

Alan Wood & Partners

**DRAINAGE ASSESSMENT
FOR
RESIDENTIAL DEVELOPMENT
ON THE FORMER
HMRC CAR PARK, BARNSELY**

~

**FOR
EMPIRE PROPERTY CONCEPTS**

PROJECT REF:- JMS/JJS/JMcA/38607-Rp001

APRIL 2017

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DRAINAGE ASSESSMENT FOR RESIDENTIAL DEVELOPMENT ON THE FORMER HMRC CAR PARK, BARNSELY

Project Reference: JMS/JJS/JMcA/38607-Rp001

Prepared by: **J McArdle**
Senior Civil Engineer

Signed:



Date: 24th March 2017

Approved by: **James Shores** BEng (Hons), CEng, MStructE
Associate

Signed:



Date: 24th March 2017

Issue	Revision	Revised by	Approved by	Revised Date
V2	Final Issue	James McArdle	James Shores	24-03-17
V3	Minor amendments following planning comments	Scott Linda	James Shores	06-04-17

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.

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1.0 Introduction

A Drainage Impact Assessment (DIA) for the proposed residential development on the former HMRC Car Park in Barnsley (S70 1JP) is required to provide civil engineering advice for the proposals, focussing on the underground drainage.

1.1 Layout of Report

Section 2 provides an introduction to the site and supporting information gathered through the consultation. Section 3 of this report details the proposed development. Section 4 of this report details the development proposals, and outlines an indicative foul and surface water drainage strategy. Section 5 of this report provides a summary and any recommendations for further work.

1.1.1 Sustainable Drainage

The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objective, and NPPF and Part H of the Building Regulations (DTLR, 2002) directs developers towards the use of SuDS wherever possible.

2.0 Existing Site Description

2.1 General

The proposed development lies within Barnsley, located off Heelis Street, as shown in Figure 1 below, and the aerial image in Figure 2. The OS grid reference for the site is approximately 434670, 405925 and the overall site is approximately 0.26 hectares (ha) in area.

Figure 1: Location Plan

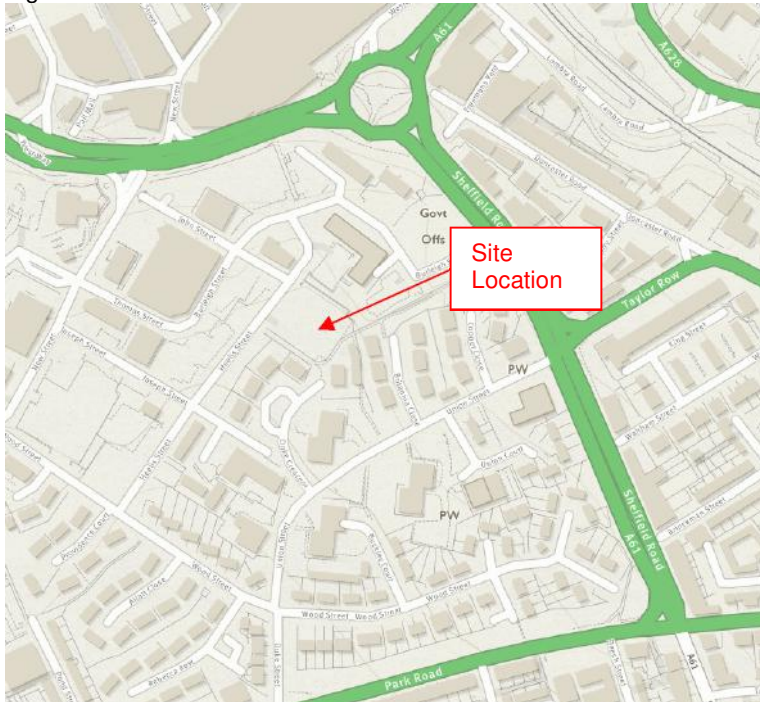
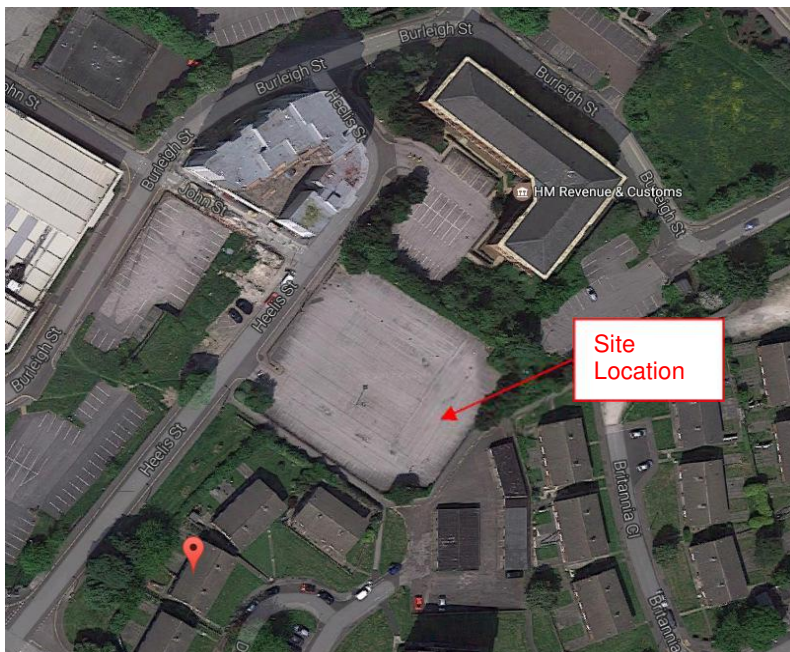


Figure 2: Aerial Image



2.2 Surrounding Features and Site Characteristics

The site is currently a macadam car park with principle access from Heelis Street. The land falls generally from north to south running parallel to Heelis Street, and is retained via a brickwork wall along the roadway edge. The site is surrounded by residential properties consisting of terrace and high rise flats. To the Northern boundary is the former HMRC Building, which is currently being converted into apartments by our client under permitted development.

2.3 Ground Investigation

There has not been any ground investigation undertaken on the site at present. However from the British Geological Survey and Information from our Geological Team, it is known the underlying strata is likely to be clay on sandstone.

- Local knowledge of the area, makes it very unlikely that soakaways will work due to underlying clay strata;
- The fact that the site is positively drained to private sewers, reinforces that soakaways are not a viable to dispose of surface water.

However further testing on site to the requirements of BRE 365, would be required to confirm the above observations.

2.4 Utility Surveys

The topographic surveys in Appendix 1.1 and Yorkshire Water Mapping (Appendix 1.2) contain information of the existing sewer systems within the site, of which are summarised below:

Within the boundary of the site there is a 375mm diameter public foul water sewer recorded crossing diagonally across the site. This then runs east down the side of the former HMRC Building car park into a manhole located within Heelis Street where the diameter changes to 450mm and becomes a combined sewer.

There is a 300mm diameter public surface water sewer recorded crossing the site east to west discharging into a manhole in Heelis Street then running east down John Street.

In addition to the above there is a 225mm diameter public surface water sewer identified on the CCTV mapping which looks to drain the existing garages and houses in Dukes Crescent. There is a single manhole in the south east corner of the development site, before heading east towards Britannia Close. The topographical survey indicates the car park is positively drained via precast concrete channels and gullies.

3.0 Proposed Development

3.1 Description

A layout of the proposed site is included in Appendix 1.3. The proposals are to:

- Construct an apartment block consisting of approximately 100 dwellings;
- Provide a residents courtyard with associated green areas;
- Provide car parking in the basement, with space for refuse collection;
- Divert existing 375mm diameter Public foul water sewer under a Section 185 agreement.

Relevant drainage risk related information is listed below:

- No works are planned to raise or lower the site ground levels at the boundaries;
- The foundations of the new buildings will be designed and constructed appropriately;
- Surface water will be collected from new roofs, car parks and hardstanding areas formally and positively discharged, as further discussions in Section 4;
- The development will be provided with a separate foul water sewer system which will connect to the local private network;
- The lifetime of the development is considered to be 60 years due to its residential nature.

3.2 Impact of Climate Change

In accordance with NPPF, the impact of climate change should be included in the analysis. Due to the development lifetime being 60 years, a 40% increase to rainfall intensity due to climate change will be included for in the 1 in 100 year analysis.

4.0 Drainage Assessment

In accordance with standard recommendations of the Environment Agency and Barnsley Metropolitan Borough Council, the drainage assessment within this report should demonstrate that the proposed foul and surface water discharge rates will be within acceptable limits through the use of flow control devices and attenuation systems. This assessment will look at whether the proposals are capable of managing peak flows in relation to both foul and surface water, and over a range of return periods. No specific design details will be provided at this stage, only an assessment based on a desk top study using the existing information; it is the intention that the report provides sufficient justification at this stage of the project to enable a suitably worded planning condition to be applied to the grant of planning permission.

In accordance with NPPF/EA/BMBC/YWS the existing discharge rates should be reduced by 30% in-line with current guidance. This is explored in section 4.4.

4.1 Existing Foul Drainage

There is at present no private foul drainage on site.

4.2 Proposed Foul Water Drainage

New foul water drainage is required to serve the development; the flow rates are not expected to be significant, less than 4.5l/s.

The proposed basement may require pumping. However, this is subject to final design. If required, 24hr storage will be needed to meet current Building Regulations.

For the proposed development foul flows will be collected in a separate private below ground foul water sewer system which will be designed to meet the standards of the Building Regulations Part H with particular reference to Table 6.

Table 1: Minimum Gradients for Foul Drains

Peak Flow (litres per second)	Pipe Diameter (mm)	Minimum Gradient (1 in ...)	Notes
< 1	100	40	None
> 1	100	80	Minimum 1 WC
> 1	150	150	Minimum 5 WCs

4.3 Existing Surface Water Drainage

The existing surface water is collected via precast channels and gullies from the car park. This area consists of a macadam finish, therefore the whole area positively drains into the network.

The area of the existing car park and contributing impermeable area is estimated as 2500m². This area is currently drained by a 225mm diameter drain.

The estimated capacity of a 225mm diameter drain at a gradient of 1 in 363 is 26.7 l/s.

A CCTV survey of the sewers was provided. The condition of the below ground drainage system is known to be good, however the survey has highlighted areas which require consideration for repairs. Further repairs are recommended in-line with recommendations as listed with the report.

A copy of the CCTV Report is included in Appendix 1.5 of this report.

Flood Estimation

Using 26.7 l/s as a control flow rate for an area of 2500m², a simplified hydraulic model has been used to estimate the flooding volumes for the existing site area, as shown in Table 2.

Table 2: Indicative Existing Flood Volumes

Return Period (1 in X years)	Flood Volume (m ³)
1	4
30	25
100	40

Flooding occurs during all return events however due to the existing usage being a car park, there is no issue with surface flooding during high return/storm periods. This will dissipate over time into the drainage system and is likely not to cause any major issues.

