


**SDS3242**
**DECEMBER 2015**

# SPECIFICATION FOR THE STABILISATION OF SHALLOW MINEWORKINGS

**beneath land at**
**THE FORMER NORTH GAWBER COLLIERY, MAPPLEWELL**

**prepared for**
**AVANT HOMES LTD**

# SPECIFICATION FOR THE DRILLING AND GROUTING TREATMENT OF MINEWORKINGS FORMER NORTH GAWBER COLLIERY MAPPLEWELL

**Prepared for**

**AVANT HOMES LIMITED**

## CONTENTS

**1. INTRODUCTION ..... 1**

**2. SITE DETAILS AND DESCRIPTION ..... 3**

**3. GEOLOGICAL SETTING ..... 4**

**4. PREVIOUS INVESTIGATIONS ..... 5**

**5. GENERAL SPECIFICATION ..... 7**

5.1. Constituent Materials for Grouting ..... 7
5.2. Storage and Use of Materials ..... 7
5.3. Grouting Plant ..... 7
5.4. Grout Mixes ..... 8
5.5. Grout Properties and Testing ..... 8
5.6. Drilling Procedures for Treatment of Shallow Mineworkings ..... 9
5.7. Grouting Procedures for Shallow Mineworkings ..... 10
5.8. Services and Roads ..... 12
5.9. *In Situ* Testing ..... 12
5.10. Records ..... 13

# APPENDICES

## APPENDIX A FIGURES AND DRAWINGS

| Drawing No. | Title | Scale |
|---|---|---|
| SDS3242/SP/01 | Site Location Plan | 1:50,000 |
| SDS3242/SP/02 | Development Layout Plan | 1:500 |
| SDS3242/SP/03 | Drill and Grout Layout Plan | 1:250 |

# 1. INTRODUCTION

Sirius Geotechnical and Environmental Ltd (Sirius) have been commissioned by Avant Homes Ltd (Avant) to prepare a Specification for the stabilisation of shallow mineworkings below the southern part of the former North Gawber colliery site in Mapplewell.

It is understood that Avant intends to develop the southern part of the site with residential properties and associated carriageways and landscaped areas. The proposed development layout is included with Appendix A.

A geo-environmental site assessment prepared for the site by RSK Environmental Ltd (RSK) has identified the presence of a coal seam beneath the site, the Mapplewell coal seam (also known as the Kents Thick coal seam), workings have been encountered in the seam which may affect surface stability.

Sirius Remediation Ltd's Drilling Services Division (SDS) have been contracted to undertake the stabilisation of shallow mineworkings within the seam, where required, beneath the defined area of the site by means of drilling and grouting method. This work will be carried out under the supervision of Sirius Geotechnical and Environmental (SGE).

Boreholes will be drilled on a primary staggered 6m x 6m grid across the building footprints with treatment extending up to 3m beyond the plot line, boreholes will also be drilled on a primary staggered 6m x 6m grid across the adoptable highways. Secondary boreholes will then be drilled around all primary holes across the building footprints and highway exhibiting evidence of shallow mineworkings, to form a local 3m x 3m grid. The grid will extend in all directions within the building footprint and highway zones until no evidence of workings is encountered.

The stabilisation works will be undertaken by injecting a PFA / cement grout into the workings via the boreholes.

A plan showing the proposed locations of the primary boreholes, together with the development proposals, is enclosed as in Appendix A.

Avant will supply the Contractor with details of all known underground and above ground services, equipment, property etc. prior to commencing operations.

All works shall be carried out in accordance with the Construction Design Management (CDM) Regulations and the Construction Phase Health and Safety Plan.

This specification is divided into two sections; the general site details including information on the site, previous investigations and their findings; the second part of this report is a general specification for the works to be undertaken.

Based upon the current available information, it appears that the all plots and adoptable highways within the north eastern part of the site will require stabilisation, a plan showing the anticipated treatment area is included with Appendix A. However as the works progress, seam thickness, seam depth and the nature and form of the seam will be reviewed in order to assess the effect on the zones of consolidation.

