Nolan Associates
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Bennet Court
Reading
Drainage Strategy

Project No.	2022-124
Prepared by:	KP
Date:	July 2024
Revision	5

CHAS Accredited Contractor CHAS.co.uk
Constructionline Part of Capita plc

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ISO 9001 REGISTERED FIRM
GB9822

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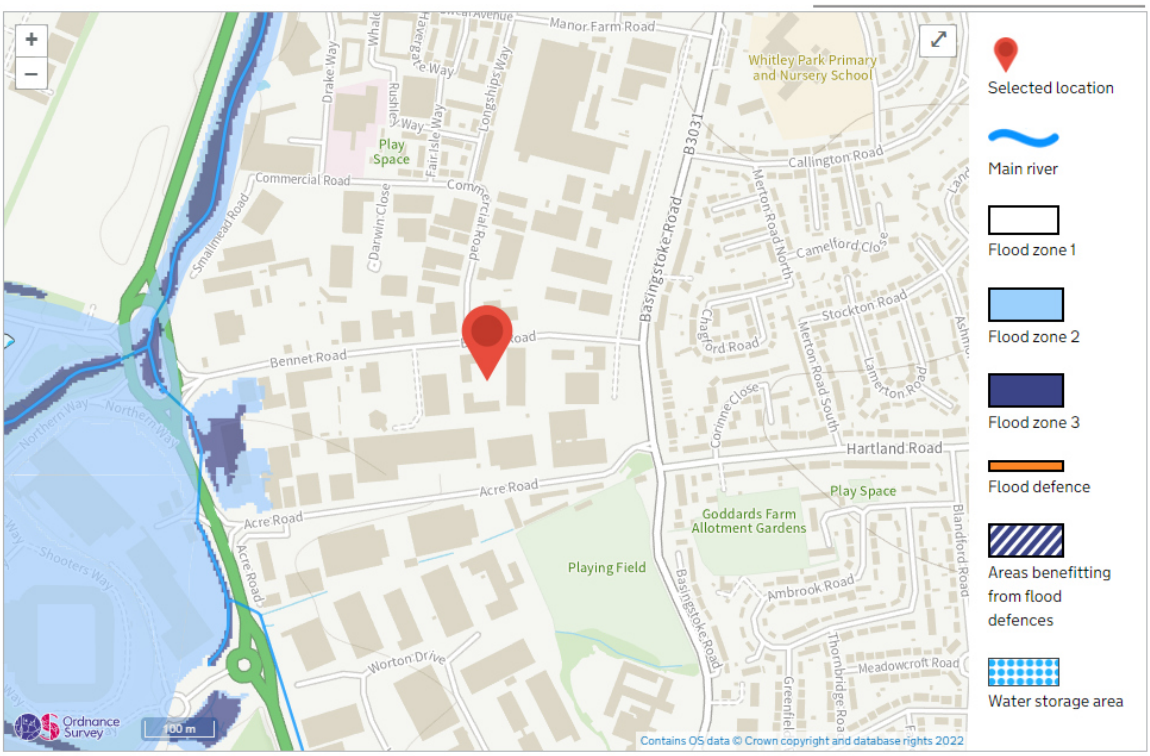
Surface Water Drainage Strategy

The proposed development is to convert the existing brownfield at Bennet Court, Bennet Road, Reading, RG2 0QX into an industrial building with associated service yard and car park. The total site area is 7471m² with a total impermeable area of circa 7140m².

It can be seen from the flood map below that the site lies within Flood Zone 1.



Therefore, as the site is under 1 Ha and lies within flood zone 1 a Flood Risk Assessment is not required.

Infiltration techniques have been investigated as a means of surface water disposal. The Site Investigation identifies the site geology comprises made ground over the Lambeth Group. The Lambeth Group was noted to be weathered at the surface comprising soft orangish brown slightly sandy slightly gravelly clay or silt with a maximum depth of 1.0 m to 3.5 m bgl. The underlying Lambeth Group was found to comprise firm grading into stiff brownish grey slightly sandy clay or silt, to depths between 6.2 m and 7.0 m bgl. The identified geology in unlikely to support the use of soakaways as a viable means of surface water disposal.

The site investigation also provides groundwater level monitoring data (extract from SI below).

Groundwater levels were measured on a total of six occasions between 9th September and 19th October 2022. Monitoring data and NAPL measurements are provided in Appendix F and summarised in the table below.

Exploratory Hole	Water level during monitoring Max to Min Range		NAPL Y/N	Stratum
	m bgl	m AOD.		
DS102	1.72 - 1.89	39.96 - 39.79	N	Lambeth Group - Shallow Cohesive
DS103	1.32 - 1.51	40.12 - 39.93	N	Lambeth Group - Shallow Cohesive
DS104	1.45 - 1.63	40.00 - 39.82	N	Lambeth Group - Shallow Cohesive
DS105	0.32 - 1.46	41.10 - 39.96	N	Lambeth Group - Shallow Cohesive
DS107	1.57 - 1.63	39.86 - 39.80	N	Lambeth Group - Shallow Cohesive
DS109	Dry	Dry	N	Lambeth Group - Shallow Cohesive/ Made Ground
DS110	2.25 - 2.41	39.12 - 38.96	N	Lambeth Group - Shallow Cohesive
CP101	1.33 - 1.7	40.12 - 39.75	N	Lambeth Group - Shallow Cohesive / Lambeth Group - Sand
CP102	1.9 - 2.15	39.49 - 39.24	N	Lambeth Group - Shallow Cohesive / Lambeth Group - Deep Cohesive
CP103	1.9 - 2.03	39.51 - 39.36	N	Lambeth Group - Shallow Cohesive / Lambeth Group - Sand

The building floor level will be at 41.56m to suit existing topography. The loading dock will be 1.2m below this at 40.36m. In order to drain the loading dock it can be seen from the drainage strategy plan that pipe invert downstream of the oil separator (MH S7) is at 39.275m. A variable soakaway needs available storage below 39.275m and groundwater to be a minimum 1m below that storage. It can be seen from the groundwater monitoring above that infiltration as the main source of disposal is unviable, with groundwater levels typically between 39.12m and 41.1m . Nevertheless, permeable paving is proposed to car parking spaces and the subbase will have a permeable liner to allow some infiltration at shallow depth. In addition the outlets from the green room will discharge to treepits which also allow some infiltration.

The nearest watercourse is circa 500m away therefore it is proposed that the site will discharge to the public surface water sewer

Existing Surface water Features and Drainage

The existing site drainage has been extensively surveyed and a number of surface water outfalls have been identified. The existing drainage information including CCTV Survey is at Appendix A

The existing impermeable area is circa 6210m². Using the industry accepted method of 35mm/hr for a brownfield calculation would equate to a discharge rate of 6210 x 35/3600 = 60 l/s. This flow rate is commensurate with the identified surface water outfall pipe sizes and so is considered a reasonable estimate of existing discharge rates.

Greenfield discharge rate

Greenfield runoff rates have been determined using the UK SuDS website with the results at Appendix B. The existing Qbar for the development is 1.0 l/s.

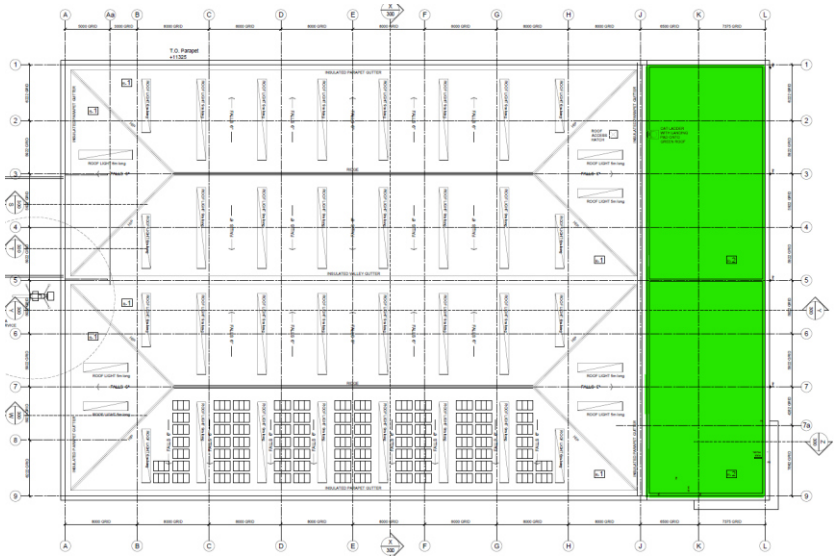
Proposed Discharge Rate

Due to the very low Qbar rate and the associated risk of blockages it is proposed to limit discharge from the site to 5.0 l/s. This is a 92% reduction compared to existing rates.

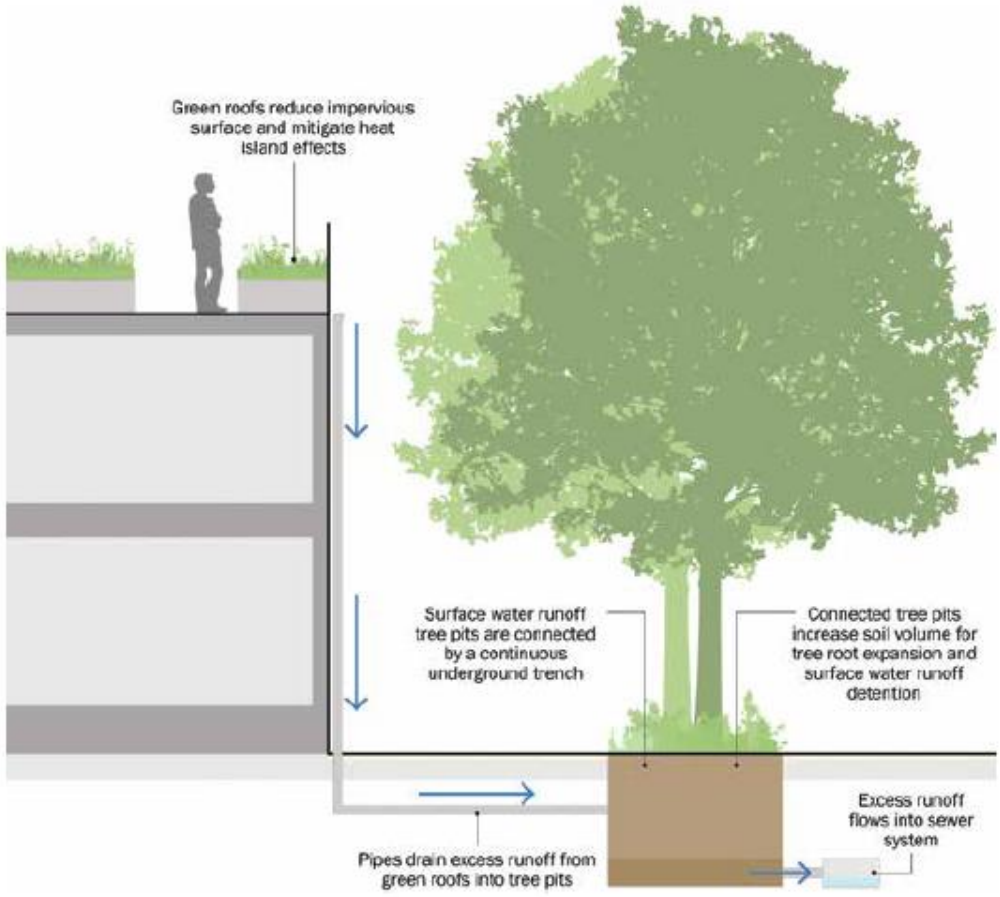
SuDS Proposals

As well as a significant reduction in discharge rate it is proposed that the car parking spaces will be drained via porous block paving. Additionally the front part of the main building will have a green roof which will not only provided biodiversity benefits but will control run-off at source. The green roof will discharge to tree pits along the building frontage, also allowing some infiltration.

The extent of green roof is shown highlighted below and a copy of the proposed Roof Plan is at Appendix C.



The figure below extracted from the SuDS manual shows a typical arrangement between green roof and tree pits. Refer Aspect Tree Pit drawing 8085.TPD.5.1C for Details.



Drainage Network

The proposed drainage layout is at Appendix C. The overall performance of the drainage network has been analysed using the MicroDrainage Simulation computer programme and this can be seen in Appendix D.

The system has been analysed for all storm durations up to 2160 minute for the 1 year, 30 year and 100 year (including 40% allowance for climate change).

The results indicate that there is no flooding on site for 30 year storm. For the 100 year + 40% climate change rainfall event there is some flooding in loading dock where the water level is 40.544m (271mm deep). The flood water within the loading dock will be entirely contained until the storm even has subsided when the flood water will flow back into the drainage network. There is also 5m3 flooding in the yard, this will also be temporarily contained within the loading dock until the storm subsides.

Water Quality

The proposed car parking will be drained using porous paving before being collected with collector pipes and discharging into the attenuated network. The yard areas will be treated with full retention interceptors.

Suds Management trains have been considered using the Simple Index Approach (CIRIA SuDS Manual) as follows:
Pollution hazard Indices from table 26.2 of the SuDS Manual based on a commercial roof and commercial yard and car park areas are shown in the table below together with mitigation indices from Table 26.3 for the permeable paving and typical mitigation indices for SPEL ESR class 1 separators.

