FLOOD RISK ASSESSMENT

Dearne Valley, Parkway

Proposed Commercial Development

Reference	18279.100/FRA/1
Date	March 2019
Version	1

73 Howard Street
North Shields
Tyne & Wear
NE30 1AF

Tel: +44(0)191 2585632
info@rwoassociatesuk.com
www.rwoassociatesuk.com

CONTENTS

Confidentiality Statement

Document History

1.0 Executive Summary....3
2.0 Introduction....4
3.0 The Site....5
4.0 Proposed Development....9
5.0 Roles & Responsibilities....10
6.0 Flood Risk....11
7.0 Ground Conditions....12
8.0 Surface Water Drainage Overview....13
Soil Infiltration....13
Watercourse....13
Public Sewer....13
9.0 Conclusions....14

APPENDICES

Appendix A Site Location Plan
Appendix B Indicative Site Layout
Appendix C Topographical Survey
Appendix D Flood Risk Data
Appendix E Geotechnical Appraisal
Appendix F BGH Drawing

CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

Bryan G Hall

This report has been prepared for the sole use and reliance of the above-named parties. This report shall not be relied upon or transferred to any other parties without the express written authorisation of RWO Associates Limited. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

DOCUMENT HISTORY

VERSION	PURPOSE/DESCRIPTION	DATE
1	Draft Issue – for client comment	19.03.2019

1.0 EXECUTIVE SUMMARY

This assessment has looked at the implications of the proposed development in relation to flood risk.

The Environment Agency flood maps have been reviewed and a low probability of flooding to proposed development has been identified from Rivers, sea and surface water. The site is identified as being in flood zone 1.

Other flood risks have been reviewed and can be managed or are low risk.

Surface water flows will discharge utilising offsite connections but restricted to 3l/s per plot in accordance with the established strategy. Discharge rates and points subject to approval.

2.0 INTRODUCTION

RWO Associates Ltd (RWO) has been instructed by Bryan G Hall on behalf of their client to prepare a Flood Risk Assessment for a planning application relating to the proposed development site. This report has been prepared to support the planning application.

The site is currently scrubland totalling 2.1 Ha and the client wishes to redevelop the site for commercial purposes; location plans are included in Appendix A.

3.0 THE SITE

The proposed development is located to the west of Dearne Valley Parkway (A6195), with existing industrial units to the north west and south west and is an employment led, mixed use scheme. The proposal includes both B1(c) and B8 industrial uses as well as the hotel and A3 food and drink uses.

Figure 1 – Site Location

The centre of the site has a grid reference of approximately 434946, 400564. The site is irregular in shape and ground levels appear to fall from the north to the south generally. As the site is currently scrubland there is no impermeable area which positively discharges to sewer.

The Hotel use of the site falls under the 'more vulnerable' classification and the rest fall under the 'less vulnerable' classification as defined in the Planning Practice Guidance (PPG) 'Table 2: Flood risk Vulnerability', which is included below.

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind Turbines.
Highly Vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunication installations required to be operational during flooding. • Emergency disposal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and **hotels**. • Non-residential uses for health services, nurseries and *educational establishments*. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*
Less vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure. • Land and buildings used for agricultural and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals workings and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewerage treatment works (if adequate measures to control pollution and manage sewerage during flooding events are in place).
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of defence installations. • Ship building, repairing, dismantling, dockside fish processing and refrigeration and

compatible activities requiring a waterside location.

- Water based recreation (excluding sleeping accommodation).
- Lifeguard and coastal stations.
- Amenity open space, nature conversation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to specific warning and evacuation plan.*

Table 1 – 'Table 2: Flood risk Vulnerability'

The proposed development is shown as being in Flood Zone 1 on flood maps.

The proposed site usage falls within the 'more vulnerable' category as identified in the PPG Table 2: Flood Risk Vulnerably classification. As such the exception test, will not need considering based on the PPG Table 3: Flood risk vulnerability and flood zone 'compatibility'.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Table 2 – 'Table 3: Flood risk Vulnerability Classification'

4.0 PROPOSED DEVELOPMENT

The proposed development site is an employment led, mixed use scheme. The proposal includes both B1(c) and B8 industrial uses as well as the hotel and A3 food and drink uses. Further detail relating to the site proposal can be found in the planning application associated with this report.

The proposed development site is located in flood zone 1.

An indicative site layout is provided in Appendix B and topographical survey in Appendix C.

5.0 ROLES & RESPONSIBILITIES

The table below covers roles & responsibilities and is for information purposes only;

Body/Authority	Responsibility
Environment Agency (EA)	• Predicting flooding from statutory main rivers and the sea including the location, timing and magnitude • Issuing of Flood Warnings to partner agencies and ensuring that the public are warned and informed • Maintenance and operation of sea and river flood defences. Check defences and undertake essential repairs as required. • Monitor and clear blockages of culverts and repair breaches of defences • Support the Police and Local Authority by providing materials, equipment and manpower as far as resources and other duties permit. • Advisory role in dealing with pollution issues following flooding
Local Authority	• Providing support to the emergency services • Mitigation of the effects of an emergency on people, including emergency feeding, accommodation and welfare. • Co-ordination of the voluntary sector response • Information services to the public and media • Flood alleviation measures where possible • Environmental health advice • Review of surface water drainage proposals • Lead Local Flood Authority
Police	• Co-ordination of the emergency services at a major flood event, as well as helping to save lives and protect property • Establishment of cordons where practical to facilitate the work of the emergency services • In conjunction with other emergency services, to evacuate people from properties at risk, if necessary • Collation and dissemination of casualty information
Fire & rescue	• Saving life and rescuing trapped persons • Provide monitoring procedures in respect of health and safety of those persons operating within an established cordon • Carry out essential damage control measures including pumping out flood water and salvage work • Rendering humanitarian services in support of the local authority
Utility Companies	• In the event of a flood, will secure their services and equipment to ensure continuity of supply • Repair services disrupted by flood • Provide alternative means of supply during service disruption if life and death health risks are identified
Met Office	• The Met office issues the severe warnings for heavy rain, snow, severe gales etc. These warnings are delivered directly to local Authorities, the emergency services and the media.

Table 3 – Role & Responsibilities

6.0 FLOOD RISK

The proposed development is located in Flood Zone 1 based on the Environment Agency (EA) data. All flood maps are included in Appendix D.

Based on the above, the development is at very low risk of flooding from rivers or the sea for all events up to and including the 1000-year return period. All other sources of flooding have been considered:

- Surface Water Runoff
- Ground Water Flooding
- Third party sources such as reservoirs

The RoFras surface water flood is identified as low by the Environment Agency.

The JBA surface water flood maps have been reviewed and illustrate surface water flooding which identify a risk of flooding on the site at the northern extent. The area shown at risk of flooding is a low spot based on the topographical survey and not associated with overland flows. Based on the flood risk not being associated with overland flows and the risk being associated with water ponding in a low spot, this will be removed when positive drainage is constructed as part of the development. The risk of surface water flooding can be managed through good design.

The BGS (British Geological Society) maps for groundwater flooding have been reviewed and the site is identified as having 'potential for groundwater flooding below ground level' at the northern extent with the remainder of site having no risk of limited risk of ground water flooding identified. On this basis it is recommended that existing ground levels should not be reduced as part of the development to ideally the finished flood level should be raised a minimum 300mm above existing ground levels. The risk of ground water flooding is minimum and mitigation measures have been identified to ensure the risk is managed.

Reservoir failure has been reviewed based upon the JBA flood modelling and there is not a risk to the proposed development site in the event of a reservoir suffering critical failure, as such this risk has been deemed low.

The Environment Agency historic flooding events map shows that there are no records of flooding within the site or 250m of its boundary. The Environment Agency historic flood data is a database of over 21,000 separate events and dates from 1947, however it should be noted that only recorded events are included and that flooding of a field or wetland areas may not have been reported.

The other consideration in terms of offsite flood risk is to third party land. To ensure that the risk to third party land flooding is not increased, the proposed drainage system will need to be designed to ensure that;

- No surcharge for the 1 in 2-year event
- No flooding for the 1 in 30-year event
- No building or third-party flooding for the 1 in 100-year event with a 40% allowance for climate change.

On-site storage will be provided for surface water to ensure discharge at greenfield rates and to protect third party land from potential overland flows.

7.0 GROUND CONDITIONS

3E Consulting have undertaken Phase 2 site investigation and assessment summary reference 15677, included in Appendix E;

Ground Conditions	The site is covered by made ground materials between 0.3m and >4.0m in thickness. The deeper areas of made ground were proven in the eastern part of the site, however, it does appear to be very variable in terms of depth rather than a consistent increase in depth. The made ground generally comprised mudstone gravels in a clayey matrix (Colliery Spoil), reworked gravelly clay or clay bound gravel and sandstone and brick. The made ground is generally underlain by firm to stiff residual clay or directly by weathered bedrock.

Figure 1 – Extract of 3E Summary report ref – 15677

3E Consulting have reported the site is mainly made ground up to 4 metres and therefore designs should take this into consideration, with the use of soil infiltration being excluded.

8.0 SURFACE WATER DRAINAGE OVERVIEW

The surface water management plan associated with this development site has been considered utilising the following documentation;

- Building Regulations Part H,
- Sewers for Adoption.

Soil Infiltration

Based upon the ground conditions this has been excluded as a feasible option for discharge of surface water under Part H, due to made ground with clay beneath.

Watercourse

There are several surface water features to the north and north west of the development site. A Yorkshire Water surface water sewer is located to the north of the development site which is understood to ultimately discharge to the watercourse to the north and as such it is proposed to discharge surface water to the Yorkshire Water sewer. This will be subject to Yorkshire Water approval.

Public Sewer

Based on the hierarchy identified in Part H it is proposed to discharge to public sewer which ultimately discharges to watercourse. It is proposed to discharge surface water at 3l/s per plot as identified on BGH drawing 10-336 Revision J dated 12.6.2017, included in Appendix F.

To ensure that the flood risk to third party land is not increased, the proposed drainage system will be designed to ensure that:

- No surcharge for the 1 in 2-year event
- No flooding for the 1 in 30-year event
- No building or third-party flooding for the 1 in 100-year event with a 30% allowance for climate change.

The discharge will need to be restricted to Greenfield runoff in accordance with current design standards as established in the outline strategy.

9.0 CONCLUSIONS

This assessment has looked at the implications of the proposed development in relation to flood risk.

The Environment Agency flood maps have been reviewed and a low probability of flooding to proposed development has been identified from Rivers, sea and surface water. The site is identified as being in flood zone 1.

Other flood risks have been reviewed and can be managed or are low risk.