On completion of the drill and grout programme, a validation report containing copies of borehole records, a borehole location plan, procedures followed during the works, the results of validation boreholes and pressure tests, and a record of any deviation from this specification will be produced and issued to the client and all other relevant parties.

This specification has been prepared for the sole use of Avant and their appointed agents. No other third party may rely upon or reproduce the contents of this report without the written approval of Sirius. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and the authors do not owe them any Duty of Care or Skill.

## 2. SITE DETAILS AND DESCRIPTION

### Table 2.1 Site Location

| | |
|---|---|
| **Location** | The site is located off Carr Green Lane, Mapplewell, approximately 4km north-west of Barnsley city centre (and occupies an area of approximately 9.0 hectares). The site is situated within the southern part of the North Gawber colliery. |
| **National Grid Reference** | NGR SE330096 |
| **Current Site Description** | The site is composed of undeveloped land, with some areas of overgrown grasses. |
| **Site Boundaries** | North – The northern part of the former colliery, as yet undeveloped<br>East – Residential properties.<br>South– Farmland.<br>West – Residential properties. |

## 3. GEOLOGICAL SETTING

A summary of available published geological information is provided in Table 3.1 below.

**Table 3.1 Geological Summary**

| | |
|---|---|
| **Sources of Information** | BGS 1:10,560 scale geological map.<br>Coal authority abandonment plans.<br>Coal Authority Mining Report |
| **Made Ground** | No made ground is recorded on the BGS map within the site boundary. |
| **Drift Geology** | No superficial soils recorded on the BGS map. |
| **Solid Geology** | Carboniferous Middle Coal Measures strata comprising shales and mudstones with coal seams.<br>One coal seam is shown to outcrop beneath the site.<br>Faulting – no faults are known to exist on site. |
| **Mining and Quarrying** | None shown on the BGS map.<br>7083 – Gawber North abandonment plan shows a small area of opencast within centre of the site, annotated as being worked in 1974.<br>Coal Authority records indicate a mineshaft (432409-005) within the site boundary, they hold no record of any treatment details. |

## 4. PREVIOUS INVESTIGATIONS

The site has been the subject of a number of mining assessments and investigations undertaken between 2005 and 2014. The geo-environmental assessment carried out by RSK and issued in March 2014 undertook additional site investigation and summaries all of the previous reports. All of the previous investigations and assessments have been carried out on the whole of the North Gawber colliery site, below is a summary if the relevant findings from geo-environmental assessment that relate to the Avant Homes site only.

### Summary

Within their report, RSK state that…

*"6No. rotary boreholes (R2O1 to R2O6 inclusive) were drilled to investigate the potential presence of shallow mine workings in the area indicated by the coal mining risk assessment report*

*In borehole R2015* (located within the site boundary) *located to the northeast of the mapped outcrop of the Mapplewell coal, a void was reported at 10.0m depth, accompanied by total loss of flush, indicating the likely presence e of old workings. This seam appears to correlate with the expected location of the Mapplewell coal. At this point the rock cover above the roof of the seam is only about 3m, so it will be necessary to stabilise any workings in this area*

*It is concluded that shallow mine workings with the potential to adversely affect the development are present in the land underlying much of the norh-eaastern part of the site. The area requiring treatment is limited in to the southwest by the outcrop of the Mapplewell Coal and it will be necessary to extend the treatment area north-eastwards until adequate rock cover is proven in this seam. The investigation suggests that the seam dip, which is stated in published data as between 1:12 and 1:21 is almost certainly at the shallower end of this range, or shallower.*

In July 2014 RSK undertook both a geophysical and a rotary probing investigation to try to identify the location of Shaft 432409-005. The geophysical investigation proved inconclusive and so rotary probing was undertaken. Shaft 432409-005 is recorded as

having been an air shaft and as they can be smaller in diameter than a winding shaft the grid spacing was at 1.0m centres. No indication of a filled or voided shaft was evident from the drilling. This additional work was reported by RSK in September 2014.

**Additional Comments.**

Due regard will be made to the historic area of opencast recorded in southern part of the treatment area, probe boreholes will be undertaken to delineate the full extent of this area.

