Report Title	# Drainage Report
Property Address	Land adj 108 Victoria Road Whitehaven CA28 6JG
Client	Roy Donnan
Our Reference	23-191r001
Date	May 2023
Prepared by	Colin Aimers BEng Hons CEng MICE CEnv **Kingoor Consulting Ltd** 6B Clifford Court Parkhouse Carlisle CA3 0JG

Contents

Introduction

The purpose of this report is to provide technical design for the proposed drainage at new dwellings on land adjacent to 108 Victoria Road, Whitehaven, CA28 6JG. This follows the detailed site review by Kingmoor Consulting Ltd.

Research has been undertaken on the site and observations made regarding the existing site and the drainage servicing the site.

Calculations associated with the drainage have been performed by software packages from a recognised resource. Where appropriate copies of calculations are provided in the Appendices of this report.

Proposed Development

It is proposed that three new dwellings be constructed on the site alongside new infrastructure to service the site. New drainage shall be installed for both foul and surface water drainage around the property, to any drainage to the combined sewer located in Victoria Road.

The Site

Existing Drainage

A United Utilities combined sewer is present on Victoria Road which carries both surface and foul drainage from the area.

At present a surface water cut off drain is present along the rear of the properties in Victoria Road which connects with the combined sewer.

Drawing 23-191 DWG002 indicated these arrangements.

Geology

Superficial Deposits

The published superficial geology by The British Geological Survey shows the site is overlain by Diamacin Till comprising of clays and silts.

Solid Geology

The solid geology as published by the British Geological Survey shows the site to be underlain by the Pennine Coal Meyers generally comprising sandstones, siltstones and mudstones.

Groundwater

No ground water was encountered in the exploratory works undertaken on the site.

Percolation tests undertaken on the site indicate that the site has no potential for direct drainage.

Drainage Strategy

Foul Drainage

it is proposed that the site shall drain into the adjacent combined sewer.

Initial consultations with United Utilities have not been undertaken as part of these works, but it is understood that the principals have been agreed previously associated with properties on this site.

A S106 Application would be made for the proposed connection to United Utilities and a S50 Application made to Cumberland Council for any drainage apparatus to be located in the public highway.

Surface Water Drainage

It is proposed to discharge the surface water from the development to the existing combined sewer present on Victoria Road. This is following investigations undertaken on the site which indicated that the site cannot accommodate natural percolation to the superficial deposits on the site.

This follows the Hierarchy of Drainage, as stated in the National Planning Practice Guidance, the aim should be to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

- Into the ground (infiltration); - ***Not suitable***
- To a surface water body; - ***Not available***
- To a surface water sewer, highway drain, or another drainage system; - ***Drains to combined sewer***
- To a combined sewer

Hydraulic Design

Foul Drainage

Calculations have been undertaken on the foul network and are presented in the Appendices of this report.

The foul drainage shall be managed privately and shall carry foul drainage to the combined sewer. A load of 1500 l/day per dwelling has been considered.

Surface Water Drainage

Principally the surface water drainage has been calculated on the impermeable areas of the development, and modelled in causeway flow. Flows are attenuated and released to the combined sewer at a rate of Q bar.

Modelling has been conducted on the following rainfall events:

- 1 in 10 years
- 1 in 30 years
- 1 in 100 years + 40% increase due to climate change

An assessment of the proposed network has been undertaken to identify the requirements of the attenuation on the site.

The following parameters were adopted in the analysis. These were obtained from UK SUDS based on the site location and data held by HR Wallingford.

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	3.8
Winter CV	0.840	Check Discharge Volume	✓
Analysis Speed	Normal	100 year 360 minute (m³)	68

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

Pre Development Discharge Rates and Volumes

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.220	Betterment (%)	0
SAAR (mm)	1122	QBar	1.8
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	10	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.220	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.508
CWI	125.305	Runoff Volume (m³)	68

Detailed Engineering

The detailed model presented in this report adopts the following engineering aspects specific to the site. Drawing 23-191 DWG001 indicates the location of the key elements.

Attenuation

Attenuation for the areas to be drained have been designed to prevent flooding occuring within and outside the site for the 1 in 100 year + 40% climate change event.

Node 11 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	93.000	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	148	Inf Depth (m)	
Safety Factor	1.0	Pit Width (m)	2.400	Number Required	1
Porosity	0.95	Pit Length (m)	8.400		

Node 7 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	98.150	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	1.0	Pit Width (m)	3.600	Number Required	1
Porosity	0.95	Pit Length (m)	7.200		

Flow Controls

Flow controls have been placed on the site to prevent flooding and store water in the system for slow release. Manhole S11 contains the final flow control device which limits flows from the site to the calculated QBar for the site.

Manhole S7 is used to control flows from the upper areas of the site and release water slowly down the site.

Node 12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	92.675	Product Number	CTL-SHE-0056-1400-1000-1400
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.4	Min Node Diameter (mm)	1200

Node 7 Online Head/Flow Control

Flap Valve	x	Invert Level (m)	98.150	Design Flow (l/s)	0.5
Replaces Downstream Link	✓	Design Depth (m)	1.200		

Head (m)	Flow (l/s)
1.500	0.625

Summary

The following summary associated with the critical storm event is offered associated with loads and flows on the system and the potential for flooding to occur..

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	1	540	99.563	0.613	1.1	0.0000	0.0000	SURCHARGED
600 minute winter	2	540	99.563	0.830	1.7	0.5280	0.0000	SURCHARGED
600 minute winter	3	540	99.563	0.713	0.3	0.1134	0.0000	SURCHARGED
600 minute winter	4	540	99.563	0.713	1.1	0.4534	0.0000	SURCHARGED
600 minute winter	5	540	99.563	0.833	1.4	0.1324	0.0000	SURCHARGED
600 minute winter	6	540	99.563	1.363	2.7	0.8667	0.0000	FLOOD RISK
600 minute winter	7	540	99.563	1.413	2.6	30.4595	0.0000	FLOOD RISK
15 minute summer	8	10	98.462	0.062	10.0	0.0396	0.0000	OK
15 minute winter	9	10	98.003	0.053	14.1	0.0336	0.0000	OK
15 minute winter	10	10	96.690	0.050	18.1	0.0321	0.0000	OK
120 minute winter	11	116	93.747	0.747	8.4	14.7790	0.0000	SURCHARGED
120 minute winter	12	116	93.746	1.071	1.9	1.2114	0.0000	FLOOD RISK
15 minute summer	99	1	92.580	0.000	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	1	2.000	2	1.1	0.813	0.089	0.0413	
600 minute winter	2	1.001	6	1.5	0.683	0.131	0.1050	
600 minute winter	3	1.000	2	0.3	0.246	0.038	0.0544	
600 minute winter	4	3.000	5	1.1	0.838	0.120	0.0412	
600 minute winter	5	3.001	6	1.3	0.817	0.074	0.0484	
600 minute winter	6	1.002	7	2.6	0.491	0.179	0.1271	
600 minute winter	7	Head/Flow	9	0.6				
15 minute summer	8	4.000	9	10.0	2.084	0.593	0.0251	
15 minute winter	9	1.004	10	14.1	2.621	0.244	0.0680	
15 minute winter	10	1.005	11	18.1	2.675	0.245	0.2441	
120 minute winter	11	1.006	12	1.9	0.575	0.053	0.1410	
120 minute winter	12	Hydro-Brake®	99	1.4				26.2

We consider that no flooding occurs on or off the site during the 1 in 30 year, and 1 in 100 year + 40% CC storm event.

Maintenance of Drainage

Operation and Maintenance Requirements

As with all traditional drainage systems, SuDS need to be inspected and maintained regularly to ensure that they operate correctly and efficiently. If SuDS are not properly maintained then there is a risk that the systems will become overloaded during periods of prolonged heavy rainfall, potentially resulting in localised flooding of the development. Recommendations for the SuDS maintenance activities for the privately maintained areas are detailed below.

All maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken in accordance with CDM regulations.

Inlets, Outlets, Controls and Inspection Chambers

- Inlets and outlets structures may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.
- SuDS flow control structures can be protected orifices, slots weirs or other controls at or near the surface to be accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- Inspection Chambers and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