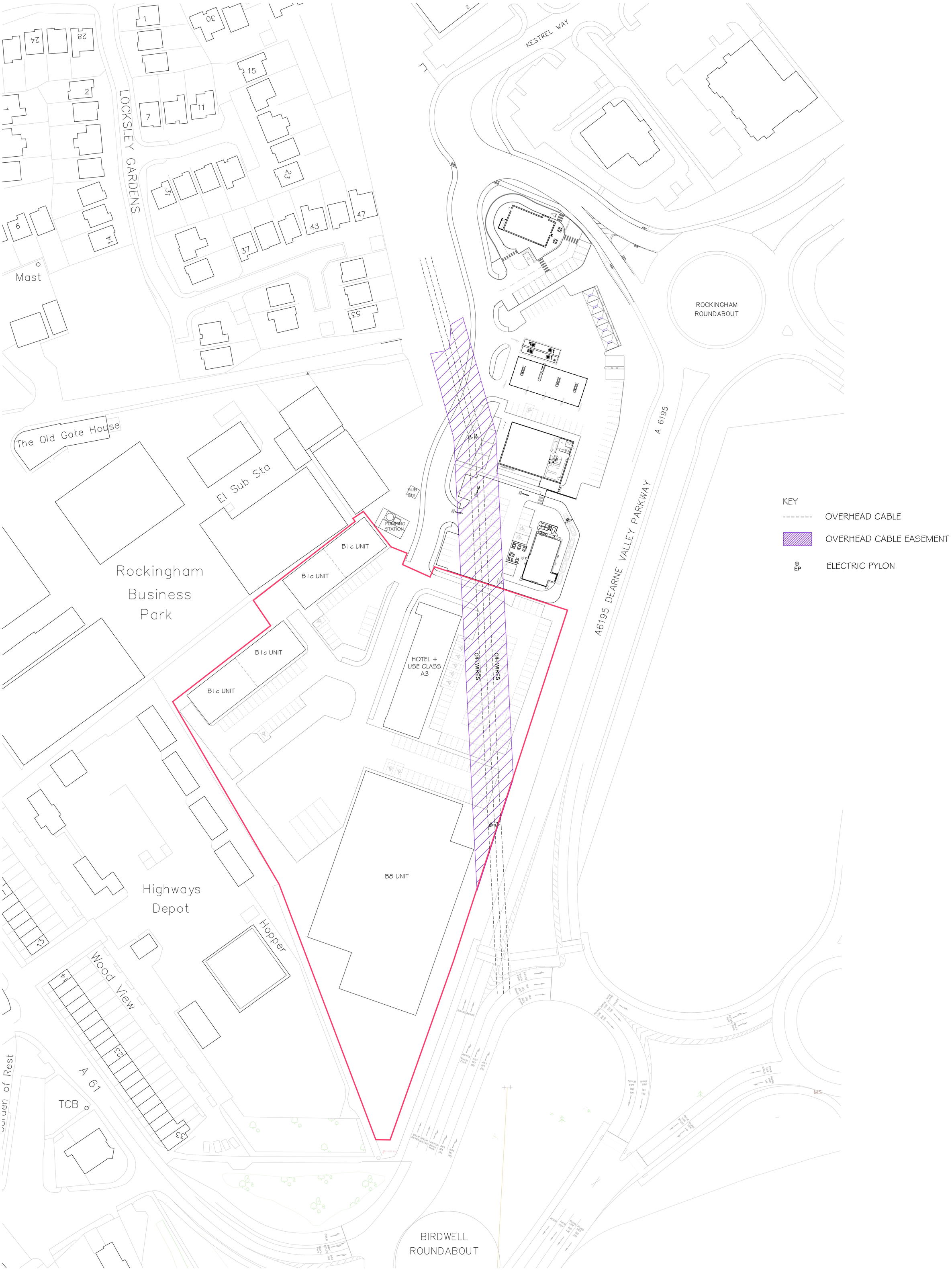
Surface water flows will discharge utilising offsite connections but restricted to 3l/s per plot in accordance with the established strategy. Discharge rates and points subject to approval.

Ross Oakley
For and behalf of RWO Associates Limited
March 2019

Appendix A Site Location Plan

Location Map	
Site	Dearne Valley Parkway
Client	Bryan G Hall
Job Number	18279
Scale	NTS

Appendix B Indicative Site Layout



REV	DATE	DESCRIPTION	BY	CHECK
B	01.03.19	AMENDED IN ACCORDANCE WITH SMITH JENKINS COMMENTS DATED 28.02.19	KW	VS
A	27.02.19	AMENDED IN ACCORDANCE WITH SMITH JENKINS COMMENTS DATED 20.02.19	KW	VS

NORTH

1:500 SCALE

10m 50m

103 / INDICATIVE SITE LAYOUT

Do not scale off this drawing - Only figured dimensions to be taken from this drawing. Drawings based on Ordnance Survey and/or existing record drawings - Design and Drawing content subject to Site Survey, Structural Survey, Site Investigations, Planning and Statutory Requirements and Approvals.
Authorised reproduction from Ordnance Survey Map with permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved.

jrp ARCHITECTURE | PLANNING | LANDSCAPE

CLIENT: HARTWOOD ESTATES

PROJECT: DEARNE VALLEY PARKWAY SHEFFIELD ROAD

DRAWING: INDICATIVE SITE LAYOUT

DRAWING NUMBER: 13 4806 103 - B

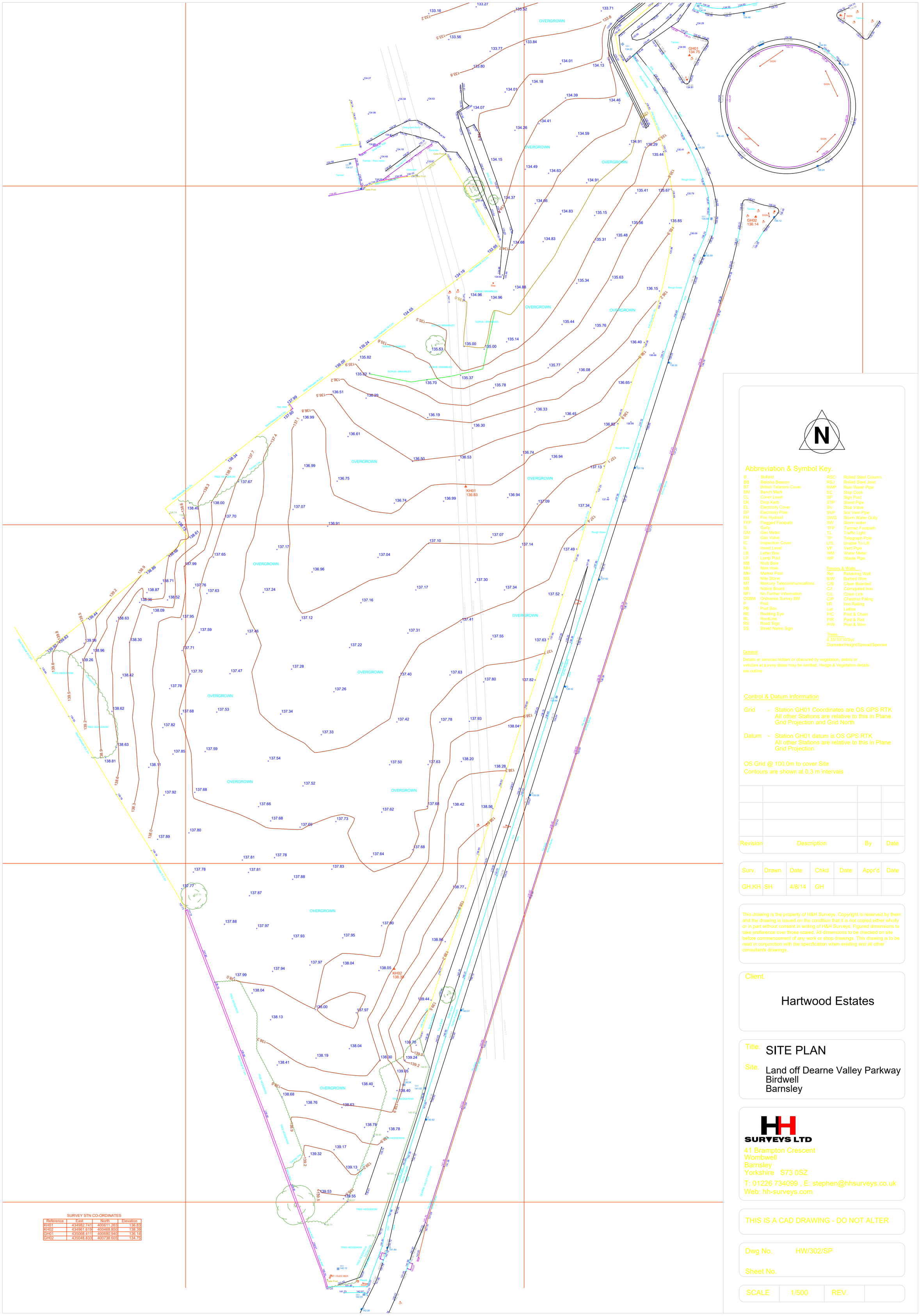
SCALE @ A0: 1:500

DRAWN: KW **DATE:** FEB 19

CHECKED: VS **DATE:** FEB 19

14 MARINER COURT / CALDER PARK / WAKEFIELD / WF4 3FL
01924 383322 / www.jrpassoc.co.uk / info@jrpassoc.co.uk
jrpassociates is a trading style of John R Paley Associates Limited

Appendix C Topographical Survey


OVERGROWN
SCRUB / BRAMBLES
TREE HEDGEROW
Rough Grass
Tarmac
Concrete
Gate Post
Overgrown Build
Stay
GH01
134.75
GH02
136.14
KH01
136.83
KH02
138.39
SIGN
Steel Palisade H1.2m
Steel Palisade H1.8m
Ret. Wall
Gully
Drop Kerb
Kerb
Fence
Hedge
Ditch
Stream
Culvert
Manhole
Inspection Cover
Gas Valve
Water Valve
Electricity Pole
Lamp Post
Post
Post Box
Bollard
Bench Mark
Cover Level
Invert Level
Letter Box
Man Hole
Marker Post
Mile Stone
Notice Board
Road Sign
Street Name Sign
Stand Pipe
Stop Valve
Vent Pipe
Water Meter
Waste Pipe
Rodding Eye
RootLine
Traffic Light
Telegraph Pole
Unable To Lift
Rail
Wire
Chestnut Paling
Iron Railing
Lattice
Post & Chain
Post & Rail
Post & Wire
Close Boarded
Corrugated Iron
Chain Link
Barbed Wire
Retaining Wall
Rolled Steel Column
Rolled Steel Joist
Rain Water Pipe
Stop Cock
Sign Post
Soil Vent Pipe
Storm Water Gully
Storm water
Tarmac Footpath
Telecom Cover
Drop Kerb
Electricity Cover
Fire Hydrant
Flagged Footpath
Gully
Gas Meter
Inspection Cover
Letter Box
Lamp Post
Multi Bole
Man Hole
Marker Post
Mile Stone
Mercury Telecommunications
Notice Board
No Further Information
Ordnance Survey BM
Post
Post Box
Rodding Eye
RootLine
Road Sign
Street Name Sign
Rolled Steel Column
Rolled Steel Joist
Rain Water Pipe
Stop Cock
Sign Post
Stand Pipe
Stop Valve
Soil Vent Pipe
Storm Water Gully
Storm water
Tarmac Footpath
Traffic Light
Telegraph Pole
Unable To Lift
Vent Pipe
Water Meter
Waste Pipe
Retaining Wall
Barbed Wire
Close Boarded
Corrugated Iron
Chain Link
Chestnut Paling
Iron Railing
Lattice
Post & Chain
Post & Rail
Post & Wire
Trees
0.25/10/10/Syc
Diameter/Height/Spread/Species
General
Details or services hidden or obscured by vegetation, debris or vehicles at survey dates may be omitted. Hedge & Vegetation details are outline
Control & Datum Information
Grid - Station GH01 Coordinates are OS GPS RTK
All other Stations are relative to this in Plane Grid Projection and Grid North
Datum - Station GH01 datum is OS GPS RTK
All other Stations are relative to this in Plane Grid Projection
OS Grid @ 100.0m to cover Site
Contours are shown at 0.3 m intervals
Revision
Description
By
Date
Surv.
Drawn
Date
Chkd
Date
Appr'd
Date
GH,KH
SH
4/8/14
GH
SURVEY STN CO-ORDINATES
Reference
East
North
Elevation
KH01
434982.741
400611.263
136.83
KH02
434961.619
400468.850
138.39
GH01
435068.411
400690.940
136.14
GH02
435048.833
400738.605
134.75
This drawing is the property of H&H Surveys. Copyright is reserved by them and the drawing is issued on the condition that it is not copied either wholly or in part without consent in writing of H&H Surveys. Figured dimensions to take preference over those scaled. All dimensions to be checked on site before commencement of any work or shop drawings. This drawing is to be read in conjunction with the specification when existing and all other consultants drawings.
Client.
Hartwood Estates
Title.
SITE PLAN
Site.
Land off Dearne Valley Parkway
Birdwell
Barnsley
HH SURVEYS LTD
41 Brampton Crescent
Wombwell
Barnsley
Yorkshire S73 0SZ
T: 01226 734099 , E: stephen@hhsurveys.co.uk
Web: hh-surveys.com
THIS IS A CAD DRAWING - DO NOT ALTER
Dwg No. HW/302/SP
Sheet No.
SCALE
1/500
REV.

