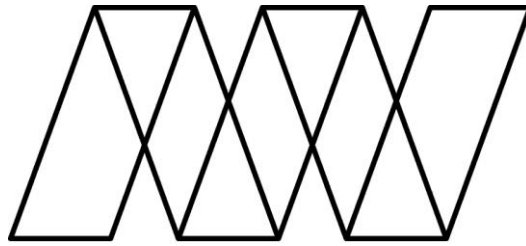


APPENDIX 11 – FLOOD RISK ASSESSMENT

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Alan Wood & Partners

**FLOOD RISK ASSESSMENT
ON
EBBERSTON MOOR 4 APPRAISAL WELL**



**FOR
VIKING UK GAS LTD**



PROJECT REF:-

33392A

JULY 2012

Issuing Office

Kingsley House
7 Pickering Road
West Ayton
Scarborough
YO13 9JE

**FLOOD RISK ASSESSMENT FOR
EBBERSTON MOOR 4 APPRAISAL WELL**

Project Reference: **33392**

Prepared by: **Paul A Aspden HNC, ABEng**

Signed:

Date: 08.08.2012

Approved by: **Neil Read CEng, MIStructE, RMaPS**

Signed:

Date: 08.08.2012

Issue	Revision	Revised by	Approved by	Revised Date
A	Amended following consultation with client	PAA		3.8.12

For the avoidance of doubt, the parties confirm that these conditions of engagement shall not and the parties do not intend that these conditions of engagement shall confer on any party any rights to enforce any term of this Agreement pursuant of the Contracts (Rights of third Parties) Act 1999.
The Appointment of Alan Wood & Partners shall be governed by and construed in all respects in accordance with the laws of England & Wales and each party submits to the exclusive jurisdiction of the Courts of England & Wales.

1.0 INTRODUCTION

- 1.1 Alan Wood & Partners were commissioned to carry out a flood risk assessment for the proposed construction of an appraisal well at Ebberston Moor, Scarborough. A well site is proposed to allow Viking UK Gas Limited to appraise a subsurface target for gas.
- 1.2 The flood risk assessment has been prepared resulting from the publication of the National Planning Policy Framework which ensures that flood risk assessments are carried out for new developments on flood plains of rivers, or subject to coastal flooding, as well as for developments which are in excess of one hectare in area.

2.0 THE SITE AS EXISTING

- 2.1 The proposed site is located within the dense woodland of Wykeham forest, Scarborough. The area surrounding the site is also dense woodland, with the nearest Hamlet/village being Wrench Green, approximately 1500m to the north east. The nearest property to the site is Coomb Slack Farm, approximately 750m to the north east of the site.
- 2.2 The proposed site is an area of dense woodland, of approximately 1.7ha in size, located 250m to the south west of the junction of Lang Gate and Great Moor Road.
- 2.3 The site will be accessed via an existing stoned track, which runs from the junction with Lang gate and Great Moor Road.
- 2.4 A site plan is included in Appendix A, which identifies the location of the proposed site.
- 2.5 A topographical survey of the site is attached within Appendix B, this shows the levels of the existing site to vary from 200.76mAOD to 197.35mAOD, with the site sloping downwards to the south eastern corner.
- 2.8 The grid reference for the approximate centre of the site is: 495390,488992.

3.0 THE PROPOSED DEVELOPMENT

- 3.1 The proposed site is being established to appraise for subsurface gas. The site is being established as follows:

The proposed development consists of four phases; site construction, drilling, extended well test and restoration.

The site will be cleared of vegetation and topsoils and subsoils removed to create a level working area. Soils will be stored in earth bunds throughout the duration of the operations. An HDPE impermeable membrane will be laid across the entire site area, including the perimeter ditches. The ditch will remain open on two sides and piped on the other two with twin walled perforated 300mm plastic pipe. MOT type 1 stone will then be laid across the site. Within the centre of the site, two 2.4m ID concrete cellars will be constructed and sealed with tokstrip. The impermeable membrane is integrated into the cellar. On completion of construction the cellar is integrity tested with a leak off test. Any surface water captured onsite will be captured onsite and removed by a licenced waste carrier to an appropriate waste facility.

