			50.12	9.88	41.1	49.43	9.80	37.0	49.12	9.42	34.4	39.0
A			50.02	11.32	49	49.80	11.31	45.0	49.80	11.30	39.9	46.7
B	TP 5B		50.06	11.28	48	49.77	11.27	44.7	49.77	10.94	39.6	45.9
C			50.16	11.41	48	49.87	11.32	45.2	49.87	10.80	39.9	45.9
A												
B	TP 5C											
C												
A			50.05	12.13	52.1	49.58	12.12	47.1	49.28	11.90	41.6	48.8
B	TP 6A		50.10	11.23	48.2	49.82	11.19	44.3	49.82	11.07	39.3	45.7
C			50.16	11.34	48.0	49.81	11.31	44.3	49.81	11.22	39.0	45.9
A			50.07	11.56	50	49.87	11.53	46.6	49.87	11.13	41.2	47.3
B	TP 6B		50.31	11.16	47	49.89	11.15	44.7	49.89	10.87	39.4	46.0
C			50.10	10.93	47	49.88	10.92	44.8	49.88	10.88	39.4	43.6
A			49.94	10.51	44.1	49.64	10.44	40.3	49.24	10.27	37.8	42.2
B	TP 7		50.12	10.39	43.3	49.66	10.29	39.7	49.45	10.17	37.1	41.6
C			50.04	11.32	47.4	49.70	11.15	43.6	49.36	10.62	40.9	45.6

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WORKS : Groveshill Farm
MATERIAL: Trial Pits
FIRED TEMP:

DATE ISSUED :-
LAB REPORT No :- 7329

Sample No.		MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
	A			49.95	12.53	53	49.70	12.25	46.5	49.40	12.21	43.3	50.3
	B	TP 8A		50.03	12.32	52	49.35	12.31	46.5	49.35	12.28	43.4	50.1
	C			50.17	12.26	52	49.24	12.25	46.3	49.24	12.03	43.3	49.6
	A			50.09	11.72	50	49.90	11.62	47.6	49.90	11.14	41.9	48.1
	B	TP 8B		50.12	11.33	49	49.83	11.27	45.9	49.83	10.94	40.0	46.6
	C			50.05	11.25	48	49.75	11.11	44.4	49.75	10.99	38.7	45.4
	A			50.07	11.24	47.0	49.71	11.11	42.9	49.45	10.68	40.3	45.2
	B	TP 8C		50.16	11.14	46.6	49.87	11.12	43.3	49.57	10.90	40.5	45.5
	C			50.21	10.20	42.4	49.90	10.13	39.7	49.88	9.87	37.0	42.3
	A			50.10	12.22	53	49.80	12.21	48.6	49.80	12.19	43.2	50.5
	B	TP 9B		50.12	11.49	48	49.80	11.32	44.2	49.80	11.21	39.0	45.6
	C			50.11	10.96	48	49.90	10.95	45.6	49.90	10.77	40.1	46.2
	A												
	B	TP 9C											
	C												
	A			50.11	12.79	53.4	49.58	12.67	48.2	49.58	12.42	42.9	50.4
	B	TP 10		50.12	10.98	46.7	49.81	10.92	43.1	49.81	10.55	38.3	44.7
	C			50.10	11.43	48.7	49.80	11.49	44.8	49.80	11.17	39.7	46.9
	A			49.69	11.11	46	49.59	11.10	42.2	49.59	10.73	37.3	43.7
	B	TP 11A		50.06	10.81	47	49.80	10.90	43.8	49.80	10.67	38.4	44.6
	C			50.08	10.81	47	49.82	10.70	44.3	49.82	10.65	38.7	44.3
		TP 10B		50.15	11.81	51	49.51	11.80	46.8	49.51	11.66	40.9	47.9
				50.13	11.45	47	49.53	11.16	44.2	49.53	11.11	38.4	44.6
				50.07	10.43	45	49.56	10.42	42.4	49.56	10.29	36.9	42.6

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WORKS: Grovehurst Farm
MATERIAL: Trial Pits
FIRED TEMP:

DATE ISSUED :-
LAB REPORT No :- 7329

Sample No.		MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
	A			50.18	12.42	53	49.95	12.36	49.6	49.95	12.31	44.1	51.3
	B	TP 11B		50.19	11.91	51	49.97	11.90	48.4	49.97	11.83	43.1	50.4
	C			50.26	11.39	49	49.96	11.38	46.3	49.96	11.33	40.7	47.7
	A			50.18	12.23	50.5	49.84	12.20	45.9	49.84	11.93	40.9	48.1
	B	TP 12		50.21	12.47	52.1	49.89	12.17	47.8	49.87	11.82	42.5	49.4
	C			50.17	13.00	53.2	49.90	12.90	49.2	49.90	12.66	43.9	50.9
	A			49.94	10.65	44.4	49.45	10.49	39.9	49.45	10.37	35.4	41.9
	B	TP 13a		50.04	10.42	43.0	49.30	10.23	38.4	49.30	9.95	34.1	40.5
	C			50.19	10.28	43.0	49.78	10.24	39.4	49.78	10.11	35.1	41.4
	A			49.72	12.29	51	48.22	12.28	44.8	48.22	11.94	40.0	45.9
	B	TP 13B		49.84	12.02	50	48.72	12.01	45.2	48.63	11.66	40.3	45.9
	C			50.18	10.68	46	49.12	10.67	42.3	49.12	10.13	37.6	43.0
	A			50.10	12.35	53	49.71	12.34	48.0	49.71	12.12	43.2	50.0
	B	TP 14A		49.99	12.12	52	49.65	12.11	47.4	49.65	12.06	42.6	49.6
	C			50.13	10.66	46	49.73	10.76	42.2	49.73	10.56	37.8	44.0
	A			49.95	11.74	48	49.02	11.57	44.1	47.88	10.86	38.6	42.7
	B	TP 14B		50.31	10.99	47	48.96	10.98	42.9	48.64	10.40	37.3	41.6
	C			49.63	11.64	47	47.24	11.28	41.2	46.77	11.04	35.9	39.4
	A			50.00	10.66	44.1	49.49	10.61	39.6	49.49	10.32	36.3	41.4
	B	TP 15		50.19	10.22	43.0	49.69	10.13	39.4	49.69	9.83	35.0	40.7
	C			50.17	10.94	44.6	49.74	10.70	41.9	49.74	10.50	37.2	43.1