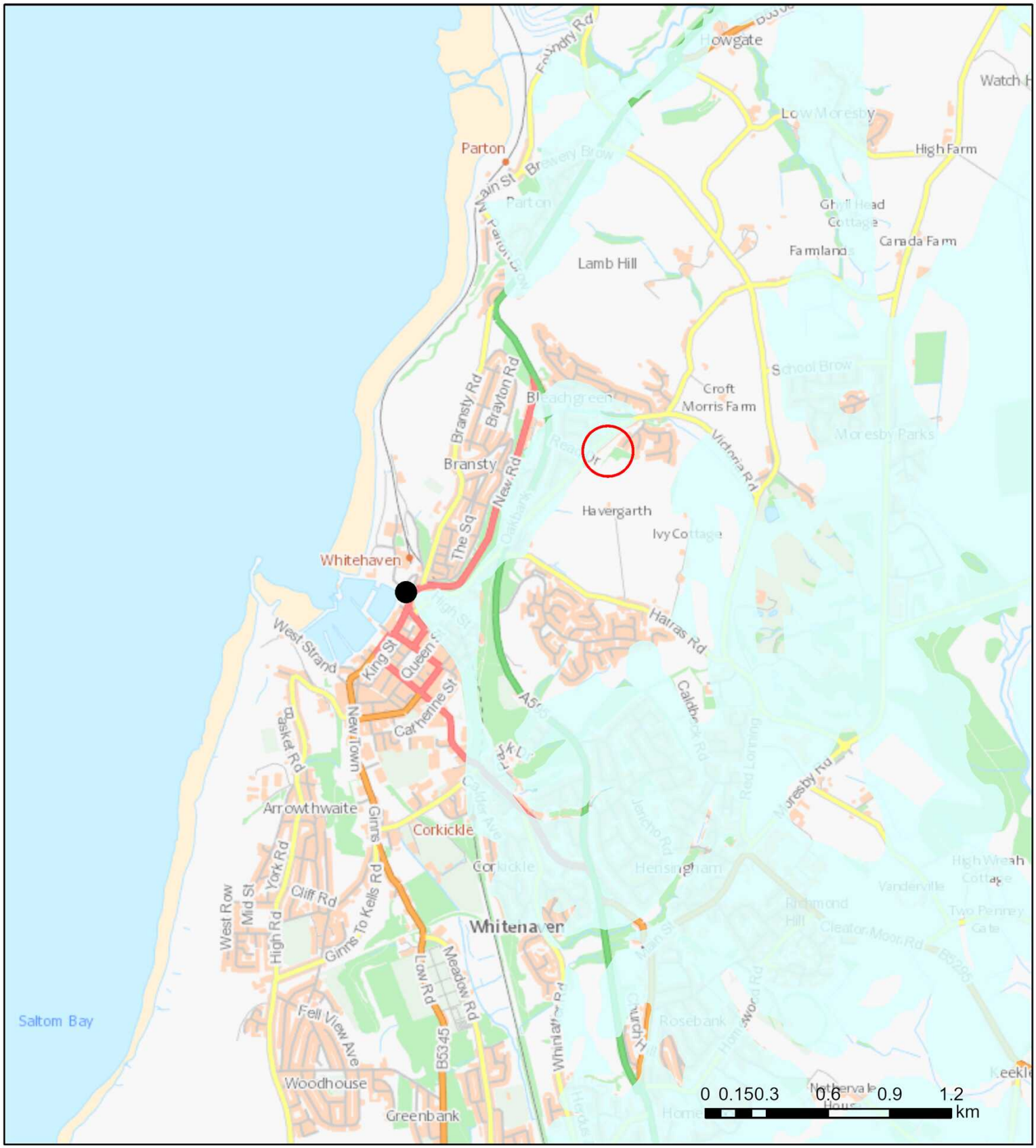
Inlets, Outlets, Controls and Inspection Chambers	Frequency
Regular Maintenance ● Inspect surface structures removing obstructions and silt as necessary. ● Check there is no physical damage. ● Strim vegetation 1m min. surround structures and keep hard aprons free from silt and debris. ● Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed.	Monthly

• Remove debris and silt. • Undertake inspection after leaf fall in autumn	
Occasional Tasks Check topsoil levels are 20mm above edges of manholes and chambers to avoid mower damage	Annual
Remedial Works Monitor effectiveness of the system and advise / inspect / clean and test if water is standing in the system. This may require specialist cleaning.	As Required

Appendices

BGS Geological Records

Superfical Deposits



Map Key

Superficial deposits 1:50,000 scale

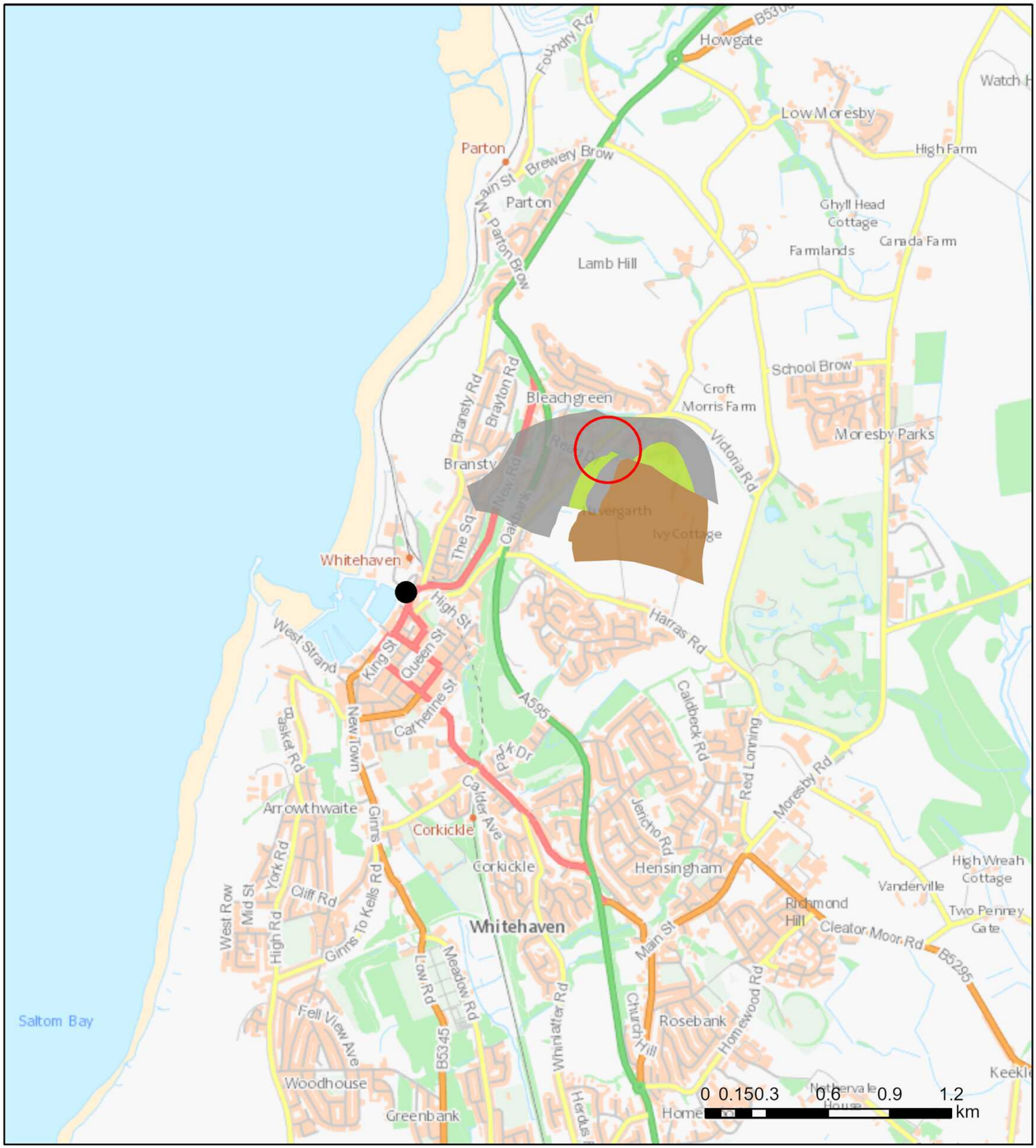
- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- TILL, DEVENSIAN - DIAMICTON
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- RAISED MARINE DEPOSITS - CLAY AND SILT
- RIVER TERRACE DEPOSITS, 1 - CLAY, SAND AND GRAVEL
- ALLUVIAL FAN DEPOSITS - SAND AND GRAVEL
- MARINE BEACH DEPOSITS - SAND AND GRAVEL
- PEAT - PEAT
- SUPERFICIAL THEME NOT MAPPED [FOR DIGITAL MAP USE ONLY] - UNKNOWN/UNCLASSIFIED ENTRY

Selection Results

Superficial deposits 1:50,000 scale

Description	Details
TILL, DEVENSIAN - DIAMICTON	More Information

Solid Geology



Map Key

Bedrock geology 1:50,000 scale

- FIRST SHALE MEMBER - SANDSTONE, SILTSTONE AND MUDSTONE
- PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- FIRST LIMESTONE (CUMBRIA) - LIMESTONE
- MILLYEAT MEMBER - MUDSTONE, SANDSTONE AND LIMESTONE
- BUTTERMERE FORMATION - MUDSTONE AND SANDSTONE
- PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- STAINMORE FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- ST BEES SANDSTONE MEMBER - SANDSTONE
- OREBANK SANDSTONE - SANDSTONE
- ST BEES SHALE FORMATION - SILTSTONE AND MUDSTONE, INTERBEDDED
- PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE
- PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
- WHITEHAVEN SANDSTONE FORMATION - SANDSTONE
- ST BEES EVAPORITE FORMATION - DOLOMITIC LIMESTONE, MUDSTONE AND ANHYDRITE-STONE
- HENSINGHAM GRIT - SANDSTONE
- BROCKRAM - BRECCIA

Selection Results

Bedrock geology 1:50,000 scale

Description	Details
WHITEHAVEN SANDSTONE FORMATION - SANDSTONE	More Information
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	More Information
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	More Information
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	More Information
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	More Information
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	More Information

United Utilities Records

United Utilities
Water for the North West

How to contact us:

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E-mail: propertysearches@uuplc.co.uk

Kingmoor Consulting Ltd

Suite 4 Atlantic House
Parkhouse Business Park,
Carlisle, Cumbria
CA3 0LJ

FAO:

Your Ref: 23-191
Our Ref: UUPS-ORD-486311
Date: 09/05/2023

Dear Sirs

Location: 114 VICTORIA ROAD, WHITEHAVEN, CA28 6JG

I acknowledge with thanks your request dated 05/05/2023 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Water for the North West