- 3.2 A plan of the proposed development is attached to appendix C.
- 3.3 The existing access route will be improved an MOT type 1 stone laid from the access point into the site. This is a permeable stone covering which does not generate any additional rainwater runoff.

4.0 POTENTIAL SOURCES OF FLOODING

- 4.1 All the area of the proposed site is located within flood zone 1, having less than a 1 in 1000 annual probability of flooding from river or sea. The main threat to this development will be surface water flooding from the site itself and adjacent areas.
- 4.2 By reference to the flood map provided on the Environment Agency web site, it can be seen that the nearest water course is the River Derwent, located 1500m to the east of site.

5.0 SEQUENTIAL TEST AND EXCEPTION TEST

- 5.1 Under the requirement of the National Planning Policy Framework, the local authority are required to apply a risk-based sequential test to new developments in order to direct them towards areas which are at the lowest probability of flooding.
- 5.2 The entire area of the proposed development lies within flood zone 1, having less than a 1 in 1000 annual probability of flooding from river or sea.
- 5.3 From table 2 of NPPF, the use of land for construction of a gas appraisal drilling well falls under the less vulnerable category.
- 5.4 Table 3 of NPPF shows that the proposed development of a less vulnerable site within an area of land designated as flood zone 1 is appropriate.
- 5.5 A site plan showing the location of flood zones in relation to the proposed development is attached in appendix D

6.0 DRAINAGE IMPACT

- 6.1 The runoff from the site is to be captured within the HDPE impermeable membrane which falls into the perimeter ditch and removed by a licenced waste carrier to a suitably approved waste disposal facility. This is considered to be the most appropriate and safe way to ensure that no contaminated water escapes into the water course/water table, contaminating the surrounding area. The well will typically be drilled with water based drilling fluids, further reducing the risk of contamination.

In accordance with the Control of Pollution (Oil Storage) Regulations 2001, any oils will be stored in bunds onsite. As a result, the risk of contamination is reduced.

- 6.2 Any foul drainage generated on site will be stored within tanks and disposed of off site, via vehicle mounted tanker.

6.3 The drainage ditch to the perimeter of the site has been designed to accommodate a 1 in 1 year storm, due to the short term nature of the site. It is intended to monitor the water levels within the ditch on a daily basis and arrange removal of water as necessary.

6.4 Attached in appendix E is a typical section through the proposed drainage ditch.

7.0 FLOOD RISK ASSESSMENT

7.1 The entire site is located within an area designated as flood zone 1, having an annual probability of flooding of less than 1 in 1000.

7.2 A copy of the flood map taken from the Environment Agency web site is appended to this report which indicates that the site is located within flood zone 1.

7.3 Due to the location of the site within dense woodland, remote from areas of urban development, and the altitude of the site, (in excess of 195mAOD) we do not consider there to be a significant risk of flooding from rivers or sea.

7.4 The risk of flooding to the site and adjacent land, as a result of rainwater runoff from the site, is managed by the excavation of the ditch to the perimeter of the site. This method of attenuation will ensure that all rainwater on the site will be captured and then removed by vehicle to a suitable registered waste facility.

8.0 RECOMMENDATIONS AND PROPOSALS

8.1 From the above assessment, it can be seen that the site is at low risk from flooding, with all areas of the development being located within flood zone 1.

8.2 Safe access to, or egress from the site, should still be achievable during a flood situation due to the elevated location of the site area and the permeable nature of the woodland surrounding the site.

8.3 Any generator or essential infrastructure should be located a minimum of 600mm above the existing ground level to provide additional protection in the event of flooding.