Hazard	Roof Hazard Index	Car Park Hazard Index	Commercial Yard / Delivery Hazard Index	Permeable Paving SuDS Mitigation Index	(Class 1 ESR separator) Mitigation Index
Total suspended solids (TSS)	0.3	0.5	0.7	0.7	0.8
Metals	0.2	0.4	0.6	0.6	0.6
Hydrocarbons	0.05	0.4	0.7	0.7	0.9

The permeable paving provides the necessary mitigation for the car park areas. The full retention separator provides the necessary mitigation for the yard areas.
Source control has also been provided by the incorporation of a green roof to part of the main warehouse building.

SuDS Maintenance

An outline SuDS maintenance Plan is provided at Appendix E. On completion of the development the SuDS maintenance plan will be supplemented by product literature as part of the operation and maintenance manuals for issue to the end user.

Foul Water Drainage

It is proposed that all foul drainage will discharge by gravity to the public sewer within Bennet Road. The formal Section 106 approval will be required to all drainage connections to the Public Sewer network.

Karl Pritchard M.Eng C.Eng MICE
For Nolan Associates

Appendix A

Existing Site Drainage
Existing Drainage Survey

Existing Public SW Sewer
Existing Public FW Sewer
Existing Private SW Sewer
Existing Private FW Sewer

All Existing PUBLIC Sewers on Site shall be surveyed prior to commencement of works, and any defects reported to the Engineer. Thames Water Assets shall be protected during the works and surveyed on completion of site works. Any remedial measures shall be undertaken to the satisfaction of Thames Water.

All Existing PRIVATE Drainage to be Abandoned.
Unless otherwise indicated on the drawings, the Contractor shall break out and dispose of old gullies, access chambers and the like. All disused drains shall be stopped off using cement concrete plugging at the point of entry.

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NOLAN ASSOCIATES

FOR TENDER PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION

REV	DESCRIPTION	BY	CHKD	DATE
T3	Proosed Site plan Revised	KP	KP	17.09.24
T2	Proosed Site plan Revised	MH	KP	01.12.23
T1	Tender issue	MH	KP	17.11.23
P1	Preliminary issue	MH	KP	06.10.23

Bennet Court

Existing Drainage Layout

NOLAN ASSOCIATES
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E-MAIL: enquiries@nolanassociates.co.uk

Drawn by	Date	Plot Date	Scale
MH	06.10.23	06.10.23	1:250@A1
Checked by	Project No		Dwg No
KP	2022-124		101 T3

CCTV Inspection Report

Bennet Court
Bennet Road
Reading
RG2 0QX

09/05/2023

Job Number: 17983

Head Office

5b Plant Lane Business Park, Plant Lane, Burntwood, WS7 3GN
www.burntwoodgroup.com | enquiries@burntwoodgroup.com
Tel: 01543 277772

Project Information

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Client Details:

Trinity Property Consultants Ltd
10-11 Greenfield Crescent
Edgbaston
Birmingham
B15 3AU

Client Contact Name: Sam Delaney-Hall

Site Details:

Bennet Court
Bennet Road
Reading
RG2 0QX

Contractor Details:

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Office Contact Number: 01543 277 772

Purpose of Survey:

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Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

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Page 12	Survey Run Sheet(Survey 3 - F2 to F3)
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Page 20	Survey Run Sheet(Survey 7 - S3 to Interceptor)
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Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

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Defect Grade Descriptions

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

1: Occurences without damage. For example, laterals, joints,etc.

NO DEFECTS WERE DETECTED.

2: Constructional deficiencies or occurences with insignificant influence to tightness, hydraulic or static pressure or pipe: Eg. wide joints, badly torched intakes, minor deformation of plastic pipes, minor erosions etc.

REHABILITATION CAN BE SCHEDULED LONG-TERM.

3: Constructional deficiencies diminishing static, hydraulic and tightness: Eg. untorched intakes, cracks, minor drainage obstructions such as calcite build ups, protruding laterals, minor damages to pipe wall, individual root penetrations, corroded pipe walls etc.

REHABILITATION IS NECESSARY MEDIUM-TERM WITHIN 3 TO 5 YEARS.

4: Constructional damages with insufficent static safety, hydraulic or tightness: Eg. axial/radial pipe bursts, pipe deformations, visually noticeable infiltration/exfiltration, cavities, in pipe-wall, severe protruding, laterals severe root penetrations, severe corrosion of pipe wall etc.

REHABILITATION PROCEDURE IS URGENT AND HAS TO BE COMPLETED WITHIN 1 TO 2 YEARS. NECESSITY FOR EMERGENCY OPERATIONS HAS TO BE EXAMINED.

5: Pipe is already or will shortly be impermeable: Eg. collapsed pipe, deeply rooted pipe or other drainage obstructions. Pipe loses water or danger of backwater in basements etc.

REHABILITATION IS URGENT AND SHORT-TERM. IN ORDER TO PREVENT FURTHER DAMAGE, NECESSARY TEMPORARY SPOT REPAIR HAS TO BE CONDUCTED ON EMERGENCY LEVEL.

Site Drawings/Photos

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

This sketch is not to scale and does not represent the exact routing of the drainage system

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**F2 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
2 - Heavy Rain		**4/0**	**69HWF65MBE**	**1**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Foul**
Catchment

Shape/Size **225mm**
Material **Vitrified clay**
Category

Start Node **F2**
End Node **F1**
Total length **56.33 metres**

Scale **1:2.96**
Direction **Downstream**

Start Node Ref:F2 | I/L :2.07 metres

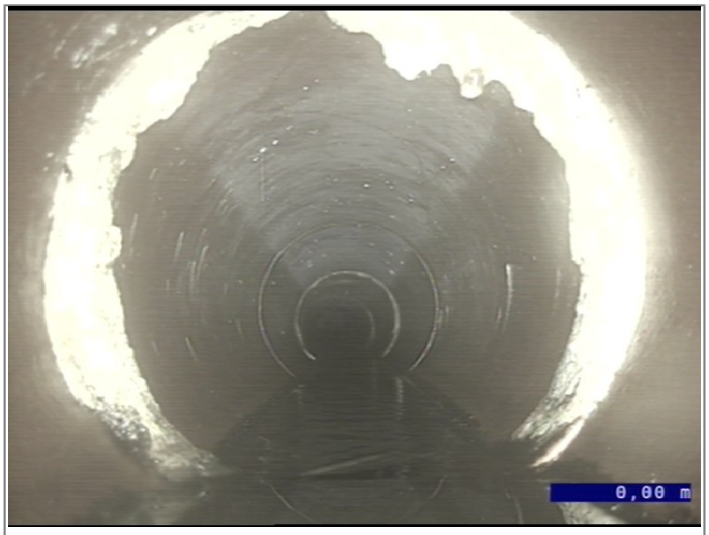
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference F2	7868478	Comment / 0
0.00	WL	Water level 5% height/diameter	7868479	Comment / 0
0.01	DEE	Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss	7868486	Service / 3
2.04	JN	Junction at 12 o'clock, diameter 150mm	7868487	Comment / 0
23.52	DEE	Attached deposits, encrustation from 9 to 3 o'clock 25% cross-sectional area loss	7868514	Service / 4
50.55	DEE	Attached deposits, encrustation from 7 to 4 o'clock 0% cross-sectional area loss	7868529	Comment / 0
56.33	MHF	Finish node type, manhole, reference F1	7868547	Comment / 0

End Node Ref:F1 | I/L :2.54 metres

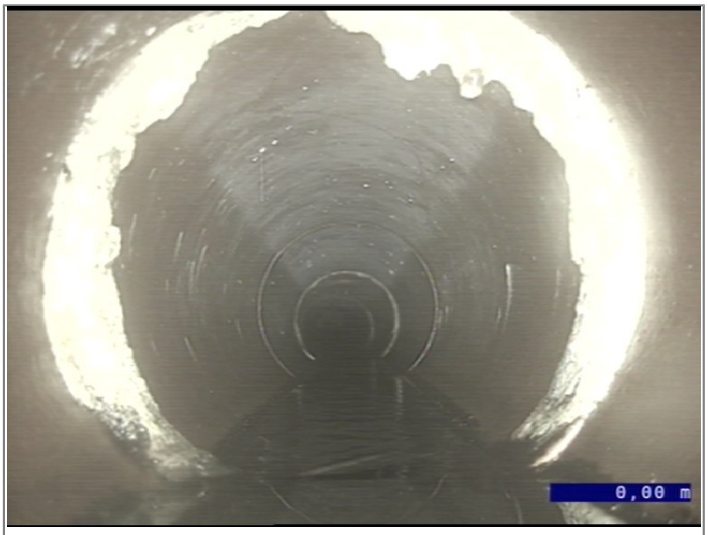
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference F2

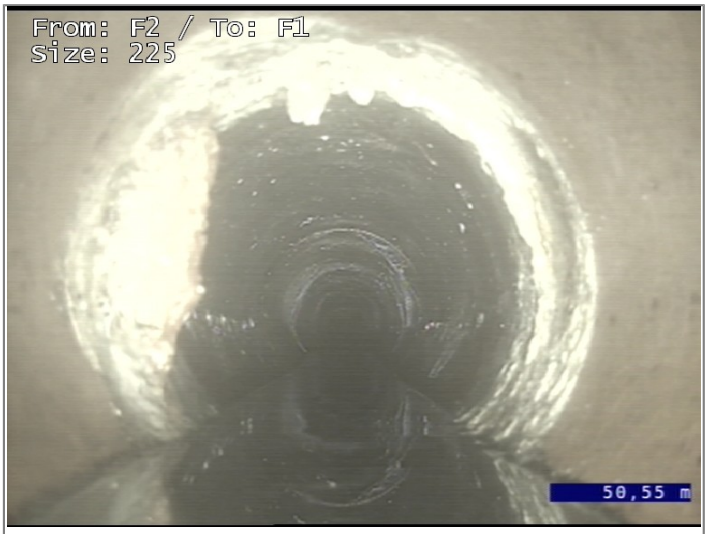


Water level 5% height/diameter

Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss

Junction at 12 o'clock, diameter 150mm

Attached deposits, encrustation from 9 to 3 o'clock 25% cross-sectional area loss



Attached deposits, encrustation from 7 to 4 o'clock 0% cross-sectional area loss

CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Finish node type, manhole, reference F1

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**F1 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
2 - Heavy Rain		**3/0**	**69HWF65MBE**	**2**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Foul**
Catchment

Shape/Size **225mm**
Material **Vitrified clay**
Category

Start Node **F1**
End Node **Mains**
Total length **9.15 metres**

Scale **1:0.48**
Direction **Downstream**

Start Node Ref:F1 | I/L :2.54 metres

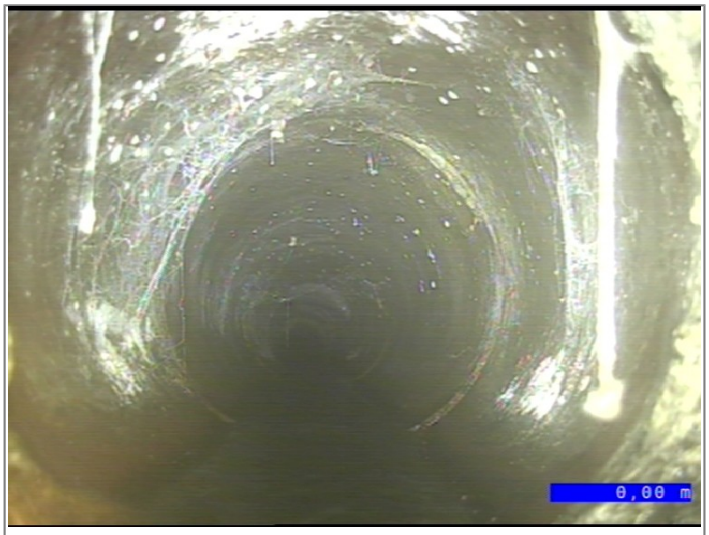
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference F1	7868588	Comment / 0
0.00	WL	Water level 5% height/diameter	7868589	Comment / 0
3.73	DEE	Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss	7868612	Service / 3
9.15	MHF	Finish node type, manhole, reference Mains	7869093	Comment / 0

End Node Ref:Mains | I/L : metres

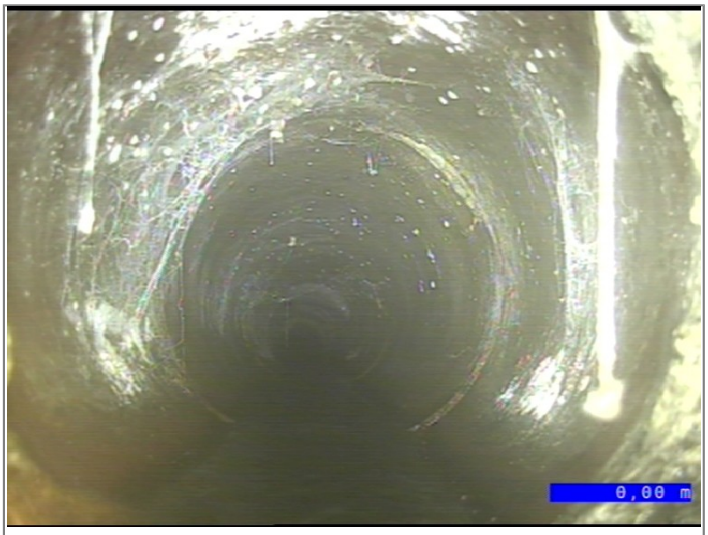
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