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WORKS: Grovehurst Farm
MATERIAL: TRIAL PITS
FIRED TEMP:

DATE ISSUED :-
LAB REPORT No :- 7324

Sample No.	MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
A			49.99	11.23	44.9	49.26	11.07	40.3	49.26	10.39	36.8	42.7
B	TP 16A		50.20	11.29	47.1	49.76	11.07	43.3	49.76	10.64	39.9	45.5
C			50.12	10.44	44.0	49.84	10.38	40.8	49.84	10.21	37.5	43.0
A			50.10	10.68	46	49.12	10.67	41.6	49.03	10.59	36.7	41.7
B	TP 16B		49.99	11.54	49	49.01	11.53	43.8	48.63	10.95	38.6	43.9
C			50.14	11.30	47	48.16	11.27	42.0	48.16	11.02	37.0	42.0
A			49.75	10.33	43	49.03	10.32	39.6	49.03	9.95	37.1	42.0
B	TP 17A		49.80	11.54	50	49.52	11.50	45.7	49.47	11.30	42.8	47.8
C			50.13	10.50	45	49.71	10.48	42.3	49.52	10.26	39.7	43.8
A			50.01	11.73	51.8	49.94	11.67	47.9	49.94	11.58	44.2	49.8
B	TP 17B		49.99	11.75	50.6	49.85	11.38	47.1	49.85	11.37	43.5	49.2
C			49.98	11.57	50.3	49.86	11.45	46.8	49.86	11.30	43.4	48.8
A			49.92	12.29	54.4	49.71	12.28	50.2	49.71	11.97	45.5	51.2
B	TP 17C		49.90	11.87	52.3	49.66	11.80	48.9	49.66	11.68	44.3	49.8
C			49.93	11.63	52.5	49.72	11.60	48.4	49.72	11.52	44.0	49.2
A			49.85	10.97	45.2	49.36	10.87	40.7	49.14	9.98	38.3	42.5
B	TP 18A		49.81	11.20	46.0	49.45	11.05	41.2	48.53	10.38	39.0	43.4
C			50.03	11.59	48.4	49.59	11.43	44.2	49.13	11.19	41.6	45.9
A			50.04	11.82	51.6	49.82	11.64	48.1	49.82	11.62	43.0	49.3
B	TP 18B		50.01	11.55	50.3	49.79	11.40	47.1	49.79	11.35	42.2	48.2
C			50.02	11.53	50.2	49.84	11.44	46.9	49.84	11.34	42.0	47.9

WIENERBERGER
R&D LABORATORY
BRIQUETTE SAMPLE TESTING SHEET

WORKS: Grove Hurst Farm
MATERIAL: Trial Dits
FIRED TEMP:

DATE ISSUED :-
LAB REPORT No :- 7329

Sample No.		MIX	Acid Test	L (mm)	W (mm)	Wet wt (g)	L (mm)	W (mm)	Dry wt (g)	L (mm)	W (mm)	Fired wt (g)	Abs wt (g)
	A			49.96	10.50	43.6	49.65	10.28	39.6	49.28	10.04	36.4	40.9
	B	TP 19 A		50.14	10.88	46.6	49.67	10.87	42.6	49.50	10.45	40.1	45.0
	C			50.14	9.42	39.2	49.76	9.22	36.4	49.59	9.20	34.3	38.4
	A			49.98	12.01	52.0	49.76	11.96	48.4	49.76	11.62	42.8	49.5
	B	TP 19 B		50.04	11.78	51.7	49.82	11.69	47.4	49.82	11.60	42.4	48.5
	C			50.00	4.29	49.3	49.80	11.24	45.4	49.80	11.15	40.6	46.8
	A			49.94	12.06	51.0	49.04	11.72	46.5	49.04	11.24	42.3	47.0
	B	TP 19 C		49.98	11.08	48.3	49.06	10.98	43.9	49.06	10.29	39.9	43.9
	C			49.62	11.98	52.4	48.25	11.97	46.1	48.25	11.33	42.3	46.8
	A												
	B												
	C												
	A												
	B												
	C												
	A												
	B												
	C												
	A												
	B												
	C												

Ceramic properties fired pieces		TP 1A	TP 1B	TP 2A	TP 2B	TP 3A	TP 3B	TP 4A	TP 4B	TP 5A	TP 5B
1080	% Dried Shrinkage	0.742952	0.564784	0.838547	0.765289	1.529959	0.548165	1.036958	0.486342	1.969597	0.532481
	% Fired Shrinkage	0.020049	0	0.671141	0	0.492013	0	0.080602	0	0.505663	0
	% Overall Shrinkage	0.762852	0.564784	1.50406	0.765289	1.991503	0.545177	1.116724	0.486342	2.465301	0.532481
Elect Kiln	% Formed Moisture Dry basis	6.57277	5.974026	5.985915	5.442177	8.41622	5.405405	9.171598	6.312057	10.13047	6.965517
	% Ignition Loss	10.38526	10.35912	1.573034	11.8705	7.017544	12.5	6.351792	11.58213	6.831768	11.48999
	% Water Absorption	16.26168	12.71015	5.399568	12.62482	10.45857	12.6871	11.94487	13.09524	11.37287	13.79061