4.4 Proposed Surface Water Drainage

Part H of the Building Regulations requires a hierarchy of discharge methods to be considered as follows:

- Discharge to ground via infiltration methods
- Discharge to watercourse
- Discharge to sewer

Potential to infiltrate to ground has been discounted as an effective method of discharging surface water. There are no watercourses within the vicinity of the site, therefore it is proposed to utilise the existing connection to the Public Sewer for the disposal of surface water run-off

The car park area is formally drained as existing, we intend to take the total discharge across the site, and provide a pro-rata 30% reduction in the rate of surface water discharge, based on the previous use of the site. From the existing topographical survey, the total impermeable area was estimated as 0.25Ha.

$$2.781 \times 0.25 \times 50\text{mm} = \mathbf{34.76 \text{ l/sec}}$$

Allow for 30% reduction in surface water discharge gives:

34.76-10.42 = **24.33 l/sec**

The proposed solution is to construct surface water drains around the building and connect to the existing manhole nearest the offsite drain, just upstream of the public sewer. To ensure flows from the site are not increased localised attenuation and flow restriction would be required.

Attenuation Estimation

It is a requirement of Building Regulations to protect sites from flooding during storm events up to and including the 1 in 30 year rainfall event.

National Planning Policy Framework requires consideration of flooding for storm events up to and including the 1 in 100 year rainfall event with an allowance for climatic change.

As noted above, controlling flows from the proposed to the rate of 24.33 l/s based on an assumed area of 2500m² requires the attenuation storage as shown in Table 3.

Table 3: Indicative Proposed Attenuation Volume (Car Park)

Return Period (1 in X years)	Attenuation Volume (m ³)
30	21
100+CC	54

CC = 40% increase due to climate change impact on rainfall intensity

Storage

Attenuation storage can be provided in a number of ways: oversized pipes, culverts, geo-cellular crates, basins or with the drainage network.

It is recommended the use of geo-cellular crate type attenuation would be suitable.

The WinDES attenuation storage volumes shown in Table 3 are included in Appendix 1.6.

Network

In order to convey surface water flow from the new development around the site, 150mm and 225mm diameter pipes laid between inspection chambers and manholes will need to be constructed to connect to the existing system.

It may not be possible to discharge into the existing public sewers hence pumping maybe required subject to levels and final design. Gullies/linear channels will need to be positioned to drain the hardstanding areas and connect into the new sewers, with the levels of the surface designed to suit.

Surface water flows should be controlled by the installation of vortex type flow control devices (HydroBrake or similar) downstream of the attenuation.

At this stage any proposed car parking provision is presumed to be small (less than 50 spaces). Therefore, oil/petrol interception would not be required. If this changes and the car park increases in size, or another is planned, the use of interceptors should be re-assessed.

An indicative layout of the new surface water sewer network is contained in Appendix 1.5 (SK01 and SK02).

4.5 Sustainable Drainage

The use of SuDS is always encouraged. On this site it is not possible to discharge surface water into the ground via infiltration due to poor ground conditions. However, permeable paving, or filter trenches or swales could be used to convey and treat surface water.

This should be considered at the detailed design stage, in relation to the specific proposals, risks, costs and the system advantages and disadvantage. For example, permeable paving can be used to store excess surface water flows, and does not require gullies to drain it.

4.6 Limitations

The information included in this report is subject to detailed design and co-ordination with the project team.

Drains to be abandoned should either be grubbed up and the trenches backfilled with engineered stable material, or the system grouted and sealed to prevent future collapse and infestation.

As noted previously, a full hydraulic model of the existing system has not been constructed, only simplified estimates have been used. At the detailed design stage it is recommended that a detailed model is built, using the survey information that has been recommended in this report, to fully determine the flood risk within the site.

All works to the existing public sewer, including Section 185 diversion works are to be discussed in detail with Yorkshire Water Services to obtain all necessary approvals/permissions and easements required.

5.0 Summary

The report has been prepared to assess drainage implications of the proposed development at the Former HMRC Car Park, Heelis Street, Barnsley.

As a result of the proposed basement it may be necessary to pump the foul and surface water drainage, dependent upon final levels and design.

The proposals as shown are subject to detailed design and may alter to reflect project developments and external levels.

The site investigations discount the use of infiltration method on the site, therefore surface water will be collected and attenuated. Geo-cellular infiltration tanks are proposed for the disposal of surface water run-off from the development. The controlled surface water run-off will then be pumped into the existing private drainage which flows into the existing public surface water sewer on site.

Any existing drainage infrastructure that becomes redundant as a result of the proposed works will be suitably capped off and/or removed in accordance with the requirements of Part H of the Building Regulations.

Further consultation is to be sought with Yorkshire Water Services regarding the proposed connection and Section 185 diversion works.

Additional investigation is recommended to confirm the pipe from X04 (see Appendix 1.4) upstream is abandoned as noted on the CCTV report.

Overall, this report demonstrates that the proposed flows have been managed effectively via appropriate measures.

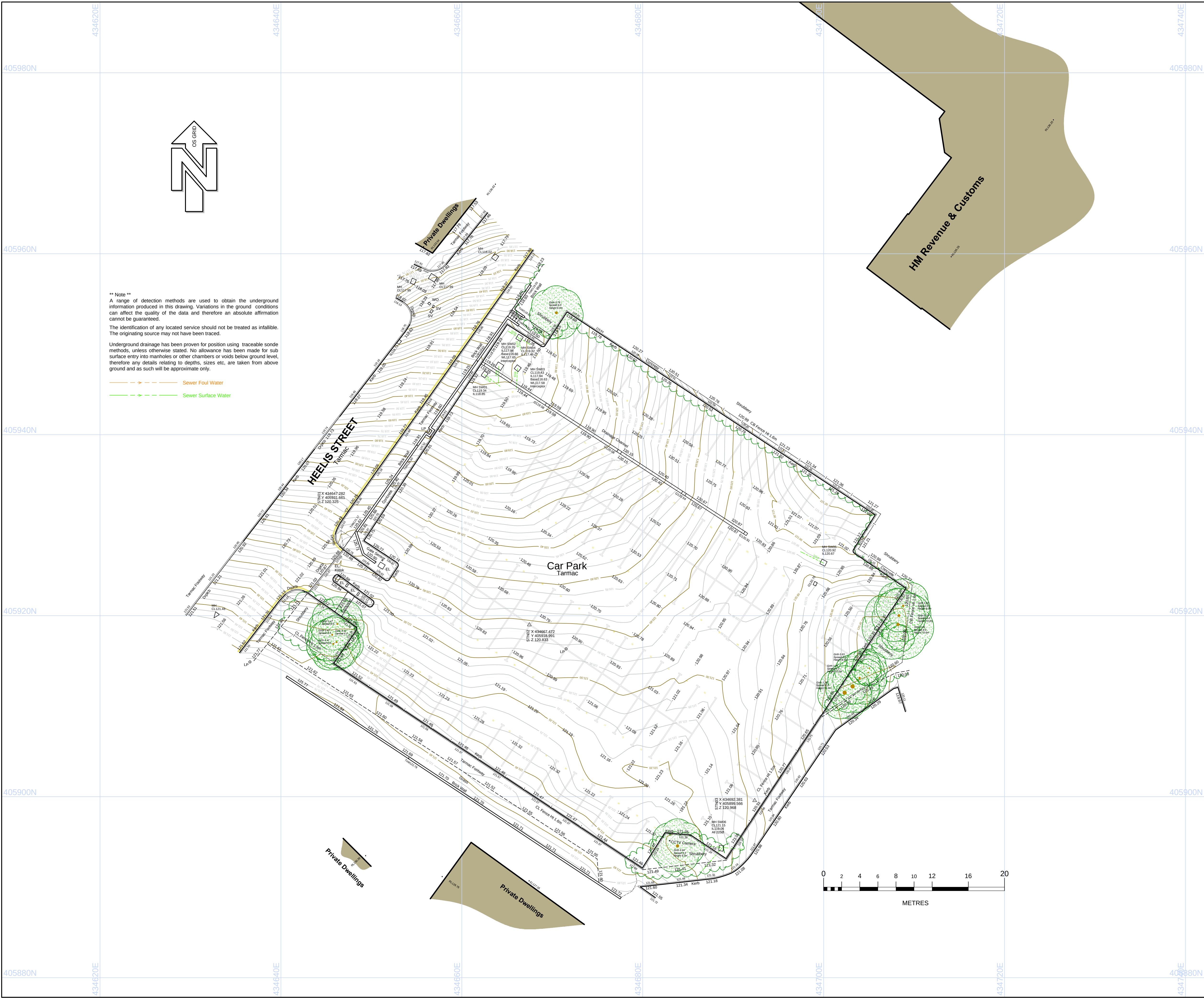
APPENDIX 1:

Supporting Information

- 1.1 TOPOGRAPHIC SURVEY
- 1.2 YORKSHIRE WATER RECORD PLANS
- 1.3 PROPOSED SITE LAYOUT
- 1.4 INDICATIVE DRAINAGE SKETCH
- 1.5 CCTV DRAINAGE REPORT
- 1.6 WINDES SURFACE WATER STORAGE CALCULATIONS

APPENDIX 1.1

TOPOGRAPHIC SURVEY



**** Note ****
A range of detection methods are used to obtain the underground information produced in this drawing. Variations in the ground conditions can affect the quality of the data and therefore an absolute affirmation cannot be guaranteed.
The identification of any located service should not be treated as infallible. The originating source may not have been traced.
Underground drainage has been proven for position using traceable sonde methods, unless otherwise stated. No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level, therefore any details relating to depths, sizes etc. are taken from above ground and as such will be approximate only.

-----> Sewer Foul Water
-----> Sewer Surface Water

Notes

- Surveyed February 2017
- Survey related to Ordnance Survey "OS Net" at control point STN02, using realtime correction received via Trimble Navigations "VRS Now" service. Survey plotted to flat plane metric grid with no local scale factor applied, i.e. 1:SF 1.00.
- Levels related to GPs Orthometric height, converted to MSL (Newlyn) by OSGM15.