Whilst no mine entries were encountered during the investigation, their presence cannot be excluded and due regard must be given for the potential presence of shafts, bellpits and/or adits which may have given access to this seam.

# 5. GENERAL SPECIFICATION

## 5.1. Constituent Materials for Grouting

Water shall be from the mains supply or other source approved by the Resident Engineer (RE) and supplied by the Client.

Cement shall Portland cement complying with BS12

PFA complying with BS EN 12715: 2000 shall be conditioned hopper ash, or dry powder ash, or a type suitable as a constituent for grout and obtained from an approved supplier.

Sand shall generally comply with BS882 and be of a grading suitable for use in the Contractor's plant and approved by the RE.

Pea gravel shall comply with BS882, and be of grading approved by the RE.

Thixotropic admixtures shall be bentonite or another admixture approved by the RE.

## 5.2. Storage and Use of Materials

Storage of materials shall be such as to prevent contamination and deterioration. Cement shall be kept in a dry location, and the sequence of deliveries recorded so that cement can be used in rotation.

PFA shall be stored within a pre-defined area and will be kept dampened to mitigate against fugitive dust.

## 5.3. Grouting Plant

The Contractor shall submit to the RE, for approval, details of the proposed method of mixing, and pumping of grout to the injection points, together with the means of monitoring grouting pressures and the quantities injected. The materials shall be introduced into the mixer via approved methods (volume batching).

The grout mixer shall be capable of producing a homogenous mix, all particles being thoroughly wetted without segregation.

## 5.4. Grout Mixes

With consideration to the future use of the area, the filing material shall generally consist of a PFA: cement grout which should be mixed in the proportions of up to 12:1 where water is present, but which may range up to 20:1 in dry conditions.

The mixes shall produce cubes with crushing strengths of not less than 1.0 $MN/m^2$ at 28 days (Note: the 7 day test is performed to indicate that the 28 day strength is achievable i.e. a 7 day value of about 0.4$MN/m^2$ would probably be considered on target.

Where excessive lateral flow of grout is anticipated or when voids greater than 500mm are encountered, the RE may order or agree to the addition of sand or pea gravel to the mix in accordance with CIRIA SP32. The specified grout mix shall have the minimum water content consistent with effective pumping.

The actual proportions to be used initially for the various grouts shall be agreed with the RE paying due regard of the conditions met in drilling and the results of any trial grouting carried out before work commences.

## 5.5. Grout Properties and Testing

With water / (cement and PFA) ratios generally in the range of 0.4 to 0.45, (including the moisture in the aggregates), the mixes proposed should produce pumpable grout with flowability readings of between 300 to 600mm, when measured in a meter of the “Colcrete” type.

The sample for the flowability test shall be obtained by the grouting Contractor at the point of injection i.e. from the end of the tremie pipe.

A minimum of two flowability tests per week shall be performed by the Contractor as directed by the RE.

High-bleed grouts shall be avoided. Bleed capacity should be limited to 5% maximum unless agreed otherwise with the RE.

A minimum of two bleed capacity tests shall be performed by the Contractor per shift or as directed the RE. The sample of grout for the test shall be taken from the point of injection i.e. the end of the tremie pipe.

Bleed capacity shall be measured in a clear plastic or glass graduated cylinder which has an internal diameter not less than 50mm and with a volume of approximately 1000ml. After placing the grout, a cover shall be placed over the cylinder to avoid evaporation. Bleed capacity shall be read at hourly intervals for neat cement grout, and readings should continue for not less than 3 hours. For PFA:cement grouts readings should continue for not less than 6 hours.

The Contractor shall prepare two sets of test cubes of grout per week, or as directed by the RE.

Each cube shall be of 100mm side, or as agreed with the RE, and shall be taken from the grout at the point of injection i.e. the end of the tremie pipe.

At the instruction of the RE, the Contractor shall arrange for them to be tested by crushing at 7 and 28 days in accordance with BS1881.

The testing shall be carried out by an independent laboratory or as agreed with the RE.

