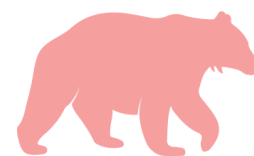




DRAINAGE INFORMATION REPORT



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APPENDICES

Appendix A – DCWW Sewer Map

Appendix B – Greenfield Runoff Calculations

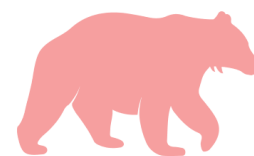
Appendix C – Proposed Drainage Layout

Appendix D – Drainage Details

Appendix E – CCTV Drainage Survey and Report (Draintech ref: 14679 No. 1)

Appendix F – Additional CCTV Drainage Survey Plan (Draintech ref: 14679 No.2)

Revision	Date	Notes	Author	Approved
-	06/10/22	First issue	JC	PC



1.0 INTRODUCTION

This document has been produced to explain the drainage strategy for the proposed commercial development at Goat Mill Road, Dowlais, Merthyr Tydfil, CF48 3TD. It covers the surface water and foul drainage strategies respectively.

The scheme was granted full planning approval on 16th November 2017 prior to the implementation of Schedule 3 of the Flood and Water Management Act 2010. As such, it is expected that SAB approval is not required (Local Authority to confirm).

2.0 SURFACE WATER DRAINAGE STRATEGY

2.1 OVERVIEW

The design of the private drainage system has been developed in accordance with the following:

- CIRIA C753 'The SuDS Manual'
- Building Regulations Part H

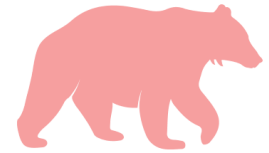
To develop the drainage strategy, an assessment has been made based on the SUDS management train. This reviews the different surface water management techniques that can avoid, reduce or delay the surface water discharge rate from site. The techniques considered include discharge to soakaways, watercourses and public sewers, in that order of preference.

2.2 INFILTRATION

A Site Investigation was carried out by Blanford Consulting (Report No. BC/MB/09.17.02/2) in May 2022. The in-situ boreholes identified within the report confirmed that the site has varying depths of Colliery Spoil Made Ground - ranging from approximately 1.00m to 6.50m deep across the site. It is therefore not viable to discharge surface water to ground for this development.

2.3 WATERCOURSE

An existing watercourse is located approximately 20 metres south of the site. The construction of any new outfall to this watercourse would disrupt access to the existing industrial units using the access road. It is also unlikely that a gravity connection to this watercourse would be feasible. It is therefore not recommended that surface water runoff from the proposed development discharges to this watercourse.



2.4 HIGHWAY DRAINAGE

A CCTV survey of the existing drainage network within the area was carried out by Draintech (Report No. 14679) in June 2022. Appended to this report, the survey identified an existing surface water network serving the gullies within the access road adjacent to the site. A Ø300mm capped pipe was also identified in the southwestern area of the site near the roundabout on Goat Mill Road. It appears the capped pipe is heading in the direction of the site, but not clear at the time of writing, as to whether this pipe was constructed as provisional works to allow for future development of the site. It is therefore recommended that surface water from the site discharges to the existing highways drainage network via the Ø300mm pipe located within the vicinity of the southwestern area.

2.5 FLOW CONTROL

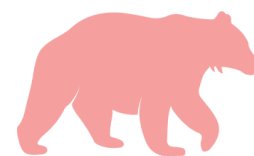
The existing Greenfield runoff rates have been calculated using the IH24 method and appended to this document. The rates are shown below:

- 1 in 1 yr: 13.42 l/s/ha
- 1 in 30 yr: 27.14 l/s/ha
- 1 in 100yr: 33.24 l/s/ha

The proposed cumulative hardstanding area equates to 0.58ha. It is therefore proposed the peak runoff rate from the development will match the existing 1 in 100yr greenfield runoff rate for all rainfall events up to and including the 1 in 100yr + 40%cc allowance. This equates to 19.28 l/s (33.24×0.58). The outfall discharge rate will be restricted using a vortex flow control device such as a Hydrobrake. Causeway drainage software has been used to design the proposed storm network and to calculate the associated storage required to prevent flooding for all rainfall events up to and including the 1 in 100 year return period (+40% cc allowance). The volume and location of the attenuation has been shown on the layout.

2.6 MAINTENANCE

It is proposed that the storm drainage network shall be privately maintained.



3.0 FOUL DRAINAGE STRATEGY

3.1 EXISTING DRAINAGE

The CCTV survey of the existing drainage network within the area, carried out by Draintech (Report No. 14679 No.1) in June 2022, concluded that there were no foul drains in the vicinity of the access road off Goat Mill Road. However, a Ø150mm diameter foul drain serving the adjacent existing units north of the site was investigated. The CCTV confirmed that the manhole is approximately 2.20m deep and located within the access road to the north of M Delacey & Sons Holdings. An additional CCTV survey was carried out by Draintech (Report No. 14679 No. 2) in September 2022. This confirmed that the existing foul drainage network then connects into a DCWW public foul sewer within Goat Mill Road. Both of these CCTV surveys have been appended to this report.

3.2 PROPOSED DRAINAGE

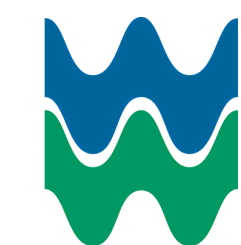
It is proposed to construct a new private package pump chamber and associated 24hr emergency storage (to be sized in accordance with British Water Code of Practice Flows & Loads - Vol. 4). The proposed rising main will then discharge to the existing foul manhole serving the adjacent units. All onsite foul drainage serving the development shall be designed in accordance with Building Regulations Approved Document Part H. Welsh Water shall confirm downstream network capacity and location of the proposed connection prior to construction.

3.3 MAINTENANCE

It is proposed that the foul drainage network shall be privately maintained.

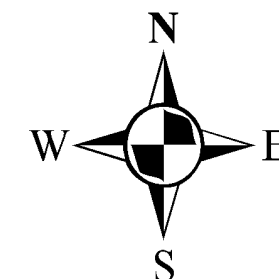


Appendix A



Dŵr Cymru
Welsh Water

Land at Goat Mill Road



LEGEND(Representative of most common features)

Waste network:	Foul chamber	Outfall
Surface water chamber	Lampole	Storm Overflow
Combined chamber	Rising main	Gravity sewer
Combined sewer overflow	Private sewer	Private sewer subject to Sect. 104 adoption agreement
Special purpose chamber	Treatment works	Private Sewer Transfer
Pumping station	Lateral Drain	Inspection Chamber

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cylchreith (The Company) gives the information as to the position of its underground apparatus by way of general guidance only and on the understanding that it is based on the best information available and no warranty as to its correctness is made upon the event of excavations or other works made in the vicinity of the Company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company is done so in accordance with statutory requirements of sections 189 and 189A of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 306418,207352
Map scale: 1:1250
Printed by: Maria Evans
Printed on: 26 Aug 2022



Appendix B

[Print](#)[Close Report](#)

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Paolo Carnevale

Site name: Land off Goat Mill Road

Site location: Merthyr Tydfil

Site Details

Latitude: 51.75558° N

Longitude: 3.35985° W

Reference: 2006521326

Date: Jun 27 2022 16:12

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.

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 1

Methodology

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

SPR estimation method: Calculate from SOIL type

Soil characteristics

Default Edited

SOIL type: 5 5

HOST class: N/A N/A

SPR/SPRHOST: 0.53 0.53

Hydrological characteristics

Default Edited

SAAR (mm): 1497 1497

Hydrological region: 9 9

Growth curve factor 1 year: 0.88 0.88

Growth curve factor 30 years: 1.78 1.78

Growth curve factor 100 years: 2.18 2.18

Growth curve factor 200 years: 2.46 2.46

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 $SPR/SPRHOST \leq 0.3$?

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): 15.25 15.25

1 in 1 year (l/s): 13.42 13.42

1 in 30 years (l/s): 27.14 27.14

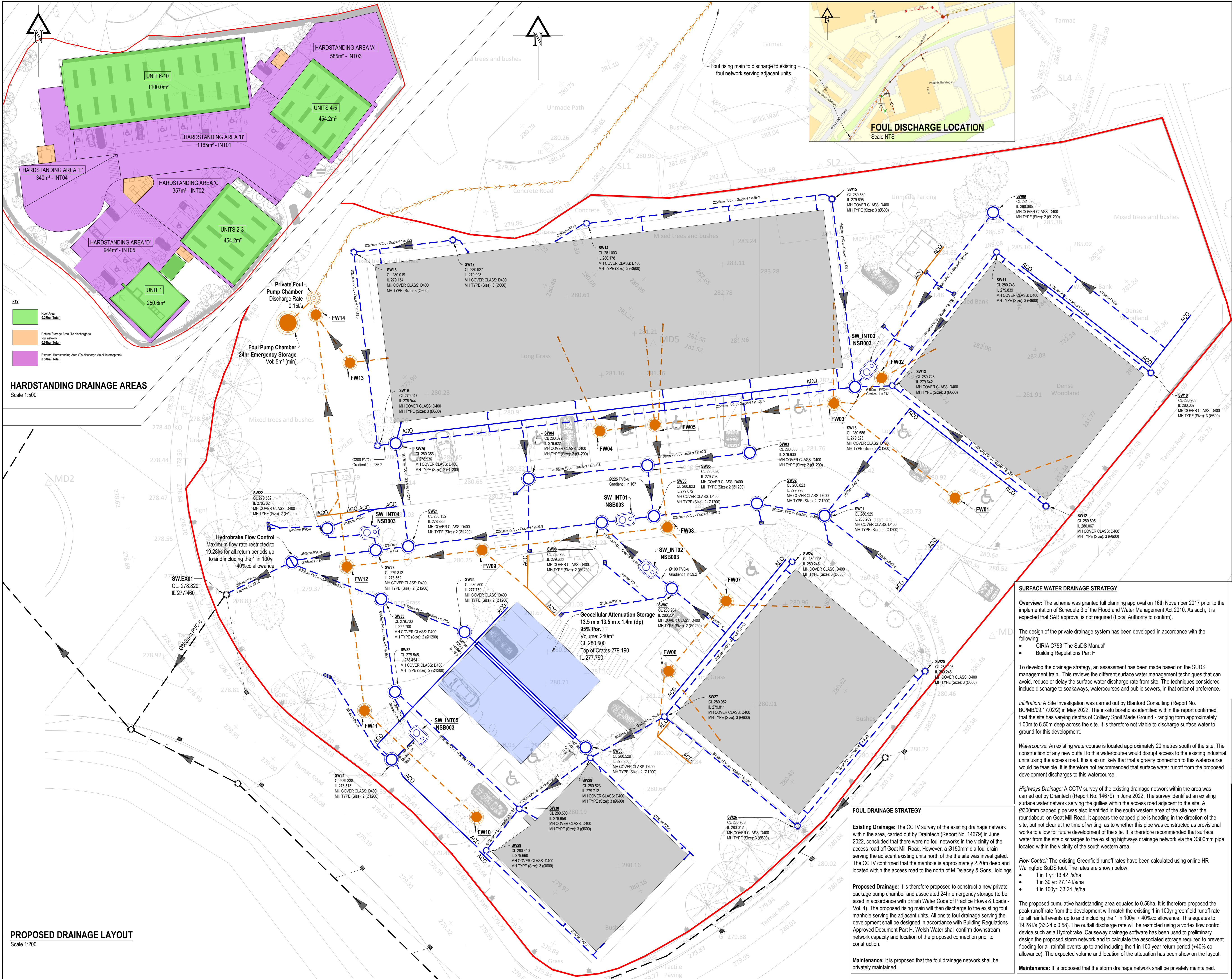
1 in 100 year (l/s): 33.24 33.24

1 in 200 years (l/s): 37.51 37.51

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.