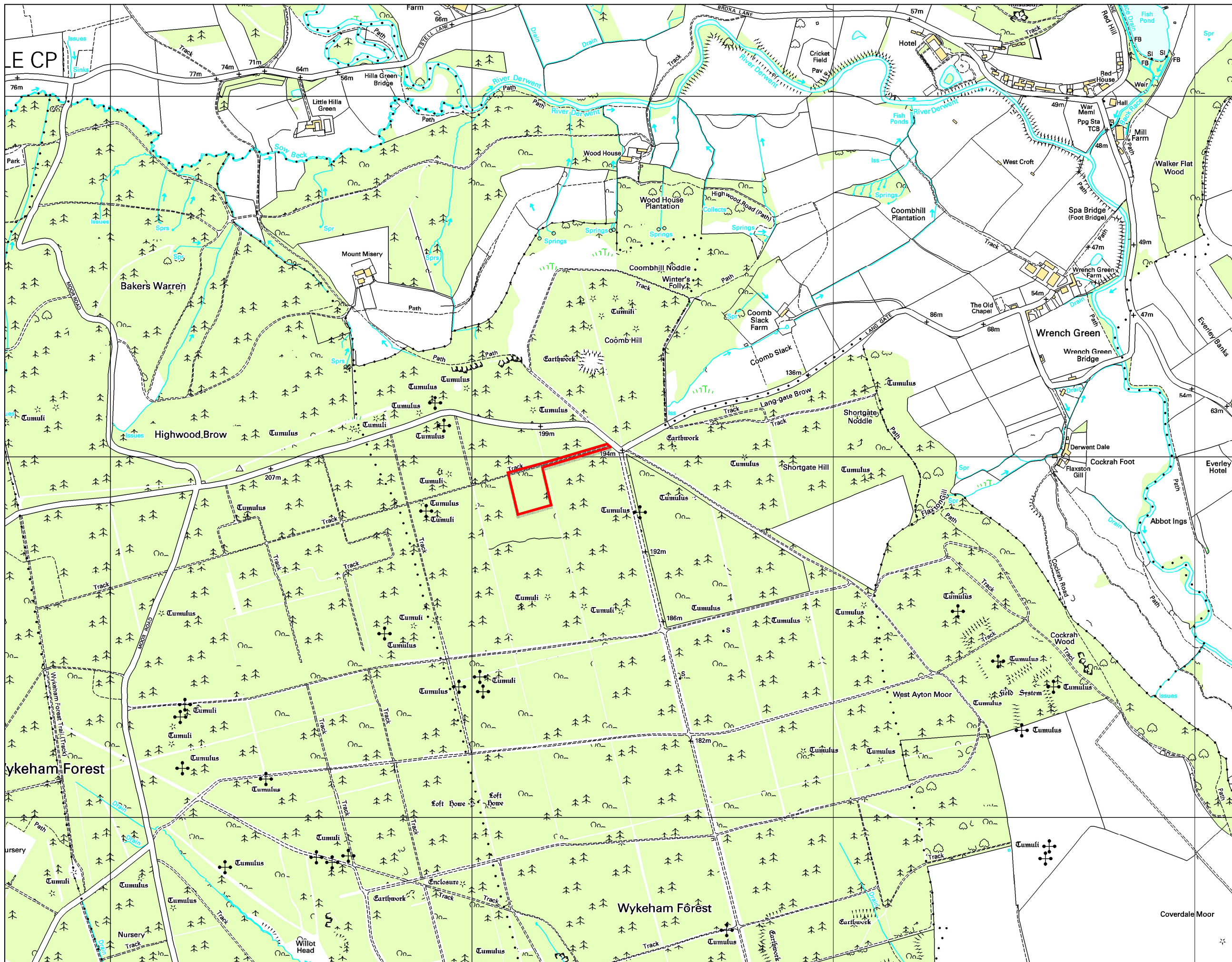
8.4 The surface water from the site should be attenuated in the perimeter drainage ditch. The capacity of this ditch is to be such that a 1 in 30 year storm can be attenuated within the ditch. Approximate ditch dimensions are as shown on the attached sketch within appendix E of this document.

9.0 **CONCLUSIONS**

9.1 Providing the above measures are incorporated within the construction, we consider that issues of flooding to the development have been adequately addressed.

