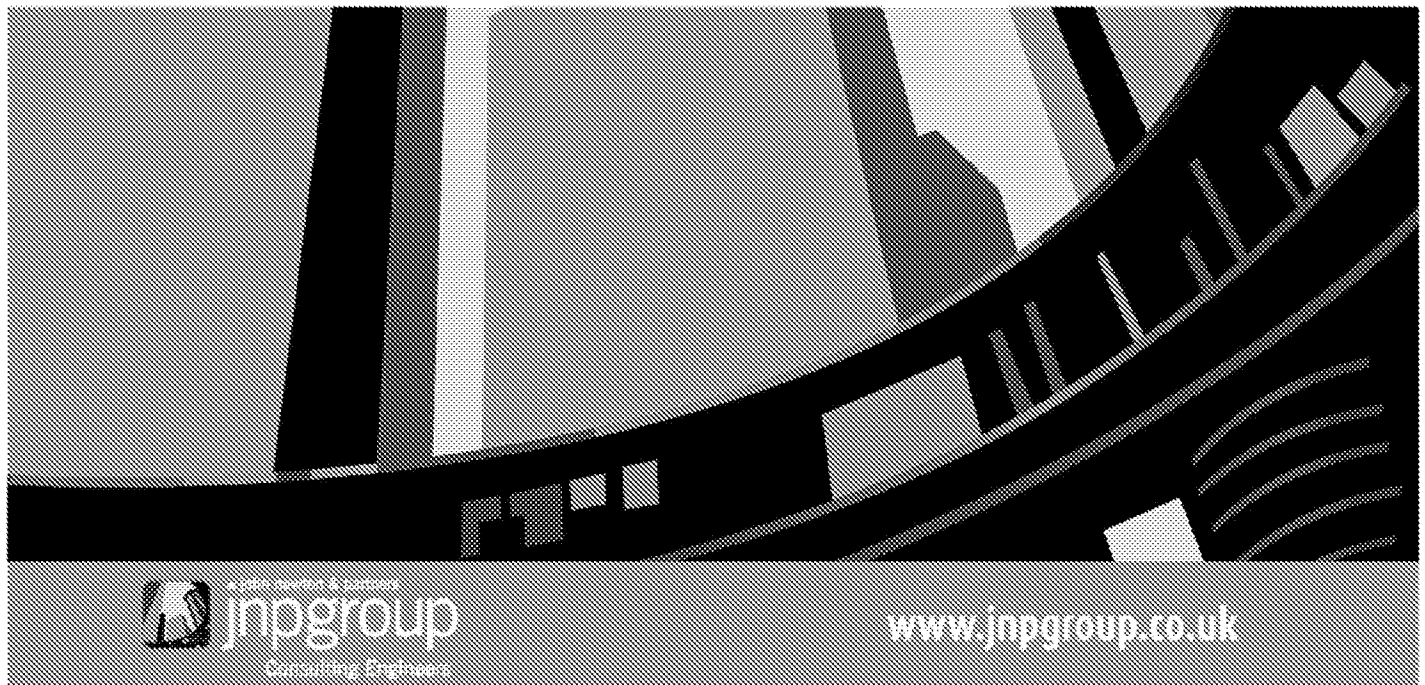




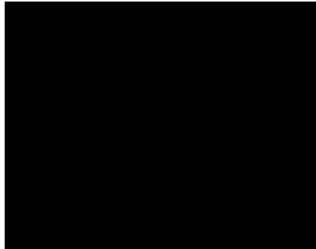
Land Engineering Works Statement

Project: Ford Airfield

Client: Redrow Homes & Wates Developments

Reference: C85228 / TN004D

Date: 14 February 2020

- 
- Civil Engineering
 - Consulting
 - Flood Risk
 - Geo-Environmental
 - Green Energy
 - Rail
 - Structural Engineering
 - Transport Planning

Offices at:

Briqhouse
Chesham
Hartlepool
Leamington Spa
Sheffield

Job name: Ford Airfield

Job No: C85228

Note No: TN004 Rev D

Date: 14/02/2020

Prepared by: Anthony McNevin

Subject: Land Engineering Works Statement

1. Introduction

- 1.1 jnp group were commissioned by Redrow Homes and Wates Developments to provide a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development of land at Ford Airfield, Arundel, West Sussex. This is required to support a submission for outline planning permission.
- 1.2 The development will comprise of up to 1,500 dwellings, employment, local centre comprising retail / commercial and community uses, two-form entry primary school, public open space, allotments, sports pitches, drainage, parking and associated access, infrastructure, landscape, ancillary and site preparation works.
- 1.3 The drainage strategy will require changes to the existing ground levels across the development site in order to provide a satisfactory solution which enables surface water runoff to discharge from the development.
- 1.4 As part of the outline planning submission Arun District Council (ADC) also require a Land Engineering Works Statement to be provided for developments where the operational site area exceeds 0.5ha and the change in levels at any point exceeds 0.3m.
- 1.5 This Land Engineering Works Statement for the Ford Airfield development should be read in conjunction with the following report:

 jnp group Ford Airfield Flood Risk Assessment and Drainage Strategy, Report Reference C85228/ R001.

2. Summary of the Proposed Land Engineering Works

- 2.1 The development site is 86.63 ha. It has an existing impermeable area of approximately 6 ha comprising former airfield runways, hardstandings and existing buildings. The remaining 80.63 ha is agricultural fields or woodland/ scrub.
- 2.2 Onsite ground levels fall from the west (7.5m AOD) to the east (5.0m AOD) with a site gradient of 1 in 550 and north (6.5m AOD) to south (4.5m AOD) with a site gradient of 1 in 800.
- 2.3 Generally, the majority of the site is gently sloping or flat with gradients in the region of 1 in 100 which rise and fall across the site. A topographical survey drawing of the site is provided in Appendix A.
- 2.4 An intrusive site investigation has been carried out by RSK Environmental limited (RSK) in August 2018. The findings are provided in RSK's Geo- environmental and Geotechnical Site Assessment Report, Report Reference 29228-R01 (00), dated 06 November 2018.

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- 2.5 The investigation confirmed that the ground conditions onsite are generally as shown on geological mapping and comprise of:
- Superficial Geology – Brickearth (slightly sandy, slightly silty CLAY) / River Terrace Deposits (clayey SAND / gravelly clayey SAND). It was noted in the borehole and trial pit logs that the River Terrace Deposits were not always present across the site beneath the Brickearth.
 - Bedrock Geology – CHALK. The initial layer comprised of highly weathered and structureless chalk composed of gravelly CLAY/SILT, which was underlain by granular material comprising a silty gravel with low to medium density chalk clasts. The chalk was noted to be increasingly competent below 6m below existing ground level.
- 2.6 Infiltration rate testing onsite showed the ground is not suitable for deep soakaways.
- 2.7 Groundwater monitoring over 2018 to 2020 recorded shallow groundwater in the south of the site.
- 2.8 The use of shallow infiltration techniques will be investigated further. However, because the infiltration component will be located in Brickearth / River Terrace Deposits where the infiltration rate will be slow it is likely shallow infiltration alone will not be suitable to serve the entire development for the 100 year + 40% Climate Change storm event.
- 2.9 The proposed drainage strategy for the development is to provide surface water attenuation basins and an underground storage tank in the existing low lying areas onsite and discharge water offsite to nearby watercourses to the east of the site (River Arun) and the west (Ryebank Rife).
- 2.10 The attenuation basins will be large excavations to provide the surface water storage volume required for the development.
- 2.11 As the development site is a former airfield it is generally flat and level. It will be necessary to raise ground levels in parts of the site to provide gravity sewers to discharge water to the basins. Generally, the ground will be raised higher where it is furthest from the basin.
- 2.12 Drainage calculations have been undertaken to assess the size of the sewers that will be required. A sufficient depth of backfill material needs to be provided over the main sewers for pipe protection and to enable connections from incoming private sewers. This generally fixes the required finished ground levels across the site.
- 2.13 The finished ground levels across the site needs to meet maximum and minimum gradient requirements for access and highway design.
- 2.14 The finished ground levels across the site also need to consider where overland water would flow in the event of a sewer blockage or collapse or an extreme storm which is greater than the 1 in 100 year + 40% Climate Change design event and could result with water flooding from road gullies. The ground levels design provided for the drainage strategy ensures that any exceedance flows / overland water flows away from the buildings towards the roads and eventually towards greenspace areas of lesser risk.
- 2.15 The Drainage Strategy is shown on JNP Group drawing numbers C85228 – D100 and D101, titled Indicative Surface Water Drainage Strategy provided in Appendix B.
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3. Proposed Changes in Ground Level