Appendix D Flood Risk Data

Flood Insight

Address:	**Land off Dearne Valley Parkway, S74 0QA**
Date:	**18 Mar 2019**
Reference:	**CMAPS-CM-786119-31982-180319**
Client:	**CENTREMAPS**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	07-Jun-2013
Grid Reference:	434946,400564
Site Size:	3.1585ha

Contents Page

Contents Page 3
Overview of Findings 4
1. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea) 6
1. Environment Agency/Natural Resources Wales Flood Zones 7
2. Environment Agency/Natural Resources Wales RoFRaS Flooding Map 12
2. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) 13
3. Environment Agency/Natural Resources Wales Historic Flooding Events Map 14
3. Environment Agency/Natural Resources Wales Historic Flooding Events 15
4. JBA Surface Water (Pluvial) Flood Map 16
4. JBA Surface Water (Pluvial) Flooding 17
5. Surface Water Features map 19
5. Surface Water Features 20
6. BGS Groundwater Flooding Map 21
6. Groundwater Flooding 22
7. BGS Geological Indicators of Flooding 24
8. JBA Canal Break map 25
8. JBA Reservoir and Canal Data 26

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed.

Section 1: Environment Agency/Natural Resources Wales Flood Zones	
1.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	No
1.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	No
1.3 Are there any Flood Defences within 250m of the study site?	No
1.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
1.5 Are there any Proposed Flood Defences within 250m of the study site?	No
1.6 Are there any areas used for Flood Storage within 250m of the study site?	No

Section 2: Risk of Flooding from Rivers and the Sea (RoFRaS)	
2.1 What is the Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating for the study site?	Very Low

Section 3: Historic Flood Events	
3.1 Has the site been subject to past flooding as recorded by the Environment Agency/Natural Resources Wales?	No

Section 4: JBA Surface Water (Pluvial) Flood	
4.1 Is the site or any area within 50m at risk of Surface Water (Pluvial) Flooding?	Yes

Section 5: Surface Water Features	
5.1 Are there any surface water features within 250m of the study site?	Yes

Section 6: Groundwater Flooding	
6.1 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
6.2 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Moderate

Section 7: BGS Geological Indicators of historic flooding	
7.1 Are there any geological indicators of historic flooding within 250m of the study site?	No

Section 8: JBA Reservoir and Canal Data	
8.1 Is the property located in an area identified as being at potential risk in the event of a reservoir failure?	No
8.2 Is the property located in an area identified as being at potential risk in the event of a canal break?	No

Additional Matters

Riparian ownership

If your land abuts a river, stream or ditch, you may have responsibility to maintain this watercourse, even if Title Deeds show the property boundary to be adjacent to the watercourse. This includes the responsibility for clearing debris and obstructions which may impede the free passage of water and fish, and also includes the responsibilities to accept flood flows through your land, even if these are caused by inadequate capacity downstream. There is no duty in common law for a landowner to improve the drainage capacity of a watercourse. Please contact Groundsure if you need further advice on riparian ownership issues relating to this property.

Sewerage Flooding

Extreme rainfall events may overwhelm sewerage systems and cause local flooding. The water and sewerage companies within the UK are required to maintain 'DG5 – At Risk Registers' which record properties that have flooded from sewers and/or are considered to be at risk of flooding from sewers in the future. If your property is on the 'At Risk' Register, this may be recorded within a standard CON29 Drainage and Water search.

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client.

Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

---

1. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)

NW N NE

W E

SW S SE

Environment Agency/Natural Resources Wales Flood Map for Planning Legend

© Crown copyright and database rights 2019. Ordnance Survey license 100035207.

- Search Centre
- Search Buffers (m) — 100, 250
- Zone 2 Floodplain
- Zone 3 Floodplain
- Flood Defences
- Area used for Flood Storage
- Proposed Flood Defence Scheme
- Area Benefiting from Flood Defences

Report Reference: CMAPS-CM-786119-31982-180319
Client Reference: 31982

1. Environment Agency/Natural Resources Wales Flood Zones

1.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? No

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 1 – Flood Map for Planning:

Database searched and no data found.

1.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? No

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.3 River and Coastal Flood Defences

Are there any Flood Defences within 250m of the study site ? No

This search consists only of flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

Any relevant data is represented on Map 1 – Flood Map for Planning.

1.5 Areas of Proposed Flood Defences

Are there any Proposed Flood Defences within 250m of the study site? No

* This illustrates the number of households that move from 'very significant' or 'significant' to 'moderate' or 'low' probability of flood risk bands if the proposed flood scheme is to be implemented.

Any relevant data is represented on Map 1 – Flood Map for Planning.

Guidance: This search consists only of proposed flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Please note that proposed flood defence schemes will not influence the current RoFRaS ratings for the site.

1.6 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

Flood Storage Areas are considered part of the functional floodplain, and are areas where water has to flow or be stored in times of flood. Technical Guidance to the National Planning Policy Framework states that only water-compatible development and essential infrastructure should be permitted within flood storage areas, and existing development within this area should be relocated to an area with a lower risk of flooding. Any relevant data is represented on Map 1 – Flood Map for Planning.

Notes on Flood Zone Data:

This data relates solely to flooding from rivers or the sea. The Environment Agency/Natural Resources Wales estimate that over 2.5 million properties are at risk of flooding within England and Wales. River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment. Coastal flooding results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen which can cause serious flooding.

The Groundsure Flood Insight Report comments upon whether a property lies in proximity to Environment Agency/Natural Resources Wales Zone 2 and Zone 3 floodplains. The Government's Technical Guidance to the National Planning Policy Framework explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and potential loss of life. The Government looks to planning authorities to ensure that flood risk is properly taken into account in the planning of developments to reduce the risk of flooding and the damage which floods cause.

Flood Zones enable planning authorities to apply the sequential test (see Technical Guidance to the National Planning Policy Framework) for development proposals and prevent inappropriate development.

Technical Guidance to the National Planning Policy Framework defines the flood zones as: -

Zone 1 – little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%

Zone 2 – low to medium risk with an annual probability of flooding of 0.1-1.0% from rivers and 0.1-0.5% from the sea.

Zone 3 – high risk with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

Flood Zone 3b/Flood Storage Areas - very high risk with the site being used as part of the functional flood plain or as a Flood Storage Area.

The flood zones are the main constraint map underpinning decisions on development and flood risk.

Existing Flood Defences

Flood defences seek to reduce the risk of flooding and to safeguard life, protect property, sustain economic activity and the natural environment. Flood defences are designed to protect against flood events of a particular magnitude, expressed as risk in any one year. For example, defences in urban areas may be built to provide protection against flood events of a size which might occur on average once in one hundred years or less.

Proposed Flood Defences

This information is taken from the Environment Agency/Natural Resources Wales's database of Areas to Benefit from New and Reconditioned Flood Defences under the Medium Term Plan (MTP). The dataset contains funding allocation for the first financial year (from April). Funding for the following four financial years is not guaranteed, being only indicative, and will be reviewed annually. Projects within the Medium Term Plan qualify for inclusion in this dataset if:

- the investment leads to a change in the current standard of protection (change projects);
- the investment is a replacement or refurbishment in order to sustain the current standard of protection (sustain projects);
- the project has an initial construction budget of £100,000 or more; and
- the project is included within the first five years of the MTP

The data includes all the Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards. The number of households and areas of land contributing to DEFRA's Outcome Measures (OM) are also attributed i.e. could benefit from major work on flood defences.

These data also contain Intermittence Flood Maintenance Programme that show the annual maintenance programme of work scheduled to be carried by the Environment Agency/Natural Resources Wales, Local Authority or Internal Drainage Board on flood defences. Data details routine maintenance as well as intermittent work that has been funded for the coming year. The data contains a start and end coordinate defining the relevant river section where work is planned.

Information Warning

Please note that the maps show the areas where investment is being made to reduce the flood and coastal erosion risk and are not detailed enough to account for individual addresses. Individual properties may not always face the same risk of flooding as the areas that surround them. Also, note that funding figures are indicative and any use or interpretation should account for future updates where annual values may change.

Every possible care is taken to ensure that the maps reflect all the data possessed by the Environment Agency/Natural Resources Wales and that they have applied their expert knowledge to create conclusions that are as reliable as possible. The Environment Agency/Natural Resources Wales consider that they have created the maps as well as they can and so should not be liable if the maps by their nature are not as accurate as might be desired or are misused or misunderstood, despite their warnings. For this reason, they are not able to promise that the maps will always be accurate or completely up to date.

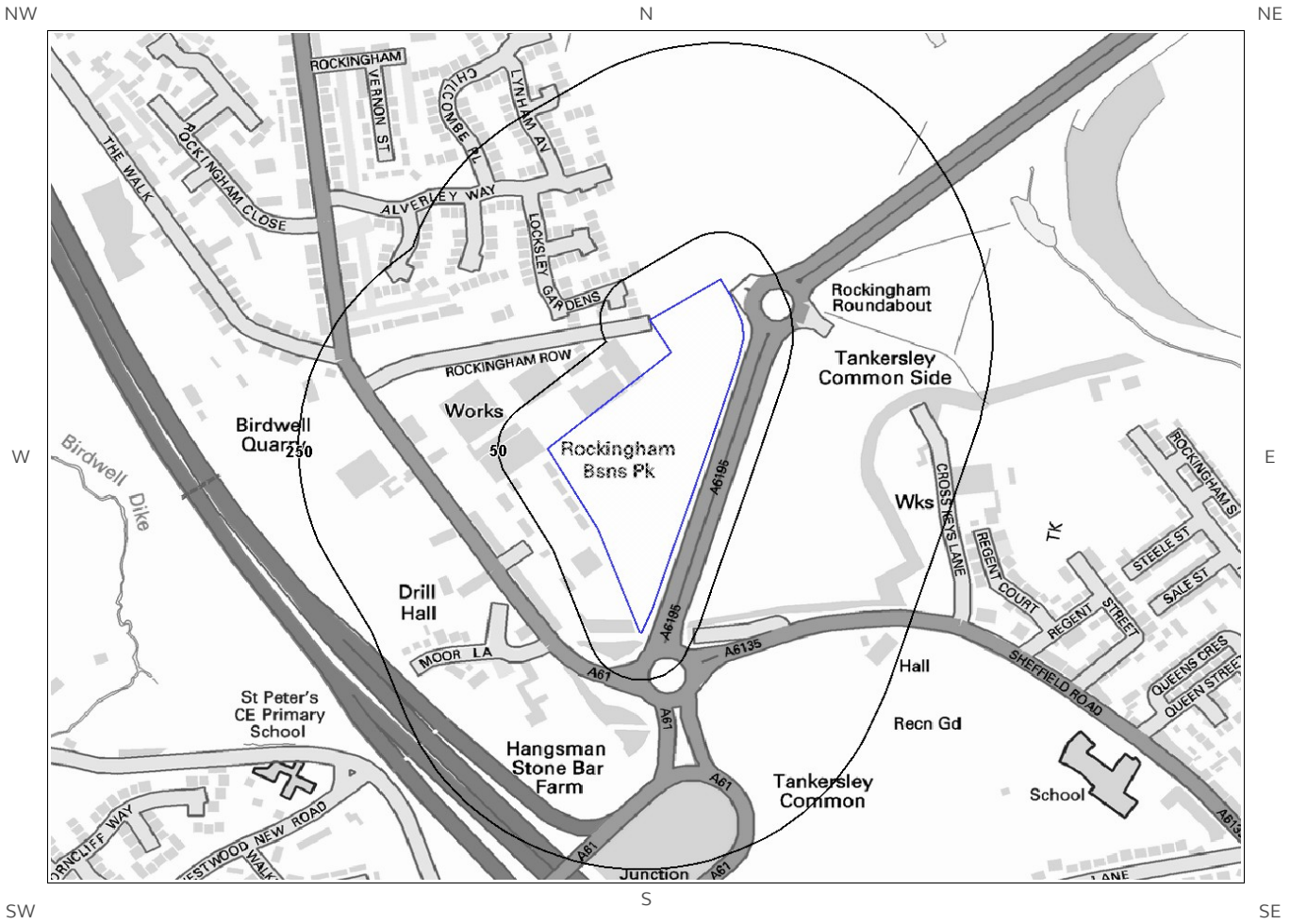
This site includes mapping data licensed from Ordnance Survey used for setting the Environment Agency/Natural Resources Wales's data in its geographical context. Ordnance Survey retains the copyright of this material and it can not be used for any other purpose.