APPENDIX A

Site Location Plan and Aerial Photograph



Key:	
Site Location	
Client:	Viking UK Gas Limited
Petroleum Safety Services Innovation Centre	Kirkleatham Business Park Redcar, TS10 5SH
Job Title:	Ebberston Moor 4 Appraisal Well
Drawing Title:	Ebberston Moor 4 Site Location Plan
Scale:	1:10,000 (Printed A3)
Date:	3 rd August 2012
Drawn By:	Jonathan Foster
Drawing No:	PSSL/VUK/EB4/PA/001
Rev:	0

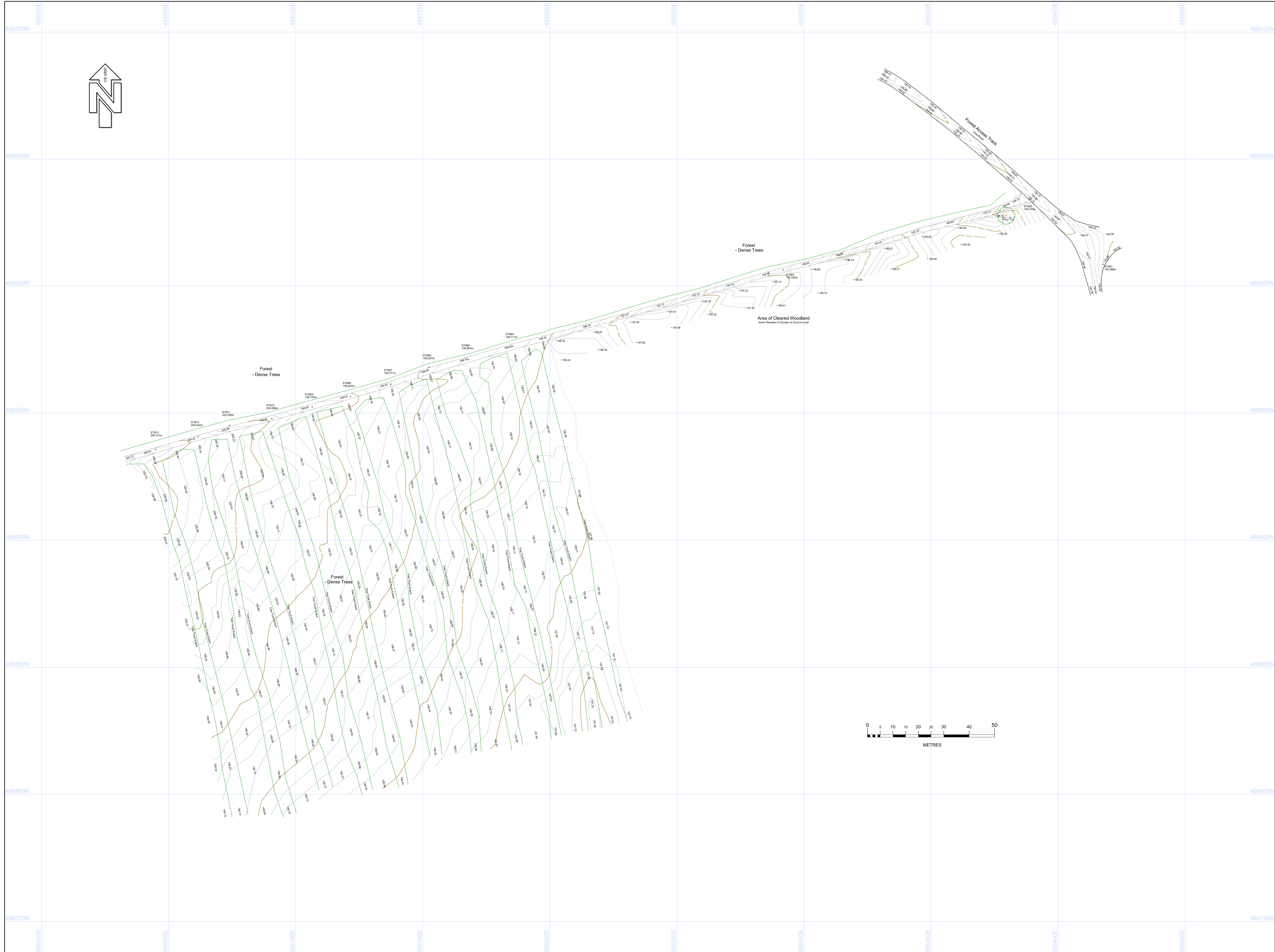
AERIAL VIEW OF SITE



Approximate Centre of Site

APPENDIX B

Topographic Survey



Notes

1. Surveyed July 2012.
2. Survey related to Ordnance Survey "OS Net", using real-time correction received via Leica Geosystems "Smart Net" service.
3. Levels related to GPS Orthometric height, converted to MSL (Newlyn) by OSGM02.