- 3.1 The proposed changes in ground level across the development site are shown on JNP Group drawing numbers C85228 – D110 and D111, titled Indicative Proposed Ground Levels provided in Appendix C.
- 3.2 These drawings show a series of indicative spot heights which represent the increase / decrease in level of the proposed surface of the development taken from existing ground level.
- 3.3 In the north of the site the increase in ground level is not significant. Over the majority of the north of the site the finished ground level of the proposed road network will rise and fall by approximately 0.60m. It increases up to 1.0m above existing ground level in localised areas.
- 3.4 In the south of the site it is envisaged ground levels in the vicinity of the Southern Basin will be raised, on average, no greater than 0.50m. The requirement to raise ground levels higher increases moving further west away from the southern basin.
- 3.5 The maximum rise in ground level occurs along a ridge which runs parallel to the south west boundary of the site as indicated on drawing C85228 - D111. The rise in ground level along the ridge generally varies between 1.00m to 1.5m above existing ground level. In one small localised area the ground level will be 2.0m above existing ground level. The finished ground levels then fall in a south westerly direction to tie into existing ground levels along the boundary of the site adjacent to Yapton Road.
- 3.6 It is envisaged the finished ground levels within the development parcels will be raised, at minimal gradients, to fall towards the road network.
- 3.7 Due to the size of the proposed development site the increase in ground level will rise and fall onsite at a shallow gradient, generally rising in the region of 1 in 40 to 1 in 80 along the carriageway.
- 3.8 The finished ground level for the proposed development gradually falls to tie into the existing ground levels around the boundary of site.
- 3.9 Drawing C85228 – D111 also provides an assessment of the gradient of the proposed areas of greenspace at the perimeter of the site. The slopes vary between 1 in 10 to 1 in 20 which is considered to be gently sloping.

4. Management of Soils Materials

- 4.1 Earthworks will be required to form the proposed ground levels across the site. This will require both cutting and filling the existing soil materials across the site.
- 4.2 In summary, the RSK Geo- environmental and Geotechnical Site Assessment Report provided the following environmental recommendations:

-  The investigation recorded localised presence of made ground ranging from 0.4 to over 3.0m in thickness which comprised sandy clay/ clayey sand with occasional fragments of brick, ash and flint.
-  An inert landfill consisting of a raised earth mound is situated in the north eastern portion of the site next to the Grundon waste treatment site.
-  The majority of the site was found to be underlain by natural soils.
-  In conclusion, the investigation found the site is virtually free from contamination. It recommended the following further works:

-  Further investigation / assessment of the inert landfill.

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- Further assessment of the soils impacted with lead at TP39
 - Additional intrusive works on the industrial unit in the north west of the site, currently occupied by the Highways Agency and a haulage company.
 - Additional intrusive works to target possible former buried features identified on the geophysical survey.
 - A remediation strategy should be developed if the additional investigation works indicate there is a potential future risk to site users or the surrounding environment.

4.3 Based on the findings of the site investigation where possible the existing soils will be reused onsite. During detailed design a qualified Geotechnical Engineer will carry out an Earthworks Materials Suitability Assessment and prepare a site specific Earthworks Specification. The Earthworks Specification will advise on the placement and compaction of the soil materials and would be broadly based on the Specification of Highways Works, Series 600 Earthworks, or similar suitable.

4.4 Reusing soil materials onsite or recovering inert soil materials and using them offsite is subject to waste regulations approval by the Environment Agency (EA). There are two options to achieve this.

4.4.1 Option 1 – Environmental Permit from the EA

To obtain an Environmental Permit from the EA to reuse soil materials onsite the Developer (or its consultant) must prepare a Waste Recovery Plan and a Waste Recovery Permit Application for approval. A Waste Disposal Permit should be completed and approved by the EA if the earthworks operation does not include reusing the soil materials onsite.