Flood Storage Areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval.

A flood storage area may take the form of a wet or dry reservoir. A wet reservoir is a water storage facility in which storage can be effected by allowing water levels to rise during flood times. A dry reservoir is typically adjacent to a river and comprises an enclosed area that accepts water only at peak times. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and the Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

2. Environment Agency/Natural Resources Wales RoFRaS Flooding Map



Environment Agency/Natural Resources Wales RoFRaS Flooding legend

© Crown copyright and database rights 2019. Ordnance Survey license 100035207.

Site Outline

100 250 Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

2. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)

2.1 Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating (River and Coastal)

What is the highest risk of flooding onsite? Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

Notes on RoFRaS data:

This information is based on the very latest Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) data. This data has been created by dividing the flood plain into 50m squares, or smaller areas where a square if intersected by a river or coastline. These are called impact cells. The method then calculates the likelihood that the centre of each impact cell will start to flood using a number of different flood scenarios.

A number of insurance companies providing cover for flood risk use this data as the basis of their risk model, although they may also utilise additional information such as claims histories, which may further influence their decision. Where a high risk of flooding is identified flood risk insurance may be difficult to obtain without further work being undertaken. Property owners of sites within Low and Medium risk areas are still considered to be at risk of flooding and insurance premiums may be increased as a result. Owners of properties within Low, Medium and High risk areas are advised to sign up to the Environment Agency/Natural Resources Wales's Flood Warning scheme. The probability estimates for RoFRaS risk bands are as follows:

Very Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

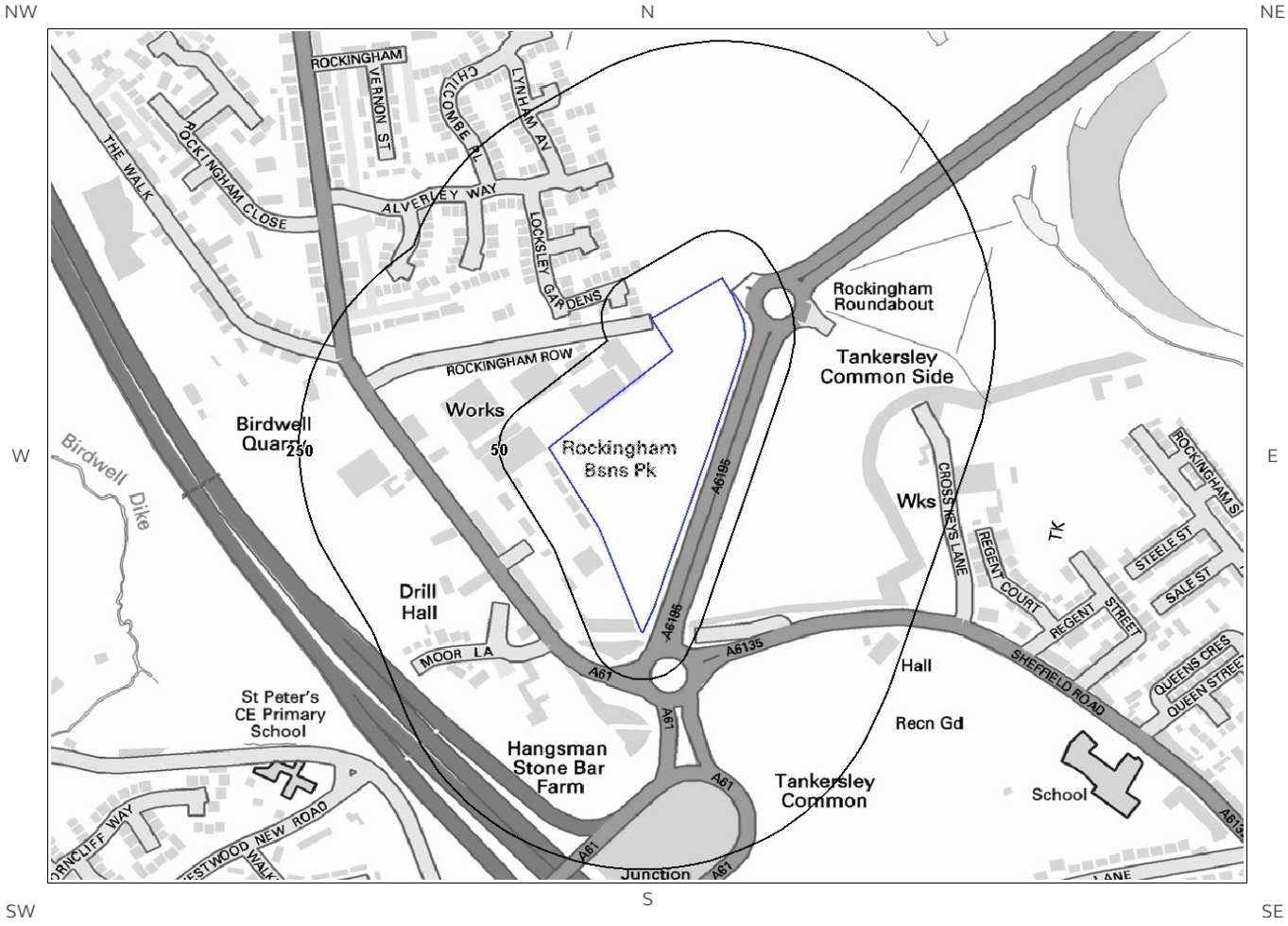
Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium – the chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.

High – the chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

---

3. Environment Agency/Natural Resources Wales Historic Flooding Events Map



Environment Agency/Natural Resources Wales Historic Flooding Events legend

© Crown copyright and database rights 2019. Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

Historic Flood Events

3. Environment Agency/Natural Resources Wales Historic Flooding Events

3.1 Historic Flood Outlines

Has the site or any area within 250m been subject to historic flooding as recorded by the Environment Agency/Natural Resources Wales? No

This database shows the individual footprint of every flood event recorded by the Environment Agency/Natural Resources Wales and previous bodies.

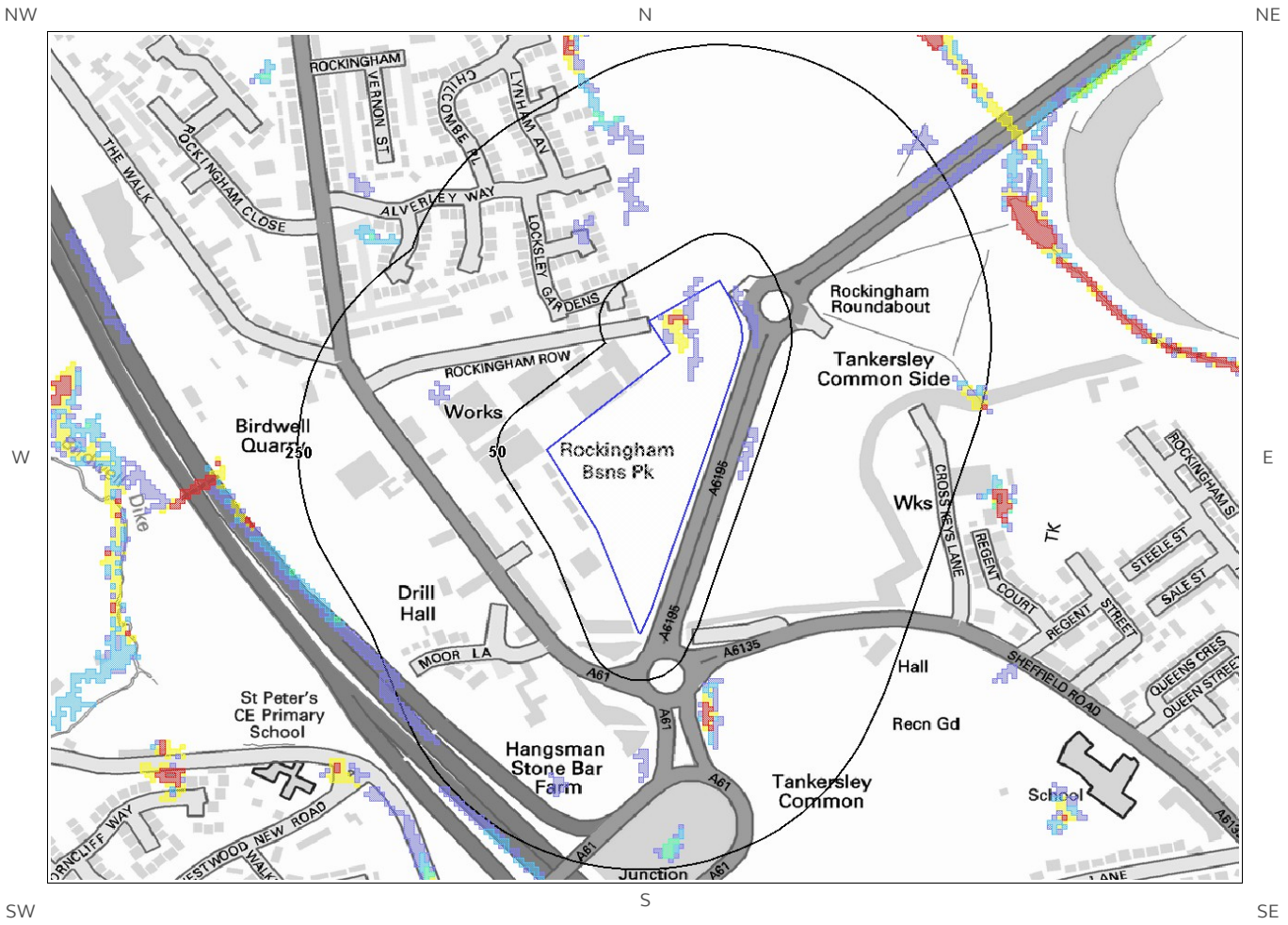
Any records found within the search radius are displayed on Map 3 – Historic Flooding Events.

Notes on Historic Flooding data:

Over 21,000 separate events are recorded within this database, dating back to 1947. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that the Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

---

4. JBA Surface Water (Pluvial) Flood Map



JBA Surface Water (Pluvial) Flood Legend

© Crown copyright and database rights 2019.
Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

Highly Significant
Significant
High
Moderate to High
Moderate
Low to Moderate
Low

4. JBA Surface Water (Pluvial) Flooding

Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

Surface Water (pluvial) flooding will usually be a result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

What is the risk of pluvial flooding at the study site? Significant

Guidance: The site or an area in close proximity has been assessed to be at Significant Risk of surface water (pluvial) flooding. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 75 year rainfall event to a depth of between 0.3m to 1m.