Appendix C



Rev.	Date.	Details.	By.	Chk.
Amendments				

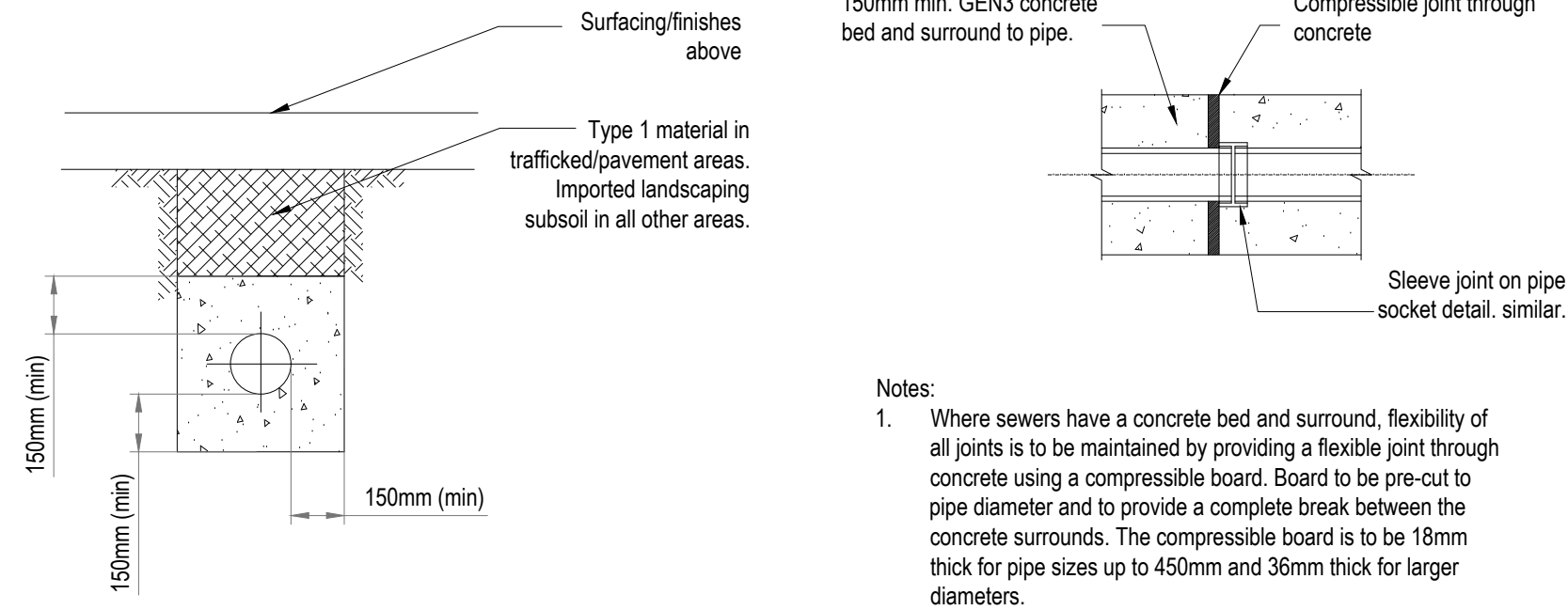


Bear Structures
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Sophia House 28 Cathedral Road Cardiff CF11 9LJ
United Kingdom 029 20 304 979

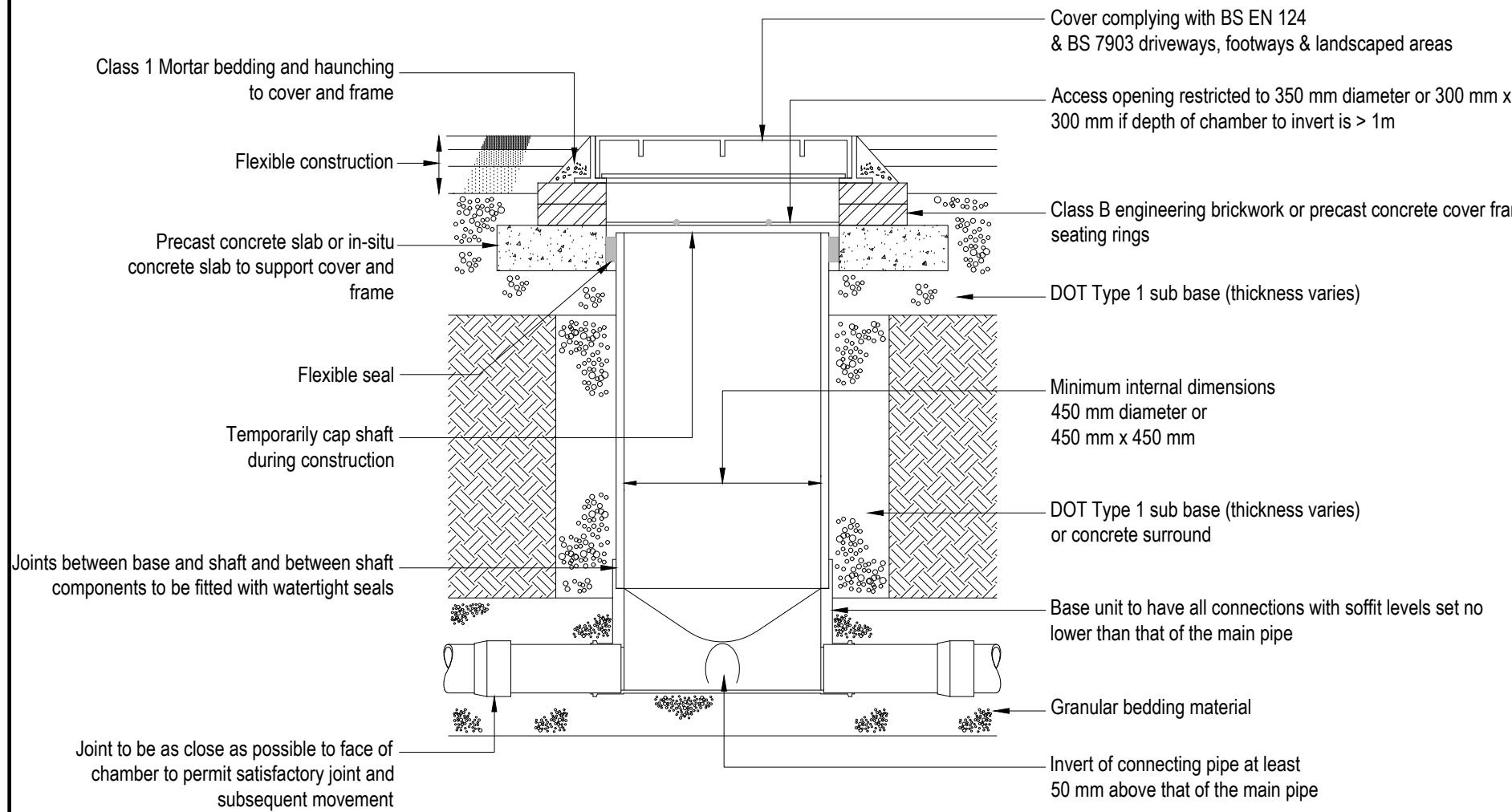
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Drawing Status:		INFORMATION	
Drawn:	Checked:	Scale(s) at A1:	
PC	-	AS SHOWN	
Date:	Job No.	Drawing No.	Revision
29.06.2022	P0379	0050	A

- Notes:
1. Bedding beneath and at sides of pipe to be well compacted.
 2. Geotextiles may be used where directed or approved by the engineer to contain bedding material in certain soils e.g. running sand.
 3. In very wet conditions, where directed or approved by the engineer a temporary land drain may be laid within the granular bed.
 4. Where rigid pipes with flexible joints are used, the concrete protection is to be interrupted over its full cross section at intervals not exceeding 5m (or as indicated by the engineer) by a shaped former of bitumen impregnated compressible filler. These interruptions shall coincide with pipe joints.
 5. Concrete to be GEN3 concrete.
 6. Where flexible pipes are used care must be taken to prevent the pipes from floating.



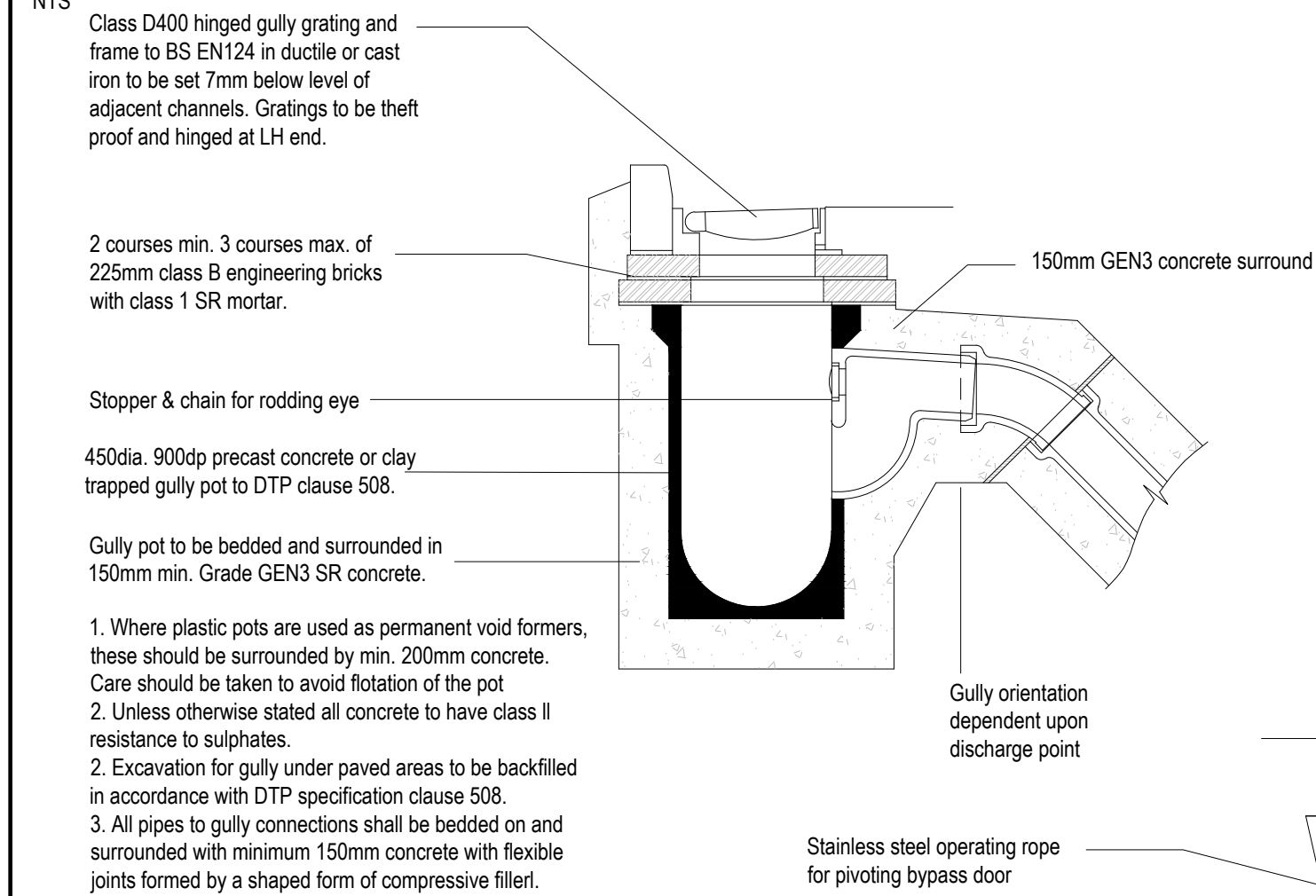
CLASS Z BEDDING WHERE COVER TO SOFFIT IS LESS THAN 600mm (1200mm IN TRAFFICKED AREAS) OR WHERE PIPE CLEARANCE BETWEEN PIPES IS LESS THAN 300mm

NTS



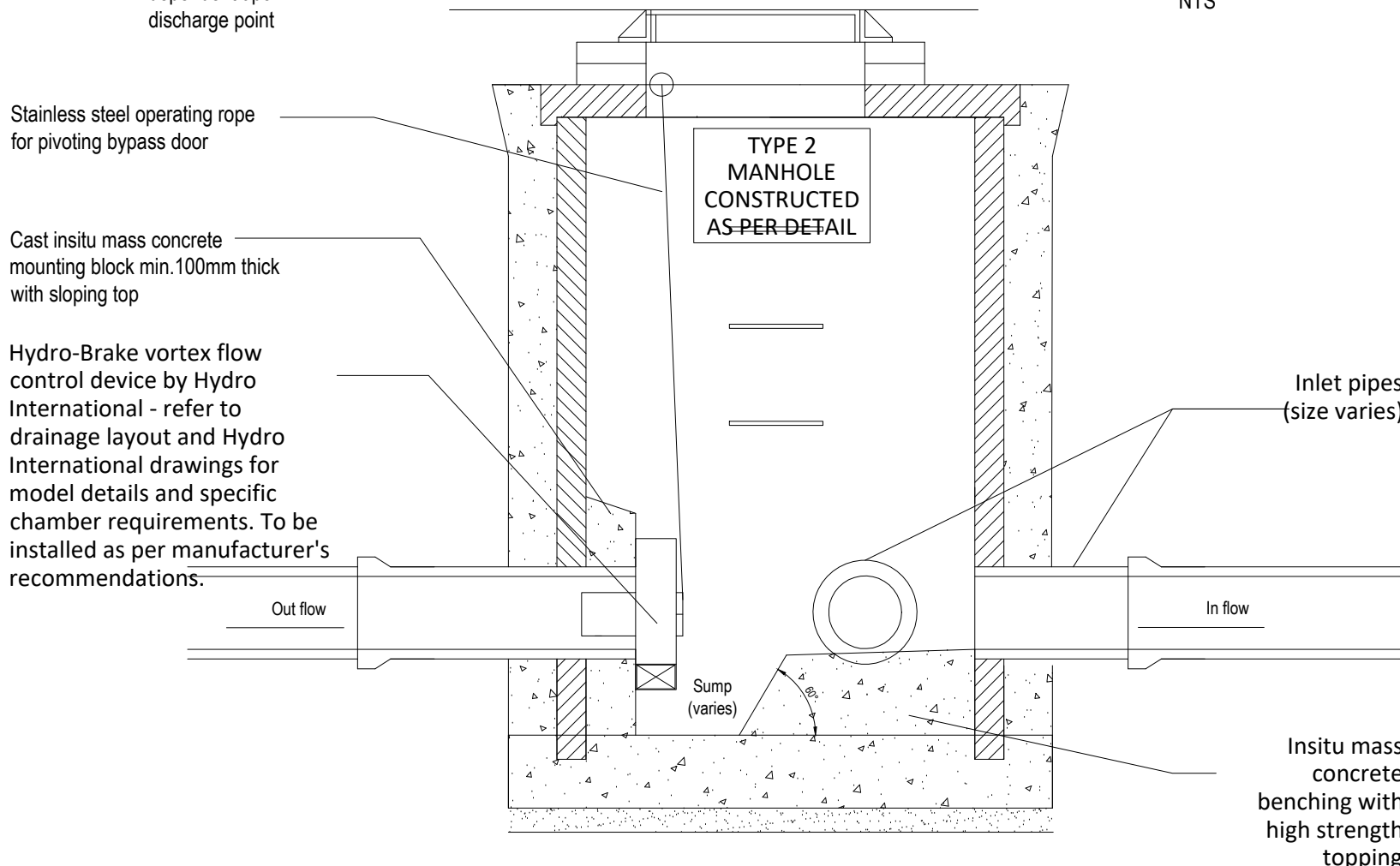
TYPICAL INSPECTION CHAMBER DETAIL - TYPE 3