As stated previously mixes shall produce cubes with crushing strengths of not less than 1.0 $MN/m^2$ at 28 days

If the RE considers the results of the test indicate that a change of mix proportions is required, the Contractor shall make such modifications as the RE may direct.

### 5.6. Drilling Procedures for Treatment of Shallow Mineworkings

All boreholes to be used for the injection of grout, including those which strike coal pillars, shall be drilled by rotary or rotary percussive techniques down to a minimum of 0.5m beyond the base of the old workings in the seam or the floor of the seam itself whichever is greater. The drilling system and flushing medium to be used shall be as instructed on the Coal Authority licence, and approved by the RE. The Contractor shall allow for the provision of appropriate dust suppression for those holes that are to be drilled near sensitive receptors

(e.g. nearby houses, highways, active commercial properties, car parks and public footpaths).

Boreholes drilled for the treatment of the plots will ensure treatment extends up to 3m outwith the building footprint, based upon anticipated grout flows

The minimum diameter of the holes shall be 75mm unless otherwise specified by the RE. When it is impracticable to drill at the minimum diameter for the full depth, the diameter of the boreholes shall be increased in the upper lengths.

Boreholes shall be temporarily cased through superficial deposits down to the rockhead and if directed by the RE, down through the rock strata. The boreholes shall be kept open until grout injection into the workings and rock is complete.

Where a borehole proves abortive because it becomes obstructed, it shall be re-drilled in a suitable location as directed by the RE, at a large diameter and re-cased.

Boreholes shall be formed in general accordance with the locations shown on the plan in Appendix A. Any deviation from this proposed layout including the drilling of additional secondary and tertiary holes shall be recorded by the Contractor and a revised borehole location plan provided to the RE.

Treatment of both seams will be required. This will be undertaken either by treating the upper worked seam prior to treatment of the lower seam, or by isolating the upper worked seam by the use of temporary casing. This would then be withdrawn following treatment of the lower seam to allow the upper to be grouted.

Should the upper seam prove to be intact within any particular borehole, the Contractor may advance the borehole to the lower seam.

### 5.7. Grouting Procedures for Shallow Mineworkings

The aim of the stabilisation work is to substantially fill any old workings within the Mapplewell seam as well as any voids or broken ground found within the overlying strata in order to prevent the development of crown holes at the surface \ foundation level.

Perimeter grout walls, if required, shall be formed by filling boreholes with a viscous grout composed of appropriate proportions of cement, PFA, sand or pea gravel and water. The mix, proportions and method must be agreed with the RE.

Pressure need not be applied to the grout in affected boreholes unless required by the RE.

Unless specified otherwise, the section of the perimeter wall at the deepest part of the seam shall be constructed first.

Immediately prior to grouting each borehole, the Contractor shall check that it is unobstructed to the required depth to receive the tubing or tremie pipes for grout injection. Obstructions shall be dealt with as described in 'drilling procedures' above.

Grout shall be injected into each hole via an approved flexible tube, or series of steel tubes, placed to the base of the hole or to such other depth to receive the tubing or pipes for grout.

Grouting shall proceed upwards from the base of each borehole to the base of the surface deposits. It is not intended that, as a general rule, significant quantities of grout shall be injected into the surface deposits unless specified otherwise. This requirement will be subject to RE review.

The grout shall be injected at the approved rates until grout appears near the point of injection, when the borehole shall be deemed complete. If the is criteria is reached quickly, the grout tubes shall be lifted to check that a local obstruction is not preventing flow of the grout into the strata.

Pressure shall be applied to the grout in every borehole. If grout has not appeared at the point of injection after 5 tonnes of grouting materials have been introduced then sand and/or pea gravel (gravel which passes through a 6.33mm sieve and is retained on a 2.36mm sieve) may be added to the mix or placed down the borehole.

Treatment of adoptable highways will generally be undertaken as per the plots although should a borehole within the highway accept more than 6 tonnes of grout, treatment within the hole will be suspended for 12 hours. Thereafter further grout will be injected in 2 tonne batches. If pressure has not been achieved or grout appeared after a total of 10 tonnes of

grout has been placed then a review of the borehole grid spacing, grout mix and materials used will be undertaken.