Ceramic properties fired pieces		TP 6A	TP 6B	TP 7A	TP 8A	TP 8B	TP 9A	TP 9B	TP 10A	TP 10B	TP 11A
1080	% Dried Shrinkage	0.731821	0.558214	0.732845	1.438561	0.5191	0.638128	0.552119	0.758332	1.163951	0.427094
	% Fired Shrinkage	0.201059	0	0.637584	0.637584	0	0.388012	0	0	0	0
	% Overall Shrinkage	0.931408	0.558214	1.365756	1.438561	0.5191	1.023664	0.552119	0.758332	1.163951	0.427094
Elect Kiln	% Formed Moisture Dry basis	8.496291	5.486111	8.308605	11.27389	6.190476	7.426471	7.114094	8.534946	6.713287	6.928571
	% Ignition Loss	11.64333	11.82954	6.31068	6.676238	12.54532	6.433678	11.63295	11.16826	12.89355	12.20261
	% Water Absorption	14.60114	13.60691	10.51005	13.12483	13.91863	11.42857	14.05481	14.5583	13.98964	13.72549

Ceramic properties fired pieces		TP 11B	TP 12A	TP 13A	TP 13B	TP 14A	TP 14B	TP 15A	TP 16A	TP 16B	TP 17A
1080	% Dried Shrinkage	0.497909	0.617694	1.092096	2.457593	0.75223	3.115618	0.957702	0.964673	2.622645	0.948691
	% Fired Shrinkage	0	0	0	0.061619	0	1.329018	-0.00672	0	0.32128	0.161878
	% Overall Shrinkage	0.497909	0.617694	1.092096	2.517697	0.75223	4.403229	0.951051	0.964673	2.935499	1.109033
Elect Kiln	% Formed Moisture Dry basis	5.686275	8.279846	9.739264	10	8.874172	9.71831	8.200456	8.529412	10.28169	7.536232
	% Ignition Loss	11.36521	10.91672	11.12999	10.88435	10.17442	12.79251	11.08354	8.199357	11.85243	6.269592
	% Water Absorption	14.3909	14.21833	15.50889	12.53709	13.92758	9.620049	14.13738	12.95732	11.9906	10.47904

Ceramic properties fired pieces		TP 17B	TP 17C	TP 18A	TP 18B	TP 19A	TP19B	TP 19C
1080	% Dried Shrinkage	0.220029	0.440735	0.861781	0.413141	0.772098	0.42661	2.133209
	% Fired Shrinkage	0	0	0.861781	0	0.476254	0	0
	% Overall Shrinkage	0.220029	0.440735	1.930657	0.413141	1.244675	0.42661	2.133209
Elect Kiln	% Formed Moisture Dry basis	8.05501	7.349246	9.670487	6.574622	8.346213	7.712418	10.01978
	% Ignition Loss	6.623932	9.288136	5.709754	10.48557	6.576728	10.90652	8.791209
	% Water Absorption	11.29905	10.91877	9.787557	12.51719	10.86082	13.12155	9.586057

Wienerberger

Sulphates, Carbon & Sulphur Results

FACTORY	GROVEHURST FARM TRIAL PITS		
LAB CODE	7329		
DATE OF RESULT		20/4/15	20/4/15
TESTED BY		SB	SB

Sample Identification	Sulphates		Sulphur	Carbon
	Result	%	%	%
TP1 - 1m			0·021319	1·7539
TP1 - 2m			0·012019	1·7177
TP2 - 1m			0·011429	0·31555
TP2 - 2·5m			0·011201	1·7876
TP3 - 1m			0·012505	0·40452
TP3 - 2·2m			0·0079998	2·1489
TP3 - 3m			0·011123	1·5288
TP4 - 1m			0·0073585	0·32501
TP4 - 2m			0·0037888	1·8305
TP5 - 1m			0·0097149	0·45264
TP5 - 2m			0·0047103	2·0173
TP5 - 3m			0·050375	0·87820
TP6 - 1m			0·010019	1·9019
TP6 - 1·9m			0·00044295	2·0528
TP7 - 1m			0·0092134	0·43264
TP7 - 1·9m			0·0048928	1·9076
TP8 - 1m			0·0095822	0·68808
TP8 - 2m			0·0042196	2·0871
TP9 - 1m			0·0090642	0·42577
TP9 - 2·3m			0·0075627	2·0543
TP9 - 3·1m			0·050688	0·92905
TP10 - 1m				
TP10 - 2m				

Chemical data- XRF			TP1A	TP1B	TP2A
Soda	Na2O	wt.%	0.28	0.27	0.24
Magnesia	MgO	wt.%	2.48	2.91	3.26
Alumina	Al2O3	wt.%	8.25	7.63	8.02
Silica	SiO2	wt.%	76.05	77.47	76.82
Phosphorus	P2O5	wt.%	0.61	0.64	0.71
Potash	K2O	wt.%	2.46	2.58	2.62
Lime	CaO	wt.%	1.21	0.9	1
Titania	TiO2	wt.%	0.98	1.01	0.93
Chromium	Cr2O3	wt.%	0.02	0.03	0.03
Manganese	MnO2	wt.%	0.18	0.1	0.08
Iron Oxide	Fe2O3	wt.%	7.48	6.46	6.29
			100	100	100
Loss of Ignition	LOI	wt.%	7.22	7.94	6.64

DETERMINATION OF FREEZE / THAW RESISTANCE OF CLAY MASONARY UNITS

Factory: Smeed Dean Brick Type: **SD London Stock (Grovehurst trials)**

Batch No: Trial KE032 Lab Ref: 7419

Tested by: JL/NM Date test finished: **28/02/2015**

Test Procedure

The test has been carried out in accordance with the Technical Specification CEN/TS 772-22 (June 2006) which involves subjecting a panel of brick work to repeated freeze-thaw cycles designed to stimulate naturally occurring conditions. From the test the bricks are given a freeze-thaw resistance classification which categorises the brick as being suitable to withstand the following conditions:

F2 – Severe Exposure **F1** – Moderate Exposure **F0** – Passive Exposure

Freeze/Thaw Cycles

The panel was immersed in water at room temperature for 7 days before installation in a freeze – thaw apparatus which subjects the main face of the panel to repeated cycles of freezing and thawing following an initial freeze at an air temperature of -15°c for 6 hours. The rear of the panel is insulated with 50mm neoprene rubber and the sides insulated with 25mm of neoprene rubber.