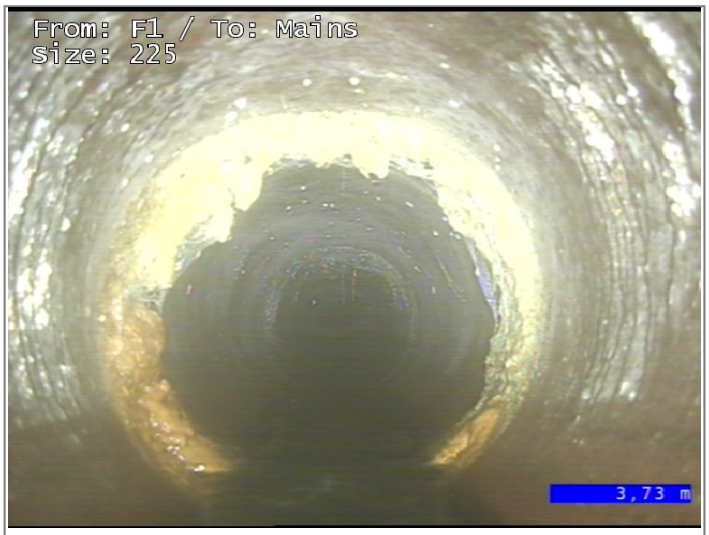
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference F1



Water level 5% height/diameter



Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss

Finish node type, manhole, reference Mains

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**F3 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
2 - Heavy Rain		**3/0**	**69HWF65MBE**	**3**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Foul**
Catchment

Shape/Size **225mm**
Material **Vitrified clay**
Category

Start Node **F2**
End Node **F3**
Total length **5.55 metres**

Scale **1:0.29**
Direction **Upstream**

Start Node Ref:F2 | I/L :2.07 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference F2	7869420	Comment / 0
0.00	WL	Water level 5% height/diameter	7869421	Comment / 0
2.73	JN	Junction at 12 o'clock, diameter 150mm	7869422	Comment / 0
3.39	DEE	Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss	7869423	Service / 3
5.55	MHF	Finish node type, manhole, reference F3	7869424	Comment / 0

End Node Ref:F3 | I/L : metres

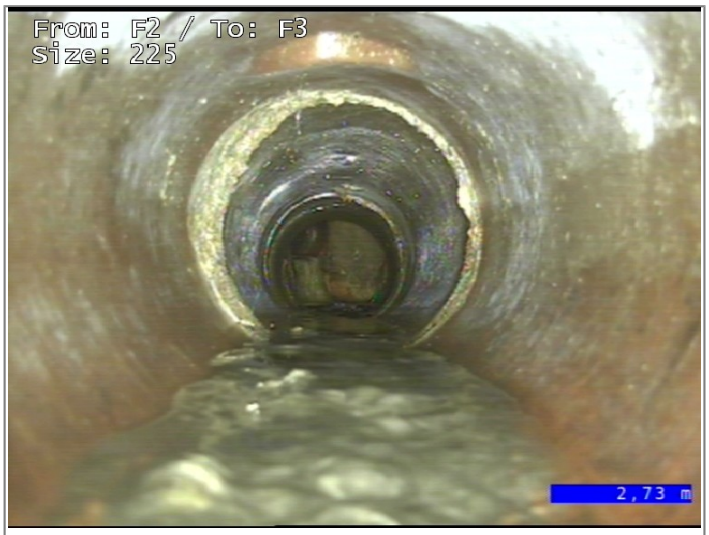
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Start node type, manhole, reference F2

Water level 5% height/diameter



Junction at 12 o'clock, diameter 150mm

Attached deposits, encrustation from 7 to 5 o'clock 10% cross-sectional area loss

Finish node type, manhole, reference F3

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**F4 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
2 - Heavy Rain		**3/0**	**69HWF65MBE**	**4**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Foul**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **F2**
End Node **F4**
Total length **2.1 metres**

Scale **1:0.11**
Direction **Upstream**

Start Node Ref:F2 | I/L :2.07 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference F2	7869505	Comment / 0
0.00	WL	Water level 5% height/diameter	7869509	Comment / 0
1.45	DEE	Attached deposits, encrustation from 11 to 5 o'clock 10% cross-sectional area loss	7869510	Service / 3
2.10	MHF	Finish node type, manhole, reference F4	7869524	Comment / 0

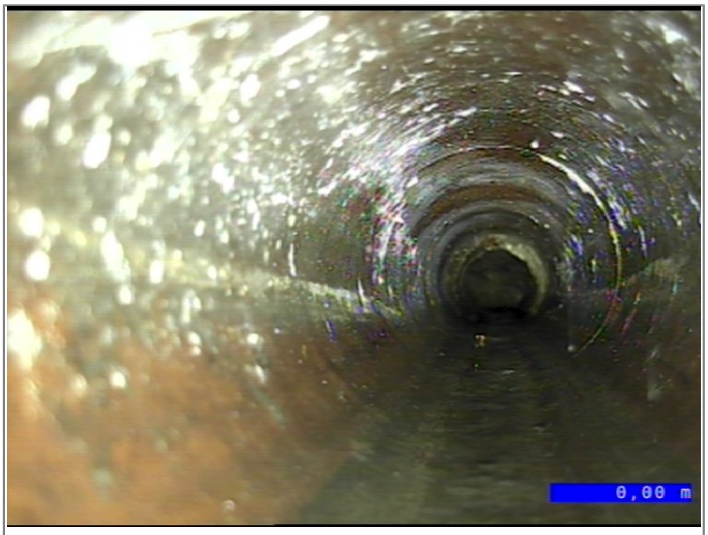
End Node Ref:F4 | I/L :1.91 metres

CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

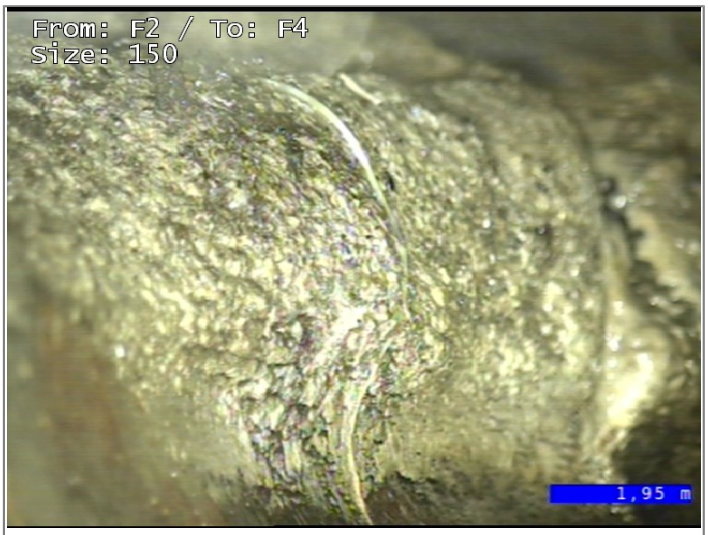
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Start node type, manhole, reference F2



Water level 5% height/diameter

Attached deposits, encrustation from 11 to 5 o'clock 10% cross-sectional area loss



Finish node type, manhole, reference F4

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S6 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/2**	**69HWF65MBE**	**5**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S6**
End Node **S5**
Total length **13.94 metres**

Scale **1:0.73**
Direction **Downstream**

Start Node Ref:S6 | I/L :0.81 metres

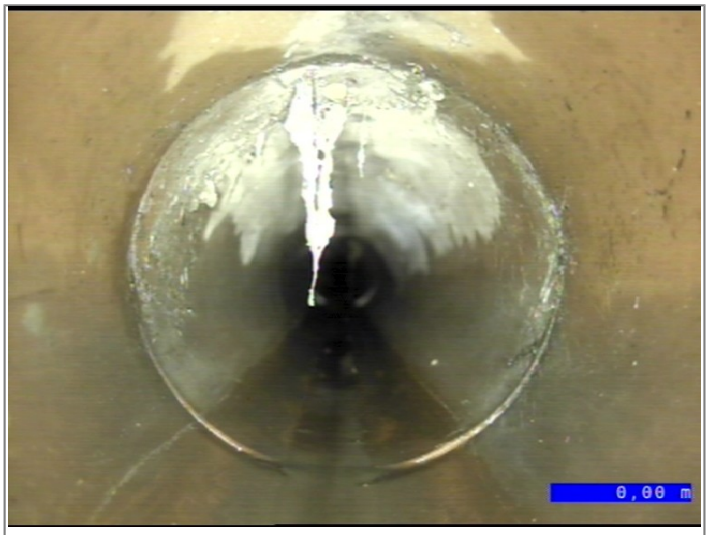
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S6	7869918	Comment / 0
0.00	WL	Water level 0% height/diameter	7869922	Comment / 0
4.77	CC	Crack circumferential from 8 to 4 o'clock	7869963	Structural / 2
12.87	CL	Crack longitudinal at 9 o'clock	7870011	Structural / 2
13.94	MHF	Finish node type, manhole, reference S5	7870045	Comment / 0

End Node Ref:S5 | I/L :1.04 metres

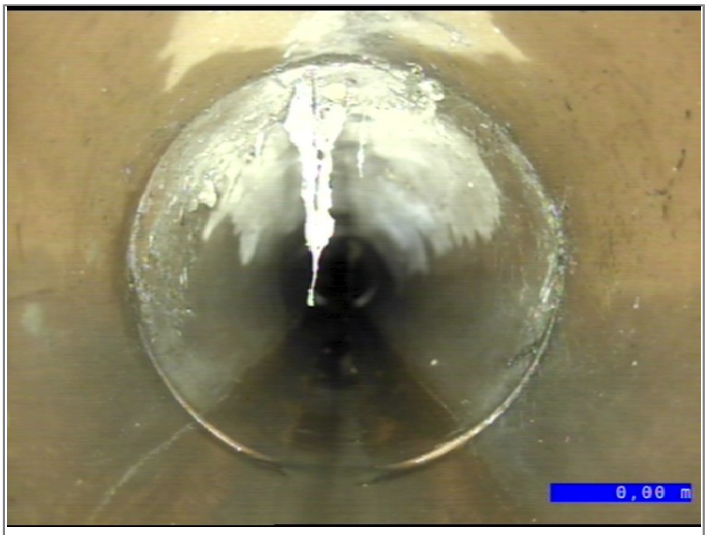
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference S6



Water level 0% height/diameter

Crack circumferential from 8 to 4 o'clock

Crack longitudinal at 9 o'clock

Finish node type, manhole, reference S5

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
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Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S5 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/2**	**69HWF65MBE**	**6**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S5**
End Node **S4**
Total length **11.69 metres**

Scale **1:0.61**
Direction **Downstream**

Start Node Ref:S5 | I/L :1.04 metres

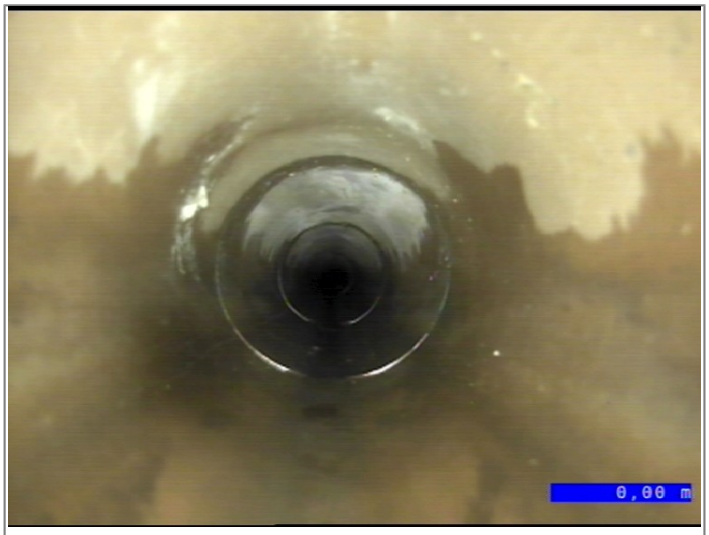
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S5	7870046	Comment / 0
0.00	WL	Water level 0% height/diameter	7870047	Comment / 0
2.49	CC	Crack circumferential from 10 to 3 o'clock	7870062	Structural / 2
3.22	JN	Junction at 2 o'clock, diameter 100mm	7870065	Comment / 0
11.69	MHF	Finish node type, manhole, reference S4	7870077	Comment / 0