All boreholes within the highway will be filled under hydrostatic pressure and once complete will be pressurised utilising a pneumatic packer to the appropriate pressure.

### 5.8. Services and Roads

The Contractor shall take all necessary precautions, including making all reasonable liaison with the Client (Avant Homes Ltd), to ascertain the positions and depths of underground services and drains passing through the site, making full allowance for working around and protecting live services and drains.

The Contractor shall be responsible for maintaining close liaison with the Local Authority and the Public Utility Authorities so as to avoid any disruption of the existing services.

When introducing grout into any borehole the Contractor shall ensure by regular inspections throughout the day that the grout is not entering adjacent drains, services, culverts and ducts. In the event that any such leakage is detected the Contractor shall immediately suspend the grouting operations and commence to remove any accumulated grout.

### 5.9. *In Situ* Testing

When directed by the RE, the Contractor shall test the consolidated ground for permeability and strength.

Permeability by grout acceptance testing shall be checked by drilling test holes in positions to be selected by the RE and injecting grout at pressures appropriate to the depth, all in accordance with the requirements for infilling grouting. If the RE considers that the quantities of grout accepted are excessive, further holes shall be drilled and grouted at the rates and prices agreed.

After testing, boreholes shall be completed in accordance with the requirements for grouting infill holes.

In general, test holes will be undertaken along the adoptable highways adjacent to boreholes exhibiting grout taken in excess of 6 tonnes.

### 5.10. Records

The Contractor shall prepare and keep available for inspection on site, plans showing the positions of all boreholes, daily drilling records (see below), together with the total amounts of grout injected.

The plans shall be updated daily in conformity with the Records noted below. On completion of the works, the Contractor shall give fair copies of the plans and sections to the RE within one week of completion of the programme of grouting.

As works proceed, the Contractor shall maintain separate daily records for drilling, for grouting and for materials and plant received in a form to be approved by the RE. The daily records signed by the Contractor's agent shall be submitted each day to the RE for his agreement. The Contractor shall provide one copy of the agreed record for the RE's retention and keep a further copy available for inspection on site.

Daily drilling records shall be provided for each borehole and contain the following information:

1. Job title and location
2. Borehole reference number
3. Date
4. Contractor's name
5. Plant in use, crew members and hours worked
6. Method of boring or drilling
7. Type, diameter and depth of casing used
8. Diameter and depth of hole at the beginning and end of each working day or shift

9. Loss of any flushing medium during drilling
10. Standing time, with reason, or time lost overcoming obstructions
11. Details of underground services located
12. Details of any settlement or ground heave
13. Daily and cumulative length drilled
14. Depth to each major change of stratum
15. Description , with identification, of the stratum and whether it is intact or broken
16. Each depth at which groundwater is encountered (if apparent), the depth to which it rose and any steps taken to stop the flow
17. Depths at which any samples are taken
18. Details and results of any permeability tests instructed by the RE
19. Details of any voids or suspected workings
20. Details of any emissions of gas, water, etc.
21. Depth of completed borehole

Daily grouting records shall be provided for each borehole and contain the following information:

1. Job title and location
2. Borehole reference number
3. Date
4. Contractor's name
5. Plant in use, crew members and hours worked

6. Details of type of injection grout-line dimensions and length of standpipes inserted

7. Type of grout mix and volumetric quantity injected including total quantity by weight by each type of grouting material introduced