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

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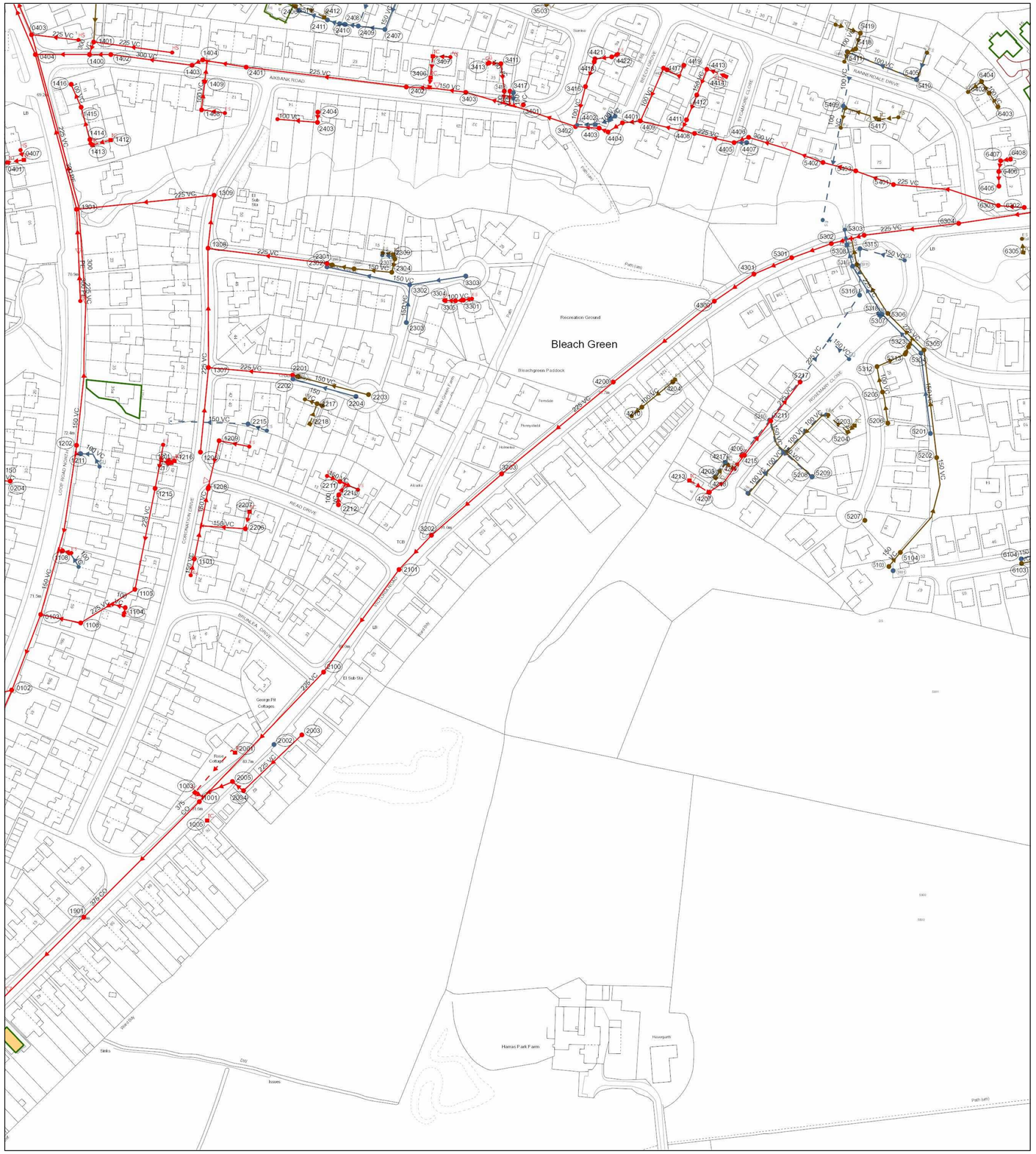

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
1301	70.42	CO	68.53	300			PF	89.02247	1 in 49
4418		CO		100			VC	14.5991	
1400	71.19	CO	68.93	300			VC	30	1 in 14
3418		CO		100			VC	7.752113	
5104		FO		150			VC	59.86064	
4422		CO		100			VC	9.444752	
5302	105.03	CO	103.67	225			VC	23.4094	1 in 15
1105		CO		225			VC	35.37936	
6303	113.55	CO	111.71	225			VC	59.81129	1 in 14
1104		CO		100			VC	7.865345	
4300	100.08	CO	98.68	225			VC	71.8401	1 in 18
2215		SW		150			VC	43.4191	
2101	89.43	SW	87.31	225			VC	70.80254	1 in 28
1202	72.48	CO	71.36	150			VC	96.28339	1 in 43
4409	95.28	CO	93.69	225			VC	10.04988	
3303	89.81	SW	87.96	150			VC	31.40064	1 in 13
0102	70.43	SW	68.31	225			VC	75.9276	1 in 12
6404		FO		100			VC	9.371755	
4419		CO		100			VC	14.25532	
5405		FO		100			VC	41.28995	
5205		FO		100			VC	14.50346	
5206		FO		100			VC	17.56566	
5316		SW		225			VC	25.93917	
1401	71.83	CO	69.66	300			VC	7.403379	1 in 10
6103		FO	0	150			VC	63.15696	
6104		SW	0	150			VC	64.03432	
5307		SW	0	225			VC	31.21655	
2409		SW		150			VC	7.363362	
1404	79.27	CO	77.39	300			VC	6.708204	1 in 9
2204	85.89	SW	84.4	150			VC	36.25044	1 in 13
3417		SW		150			VC	7.449937	
1309		CO		225			VC	76.64252	
5310		SW	0	225			VC	12.3234	
1415		CO		100			VC	14.00625	
4406	100.4	CO	98.27	300			VC	8.544003	1 in 15
5301	103.38	CO	102.09	225			VC	22.84732	1 in 13
1414		CO		100			VC	18.63151	
5401	108.22	CO	105.96	225			VC	22.12219	
3203	92.41	CO	90.92	225			VC	51.73973	1 in 21
1403	78.53	CO	76.61	300			VC	45.39824	1 in 9
1402	72.75	CO	71.32	300			VC	12	1 in 5
6406		CO		100			VC	8.11915	
5418		FO		100			VC	4.916245	
4408	97.35	CO	95.54	225			VC	30.80584	1 in 16.9262876
4210		FO		100			VC	7.690635	
2005		CO		225			VC	14.42261	
2305	82.03	FO	81.19	150			VC	3.162278	1 in 13
4401	94.88	CO	0	225			VC	9.433981	
6402		FO		100			VC	7.572215	
1101		CO		150			VC	27.78321	
2309		FO		150			VC	7.708256	
4215		SW		225			VC	24.21341	
3503		FO		100			VC	17.28245	
4421		CO		100			VC	1.662617	
1408		CO		100			VC	15.62908	
4413		CO		150			VC	15.40937	
1208		CO		150			VC	4.258821	
4411		CO		150			VC	6.634584	
5413		FO		100			VC	11.3229	
1206		CO		225			VC	47.18637	
3411		CO		100			VC	15.31775	
2100	86.89	SW	84.71	225			VC	99.72462	1 in 22
4417		CO		100			VC	32.08702	
5210		SW		225			VC	85.55335	
5419		FO		100			VC	9.081322	
3413		CO		100			VC	6.532696	
6407		CO		100			VC	6.135821	
3202	90.69	CO	88.39	225			VC	26.1725	1 in 25
3301		CO		100			VC	4.475245	
5403	104.47	CO	0	225			VC	18.96741	
2210		CO		100			VC	7.033566	
2004		CO		225			VC	7.820516	
2217		FO		150			VC	7.166011	
5311		FO	0	225			VC	14.81466	
4204		FO		100			VC	22.10105	
2302	81.88	SW	80.95	150			VC	2	1 in 200
1901	77.41	CO	74.5	375			CO	59.39697	1 in 17
5209		SW		150			VC	40.84346	
3412		CO		100			VC	6.761071	
1001	82	CO	79.16	375			CO	90.50967	1 in 20
2211		CO		150			VC	10.88154	
3305		CO		100			VC	5.663315	
2403		CO		100			VC	22.32588	
3403	89.73	CO	88.98	150			VC	16.12452	1 in 14
1209		CO		150			VC	23.16346	
4301	101.68	CO	100.32	225			VC	26.62705	1 in 16
3304		CO		100			VC	0.5566934	
1211		SW		100			VC	2.940455	
4207		CO		225			VC	16.98216	
2303	87.63	SW	0	150			VC	21.09502	
2401	81.76	CO	80.55	225			VC	24.33567	1 in 8
2513	85.65	FO	84.49	100			PE	5.365402	1 in 67
2202	82.64	SW	81.59	150			VC	2.316969	
4407	100.1	SW	98.64	225			VC	7	1 in 4
1106		CO		225			VC	22.73255	
2203	86.21	FO	84.51	150			VC	40.26164	1 in 16
1409		CO		100			VC	11.69094	
4206		CO		225			VC	23.96502	
5211		CO		225			VC	27.01406	
5208		FO		100			VC	40.09439	
5312		FO		100			VC	17.09246	
5304		SW	0	225			VC	30.49752	
5305		FO	0	225			VC	29.68031	
5313		FO		100			VC	4.398798	
5323		FO		100			VC	5.176154	
5201		SW	0	150			VC	45.12308	
5202		FO	0	150			VC	60.1408	
4404	93.78	CO	92.33	225			VC	5.385165	1 in 67
4403	93.61	CO	92.25	225			VC	13.0384	1 in 16
3402	92.9	CO	91.39	225			VC	31.62278	1 in 26
3416		CO		100			VC	22.78903	
4420		CO		100			VC	2.113323	
1307		CO		225			VC	66.201	
0103	71.49	CO	69.09	225			VC	44.94441	1 in 63
3302	87.37	SW	85.58	150			VC	47.07441	1 in 10
2212		CO		100			VC	5.554191	
5411		SW		100			VC	30.59263	
2407		SW		150			VC	14.96305	
2206		CO		150			VC	24.65396	
5306		FO	0	225			VC	31.96883	
5402	104.01	CO	103.05	225			VC	22.68843	1 in 13
5308		SW	104.31	225			VC	8.48646	
2402	87.82	CO	86.67	225			VC	89.6772	1 in 15
2306	83.58	FO	81.69	150			VC	12.16553	1 in 25
5103		FO		150			VC	10.1879	
2304	85.99	FO	84.15	150			VC	21.09502	1 in 10
6408		CO		100			VC	5.425109	
6304	111.1	CO	109.76	225			VC	52.8909	1 in 10
0204	70	CO	0	150			VC	24.08319	
0404	68.45	CO	66.71	300			VC	51.07837	1 in 79
1308		CO		225			VC	29.76303	
0403	68.19	CO	66.14	225			VC	35.8469	1 in 65
1202	72.48	CO	72.48	150			VC	78.2278	
5409		SW		100			VC	64.30447	
2411		SW		150			VC	16.82474	
5406		FO		100			VC	5.47417	
2201	82.65	CO	81.64	225			VC	46.96885	
1215		CO		225			VC	57.19735	
5303	106.62	CO	104.31	225			VC	7.294498	
2301	81.85	CO	80.94	225			VC	66.67302	
1108		CO		100			VC	2.24228	
2404		CO		100			VC	5.558062	
2003		CO		225			VC	44.98887	
4200	96.01	CO	94.73	225			VC	80.28075	1 in 21
2205	83.08	FO	82.03	150			VC	3.162278	1 in 8
6302	113.87	CO	112.9	225			VC	14.48184	1 in 12
5410		SW		100			VC	41.37797	
4405	99.54	CO	96.86	225			VC	22.56103	1 in 17
2408		SW		150			VC	3.11587	
2406	85.65	SW	84.74	150			PE	7.504492	1 in 68
2410		SW		150			VC	7.044326	
4412		CO		150			VC	14.89819	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
PE	Polyethylene
RP	Reinforced Plastic Matrix
CO	Concrete
CSB	Concrete Segment Bolted
CSU	Concrete Segment Unbolted
CC	Concrete Box Culverted
PSC	Plastic / Steel Composite
GRC	Glass Reinforced Plastic
DI	Ductile Iron
PVC	Polyvinyl Chloride
CI	Cast Iron
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