Control

STN	East	North	Level	Type
STN01	434647.282	405931.661	120.325	Nail
STN02	434667.472	405918.991	120.833	Nail
STN03	434692.381	405899.566	120.968	Nail

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 Kerb & Drainage System	Drainage Channel	
Road Traffic Sensors	Fence Line -	
BW Barbed Wire	HR Hand Rail	PR Post & Rail
CB Close Boarded	IR Iron Railings	SB Safety Barrier
CH Chain Link	ME Metal Post & Rail	SE Security Fence
CL Chain Link	OB Open Boarded	TF Temporary Fence
CP Concrete Panel	PA Paving	WM Wire Mesh
(D) Dispersed	PC Post & Chain	
Hedge Line		○ Bush
Tree / Scrub Canopy Line		⊗ Tree-Deciduous
O/H Telephone / Electric Cable(s)		⊗ Tree-Evergreen
Rock Face		
Pipe Line (Above Ground)		
PT Pit (with level)	Survey Station	Gate
BH Borehole (with level)	Spot Level	Level Datum (Deciduous)
	Woodland Area (Coniferous)	Electric Pylon
		Marsh Land

Feature Abbreviations

ACU Air Conditioning Unit	FH Fire Hydrant	NP Name Plate	SVP Sol Vent Pipe
BB Bellisha Beacon	FP Fence Post	PB Post Box	TAP Stand Pipe
BD Ballast	FL Floor Light	PM Parking Meter	TCB Telephone Box
BOU Ballast (L)	G Gully (with Level)	RBB Rodent Bait Box	TEL Telecom's Cover
BP Boundary Post	RE Roadside Eye	RS Road Sign	TP Telephone Pole
BS Bus Stop	GC Gas Cover	RS Road Sign	TS Traffic Signal Cover
CATV Cable TV Cover	LO Lighting Beacon	RWP Rain Water Pipe	VP Vent Pipe
CCTV Close Circuit TV	LP Lamp Post	SNR Sensor	WM Water Meter
COL Column	LB Litter Bin	SP Sign Post	WO Wash Out
CP Concrete Post	ME Meter	SPL Sign Post (L)	WV Water Valve
DWB Dog Waste Bin	MH Manhole	SPL Sign Post (L)	UCU Unleashed Cover
EL Electric Cover	MP Marker Post	STAY Cable Stay	UTL Unable to Lift
EP Electricity Pole	MEP Metal Post	SV Stop Valve	Ø Diameter
ER Earth Rod			

Description Abbreviations

ASnd Rd Assumed Route	Flw Bd Flower Bed	O/H Overhead	OSBM Ordnance Survey
Bdwp Back Drop	FW Foul Water	OSBM Ordnance Survey	Bench Mark
Brk Brick	GTTP Grease Trap	RetWall Retaining Wall	Rd Edg Road Edge
BusSk Bus Stop Kerb	Ht Height	Rd Edg Road Edge	Spd Rtr Speed Retarder
Bldg Building	Hg Hedge	Stn Station	St Surface Water
CDMkbs Combined Drainage	Intgr Interceptor	STN Station	Tac Tactile Paving
CPI Catch Pit	Lvl Level	Tac Tactile Paving	Tarmac
Conc Concrete	Lvl Level		
CPI Catch Pit	mm Millimetres		
DrpK Drop Kerb	MSL Mean Sea Level		
Dm Chn Drainage Channel	No. Number		

Level Prefix

AL Arch Level	RL Road / Ridge Level	TSL Top of Steel Level	FFL Finished Floor Level
CL Cover Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level
EL Eave Level	SLL Slope Level	TSL Top of Steel Level	1st FFL 1st Finished Floor Level

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No.	Description	Date	Signed

Revisions

Drawing Status	
FINAL	

Surveyed	Date	Scale
WM	20.02.17	1:200

Drawn	Sheet	Approved
WM	1 of 1	AF

Client Doncaster Property Developments

Title Topographical Survey

Project HMRC Car Park
Heelis Street, Barnsley
South Yorkshire

Drawing No.	4162/10/001	Rev.

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Registered Office: St Vincent House, Normanby Road, Southcliffe, North Lincolnshire, DN15 8OT

APPENDIX 1.2

YORKSHIRE WATER SERVICE PLANS



YorkshireWater

Mr B Charles
Alan Wood & Partners
Hallamshire House
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Hayland Street
Sheffield
S9 1BY

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834

Your Ref: 38607 DLP Ltd
Our Ref: S017754

Email:
Technical.Sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

29th November 2016

Dear Mr Charles,

HMRC Car Park, Heelis Street, Barnsley, S70 1JP - Pre-planning sewerage enquiry on R374218 - Residential

Thank you for your recent enquiry. Our charge of £152.00 (plus VAT) will be added to your account with us, reference . You will receive an invoice for your account in due course.

Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months.

Existing Infrastructure

There is a 375 mm diameter public foul water sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within (3) three metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer.

There is a 300 mm diameter public surface water sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within (3) three metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer.

If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

(Please note:- due to the change in legislation on 01/10/2011 there may be public sewers within the site boundary which is not recorded on the Statutory Sewer Map the presence of which should be taken into account in the design of the scheme)

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul water domestic waste should discharge to the 375 mm diameter public foul sewer recorded crossing the site.



Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

If other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site. You will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense.

To do this, Yorkshire Water requires to see existing and proposed drainage layouts with pipe sizes, gradients and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRC publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

The public sewer network is for domestic sewage purposes. This generally means foul water for domestic purposes and, where a suitable surface water or combined sewer is available, surface water from the roofs of buildings together with surface water from paved areas of land appurtenant to those buildings. Land and highway drainage have no right of connection to the public sewer network. No land drainage to be connected/discharged to public sewer.

As a last resort, highway drainage may be accepted under certain circumstances. If it can be demonstrated, through satisfactory evidence, that SuDS are not a viable option, there are no watercourses or highway drains available and if capacity is available within the public sewer network, highway drainage discharges to the public sewer network may be permitted. In this event, the developer may be required to enter into a formal agreement with Yorkshire Water Services under Section 115 Water Industry Act 1991 to discharge non-domestic flows into the public sewer network.

All the above comments are based upon the information and records available at the present time. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith.



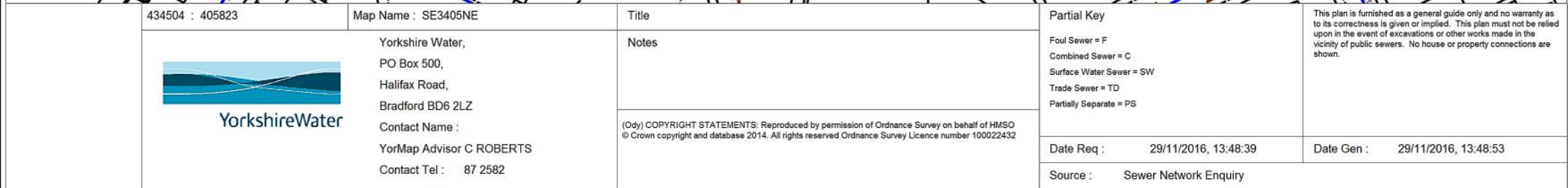
YorkshireWater

Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Chris Roberts'.

Chris Roberts
Sewerage Technician
Developer Services



APPENDIX 1.3

PROPOSED SITE LAYOUT



BIRCHLEIGH
468 SHADWELL LANE
SHADWELL
LEEDS
LS17 8BA

Email: s-eccles1@sky.com

Tel: 0113 808 4157
eFax: 0113 322 4639
Mob: 0794 6537770

RESIDENTIAL DEVELOPMENT
JOSEPH LOCKE HOUSE, HEELIS STREET
BARNSELY S70 1LG
for
EMPIRE PROPERTY CONCEPTS

PROPOSED PLAN

Date:	Drawn By:	Checked By:	Scale:
SEPT 2016	SDE		1:500 @ A4

Project No:	Drawing No:	Revision:
1082	010	

APPENDIX 1.4

INDICATIVE DRAINAGE SKETCH

Notes

A01. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS, WHERE CONFLICT OF REQUIREMENTS EXISTS THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION, OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.

A02. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.

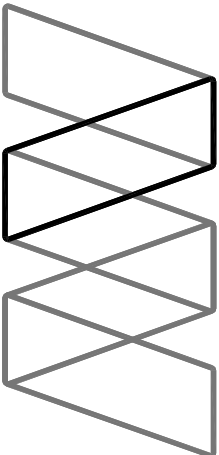
A03. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK IS COMMENCED.

NO PART OF THIS DRAWING MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT PRIOR PERMISSION IN WRITING FROM ALAN WOOD & PARTNERS.

GENERAL

G01. INFORMATION NOTED ON THIS DRAWING IS SUBJECT TO FINAL DESIGN AND SITE CONFIRMATION AS IS INTENDED FOR CONCEPT STAGE ONLY.

Rev.	Description	Date	Dwn.	Chk.
-	-	-	-	-



Alan Wood & Partners

Sheffield Office Hallamshire House Meadow Court Hayland Street Sheffield S9 1BY T. 01142 440077 www.alanwood.co.uk	Consulting Civil & Structural Engineers Project Managers Building Surveyors Also at: Hull Lincoln Manchester Scarborough Teesside York T. 01482 442138 T. 01522 200210 T. 01616 389234 T. 01723 865484 T. 01642 956680 T. 01904 611594
---	--

Project:	RESIDENTIAL DEVELOPMENT ON FORMER HMRC CAR PARK, BARNSLEY				
Client:	EMPIRE PROPERTY CONCEPTS				
Drawing:	INDICATIVE DRAINAGE SKETCH				
Date:	24.03.17	Scale@A3:	NTS		
Drawn By:	JMCA	Check By:	JJS	Approved By:	-
Drawing Status:	PRELIMINARY				
Job. no.	38607	Dwg. no.	SK01	Rev.	-



100mm at A3

APPENDIX 1.5

CCTV DRAINAGE SURVEY

Project

Project Name	10005341 EMPIRE PROPERTY CONCEPT
Description	CCTV Survey
Start Date	09/02/2017
Project Status	Not Set
Inspection Standard	

CCTV Survey Report

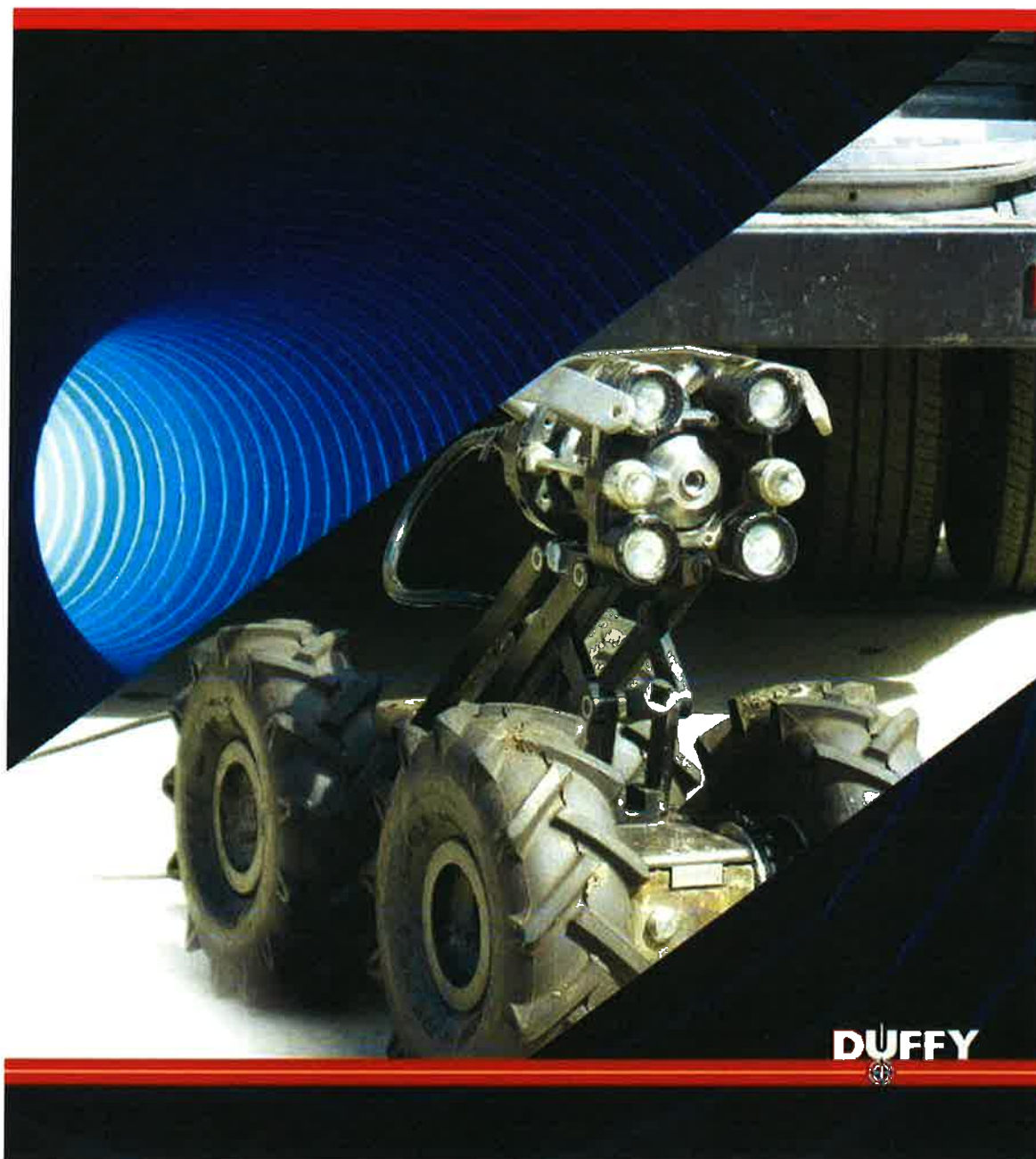


Table of Contents

Project Name 10005341 EMPIRE PROPERTY CONCEPT	Project Number:	Date: 09/02/2017
---	-----------------	----------------------------