4.4.2 Option 2 – Materials Management Plan in accordance with the Definition of Waste Code of Practice

4.4.3 Alternatively, the Developer can prepare a Materials Management Plan (MMP) in accordance with the Definition of Waste Code of Practice (DoWCoP). This requires a qualified person to provide a declaration to the EA before soils materials are reused onsite or dispatched for use on another site.

4.4.4 The MMP Declaration must be completed by a Qualified Person. The Qualified Person must be currently registered with the independent research group Contaminated Land Applications in Real Environments (CL:AIRE).

4.4.5 The basic steps of the of the DoWCoP are:

- Ensure an adequate MMP is in place
- Ensure the MMP is based on appropriate risk assessment
- Ensure materials are treated and used as set out in the MMP (as demonstrated in the subsequent Verification Report).

4.5 The EA may conclude that the materials are waste if they are not used in accordance with the MMP and risk assessment.

4.6 The Developer will confirm which option will be carried out after outline planning permission has been granted.

4.7 A preliminary earthworks assessment for the development indicates that:

- Topsoil will be reused for the development. It is likely surplus topsoil will be dispatched offsite for reuse elsewhere.
- Inert soil materials will be reused on site as engineered fill.

- It is likely soil materials will need to be imported to site to achieve the proposed ground levels for the development.
- A more accurate earthworks assessment will be carried out as the design is developed further.

5. Conclusions

- 5.1 The development will comprise of up to 1,500 dwellings, employment, local centre comprising retail / commercial and community uses, two-form entry primary school, public open space, allotments, sports pitches, drainage, parking and associated access, infrastructure, landscape, ancillary and site preparation works.
- 5.2 Generally, the majority of the existing site is gently sloping or flat with gradients in the region of 1 in 100 which rise and fall across the site.
- 5.3 The proposed drainage strategy for the development is to provide surface water attenuation basins and an underground storage tank in the existing low lying areas onsite and discharge water offsite to nearby watercourses to the east of the site (River Arun) and the west (Ryebank Rife).
- 5.4 As the development site is a former airfield it is generally flat and level. It will be necessary to raise ground levels in parts of the site to provide gravity sewers to discharge water to the basins. Generally, the ground will be raised higher where it is furthest from the basin.
- 5.5 In the north of the site the increase in ground level is not significant. Over the majority of the north of the site the finished ground level, of the proposed road network, will rise and fall by approximately 0.60m. It increases up to 1.0m above existing ground level in localised areas.
- 5.6 In the south of the site the increase in ground levels generally varies between 0.5 to 1.5m. In one small localised area the ground level will be 2.0m above existing ground level.
- 5.7 It is envisaged the finished ground levels within the development parcels will be raised, at minimal gradients, to fall towards the road network
- 5.8 At the edges of the site the ground falls gently over the proposed areas of greenspace at the perimeter of the site.
- 5.9 Based on the findings of the site investigation where possible existing soil materials will be reused onsite.
- 5.10 Reusing soil materials onsite or recovering inert soil materials and using them offsite requires either an Environmental Permit to be agreed with the EA or preparing a Materials Management Plan with a declaration which has been completed by a Qualified Person who is registered with CL:AIRE.
- 5.11 The Developer will confirm which option will be carried out after outline planning permission has been granted.
- 5.12 An earthworks volumes assessment will be carried out as the design is developed further.

List of Appendices

- Appendix A Topographical Survey of the Development site.*
- Appendix B Indicative Surface Water Drainage Strategy*
- Appendix C Indicative Proposed Ground Levels*



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Any comments given within this report are based on the understanding that the proposed works to be undertaken will be as described in the introduction. The information referred to and provided by others and will be assumed to be correct and will not have been checked by jnp group, jnp group will not accept any liability or responsibility for any inaccuracy in such information.