Control

STN	East	North	Level	Type
STN01	495417.725	489008.623	194.086	Nail
STN02	495388.739	489034.276	194.749	Nail
STN03	495291.837	489006.420	197.020	Peg
STN04	495195.939	489076.268	198.711	Peg
STN05	495168.010	489071.114	198.864	Peg
STN06	495152.462	489066.123	199.007	Peg
STN07	495137.234	489061.387	199.271	Peg
STN08	495121.555	489056.548	199.624	Peg
STN09	495106.444	489052.463	199.733	Peg
STN10	495090.597	489047.821	200.000	Peg
STN11	495073.343	489045.186	200.226	Peg
STN12	495056.488	489040.665	200.542	Peg
STN13	495044.851	489035.713	200.741	Peg

General

- Every effort is made to identify all visible above ground features. However, it should be borne in mind that at the time of survey, some surface features may have been obscured.
- Visible features in the vicinity of the site extents, as detailed on this survey, may not represent the legally conveyed ownership boundaries.

Legend

	Top / Bottom of Bank
	Building / Overhead Canopy
	Wall
	Solid Surface Feature / Road Edge
	Hard / Soft Surface Change
	Kerb / Dropped Kerb
	Combined Foot & Drainage System
	Drainage Channel
	Fence Line
	Gate
	Survey Station
	Level Datum
	Woodland Area
	Stake Line
	Hedge Line
	Tree / Shrub Canopy Line
	OHT Telephone / Electric / Cable(s)
	Rock Face
	Pine Tree (Above Ground)
	Bush
	Tree
	Conifer

Feature Abbreviations

ACU	At Controlling Unit	FF	Fire Hydrant	HP	Home Plug	SP	Soil Vent Pipe
AD	Admission	FL	Fire Lane	IP	Iron Pipe	ST	Street
BD	Buried	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box
BS	Bulk	FL	Flange	IP	Iron Pipe	TC	Telephone Box

Description Abbreviations

AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box
AS	Asphalt	FL	Flange	IP	Iron Pipe	TC	Telephone Box

Level Prefix

1	1st Floor	2	2nd Floor	3	3rd Floor	4	4th Floor	5	5th Floor
6	6th Floor	7	7th Floor	8	8th Floor	9	9th Floor	10	10th Floor
11	11th Floor	12	12th Floor	13	13th Floor	14	14th Floor	15	15th Floor
16	16th Floor	17	17th Floor	18	18th Floor	19	19th Floor	20	20th Floor
21	21st Floor	22	22nd Floor	23	23rd Floor	24	24th Floor	25	25th Floor
26	26th Floor	27	27th Floor	28	28th Floor	29	29th Floor	30	30th Floor
31	31st Floor	32	32nd Floor	33	33rd Floor	34	34th Floor	35	35th Floor
36	36th Floor	37	37th Floor	38	38th Floor	39	39th Floor	40	40th Floor
41	41st Floor	42	42nd Floor	43	43rd Floor	44	44th Floor	45	45th Floor
46	46th Floor	47	47th Floor	48	48th Floor	49	49th Floor	50	50th Floor

Digital File: 3249_001_2d.dwg Original Size: A0

Revisions

No.	Description	Date	Signed

Drawing Status: FINAL

Surveyed	Date	Scale
MJS	18.07.12	1:500

Drawn: MJS Sheet: 1 of 1 Approved:

Client: **Viking UK Gas Ltd**

Title: **Topographical Survey**

Project: **Proposed Well Site Eberston Moor 4 Wykeham Forest**

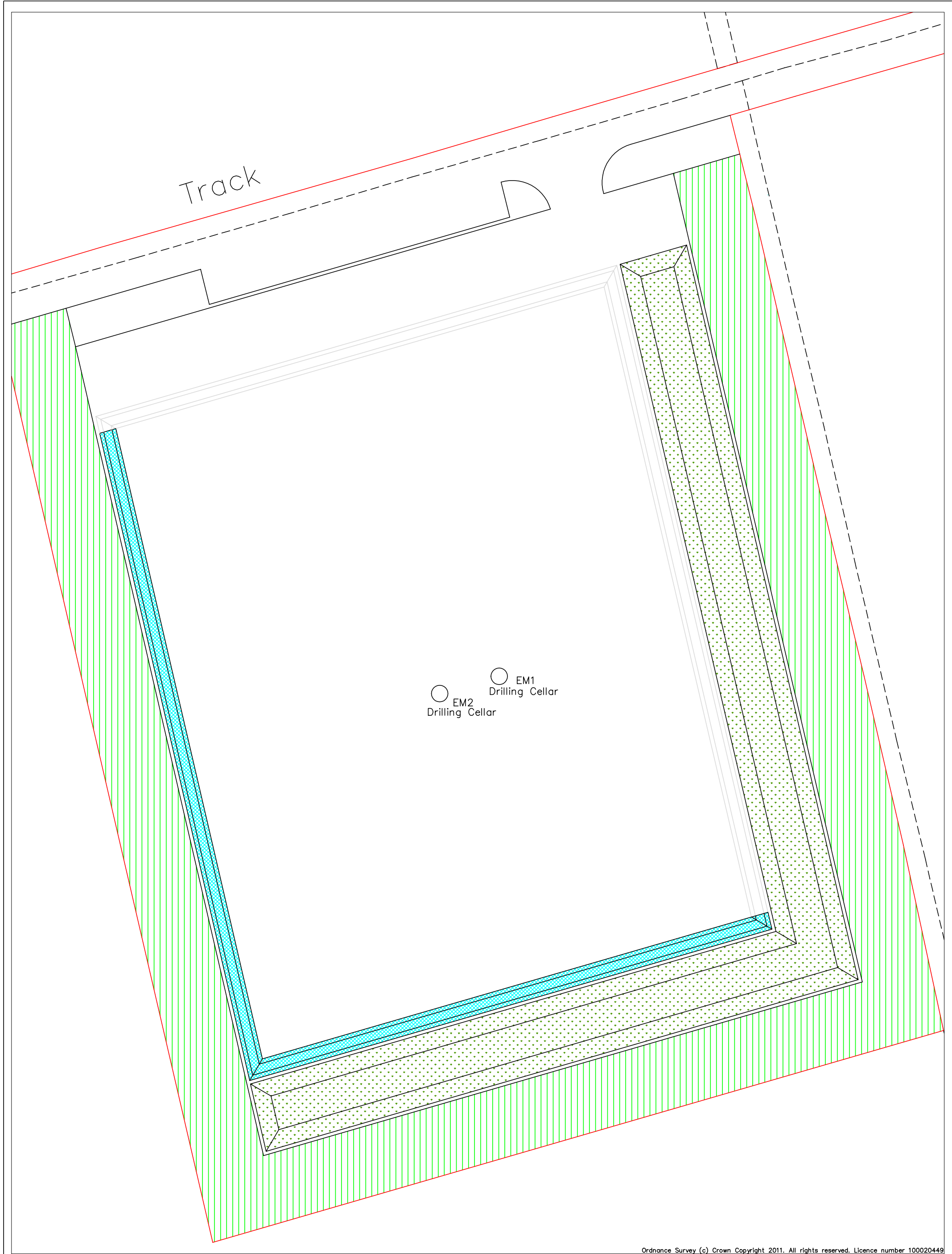
Drawing No. 3249/001 Rev. -



Clugston Survey Services
 25 Street House
 Northmoor Road
 North Loochgrove
 LE15 2JZ
 Tel: 01753 783170
 Fax: 01753 783171
 www.clugstonsurvey.co.uk

APPENDIX C

Proposed Development Plan



Track

○ EM2
Drilling Cellar

○ EM1
Drilling Cellar

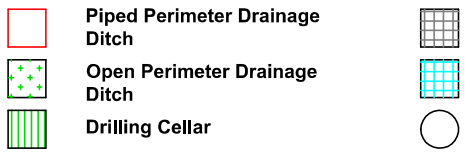
Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Key:

Planning Application
Red Line Boundary

Topsoil Screening Bund

20m Wide Strip Set-Aside for
Retaining Existing Forest



PSSL
Petroleum Safety Services Limited

Petroleum Safety Services Ltd
The Innovation Centre
Kirkleatham Business Park
Redcar
TS10 5SH

Client:
Viking UK Gas Limited

Project:
Ebberston Moor 4 Appraisal
Well

Drawing Title:
Site Construction Layout

Scale: 1:500

Drawn By: P Silk
Date Drawn: 02/08/2012

Approved By: P Silk
Date Approved:

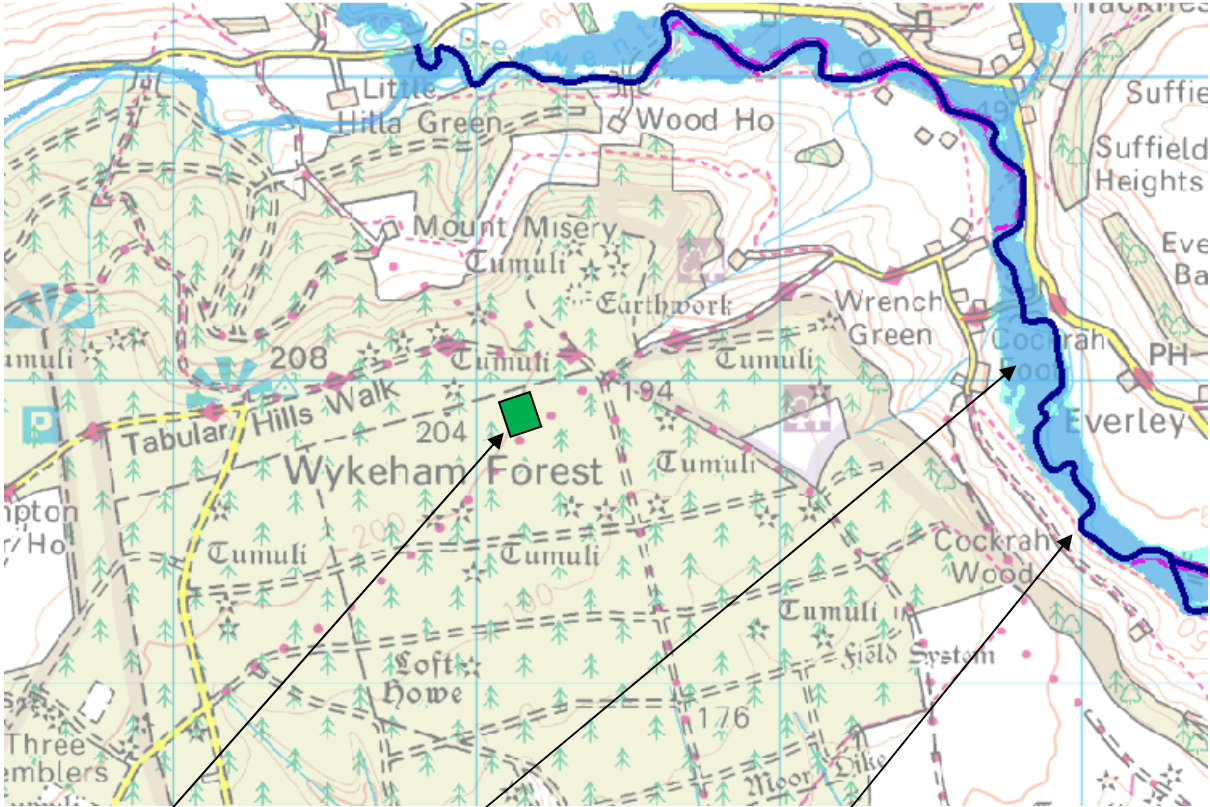
Drawing No:
PSSL/VUK/EB4/PA/003

Rev: 0

APPENDIX D

Environment Agency Flood Map

FLOOD MAP TAKEN FROM ENVIRONMENT AGENCY WEB SITE.