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Section: 5; SE34056906 - SE3405XX04	6
Section: 6; SE3405XX04 - SE34056907	7
Section: 7; SE3405XX03 - SE3405XX04	9
Section: 8; SE34056804 - SE34056902	11

Scoring Summary

 Project Name :
 10005341 EMPIRE PROPERTY CONCEPT

Project Number :

 Date :
 09/02/2017

Structural Defects

Section	Pipe Ref	Grade	Description
---------	----------	-------	-------------

6	SE3405XX04X	4	Fracture, multiple from 12 o'clock to 12 o'clock
8	SE34056804X	4	Broken pipe from 5 o'clock to 9 o'clock

Grade 3: Best practice suggests consideration should be given to repairs in the medium term.

Grade 4: Best practice suggests consideration should be given to repairs to avoid a potential collapse.

Grade 5: Best practice suggests that this pipe is at risk of collapse at any time. Urgent consideration should be given to repairs to avoid total failure

Service / Operational Defects

Section	Pipe Ref	Grade	Description
---------	----------	-------	-------------

2	SE34056806X	4	Settled deposits, hard or compacted, 35% cross-sectional area loss
5	SE34056906X	3	Settled deposits, fine, 15% cross-sectional area loss
8	SE34056804X	4	Multiple defects

Grade 3: Best practice suggests consideration should be given to maintenance activities in the medium term.

Grade 4: Best practice suggests consideration should be given to maintenance activity to avoid potential blockages.

Grade 5: Best practice suggests that this pipe is at a high risk of backing up or causing flooding.

Abandoned Surveys

Section	Pipe Ref	Description
---------	----------	-------------

1	SE34056808X	Survey abandoned
5	SE34056906X	Survey abandoned
8	SE34056804X	Survey abandoned

Information

These summaries are based on the SRM grading from the WRC.

Project Information

Project Name 10005341 EMPIRE PROPERTY CONCEPT	Client's ref : 	Contractor's ref : 10005341	Date: 09/02/2017
---	--------------------	---------------------------------------	----------------------------

Description CCTV Survey

Client

Company or Site Name: Empire Property Concept
 Contact: Paul Rothwell
 Department: Office
 Street: 92-98 Cleveland Street
 Town or City: Doncaster
 Phone: N/a
 Fax: N/a
 Mobile: N/a
 Email: paul.rothwell@empirepropertyconcept.co.uk

Site

Company or Site Name: Empire Property Concept
 Contact: Paul Rothwell
 Department: Site
 Street: Former HMRC Carpark, Heelis Street
 Town or City: Barnsley, S70 1JP
 Phone: N/a
 Fax: N/a
 Mobile: N/a
 Email: paul.rothwell@empirepropertyconcept.co.uk

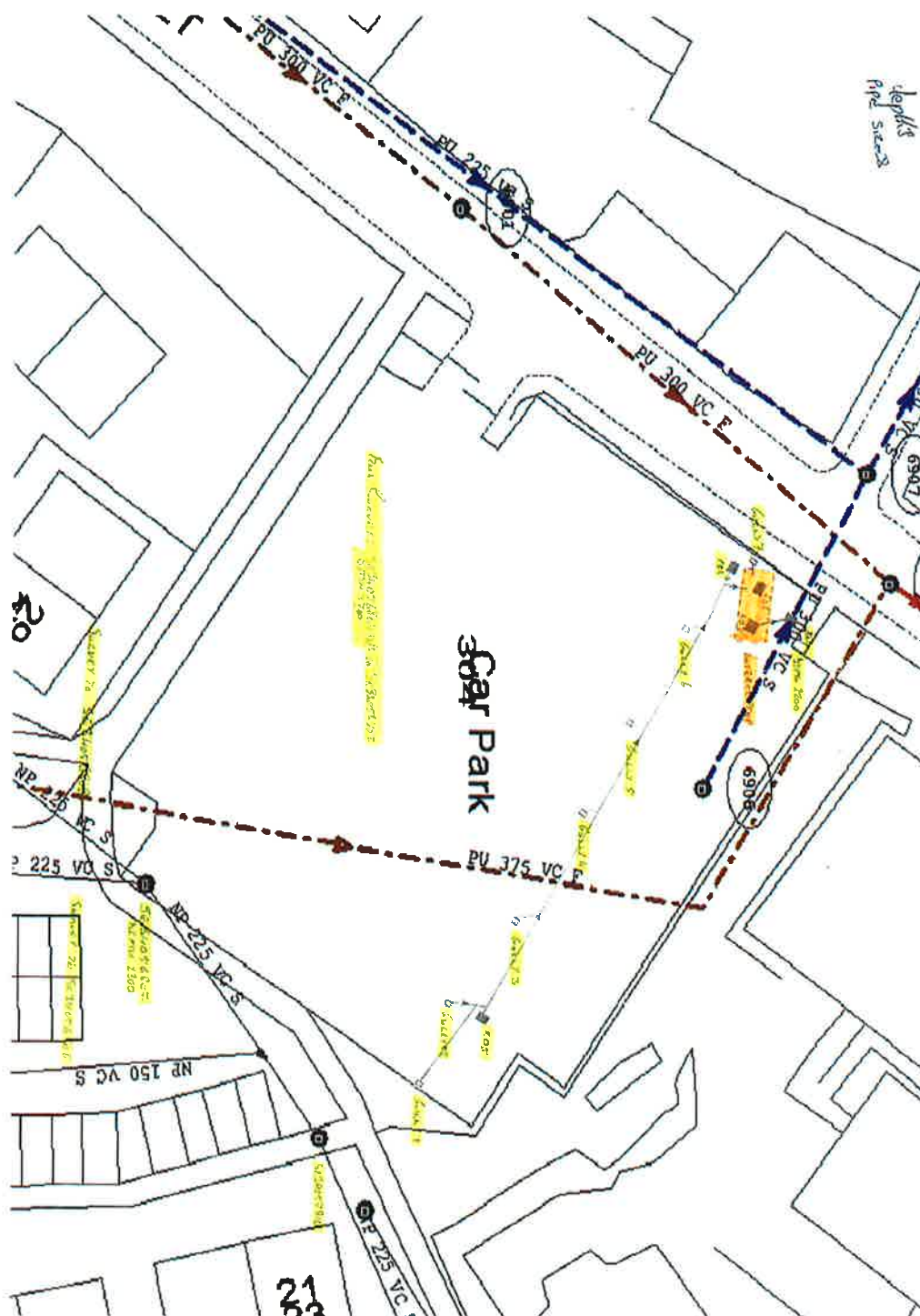
Contractor

Company or Site Name: Drainsaid
 Contact: Mike Booth
 Department: CCTV & Desilting
 Street: Connaught House, Park View
 Town or City: Lofthouse Gate, Wakefield
 Phone: 0800 0180123
 Fax: 01132 365488
 Mobile: 07507 816063
 Email: m.booth@peterduffyLtd.com

Project Information

Project Name	Client's ref :	Contractor's ref :	Date:
10005341 EMPIRE PROPERTY CONCEPT		10005341	09/02/2017

Description	CCTV Survey
-------------	-------------



Project Pictures

Project Name
10005341 EMPIRE PROPERTY CONCEPT

Date
09/02/2017



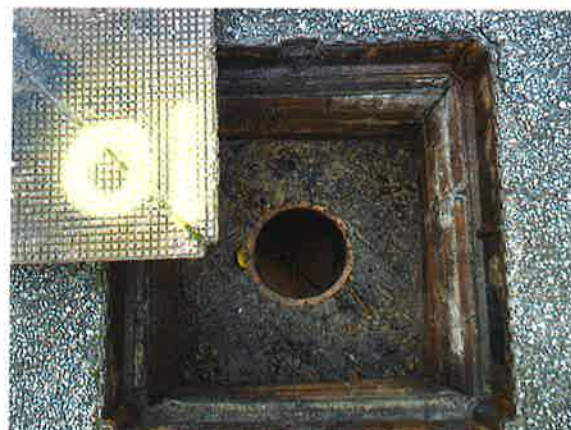
DSCF0733



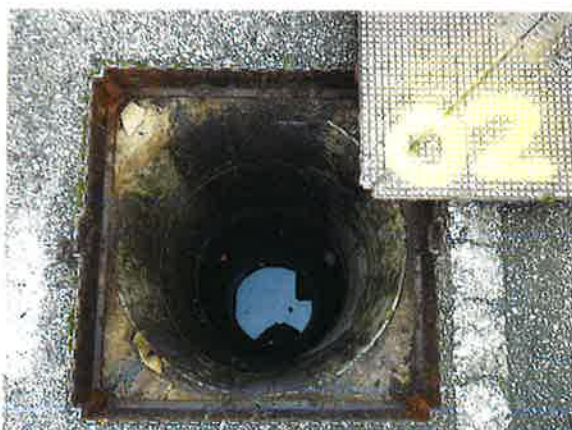
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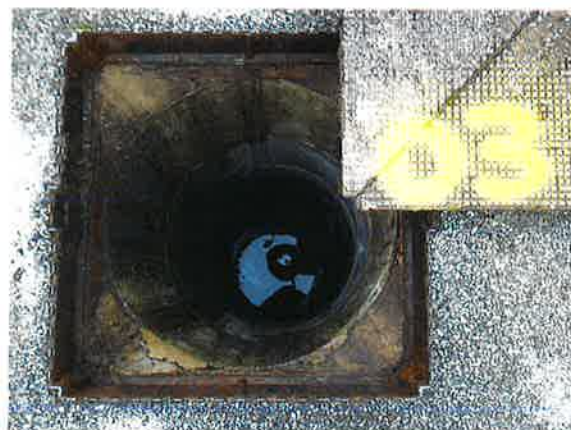
DSCF0735