114 VICTORIA ROAD,
WHITEHAVEN,
CA28 6JG

Scale: 1:1250 **Date:** 09/05/2023

Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS

United Utilities
Water for the North West

Drawings

ENGINEER
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T: 01228 915900
E: hello@kingmoorconsulting.co.uk

CLIENT

PROJECT
PROPOSED DEVELOPMENT VICTORIA ROAD, WHITEHAVEN

TITLE
PROPOSED DRAINAGE ARRANGEMENTS SITE PLAN

SCALE	STATUS	
1:100	FOR PLANNING PURPOSES	
PAPER SIZE	DRAWN BY	CHECKED AND APPROVED
A1	S LOWES	C AIMERS
PROJECT PHASE	DATE	DATE
BUILD	MAY 2023	MAY 2023
DRAWING NUMBER		REVISION
23-191-DWG001		B

KEY

SHARED SURFACE

DRIVEWAY [PRIVATE]

LANDSCAPED SURFACE

SERVICE STRIP

VISIBILITY SPLAY
2.4m X 43.0m

FOUL DRAINAGE

SURFACE DRAINAGE

DIRECTION OF FALLS

GENERAL NOTES

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED AND NOT TO BE SCALED FROM DRAWINGS. USE WRITTEN DIMENSIONS ONLY AND CHECK ON SITE BEFORE ORDERING MATERIALS OR STEELWORK.
2. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH DRAWINGS PRODUCED BY OTHERS AND ANY ERRORS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PROIR TO COMMENCEMENT OR INSTALLATION OF THE WORKS.
3. ALL MATERIALS AND WORKMANSHIP TO BE UNDERTAKEN IN ACCORDANCE WITH BEST PRACTICE AND THE RELEVANT CODES INCLUDING BRITISH STANDARDS AND BUILDING REGULATIONS.

POINT OF CONNECTION TO UU NETWORK

DISHED CHANNEL AND GULLY

MANHOLE S12
1200mm DIA

HYDROBRAKE
HEAD 1.2m
QBAR 1.7 L/SEC

RAISED PAVEMENT STRIP

ATTENUATION TANK
IL m AOD
36 UNITS [13.75cuM]
2.4x8.4x1.2
93.000

MANHOLE S7
900mm DIA

HYDROBRAKE FLOW
0.5 L/s HEAD = 1.2m

ATTENUATION TANK
IL m AOD
36 UNITS [13.75cuM]
3.6x7.2x1.2
98.150

RAISED PAVEMENT STRIP

S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10

Fl.level 0.000
Fl.level 1.500

PLAN
SCALE 1:100

PLAN

SCALE 1:200

ENGINEER

KINGMOOR CONSULTING

SUITE 4 ATLANTIC HOUSE, PARKHOUSE BUSINESS PARK, CARLISLE, CA3 0LJ
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CLIENT

PROJECT

PROPOSED DEVELOPMENT
VICTORIA ROAD, WHITEHAVEN

TITLE

EXISTING DRAINAGE ARRANGEMENTS
SITE PLAN

SCALE	STATUS	
1:200	FOR PLANNING PURPOSES	
PAPER SIZE	DRAWN BY	CHECKED AND APPROVED
A1	S LOWES	C AIMERS
PROJECT PHASE	DATE	DATE
BUILD	MAY 2023	MAY 2023

DRAWING NUMBER	REVISION
23-191-DWG002	A

Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.020	4.00	100.250		96.300	27.100	1.300
2	0.005	4.00	100.150	900	93.800	31.750	1.417
3	0.005	4.00	100.150	450	88.023	35.630	1.300
4	0.020	4.00	100.150	900	107.000	34.350	1.300
5	0.005	4.00	100.030	450	102.640	37.300	1.300
6	0.000		99.700	900	100.800	43.200	1.500
7	0.000		99.700	900	106.280	47.900	1.550
8	0.020	4.00	99.700	900	114.730	48.900	1.300
9	0.008	4.00	99.300	900	110.141	51.420	1.350
10	0.008	4.00	97.990	900	101.370	60.530	1.350
11	0.010	4.00	94.350	900	88.415	77.570	1.350
12			94.025	1200	83.361	83.786	1.350
99			93.930		78.859	86.716	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	1	2	5.279	0.600	98.950	98.733	0.217	24.3	100	4.06	50.0
1.000	3	2	6.959	0.600	98.850	98.733	0.117	59.5	100	4.12	50.0
3.000	4	5	5.264	0.600	98.850	98.730	0.120	43.9	100	4.08	50.0
3.001	5	6	6.180	0.600	98.730	98.250	0.480	12.9	100	4.12	50.0
1.002	6	7	7.219	0.600	98.200	98.150	0.050	144.4	150	4.41	50.0
4.000	8	9	5.235	0.600	98.400	98.000	0.400	13.1	100	4.04	50.0
1.003	7	9	5.225	0.600	98.150	97.950	0.200	26.1	150	4.46	50.0
1.004	9	10	12.646	0.600	97.950	96.640	1.310	9.7	150	4.52	50.0
1.001	2	6	13.420	0.600	98.733	98.250	0.483	27.8	100	4.27	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.571	12.3	3.8	1.200	1.317	0.020	0.0	38	1.380
1.000	1.000	7.9	0.9	1.200	1.317	0.005	0.0	24	0.679
3.000	1.167	9.2	3.8	1.200	1.200	0.020	0.0	45	1.113
3.001	2.165	17.0	4.7	1.200	1.350	0.025	0.0	36	1.862
1.002	0.834	14.7	10.4	1.350	1.400	0.055	0.0	93	0.904
4.000	2.147	16.9	3.8	1.200	1.200	0.020	0.0	32	1.739
1.003	1.978	34.9	10.4	1.400	1.200	0.055	0.0	56	1.728
1.004	3.262	57.6	15.7	1.200	1.200	0.083	0.0	54	2.790
1.001	1.469	11.5	5.7	1.317	1.350	0.030	0.0	50	1.465

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.005	10	11	21.405	0.600	96.640	93.000	3.640	5.9	150	4.61	50.0
1.006	11	12	8.011	0.600	93.000	92.675	0.325	24.7	150	4.67	50.0
1.007	12	99	5.371	0.600	92.675	92.580	0.095	56.5	150	4.74	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.005	4.183	73.9	17.3	1.200	1.200	0.091	0.0	49	3.412
1.006	2.036	36.0	19.2	1.200	1.200	0.101	0.0	78	2.065
1.007	1.340	23.7	19.2	1.200	1.200	0.101	0.0	103	1.490