Flood data provided by JBA RISK MANAGEMENT LIMITED Copyright © JBA RISK MANAGEMENT LIMITED 2008-2019

The following pluvial (surface water) flood risk records within 50m of the study site are shown on the JBA Surface Water Flooding Map:

Distance	Direction	Risk
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Significant
0.0	On Site	Significant
1.0	E	Low
4.0	E	Low
6.0	NW	Low
32.0	E	Low
32.0	E	Low
36.0	E	Low

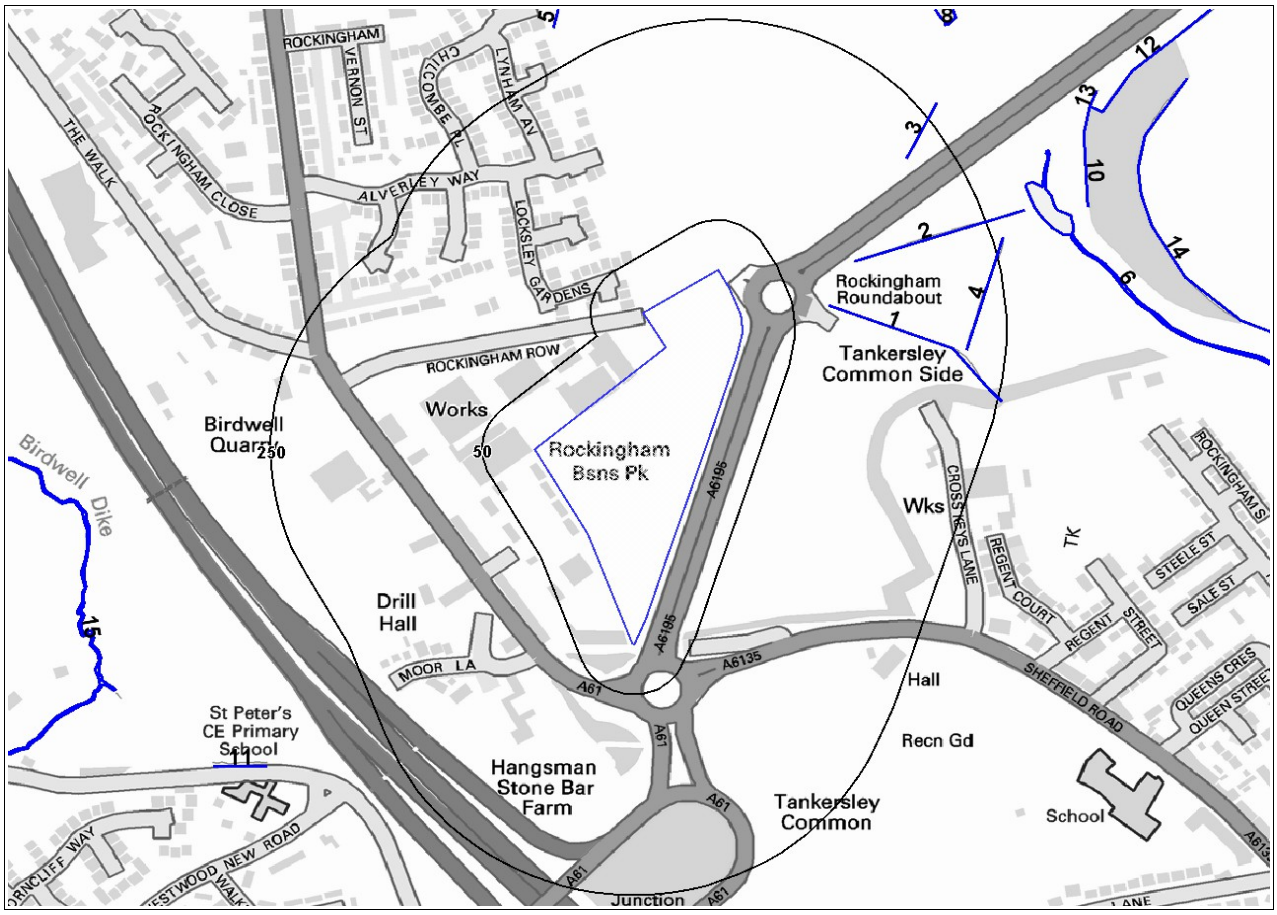
Notes on Surface water (Pluvial) Flooding data:

JBA Consulting surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or "pluvial" flooding. This data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

The model provides the maximum depth of flooding in each 5m "cell" of topographical mapping coverage. The maps include 7 bands indicating areas of increasing natural vulnerability to surface water flooding. These are:-

- **Less than 0.1m in a 1 in 1000 year rainfall event** - Negligible
- **Greater than 0.1m in a 1 in 1000 year rainfall event** - Low
- **Between 0.1m and 0.3m in a 1 in 200 year rainfall event** – Low to Moderate
- **Between 0.3m and 1m in a 1 in 200 year rainfall event –** Moderate
- **Greater than 1m in a 1 in 200 year rainfall event** – Moderate to High
- **Between 0.1m and 0.3m in a 1 in 75 year rainfall event** – High
- **Between 0.3m to 1m in a 1 in 75 year rainfall event** - Significant
- **Greater than 1m in a 1 in 75 year rainfall event** – Highly Significant

5. Surface Water Features map



Surface Water Features legend

© Crown copyright and database rights 2019.
Ordnance Survey license 100035207.

Site Outline

Surface Water Feature (wider than 5m)

50
250
Search Buffers (m)

Surface Water Feature (narrower than 5m)

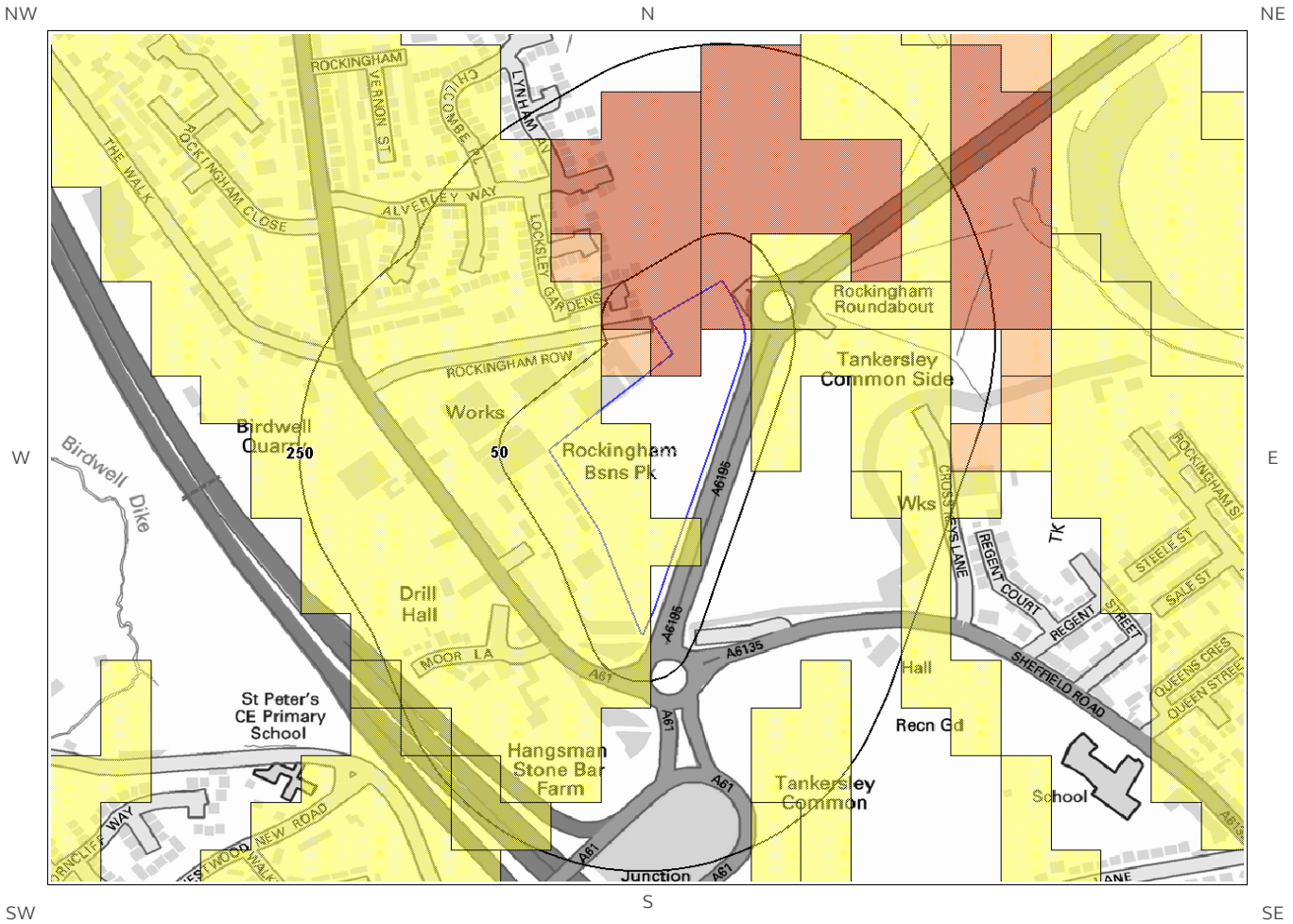
5. Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are represented on mapping:

ID	Distance (m)	Direction
1	84.0	E
2	119.0	E
3	210.0	NE
4	213.0	E

6. BGS Groundwater Flooding Map



BGS Groundwater Flooding legend

© Crown copyright and database rights 2019.
Ordnance Survey license 100035207.

Site Outline

50
250
Search Buffers (m)

Limited potential for groundwater flooding to occur

Potential for groundwater flooding of property below ground level

Potential for groundwater flooding to occur at surface

6. Groundwater Flooding

6.1 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site? Yes

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? Potential for groundwater flooding at surface

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Superficial Deposits Flooding

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

6.2 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Moderate

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

Notes on Groundwater Flooding data:

The BGS Susceptibility to Groundwater Flooding hazard dataset identifies areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

The susceptibility data is suitable for use for regional or national planning purposes where the groundwater flooding information will be used along with a range of other relevant information to inform land-use planning decisions. It might also be used in conjunction with a large number of other factors, e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information, to establish relative, but not absolute, risk of groundwater flooding at a resolution of greater than a few hundred metres. The susceptibility data should not be used on its own to make planning decisions at any scale, and, in particular, should not be used to inform planning decisions at the site scale. The susceptibility data cannot be used on its own to indicate risk of groundwater flooding.

7. BGS Geological Indicators of Flooding

Are there any geological indicators of flooding within 250m of the study site? No

This dataset identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. This assessment does not take account of any man-made factors such as flood protection schemes, and the data behind the report are purely geological.

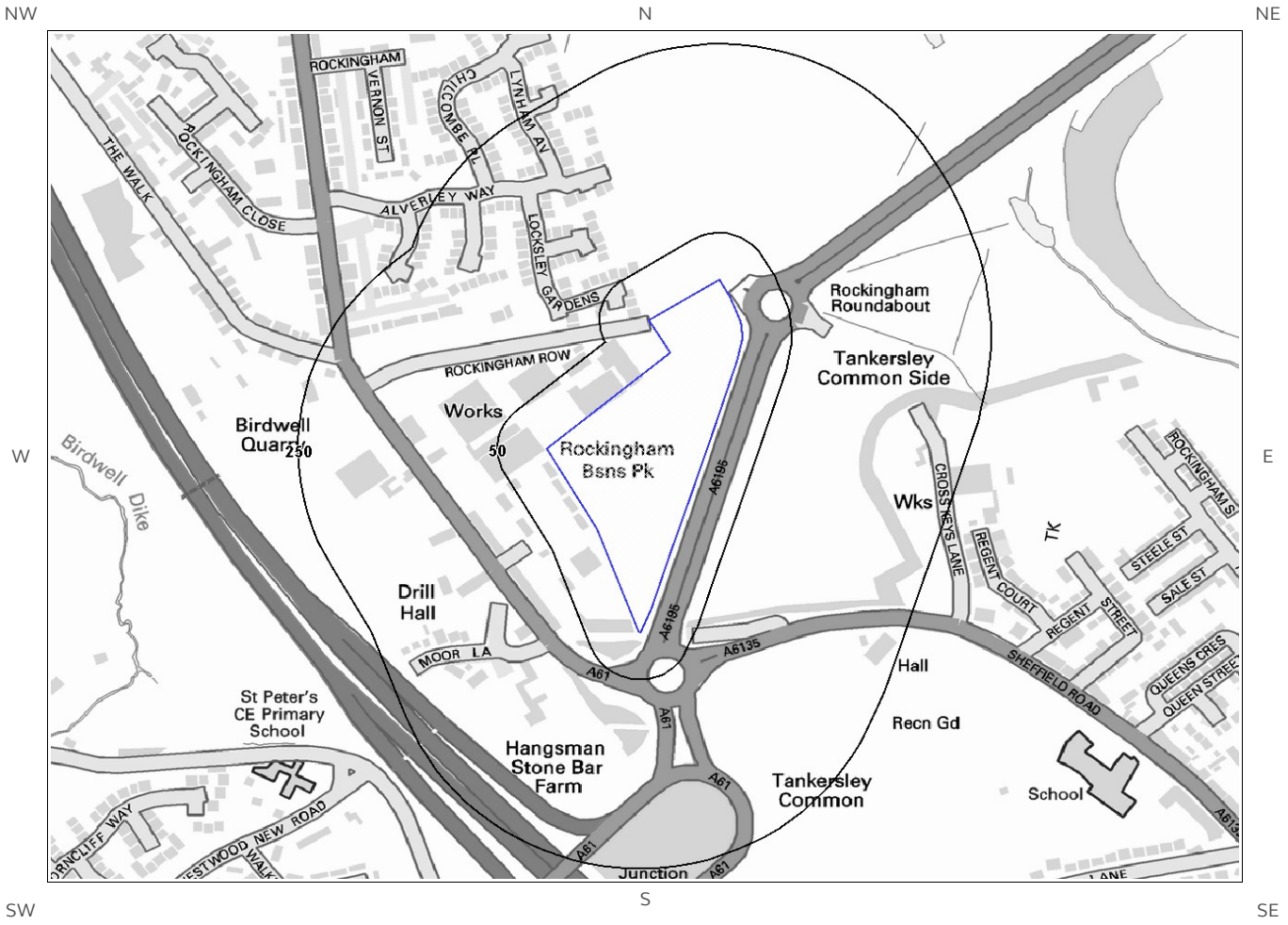
Notes on BGS Geological Indicators of Flooding data:

The BGS Geological Indicators of Flooding (GIF) data set is a digital map based on the BGS Digital Geological Map of Great Britain at the 1:50,000 scale (DiGMapGB-50). It was produced by characterising Superficial (Drift) Deposits on DiGMapGB-50 in terms of their likely vulnerability to flooding, either from coastal or inland water flow. These Superficial Deposits are considered 'recent' in geological terms, most having been formed in the later parts of the Quaternary geological period (i.e. within the last few tens of thousands of years). Observations made during recent major inland and coastal flooding events have demonstrated that the erosion and deposition of these recent geological sediments have produced subtle topographical variations, resulting in landforms such as fluvial and coastal floodplains. The mapping of these landforms, in conjunction with the fluvial and/or coastal deposits that underlie them, has in turn determined the extent of previous coastal and inland flooding.

On this basis, the floodplains which are at greatest risk from flooding can be both visualised and defined by Superficial Deposits as depicted on geological maps. These include deposits such as river alluvium and lacustrine (lake) alluvium, as well as the First River Terrace or 'Floodplain terrace' (raised flat areas adjacent to or within floodplains, which represent the level of the floodplain prior to the most recent episode of down-cutting). Older and higher river terraces have been excluded as they lie outside the geologically defined floodplain. Areas at risk from coastal inundation are similarly characterised by a range of estuarine or marine deposits that include, for example, tidal flats.

---

8. JBA Canal Break map



JBA Canal Break legend

© Crown copyright and database rights 2019.
Ordnance Survey license 100035207.

Site Outline

50
250
Search Buffers (m)

Areas at risk from Canal Breach

8. JBA Reservoir and Canal Data

8.1 JBA Reservoir Failure Impact Modelling

Is the property located in an area identified as being at potential risk in the event of a reservoir failure? No

JBA consulting have modelled the flooding impact from 1,700 reservoirs in England and Wales, should there be a catastrophic failure of a reservoir wall or embankment. This data is not displayed on mapping.

Guidance: None required

Notes on Reservoir Failure Impact data:

This dataset identified areas that are most likely to flood following the sudden catastrophic failure of a reservoir and is provided by JBA Consulting. JBA has identified over 1,700 reservoirs that pose a risk to people and property. These maps identify properties that would flood in the unlikely event of the failure of the reservoir's dam or embankment. Empirical methods were used to predict the flow that would result from the failure which was then modelled onto high resolution Digital Terrain Models (DTM) using JBA's advanced 2D hydraulic modelling techniques. The model provides the maximum depth of flooding in each cell of the DTM.

8.2 JBA Canal Break Modelling

Is the property located within 500m of an area identified as being at potential risk in the event of a canal break? No

Database searched and no data found.

Notes on Canal Break modelling data

Canal failure mapping includes two types of failure:

- Breach of raised canal embankments - failure of the embankment due to weaknesses; these are typically caused by erosion or animal burrowing but can also arise from poor maintenance.
- Aqueduct failure - an aqueduct is where the canal passes over infrastructure such as roads, railways and subways, or over other canals and rivers. Failures of these are typically caused by the collapse of the underlying culvert.

A length of over 1,700km of canal covering England, Wales and Scotland was modelled. The canal modelling is restricted to the areas where LIDAR is available as the raised embankments are more defined in the LIDAR than in the Photogrammetry data. Each canal is categorised as part of the Merchant Shipping Notice (MSN 1776 (M)). The majority of the modelled canals are categorised as A, with a few exceptions, which fell under category B.

- Category A: narrow rivers and canals where the depth of water is generally less than 1.5m.
- Category B: wider rivers and canals where the depth of water is generally 1.5m or more and where the significant wave height could not be expected to exceed 0.6m at any time.
- Category C: tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2m at any time.
- Category D: tidal rivers and estuaries where the significant wave height could not be expected to exceed 2m at any time.

The canal map provides flood extent data only and show flooded areas with a depth greater than 0.1m.

Contact Details

CENTREMAPS

Telephone: 01886 832972
Groundsure@centremaps.co.uk
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk

JBA Risk Management

South Barn
Broughton Hall
Skipton
BD23 3AE
Tel: 01756 799919

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Local Authority

Authority: Barnsley Metropolitan Borough Council
Phone: 01226 770770
Web: http://www.barnsley.gov.uk/
Address: PO Box 634, Barnsley, South Yorkshir, S70 9GG

Getmapping PLC

Virginia Villas, High Street, Hartley Witney
Hampshire RG27 8NW
Tel: 01252 845444
Website: http://www1.getmapping.com/

Acknowledgements: Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-feb11-2019

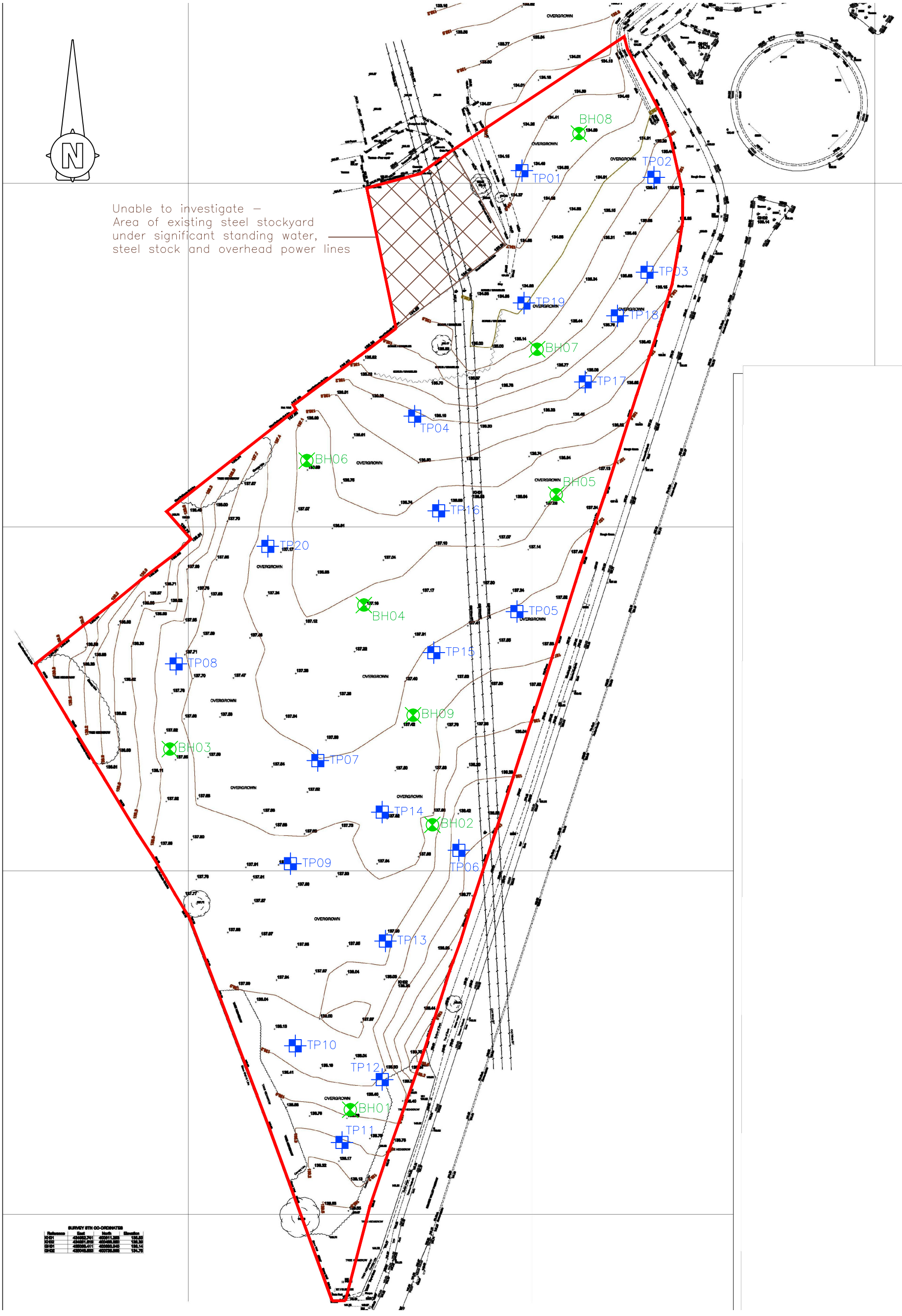
Appendix E Geotechnical Appraisal

Proposed Rockingham Development, Birdwell
Phase II Geo-Environmental Assessment Summary

Site Investigation	The investigation has involved: • Review of an existing desk study report. • 20 trial pits to a maximum depth of 4.0m • 9 mini percussion boreholes to a maximum depth of 4.0m. • Installation of ground gas monitoring wells. • Geotechnical and contamination related testing (to follow once received). • Preliminary ground gas and groundwater monitoring.
Current Use	The site is open and unoccupied land overgrown with scrub vegetation, long grass. Numerous semi mature and mature trees are present, the majority of which are along site boundaries. The site is uneven with lower lying parts of the site marked by waterlogged surface conditions with bog grass present identifying that it is a regular condition on the site.
Site History	In house data identifies the site to have been on the fringes of an opencast coal mine, which was backfilled in the 1990s. Historical reports suggest that engineered made ground comprising colliery spoil present to depths of between 0.8m and >4.0m. A former mineral railway in a potential shallow cutting is also present running northeast/southwest along the northern boundary.
Ground Conditions	The site is covered by made ground materials between 0.3m and >4.0m in thickness. The deeper areas of made ground were proven in the eastern part of the site, however, it does appear to be very variable in terms of depth rather than a consistent increase in depth. The made ground generally comprised mudstone gravels in a clayey matrix (Colliery Spoil), reworked gravelly clay or clay bound gravel and sandstone and brick. The made ground is generally underlain by firm to stiff residual clay or directly by weathered bedrock.
Groundwater	Groundwater was encountered sporadically within the made ground at depths between 1.3m and 2.7m and prevented excavation progress in one location (TP09). During the preliminary monitoring visits, three wells were found to be dry or damp at base to a maximum depth of 2.50m bgl. However, a single well (BH07) sited in a low lying area in the northern part of the site was fully waterlogged.
Gas Monitoring	Ground gas monitoring has been carried out on 1 occasion to date, with five further visits are planned. The results of the preliminary gas monitoring results indicate that no combustible ground gas (methane) is present and high concentrations of carbon dioxide (18.8% v/v). The results suggest a CIRIA C665 Characteristic Situation 2, but this will be confirmed on completion of the monitoring programme.
Contamination	Information obtained during the desk study by Enzygo indicated a low to moderate risk of contamination. No physical evidence of contamination was encountered during the intrusive works and the results of the laboratory chemical analysis is likely to indicate low determinand concentrations which do not exceed the generic assessment criteria for human health for the proposed commercial end use. This will be confirmed upon receipt and review of the laboratory test results.