A freeze thaw cycle consists of 120 minutes (± 5mins) of freezing to -15°c (± 3c) air temperature, heating with re-circulated warm air to 20°c (±3°c) for 20 mins, 2mins flood coat spray at a water temperature of 18–25°c followed by a two minute drain period. This gives 10 cycles every 24 hours and a standard test will continue for 100 cycles.

Assessment of Freeze/Thaw Resistance

The panel was examined after 15 and 50 cycles. After 100 cycles the panel was allowed to thaw completely, removed from the apparatus and photographed. The panel was then dismantled and individual bricks examined for frost damage as categorised in Table 1

Key to EN 772-22 Failures - Table 1	
Categories of Damage	**Type**
None	0
Crater (e.g. lime burst	1
Hair Crack ≤ 0.2mm	2
Minor Crack	3
Surface Crack >0.2mm	4
Through Crack	5
Chipping, Peeling, Scaling	6
Fracture	7
Spalling, Delamination	8
If no damage of type 4 (in red) or greater occurs to any of the units or half units during the 100 cycles the units are considered to be suitable for use in Severe Exposure Category F2.	

Results

After 15 cycles	After 50 cycles	After 100 cycles

Total No Damaged = Nil

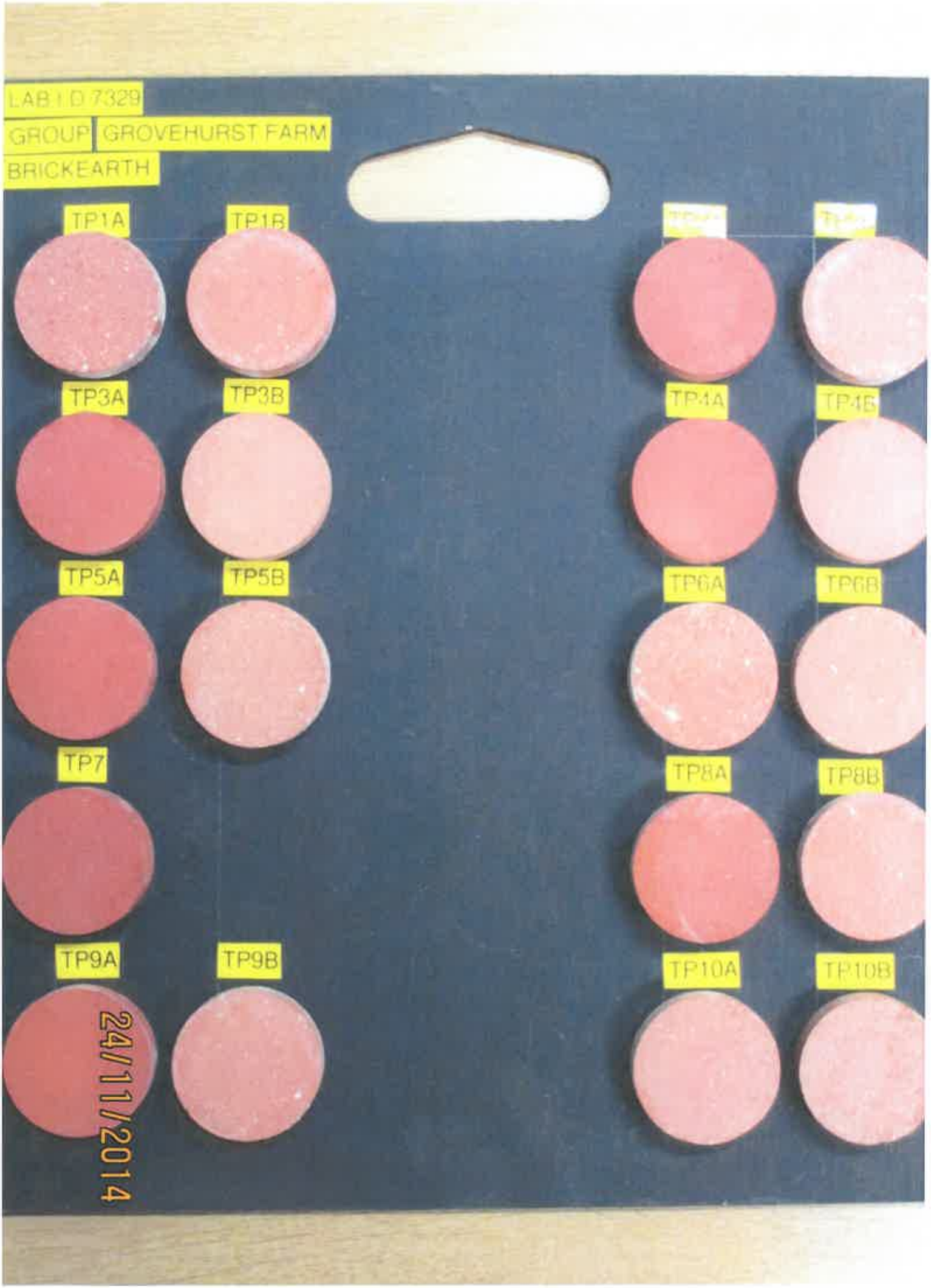
Total No Damaged = Nil

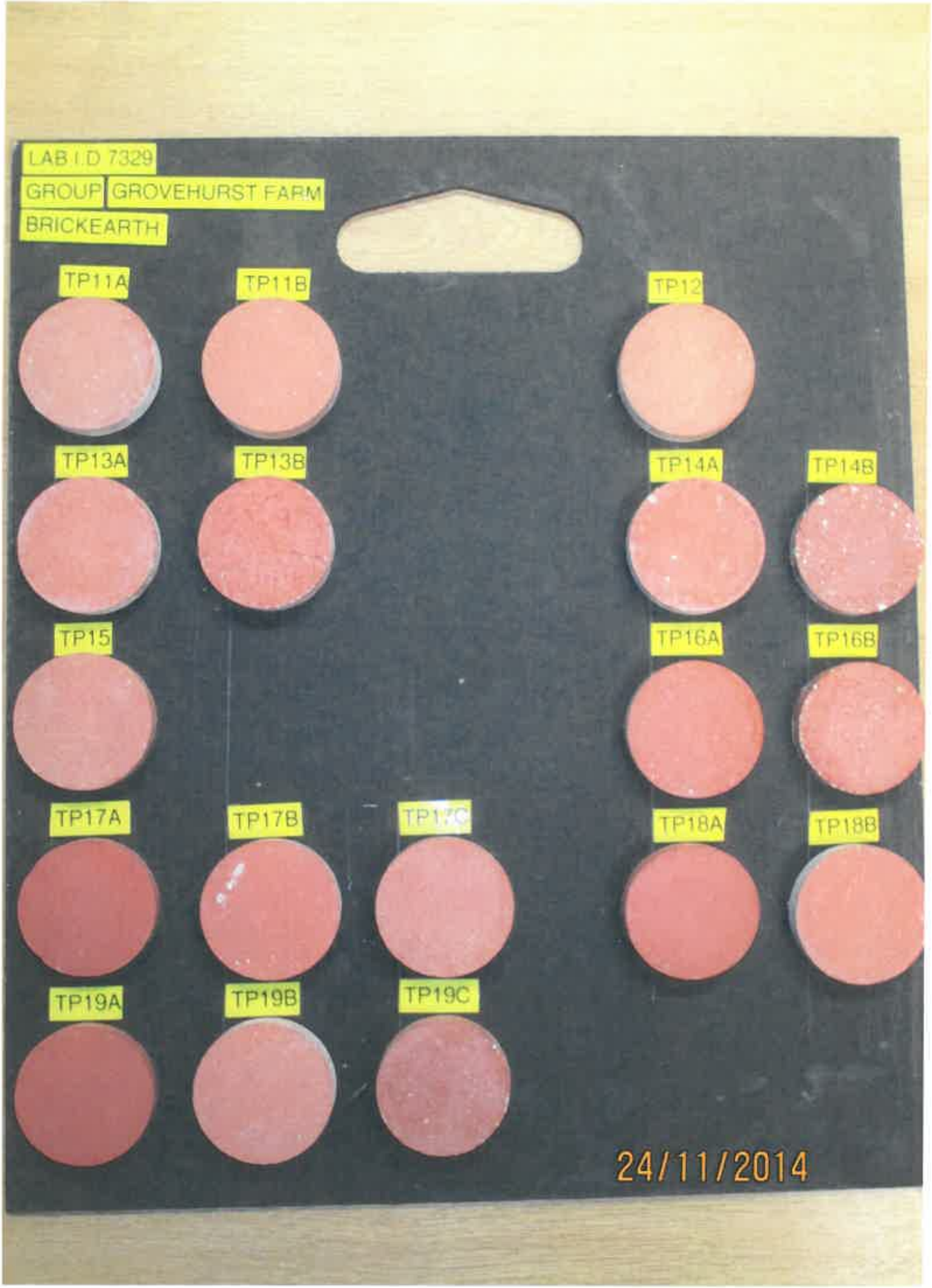
Total No Damaged = Nil

Conforms to: F2 - Pass

Please see

The results are for the Grovehurst Brickearth Trials.


LAB I D 7329
GROUP GROVEHURST FARM
BRICKEARTH
TP1A
TP1B
TP3A
TP3B
TP4A
TP4B
TP5A
TP5B
TP6A
TP6B
TP7
TP8A
TP8B
TP9A
TP9B
TP10A
TP10B
24/11/2014


LAB I.D 7329
GROUP GROVEHURST FARM
BRICKEARTH
TP11A
TP11B
TP12
TP13A
TP13B
TP14A
TP14B
TP15