Pipeline Schedule

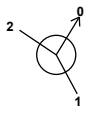
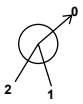
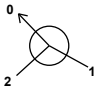
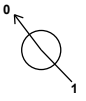
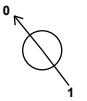
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	5.279	24.3	100	Circular	100.250	98.950	1.200	100.150	98.733	1.317
1.000	6.959	59.5	100	Circular	100.150	98.850	1.200	100.150	98.733	1.317
3.000	5.264	43.9	100	Circular	100.150	98.850	1.200	100.030	98.730	1.200
3.001	6.180	12.9	100	Circular	100.030	98.730	1.200	99.700	98.250	1.350
1.002	7.219	144.4	150	Circular	99.700	98.200	1.350	99.700	98.150	1.400
4.000	5.235	13.1	100	Circular	99.700	98.400	1.200	99.300	98.000	1.200
1.003	5.225	26.1	150	Circular	99.700	98.150	1.400	99.300	97.950	1.200
1.004	12.646	9.7	150	Circular	99.300	97.950	1.200	97.990	96.640	1.200
1.001	13.420	27.8	100	Circular	100.150	98.733	1.317	99.700	98.250	1.350
1.005	21.405	5.9	150	Circular	97.990	96.640	1.200	94.350	93.000	1.200
1.006	8.011	24.7	150	Circular	94.350	93.000	1.200	94.025	92.675	1.200
1.007	5.371	56.5	150	Circular	94.025	92.675	1.200	93.930	92.580	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	1		Junction		2	900	Manhole	Adoptable
1.000	3	450	Manhole	Adoptable	2	900	Manhole	Adoptable
3.000	4	900	Manhole	Adoptable	5	450	Manhole	Adoptable
3.001	5	450	Manhole	Adoptable	6	900	Manhole	Adoptable
1.002	6	900	Manhole	Adoptable	7	900	Manhole	Adoptable
4.000	8	900	Manhole	Adoptable	9	900	Manhole	Adoptable
1.003	7	900	Manhole	Adoptable	9	900	Manhole	Adoptable
1.004	9	900	Manhole	Adoptable	10	900	Manhole	Adoptable
1.001	2	900	Manhole	Adoptable	6	900	Manhole	Adoptable
1.005	10	900	Manhole	Adoptable	11	900	Manhole	Adoptable
1.006	11	900	Manhole	Adoptable	12	1200	Manhole	Adoptable
1.007	12	1200	Manhole	Adoptable	99		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	96.300	27.100	100.250	1.300					
						0	2.000	98.950	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
2	93.800	31.750	100.150	1.417	900		1 2 0	2.000 1.000 1.001	98.733 98.733 98.733	100 100 100
3	88.023	35.630	100.150	1.300	450		 0	 1.000	 98.850	 100
4	107.000	34.350	100.150	1.300	900		 0	 3.000	 98.850	 100
5	102.640	37.300	100.030	1.300	450		1 0	3.000 3.001	98.730 98.730	100 100
6	100.800	43.200	99.700	1.500	900		1 2 0	3.001 1.001 1.002	98.250 98.250 98.200	100 100 150
7	106.280	47.900	99.700	1.550	900		1 0	1.002 1.003	98.150 98.150	150 150
8	114.730	48.900	99.700	1.300	900		 0	 4.000	 98.400	 100
9	110.141	51.420	99.300	1.350	900		1 2 0	4.000 1.003 1.004	98.000 97.950 97.950	100 150 150
10	101.370	60.530	97.990	1.350	900		1 0	1.004 1.005	96.640 96.640	150 150
11	88.415	77.570	94.350	1.350	900		1 0	1.005 1.006	93.000 93.000	150 150
12	83.361	83.786	94.025	1.350	1200		1 0	1.006 1.007	92.675 92.675	150 150
99	78.859	86.716	93.930	1.350			1	1.007	92.580	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	3.8
Winter CV	0.840	Check Discharge Volume	✓
Analysis Speed	Normal	100 year 360 minute (m³)	68

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.220	Betterment (%)	0
SAAR (mm)	1122	QBar	1.8
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	10	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.220	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.508
CWI	125.305	Runoff Volume (m³)	68

Node 12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	92.675	Product Number	CTL-SHE-0056-1400-1000-1400
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.4	Min Node Diameter (mm)	1200

Node 7 Online Head/Flow Control

Flap Valve	x	Invert Level (m)	98.150	Design Flow (l/s)	0.5
Replaces Downstream Link	✓	Design Depth (m)	1.200		

Head (m)	Flow (l/s)
1.500	0.625

Node 11 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	93.000	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	148	Inf Depth (m)	
Safety Factor	1.0	Pit Width (m)	2.400	Number Required	1
Porosity	0.95	Pit Length (m)	8.400		

Node 7 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	98.150	Depth (m)	1.200
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	1.0	Pit Width (m)	3.600	Number Required	1
Porosity	0.95	Pit Length (m)	7.200		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 15 minute summer	163.157	46.168	10 year 480 minute summer	19.082	5.043
10 year 15 minute winter	114.496	46.168	10 year 480 minute winter	12.678	5.043
10 year 30 minute summer	110.362	31.229	10 year 600 minute summer	15.796	4.321
10 year 30 minute winter	77.447	31.229	10 year 600 minute winter	10.793	4.321
10 year 60 minute summer	77.042	20.360	10 year 720 minute summer	14.204	3.807
10 year 60 minute winter	51.185	20.360	10 year 720 minute winter	9.546	3.807
10 year 120 minute summer	49.087	12.972	10 year 960 minute summer	11.834	3.116
10 year 120 minute winter	32.612	12.972	10 year 960 minute winter	7.839	3.116
10 year 180 minute summer	38.430	9.889	10 year 1440 minute summer	8.760	2.348
10 year 180 minute winter	24.980	9.889	10 year 1440 minute winter	5.888	2.348
10 year 240 minute summer	30.773	8.132	30 year 15 minute summer	205.071	58.028
10 year 240 minute winter	20.445	8.132	30 year 15 minute winter	143.910	58.028
10 year 360 minute summer	23.902	6.151	30 year 30 minute summer	140.191	39.669
10 year 360 minute winter	15.537	6.151	30 year 30 minute winter	98.380	39.669

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 60 minute summer	98.615	26.061	100 year +40% CC 30 minute summer	255.101	72.185
30 year 60 minute winter	65.517	26.061	100 year +40% CC 30 minute winter	179.018	72.185
30 year 120 minute summer	63.038	16.659	100 year +40% CC 60 minute summer	180.954	47.821
30 year 120 minute winter	41.881	16.659	100 year +40% CC 60 minute winter	120.222	47.821
30 year 180 minute summer	49.285	12.683	100 year +40% CC 120 minute summer	116.088	30.679
30 year 180 minute winter	32.037	12.683	100 year +40% CC 120 minute winter	77.126	30.679
30 year 240 minute summer	39.344	10.398	100 year +40% CC 180 minute summer	90.626	23.321
30 year 240 minute winter	26.139	10.398	100 year +40% CC 180 minute winter	58.909	23.321
30 year 360 minute summer	30.343	7.808	100 year +40% CC 240 minute summer	72.104	19.055
30 year 360 minute winter	19.724	7.808	100 year +40% CC 240 minute winter	47.904	19.055
30 year 480 minute summer	24.111	6.372	100 year +40% CC 360 minute summer	55.175	14.198
30 year 480 minute winter	16.019	6.372	100 year +40% CC 360 minute winter	35.865	14.198
30 year 600 minute summer	19.882	5.438	100 year +40% CC 480 minute summer	43.619	11.527
30 year 600 minute winter	13.585	5.438	100 year +40% CC 480 minute winter	28.979	11.527
30 year 720 minute summer	17.819	4.776	100 year +40% CC 600 minute summer	35.816	9.797
30 year 720 minute winter	11.975	4.776	100 year +40% CC 600 minute winter	24.472	9.797
30 year 960 minute summer	14.763	3.887	100 year +40% CC 720 minute summer	31.983	8.572
30 year 960 minute winter	9.779	3.887	100 year +40% CC 720 minute winter	21.495	8.572
30 year 1440 minute summer	10.836	2.904	100 year +40% CC 960 minute summer	26.337	6.935
30 year 1440 minute winter	7.282	2.904	100 year +40% CC 960 minute winter	17.446	6.935
100 year +40% CC 15 minute summer	368.854	104.373	100 year +40% CC 1440 minute summer	19.151	5.133
100 year +40% CC 15 minute winter	258.845	104.373	100 year +40% CC 1440 minute winter	12.870	5.133

Results for 10 year Critical Storm Duration. Lowest mass balance: 97.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	98.991	0.041	4.4	0.0000	0.0000	OK
15 minute summer	2	10	98.789	0.056	6.6	0.0359	0.0000	OK
15 minute winter	3	10	98.875	0.025	1.1	0.0040	0.0000	OK
15 minute winter	4	10	98.904	0.054	4.4	0.0345	0.0000	OK
15 minute winter	5	10	98.769	0.039	5.5	0.0062	0.0000	OK
960 minute winter	6	675	98.749	0.549	1.1	0.3494	0.0000	SURCHARGED
960 minute winter	7	675	98.749	0.599	1.0	15.1381	0.0000	SURCHARGED
15 minute winter	8	10	98.437	0.037	4.4	0.0237	0.0000	OK
15 minute winter	9	10	97.984	0.034	6.2	0.0218	0.0000	OK
15 minute winter	10	10	96.673	0.033	8.0	0.0212	0.0000	OK
60 minute winter	11	58	93.197	0.197	5.4	3.8942	0.0000	SURCHARGED
60 minute winter	12	58	93.196	0.521	2.9	0.5897	0.0000	SURCHARGED
15 minute summer	99	1	92.580	0.000	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	2.000	2	4.4	1.169	0.357	0.0200	
15 minute summer	2	1.001	6	6.6	1.451	0.574	0.0615	
15 minute winter	3	1.000	2	1.1	0.368	0.140	0.0211	
15 minute winter	4	3.000	5	4.4	1.225	0.480	0.0189	
15 minute winter	5	3.001	6	5.5	1.646	0.324	0.0250	
960 minute winter	6	1.002	7	1.0	0.491	0.071	0.1271	
960 minute winter	7	Head/Flow	9	0.2				
15 minute winter	8	4.000	9	4.4	1.727	0.261	0.0133	
15 minute winter	9	1.004	10	6.2	2.099	0.108	0.0376	
15 minute winter	10	1.005	11	8.0	2.302	0.109	0.1890	
60 minute winter	11	1.006	12	2.9	0.570	0.082	0.1410	
60 minute winter	12	Hydro-Brake®	99	1.3				9.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.74%