End Node Ref:S4 | I/L :1.18 metres

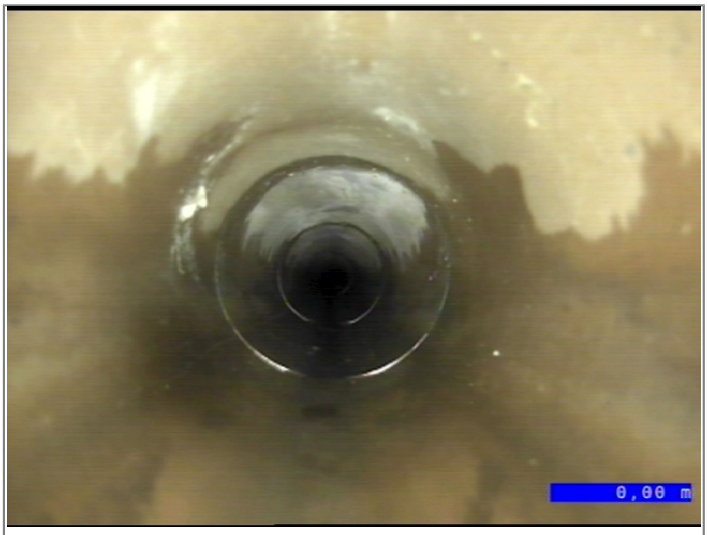
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

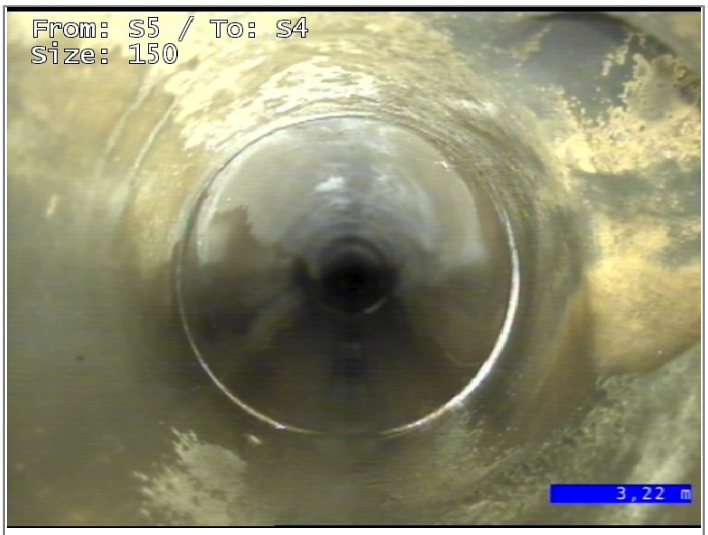


Start node type, manhole, reference S5



Water level 0% height/diameter

Crack circumferential from 10 to 3 o'clock



Junction at 2 o'clock, diameter 100mm

Finish node type, manhole, reference S4

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S3 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**7**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S3**
End Node **Interceptor**
Total length **5.21 metres**

Scale **1:0.27**
Direction **Downstream**

Start Node Ref:S3 | I/L :1.32 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S3	7870180	Comment / 0
0.00	WL	Water level 0% height/diameter	7870182	Comment / 0
5.21	OSF	Finish node type, oil separator, reference Interceptor	7870204	Comment / 0

End Node Ref:Interceptor | I/L : metres

CCTV Inspection Photos

Burntwood Group
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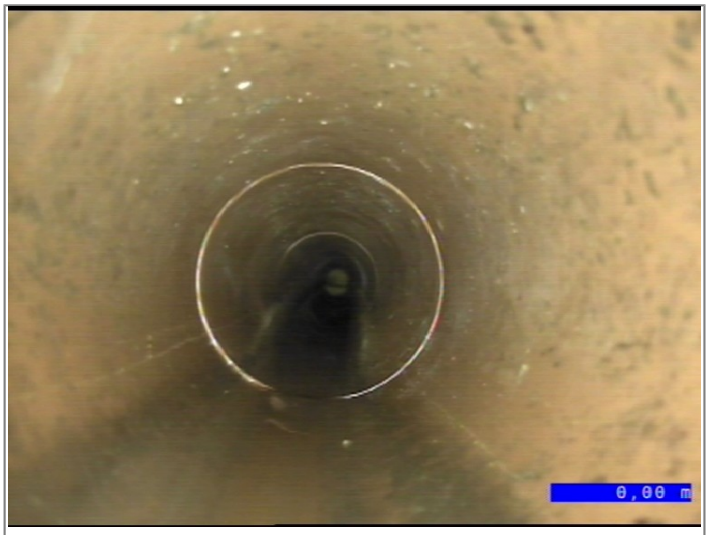
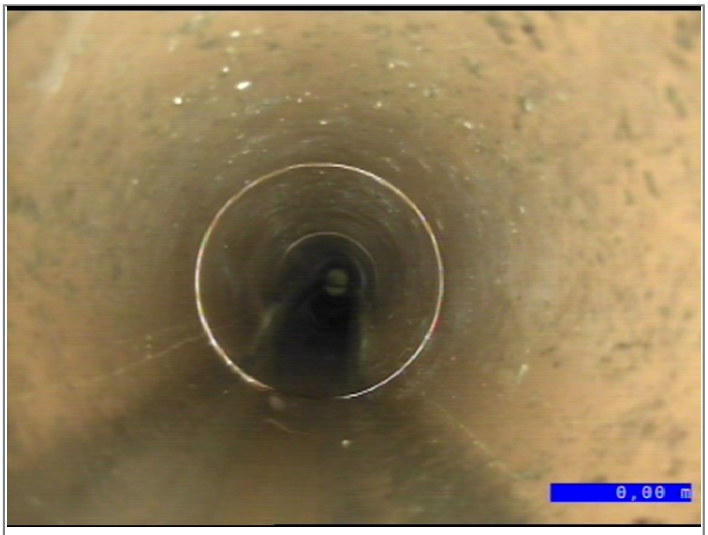
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference S3



Water level 0% height/diameter

Finish node type, oil separator, reference Interceptor

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
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Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S4 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**8**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S4**
End Node **S3**
Total length **15.73 metres**

Scale **1:0.83**
Direction **Downstream**

Start Node Ref:S4 | I/L :1.18 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S4	7870373	Comment / 0
0.00	WL	Water level 0% height/diameter	7870375	Comment / 0
5.53	JN	Junction at 2 o'clock, diameter 100mm	7870381	Comment / 0
15.73	MHF	Finish node type, manhole, reference S3	7870394	Comment / 0

End Node Ref:S3 | I/L :1.32 metres

CCTV Inspection Photos

Burntwood Group
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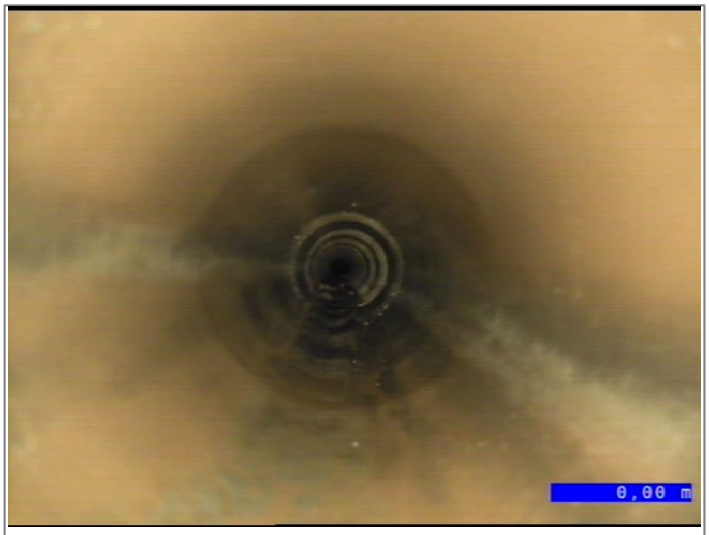
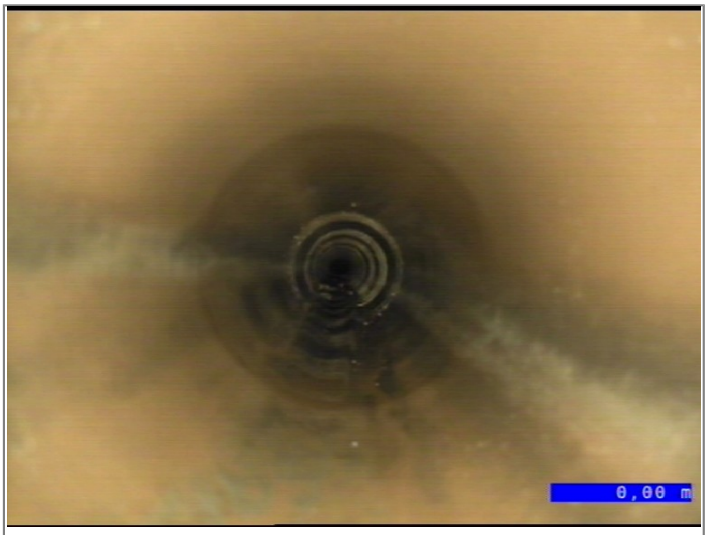
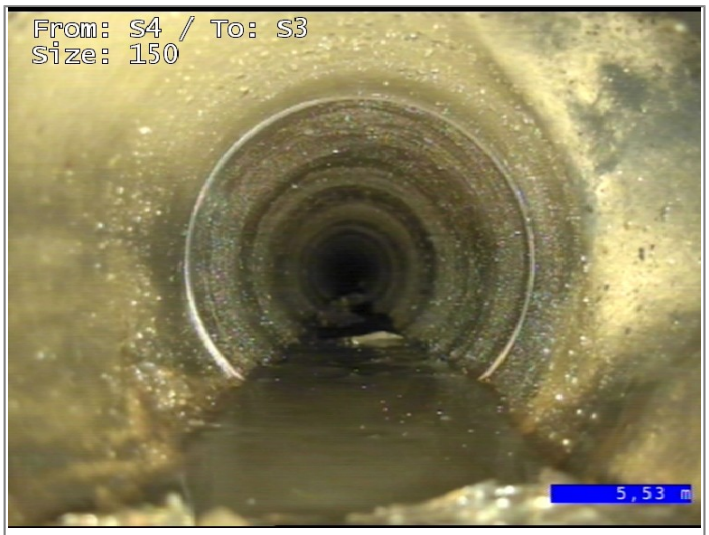
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference S4



Water level 0% height/diameter



Junction at 2 o'clock, diameter 100mm

Finish node type, manhole, reference S3

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
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Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**InterceptoX**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**9**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S2**
End Node **Interceptor**
Total length **0.02 metres**

Scale **1:0.00**
Direction **Upstream**

Start Node Ref:S2 | I/L :1.51 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S2	7870456	Comment / 0
0.00	WL	Water level 0% height/diameter	7870475	Comment / 0
0.02	OSF	Finish node type, oil separator, reference Interceptor	7870477	Comment / 0

End Node Ref:Interceptor | I/L : metres

CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
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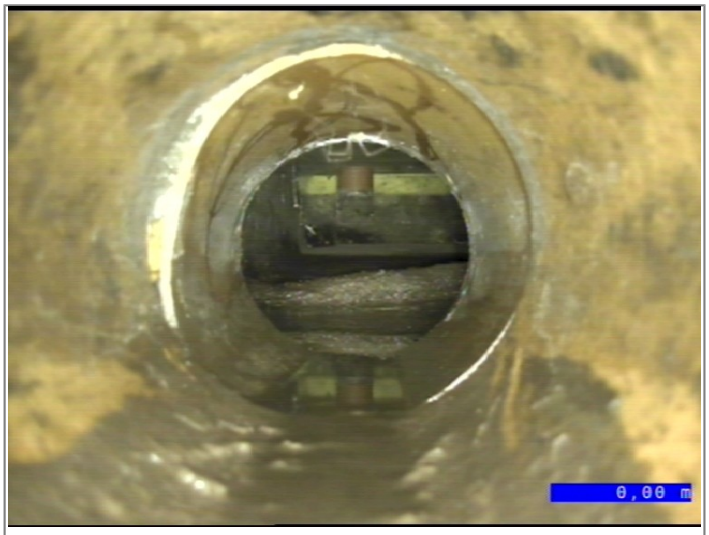
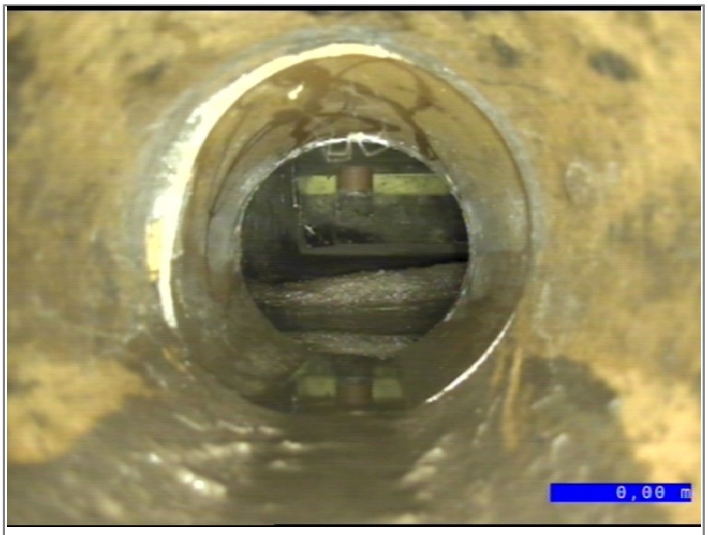
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference S2