TP16A
TP16B
TP17A
TP17B
TP17C
TP18A
TP18B
TP19A
TP19B
TP19C
24/11/2014

NPD KE032

Grovehurst Brick Earth Trial

Summary

Dependent on the durability test results and that the brick earth is the same consistency and make-up of the trial sample there should be no problems making London stock bricks from the material. All of the results from the works quality tests gave positive results with no failures.

Method

A trial using Grovehurst Brick Earth was carried out on Friday 31st October 2014. All the raw material settings were left the same as the London bricks, made with the current stockpile.

Tests were carried out on samples taken during the trial and compared against results from the day's normal mix. The results are as follows:

	Trial (%)	Normal (%)
Brick Mix $CaCO_3$	13.6	14.5
Brick Earth $CaCO_3$	2.3	1.9
Brick Mix LOI	10.9	11.9
Brick Earth LOI	4.4	4.2
Brick Mix Moisture	28.9	28.2
Brick Earth Moisture	24.1	23.5

Driers and Kiln Cars

The bricks were placed in drier 2 on the following tracks:
6 (whole track, 8 loads), 7 (whole track, 9 loads) & 8 (whole track, 9 loads)

26 loads (19,968 bricks) were made in total.

Upon removal from the driers the bricks were placed on the following kiln cars:
44 (cubes 7&8), 9, 84, 21, 76, 110 & 90

Firing

The cars were put in the kiln as a batch with the first car entering the kiln at 17:15 on Tuesday 4th November 2014.

Sorting

The bricks were sorted on Monday 10th November & Tuesday 11th November 2014 and bricks from the trials were obtained for dimension, water absorption and compressive testing. The bricks passed all three tests.