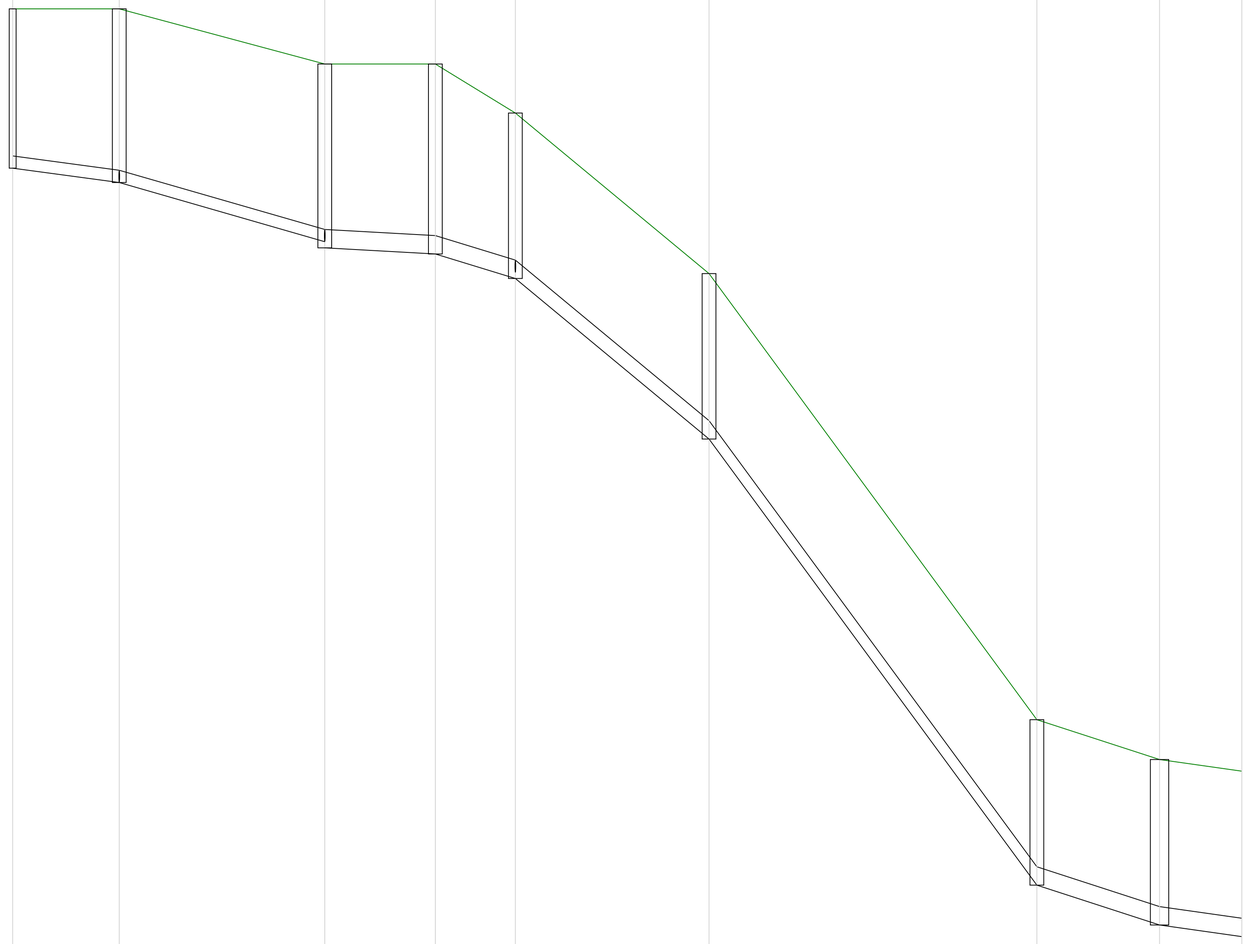
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	98.997	0.047	5.6	0.0000	0.0000	OK
1440 minute winter	2	960	98.902	0.169	0.5	0.1077	0.0000	SURCHARGED
1440 minute winter	3	960	98.902	0.052	0.1	0.0083	0.0000	OK
15 minute winter	4	10	98.914	0.064	5.6	0.0404	0.0000	OK
1440 minute winter	5	960	98.902	0.172	0.4	0.0274	0.0000	SURCHARGED
1440 minute winter	6	960	98.902	0.702	0.9	0.4466	0.0000	SURCHARGED
1440 minute winter	7	960	98.902	0.752	0.9	18.9977	0.0000	SURCHARGED
15 minute winter	8	10	98.443	0.043	5.6	0.0273	0.0000	OK
15 minute winter	9	10	97.989	0.039	7.8	0.0246	0.0000	OK
15 minute winter	10	10	96.677	0.037	10.0	0.0238	0.0000	OK
120 minute winter	11	98	93.297	0.297	4.7	5.8802	0.0000	SURCHARGED
120 minute winter	12	98	93.297	0.622	2.4	0.7032	0.0000	SURCHARGED
15 minute summer	99	1	92.580	0.000	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	2.000	2	5.6	1.257	0.454	0.0235	
1440 minute winter	2	1.001	6	0.5	0.448	0.043	0.1050	
1440 minute winter	3	1.000	2	0.1	0.233	0.013	0.0416	
15 minute winter	4	3.000	5	5.6	1.293	0.611	0.0228	
1440 minute winter	5	3.001	6	0.4	0.584	0.024	0.0484	
1440 minute winter	6	1.002	7	0.9	0.424	0.059	0.1271	
1440 minute winter	7	Head/Flow	9	0.3				
15 minute winter	8	4.000	9	5.6	1.833	0.332	0.0160	
15 minute winter	9	1.004	10	7.8	2.241	0.136	0.0443	
15 minute winter	10	1.005	11	10.0	2.403	0.136	0.2157	
120 minute winter	11	1.006	12	2.4	0.518	0.067	0.1410	
120 minute winter	12	Hydro-Brake®	99	1.3				16.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	1	540	99.563	0.613	1.1	0.0000	0.0000	SURCHARGED
600 minute winter	2	540	99.563	0.830	1.7	0.5280	0.0000	SURCHARGED
600 minute winter	3	540	99.563	0.713	0.3	0.1134	0.0000	SURCHARGED
600 minute winter	4	540	99.563	0.713	1.1	0.4534	0.0000	SURCHARGED
600 minute winter	5	540	99.563	0.833	1.4	0.1324	0.0000	SURCHARGED
600 minute winter	6	540	99.563	1.363	2.7	0.8667	0.0000	FLOOD RISK
600 minute winter	7	540	99.563	1.413	2.6	30.4595	0.0000	FLOOD RISK
15 minute summer	8	10	98.462	0.062	10.0	0.0396	0.0000	OK
15 minute winter	9	10	98.003	0.053	14.1	0.0336	0.0000	OK
15 minute winter	10	10	96.690	0.050	18.1	0.0321	0.0000	OK
120 minute winter	11	116	93.747	0.747	8.4	14.7790	0.0000	SURCHARGED
120 minute winter	12	116	93.746	1.071	1.9	1.2114	0.0000	FLOOD RISK
15 minute summer	99	1	92.580	0.000	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	1	2.000	2	1.1	0.813	0.089	0.0413	
600 minute winter	2	1.001	6	1.5	0.683	0.131	0.1050	
600 minute winter	3	1.000	2	0.3	0.246	0.038	0.0544	
600 minute winter	4	3.000	5	1.1	0.838	0.120	0.0412	
600 minute winter	5	3.001	6	1.3	0.817	0.074	0.0484	
600 minute winter	6	1.002	7	2.6	0.491	0.179	0.1271	
600 minute winter	7	Head/Flow	9	0.6				
15 minute summer	8	4.000	9	10.0	2.084	0.593	0.0251	
15 minute winter	9	1.004	10	14.1	2.621	0.244	0.0680	
15 minute winter	10	1.005	11	18.1	2.675	0.245	0.2441	
120 minute winter	11	1.006	12	1.9	0.575	0.053	0.1410	
120 minute winter	12	Hydro-Brake®	99	1.4				26.2