Water level 0% height/diameter

Finish node type, oil separator, reference Interceptor

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S2 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**10**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S2**
End Node **S1**
Total length **1.75 metres**

Scale **1:0.09**
Direction **Downstream**

Start Node Ref:S2 | I/L :1.51 metres

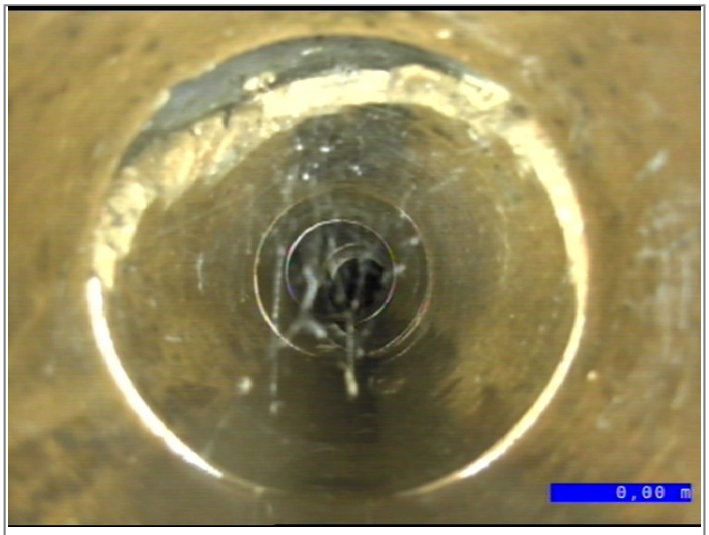
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S2	7870480	Comment / 0
0.00	WL	Water level 0% height/diameter	7870483	Comment / 0
0.01	RPH	Point repair, hole repaired from 10 to 2 o'clock	7870510	Comment / 0
1.75	MHF	Finish node type, manhole, reference S1	7870512	Comment / 0

End Node Ref:S1 | I/L : metres

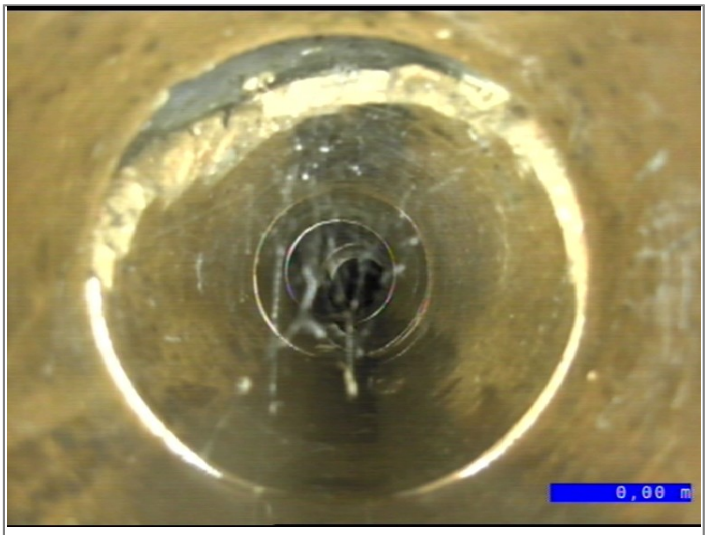
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

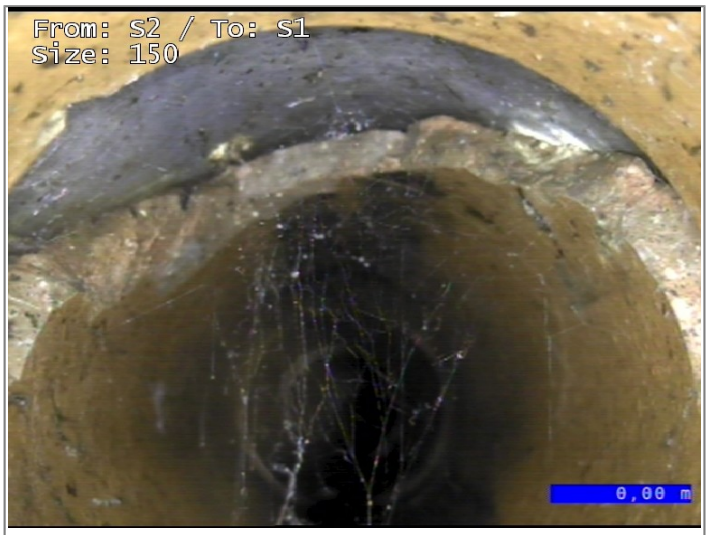
Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**



Start node type, manhole, reference S2



Water level 0% height/diameter



Point repair, hole repaired from 10 to 2 o'clock

Finish node type, manhole, reference S1

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**S7 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**11**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Surface water**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **S6**
End Node **S7**
Total length **18.62 metres**

Scale **1:0.98**
Direction **Upstream**

Start Node Ref:S6 | I/L :0.81 metres

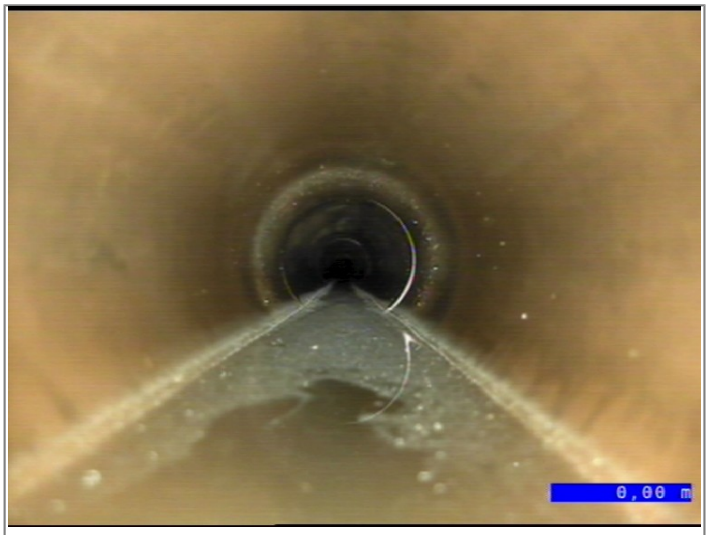
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference S6	7870557	Comment / 0
0.00	WL	Water level 0% height/diameter	7870558	Comment / 0
7.42	JN	Junction at 2 o'clock, diameter 100mm	7870584	Comment / 0
18.62	MHF	Finish node type, manhole, reference S7	7870642	Comment / 0

End Node Ref:S7 | I/L :0.7 metres

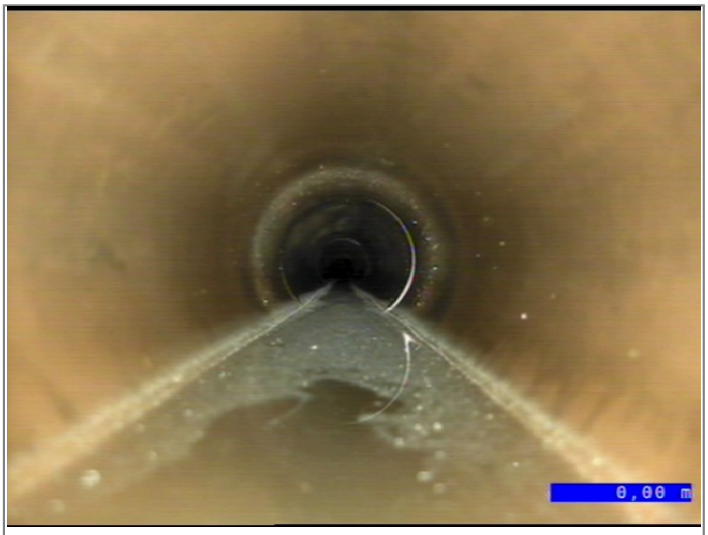
CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

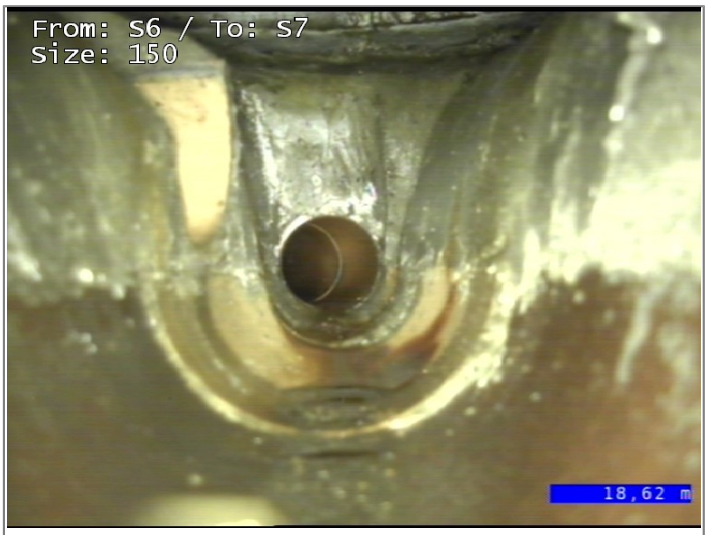


Start node type, manhole, reference S6



Water level 0% height/diameter

Junction at 2 o'clock, diameter 100mm



Finish node type, manhole, reference S7

CCTV Inspection Report

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
Shaun Phillips	**17983**	**F5 X**	**09/05/2023**	**HPWJ to clean prior to survey**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**69HWF65MBE**	**12**

Road **Bennet Court**
Place **Bennet Road**
Location **Reading**

Division
District
Location Details

Purpose
Duty **Foul**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **F5**
End Node **Mains**
Total length **13.12 metres**

Scale **1:0.69**
Direction **Downstream**

Start Node Ref:F5 | I/L :1.82 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference F5	7870905	Comment / 0
0.00	WL	Water level 0% height/diameter	7870907	Comment / 0
13.12	MHF	Finish node type, manhole, reference Mains	7870947	Comment / 0

End Node Ref:Mains | I/L : metres

CCTV Inspection Photos

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
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Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Start node type, manhole, reference F5

Water level 0% height/diameter

Finish node type, manhole, reference Mains

Structural Defects (SRM 4)

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

No.	PLR	Dir.	Use	Shape/Size	Date	Mat.	Total Length	Inspection Length	Cat.	Peak Score	Grade	Mean Score	Total Score
1	F2 X	D	F	225	09/05/2023	Vitrified clay	56.33 metres	56.33		0	1	0	0
2	F1 X	D	F	225	09/05/2023	Vitrified clay	9.15 metres	9.15		0	1	0	0
3	F3 X	U	F	225	09/05/2023	Vitrified clay	5.55 metres	5.55		0	1	0	0
4	F4 X	U	F	150	09/05/2023	Vitrified clay	2.1 metres	2.1		0	1	0	0
5	S6 X	D	S	150	09/05/2023	Vitrified clay	13.94 metres	13.94		10	2	1.43	20
6	S5 X	D	S	150	09/05/2023	Vitrified clay	11.69 metres	11.69		10	2	0.86	10
7	S3 X	D	S	150	09/05/2023	Vitrified clay	5.21 metres	5.21		0	1	0	0
8	S4 X	D	S	150	09/05/2023	Vitrified clay	15.73 metres	15.73		0	1	0	0
9	InterceptoX	U	S	150	09/05/2023	Vitrified clay	0.02 metres	0.02		0	1	0	0
10	S2 X	D	S	150	09/05/2023	Vitrified clay	1.75 metres	1.75		0	1	0	0
11	S7 X	U	S	150	09/05/2023	Vitrified clay	18.62 metres	18.62		0	1	0	0
12	F5 X	D	F	150	09/05/2023	Vitrified clay	13.12 metres	13.12		0	1	0	0

Service Defects (SRM 4)

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

No.	PLR	Dir.	Use	Shape/Size	Date	Mat.	Total Length	Inspection Length	Cat.	Peak Score	Grade	Mean Score	Total Score
1	F2 X	D	F	225	09/05/2023	Vitrified clay	56.33 metres	56.33		5	4	0.12	7
2	F1 X	D	F	225	09/05/2023	Vitrified clay	9.15 metres	9.15		2	3	0.22	2
3	F3 X	U	F	225	09/05/2023	Vitrified clay	5.55 metres	5.55		2	3	0.36	2
4	F4 X	U	F	150	09/05/2023	Vitrified clay	2.1 metres	2.1		2	3	0.95	2
5	S6 X	D	S	150	09/05/2023	Vitrified clay	13.94 metres	13.94		0	1	0	0
6	S5 X	D	S	150	09/05/2023	Vitrified clay	11.69 metres	11.69		0	1	0	0
7	S3 X	D	S	150	09/05/2023	Vitrified clay	5.21 metres	5.21		0	1	0	0
8	S4 X	D	S	150	09/05/2023	Vitrified clay	15.73 metres	15.73		0	1	0	0
9	InterceptoX	U	S	150	09/05/2023	Vitrified clay	0.02 metres	0.02		0	1	0	0
10	S2 X	D	S	150	09/05/2023	Vitrified clay	1.75 metres	1.75		0	1	0	0
11	S7 X	U	S	150	09/05/2023	Vitrified clay	18.62 metres	18.62		0	1	0	0
12	F5 X	D	F	150	09/05/2023	Vitrified clay	13.12 metres	13.12		0	1	0	0