NTS



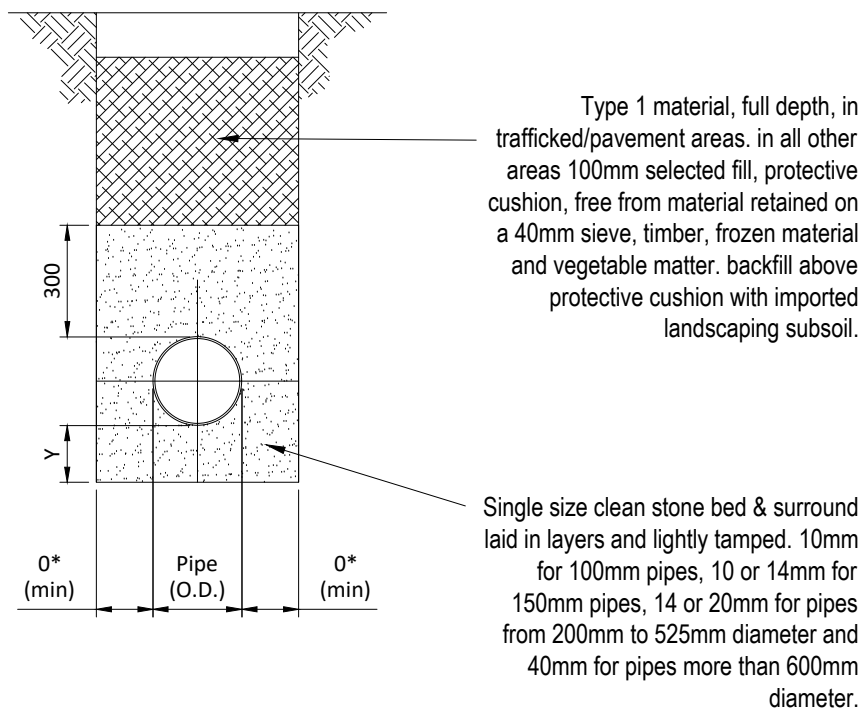
TYPICAL RWP CONNECTION DETAIL

NTS



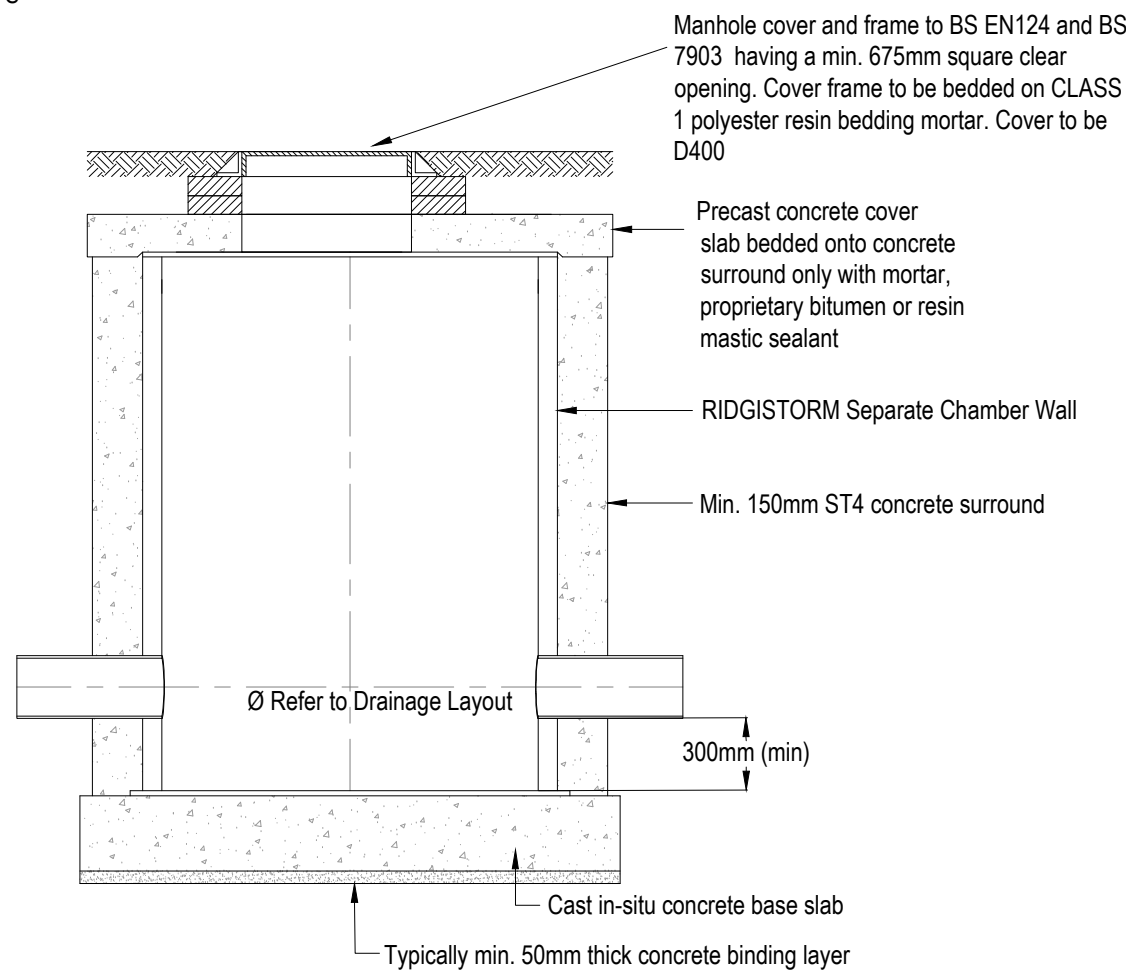
TYPICAL HYDRO-BRAKE CHAMBER DETAIL.

Scale: 1:20



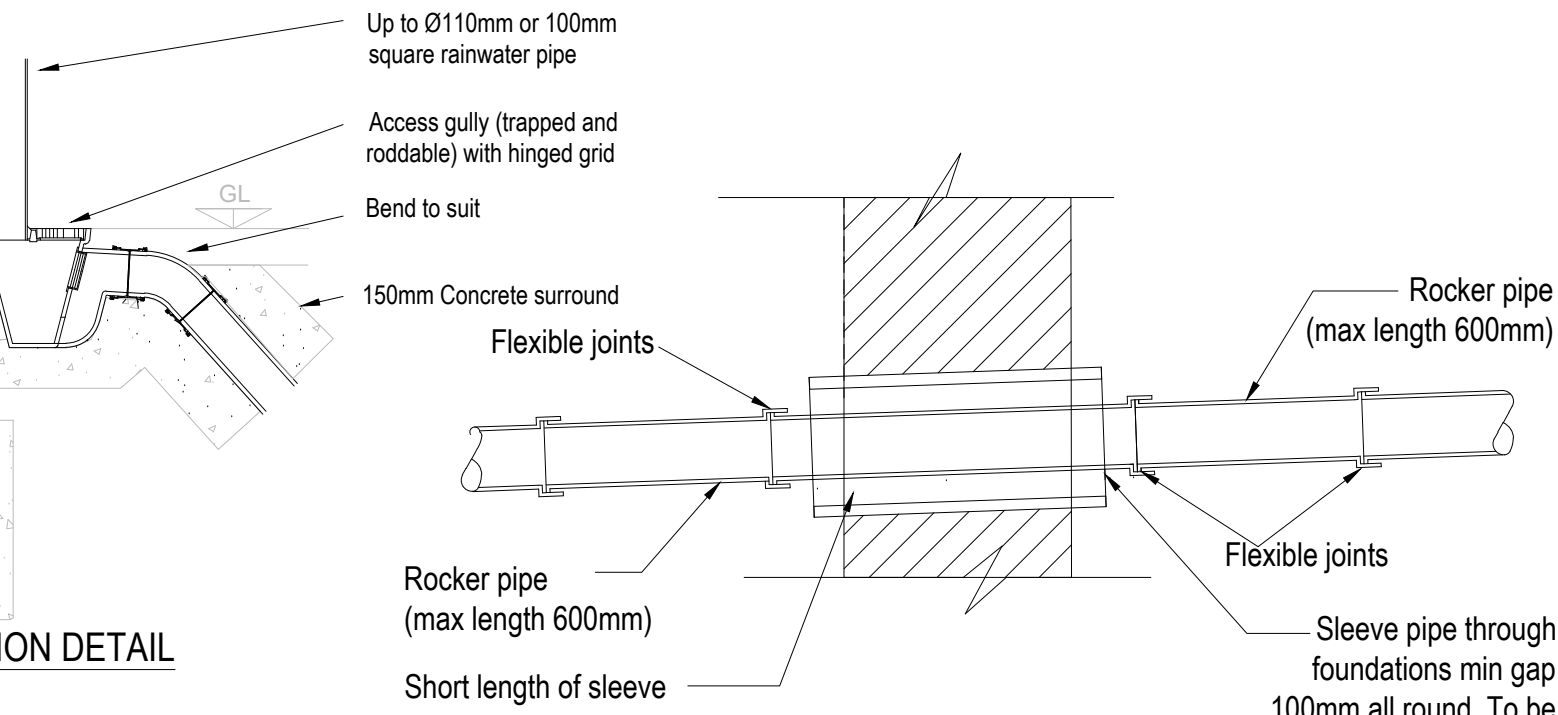
CLASS S BEDDING FOR DRAINS (WHERE COVER TO SOFFIT IS MORE THAN 1200mm IN TRAFFICKED AREAS OR 600mm ELSEWHERE)