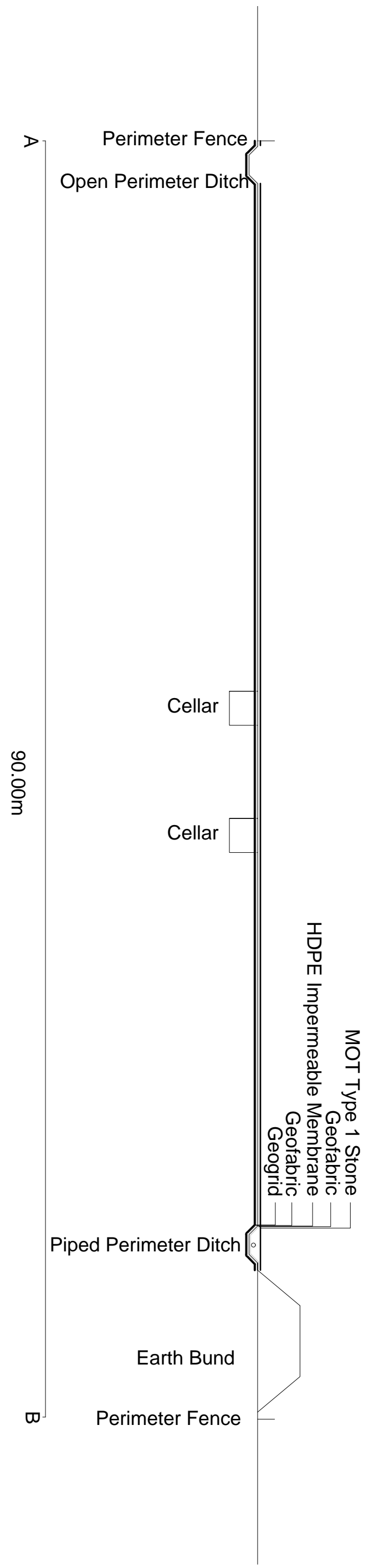
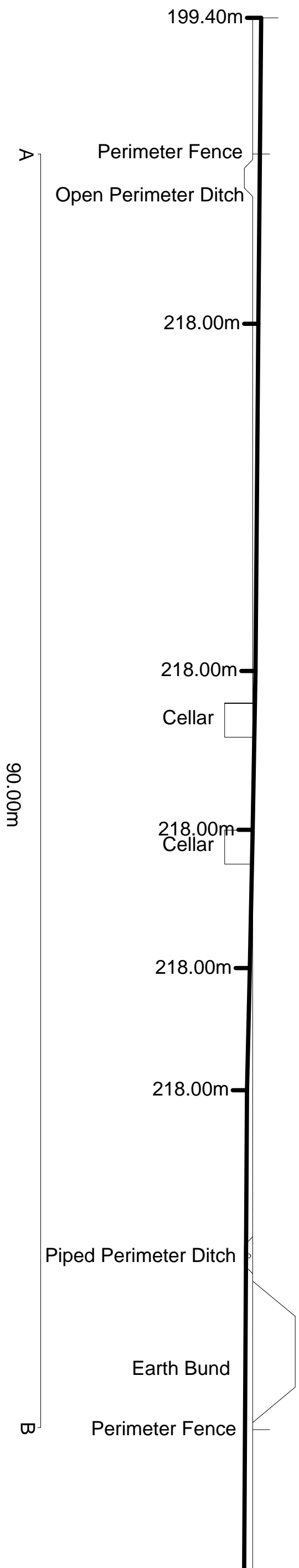
Denotes Flood Zone 3

Approx Site location

River Derwent

APPENDIX E

Proposed Section Through Perimeter Drainage Ditch



Alan Wood & Partners

Our Services

Blast Design
Building Regulations Applications
Building Surveyors
CDM Co-ordinator
Civil Engineering
Contract Administration
Disabled Access Consultants
Expert Witness Services
Flood Risk Assessments
Foundation Design
Historic Building Services
Land Remediation Advice

Land Surveying
Marine Works
Modular Building Design
Party Wall Surveyors
Planning Applications
Project Managers
Road & Drainage Design
Site Investigations
Structural Engineering
Sulphate Attack Specialists
Topographic Surveys
Traffic Assessments

Quality Assurance Accreditation

ISO 9001 Registered firm
Certificate no. GB.02/07

Environmental Accreditation

ISO 14001 Registered firm
Certificate no. GB.09/277b