Report Summary

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Job Information

Total Distance Surveyed: **153.21 metres**
Engineer: **Shaun Phillips**
Number of Surveys: **12**
Number of Surveys grade 4 or above: **0**

Section 1 Overview (09/05/2023)

Manholes: **F2 to F1**
Pipe Length: **56.33 metres**
Structural Grade: **0**
Service Grade: **4**
Material: **Vitrified clay**
Pipe Size: **225mm**
Use: **Foul**

Section 2 Overview (09/05/2023)

Manholes: **F1 to Mains**
Pipe Length: **9.15 metres**
Structural Grade: **0**
Service Grade: **3**
Material: **Vitrified clay**
Pipe Size: **225mm**
Use: **Foul**

Section 3 Overview (09/05/2023)

Manholes: **F2 to F3**
Pipe Length: **5.55 metres**
Structural Grade: **0**
Service Grade: **3**
Material: **Vitrified clay**
Pipe Size: **225mm**
Use: **Foul**

Section 4 Overview (09/05/2023)

Manholes: **F2 to F4**
Pipe Length: **2.1 metres**
Structural Grade: **0**
Service Grade: **3**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Foul**

Section 5 Overview (09/05/2023)

Manholes: **S6 to S5**
Pipe Length: **13.94 metres**
Structural Grade: **2**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Section 6 Overview (09/05/2023)

Manholes: **S5 to S4**
Pipe Length: **11.69 metres**
Structural Grade: **2**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Section 7 Overview (09/05/2023)

Manholes: **S3 to Interceptor**
Pipe Length: **5.21 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Section 8 Overview (09/05/2023)

Manholes: **S4 to S3**
Pipe Length: **15.73 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Section 9 Overview (09/05/2023)

Manholes: **S2 to Interceptor**
Pipe Length: **0.02 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Section 10 Overview (09/05/2023)

Manholes: **S2 to S1**
Pipe Length: **1.75 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Section 11 Overview (09/05/2023)

Manholes: **S6 to S7**
Pipe Length: **18.62 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Surface water**

Report Summary

Burntwood Group
5b Plant Lane Business Park
Plant Lane
Burntwood
WS7 3GN

Job Number	Surveyed by (Operator)	Base Unit	Date
17983	**Shaun Phillips**	**69HWF65MBE**	**09/05/2023**

Section 12 Overview (09/05/2023)

Manholes: **F5 to Mains**
Pipe Length: **13.12 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Foul**

Appendix B

Greenfield Runoff Rate Estimation

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	karl pritchard
Site name:	Bennet
Site location:	Reading

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.42569° N
Longitude:	0.97379° W
Reference:	482816994
Date:	Dec 14 2023 11:40

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.62

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	639	639
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	1.02	1.02
1 in 1 year (l/s):	0.86	0.86
1 in 30 years (l/s):	2.34	2.34
1 in 100 year (l/s):	3.24	3.24
1 in 200 years (l/s):	3.8	3.8

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Appendix C

Roof Plan
Drainage Layout

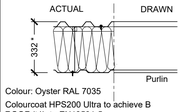
A1

ROOF CONSTRUCTION

ROOF-R1

SECTION

ACTUAL DRAWN



EXTERIOR

Built up steel cladding system, CA Building Products Twin-Therm outer sheet CA 32 1000R (or similar approved.)

* DIM TBC system depth to be better than design u-value

Colour: Oyster RAL 7035

Colourcoat HPS200 Ultra to achieve B ROOF (t4) to EN13501-5

SYPHONIC SYSTEM

INTERIOR

DESIGN U-VALUES

U VALUES TO BUILDING FABRIC TO BE BETTER THAN THE DESIGN LIMITS.

0.14 W/m²K -	ROOF (6° PITCH)	1.4 W/m²K -	EXTERNAL WINDOWS
0.18 W/m²K -	EXTERNAL WALLS	1.0 W/m²K -	ROOFLIGHTS
0.18 W/m²K -	GROUND FLOOR	1.4 W/m²K -	EXTERNAL DOORS
0.26 W/m²K -	SEPARATING WALLS	1.3 W/m²K -	VEHICLE / DOCK DOORS
		2.0 W/m²K -	ENTRANCE DOORS

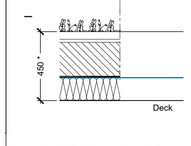
AIR PERMEABILITY (WORST ACCEPTABLE) - 2 m³ / (H m²) at 50 Pa

ALL SUBJECT TO SBEM CALCULATIONS BY M & E CONSULTANT.

ROOF-R2

SECTION

ACTUAL DRAWN



To achieve B ROOF (t4) to EN13501-5

EXTERIOR

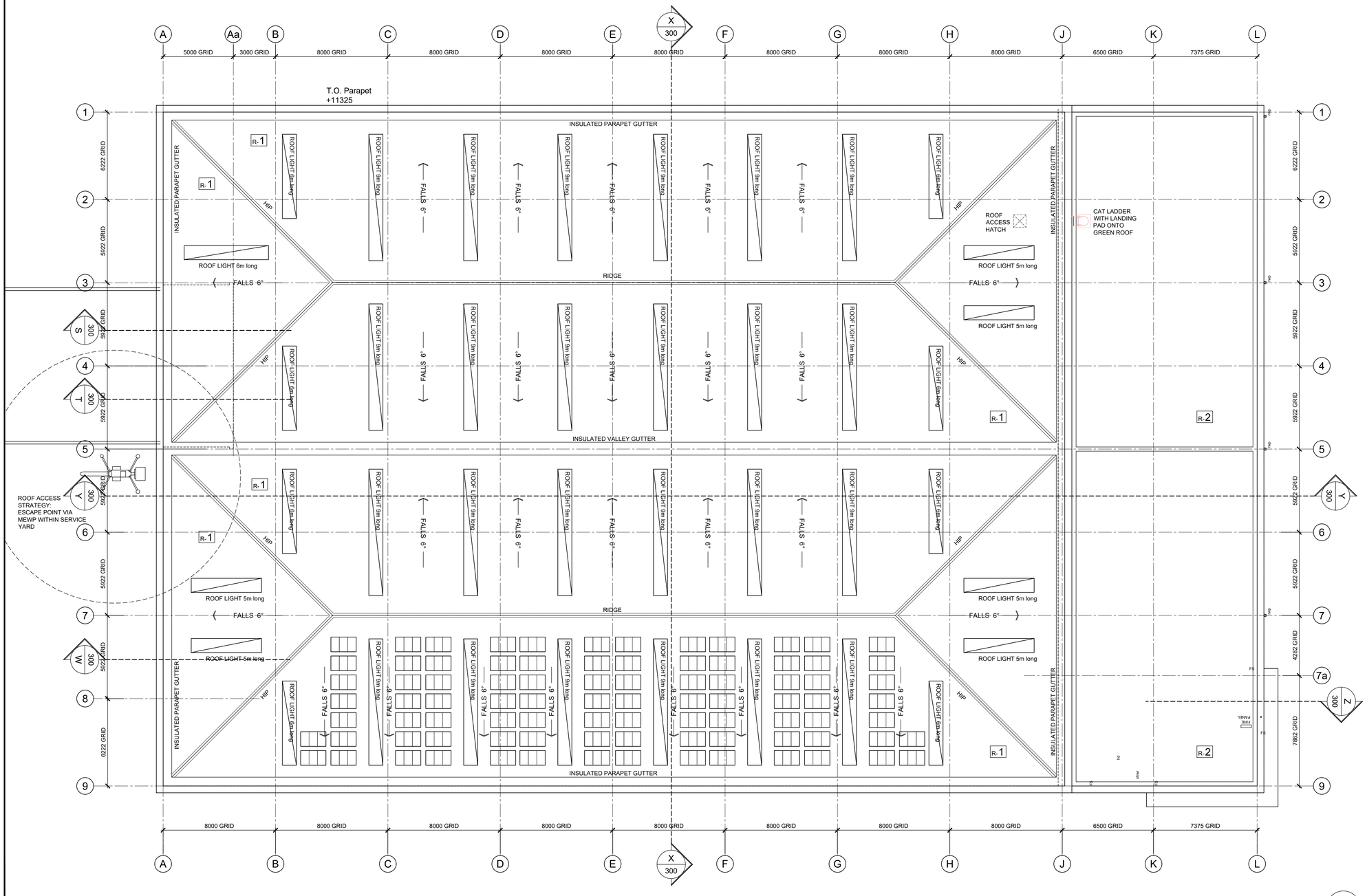
Lightweight extensive green roof (sedum) with nominal 300mm wide gravel ballast border at parapet edge.

- Sedum and wildflower.
- Extensive Sedum mat nom. 20mm
- Extensive Sedum Substrate max 150mm
- Drainage board with integral filtration layer to upper surface nom. 20mm
- Protection mat nom. 4mm
- Mechanically fixed polymeric roof membrane system.
- Insulation to achieve design u-value
- Vapour Control Layer

INTERIOR

GREEN ROOF

NOTE:
In accordance with the recommendations from Ecologists (FCFR), the implementation of a 620m2 Green Roof, inclusive of gravel margin with ephemeral species acting as pollinators and fire breaks will contribute towards achieving a minimum of 10% BNG, in addition to previously agreed off-site tree planting.



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The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided.

This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contaminates on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert.

Where existing trees are to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting.

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation including ground conditions/contaminants, drainage, design & planning/density negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features, accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

LEGEND

1 — Detail ref
121 — on Drawing ref

N.B. ROOF ACCESS STRATEGY IS VIA MEWP. NO FIXED LADDERS AND ROOF ACCESS HATCHES HAVE BEEN INDICATED.
Secondary roof escape from Production roof must be in place when operatives are on roof, i.e. 2 no. MEWPS required at all times.
See also fire strategy drawing ref.151.

ROOF LIGHT

Site assembled translucent rooflight fixed to roof purlins strictly in accordance with Manufacturer's details.

Rooflights to provide a min. 10% of the net Production Area floor area in an even distribution.

Size of gutter, outlet locations and overflow locations all to S.S.C.'s details.

Mansafe system will be required to roofs. All to Specialist details.

ABBREVIATIONS

Nom.	Nominal	U/s	Underside of
T.O.S	Top of steel	T.O.	Top of
S.O.	Structural Opening	F.O.	Face of
F.F.L.	Finished Floor Level	AFFL	Above Finished Floor Level
S.S.C.	Specialist Sub Contractor	S.S.L.	Structural Slab Level
EOB	Edge Of Beam		

Revisions:	Amendment:	Date:	Name:
T3	Air permeability note amended	11.12.23	jmc
T2	CAT ladder added. R2 spec updated	28.11.23	jmc
T1	First issue at tender status	16.11.23	A.A.

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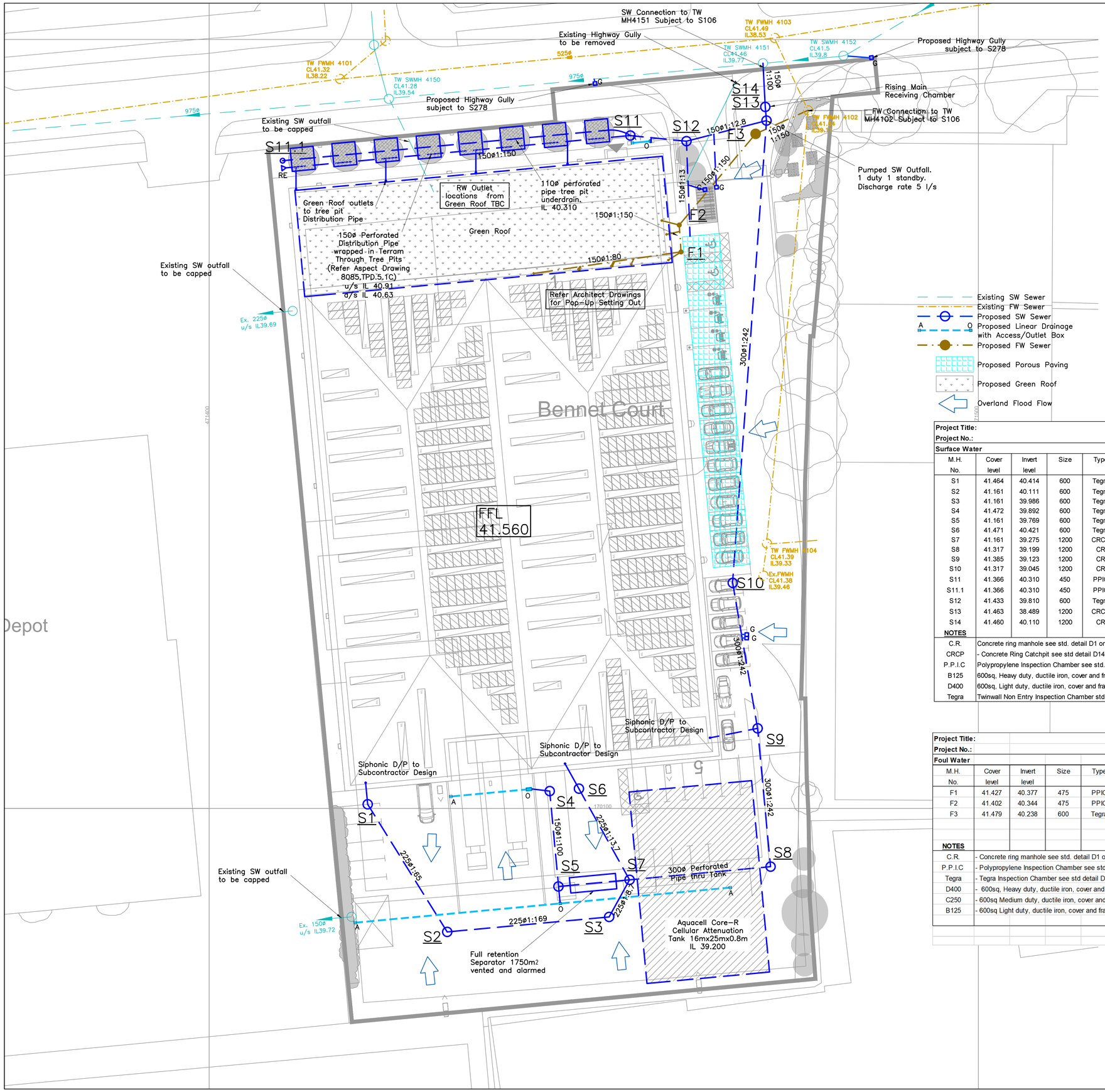
TENDER

CLIENT: COLTHAM

PROJECT: BENNET COURT, BENNET ROAD READING.