NTS



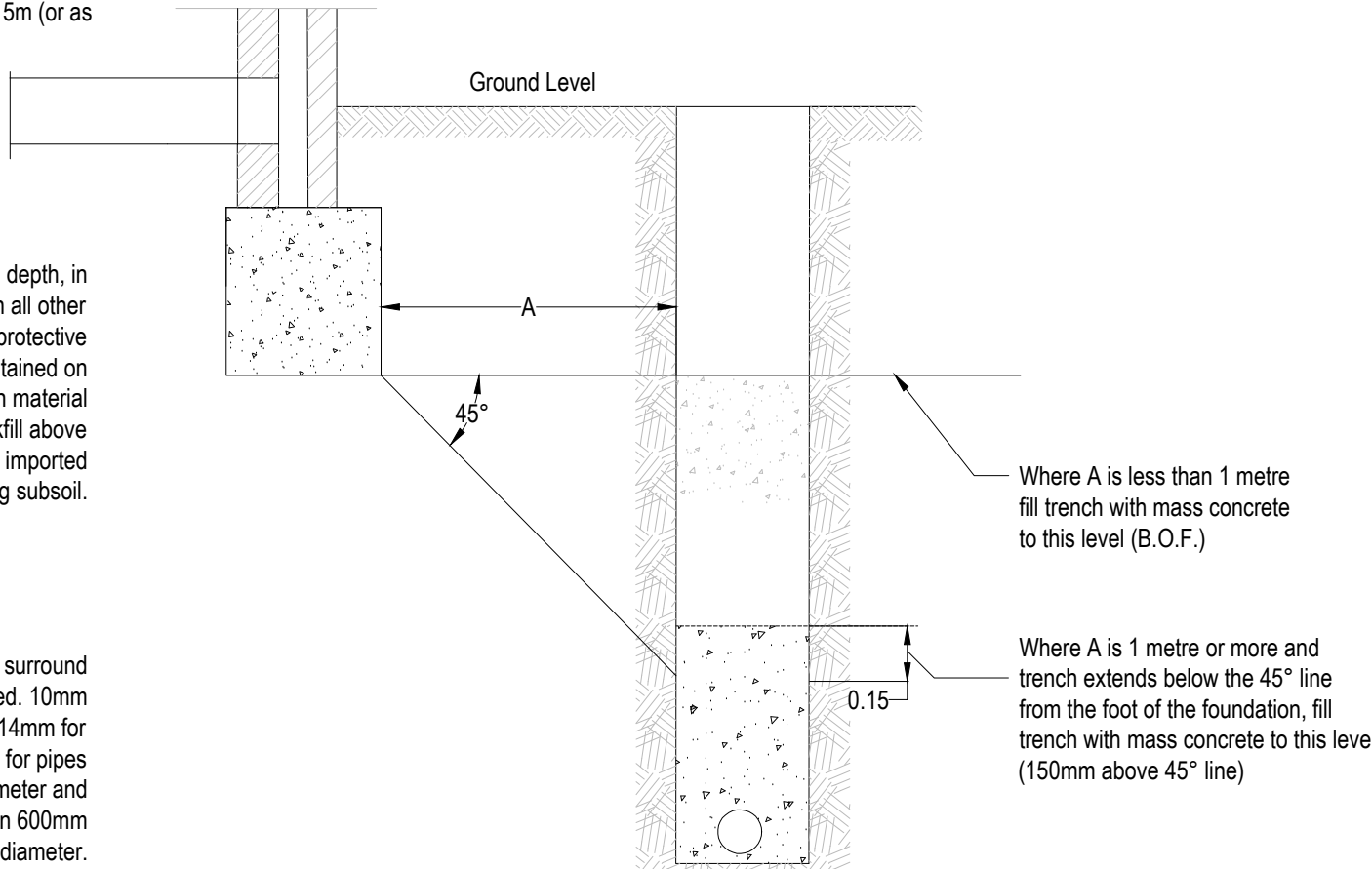
RIDGISTORM SEPARATE CATCHPIT CHAMBER DETAIL

NTS



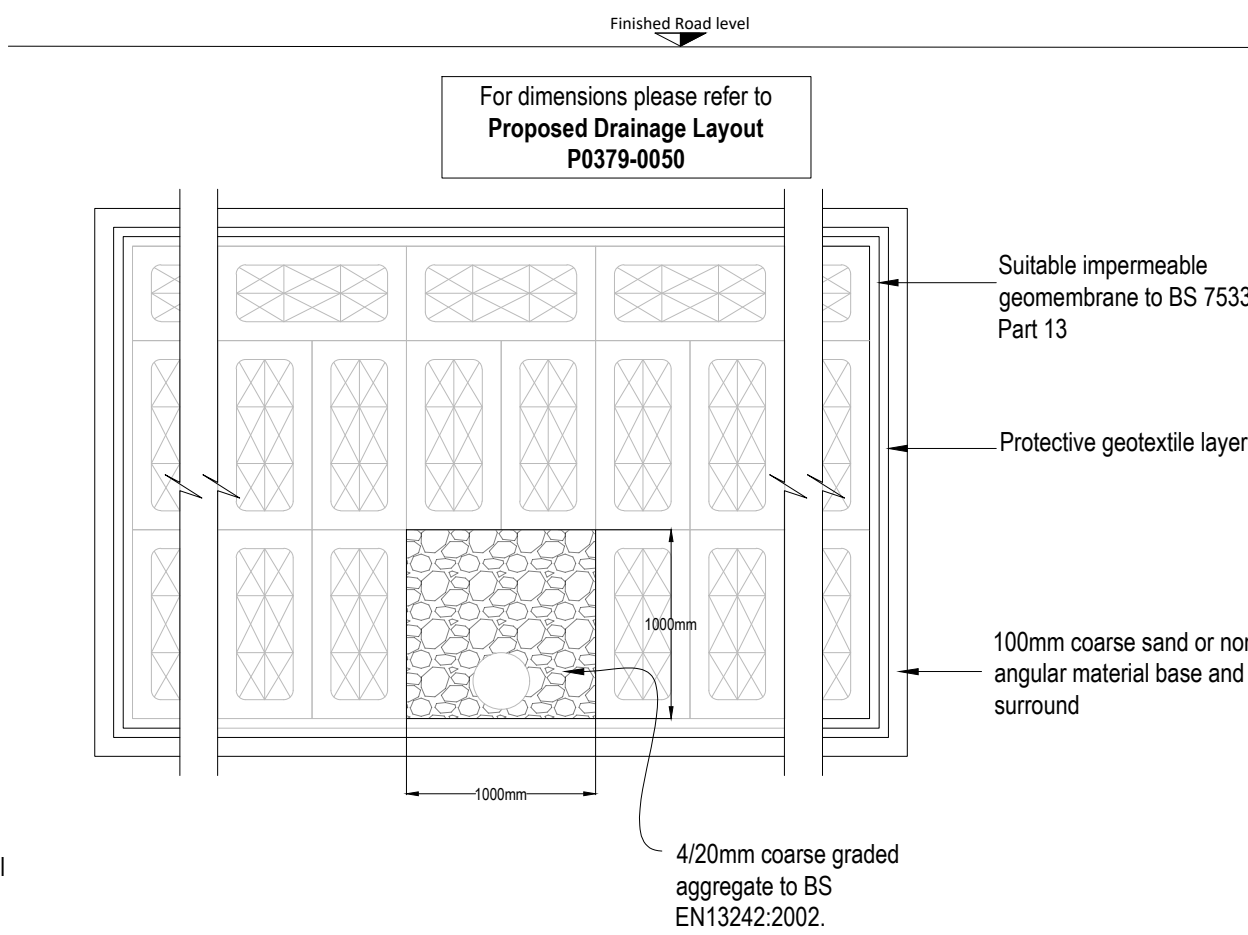
TYPICAL DETAIL FOR DRAINS THROUGH FOUNDATIONS

NTS



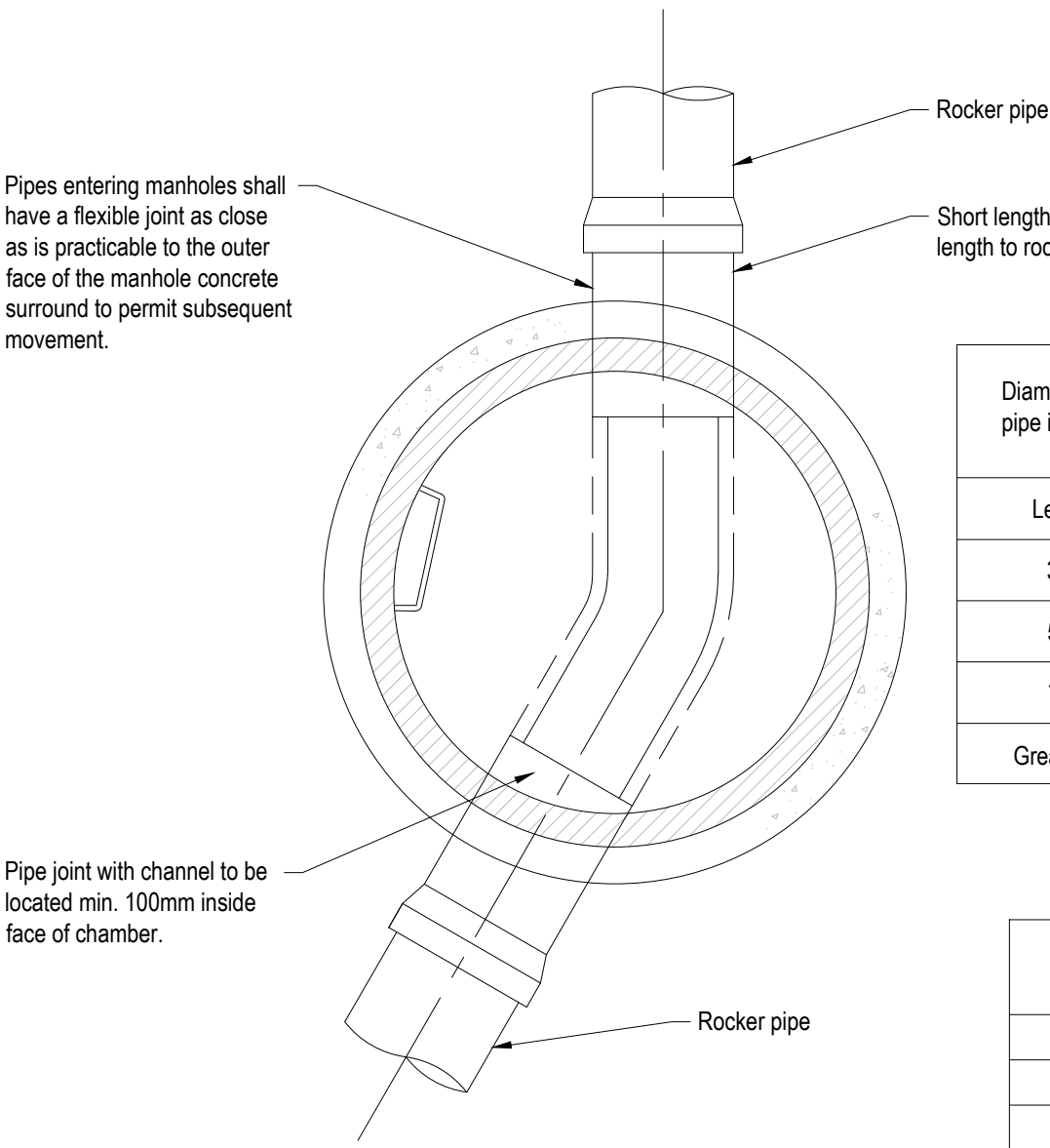
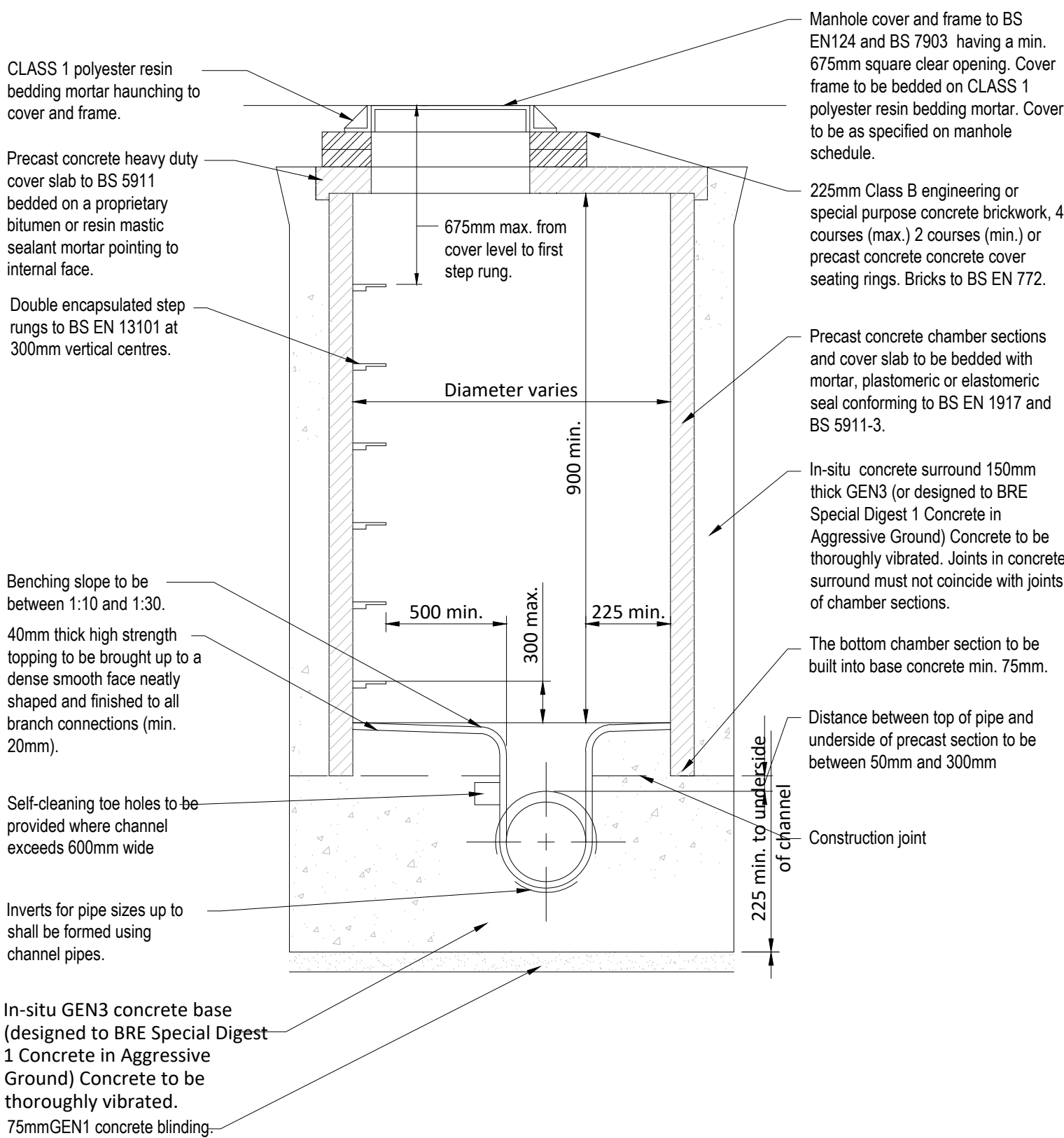
TYPICAL DETAIL FOR PRIVATE PIPE RUNS NEAR FOUNDATIONS

NTS



GEOCELLULAR CRATE CONSTRUCTION DETAIL

Scale 1:40



MH chamber sizes	
Diameter of Largest pipe in Manhole (mm)	Internal Diameter of Manhole (mm)
Less than 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800
Greater than 900	Pipe dia. + 900

Rocker Pipes	
Pipe dia.	Rocker pipe length
100 - 600	0.6m
600 - 750	1.0m
over 750	1.25m

MANHOLE - TYPE 2 not to scale
Depth to soffit = 3.0m max.