DSCF0736



DSCF0737



DSCF0738

Project Pictures

Project Name
10005341 EMPIRE PROPERTY CONCEPT

Date
09/02/2017



DSCF0739



DSCF0740



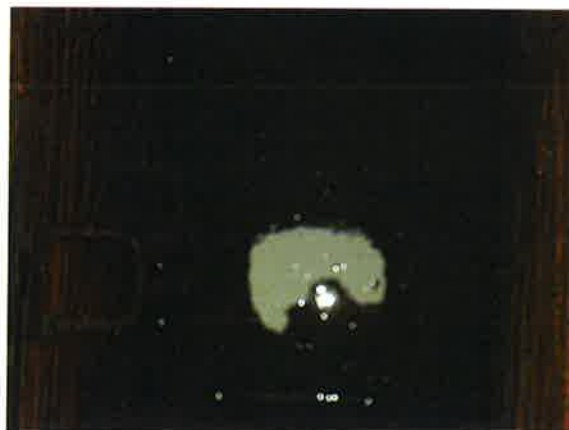
DSCF0741



DSCF0742



DSCF0743



DSCF0744

Section Inspection - 09/02/2017 - SE34056808X

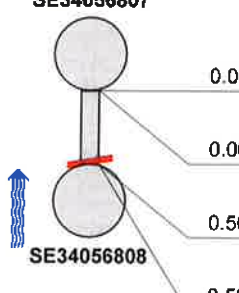
Section: 1	Inspection: 1	Date: 09/02/17	Time: 9:24	Client's Ref :	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056808X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

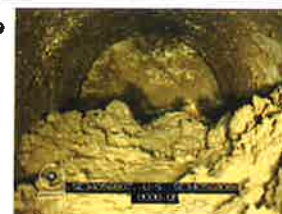
Town or Village:	Barnsley	Insp Dir:	SE34056807 ~ SE34056808	US MH:	SE34056808
Road:	Heelis Street	Inspected Length:	0.50 m	US Depth:	0.00 m
Location:	Other (state in comments)	Total Length:	0.50 m	DS MH:	SE34056807
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	2,300.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	225 / 225 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:

Recommendation:

1:50	Position m	Code	Observation	Grade
Depth: 2300.00 SE34056807				
	0.00	MH	Start node type, manhole, reference number: SE34056807	
	0.00	WL	Water level, 0% of the vertical dimension	
	0.50	REM	General remark: NO SEWER INSITU U/S TO MANHOLE SE34056808.	
	0.50	SA	Survey abandoned: DUE TO THE ABOVE	
Depth: 0.00				



0.50m // 00:00:39.78 // 1

Structural defects

Service and maintenance defects

Constructional features

Miscellaneous features

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 09/02/2017 - SE34056808X

Section Number :
1

Survey Direction :
SE34056807 ← SE34056808

PLR :
SE34056808X

Client's Ref :

Contractor's Ref :
10005341



1, 00:00:39, 0.50m
General remark / NO SEWER INSITU U/S TO MANHOLE SE34056808.

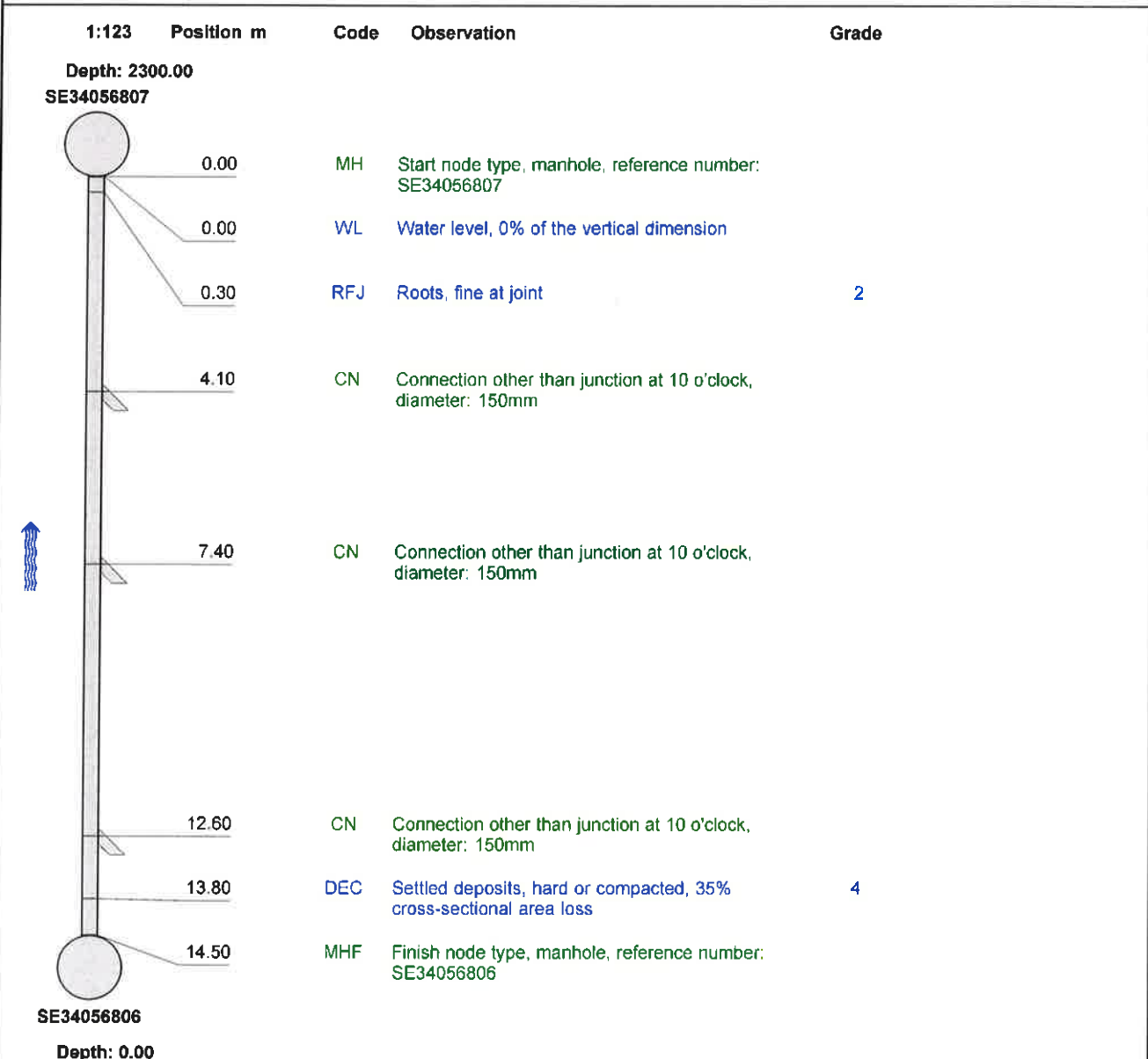
Section Inspection - 09/02/2017 - SE34056806X

Section: 2	Inspection: 2	Date: 09/02/17	Time: 9:32	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056806X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village:	Barnsley	Insp Dir:	SE34056807 < SE34056806	US MH:	SE34056806
Road:	Heelis Street	Inspected Length:	14.50 m	US Depth:	0.00 m
Location:	Other (state in comments)	Total Length:	14.50 m	DS MH:	SE34056807
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	2,300.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	225 / 225 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:
 Recommendation:



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	2	5.0	0.4	6.0	4.0

Section Inspection - 09/02/2017 - SE34056807X

Section: 3	Inspection: 3	Date: 09/02/17	Time: 9:41	Client's Ref :	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056807X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village:	Barnsley	Insp Dir:	SE34056807 ~> SE34057910	US MH:	SE34056807
Road:	Heells Street	Inspected Length:	25.50 m	US Depth:	2,300.00 m
Location:	Other (state in comments)	Total Length:	25.50 m	DS MH:	SE34057910
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	0.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	225 / 225 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:
 Recommendation:

1:216	Position m	Code	Observation	Grade
Depth: 2300.00 SE34056807				
	0.00	MH	Start node type, manhole, reference number: SE34056807	
	0.00	WL	Water level, 0% of the vertical dimension	
	15.30	CC	Crack, circumferential from 1 o'clock to 6 o'clock	2
	17.30	CN	Connection other than junction at 3 o'clock, diameter: 150mm	
	21.90	JN	Junction at 3 o'clock, diameter: 150mm: BLANK	
	23.10	CN	Connection other than junction at 12 o'clock, diameter: 150mm	
	25.50	MHF	Finish node type, manhole, reference number: SE34057910	
SE34057910 Depth: 0.00				

Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	10.0	0.4	0.4	2.0	0	0.0	0.0	0.0	1.0

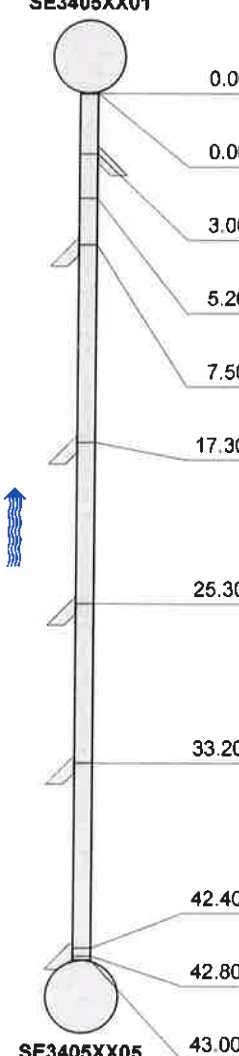
Section Inspection - 09/02/2017 - SE3405XX05X

Section: 4	Inspection: 4	Date: 09/02/17	Time: 10:48	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE3405XX05X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village: Barnsley	Insp Dir: SE3405XX01 ~ SE3405XX05	US MH: SE3405XX05
Road: Heelis Street	Inspected Length: 43.00 m	US Depth:
Location: Other (state in comments)	Total Length: 43.00 m	DS MH: SE3405XX01
Surface Cover: ASPHALT HIGHWAY	Pipe Length: 0.00 m	DS Depth:

Use: Surface water	Pipe Shape: Circular
Lining Type: None	Height / Width: 225 / 225 mm
Inspection Purpose: Investment planning	Pipe Material: Vitrified clay pipe (i.e. all clayware)
Year Constructed:	Flow Control: No flow control

Comment:
 Recommendation:

1:363	Position m	Code	Observation	Grade
Depth: SE3405XX01				
	0.00	MH	Start node type, manhole, reference number: SE3405XX01	
	0.00	WL	Water level, 0% of the vertical dimension	
	3.00	JN	Junction at 9 o'clock, diameter: 225mm: TO INTERCEPTOR.	
	5.20	LR	Line deviates right	
	7.50	JN	Junction at 2 o'clock, diameter: 150mm: FROM GULLY No 6.	
	17.30	JN	Junction at 2 o'clock, diameter: 150mm: FROM GULLY No 5.	
	25.30	JN	Junction at 2 o'clock, diameter: 150mm: FROM GULLY No 4.	
	33.20	JN	Junction at 2 o'clock, diameter: 150mm: FROM GULLY No 3.	
	42.40	JN	Junction at 1 o'clock, diameter: 150mm: FROM GULLYS 1+2.	
	42.80	LU	Line deviates up: TO MANHOLE SE3405XX05.	
SE3405XX05	43.00	MHF	Finish node type, manhole, reference number: SE3405XX05: NO DEFECTS TO REPORT.	

Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Depth:	STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total
0		0.0	0.0	0.0	1.0	0	0.0	0.0	0.0

Section Inspection - 09/02/2017 - SE34056906X

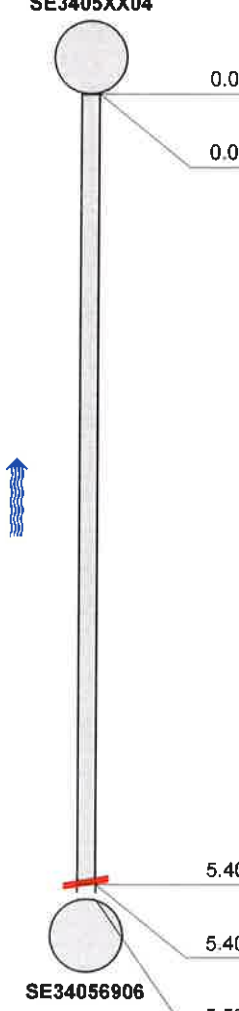
Section: 5	Inspection: 5	Date: 09/02/17	Time: 11:46	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056906X
Operator: C. Boswell		Vehicle: YA63NNX		Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Town or Village:	Barnsley	Insp Dir:	SE3405XX04 < SE34056906	US MH:	SE34056906
Road:	Heells Street	Inspected Length:	5.40 m	US Depth:	0.00 m
Location:	Other (state in comments)	Total Length:	5.50 m	DS MH:	SE3405XX04
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	2,200.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	300 / 300 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:

Recommendation:

1:50	Position m	Code	Observation	Grade
Depth: 2200.00 SE3405XX04				
	0.00	MH	Start node type, manhole, reference number: SE3405XX04	
	0.00	WL	Water level, 0% of the vertical dimension	
	5.40	DES	Settled deposits, fine, 15% cross-sectional area loss	3
	5.40	SA	Survey abandoned: DUE TO THE ABOVE. LINE ASSUMED REDUNDANT.	
	5.50		End of pipe	

 Depth: 0.00 **Structural defects**

Service and maintenance defects

Constructional features

Miscellaneous features

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	1	2.0	0.4	2.0	3.0

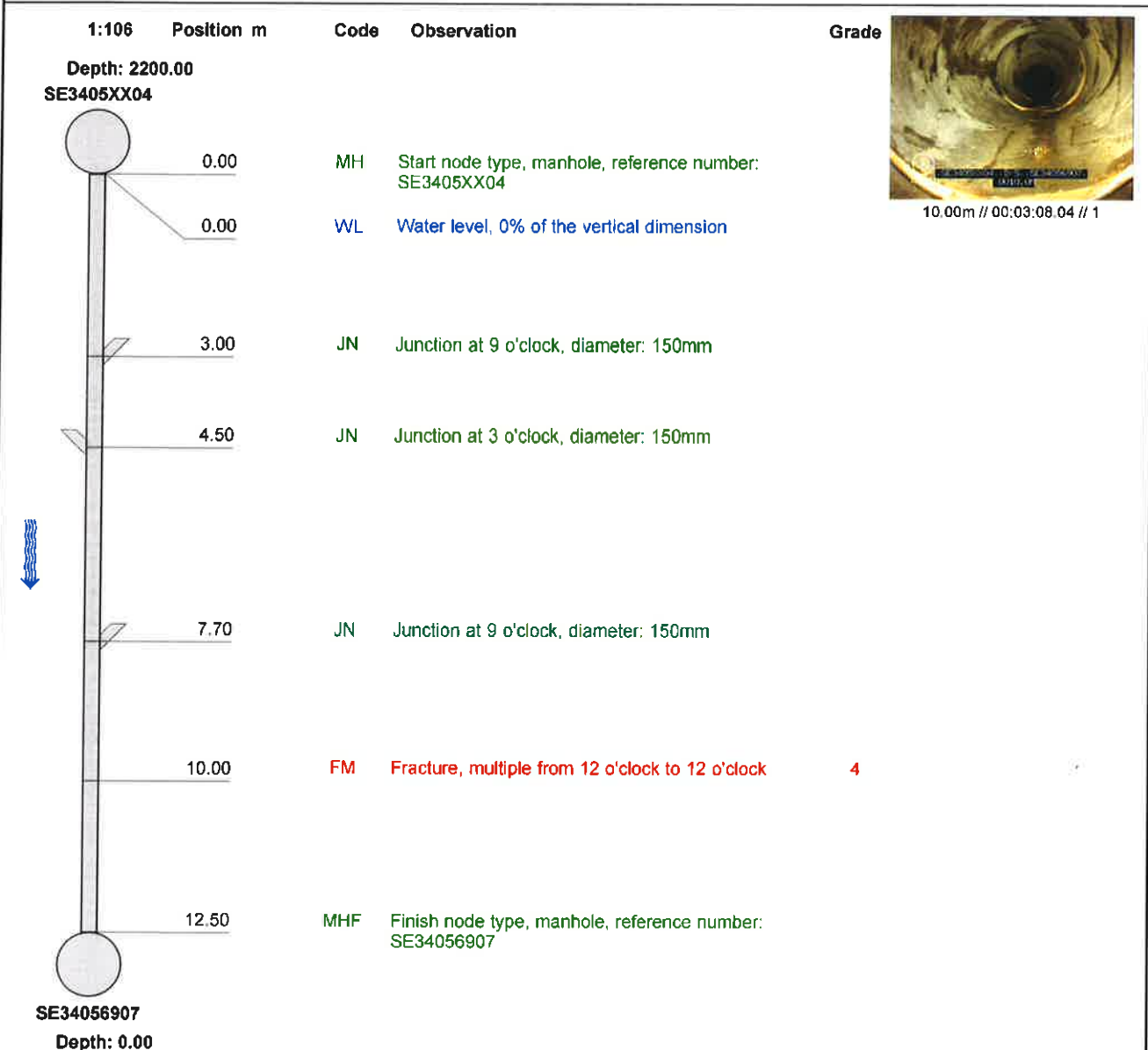
Section Inspection - 09/02/2017 - SE3405XX04X

Section: 6	Inspection: 6	Date: 09/02/17	Time: 12:14	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE3405XX04X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village:	Barnsley	InspDir:	SE3405XX04 ~ SE34056907	US MH:	SE3405XX04
Road:	Heelis Street	Inspected Length:	12.50 m	US Depth:	2,200.00 m
Location:	Other (state in comments)	Total Length:	12.50 m	DS MH:	SE34056907
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	0.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	300 / 300 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:
 Recommendation:



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	80.0	6.4	6.4	4.0	0	0.0	0.0	0.0	1.0

Section Pictures - 09/02/2017 - SE3405XX04X

Section Number :
6

Survey Direction :
SE3405XX04 → SE34056907

PLR :
SE3405XX04X

Client's Ref :

Contractor's Ref :
10005341



1, 00:03:08, 10.00m
Fracture, multiple from 12 o'clock to 12 o'clock

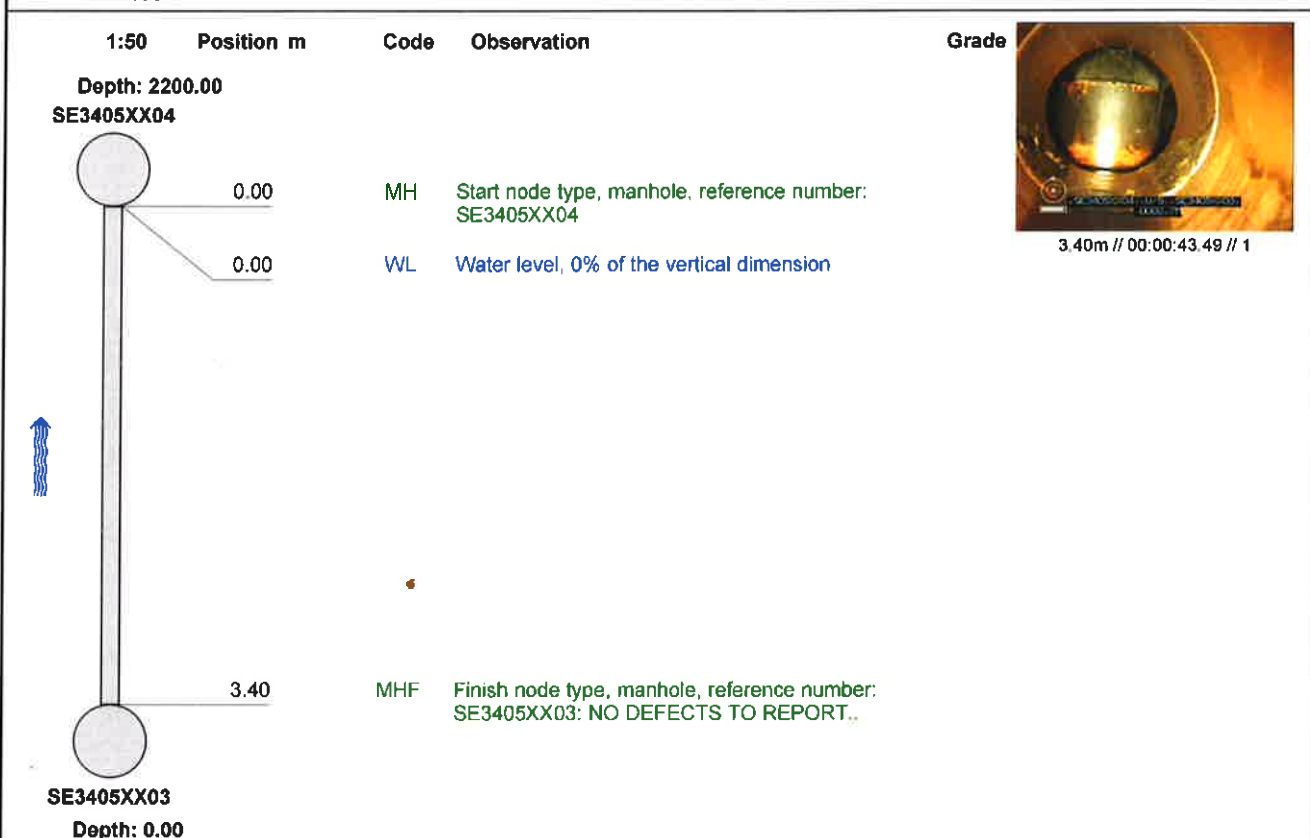
Section Inspection - 09/02/2017 - SE3405XX03X

Section: 7	Inspection: 7	Date: 09/02/17	Time: 12:20	Client's Ref :	Weather: No rain or snow	Pre Cleaned: No	PLR: SE3405XX03X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village:	Barnsley	Insp Dir:	SE3405XX04 < SE3405XX03	US MH:	SE3405XX03
Road:	Heells Street	Inspected Length:	3.40 m	US Depth:	0.00 m
Location:	Other (state in comments)	Total Length:	3.40 m	DS MH:	SE3405XX04
Surface Cover:	ASPHALT HIGHWAY	Pipe Length:	0.00 m	DS Depth:	2,200.00 m

Use:	Surface water	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	225 / 225 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:
 Recommendation:



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 09/02/2017 - SE3405XX03X

Section Number :
7

Survey Direction :
SE3405XX04 ← SE3405XX03

PLR :
SE3405XX03X

Client's Ref :

Contractor's Ref :
10005341



1, 00:00:43, 3.40m

Finish node type, manhole, reference number: SE3405XX03 / NO DEFECTS TO REPORT...