8. Grout pressures recorded, with the corresponding depths

9. The results of all flow and bleed tests

10. Details of casing abandoned

11. Details of grouting materials delivered to the site and a running total of each of the materials delivered

12. The nature, frequency and results of all inspections of services to check for grout penetration

13. Details of all stoppages or delays and any other relevant information

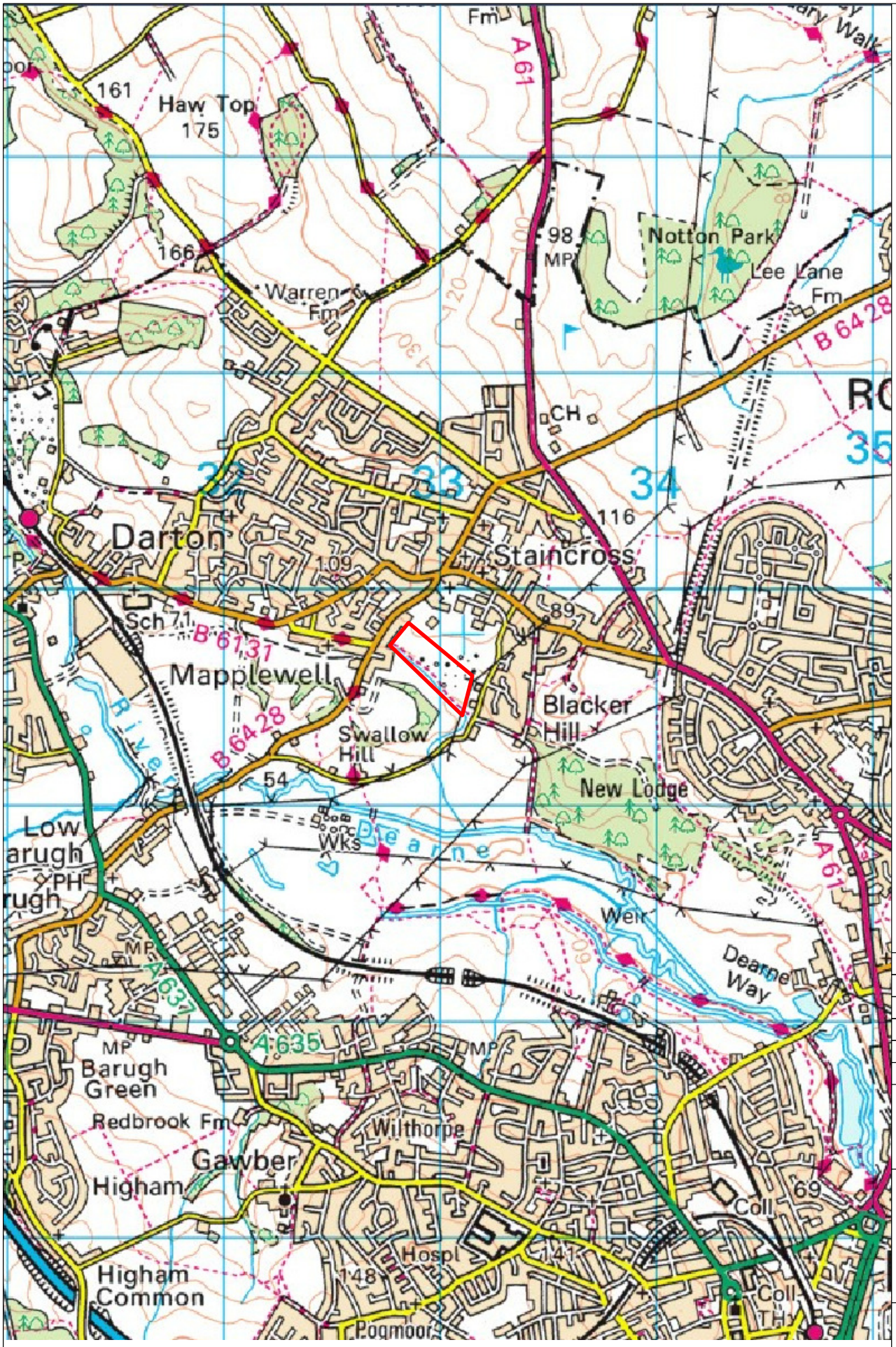
The daily records of materials and plant received shall show in particular that day's quantities by weight of each type of material and cumulative quantities. With the daily records, the Contractor shall submit to the RE copies of receipts or invoices for all materials delivered and he shall keep them on site until the Works are complete.

Notwithstanding the information listed above, the Contractor shall provide any other information required by the RE.