Drawing Notes:

1. This drawing has been produced for planning submission only and should not be used for construction purposes.
2. This drawing is to be read in conjunction with other Architect, Engineering and Survey drawings.

GENERAL NOTES

DRAWINGS AND SPECIFICATIONS: This drawing is to be read in conjunction with all relevant Architects, Engineers and Specialists drawings together with the specification.

DRAINAGE NOTES

DRAINAGE STANDARDS: All private drainage works shall be in accordance with Building Regulations Document Part H. All adoptable drainage works shall be in accordance with Sewers for Adoption 7th Edition and statutory undertaker's requirements.

ABOVE GROUND DRAINAGE: RWP/SVP drainage positions shown on BSL drawings, upon which the below ground drainage is designed, are based upon the positions provided to us by the Architect and these are to be set out on the Architect's floor plans unless agreed otherwise. If above ground drainage positions change then BSL will need to be informed of these changes in writing and the changes in position clearly noted or highlighted on a drawing, i.e. using revision clouds, with relevant CAD files provided to BSL below ground drainage drawings to be updated. Note that should these changes occur following BSL issue of Construction status drawings then there is a risk of the contractor undertaking abortive works.

LAYING DRAINAGE: It is recommended that all drains be laid starting from the downstream connection to the existing network and working upstream to and through the new development.

DRAINAGE PIPE SIZES: All foul water drains to be 100mm diameter unless noted otherwise. All surface water drains to be 150mm unless noted otherwise.

MANHOLE COVER LEVELS: All manhole & inspection chamber cover levels are to be adjusted to suit the Architect's proposed finished surface levels. If the cover levels proposed in the drainage schedules vary from proposed surface level by more than 100mm, Contractor to notify BSL.

Rev.	Date.	Details.	By.	Chk.
Amendments				



Bear Structures
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Sophia House 28 Cathedral Road Cardiff CF11 9LJ
United Kingdom 029 20 304 979

Project:
M DELACEY & SONS, GOAT MILL ROAD, DOWLAIS, MERTHYR TYDFIL

Title:
**CONSTRUCTION DETAILS
SHEET 1**

Drawing Status:
INFORMATION

Drawn:	Checked:	Scale(s) at A1:
PC	-	AS SHOWN
Date:	Job No:	Drawing No.
04.10.2022	P0379	0010
		Revision
		-

ACO M100D NOTES:-

1.0 Load Class

Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions

The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Jointing

Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.

Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints

The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ Slab

Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation

A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

7.0 Block Pavements

The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

8.0 Grate Locking System

Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

9.0 Channel Protection

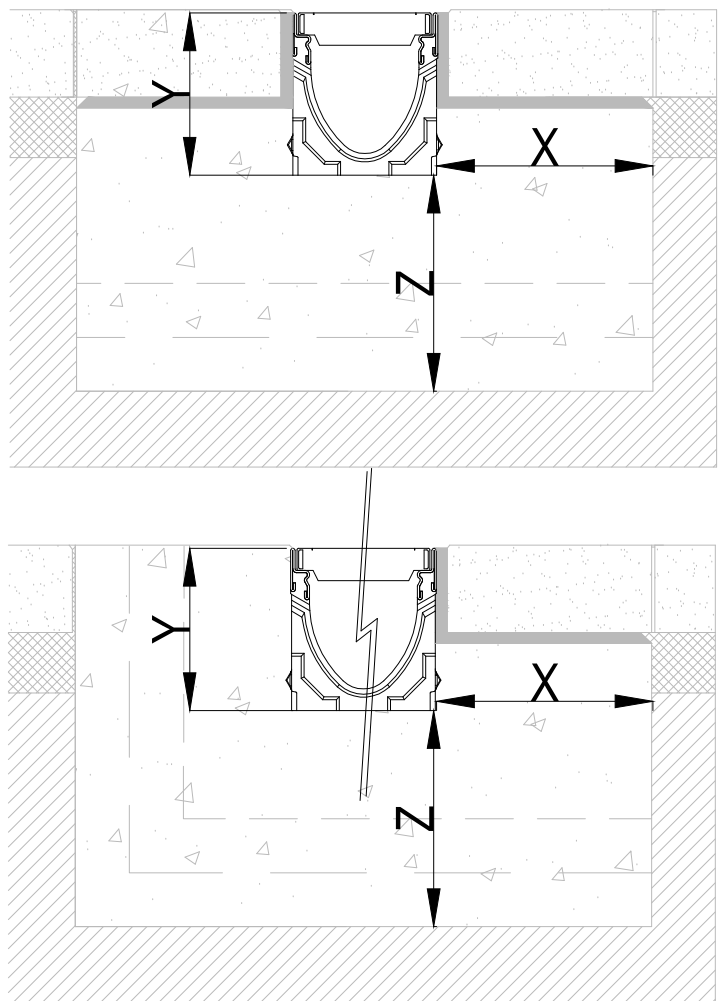
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the grating, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. (Please note that ACO channels must be installed with the grating in place to prevent deformation of the channel).

10.0 Watertight Installation to BS EN 1433:2002

Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

- For Guidance a typical method of application follows:
- The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
 - Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
 - Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
 - Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
 - Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
 - The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
 - Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
 - The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.



Load Class		A 15	B 125	C 250	D 400*
Minimum	X	100	150	150	200
Dimensions (mm)	Y	Full Channel Height (Less Y2 where applicable)			
	Z	100	150	150	200
Maximum	Y2	35	35	35	35
Dimensions (mm)	Y3	100	60	60	60

* e.g. parking areas for all types of road vehicle.
Not suitable for carriageway of roads or industrial areas.

PROPOSED ACO MULTIDRAIN DETAIL

Scale 1:10

Drawing Notes:

1. This drawing has been produced for planning submission only and should not be used for construction purposes.
2. This drawing is to be read in conjunction with other Architect, Engineering and Survey drawings.

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DRAINAGE NOTES

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ABOVE GROUND DRAINAGE: RWP/SPV drainage positions shown on BSL drawings, upon which the below ground drainage is designed, are based upon the positions provided to us by the Architect and these are to be set out on the Architect's floor plans unless agreed otherwise. If above ground drainage positions change then BSL will need to be informed of these changes in writing and the changes in position clearly noted or highlighted on a drawing, i.e. using revision clouds, with relevant CAD files provided to BSL below ground drainage drawings to be updated. Note that should these changes occur following BSL issue of Construction status drawings then there is a risk of the contractor undertaking abortive works.

LAYING DRAINAGE: It is recommended that all drains be laid starting from the downstream connection to the existing network and working upstream to and through the new development.

DRAINAGE PIPE SIZES: All foul water drains to be 100mm diameter unless noted otherwise. All surface water drains to be 150mm unless noted otherwise.

MANHOLE COVER LEVELS: All manhole & inspection chamber cover levels are to be adjusted to suit the Architect's proposed finished surface levels. If the cover levels proposed in the drainage schedules vary from proposed surface level by more than 100mm, Contractor to notify BSL.

Rev.	Date.	Details.	By.	Chk.
------	-------	----------	-----	------

Amendments



Bear Structures
Rugged by design

Sophia House 28 Cathedral Road Cardiff CF11 9LJ
United Kingdom 029 20 304 979

Project:

**M DELACEY & SONS, GOAT MILL ROAD,
DOWLAIS, MERTHYR TYDFIL**

Title:

**CONSTRUCTION DETAILS
SHEET 2**

Drawing Status:

INFORMATION

Drawn:	Checked:	Scale(s) at A1:
PC	-	AS SHOWN
Date:	Job No.	Drawing No.
04.10.2022	P0379	0011
		Revision
		-



Appendix D

Technical Specification

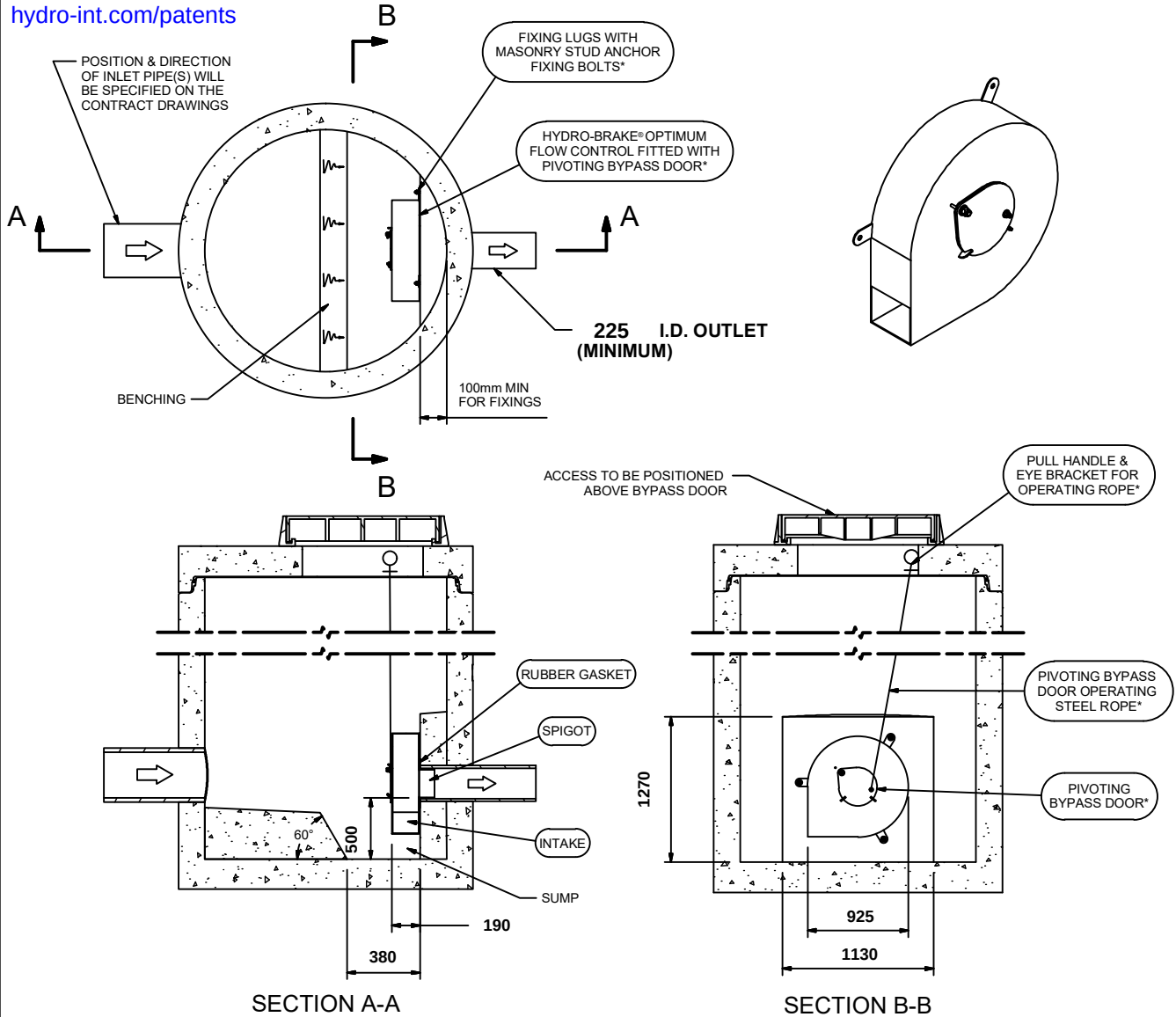
Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	19.300
Flush-Flo™	0.575	19.281
Kick-Flo®	1.225	15.286
Mean Flow		16.799

Hydro-Brake® Optimum Flow Control including:

- 5 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 672 kg



hydro-int.com/patents



IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW
 CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0181-1930-2000-1930 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International®