Appraisal	Remediation – Subject to receipt of the laboratory test results the proposed areas of building and hardstanding is likely to be sufficient to break the latent pollutant pathway between the made ground and end users. Where landscaping areas are present, a capping of 300mm of imported topsoil materials will be required. Imported fill and capping will need to be validated to ensure it is not pose a risk to the environment. Where more sensitive end uses such as a crèche are proposed the capping depth may need to be increased in areas of private soft landscaping. Disposal of Materials - Waste classification testing has not been carried out, however, an initial assessment and suggest that generally, the made ground are considered to be suitable for disposal as stable non-reactive hazardous waste. Mining – Based on the findings of the desk study the site is considered to be stable with respect to mining. Foundations and Floor Slabs – At this stage, in the western and extreme southern parts of the site the natural residual clays appear suitable for pad and strip foundations at a minimum depth of 900mm based on an allowable bearing capacity of 100kN/m^2. Foundations will need to be deepened for heave where effected by trees which are present, particularly around boundaries. Elsewhere where deep variable made ground is present an alternative foundation solution will be required. This could be ground improvement by vibro stone columns, although allowance for pre boring of the columns may be required, or the adoption of raft foundations on fully re-engineered fill materials where building size and sensitivity allows. Alternatively, large scale settlement testing could be carried out to determine the settlement characteristics, which may allow the use of current made ground as a bearing stratum without significant full depth re-engineering. Based on the depth of fill present use of a suspended floor slab should be allowed for at this stage, unless ground improvement is carried out. External Works – A CBR value of 2% should be adopted at this stage for design. Gas precautions – The results of the preliminary gas monitoring results indicate that no combustible ground gas (methane) is present, however, carbon dioxide was recorded to a maximum concentration of 18.8%. The results suggest a CIRIA C665 Characteristic Situation 2 i.e. gas protection measures required. This recommendation is subject to revision following completion of the gas monitoring and issue of the gas monitoring addendum report. Water Supply Pipes – UKWIR analysis has not been undertaken as part of this assessment. It is recommended that the results of the assessment are provided to the water supply company so that the correct pipe material can be selected. Subject to the receipt of the laboratory testing results, our preliminary assessment indicates that basic precautions are required with respect to water supply pipes. Drainage – Based on the presence of deep made ground and cohesive soils, the use of soakaways are not considered feasible. Excavations and Dewatering – If man entry is proposed into excavations, the use of support to excavation sides is recommended, in line with health and safety guidelines. Significant groundwater ingress into shallow excavations is anticipated sporadically across the site and dewatering of excavation should be allowed for and carefully monitoring. Sulphate attack on buried concrete – Allowance should be made for sulphate

	resistant concrete. The BRE Special Digest 1:2005 Design Sulphate Class will be determined upon receipt of the laboratory testing results.
Further Works	Further investigation to confirm the depth of made ground in areas of potential uncertainty/variability. If it is proposed to construct raft foundations on the made ground without re-engineering of the foundation soils, settlement testing should be carried out to confirm that potential settlements are within acceptable limits. This testing could be carried out by the construction of an appropriately loaded dummy foundation or the construction of a surcharge embankment designed to simulate the loads imposed by the proposed development, accurately monitored by precise levelling.



Legend:

TP — Trial Pit Position

BH — Mini Percussive Borehole Location

consulting engineers

1st Floor, Block C
Holland Park
Holland Drive
Newcastle upon Tyne
NE2 4LD

tel: 0191 230 2993
fax: 0191 230 3677

www.3econsult.com

Project	Rockingham Development, Birdwell, Barnsley for Hartwood Estates Ltd.		
Title	Exploratory Hole Location Plan		
Scale: NTS	Drawn: NW	Checked: AHC	Date: Aug '15
Job No.: 15677	Drawing No.: Figure 2		Rev: 0

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH01

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
0.20	ES		(0.30) 0.30	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone. (Colliery Spoil)					
0.90	D		(1.20)	Stiff brown mottled yellow CLAY.					
1.00	C	N22 (3/3/4/4/6/8)	1.50		1.0				
1.90	D		(0.50)	Brown/grey completely weathered MUDSTONE.					
2.00	C	N46/225mm (7/9/12/15/19/-)	2.00	*End of Exploratory Hole at 2m*	2.0				

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH02

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No. = Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			0.10	MADE GROUND: Clayey TOPSOIL.					
0.30	ES		(0.30) 0.40	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone. (Colliery Spoil)					
0.80	D			MADE GROUND: Brown friable gravelly CLAY. Gravel is fine to coarse angular mudstone and sandstone.					
1.00	C	N19 (3/3/4/5/5/5)	(1.50)		1.0				
1.80	D		1.90						
2.00	C	N12 (2/2/3/2/3/4)		POSSIBLE MADE GROUND: Firm to stiff friable brown mottled grey slightly gravelly CLAY.	2.0				
2.80	D		(1.80)						
3.00	C	N20 (4/3/4/4/6/6)			3.0			1	
			3.70						
			(0.30)	Stiff grey mottled brown CLAY.					
4.00	C	N51 (5/6/6/8/13/24)	4.00		4.0				
				End of Exploratory Hole at 4m					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
1	3.0	Groundwater strike.					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH03

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(1.10)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone. (Colliery Spoil)					
0.50	ES								
1.00	C	N18 (2/2/3/4/5/6)	1.10		1.0				
			(0.85)	Firm to stiff brown mottled grey slightly gravelly CLAY.					
1.50	D		1.95						
2.00	D		2.00		2.0				
2.00	C	N50/50mm (8/12/50/-/-/-)		Completely weathered SANDSTONE/SILTSTONE recovered as tabular angular gravel.					
				End of Exploratory Hole at 2m					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH04

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(1.50)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone and occasional ironstone. (Colliery Spoil)					
0.50	ES								
1.00	C	N18 (2/2/3/4/5/6)	1.50		1.0				
1.60	D		(0.40)	Brown gravelly CLAY. Gravel is fine to coarse angular sandstone and mudstone.					
			1.90						
2.00	D		(0.15)						
2.00	C	N50/15mm (25/-/50/-/-/-)	2.05	Firm brown mottled grey gravelly CLAY.	2.0				
				End of Exploratory Hole at 2.05m					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH05

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(2.50)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone. (Colliery Spoil)	1.0				
0.50	ES								
1.00	C	N23 (4/7/6/6/5/6)							
1.50	D								
2.00	C	N15 (3/3/2/2/5/6)			2.0				
2.50	C	N50/0mm (25/-/50/-/-/-)	2.50	*End of Exploratory Hole at 2.5m*					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH06

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(1.70)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone and occasional sandstone. (Colliery Spoil)					
0.40	ES								
1.00	C	N17 (2/3/4/4/5/4)			1.0				
1.40	D								
			1.70						
1.75	D		1.80	MADE GROUND: Grey/brown gravelly CLAY. Gravel is fine to coarse angular mudstone and occasional brick					
1.85	D		1.85						
1.85	C	N50/0mm (18/12/50/-/-/-)		SUSPECTED BEDROCK: Recovered as gravel of SANDSTONE.					
				End of Exploratory Hole at 1.85m					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH07

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(2.90)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone. (Colliery Spoil)	1.0				
1.00	C	N19 (2/2/4/5/5/5)							
2.00	C	N19 (3/4/4/5/5/5)			2.0				
				2.50 - 2.90 occasional sandstone gravel					
2.90	C	N50/10mm (25/-/50/-/-/-)	2.90	*End of Exploratory Hole at 2.9m*					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH08

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key:
= Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
			(1.30)	MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone with pockets of brown gravelly clay. (Colliery Spoil)					
0.50	ES								
1.00	C	N29 (2/3/3/5/7/14)			1.0				
1.30	C	N60/0mm (25/-/50/-/-/10)	1.30	*End of Exploratory Hole at 1.3m*					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Mini-Percussive Log

BH09

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Contractor: White Rose

Key: = Water Strike Depth & No.
= Resting Water Depth & No.
D = Small Disturbed Sample
B = Large Disturbed Sample
ES = Environmental Sample
W = Water Sample
HSV = Hand Shear Vane (kPa)
S / C = Split Spoon / Cone
N = SPT N Value

Plant: Mini Percussive Rig
Date: 19/08/2015
Logged By: AHC

Samples/Tests			Strata Details					Well	
Depth (m)	Type	Results	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend	Strike	Log
				MADE GROUND: Grey clayey, sandy angular GRAVEL of mudstone with pockets of brown gravelly clay. (Colliery Spoil)					
0.50	ES								
1.00	C	N11 (1/2/2/2/3/4)			1.0				
1.50	D		(3.40)						
2.00	C	N21 (1/2/3/6/7/5)			2.0				
2.50	D								
3.00	C	N26 (2/3/3/4/5/14)			3.0				
			3.40						
3.45	C	N50/10mm (25/-/50/-/-/-)		*End of Exploratory Hole at 3.45m*					

Groundwater Observations			Window Sample Run				General Remarks
No.	Struck (m)	Remarks	From (m)	To (m)	Dia. (mm)	Recovery (%)	1. Borehole terminated on refusal
		No Groundwater Encountered					

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP01

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil)			
					(1.00)	MADE GROUND: Grey clayey sandy fine to coarse angular GRAVEL of mudstone. occasional cobbles of subrounded sandstone. (Colliery spoil).			
1.00	D				1.10		1.0		
1.30	D				(0.30)	MADE GROUND: Firm brown very silty slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded mixed aggregates.			
					1.40				
					(1.10)	MADE GROUND: Grey claybound fine to coarse angular GRAVEL of mudstone. (Colliery spoil).			
2.00	D				2.50		2.0		
					2.60	SUSPECTED BEDROCK: Recovered as fine to coarse gravel of SANDSTONE.			
						End of Exploratory Hole at 2.6m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP02

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over soft grey silty very gravelly CLAY. Gravel is fine to coarse angular mudstone and sandstone. Many rootlets. (Colliery spoil)			
					(1.20)	MADE GROUND: Grey sandy fine to coarse angular GRAVEL of siltstone and mudstone. (Colliery spoil)	1.0		
					1.30				
1.40	ES				(0.50)	Grey clayey fine to coarse gravel of highly weathered MUDSTONE.			
					1.80				
					(0.90)	BEDROCK: Recovered as fine to coarse angular gravel of MUDSTONE.	2.0		
2.50	D				2.70				
						End of Exploratory Hole at 2.7m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP03

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.20) 0.20	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil)			
					(0.40) 0.60	MADE GROUND: Grey sandy fine to coarse angular GRAVEL and COBBLES of mudstone. (Colliery spoil).			
0.60	ES				(1.80) 2.40	MADE GROUND: Grey claybound fine to coarse angular GRAVEL of mudstone. occasional pockets of clay.	1.0 2.0		
2.70	D				(0.40) 2.80	SUSPECTED BEDROCK: Grey/brown clayey fine to coarse angular gravel of MUDSTONE becoming less clayey with depth.			
						End of Exploratory Hole at 2.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP04

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
						MADE GROUND:Grey clayey fine to coarse angular GRAVEL and COBBLES of mudstone with occasional clay pockets. (Colliery spoil).			
1.10	ES						1.0		
					(2.80)				
1.90	D						2.0		
					2.90				
3.00	ES				(0.20) 3.10	MADE GROUND: Grey/brown clayey sandy fine to coarse angular GRAVEL of mudstone, sandstone, brick fragments and ironstone.	3.0		
					3.20				
					(0.35)	MADE GROUND: Yellow sandy fine to coarse angular to rounded GRAVEL of dolomite.			
					3.55	MADE GROUND: Grey clayey sandy fine to coarse GRAVEL mudstone, coal, sandstone.			
					3.60	SUSPECTED BEDROCK: Brown fine to coarse gravel of SANDSTONE.			
						End of Exploratory Hole at 3.6m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP05