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February 20

Appendix A

Topographical Survey





Notes:

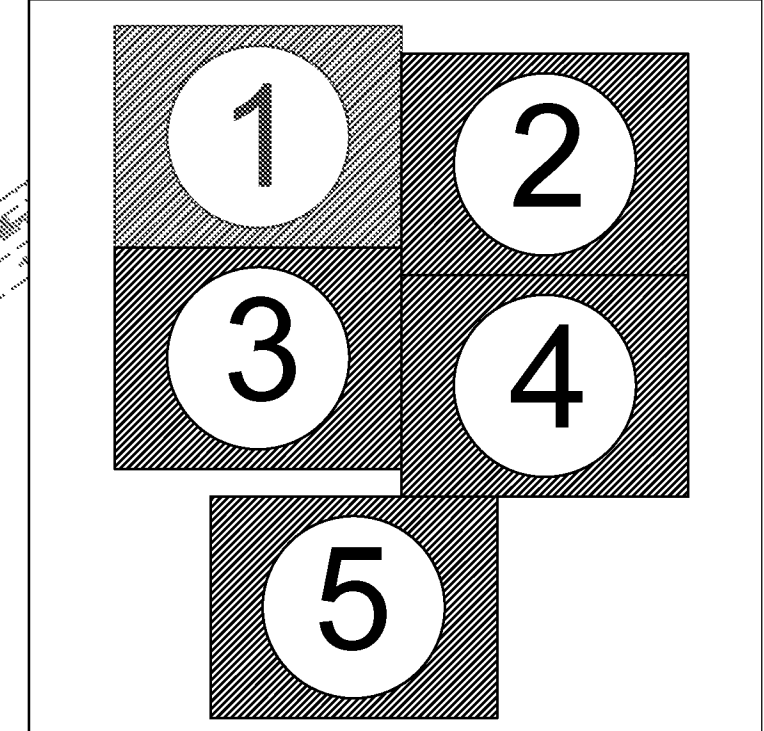
All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction. Grid coordinates are based on an OS GNSS system.

DISCLAIMER: The location of underground services shown on this drawing have been determined using electro-magnetic and/or ground probing radar, where requested) techniques and visual observations. The limitations of this drawing should be noted. It should not be given that all services have been identified. This drawing should not include the location of all public services as they may be at the site of the proposed service drawings should be obtained from the appropriate utility company and used in conjunction with the drawing. It is not intended to show any other below ground obstructions not indicated on this drawing may be present on site. Reference should be made to the historical ground and soil drawings. Excavations in the vicinity of services should be carried out with due diligence (ref: HSG47 documents) and the services should be identified and services. Location accuracy is determined by referring to manufacturers guidelines for the systems employed.

All utilities and features have been added to base plan, creating a scale hand drawing on site then transferring to caad.

[illegible]

Sheet Layout



SURVEY NOTES	

[illegible]

Rev. Suffix	Date		Initial		Revision Details				
Surveyor	SS	Verified By	SS	CAD Operator	ARL	Approved By	TJH	Date	30.01.18
Levelling		GNSS			Datum		OSGB36		

To an OS GNSS Datum

Client
Barton Wilmore

Location	
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Ford Airfield
Ford, West Sussex

Drawing Title

Underground CCTV

Survey - Sheet 1 of 5

Drawing Number BW/1812008/1	Revision Suffix
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Scale 1:500m (A0)	Date January 2019
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ALL UTILITIES AND FEATURES SHOWN BY S/S HAVE BEEN ADDED TO BASE PLAN BY CREATING A SCALE HAND DRAWING ON SITE THEN TRANSFERRED TO DAD.

DUE TO POTENTIAL INADEQUACIES THAT MAY ARISE FROM SUCH TECHNIQUES THE LOCATION OF ALL S/S SHOWN FEATURES MUST BE TREATED AS INDICATIVE AND ANY UTILITY DIMENSIONS CONFIRMED ON SITE.