DATE	04/10/2022 15:09
SITE	Goat Mill Road
DESIGNER	Paolo Carnevale
REF	P0379

SHE-0181-1930-2000-1930
 Hydro-Brake® Optimum

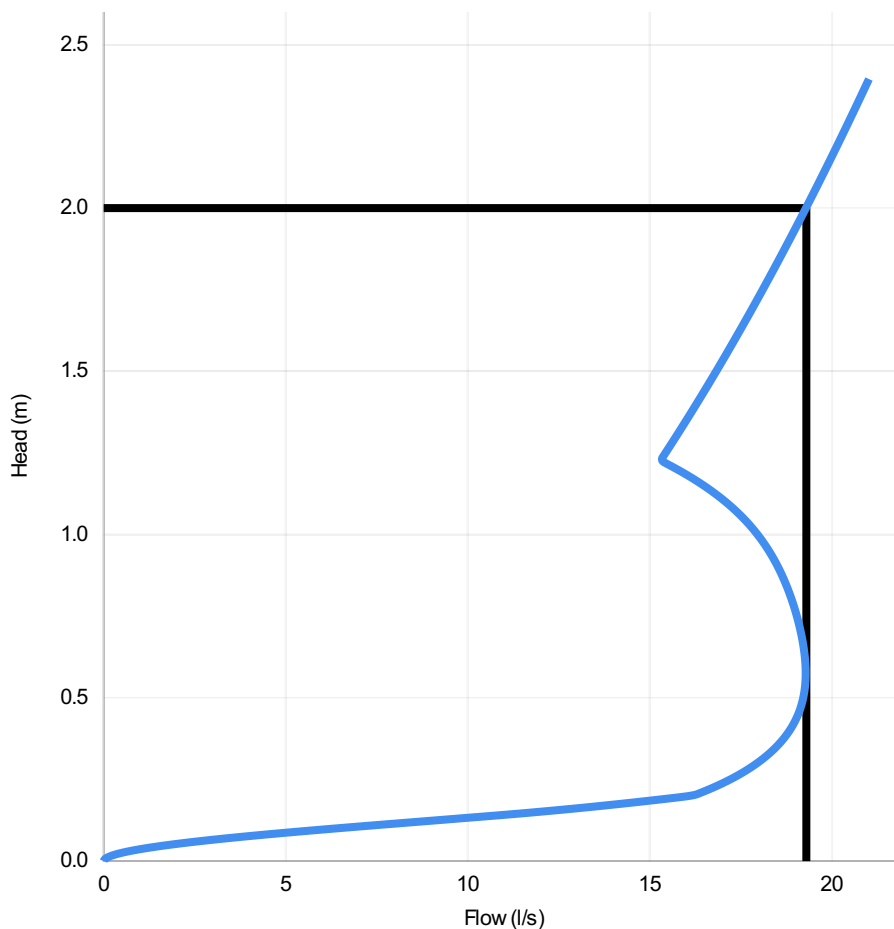
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	19.300
Flush-Flo	0.575	19.281
Kick-Flo®	1.225	15.286
Mean Flow		16.799



PT/329/0412

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Head (m)	Flow (l/s)
0.000	0.000
0.069	3.294
0.138	10.587
0.207	16.343
0.276	17.620
0.345	18.429
0.414	18.916
0.483	19.176
0.552	19.275
0.621	19.262
0.690	19.169
0.759	19.017
0.828	18.811
0.897	18.541
0.966	18.183
1.034	17.701
1.103	17.048
1.172	16.173
1.241	15.380
1.310	15.779
1.379	16.167
1.448	16.545
1.517	16.914
1.586	17.275
1.655	17.628
1.724	17.973
1.793	18.311
1.862	18.643
1.931	18.968
2.000	19.288

DESIGN ADVICE



The head/flow characteristics of this SHE-0181-1930-2000-1930 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International

DATE 04/10/2022 15:09

Site Goat Mill Road

DESIGNER Paolo Carnevale

Ref P0379

SHE-0181-1930-2000-1930

Hydro-Brake Optimum®

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)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.200	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW14	0.018	5.00	281.003	600	306241.564	207245.777	0.825
SW15	0.014	5.00	280.569	600	306270.340	207248.629	0.874
SW09	0.016	5.00	281.086	1200	306289.248	207247.068	1.001
SW_INT03	0.016	5.00	280.582	1200	306274.656	207228.623	0.750
SW10	0.012	5.00	280.968	600	306307.758	207228.244	0.901
SW11	0.012	5.00	280.743	600	306289.645	207242.399	0.904
SW12	0.012	5.00	280.805	600	306295.457	207212.607	0.738
SW13	0.012	5.00	280.728	600	306277.417	207226.751	1.086
SW16	0.014	5.00	280.586	1200	306273.046	207226.592	1.063
SW17	0.014	5.00	280.927	600	306225.866	207243.821	0.929
SW18	0.014	5.00	280.019	600	306214.253	207242.395	0.865
SW19	0.014	5.00	279.947	600	306217.038	207219.715	1.003
SW20	0.014	5.00	280.356	1200	306218.909	207219.977	1.420
SW03	0.032	5.00	280.680	1200	306260.701	207218.878	0.750
SW04	0.032	5.00	280.672	1200	306234.766	207215.844	0.750
SW05	0.032	5.00	280.680	1200	306248.694	207217.404	0.972
SW01	0.022	5.00	280.925	1200	306269.477	207211.491	0.716
SW02	0.022	5.00	280.823	1200	306261.548	207212.924	0.825
SW06	0.022	5.00	280.823	1200	306249.467	207211.442	1.151
SW_INT01	0.000		280.799	1200	306245.765	207210.976	1.149
SW07	0.034	5.00	280.904	1200	306251.564	207202.959	0.700
SW_INT02	0.000		280.861	1200	306248.545	207205.441	0.723
SW08	0.000		280.780	1200	306243.336	207210.690	1.145
SW21	0.011	5.00	280.132	1350	306220.648	207207.906	1.246
SW22	0.016	5.00	279.532	1200	306211.148	207209.993	0.750
SW_INT04	0.016	5.00	279.808	1200	306215.796	207209.494	1.073
SW23	0.011	5.00	279.812	1200	306216.831	207207.452	1.250
SW24	0.012	5.00	280.995	600	306265.677	207206.099	0.750
SW25	0.012	5.00	280.996	600	306281.272	207193.245	0.750
SW26	0.012	5.00	280.963	600	306266.310	207175.091	0.951
SW27	0.012	5.00	280.952	600	306250.697	207187.924	1.141
SW28	0.013	5.00	280.523	600	306241.996	207183.096	0.811
SW29	0.007	5.00	280.410	600	306229.799	207172.229	0.750
SW30	0.007	5.00	280.500	1200	306233.667	207177.111	1.542
SW31	0.017	5.00	279.338	1200	306218.695	207182.882	0.825
SW_INT05	0.017	5.00	279.473	1200	306221.601	207185.995	0.986
SW32	0.017	5.00	279.545	1200	306219.081	207190.825	1.091
SW33		5.00	280.529	1200	306241.451	207184.310	2.179
SW.ATTENUATION			280.500		306234.432	207190.995	2.710
SW34			280.500	1200	306227.241	207197.843	2.750
SW35	0.017	5.00	279.700	1200	306217.469	207201.714	2.000
SW_HYDROBRAKE	0.000		279.239	1800	306206.995	207206.047	1.753
SW.EX01	0.000		278.827	1350	306199.323	207202.240	1.367
SW.EX02			278.950	1350	306188.132	207186.427	1.550

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)
1.000	SW14	SW15	28.917	0.600	280.178	279.695	0.483	59.9	225	5.28	50.0
1.001	SW15	SW16	22.203	0.600	279.695	279.523	0.172	129.1	225	5.61	50.0
2.000	SW09	SW_INT03	23.519	0.600	280.085	279.832	0.253	93.0	150	5.38	50.0
2.001	SW_INT03	SW16	2.592	0.600	279.832	279.598	0.234	11.1	150	5.39	50.0
3.000	SW10	SW11	22.988	0.600	280.067	279.839	0.228	100.8	150	5.38	50.0
3.001	SW11	SW13	19.859	0.600	279.839	279.642	0.197	100.8	150	5.71	50.0
4.000	SW12	SW13	22.924	0.600	280.067	279.642	0.425	53.9	150	5.28	50.0
3.002	SW13	SW16	4.374	0.600	279.642	279.598	0.044	99.4	150	5.79	50.0
1.002	SW16	SW20	54.540	0.600	279.523	279.011	0.512	106.5	225	6.50	50.0
5.000	SW17	SW18	11.700	0.600	279.998	279.154	0.844	13.9	225	5.06	50.0
5.001	SW18	SW19	22.850	0.600	279.154	279.019	0.135	169.3	225	5.44	50.0
5.002	SW19	SW20	1.889	0.600	278.944	278.936	0.008	236.2	300	5.47	50.0
1.003	SW20	SW21	12.196	0.600	278.936	278.886	0.050	243.9	300	6.71	50.0
6.000	SW03	SW05	12.097	0.600	279.930	279.783	0.147	82.3	150	5.18	50.0
7.000	SW04	SW05	14.015	0.600	279.922	279.783	0.139	100.8	150	5.23	50.0
6.001	SW05	SW06	6.012	0.600	279.708	279.672	0.036	167.0	225	5.33	50.0
8.000	SW01	SW02	8.057	0.600	280.209	279.998	0.211	38.2	225	5.06	50.0
8.001	SW02	SW06	12.172	0.600	279.998	279.672	0.326	37.3	225	5.16	50.0
6.002	SW06	SW_INT01	3.731	0.600	279.672	279.650	0.022	169.6	225	5.39	50.0
6.003	SW_INT01	SW08	2.446	0.600	279.650	279.635	0.015	163.1	225	5.43	50.0
9.000	SW07	SW_INT02	3.908	0.600	280.204	280.138	0.066	59.2	100	5.06	50.0
9.001	SW_INT02	SW08	7.395	0.600	280.138	279.760	0.378	19.6	100	5.14	50.0
6.004	SW08	SW21	22.858	0.600	279.635	278.961	0.674	33.9	225	5.60	50.0
1.004	SW21	SW23	3.844	0.600	278.886	278.562	0.324	11.9	300	6.72	50.0
14.000	SW22	SW_INT04	4.675	0.600	278.782	278.735	0.047	99.5	150	5.08	50.0
14.001	SW_INT04	SW23	2.289	0.600	278.735	278.712	0.023	99.5	150	5.12	50.0
1.005	SW23	SW_HYDROBRAKE	9.936	0.600	278.562	277.561	1.001	9.9	300	6.75	50.0
10.000	SW24	SW27	23.553	0.600	280.245	279.811	0.434	54.3	150	5.29	50.0
11.000	SW25	SW26	23.525	0.600	280.246	280.012	0.234	100.5	150	5.39	50.0
11.001	SW26	SW27	20.210	0.600	280.012	279.811	0.201	100.5	150	5.73	50.0
10.001	SW27	SW28	9.951	0.600	279.811	279.712	0.099	100.5	150	5.89	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)
1.000	1.693	67.3	3.4	0.600	0.649	0.018	0.0
1.001	1.149	45.7	6.1	0.649	0.838	0.032	0.0
2.000	1.042	18.4	3.0	0.851	0.600	0.016	0.0
2.001	3.044	53.8	6.1	0.600	0.838	0.032	0.0
3.000	1.000	17.7	2.3	0.751	0.754	0.012	0.0
3.001	1.001	17.7	4.6	0.754	0.936	0.024	0.0
4.000	1.372	24.3	2.3	0.588	0.936	0.012	0.0
3.002	1.008	17.8	9.1	0.936	0.838	0.048	0.0
1.002	1.266	50.3	23.9	0.838	1.120	0.126	0.0
5.000	3.532	140.5	2.7	0.704	0.640	0.014	0.0
5.001	1.002	39.8	5.3	0.640	0.703	0.028	0.0
5.002	1.019	72.0	8.0	0.703	1.120	0.042	0.0
1.003	1.002	70.8	34.5	1.120	0.946	0.182	0.0
6.000	1.109	19.6	6.1	0.600	0.747	0.032	0.0
7.000	1.000	17.7	6.1	0.600	0.747	0.032	0.0
6.001	1.009	40.1	18.2	0.747	0.926	0.096	0.0
8.000	2.123	84.4	4.2	0.491	0.600	0.022	0.0
8.001	2.147	85.4	8.3	0.600	0.926	0.044	0.0
6.002	1.001	39.8	30.7	0.926	0.924	0.162	0.0
6.003	1.021	40.6	30.7	0.924	0.920	0.162	0.0
9.000	1.003	7.9	6.5	0.600	0.623	0.034	0.0
9.001	1.754	13.8	6.5	0.623	0.920	0.034	0.0
6.004	2.254	89.6	37.2	0.920	0.946	0.196	0.0
1.004	4.588	324.3	73.8	0.946	0.950	0.389	0.0
14.000	1.007	17.8	3.0	0.600	0.923	0.016	0.0
14.001	1.007	17.8	6.1	0.923	0.950	0.032	0.0
1.005	5.018	354.7	82.0	0.950	1.378	0.432	0.0
10.000	1.368	24.2	2.3	0.600	0.991	0.012	0.0
11.000	1.002	17.7	2.3	0.600	0.801	0.012	0.0
11.001	1.002	17.7	4.6	0.801	0.991	0.024	0.0
10.001	1.002	17.7	9.1	0.991	0.661	0.048	0.0