Section Inspection - 09/02/2017 - SE34056804X

Section: 8	Inspection: 8	Date: 09/02/17	Time: 13:25	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056804X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Town or Village:	Barnsley	Insp Dir:	SE34056804 → SE34056902	US MH:	SE34056804
Road:	Heelis Street	Inspected Length:	98.00 m	US Depth:	3,700.00 m
Location:	Other (state in comments)	Total Length:	115.00 m	DS MH:	SE34056902
Surface Cover:	GRASS	Pipe Length:	0.00 m	DS Depth:	0.00 m

Use:	Foul	Pipe Shape:	Circular
Lining Type:	None	Height / Width:	375 / 375 mm
Inspection Purpose:	Investment planning	Pipe Material:	Vitrified clay pipe (i.e. all clayware)
Year Constructed:		Flow Control:	No flow control

Comment:
 Recommendation:

1:243	Position m	Code	Observation	Grade
Depth: 3700.00 SE34056804				
	0.00	MH	Start node type, manhole, reference number: SE34056804	
	0.00	WL	Water level, 5% of the vertical dimension	
	1.20	FL	Fracture, longitudinal at 12 o'clock	3
	2.00	D	Deformed sewer/drain, 5%	2
	2.00	CC	Crack, circumferential from 7 o'clock to 5 o'clock	2
	3.00	B	Broken pipe from 5 o'clock to 9 o'clock	4
	3.00	CL	Crack, longitudinal at 12 o'clock	2
	4.00	CL	Crack, longitudinal at 11 o'clock	2
	4.20	CL	Crack, longitudinal at 3 o'clock	2
	4.20	CL	Crack, longitudinal at 9 o'clock	2
	4.70	CC	Crack, circumferential from 2 o'clock to 6 o'clock	2
	6.00	CL	Crack, longitudinal at 12 o'clock	2
	8.00	CL	Crack, longitudinal at 11 o'clock	2
	9.60	CC	Crack, circumferential from 11 o'clock to 12 o'clock	2
	10.70	CL	Crack, longitudinal at 12 o'clock	2

Section Inspection - 09/02/2017 - SE34056804X

Section: 8	Inspection: 8	Date: 09/02/17	Time: 13:25	Client's Ref :	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056804X
Operator: C. Boswell		Vehicle: YA63NNX		Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Recommendation:

1:243	Position m	Code	Observation	Grade
	11.20	FL	Fracture, longitudinal at 10 o'clock: #	3
	14.70	JN	Junction at 10 o'clock, diameter: 150mm	
	19.70	JN	Junction at 10 o'clock, diameter: 150mm	
	21.00	JN	Junction at 10 o'clock, diameter: 150mm	
	21.70	JN	Junction at 2 o'clock, diameter: 150mm	
	26.20	JN	Junction at 9 o'clock, diameter: 150mm	
	26.80	JN	Junction at 2 o'clock, diameter: 100mm	
	31.50	DES	Settled deposits, fine, 10% cross-sectional area loss	3
	32.00	CL	Crack, longitudinal at 12 o'clock	2
	33.00	DES	Settled deposits, fine, 10% cross-sectional area loss	3
	35.00	CL	Crack, longitudinal at 12 o'clock	2
	36.00	DES	Settled deposits, fine, 10% cross-sectional area loss	3
	37.50	JN	Junction at 9 o'clock, diameter: 225mm	
	38.00	JN	Junction at 4 o'clock, diameter: 150mm	
	43.00	DES	Settled deposits, fine, 10% cross-sectional area loss	3
	44.00	CL	Crack, longitudinal at 10 o'clock	2
	44.00	CL	Crack, longitudinal at 12 o'clock	2
	45.00	CL	Crack, longitudinal at 12 o'clock	2
	45.00	CL	Crack, longitudinal at 4 o'clock	2

Section Inspection - 09/02/2017 - SE34056804X

Section: 8	Inspection: 8	Date: 09/02/17	Time: 13:25	Client's Ref :	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056804X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Recommendation:

1:243	Position m	Code	Observation	Grade
	46.00	CL	Crack, longitudinal at 7 o'clock	2
	47.60	CM	Cracks, multiple from 12 o'clock to 11 o'clock	3
	48.50	JN	Junction at 10 o'clock, diameter: 150mm	
	49.20	JN	Junction at 2 o'clock, diameter: 150mm	
	51.00	JN	Junction at 12 o'clock, diameter: 100mm	
	51.00	LL	Line deviates left	
	51.50	CL	Crack, longitudinal at 12 o'clock	2
	51.50	CL	Crack, longitudinal at 1 o'clock	2
	51.50	CL	Crack, longitudinal at 9 o'clock	2
	53.00	JN	Junction at 12 o'clock, diameter: 150mm	
	53.00	CL	Crack, longitudinal at 6 o'clock	2
	53.60	JN	Junction at 10 o'clock, diameter: 150mm	
	54.00	CM	Cracks, multiple from 12 o'clock to 11 o'clock	3
	55.00	JN	Junction at 11 o'clock, diameter: 225mm	
	55.40	CXI	Connection intruding at 12 o'clock, diameter: 100mm, intrusion: 75%	4
	59.00	JN	Junction at 1 o'clock, diameter: 225mm	
	62.50	JN	Junction at 1 o'clock, diameter: 150mm	
	65.00	JN	Junction at 10 o'clock, diameter: 150mm	
	71.00	CL	Crack, longitudinal at 12 o'clock	2

Section Inspection - 09/02/2017 - SE34056804X

Section: 8	Inspection: 8	Date: 09/02/17	Time: 13:25	Client's Ref:	Weather: No rain or snow	Pre Cleaned: No	PLR: SE34056804X
Operator: C. Boswell	Vehicle: YA63NNX	Camera: Pearpoint	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer		

Recommendation:

1:243	Position m	Code	Observation	Grade
	73.00	CM	Cracks, multiple from 12 o'clock to 11 o'clock	3
	75.00	CXI	Connection intruding at 2 o'clock, diameter: 150mm, intrusion: 50%	4
	77.00	JN	Junction at 10 o'clock, diameter: 150mm	
	77.50	JN	Junction at 3 o'clock, diameter: 100mm	
	79.50	JN	Junction at 3 o'clock, diameter: 150mm	
	83.00	CM	Cracks, multiple from 12 o'clock to 11 o'clock	3
	87.60	CN	Connection other than junction at 10 o'clock, diameter: 150mm	
	88.30	JN	Junction at 3 o'clock, diameter: 100mm	
	98.00	SA	Survey abandoned: LOSS OF TRACTION DUE TO BENDS IN SEWER.	

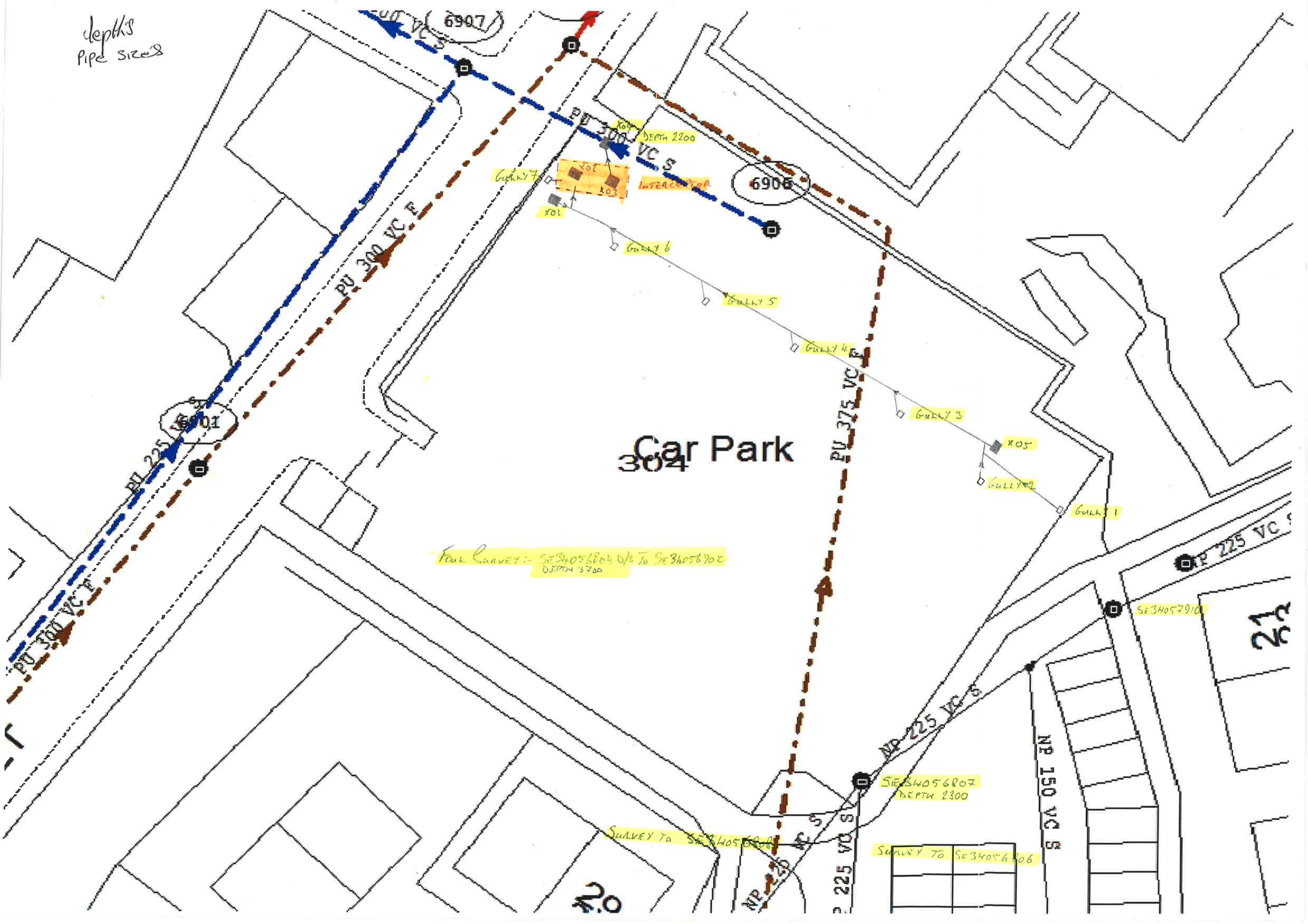
115.00

End of pipe

SE34056902
 Depth: 0.00

Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
30	90.0	2.8	2.8	4.0	6	8.0	0.1	21.0	4.0

depths
pipe sizes



Car Park

FOUR SURVEY:- SE34056804 D/S TO SE34056902
DEPTH 3700

SURVEY TO SE34056800

SE34056807
DEPTH 2300

SURVEY TO SE34056806

2.0

2.2

APPENDIX 1.6

WINDES SURFACE WATER STORAGE CALCULATIONS

Alan Wood & Partners		Page 1
Omega 2 Monks Cross Drive York YO32 9GZ	38607 Former HMRC Car Park M30	
Date 22-03-2017 13:50 File M30.SRCX	Designed by JMcA Checked by JJS	
Micro Drainage Source Control 2016.1		