TITLE: GENERAL ARRANGEMENT ROOF PLAN

Scale: 1:200 @ A1	Date : NOV 23
Drawn : A.A.	Checked By : D.N.
Drw No : 22-024- T-112	Revision: T3



Existing SW Sewer
Existing FW Sewer
Proposed SW Sewer
Proposed Linear Drainage with Access/Outlet Box
Proposed FW Sewer
Proposed Porous Paving
Proposed Green Roof
Overland Flood Flow

Project Title:	Bennet Court						
Project No.:	2022-124						
Surface Water							
M.H. No.	Cover level	Invert level	Size	Type	Largest pipe	Cover type	Notes
S1	41.464	40.414	600	Tegra	225	D400	
S2	41.161	40.111	600	Tegra	220	D400	
S3	41.161	39.986	600	Tegra	225	D400	
S4	41.472	39.892	600	Tegra	150	D400	
S5	41.161	39.769	600	Tegra	150	D400	
S6	41.471	40.421	600	Tegra	225	D400	
S7	41.161	39.275	1200	CRCP	300	D400	
S8	41.317	39.199	1200	CR	300	D400	
S9	41.385	39.123	1200	CR	300	D400	
S10	41.317	39.045	1200	CR	300	D400	
S11	41.366	40.310	450	PPIC	150	B125	
S11.1	41.366	40.310	450	PPIC	150	B125	
S12	41.433	39.810	600	Tegra	150	B125	
S13	41.463	38.489	1200	CRCP	300	D400	Pump Chamber 5 l/s
S14	41.460	40.110	1200	CR	150	D400	
NOTES							
C.R.	Concrete ring manhole see std. detail D1 or D15.						
CRCP	- Concrete Ring Catchpit see std detail D14						
P.P.I.C	Polypropylene Inspection Chamber see std.detail D13						
B125	600sq, Heavy duty, ductile iron, cover and frame to BS EN 124:B125						
D400	600sq, Light duty, ductile iron, cover and frame to BS EN 124:D400						
Tegra	Twinwall Non Entry Inspection Chamber std Detail D51						

Project Title:	Bennet Court						
Project No.:	2022-124						
Foul Water							
M.H. No.	Cover level	Invert level	Size	Type	Largest pipe	Cover type	Notes
F1	41.427	40.377	475	PPIC	150	B125	
F2	41.402	40.344	475	PPIC	150	B125	
F3	41.479	40.238	600	Tegra	150	D400	
NOTES							
C.R.	- Concrete ring manhole see std. detail D1 or D15.						
P.P.I.C	- Polypropylene Inspection Chamber see std.detail D13						
Tegra	- Tegra Inspection Chamber see std detail D51						
D400	- 600sq, Heavy duty, ductile iron, cover and frame to BS EN 124:D400						
C250	- 600sq Medium duty, ductile iron, cover and frame to BS EN 124:C250						
B125	- 600sq Light duty, ductile iron, cover and frame to BS EN 124:B125						

NOLAN ASSOCIATES

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

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NOTES.

1. This drawing is to be read in conjunction with all relevant Architect's, Engineer's, Specialists details and the Specification.
2. All surface water pipes 150ø u.n.o.
3. All foul water pipes 100ø u.n.o.
4. All drainage pipes to BS EN 295 (clayware) or BS EN 1401 (plastic) U.N.O. Other materials may be permitted subject to the approval of the Engineer.
5. Pipes to BS EN 295 with more than 900mm cover between pipe soffit and finished surface to be in Type 'B' bedding. Pipes to BS EN 1401 with more than 900mm between pipe soffit and finished surface to be in Type 'S' bedding.
6. All pipes under external paved areas with less than 900mm cover to be in Type 'A5' bedding.
7. All manholes, trenches, culverts etc to be backfilled with imported granular fill to Class 6F1 (capping material) compacted to a maximum of 95% of maximum dry density of BS.1377: Part 4 (Vibrating Hammer method).
8. The Contractor is responsible for ensuring that full and adequate temporary works are provided to maintain safety and stability of the existing structure whilst the new works are being carried out. The propping is to remain in position until such time that the new works can adequately sustain the intended loads. Details of the proposed temporary works are to be forwarded to the Engineer for comment prior to commencement of works being carried out. Reference should also be made to Nolan Associates Standard detail – Pipes near buildings. (D22)
9. Polypropylene Access Chambers (denoted A.C.) are to be no deeper than 1200mm.
10. Pipe Gradients:

    Pipes are to be laid to the levels and gradients shown. Pipe branches are to be laid no flatter than the following table:

	100ø	150ø
Gullies, sinks and basins	1:40	1:40
Pipes draining 1 or more WC's	1:80	–
Pipes draining 5 or more WC's	1:80	1:150

11. For Manhole covers see schedule.
12. The Contractor is to enter into all necessary legal agreements with the drainage authority for all connections to the Public Sewer Network.
13. The Contractor is to survey all drainage outfalls and determine the levels of any Utility Apparatus that might affect the levels of drainage connections, prior to commencing any drainage works on site.
14. The Contractor is to obtain the consent of the Highway Authority to any works within the highway and enter into any necessary legal agreements.
15. Rising main to be BS EN 13244-2, all joints electrofusion welded to provide continuous main.

REV	DESCRIPTION	BY	CHKD	DATE
T8	Tree pit drawing rev no. added Site Plan Update. No Drainage Changes	KP	KP	20.09.24
T7		KP	KP	17.09.24
T6	Tree Pit Details Updated	KP	KP	03.07.24
T5	Tree Pit Details Updated	KP	KP	20.06.24
T4	S13/S14 moved slightly	KP	KP	29.04.24
T3	Tree pit drainage Added	KP	KP	19.03.24
T2	Revised Tender Site Plan	KP	KP	01.12.23
T1	Strategy Updated	LC	KP	17.11.23
P3	Revised layout added	LC	JJG	09.01.23
P2	Revised layout added	MH	JJG	07.12.22
P1	Preliminary issue	MH	JJG	21.11.22

Bennet Court

Drainage Layout

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E-MAIL: enquiries@nolanassociates.co.uk

Drawn by	Date	Plot Date	Scale
MH	21.11.22	09.01.23	1:250@A1
Checked by	**Project No**		**Dwg No**
JJG	2022-124		100 T8

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consulting civil and structural engineers

Appendix D
Microdrainage Network and Results

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	19.554	0.303	64.5	0.082	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	21.145	0.125	169.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	5.506	0.636	8.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	2.318	0.023	100.9	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	12.448	0.123	100.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	2.046	0.291	7.0	0.156	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	9.261	0.344	26.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	13.558	1.071	12.7	0.154	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	18.366	0.076	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	18.310	0.076	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	19.060	0.079	241.9	0.083	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	2.608	1.055	2.5	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	61.711	0.255	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	51.044	0.506	100.9	0.065	15.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	12.478	0.985	12.7	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.20	40.414	0.082	0.0	0.0	0.0	1.63	64.8	11.2
S1.001	50.00	5.55	40.111	0.082	0.0	0.0	0.0	1.00	39.9	11.2
S1.002	50.00	5.57	39.986	0.082	0.0	0.0	0.0	4.47	177.9	11.2
S2.000	50.00	5.04	39.915	0.019	0.0	0.0	0.0	1.00	17.7	2.5
S2.001	50.00	5.25	39.892	0.019	0.0	0.0	0.0	1.00	17.7	2.5
S3.000	50.00	5.01	40.060	0.156	0.0	0.0	0.0	3.83	67.6	21.1
S2.002	50.00	5.31	39.694	0.175	0.0	0.0	0.0	2.53	100.7	23.6
S4.000	50.00	5.06	40.421	0.154	0.0	0.0	0.0	3.70	147.0	20.9
S1.003	50.00	5.88	39.275	0.411	0.0	0.0	0.0	1.01	71.1	55.7
S1.004	50.00	6.18	39.199	0.411	0.0	0.0	0.0	1.01	71.1	55.7
S1.005	50.00	6.49	39.123	0.494	0.0	0.0	0.0	1.01	71.1	66.9
S5.000	50.00	5.01	40.250	0.028	0.0	0.0	0.0	6.46	114.2	3.7
S1.006	50.00	7.52	39.044	0.521	0.0	0.0	0.0	1.01	71.1	70.6
S6.000	50.00	15.85	40.316	0.065	0.0	0.0	0.0	1.00	17.7	8.8
S7.000	50.00	5.07	40.795	0.060	0.0	0.0	0.0	2.85	50.3	8.2

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	11.183	0.871	12.8	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	6.125	0.025	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	50.00	15.92	39.810	0.146	0.0	0.0	0.0	2.83	50.0	19.8
S1.007	50.00	5.10	38.489	0.000	5.0	0.0	0.0	1.01	71.1	5.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	41.464	1.050	Open Manhole	1200	S1.000	40.414	225				
S2	41.161	1.050	Open Manhole	1200	S1.001	40.111	225	S1.000	40.111	225	
S3	41.161	1.175	Open Manhole	1200	S1.002	39.986	225	S1.001	39.986	225	
SDock	40.565	0.650	Open Manhole	1200	S2.000	39.915	150				
S4	41.472	1.580	Open Manhole	1200	S2.001	39.892	150	S2.000	39.892	150	
SYard	41.110	1.050	Open Manhole	1200	S3.000	40.060	150				
S5	41.161	1.467	Open Manhole	1200	S2.002	39.694	225	S2.001	39.769	150	
								S3.000	39.769	150	
S6	41.471	1.050	Open Manhole	1200	S4.000	40.421	225				
S7	41.161	1.886	Open Manhole	1200	S1.003	39.275	300	S1.002	39.350	225	
								S2.002	39.350	225	
								S4.000	39.350	225	
S8	41.317	2.118	Open Manhole	1200	S1.004	39.199	300	S1.003	39.199	300	
S9	41.385	2.262	Open Manhole	1200	S1.005	39.123	300	S1.004	39.123	300	
SACO	41.300	1.050	Open Manhole	1200	S5.000	40.250	150				
S10	41.317	2.273	Open Manhole	1200	S1.006	39.044	300	S1.005	39.044	300	
								S5.000	39.195	150	
S11	41.366	1.050	Open Manhole	1200	S6.000	40.316	150				
SPorPav	41.275	0.480	Open Manhole	1200	S7.000	40.795	150				
S12	41.433	1.623	Open Manhole	1200	S6.001	39.810	150	S6.000	39.810	150	
								S7.000	39.810	150	
Sp13	41.463	2.974	Open Manhole	1200	S1.007	38.489	300	S1.006	38.789	300	300
								S6.001	38.939	150	300
S4151	41.419	2.955	Open Manhole	2100		OUTFALL		S1.007	38.464	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	471420.609	170100.541	471420.609	170100.541	Required	
S2	471430.946	170083.943	471430.946	170083.943	Required	
S3	471452.002	170085.889	471452.002	170085.889	Required	
SDock	471441.964	170102.042	471441.964	170102.042	Required	
S4	471444.273	170102.248	471444.273	170102.248	Required	
SYard	471445.621	170087.816	471445.621	170087.816	Required	