On completion of the drill and grout programme, the RE shall prepare a validation report containing copies of borehole records, a borehole location plan, procedures followed during the works, the results of validation boreholes and pressure tests, and a record of any deviation from this specification.

# APPENDIX A

# FIGURES AND DRAWINGS




NOTES

Site Location

| REVISION | |
|---|---|
| 0 | >> |
| A | >> |
| B | >> |
| C | >> |
| D | >> |


SIRIUS REMEDIATION LTD
4245 Park Approach,
Thorpe Park,
Leeds
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962


CLIENT

**AVANT HOMES LTD**

SITE

**FORMER NORTH GAWBER COLLIERY MAPPLEWELL**

DRAWING TITLE

**SITE LOCATION PLAN**

| DRAWING NO. | REVISION NO. |
|---|---|
| SDS3242/SP/01 | >> |
| DRAWN BY | APPROVED BY |
| JCC | >> |

| DATE | SCALE | PAPER SIZE |
|---|---|---|
| DEC 2015 | 1:50,000 | A4 |


Reproduced from the Ordnance Survey 1:50,000 scale Landranger® map with the permission of The Controller of Her Majesty's Stationary Office, © Crown Copyright. All rights reserved.Sirius Geotechnical & Environmental Ltd, Suite 2, Russel House, Mill Road, Langley moor, Durham DH7 8HJ. Licence No. 100042005

N

COMBINED
WITH 3m
-OFF TO
SIDES

For footpath and drainage details
see planning permission reference
2014/0452 and associated
discharge of conditions application

525mm COMBINED
PUBLIC SEWER WITH
6m STAND-OFF TO
BOTH SIDES

525mm COMBINED PUBLIC SEWER
WITH 6m STAND-OFF TO BOTH SIDES

LEAP TO BE LOCATED
IN THIS AREA OF OPEN
SPACE (DETAILED
DESIGN TO BE
CONFIRMED)

525mm COMBINED
PUBLIC SEWER WITH
6m STAND-OFF TO
BOTH SIDES

Comb Dia 375

Comb Dia 375

NOTES

Site Boundary

| REVISION | |
|---|---|
| 0 | >> |
| A | >> |
| B | >> |
| C | >> |
| D | >> |


SIRIUS REMEDIATION LTD
4245 Park Approach,
Thorpe Park,
Leeds
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962


CLIENT

**AVANT HOMES LTD**

SITE

**FORMER NORTH GAWBER COLLIERY MAPPLEWELL**

DRAWING TITLE

**DEVELOPMENT LAYOUT PLAN**

| DRAWING NO. | REVISION NO. |
|---|---|
| **SDS3242/SP/02** | **>>** |
| DRAWN BY | APPROVED BY |
| **AGT** | **>>** |

| DATE | SCALE | PAPER SIZE |
|---|---|---|
| **DEC 2015** | **1:500** | **A0** |

N

Conjuctured outcrop of Mapplewell Coal Seam (dipping north-easterly)

LEAP TO BE LOCATED IN THIS AREA OF OPEN SPACE (DETAILED DESIGN TO BE CONFIRMED)

Service Morgan

Service Morgan

Service Morgan

NOTES

- Site Boundary
- Proposed Primary Plot Borehole
- Proposed Primary Road Borehole
- Area of historic opencast

REVISION

| | |
|---|---|
| 0 | >> |
| A | >> |
| B | >> |
| C | >> |
| D | >> |


SIRIUS REMEDIATION LTD
4245 Park Approach,
Thorpe Park,
Leeds
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962


CLIENT

**AVANT HOMES LTD**

SITE

**FORMER NORTH GAWBER COLLIERY MAPPLEWELL**

DRAWING TITLE

**DEVELOPMENT LAYOUT PLAN**

| DRAWING NO. | REVISION NO. |
|---|---|
| SDS3242/SP/02 | >> |

| DRAWN BY | APPROVED BY |
|---|---|
| JCC | >> |

| DATE | SCALE | PAPER SIZE |
|---|---|---|
| DEC 2015 | 1:250 | A0 |