Works Quality Test Results

The dimensions average test result is 215.5mm x 102mm x 65mm.
The water absorption average test result is 14.8%.
The BS 3921 compression average test result is 16.75N/mm2

Determination of Dimensions (BS EN 772-16:2011)

Factory	Date Sorted	Kiln Car No.	Brick Name
Smeed Dean	10-Nov-14	96	SD Original London

A4614 TRIALS

Work Size		
Length	Width	Height
215	102.5	65

Limits			
	Length	Width	Height
Size Tolerances			
T2 (+/-)	4.0	3.0	2.0
T1 (+/-)	6.0	4.0	3.0
Range Tolerances			
R2	4.0	3.0	2.0
R1	9.0	6.0	5.0

Sample No.	Length	Width	Height
1	216.3	101.9	65.7
2	216.6	103.0	65.7
3	215.4	102.3	64.9
4	215.4	101.5	65.1
5	215.9	102.4	65.7
6	215.3	102.0	65.0
7	216.0	103.0	64.9
8	216.4	102.5	65.6
9	215.3	101.8	65.5
10	215.3	101.5	65.1

Sorter
G. Gearing
B. Clark
R. Hawkins
J. Edwards
M. Bartlett
M. Bartlett
M. Hutchison
M. Bartlett (2)
M. Edwards
M. Edwards

Sample No.	Length	Width	Height 1
1	216.5	102.0	65.5
2	216.5	103.0	65.5
3	215.5	102.5	65.0
4	215.5	101.5	65.0
5	216.0	102.5	65.5
6	215.5	102.0	65.0
7	216.0	103.0	65.0
8	216.5	102.5	65.5
9	215.5	102.0	65.5
10	215.5	101.5	65.0
Average	216	102	65
Range	1	2	1

	Length	Width	Height
Size Category	T2	T2	T2
Range Category	R2	R2	R2

Overall Result	
Size	T2
Range	R2

Colour Test Results
Passed

C:\Users\ukrogsim\Desktop\Dimensions\Group 1

Determination of Dimensions (BS EN 772-16:2011)

Factory	Date Sorted	Kiln Car No.	Brick Name
Smeed Dean	11-Nov-14	21, 84	SD Original London

B4614 TRIALS

Work Size		
Length	Width	Height
215	102.5	65

Limits			
	Length	Width	Height
Size Tolerances			
T2 (+/-)	4.0	3.0	2.0
T1 (+/-)	6.0	4.0	3.0
Range Tolerances			
R2	4.0	3.0	2.0
R1	9.0	6.0	5.0

Sample No.	Length	Width	Height	Sorter
1	213.9	100.6	64.6	G. Gearing
2	214.2	100.7	65.1	B. Clark
3	216.7	103.3	65.2	R. Hawkins
4	216.3	103.3	65.3	J. Edwards
5	216.4	102.6	65.6	J. Edwards
6	211.5	100.4	64.6	M. Bartlett
7	213.7	101.9	65.6	M. Hutchison
8	214.1	102.3	65.7	M. Bartlett (2)
9	214.0	102.6	65.8	M. Bartlett (2)
10	215.6	102.9	66.0	M. Edwards

Sample No.	Length	Width	Height 1
1	214.0	100.5	64.5
2	214.0	100.5	65.0
3	216.5	103.5	65.0
4	216.5	103.5	65.5
5	216.5	102.5	65.5
6	211.5	100.5	64.5
7	213.5	102.0	65.5
8	214.0	102.5	65.5
9	214.0	102.5	66.0
10	215.5	103.0	66.0
Average	215	102	65
Range	5	3	2

	Length	Width	Height
Size Category	T2	T2	T2
Range Category	R1	R2	R2

Overall Result	
Size	T2
Range	R1

Colour Test Results
Passed

C:\Users\ukrogsim\Desktop\Dimensions\Group 1

Weekly Fired Brick Results Sheet

Week No: 46 A4614 **Car:** 96 **Year:** 2014

Brick Type: SD Original London Stock **BS3921 Strength** 12

TRIALS

Compressive Strength

Brick No	Individual Dimensions Length mm	Width mm	Height mm	Crushing Area cm2	Monitor Reading KN	Result N/MM2	80 % Pass / fail
1	216.3	101.9	65.7	220.4	359.4	16.3	Pass
2	216.6	103.0	65.7	223.1	351.7	15.8	Pass
3	215.4	102.3	64.9	220.4	355.7	16.1	Pass
4	215.4	101.5	65.1	218.6	315.8	14.4	Pass
5	215.9	102.4	65.7	221.1	326.3	14.8	Pass
AVG	216.9	102.2	65.4	220.7	341.8	15.5	

Water Absorption

	1	2	3	4	5
DRY	1884	1881	1881	1891	1908
WET	2153	2187	2158	2179	2211
W/A %	14%	16%	15%	15%	16%

	6	7	8	9	10	AVG
DRY	1896	1880	1887	1896	1894	1890
WET	2164	2169	2166	2163	2151	2170
W/A %	14%	15%	15%	14%	14%	14.8%

Water Absorption Mean: 14.8%

Average Dry Bulk Density: 1309 Kg/m3
(Weight / Volume)

Category 1 Masonary Units compliant: Pass

Comments:

Weekly Fired Brick Results Sheet

Week No: 46 A4614 **Car:** 96 **Year:** 2014

Brick Type: SD Original London Stock **BS3921 Strength** 12

TRIALS

Compressive Strength

Brick No	Individual Dimensions Length mm	Width mm	Height mm	Crushing Area cm2	Monitor Reading KN	Result N/MM2	80 % Pass / fail
6	215.3	102.0	65.0	219.6	414.6	18.9	Pass
7	216.0	103.0	64.9	222.5	350.2	15.7	Pass
8	216.4	102.5	65.6	221.8	376.3	17.0	Pass
9	215.3	101.8	65.5	219.2	435.9	19.9	Pass
10	215.3	101.5	65.1	218.5	404.1	18.5	Pass
AVG	215.7	102.2	65.2	220.3	396.2	18.0	

Water Absorption

	1	2	3	4	5
DRY					
WET					
W/A %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	6	7	8	9	10	AVG
DRY						#DIV/0!
WET						#DIV/0!
W/A %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Water Absorption Mean: #DIV/0!