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	D				(0.20) 0.20	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone and coal. Many rootlets. (Colliery spoil).			
					(0.40) 0.60	MADE GROUND: Brown sandy fine to coarse angular GRAVEL and COBBLES of sandstone and mudstone.			
					(0.50) 1.10	MADE GROUND: grey clayey sandy fine to coarse angular GRAVEL of mudstone.	1.0		
1.20	ES				1.20	BEDROCK: Recovered as grey fine to coarse angular gravel of SANDSTONE.			
						End of Exploratory Hole at 1.2m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP06

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
0.70	ES				(1.60)	MADE GROUND: Grey clayey sandy fine to coarse angular GRAVEL and COBBLES of mudstone. occasional boulders of subrounded sandstone. (Colliery spoil).	1.0		
1.30	D				1.70				
					(1.40)	MADE GROUND: Brown/grey fine to coarse angular GRAVEL of mudstone and sandstone. (Colliery spoil).	2.0		
					3.10		3.0		
3.20	D				(0.30)	Firm brown silty CLAY.			
					3.40	*End of Exploratory Hole at 3.4m*			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP07

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
					(0.30)				
					0.40	MADE GROUND: Grey clayey sandy fine to coarse angular GRAVEL of mudstone.			
0.50	ES				(0.40)				
						MADE GROUND: Brown sandy fine to coarse angular GRAVEL of sandstone.			
					0.80				
0.90	D					MADE GROUND: Firm to stiff brown silty slightly gravelly CLAY. Gravel is fine to coarse angular mudstone and occasional brick fragments.	1.0		
					(0.80)				
1.30	ES								
					1.60				
						POSSIBLE MADE GROUND: Brown and grey firm silty slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded mixed lithology.			
2.00	D				(0.90)				
					2.50				
					2.55	SUSPECTED BEDROCK: Recovered as a brown gravel of SANDSTONE.			
						End of Exploratory Hole at 1.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP08

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				(0.25) 0.25	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
0.60	D				(1.25) 1.50	Stiff brown and grey silty CLAY	1.0		
					(0.30) 1.80	BEDROCK: Recovered as brown angular gravel of MUDSTONE.			
						End of Exploratory Hole at 1.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP09

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
						MADE GROUND: Grey sandy fine to coarse angular GRAVEL and COBBLES sandstone and mudstone. Becomes clayey below 1.3m.			
0.90	ES				(2.10)		1.0		
					2.20		2.0		
2.30	D				(0.20) 2.40	Stiff silty slightly gravelly CLAY. Gravel is fine to coarse of mudstone.			
						End of Exploratory Hole at 2.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
1	1.3	Moderate groundwater seepage.

Stability / Dimensions

Stability: Poor below water strike
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP10

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 19/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
					(1.40)	MADE GROUND: Brown sandy fine to coarse angular GRAVEL and COBBLES of sandstone with occasional brick.	1.0		
					1.50				
1.60	D				(0.15) 1.65	MADE GROUND: Very soft brown and grey silty CLAY with occasional fibrous organic matter.			
1.70	D					Firm brown and grey silty CLAY.	2.0		
					(1.25)				
2.70	D				2.90				
					3.00	SUSPECTED BEDROCK: Recovered as brown fine to coarse angular gravel of MUDSTONE.			
						End of Exploratory Hole at 2.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP11

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.20	ES				(1.00) 1.00	MADE GROUND: Grass over grey clayey sandy fine to coarse angular GRAVEL mudstone and sandstone. occasional rootlets and brick fragments. (Colliery spoil).	1.0		
1.10	D				(1.30) 2.30	Firm to stiff brown and grey silty slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded mixed lithology.	2.0		
1.80	D				(0.50) 2.80	SUSPECTED BEDROCK: Recovered as brown and grey fine to coarse angular gravel of MUDSTONE.			
						End of Exploratory Hole at 2.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP12

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				(0.15) 0.15	MADE GROUND: Grass over soft grey silty gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
0.30	ES				(0.45) 0.60	MADE GROUND: Brown very friable sandy gravelly CLAY. Gravel is fine to coarse angular mudstone, sandstone and old pipe fragment.			
					0.70	MADE GROUND: Dark brown friable silty sandy slightly gravelly CLAY. Gravel is fine to coarse angular sandstone. (Possible relict topsoil).			
					(0.40) 1.10	POSSIBLE MADE GROUND: Firm to stiff brown silty sandy slightly gravelly CLAY. occasional concrete.	1.0		
1.50	D				(1.10) 2.20	Firm to stiff brown silty sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded mixed lithology.	2.0		
					(0.60) 2.80	SUSPECTED BEDROCK: Brown fine to coarse angular gravel of MUDSTONE.			
						End of Exploratory Hole at 2.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP13

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.10	ES				(0.20) 0.20	MADE GROUND: Grass over brown and grey clayey sandy fine to coarse angular GRAVEL of sandstone and mudstone. Many rootlets. (Colliery spoil).			
0.40	ES				(0.65) 0.85	MADE GROUND: Brown clayey sandy fine to coarse angular GRAVEL of mudstone and sandstone.			
					(0.55) 1.40	MADE GROUND: Firm to stiff friable sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded mixed lithology.	1.0		
2.20	D				(1.30) 2.70	MADE GROUND: Firm friable brown and grey silty sandy gravelly CLAY.	2.0		
2.80	D				(0.30) 3.00	Stiff brown and grey silty CLAY.	3.0		
						End of Exploratory Hole at 3m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP14

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.25) 0.25	MADE GROUND: Grass over very soft grey sandy very gravelly CLAY. Gravel is fine to coarse angular mudstone. Many rootlets. (Colliery spoil).			
					(0.75) 1.00	MADE GROUND: Grey sandy fine to coarse angular GRAVEL mudstone and sandstone with occasional clay pockets. (colliery spoil).	1.0		
1.10	ES				(0.40) 1.40	MADE GROUND: Brown clayey sandy fine to coarse angular GRAVEL sandstone with occasional clay pockets.			
1.80	D				(1.50) 2.90	MADE GROUND: Firm brown and grey friable sandy gravelly reworked CLAY. Gravel is fine to coarse angular mudstone and sandstone.	2.0		
3.00	D				(0.50) 3.40	Stiff brown and grey silty CLAY.	3.0		
						End of Exploratory Hole at 3.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP15

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(2.70) 2.70	MADE GROUND: Grass over grey sandy fine to coarse angular GRAVEL of sandstone and mudstone.. Many rootlets. (Colliery spoil).	1.0 2.0		
1.30	ES								
					(0.80) 3.50	MADE GROUND: Brown slightly clayey very sandy fine to coarse angular GRAVEL of sandstone with occasional clay pockets.	3.0		
3.70	D				(0.40) 3.90	MADE GROUND: Very soft grey and brown sandy gravelly CLAY. Gravel is fine to coarse angular sandstone, mudstone, ironstone, bricks and occasional fibrous organic matter.			
3.95	D				4.00	Firm to stiff brown and grey very sandy silty CLAY.	4.0		
						End of Exploratory Hole at 4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP16

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
0.15	ES				(0.20) 0.20	MADE GROUND: Grass over slightly clayey silty gravelly fine to medium SAND. Gravel is fine to coarse angular mudstone. Many rootlets.			
0.50	D				(0.60) 0.80	MADE GROUND: Grey sandy fine to coarse angular GRAVEL and COBBLE of sandstone and siltstone.			
					(0.80) 1.60	MADE GROUND: Grey clayey sandy fine to coarse angular GRAVEL of sandstone and mudstone.	1.0		
					1.65	BEDROCK: Recovered as grey fine to coarse angular gravel of SANDSTONE. *End of Exploratory Hole at 1.65m*			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in bedrock

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP17

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					0.10	MADE GROUND: Grass over dark brown clayey sandy fine to coarse angular GRAVEL of mudstone. occasional rootlets.			
						MADE GROUND: Grey sandy fine to coarse GRAVEL and COBBLES of mudstone and sandstone. Many boulders.	1.0		
					(3.60)		2.0		
							3.0		
					3.70				
					3.80	Grey and brown silty CLAY.			
						End of Exploratory Hole at 3.8m			

Groundwater Observations		
No.	Struck (m)	Remarks
1	2.7	Slight water ingress.

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP18

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(3.20) 3.20	MADE GROUND: Grass over grey slightly clayey sandy fine to coarse angular GRAVEL and COBBLES of mudstone and sandstone. Colliery spoil). Many boulders of mudstone and sandstone and becomes clayey below 1.8m.	1.0 2.0 3.0		
1.40	ES								
2.10	D								
3.50	D				(0.40) 3.60	Very stiff brown and grey CLAY			
						End of Exploratory Hole at 3.6m			

Groundwater Observations		
No.	Struck (m)	Remarks
1	1.8	Slight water ingress.

Stability / Dimensions

Stability: Good
Length:
Width:
Orientation:

General Remarks

1. Excavation terminated in natural soils

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP19

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(1.20) 1.20	MADE GROUND: Grass over sandy fine to coarse angular GRAVEL and COBBLES sandstone and mudstone. occasional boulders of angular sandstone.	1.0		
					(0.50) 1.70	MADE GROUND: Brown slightly clayey sandy angular fine to coarse GRAVEL, with sandstone and occasional brick (colliery spoil).			
1.80	ES				(0.40) 2.10	MADE GROUND: Friable brown and grey slightly gravelly silty CLAY. Gravel is angular fine to coarse sandstone, with occasional brick and dolomite.	2.0		
2.20	D				(1.90) 4.00	MADE GROUND: Firm grey sandy gravelly CLAY, with occasional soft clay pockets. Gravel is angular to subangular fine to coarse dolomite, mudstone and occasional brick (reworked clay).	3.0		
						End of Exploratory Hole at 4m	4.0		

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated on maximum depth of excavator

consulting engineers
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Tel. 01924 240420

Trial Pit Log

TP20

Site Name: Rockingham, Birdwell
Client: Hartwood Estates Ltd
Project No: 15677

Ground Level:
Easting:
Northing:

Key: B = Large Disturbed Sample; D = Small Disturbed Sample; W = Water Sample; HSV = Hand Shear Vane; CBR = Mexecone; ES = Environmental Sample

Plant: Backhoe Excavator
Date: 20/08/2015
Logged By: CB

Samples		Tests			Strata Details				
Depth (m)	Type	Depth (m)	HSV (kPa)	CBR (%)	Depth (m) (Thickness)	Strata Description	Depth (m)	Level (AOD)	Legend
					(0.70) 0.70	MADE GROUND: Grass over clayey sandy fine to coarse angular GRAVEL and COBBLES, with occasional boulders. Gravel and cobbles consist of sandstone. Boulders are subangular sandstone (colliery spoil).			
1.10	ES				(0.90) 1.60	MADE GROUND: Brown slightly clayey sandy angular GRAVEL and COBBLES, with occasional boulders. Gravel and cobbles consist of sandstone and mudstone. Boulders are subrounded sandstone (colliery spoil).	1.0		
					(0.80) 2.40	BEDROCK: Recovered as very weak fine to coarse sandstone GRAVEL.	2.0		
						End of Exploratory Hole at 2.4m			

Groundwater Observations		
No.	Struck (m)	Remarks
		No Groundwater Encountered

Stability / Dimensions
Stability: Good
Length:
Width:
Orientation:

General Remarks
1. Excavation terminated in bedrock

Gas monitoring record

3e Consulting Engineers Ltd
4 Calder Close
Calder Park
Wakefield
WF4 3BA

Job no: 15677
Site: Rockingham, Birdwell
Date: 26/08/2015
Weather: Sunny with clouds
Pressure Trend: Rising

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
BH1	0.0	2.8	15.2	985	0.0	Dry	
BH4	0.0	11.6	3.2		0.0	DAB	
BH5	0.0	18.8	2.6		0.0	Dry	
BH7	*	*	*	*	*	*	Waterlogged to surface

DAB = Damp at Base

Appendix F BGH Drawing

73 Howard Street
North Shields
Tyne & Wear
NE30 1AF

Tel: +44(0)191 2585632
info@rwoassociatesuk.com
www.rwoassociatesuk.com