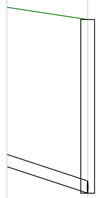


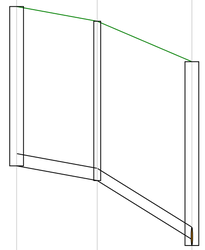
A1 drawing

Hor Scale 200
Ver Scale 25

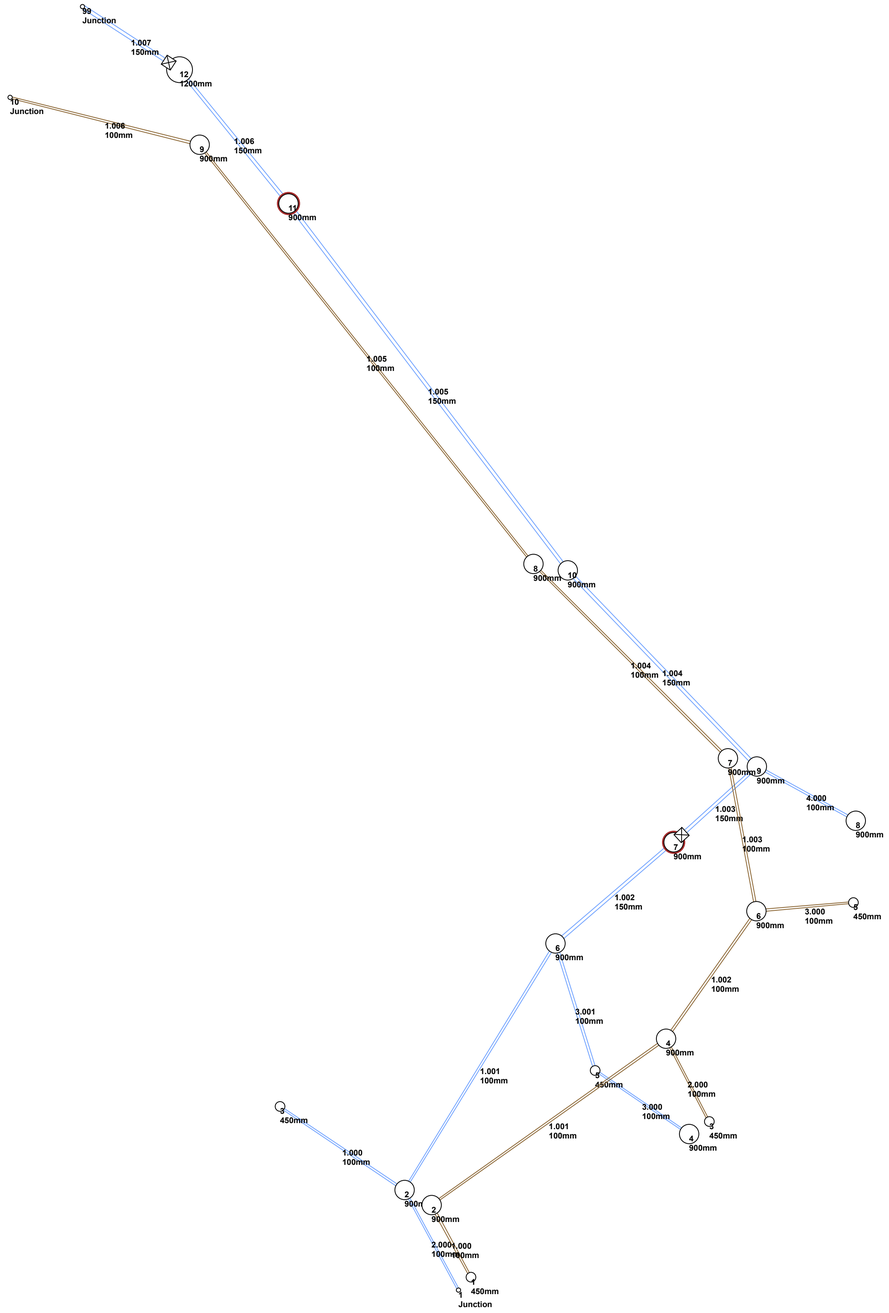
Datum (m) 90.000

Node Name	3	2	6	7	9	10	11	12	99
Link Name	1.000	1.001	1.002	1.003	1.004	1.005	1.006	1.007	
Section Type	100mm	100mm	150mm	150mm	150mm	150mm	150mm	150mm	
Slope (1:X)	59.5	27.8	144.4	26.1	9.7	5.9	24.7	56.5	
Cover Level (m)	100.150	100.150	99.700	99.700	99.300	97.990	94.350	94.025	93.930
Invert Level (m)	98.850	98.733 / 98.733	98.250 / 98.200	98.150 / 98.150	97.950 / 97.550	96.640 / 96.640	93.000 / 93.000	92.675 / 92.675	92.580
Length (m)	6.959	13.420	7.219	5.225	12.646	21.405	8.011	5.371	

Node Name	1	2
A1 drawing Hor Scale 200 Ver Scale 25 Datum (m) 93.000		
Link Name	2.000	
Section Type	100mm	
Slope (1:X)	24.3	
Cover Level (m)	100.250	100.150
Invert Level (m)	98.950	98.733
Length (m)	5.279	

Node Name		4	5	6
				
A1 drawing Hor Scale 200 Ver Scale 25 Datum (m) 93.000				
Link Name		3.000	3.001	
Section Type		100mm	100mm	
Slope (1:X)		43.9	12.9	
Cover Level (m)		100.150	100.030	99.700
Invert Level (m)		98.850	98.730 / 98.730	98.250
Length (m)		5.264	6.180	

Node Name	8	9
A1 drawing Hor Scale 200 Ver Scale 25 Datum (m) 93.000		
Link Name	4.000	
Section Type	100mm	
Slope (1:X)	13.1	
Cover Level (m)	99.700	99.300
Invert Level (m)	98.400	98.000
Length (m)	5.235	



Design Settings

Frequency of use (kDU)	1.00	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	1500	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
1	1	100.250	Adoptable	96.880	27.700	1.300
2		100.150	Adoptable	95.055	31.050	1.300
3	1	100.150	Adoptable	107.937	34.930	1.300
4		99.900	Adoptable	105.930	38.776	1.300
5	1	99.700	Adoptable	114.620	45.100	1.300
6		99.700	Adoptable	110.120	44.700	1.357
7		99.250	Adoptable	108.800	51.800	1.300
8		98.350	Adoptable	99.778	60.829	1.300
9		94.027	Adoptable	84.294	80.300	1.300
10		93.900		75.500	82.500	1.300

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	1	2	3.815	1.500	98.950	98.850	0.100	38.1	100
1.001	2	4	13.340	1.500	98.850	98.600	0.250	53.4	100
1.002	4	6	7.256	1.500	98.600	98.343	0.257	28.2	100
1.003	6	7	7.222	1.500	98.343	97.950	0.393	18.4	100
1.004	7	8	12.764	1.500	97.950	97.050	0.900	14.2	100
1.005	8	9	24.877	1.500	97.050	92.727	4.323	5.8	100
1.006	9	10	9.065	1.500	92.727	92.600	0.127	71.4	100
3.000	5	6	4.518	1.500	98.400	98.343	0.057	79.3	100
2.000	3	4	4.338	1.500	98.850	98.600	0.250	17.4	100

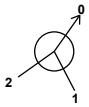
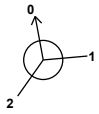
Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.109	1.079	8.5	0.0	1.200	1.200	0.000	1	0.0	0.0	4	0.182
1.001	0.123	0.912	7.2	0.0	1.200	1.200	0.000	1	0.0	0.0	4	0.180
1.002	0.172	1.256	9.9	0.0	1.200	1.257	0.000	2	0.0	0.0	4	0.250
1.003	0.214	1.558	12.2	0.1	1.257	1.200	0.000	3	0.0	0.0	5	0.354
1.004	0.244	1.774	13.9	0.1	1.200	1.200	0.000	3	0.0	0.0	5	0.404
1.005	0.386	2.788	21.9	0.1	1.200	1.200	0.000	3	0.0	0.0	4	0.476
1.006	0.155	0.788	6.2	0.1	1.200	1.200	0.000	3	0.0	0.0	7	0.218
3.000	0.100	0.747	5.9	0.0	1.200	1.257	0.000	1	0.0	0.0	4	0.147
2.000	0.164	1.603	12.6	0.0	1.200	1.200	0.000	1	0.0	0.0	3	0.220

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	3.815	38.1	100	Circular	100.250	98.950	1.200	100.150	98.850	1.200
1.001	13.340	53.4	100	Circular	100.150	98.850	1.200	99.900	98.600	1.200
1.002	7.256	28.2	100	Circular	99.900	98.600	1.200	99.700	98.343	1.257
1.003	7.222	18.4	100	Circular	99.700	98.343	1.257	99.250	97.950	1.200
1.004	12.764	14.2	100	Circular	99.250	97.950	1.200	98.350	97.050	1.200
1.005	24.877	5.8	100	Circular	98.350	97.050	1.200	94.027	92.727	1.200
1.006	9.065	71.4	100	Circular	94.027	92.727	1.200	93.900	92.600	1.200
3.000	4.518	79.3	100	Circular	99.700	98.400	1.200	99.700	98.343	1.257
2.000	4.338	17.4	100	Circular	100.150	98.850	1.200	99.900	98.600	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	450	Manhole	Adoptable	2	900	Manhole	Adoptable
1.001	2	900	Manhole	Adoptable	4	900	Manhole	Adoptable
1.002	4	900	Manhole	Adoptable	6	900	Manhole	Adoptable
1.003	6	900	Manhole	Adoptable	7	900	Manhole	Adoptable
1.004	7	900	Manhole	Adoptable	8	900	Manhole	Adoptable
1.005	8	900	Manhole	Adoptable	9	900	Manhole	Adoptable
1.006	9	900	Manhole	Adoptable	10		Junction	
3.000	5	450	Manhole	Adoptable	6	900	Manhole	Adoptable
2.000	3	450	Manhole	Adoptable	4	900	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	96.880	27.700	100.250	1.300	450				
						0	1.000	98.950	100
2	95.055	31.050	100.150	1.300	900		1.000	98.850	100
						0	1.001	98.850	100
3	107.937	34.930	100.150	1.300	450				
						0	2.000	98.850	100
4	105.930	38.776	99.900	1.300	900		2.000	98.600	100
							1.001	98.600	100
						0	1.002	98.600	100
5	114.620	45.100	99.700	1.300	450				
						0	3.000	98.400	100
6	110.120	44.700	99.700	1.357	900		3.000	98.343	100
							1.002	98.343	100
						0	1.003	98.343	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
7	108.800	51.800	99.250	1.300	900	1	1.003	97.950	100
						0	1.004	97.950	100
8	99.778	60.829	98.350	1.300	900	1	1.004	97.050	100
						0	1.005	97.050	100
9	84.294	80.300	94.027	1.300	900	1	1.005	92.727	100
						0	1.006	92.727	100
10	75.500	82.500	93.900	1.300		1	1.006	92.600	100

Simulation Settings

Analysis Speed	Normal	Drain Down Time (mins)	240
Skip Steady State	x	Foul Event Duration (mins)	15

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	10
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.220	Betterment (%)	0
SAAR (mm)	1122	QBar	1.8
Soil Index	4	Q 100 year (l/s)	3.8
SPR	0.47		