Average Dry Bulk Density: #DIV/0! Kg/m3
(Weight / Volume)

Category 1 Masonary Units compliant: Pass

Comments:

DETERMINATION OF FREEZE / THAW RESISTANCE OF CLAY MASONARY UNITS

Factory: Smeed Dean — Brick Type: **SD London Stock (Grovehurst trials)**

Batch No: Trial KE032 — Lab Ref: 7419

Tested by: JL/NM — Date test finished: **28/02/2015**

Test Procedure

The test has been carried out in accordance with the Technical Specification CEN/TS 772-22 (June 2006) which involves subjecting a panel of brick work to repeated freeze-thaw cycles designed to stimulate naturally occurring conditions. From the test the bricks are given a freeze-thaw resistance classification which categorises the brick as being suitable to withstand the following conditions:

F2 – Severe Exposure **F1** – Moderate Exposure **F0** – Passive Exposure

Freeze/Thaw Cycles

The panel was immersed in water at room temperature for 7 days before installation in a freeze – thaw apparatus which subjects the main face of the panel to repeated cycles of freezing and thawing following an initial freeze at an air temperature of -15°c for 6 hours. The rear of the panel is insulated with 50mm neoprene rubber and the sides insulated with 25mm of neoprene rubber.

A freeze thaw cycle consists of 120 minutes (± 5mins) of freezing to -15°c (± 3c) air temperature, heating with re-circulated warm air to 20°c (±3°c) for 20 mins, 2mins flood coat spray at a water temperature of 18–25°c followed by a two minute drain period. This gives 10 cycles every 24 hours and a standard test will continue for 100 cycles.

Assessment of Freeze/Thaw Resistance

The panel was examined after 15 and 50 cycles. After 100 cycles the panel was allowed to thaw completely, removed from the apparatus and photographed. The panel was then dismantled and individual bricks examined for frost damage as categorised in Table 1

Key to EN 772-22 Failures - Table 1	
Categories of Damage	**Type**
None	0
Crater (e.g. lime burst	1
Hair Crack ≤ 0.2mm	2
Minor Crack	3
Surface Crack >0.2mm	4
Through Crack	5
Chipping, Peeling, Scaling	6
Fracture	7
Spalling, Delamination	8
If no damage of type 4 (in red) or greater occurs to any of the units or half units during the 100 cycles the units are considered to be suitable for use in Severe Exposure Category F2.	

Results

After 15 cycles	After 50 cycles	After 100 cycles
Total No Damaged = Nil	Total No Damaged = Nil	Total No Damaged = Nil