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)
10.002	SW28	SW30	10.256	0.600	279.712	278.958	0.754	13.6	150	5.96	50.0
12.000	SW29	SW30	6.229	0.600	279.660	278.958	0.702	8.9	150	5.03	50.0
10.003	SW30	SW32	20.021	0.600	278.958	278.529	0.429	46.7	150	6.18	50.0
13.000	SW31	SW_INT05	4.259	0.600	278.513	278.487	0.026	163.8	225	5.07	50.0
13.001	SW_INT05	SW32	5.448	0.600	278.487	278.454	0.033	165.1	225	5.16	50.0
10.004	SW32	SW35	11.008	0.600	278.454	277.775	0.679	16.2	225	6.24	50.0
15.000	SW33	SW.ATTENUATION	9.693	0.600	278.350	277.790	0.560	17.3	300	5.04	50.0
15.001	SW.ATTENUATION	SW34	9.930	0.600	277.790	277.750	0.040	248.3	300	5.21	50.0
15.002	SW34	SW35	10.511	0.600	277.750	277.700	0.050	210.2	300	5.37	50.0
10.005	SW35	SW_HYDROBRAKE	11.335	0.600	277.700	277.651	0.049	231.3	300	6.42	50.0
1.006	SW_HYDROBRAKE	SW.EX01	8.565	0.600	277.486	277.460	0.026	329.4	300	6.92	50.0
1.007	SW.EX01	SW.EX02	19.372	0.600	277.460	277.400	0.060	322.9	300	7.29	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)
10.002	2.746	48.5	11.6	0.661	1.392	0.061	0.0
12.000	3.403	60.1	1.3	0.600	1.392	0.007	0.0
10.003	1.476	26.1	14.2	1.392	0.866	0.075	0.0
13.000	1.019	40.5	3.2	0.600	0.761	0.017	0.0
13.001	1.015	40.3	6.5	0.761	0.866	0.034	0.0
10.004	3.266	129.8	23.9	0.866	1.700	0.126	0.0
15.000	3.796	268.4	0.0	1.879	2.410	0.000	0.0
15.001	0.993	70.2	0.0	2.410	2.450	0.000	0.0
15.002	1.080	76.4	0.0	2.450	1.700	0.000	0.0
10.005	1.029	72.8	27.1	1.700	1.288	0.143	0.0
1.006	0.861	60.8	109.1	1.453	1.067	0.575	0.0
1.007	0.869	61.4	109.1	1.067	1.250	0.575	0.0

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	28.917	59.9	225	Circular_Default Sewer Type	281.003	280.178	0.600	280.569	279.695	0.649
1.001	22.203	129.1	225	Circular_Default Sewer Type	280.569	279.695	0.649	280.586	279.523	0.838
2.000	23.519	93.0	150	Circular_Default Sewer Type	281.086	280.085	0.851	280.582	279.832	0.600
2.001	2.592	11.1	150	Circular_Default Sewer Type	280.582	279.832	0.600	280.586	279.598	0.838
3.000	22.988	100.8	150	Circular_Default Sewer Type	280.968	280.067	0.751	280.743	279.839	0.754
3.001	19.859	100.8	150	Circular_Default Sewer Type	280.743	279.839	0.754	280.728	279.642	0.936
4.000	22.924	53.9	150	Circular_Default Sewer Type	280.805	280.067	0.588	280.728	279.642	0.936
3.002	4.374	99.4	150	Circular_Default Sewer Type	280.728	279.642	0.936	280.586	279.598	0.838
1.002	54.540	106.5	225	Circular_Default Sewer Type	280.586	279.523	0.838	280.356	279.011	1.120
5.000	11.700	13.9	225	Circular_Default Sewer Type	280.927	279.998	0.704	280.019	279.154	0.640
5.001	22.850	169.3	225	Circular_Default Sewer Type	280.019	279.154	0.640	279.947	279.019	0.703
5.002	1.889	236.2	300	Circular_Default Sewer Type	279.947	278.944	0.703	280.356	278.936	1.120
1.003	12.196	243.9	300	Circular_Default Sewer Type	280.356	278.936	1.120	280.132	278.886	0.946
6.000	12.097	82.3	150	Circular_Default Sewer Type	280.680	279.930	0.600	280.680	279.783	0.747
7.000	14.015	100.8	150	Circular_Default Sewer Type	280.672	279.922	0.600	280.680	279.783	0.747

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW14	600	Manhole	Adoptable	SW15	600	Manhole	Adoptable
1.001	SW15	600	Manhole	Adoptable	SW16	1200	Manhole	Adoptable
2.000	SW09	1200	Manhole	Adoptable	SW_INT03	1200	Manhole	Adoptable
2.001	SW_INT03	1200	Manhole	Adoptable	SW16	1200	Manhole	Adoptable
3.000	SW10	600	Manhole	Adoptable	SW11	600	Manhole	Adoptable
3.001	SW11	600	Manhole	Adoptable	SW13	600	Manhole	Adoptable
4.000	SW12	600	Manhole	Adoptable	SW13	600	Manhole	Adoptable
3.002	SW13	600	Manhole	Adoptable	SW16	1200	Manhole	Adoptable
1.002	SW16	1200	Manhole	Adoptable	SW20	1200	Manhole	Adoptable
5.000	SW17	600	Manhole	Adoptable	SW18	600	Manhole	Adoptable
5.001	SW18	600	Manhole	Adoptable	SW19	600	Manhole	Adoptable
5.002	SW19	600	Manhole	Adoptable	SW20	1200	Manhole	Adoptable
1.003	SW20	1200	Manhole	Adoptable	SW21	1350	Manhole	Adoptable
6.000	SW03	1200	Manhole	Adoptable	SW05	1200	Manhole	Adoptable
7.000	SW04	1200	Manhole	Adoptable	SW05	1200	Manhole	Adoptable

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)
6.001	6.012	167.0	225	Circular_Default Sewer Type	280.680	279.708	0.747	280.823	279.672	0.926
8.000	8.057	38.2	225	Circular_Default Sewer Type	280.925	280.209	0.491	280.823	279.998	0.600
8.001	12.172	37.3	225	Circular_Default Sewer Type	280.823	279.998	0.600	280.823	279.672	0.926
6.002	3.731	169.6	225	Circular_Default Sewer Type	280.823	279.672	0.926	280.799	279.650	0.924
6.003	2.446	163.1	225	Circular_Default Sewer Type	280.799	279.650	0.924	280.780	279.635	0.920
9.000	3.908	59.2	100	Circular_Default Sewer Type	280.904	280.204	0.600	280.861	280.138	0.623
9.001	7.395	19.6	100	Circular_Default Sewer Type	280.861	280.138	0.623	280.780	279.760	0.920
6.004	22.858	33.9	225	Circular_Default Sewer Type	280.780	279.635	0.920	280.132	278.961	0.946
1.004	3.844	11.9	300	Circular_Default Sewer Type	280.132	278.886	0.946	279.812	278.562	0.950
14.000	4.675	99.5	150	Circular_Default Sewer Type	279.532	278.782	0.600	279.808	278.735	0.923
14.001	2.289	99.5	150	Circular_Default Sewer Type	279.808	278.735	0.923	279.812	278.712	0.950
1.005	9.936	9.9	300	Circular_Default Sewer Type	279.812	278.562	0.950	279.239	277.561	1.378
10.000	23.553	54.3	150	Circular_Default Sewer Type	280.995	280.245	0.600	280.952	279.811	0.991
11.000	23.525	100.5	150	Circular_Default Sewer Type	280.996	280.246	0.600	280.963	280.012	0.801
11.001	20.210	100.5	150	Circular_Default Sewer Type	280.963	280.012	0.801	280.952	279.811	0.991
10.001	9.951	100.5	150	Circular_Default Sewer Type	280.952	279.811	0.991	280.523	279.712	0.661
10.002	10.256	13.6	150	Circular_Default Sewer Type	280.523	279.712	0.661	280.500	278.958	1.392
12.000	6.229	8.9	150	Circular_Default Sewer Type	280.410	279.660	0.600	280.500	278.958	1.392
10.003	20.021	46.7	150	Circular_Default Sewer Type	280.500	278.958	1.392	279.545	278.529	0.866
13.000	4.259	163.8	225	Circular_Default Sewer Type	279.338	278.513	0.600	279.473	278.487	0.761
13.001	5.448	165.1	225	Circular_Default Sewer Type	279.473	278.487	0.761	279.545	278.454	0.866
10.004	11.008	16.2	225	Circular_Default Sewer Type	279.545	278.454	0.866	279.700	277.775	1.700
15.000	9.693	17.3	300	Circular_Default Sewer Type	280.529	278.350	1.879	280.500	277.790	2.410
15.001	9.930	248.3	300	Circular_Default Sewer Type	280.500	277.790	2.410	280.500	277.750	2.450
15.002	10.511	210.2	300	Circular_Default Sewer Type	280.500	277.750	2.450	279.700	277.700	1.700
10.005	11.335	231.3	300	Circular_Default Sewer Type	279.700	277.700	1.700	279.239	277.651	1.288
1.006	8.565	329.4	300	Circular_Default Sewer Type	279.239	277.486	1.453	278.827	277.460	1.067
1.007	19.372	322.9	300	Circular_Default Sewer Type	278.827	277.460	1.067	278.950	277.400	1.250

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6.001	SW05	1200	Manhole	Adoptable	SW06	1200	Manhole	Adoptable
8.000	SW01	1200	Manhole	Adoptable	SW02	1200	Manhole	Adoptable
8.001	SW02	1200	Manhole	Adoptable	SW06	1200	Manhole	Adoptable
6.002	SW06	1200	Manhole	Adoptable	SW_INT01	1200	Manhole	Adoptable
6.003	SW_INT01	1200	Manhole	Adoptable	SW08	1200	Manhole	Adoptable
9.000	SW07	1200	Manhole	Adoptable	SW_INT02	1200	Manhole	Adoptable
9.001	SW_INT02	1200	Manhole	Adoptable	SW08	1200	Manhole	Adoptable
6.004	SW08	1200	Manhole	Adoptable	SW21	1350	Manhole	Adoptable
1.004	SW21	1350	Manhole	Adoptable	SW23	1200	Manhole	Adoptable
14.000	SW22	1200	Manhole	Adoptable	SW_INT04	1200	Manhole	Adoptable
14.001	SW_INT04	1200	Manhole	Adoptable	SW23	1200	Manhole	Adoptable
1.005	SW23	1200	Manhole	Adoptable	SW_HYDROBRAKE	1800	Manhole	Adoptable
10.000	SW24	600	Manhole	Adoptable	SW27	600	Manhole	Adoptable
11.000	SW25	600	Manhole	Adoptable	SW26	600	Manhole	Adoptable
11.001	SW26	600	Manhole	Adoptable	SW27	600	Manhole	Adoptable
10.001	SW27	600	Manhole	Adoptable	SW28	600	Manhole	Adoptable
10.002	SW28	600	Manhole	Adoptable	SW30	1200	Manhole	Adoptable
12.000	SW29	600	Manhole	Adoptable	SW30	1200	Manhole	Adoptable
10.003	SW30	1200	Manhole	Adoptable	SW32	1200	Manhole	Adoptable
13.000	SW31	1200	Manhole	Adoptable	SW_INT05	1200	Manhole	Adoptable
13.001	SW_INT05	1200	Manhole	Adoptable	SW32	1200	Manhole	Adoptable
10.004	SW32	1200	Manhole	Adoptable	SW35	1200	Manhole	Adoptable
15.000	SW33	1200	Manhole	Adoptable	SW.ATTENUATION		Junction	
15.001	SW.ATTENUATION		Junction		SW34	1200	Manhole	Adoptable
15.002	SW34	1200	Manhole	Adoptable	SW35	1200	Manhole	Adoptable
10.005	SW35	1200	Manhole	Adoptable	SW_HYDROBRAKE	1800	Manhole	Adoptable
1.006	SW_HYDROBRAKE	1800	Manhole	Adoptable	SW.EX01	1350	Manhole	Adoptable
1.007	SW.EX01	1350	Manhole	Adoptable	SW.EX02	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW14	306241.564	207245.777	281.003	0.825	600				
						0	1.000	280.178	225
SW15	306270.340	207248.629	280.569	0.874	600		1	1.000	279.695
						0	1.001	279.695	225
SW09	306289.248	207247.068	281.086	1.001	1200		0	2.000	280.085
SW_INT03	306274.656	207228.623	280.582	0.750	1200		1	2.000	279.832
						0	2.001	279.832	150
SW10	306307.758	207228.244	280.968	0.901	600		0	3.000	280.067
						0	3.000	279.839	150
SW11	306289.645	207242.399	280.743	0.904	600		1	3.000	279.839
						0	3.001	279.839	150
SW12	306295.457	207212.607	280.805	0.738	600		0	4.000	280.067
						0	4.000	279.642	150
SW13	306277.417	207226.751	280.728	1.086	600		1	4.000	279.642
						2	3.001	279.642	150
						0	3.002	279.642	150
SW16	306273.046	207226.592	280.586	1.063	1200		1	3.002	279.598
						2	2.001	279.598	150
						3	1.001	279.523	225
						0	1.002	279.523	225
SW17	306225.866	207243.821	280.927	0.929	600		0	5.000	279.998
						0	5.000	279.154	225
SW18	306214.253	207242.395	280.019	0.865	600		1	5.000	279.154
						0	5.001	279.154	225
SW19	306217.038	207219.715	279.947	1.003	600		1	5.001	279.019
						0	5.002	278.944	300
SW20	306218.909	207219.977	280.356	1.420	1200		1	5.002	278.936
						2	1.002	279.011	225
						0	1.003	278.936	300
SW03	306260.701	207218.878	280.680	0.750	1200		0	6.000	279.930
						0	6.000	279.930	150
SW04	306234.766	207215.844	280.672	0.750	1200		0	7.000	279.922
						0	7.000	279.783	150
SW05	306248.694	207217.404	280.680	0.972	1200		1	7.000	279.783
						2	6.000	279.783	150
						0	6.001	279.708	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW01	306269.477	207211.491	280.925	0.716	1200				
						0	8.000	280.209	225
SW02	306261.548	207212.924	280.823	0.825	1200		1	8.000	279.998
						0	8.001	279.998	225
SW06	306249.467	207211.442	280.823	1.151	1200		1	8.001	279.672
						2	6.001	279.672	225
SW_INT01	306245.765	207210.976	280.799	1.149	1200		0	6.002	279.672
						1	6.002	279.650	225
SW07	306251.564	207202.959	280.904	0.700	1200		0	6.003	279.650
						0	9.000	280.204	100
SW_INT02	306248.545	207205.441	280.861	0.723	1200		1	9.000	280.138
						0	9.001	280.138	100
SW08	306243.336	207210.690	280.780	1.145	1200		1	9.001	279.760
						2	6.003	279.635	225
SW21	306220.648	207207.906	280.132	1.246	1350		0	6.004	279.635
						1	6.004	278.961	225
						2	1.003	278.886	300
SW22	306211.148	207209.993	279.532	0.750	1200		0	1.004	278.886
						0	14.000	278.782	150
SW_INT04	306215.796	207209.494	279.808	1.073	1200		1	14.000	278.735
						0	14.001	278.735	150
SW23	306216.831	207207.452	279.812	1.250	1200		1	14.001	278.712
						2	1.004	278.562	300
SW24	306265.677	207206.099	280.995	0.750	600		0	1.005	278.562
						0	10.000	280.245	150
SW25	306281.272	207193.245	280.996	0.750	600		0	11.000	280.246
						0	11.000	280.012	150
SW26	306266.310	207175.091	280.963	0.951	600		1	11.001	280.012
						0	11.001	280.012	150
SW27	306250.697	207187.924	280.952	1.141	600		1	11.001	279.811
						2	10.000	279.811	150
SW28	306241.996	207183.096	280.523	0.811	600		0	10.001	279.811
						1	10.001	279.712	150
						0	10.002	279.712	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW29	306229.799	207172.229	280.410	0.750	600		0	12.000	279.660 150
SW30	306233.667	207177.111	280.500	1.542	1200		1 2 0	12.000 10.002 10.003	278.958 278.958 278.958 150 150
SW31	306218.695	207182.882	279.338	0.825	1200		0	13.000	278.513 225
SW_INT05	306221.601	207185.995	279.473	0.986	1200		1	13.000	278.487 225
SW32	306219.081	207190.825	279.545	1.091	1200		0 1 2	13.001 10.003	278.487 278.454 278.529 225 150
SW33	306241.451	207184.310	280.529	2.179	1200		0	15.000	278.350 300
SW.ATTENUATION	306234.432	207190.995	280.500	2.710			1	15.000	277.790 300
SW34	306227.241	207197.843	280.500	2.750	1200		0	15.001	277.790 300
SW35	306217.469	207201.714	279.700	2.000	1200		1 2 0	15.002 10.004	277.750 277.700 277.775 300 225
SW_HYDROBRAKE	306206.995	207206.047	279.239	1.753	1800		0 1 2	10.005 10.005 1.005	277.700 277.651 277.561 300 300
SW.EX01	306199.323	207202.240	278.827	1.367	1350		0	1.006	277.486 300
SW.EX02	306188.132	207186.427	278.950	1.550	1350		1	1.007	277.460 300