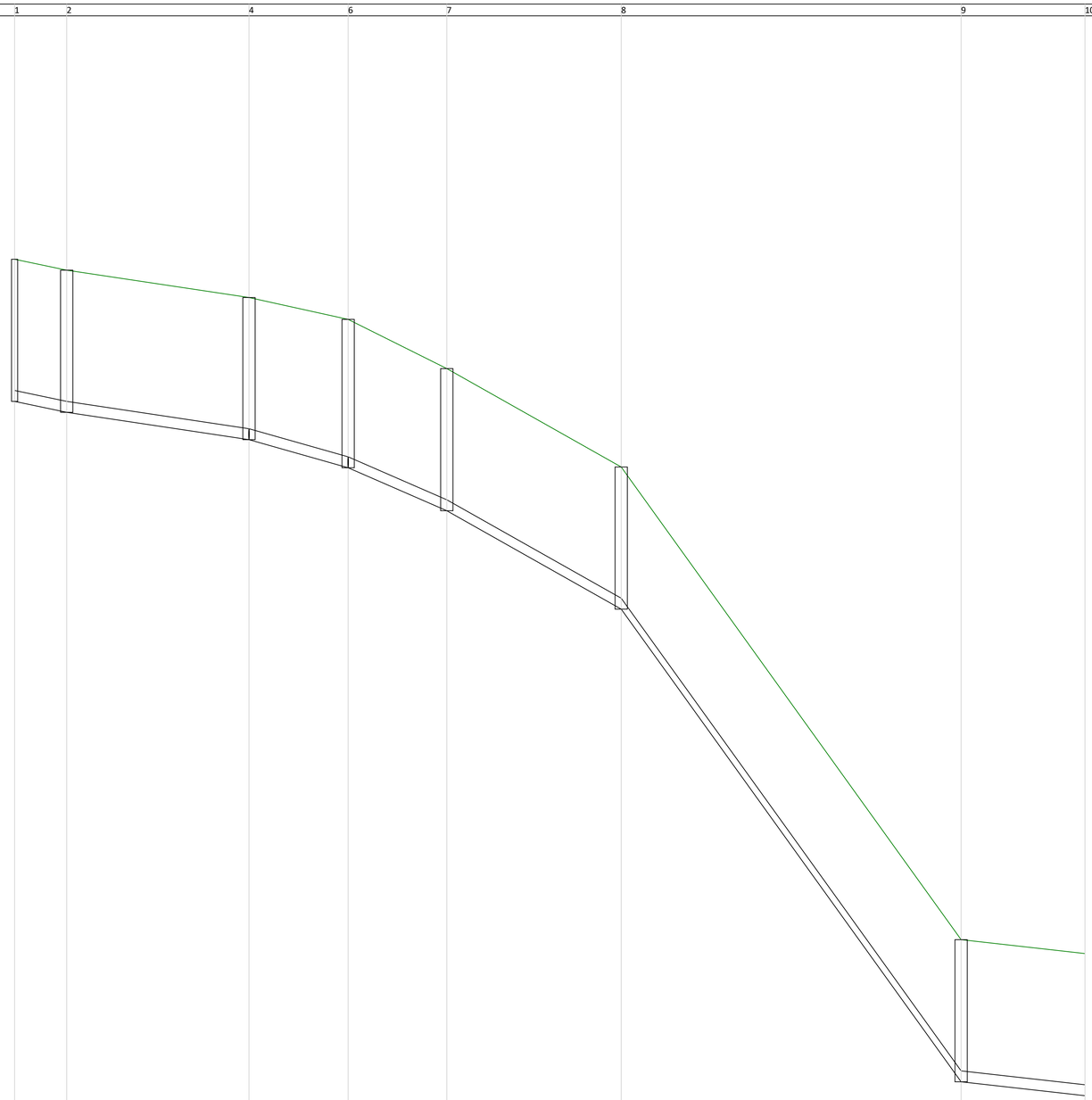
Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.220	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.508
CWI	125.305	Runoff Volume (m^3)	68

Results for Foul Event Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
Foul Event	1	1	98.950	0.000	0.0	0.0000	0.0000	OK
Foul Event	2	1	98.850	0.000	0.0	0.0000	0.0000	OK
Foul Event	3	1	98.850	0.000	0.0	0.0000	0.0000	OK
Foul Event	4	1	98.600	0.000	0.0	0.0000	0.0000	OK
Foul Event	5	1	98.400	0.000	0.0	0.0000	0.0000	OK
Foul Event	6	1	98.343	0.000	0.0	0.0000	0.0000	OK
Foul Event	7	1	97.950	0.000	0.0	0.0000	0.0000	OK
Foul Event	8	1	97.050	0.000	0.0	0.0000	0.0000	OK
Foul Event	9	1	92.727	0.000	0.0	0.0000	0.0000	OK
Foul Event	10	1	92.600	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
Foul Event	1	1.000	2	0.0	0.000	0.000	0.0000	
Foul Event	2	1.001	4	0.0	0.000	0.000	0.0000	
Foul Event	3	2.000	4	0.0	0.000	0.000	0.0000	
Foul Event	4	1.002	6	0.0	0.000	0.000	0.0000	
Foul Event	5	3.000	6	0.0	0.000	0.000	0.0000	
Foul Event	6	1.003	7	0.0	0.000	0.000	0.0000	
Foul Event	7	1.004	8	0.0	0.000	0.000	0.0000	
Foul Event	8	1.005	9	0.0	0.000	0.000	0.0000	
Foul Event	9	1.006	10	0.0	0.000	0.000	0.0000	0.0

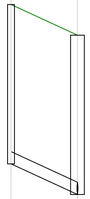


A1 drawing

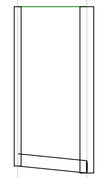
Hor Scale 200
Ver Scale 25

Datum (m) 90.000

Node Name								
Link Name		1.000	1.001	1.002	1.003	1.004	1.005	1.006
Section Type		100mm	100mm	100mm	100mm	100mm	100mm	100mm
Slope (1:X)		38.1	53.4	28.2	18.4	14.2	5.8	71.4
Cover Level (m)		100.250	100.150	99.900	99.700	99.250	98.350	94.027	93.900
Invert Level (m)		98.950	98.850	98.850	98.600	98.600	98.343	98.343	97.950	97.950	97.050	97.050	92.727	92.727	92.600
Length (m)		3.815	13.340	7.256	7.222	12.764	24.877	9.065	

Node Name	3	4
A1 drawing Hor Scale 200 Ver Scale 25 Datum (m) 93.000		
Link Name	2.000	
Section Type	100mm	
Slope (1:X)	17.4	
Cover Level (m)	100.150	99.900
Invert Level (m)	98.850	98.600
Length (m)	4.338	

Node Name	5	6

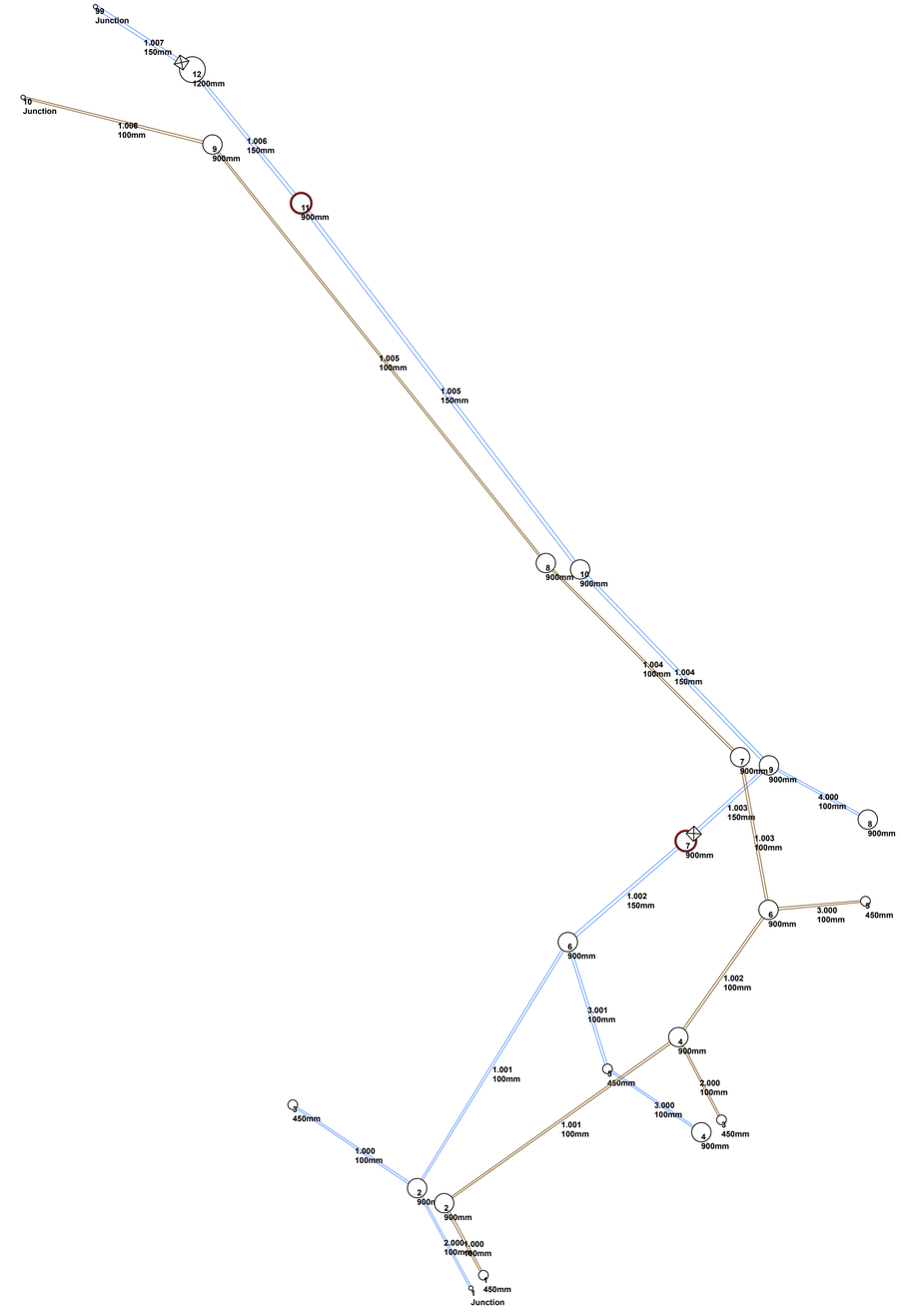


A1 drawing

Hor Scale 200
Ver Scale 25

Datum (m) 93.000

Link Name	3.000	
Section Type	100mm	
Slope (1:X)	79.3	
Cover Level (m)	99.700	99.700
Invert Level (m)	98.400	98.343
Length (m)	4.518	



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