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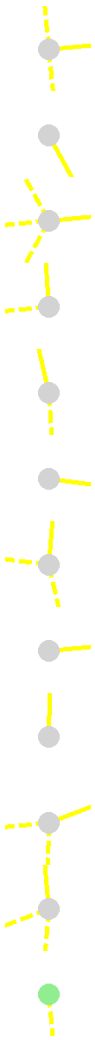
Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	471445.430	170089.853	471445.430	170089.853	Required	
S6	471448.071	170102.570	471448.071	170102.570	Required	
S7	471454.651	170090.716	471454.651	170090.716	Required	
S8	471472.933	170092.470	471472.933	170092.470	Required	
S9	471471.702	170110.739	471471.702	170110.739	Required	
SACO	471464.835	170129.654	471464.835	170129.654	Required	
S10	471467.420	170129.311	471467.420	170129.311	Required	
S11	471411.295	170182.006	471411.295	170182.006	Required	
SPorPav	471461.847	170174.350	471461.847	170174.350	Required	
S12	471462.111	170186.825	471462.111	170186.825	Required	
Sp13	471472.561	170190.808	471472.561	170190.808	Required	
S4151	471472.004	170196.907			No Entry	



Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S4151	41.419	38.464	39.770	2100	0

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Online Controls for Storm

Level Controlled Pump Manhole: Sp13, DS/PN: S1.007, Volume (m³): 7.8

Invert Level (m) 38.489 Cut In Height (m) 0.300 Cut Out Height (m) 0.200

Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)
0.100	5.0000	0.900	5.0000	1.700	5.0000	2.500	5.0000
0.200	5.0000	1.000	5.0000	1.800	5.0000	2.600	5.0000
0.300	5.0000	1.100	5.0000	1.900	5.0000	2.700	5.0000
0.400	5.0000	1.200	5.0000	2.000	5.0000	2.800	5.0000
0.500	5.0000	1.300	5.0000	2.100	5.0000	2.900	5.0000
0.600	5.0000	1.400	5.0000	2.200	5.0000	3.000	5.0000
0.700	5.0000	1.500	5.0000	2.300	5.0000		
0.800	5.0000	1.600	5.0000	2.400	5.0000		

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Storage Structures for Storm

Tank or Pond Manhole: SDock, DS/PN: S2.000

Invert Level (m) 40.265

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.035	61.0	0.135	132.0	0.235	146.0	0.335	160.0

Cellular Storage Manhole: S8, DS/PN: S1.004

Invert Level (m) 39.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	400.0	300.0	0.800	400.0	327.7	0.801	0.0	327.7

Porous Car Park Manhole: SPorPav, DS/PN: S7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.2
Max Percolation (l/s)	60.0	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	40.943	Cap Volume Depth (m)	0.300

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.900 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	1	+0%					40.479	-0.160
S1.001	S2	15 Winter	1	+0%	100/15 Summer				40.195	-0.141
S1.002	S3	15 Winter	1	+0%	100/15 Summer				40.033	-0.178
S2.000	SDock	15 Winter	1	+0%	100/15 Summer				39.964	-0.101
S2.001	S4	15 Winter	1	+0%	100/15 Summer				39.931	-0.111
S3.000	SYard	15 Winter	1	+0%	30/15 Summer	100/15 Summer			40.145	-0.065
S2.002	S5	15 Winter	1	+0%	30/15 Summer				39.775	-0.144
S4.000	S6	15 Winter	1	+0%					40.481	-0.165
S1.003	S7	15 Winter	1	+0%	30/15 Summer				39.493	-0.081
S1.004	S8	180 Winter	1	+0%	30/60 Summer				39.323	-0.176
S1.005	S9	30 Winter	1	+0%	1/30 Winter				39.426	0.003
S5.000	SACO	15 Winter	1	+0%	100/180 Winter				40.273	-0.127
S1.006	S10	30 Winter	1	+0%	1/15 Winter				39.437	0.092
S6.000	S11	30 Winter	1	+0%	100/15 Summer				40.368	-0.098
S7.000	SPorPav	15 Winter	1	+0%	100/15 Summer				40.837	-0.108
S6.001	S12	15 Winter	1	+0%	30/15 Summer				39.867	-0.094
S1.007	Sp13	30 Winter	1	+0%	1/15 Summer				39.455	0.666

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.18			10.8	OK	
S1.001	S2	0.000	0.30			10.7	OK	
S1.002	S3	0.000	0.10			10.8	OK	
S2.000	SDock	0.000	0.22			2.4	OK	
S2.001	S4	0.000	0.15			2.5	OK	
S3.000	SYard	0.000	0.60			20.3	OK	4
S2.002	S5	0.000	0.27			22.7	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S6	0.000	0.16			20.2	OK	
S1.003	S7	0.000	0.88			53.7	OK	
S1.004	S8	0.000	0.08		115	5.2	OK	
S1.005	S9	0.000	0.14			8.9	SURCHARGED	
S5.000	SACO	0.000	0.06			3.6	OK	
S1.006	S10	0.000	0.14			9.8	SURCHARGED	
S6.000	S11	0.000	0.26			4.5	OK	
S7.000	SPorPav	0.000	0.17		6	7.9	OK	
S6.001	S12	0.000	0.30			13.5	OK	
S1.007	Sp13	0.000	0.10			5.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.900 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	30	+0%					40.521	-0.118
S1.001	S2	15 Winter	30	+0%	100/15 Summer				40.256	-0.080
S1.002	S3	15 Winter	30	+0%	100/15 Summer				40.060	-0.151
S2.000	SDock	15 Winter	30	+0%	100/15 Summer				39.996	-0.069
S2.001	S4	15 Winter	30	+0%	100/15 Summer				39.983	-0.059
S3.000	SYard	15 Winter	30	+0%	30/15 Summer	100/15 Summer			40.485	0.275
S2.002	S5	15 Winter	30	+0%	30/15 Summer				39.961	0.042
S4.000	S6	15 Winter	30	+0%					40.519	-0.127
S1.003	S7	15 Winter	30	+0%	30/15 Summer				39.791	0.216
S1.004	S8	240 Winter	30	+0%	30/60 Summer				39.621	0.122
S1.005	S9	15 Winter	30	+0%	1/30 Winter				39.864	0.441
S5.000	SACO	15 Winter	30	+0%	100/180 Winter				40.287	-0.113
S1.006	S10	15 Winter	30	+0%	1/15 Winter				39.929	0.585
S6.000	S11	15 Winter	30	+0%	100/15 Summer				40.436	-0.031
S7.000	SPorPav	15 Winter	30	+0%	100/15 Summer				40.864	-0.081
S6.001	S12	15 Winter	30	+0%	30/15 Summer				40.307	0.347
S1.007	Sp13	15 Winter	30	+0%	1/15 Summer				40.041	1.252

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.45			26.4	OK	
S1.001	S2	0.000	0.73			26.3	OK	
S1.002	S3	0.000	0.23			26.4	OK	
S2.000	SDock	0.000	0.55			6.0	OK	
S2.001	S4	0.000	0.37			5.9	OK	
S3.000	SYard	0.000	1.32			44.7	SURCHARGED	4
S2.002	S5	0.000	0.63			52.2	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S6	0.000	0.39			49.6	OK	
S1.003	S7	0.000	1.98			121.7	SURCHARGED	
S1.004	S8	0.000	0.49			30.3	SURCHARGED	
S1.005	S9	0.000	0.32			19.8	SURCHARGED	
S5.000	SACO	0.000	0.14			8.9	OK	
S1.006	S10	0.000	0.26			17.5	SURCHARGED	
S6.000	S11	0.000	0.62			10.7	OK	
S7.000	SPorPav	0.000	0.42		6	19.4	OK	
S6.001	S12	0.000	0.80			36.1	SURCHARGED	
S1.007	Sp13	0.000	0.10			5.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.900 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	100	+40%					40.611	-0.028
S1.001	S2	360 Winter	100	+40%	100/15 Summer				40.576	0.240
S1.002	S3	360 Winter	100	+40%	100/15 Summer				40.574	0.363
S2.000	SDock	360 Winter	100	+40%	100/15 Summer				40.544	0.479
S2.001	S4	360 Winter	100	+40%	100/15 Summer				40.549	0.507
S3.000	SYard	15 Winter	100	+40%	30/15 Summer	100/15 Summer			41.115	0.905
S2.002	S5	360 Winter	100	+40%	30/15 Summer				40.570	0.651
S4.000	S6	15 Winter	100	+40%					40.624	-0.022
S1.003	S7	360 Winter	100	+40%	30/15 Summer				40.573	0.998
S1.004	S8	360 Winter	100	+40%	30/60 Summer				40.571	1.072
S1.005	S9	360 Winter	100	+40%	1/30 Winter				40.569	1.146
S5.000	SACO	240 Winter	100	+40%	100/180 Winter				40.567	0.167
S1.006	S10	240 Winter	100	+40%	1/15 Winter				40.567	1.222
S6.000	S11	30 Winter	100	+40%	100/15 Summer				41.338	0.872
S7.000	SPorPav	15 Winter	100	+40%	100/15 Summer				40.973	0.028
S6.001	S12	15 Summer	100	+40%	30/15 Summer				40.820	0.860
S1.007	Sp13	240 Winter	100	+40%	1/15 Summer				40.563	1.773

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.79			46.3	OK	
S1.001	S2	0.000	0.19			6.8	SURCHARGED	
S1.002	S3	0.000	0.06			6.8	SURCHARGED	
S2.000	SDock	0.000	0.39			4.2	FLOOD RISK	
S2.001	S4	0.000	0.26			4.2	SURCHARGED	
S3.000	SYard	5.047	1.82			61.4	FLOOD	4
S2.002	S5	0.000	0.17			14.3	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S6	0.000	0.67			86.1	OK	
S1.003	S7	0.000	0.55			33.5	SURCHARGED	
S1.004	S8	0.000	0.43			26.1	SURCHARGED	
S1.005	S9	0.000	0.38			23.2	SURCHARGED	
S5.000	SACO	0.000	0.05			3.1	SURCHARGED	
S1.006	S10	0.000	0.08			5.7	SURCHARGED	
S6.000	S11	0.000	1.29			22.3	FLOOD RISK	
S7.000	SPorPav	0.000	0.57		4	25.8	SURCHARGED	
S6.001	S12	0.000	1.03			46.5	SURCHARGED	
S1.007	Sp13	0.000	0.10			5.0	SURCHARGED	

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Appendix E

Suds Maintenance

All maintenance to be the responsibility of the landowner.

Component	Regular Maintenance	Occasional (Infrequent) Maintenance	Remedial Maintenance	Monitoring
Attenuation storage tank **(1)**	Inspect and identify any areas that are not operating correctly. Will be seen from inspection of (2) showing large sediment and water. If required, take remedial action. Remove debris from the catchment surface **MONTHLY**. Remove sediment from pre-treatment structures **ANNUALLY**. Manholes to be lifted using manhole keys.		Repair/rehabilitate inlets, outlets, overflows and vents. As this is remedial maintenance this is only required if the attenuation tank is not function as required. This would be evident from inspections of the upstream and downstream catchpits overfilling.	Inspect/check all inlets (2) , outlets (2), vents and overflows to ensure that they are in good condition and operating as designed annually. Survey inside of tank for sediment build-up and remove if necessary **EVERY FIVE YEARS.**
Catchpits **(3)**	Visual Inspection **ANNUALLY** to determine silt build up. Manholes to be lifted using manhole keys.	Use gully sucker to remove silt if any present.		Visual Inspection **ANNUALLY** to determine silt build up
Hydrobrake **(4)**	Remove sediment and debris from flow control chambers and upstream manholes **MONTHLY FOR FIRST 6 MONTHS THEN ANNUALLY** Manholes to be lifted using manhole keys.		Replace or clean hydrobrake if performance deteriorates or failure occurs.	Check flow control to ensure emptying is occurring **ANNUALLY** and **POST HIGH INTENSITY STORM EVENT**
Linear Drainage Channels **(5)**	Visual Inspection **ANNUALLY** to determine silt build up. Channel to be lifted with crowbar.	Use gully sucker to remove silt from outlet sump and Jetting to remove silt build up in channel if silt has built up. Channels are more likely to fill within the autumn with leaves so more regular inspections should take place in this season.		Visual Inspection **ANNUALLY** to determine silt build up
Pervious Pavements (6)	Brushing and vacuuming (standard cosmetic sweep over whole surface) **ONCE A YEAR**	Stabilise and mow contributing and adjacent areas **AS REQUIRED**. Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying **AS REQUIRED.**	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving as required. Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a	Initial inspection **MONTHLY**. Inspect for evidence of poor operation and/or weed growth – if required, take remedial action three monthly. Inspect silt accumulation rates and establish appropriate brushing frequencies **ANNUALLY**.

			hazard to users, and replace lost jointing material **AS REQUIRED.**	Monitor inspection chambers **ANNUALLY.**
Green Roof (7)	For vegetation maintenance Refer Landscape Management Plan			
				Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes, and roof structure for proper operation, integrity of waterproofing and structural stability, take action **AS REQUIRED**
Tree Pit (8)	Tree/ planting maintenance Refer Landscape Management Plan			
				Inspect/check all inlets, outlets, to ensure that they are in good condition, free from blockages and operating as designed. Take action **AS REQUIRED**