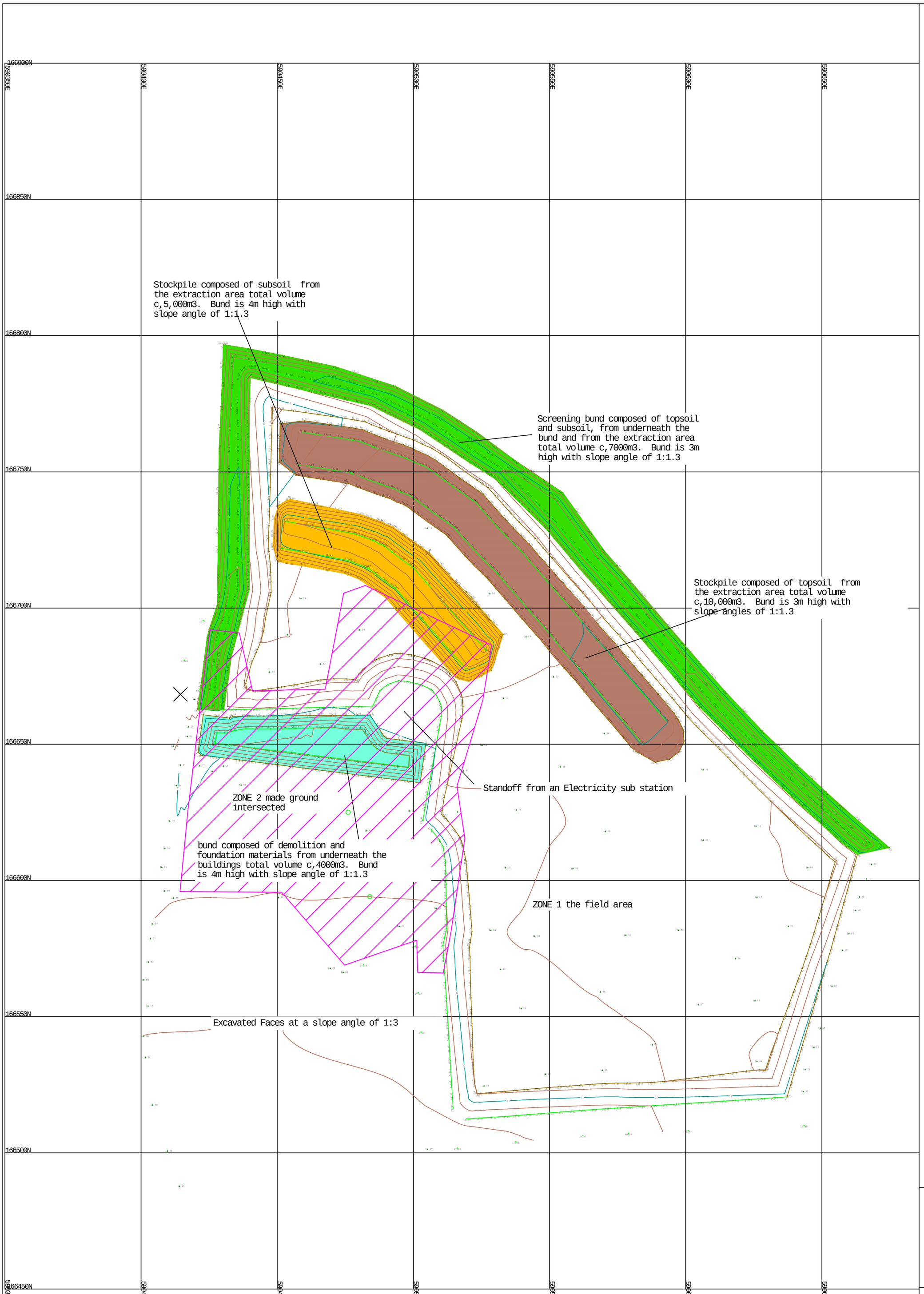
Conforms to: F2 - Pass

Please see

The results are for the Grovehurst Brickearth Trials.

Appendix D

Initial Quarry Design



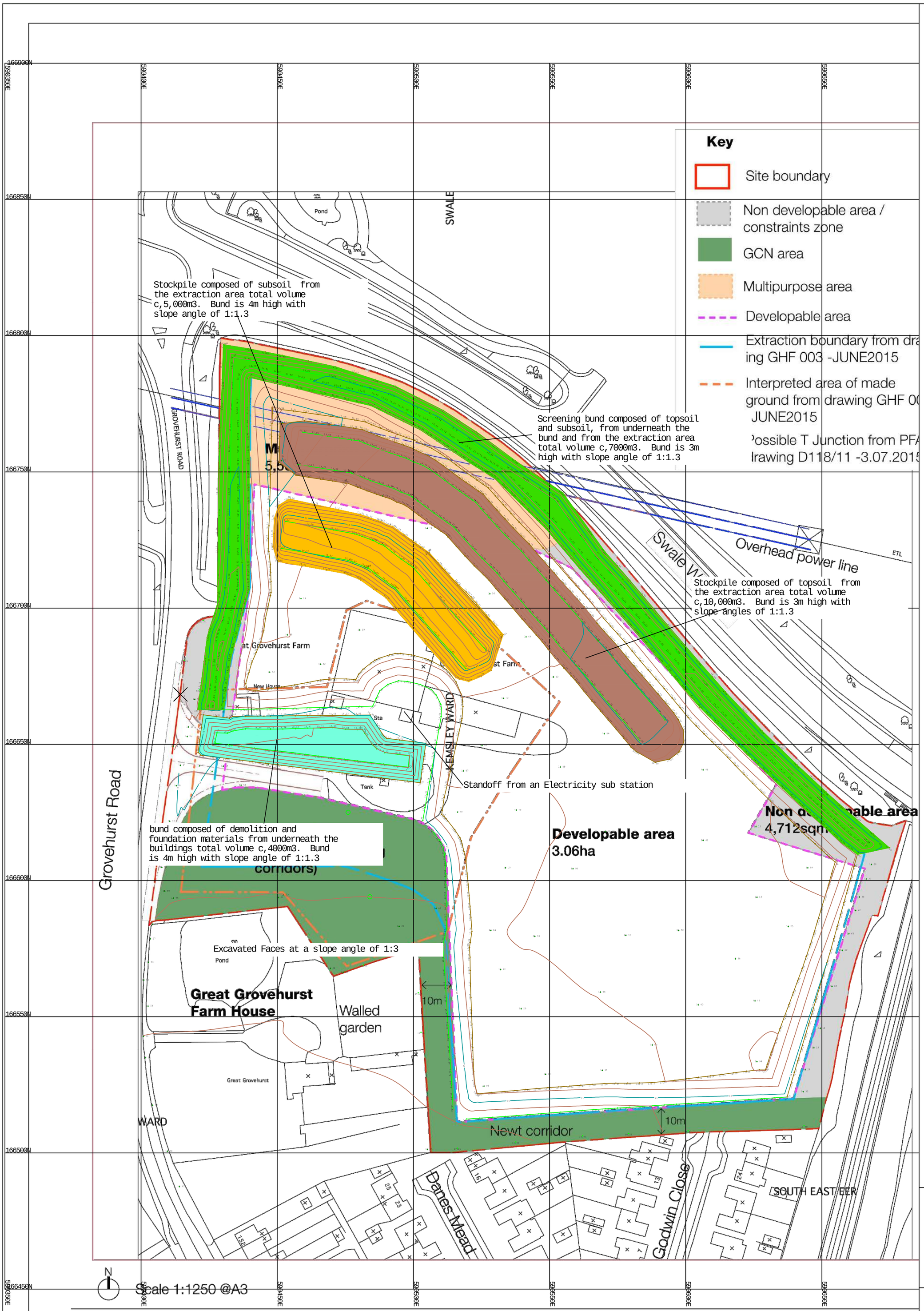
Legend

- Topsoil Mound
- Subsoil Mound
- Screening Bund (Topsoil and Subsoil)
- Demolition and made ground materials
- Area where made ground present (Zone 2)

Great Grovehurst Farm Brickearth Project

Preliminary Quarry Design

Drawn By	Date
ADN	Sept 2015
Scale	Drawing No.
1:1000	GHF-007



Legend

- Topsoil Mound
- Subsoil Mound
- Screening Bund (Topsoil and Subsoil)
- Demolition and made ground materials

Tibbalds

Great Grovehurst Farm, Sittingbourne

GCN Mitigation Option

27 July 2015

DR

Great Grovehurst Farm Brickearth Project

Preliminary Quarry Design and Surrounding Features

Drawn By	Date
ADN	Sept 2015
Scale	Drawing No.
1:1000	GHF-007a