Source Control 2016.1

Summary of Results for 30 year Return Period

Half Drain Time : 8 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.245	0.245	0.0	24.1	24.1	14.9	0 K
30 min Summer	8.288	0.288	0.0	24.3	24.3	17.5	0 K
60 min Summer	8.271	0.271	0.0	24.2	24.2	16.5	0 K
120 min Summer	8.200	0.200	0.0	23.7	23.7	12.1	0 K
180 min Summer	8.156	0.156	0.0	21.9	21.9	9.5	0 K
240 min Summer	8.132	0.132	0.0	19.0	19.0	8.0	0 K
360 min Summer	8.104	0.104	0.0	15.0	15.0	6.3	0 K
480 min Summer	8.087	0.087	0.0	12.5	12.5	5.3	0 K
600 min Summer	8.075	0.075	0.0	10.7	10.7	4.5	0 K
720 min Summer	8.066	0.066	0.0	9.4	9.4	4.0	0 K
960 min Summer	8.053	0.053	0.0	7.7	7.7	3.2	0 K
1440 min Summer	8.037	0.037	0.0	5.7	5.7	2.3	0 K
2160 min Summer	8.024	0.024	0.0	4.3	4.3	1.5	0 K
2880 min Summer	8.016	0.016	0.0	3.4	3.4	0.9	0 K
4320 min Summer	8.006	0.006	0.0	2.5	2.5	0.3	0 K
5760 min Summer	8.000	0.000	0.0	2.0	2.0	0.0	0 K
7200 min Summer	8.000	0.000	0.0	1.7	1.7	0.0	0 K
8640 min Summer	8.000	0.000	0.0	1.5	1.5	0.0	0 K
10080 min Summer	8.000	0.000	0.0	1.3	1.3	0.0	0 K
15 min Winter	8.287	0.287	0.0	24.3	24.3	17.5	0 K
30 min Winter	8.332	0.332	0.0	24.3	24.3	20.2	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	69.299	0.0	32.5	19
30 min Summer	45.987	0.0	43.1	28
60 min Summer	29.238	0.0	54.9	44
120 min Summer	18.051	0.0	67.7	72
180 min Summer	13.465	0.0	75.8	102
240 min Summer	10.884	0.0	81.6	132
360 min Summer	8.039	0.0	90.4	192
480 min Summer	6.482	0.0	97.2	252
600 min Summer	5.481	0.0	102.7	312
720 min Summer	4.777	0.0	107.5	372
960 min Summer	3.844	0.0	115.3	492
1440 min Summer	2.826	0.0	127.1	736
2160 min Summer	2.074	0.0	140.0	1100
2880 min Summer	1.664	0.0	149.8	1468
4320 min Summer	1.219	0.0	164.5	2200
5760 min Summer	0.977	0.0	175.8	0
7200 min Summer	0.822	0.0	184.9	0
8640 min Summer	0.714	0.0	192.7	0
10080 min Summer	0.634	0.0	199.7	0
15 min Winter	69.299	0.0	36.4	20
30 min Winter	45.987	0.0	48.3	29

Alan Wood & Partners		Page 2
Omega 2 Monks Cross Drive York YO32 9GZ	38607 Former HMRC Car Park M30	
Date 22-03-2017 13:50 File M30.SRCX	Designed by JMcA Checked by JJS	
Micro Drainage	Source Control 2016.1	

Source Control 2016.1

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	8.283	0.283	0.0	24.3	24.3	17.2	0 K
120 min Winter	8.169	0.169	0.0	23.3	23.3	10.3	0 K
180 min Winter	8.129	0.129	0.0	18.6	18.6	7.9	0 K
240 min Winter	8.107	0.107	0.0	15.5	15.5	6.5	0 K
360 min Winter	8.081	0.081	0.0	11.7	11.7	4.9	0 K
480 min Winter	8.066	0.066	0.0	9.4	9.4	4.0	0 K
600 min Winter	8.055	0.055	0.0	8.0	8.0	3.4	0 K
720 min Winter	8.048	0.048	0.0	7.0	7.0	2.9	0 K
960 min Winter	8.037	0.037	0.0	5.7	5.7	2.2	0 K
1440 min Winter	8.023	0.023	0.0	4.2	4.2	1.4	0 K
2160 min Winter	8.012	0.012	0.0	3.1	3.1	0.7	0 K
2880 min Winter	8.005	0.005	0.0	2.4	2.4	0.3	0 K
4320 min Winter	8.000	0.000	0.0	1.8	1.8	0.0	0 K
5760 min Winter	8.000	0.000	0.0	1.4	1.4	0.0	0 K
7200 min Winter	8.000	0.000	0.0	1.2	1.2	0.0	0 K
8640 min Winter	8.000	0.000	0.0	1.1	1.1	0.0	0 K
10080 min Winter	8.000	0.000	0.0	0.9	0.9	0.0	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	29.238	0.0	61.2	44
120 min Winter	18.051	0.0	75.8	72
180 min Winter	13.465	0.0	84.7	102
240 min Winter	10.884	0.0	91.4	132
360 min Winter	8.039	0.0	101.3	192
480 min Winter	6.482	0.0	108.9	252
600 min Winter	5.481	0.0	115.1	314
720 min Winter	4.777	0.0	120.4	372
960 min Winter	3.844	0.0	129.1	490
1440 min Winter	2.826	0.0	142.4	738
2160 min Winter	2.074	0.0	156.8	1100
2880 min Winter	1.664	0.0	167.7	1472
4320 min Winter	1.219	0.0	184.3	0
5760 min Winter	0.977	0.0	196.9	0
7200 min Winter	0.822	0.0	207.1	0
8640 min Winter	0.714	0.0	215.9	0
10080 min Winter	0.634	0.0	223.7	0

Alan Wood & Partners		Page 3
Omega 2 Monks Cross Drive York YO32 9GZ	38607 Former HMRC Car Park M30	
Date 22-03-2017 13:50 File M30.SRCX	Designed by JMcA Checked by JJS	
Micro Drainage Source Control 2016.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.357	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.250

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.083	4	8	0.083	8	12	0.083

Alan Wood & Partners		Page 4
Omega 2	38607	
Monks Cross Drive	Former HMRC Car Park	
York YO32 9GZ	M30	
Date 22-03-2017 13:50	Designed by JMcA	
File M30.SRCX	Checked by JJS	
Micro Drainage	Source Control 2016.1	

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.000
Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.95

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	64.0	64.0	1.100	0.0	96.0
1.000	64.0	96.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0216-2430-1000-2430
Design Head (m) 1.000
Design Flow (l/s) 24.3
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 216
Invert Level (m) 7.950
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	24.3
Flush-Flo™	0.360	24.3
Kick-Flo®	0.736	21.0
Mean Flow over Head Range	-	20.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.3	1.200	26.5	3.000	41.2	7.000	62.1
0.200	21.2	1.400	28.5	3.500	44.4	7.500	64.2
0.300	24.2	1.600	30.4	4.000	47.3	8.000	66.2
0.400	24.3	1.800	32.2	4.500	50.1	8.500	68.2
0.500	23.9	2.000	33.9	5.000	52.7	9.000	70.1
0.600	23.2	2.200	35.5	5.500	55.2	9.500	72.0
0.800	21.9	2.400	37.0	6.000	57.6		
1.000	24.3	2.600	38.4	6.500	59.9		

Alan Wood & Partners		Page 2
Omega 2 Monks Cross Drive York YO32 9GZ	38607 Former HMRC Car Park M100 (+40cc)	
Date 22-03-2017 13:49 File M100 (+40cc).SRCX	Designed by JMcA Checked by JJS	
Micro Drainage		Source Control 2016.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	8.886	0.886	0.0	24.3	24.3	53.9	0 K
120 min Winter	8.700	0.700	0.0	24.3	24.3	42.5	0 K
180 min Winter	8.447	0.447	0.0	24.3	24.3	27.2	0 K
240 min Winter	8.271	0.271	0.0	24.2	24.2	16.4	0 K
360 min Winter	8.149	0.149	0.0	21.0	21.0	9.0	0 K
480 min Winter	8.118	0.118	0.0	17.1	17.1	7.2	0 K
600 min Winter	8.100	0.100	0.0	14.4	14.4	6.1	0 K
720 min Winter	8.088	0.088	0.0	12.6	12.6	5.3	0 K
960 min Winter	8.071	0.071	0.0	10.1	10.1	4.3	0 K
1440 min Winter	8.051	0.051	0.0	7.4	7.4	3.1	0 K
2160 min Winter	8.034	0.034	0.0	5.4	5.4	2.1	0 K
2880 min Winter	8.025	0.025	0.0	4.3	4.3	1.5	0 K
4320 min Winter	8.013	0.013	0.0	3.1	3.1	0.8	0 K
5760 min Winter	8.006	0.006	0.0	2.5	2.5	0.3	0 K
7200 min Winter	8.001	0.001	0.0	2.1	2.1	0.0	0 K
8640 min Winter	8.000	0.000	0.0	1.8	1.8	0.0	0 K
10080 min Winter	8.000	0.000	0.0	1.6	1.6	0.0	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	53.779	0.0	112.9	50
120 min Winter	33.226	0.0	139.6	88
180 min Winter	24.710	0.0	155.6	118
240 min Winter	19.890	0.0	167.1	144
360 min Winter	14.593	0.0	183.8	194
480 min Winter	11.713	0.0	196.7	252
600 min Winter	9.868	0.0	207.2	312
720 min Winter	8.575	0.0	216.0	372
960 min Winter	6.863	0.0	230.6	492
1440 min Winter	5.006	0.0	252.2	736
2160 min Winter	3.643	0.0	275.4	1100
2880 min Winter	2.904	0.0	292.7	1468
4320 min Winter	2.106	0.0	318.4	2196
5760 min Winter	1.675	0.0	337.6	2936
7200 min Winter	1.401	0.0	353.1	3608
8640 min Winter	1.211	0.0	366.3	0
10080 min Winter	1.072	0.0	378.1	0

Alan Wood & Partners		Page 3
Omega 2 Monks Cross Drive York YO32 9GZ	38607 Former HMRC Car Park M100 (+40cc)	
Date 22-03-2017 13:49 File M100 (+40cc).SRCX	Designed by JMcA Checked by JJS	
Micro Drainage		Source Control 2016.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.357	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.250

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.083	4	8	0.083	8	12	0.083

Alan Wood & Partners		Page 4
Omega 2	38607	
Monks Cross Drive	Former HMRC Car Park	
York YO32 9GZ	M100 (+40cc)	
Date 22-03-2017 13:49	Designed by JMcA	
File M100 (+40cc).SRCX	Checked by JJS	
Micro Drainage	Source Control 2016.1	

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.000
Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.95

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	64.0	64.0	1.100	0.0	96.0
1.000	64.0	96.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0216-2430-1000-2430
Design Head (m) 1.000
Design Flow (l/s) 24.3
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 216
Invert Level (m) 7.950
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	24.3
Flush-Flo™	0.360	24.3
Kick-Flo®	0.736	21.0
Mean Flow over Head Range	-	20.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.3	1.200	26.5	3.000	41.2	7.000	62.1
0.200	21.2	1.400	28.5	3.500	44.4	7.500	64.2
0.300	24.2	1.600	30.4	4.000	47.3	8.000	66.2
0.400	24.3	1.800	32.2	4.500	50.1	8.500	68.2
0.500	23.9	2.000	33.9	5.000	52.7	9.000	70.1
0.600	23.2	2.200	35.5	5.500	55.2	9.500	72.0
0.800	21.9	2.400	37.0	6.000	57.6		
1.000	24.3	2.600	38.4	6.500	59.9		

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