Rev. Suffix	Date		Initial		Revision Details					
Surveyor	SS	Verified By	SS	CAD Operator	ARL	Approved By	T-J-I	Date	30.01.18	
Levelling		GNSS			Datum		OSGB36			

Client	
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Location	

Drawing Title

Underground CCTV
Survey - Sheet 4 of 5

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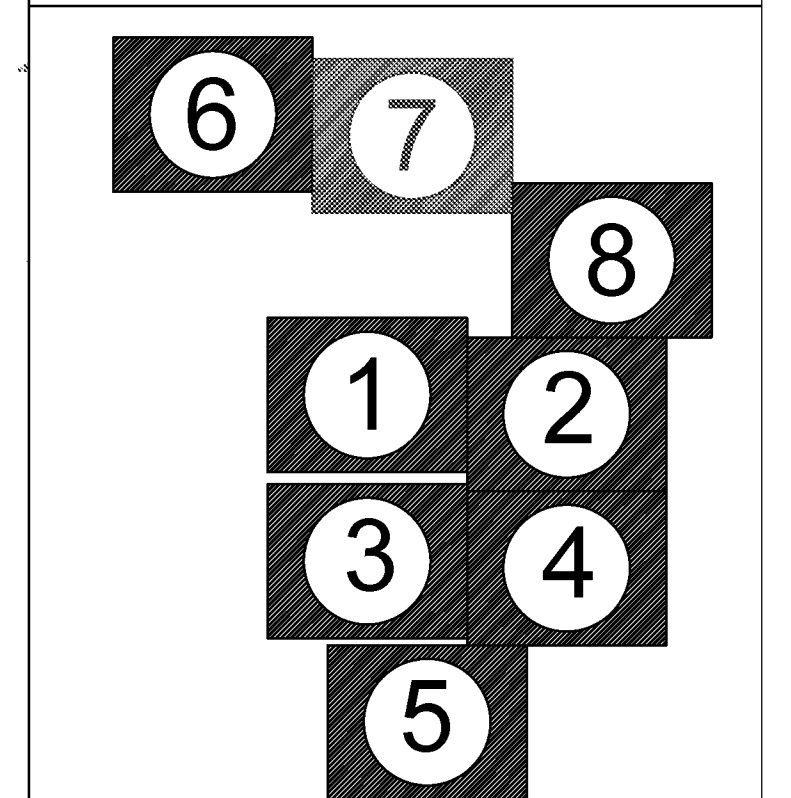
All information contained in this drawing (including digital data) should be checked and verified against the facts of the investigation. Grid coordinates are based on the OS GNS5 system.

DISCLAIMER: The location of underground services shown on this drawing have been determined using electro-magnetic (and/or ground probing) methods (where requested) and/or visual observations. The limitations of this drawing should be realised and no guarantee can be given that all services shown are correct. This drawing may not include the location of all public services that may cross the site and therefore the relevant service providers should be consulted to obtain appropriate utility company and used in conjunction with this drawing. Additional services, structures or other features may be observed on site and shown on this drawing may be present on site. Reference should be made to historical plans and as built drawings. Excavations in the vicinity of services should be carried out with due diligence to HSG47 identifying dangers from underground services. Location accuracy is determined by referring to manufacturers guidelines for the systems deployed.

Use of utilities and features have added to base plan, creating a scale hand drawing on site then transferred to CAD.

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Sheet Layout



SURVEY NOTES

USE TO REPORT UNDESIRABLE THING THAT AFFECTS YOUR STUDY TECHNOLOGY. THE LOCATION OF AND HOW SOME PEOPLE USE YOUR EQUIPMENT FOR INFORMATION AND ARE UNWILLING TO BECOME RESPONSIBLE FOR THEM.			
A	13.02.19	ARL	Additional information added to survey

Rev. Suffix	Date	Initial	Revision Details						
Surveyor	SS	Verified By	SS	CAD Operator	ARL	Approved By	TJH	Date	30.01.18
Levelling		GNSS		Datum			OSGB36		

To an OS GNSS Datum

Client

Barton Wilmore

Location

Location	Ford Airfield
Environment	Field
Weather	Clear
Time of Day	1400
Altitude	100
Temperature	20
Humidity	50
Wind Speed	10
Wind Direction	090
Visibility	10
Barometric Pressure	30.0
Relative Humidity	50
Dew Point	55
Cloud Cover	0
Cloud Type	
Cloud Height	
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Ford, West Sussex
Drawing Title

Underground CCTV

Survey - Sheet 7 of 8	
Job No. 1812008	Old Job No.

Drawing Number	Revision Suffix
BW/1812008/7	A

Scale 1:500m (AO)	Date January 2010
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