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840	Check Discharge Rate(s)	✓
FSR Region	England and Wales	Analysis Speed	Normal	Check Discharge Volume	✓
M5-60 (mm)	20.000	Skip Steady State	✓	100 year 360 minute (m³)	
Ratio-R	0.200	Drain Down Time (mins)	240		
Summer CV	0.750	Additional Storage (m³/ha)	20.0		

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	40	0	0
30	40	0	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.10	Betterment (%)	0
Greenfield Method	IH124	Region	1	QBar	
Positively Drained Area (ha)		Growth Factor 1 year	0.85	Q 1 year (l/s)	
SAAR (mm)		Growth Factor 30 year	1.95	Q 30 year (l/s)	
Soil Index	1	Growth Factor 100 year	2.48	Q 100 year (l/s)	

Pre-development Discharge Volume

Site Makeup	Greenfield	SPR	0.10	Storm Duration (mins)	360
Greenfield Method	FSR/FEH	CWI		Betterment (%)	0
Positively Drained Area (ha)		Return Period (years)	100	PR	
Soil Index	1	Climate Change (%)	0	Runoff Volume (m³)	

Node SW_HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	277.486	Product Number	CTL-SHE-0181-1930-2000-1930
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	19.3	Min Node Diameter (mm)	1800

Node SW.ATTENUATION Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	277.790
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	156

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.400	200.0	0.0	1.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW14	10	280.204	0.026	2.0	0.0190	0.0000	OK
15 minute winter	SW15	11	279.737	0.042	3.6	0.0252	0.0000	OK
15 minute winter	SW09	10	280.117	0.032	1.8	0.0467	0.0000	OK
15 minute winter	SW_INT03	10	279.860	0.028	3.5	0.0442	0.0000	OK
15 minute winter	SW10	11	280.095	0.028	1.3	0.0151	0.0000	OK
15 minute winter	SW11	11	279.878	0.039	2.6	0.0212	0.0000	OK
15 minute winter	SW12	11	280.091	0.024	1.3	0.0144	0.0000	OK
15 minute winter	SW13	11	279.703	0.061	5.2	0.0305	0.0000	OK
15 minute winter	SW16	11	279.602	0.079	13.6	0.1107	0.0000	OK
15 minute winter	SW17	10	280.015	0.017	1.6	0.0099	0.0000	OK
15 minute winter	SW18	11	279.197	0.043	3.2	0.0259	0.0000	OK
15 minute winter	SW19	11	279.046	0.102	4.6	0.0574	0.0000	OK
15 minute winter	SW20	11	279.045	0.109	19.2	0.1447	0.0000	OK
15 minute winter	SW03	10	279.975	0.045	3.6	0.0883	0.0000	OK
15 minute winter	SW04	10	279.969	0.047	3.6	0.0926	0.0000	OK
15 minute winter	SW05	11	279.804	0.096	10.6	0.1725	0.0000	OK
15 minute winter	SW01	10	280.235	0.026	2.5	0.0461	0.0000	OK
15 minute winter	SW02	10	280.034	0.036	5.0	0.0606	0.0000	OK
15 minute winter	SW06	11	279.792	0.120	17.7	0.1812	0.0000	OK
15 minute winter	SW_INT01	11	279.757	0.107	17.7	0.1214	0.0000	OK
15 minute winter	SW07	10	280.258	0.054	3.8	0.1133	0.0000	OK
15 minute winter	SW_INT02	10	280.175	0.037	3.7	0.0420	0.0000	OK
15 minute winter	SW08	11	279.713	0.078	21.4	0.0878	0.0000	OK
15 minute winter	SW21	11	278.974	0.088	41.7	0.1418	0.0000	OK
15 minute winter	SW22	10	278.814	0.032	1.8	0.0497	0.0000	OK
15 minute winter	SW_INT04	10	278.786	0.051	3.6	0.0724	0.0000	OK
15 minute winter	SW23	11	278.635	0.073	46.3	0.0950	0.0000	OK
15 minute winter	SW24	11	280.269	0.024	1.3	0.0143	0.0000	OK
15 minute winter	SW25	11	280.274	0.027	1.3	0.0166	0.0000	OK
15 minute winter	SW26	11	280.051	0.039	2.6	0.0207	0.0000	OK
15 minute winter	SW27	11	279.871	0.060	5.2	0.0295	0.0000	OK
15 minute winter	SW28	11	279.749	0.037	6.5	0.0225	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	SW14	1.000	SW15	2.0	0.527	0.029	0.1102	
15 minute winter	SW15	1.001	SW16	3.5	0.419	0.076	0.1951	
15 minute winter	SW09	2.000	SW_INT03	1.7	0.691	0.095	0.0597	
15 minute winter	SW_INT03	2.001	SW16	3.5	1.609	0.065	0.0056	
15 minute winter	SW10	3.000	SW11	1.3	0.453	0.073	0.0667	
15 minute winter	SW11	3.001	SW13	2.6	0.512	0.147	0.1018	
15 minute winter	SW12	4.000	SW13	1.3	0.341	0.054	0.0965	
15 minute winter	SW13	3.002	SW16	5.1	0.823	0.289	0.0274	
15 minute winter	SW16	1.002	SW20	13.1	1.068	0.261	0.6729	
15 minute winter	SW17	5.000	SW18	1.6	0.525	0.011	0.0383	
15 minute winter	SW18	5.001	SW19	3.1	0.595	0.077	0.1183	
15 minute winter	SW19	5.002	SW20	4.5	0.233	0.063	0.0418	
15 minute winter	SW20	1.003	SW21	19.0	0.956	0.269	0.2461	
15 minute winter	SW03	6.000	SW05	3.5	0.823	0.179	0.0516	
15 minute winter	SW04	7.000	SW05	3.5	0.768	0.197	0.0639	
15 minute winter	SW05	6.001	SW06	10.5	0.558	0.261	0.1133	
15 minute winter	SW01	8.000	SW02	2.5	0.735	0.029	0.0272	
15 minute winter	SW02	8.001	SW06	4.9	0.404	0.057	0.1553	
15 minute winter	SW06	6.002	SW_INT01	17.7	0.879	0.444	0.0749	
15 minute winter	SW_INT01	6.003	SW08	17.7	1.152	0.436	0.0377	
15 minute winter	SW07	9.000	SW_INT02	3.7	1.076	0.474	0.0136	
15 minute winter	SW_INT02	9.001	SW08	3.7	1.441	0.268	0.0190	
15 minute winter	SW08	6.004	SW21	21.5	1.819	0.240	0.2700	
15 minute winter	SW21	1.004	SW23	41.7	2.746	0.128	0.0584	
15 minute winter	SW22	14.000	SW_INT04	1.8	0.450	0.099	0.0186	
15 minute winter	SW_INT04	14.001	SW23	3.5	0.726	0.197	0.0111	
15 minute winter	SW23	1.005	SW_HYDROBRAKE	46.3	1.571	0.131	0.4152	
15 minute winter	SW24	10.000	SW27	1.3	0.342	0.054	0.0979	
15 minute winter	SW25	11.000	SW26	1.3	0.454	0.073	0.0682	
15 minute winter	SW26	11.001	SW27	2.6	0.516	0.146	0.1024	
15 minute winter	SW27	10.001	SW28	5.1	1.045	0.291	0.0495	
15 minute winter	SW28	10.002	SW30	6.5	1.351	0.135	0.0503	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW29	10	279.672	0.012	0.8	0.0057	0.0000	OK
15 minute winter	SW30	11	279.017	0.059	8.0	0.0718	0.0000	OK
15 minute winter	SW31	10	278.547	0.034	1.9	0.0526	0.0000	OK
15 minute winter	SW_INT05	10	278.536	0.049	3.8	0.0725	0.0000	OK
15 minute winter	SW32	11	278.503	0.049	13.5	0.0705	0.0000	OK
15 minute summer	SW33	1	278.350	0.000	0.0	0.0000	0.0000	OK
60 minute winter	SW.ATTENUATION	46	277.876	0.086	23.1	16.2871	0.0000	OK
15 minute winter	SW34	11	277.964	0.213	41.8	0.2414	0.0000	OK
15 minute winter	SW35	11	278.000	0.300	42.2	0.3907	0.0000	SURCHARGED
15 minute winter	SW_HYDROBRAKE	11	278.012	0.526	46.3	1.3379	0.0000	SURCHARGED
15 minute winter	SW.EX01	11	277.579	0.119	19.0	0.1697	0.0000	OK
15 minute winter	SW.EX02	11	277.505	0.105	19.0	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)
15 minute winter	SW29	12.000	SW30	0.8	0.436	0.013	0.0218	
15 minute winter	SW30	10.003	SW32	8.0	1.277	0.307	0.1254	
15 minute winter	SW31	13.000	SW_INT05	1.9	0.370	0.046	0.0216	
15 minute winter	SW_INT05	13.001	SW32	3.7	0.588	0.092	0.0345	
15 minute winter	SW32	10.004	SW35	13.5	1.765	0.104	0.2536	
15 minute summer	SW33	15.000	SW.ATTENUATION	0.0	0.000	0.000	0.0405	
60 minute winter	SW.ATTENUATION	15.001	SW34	-23.1	-1.165	-0.329	0.2466	
15 minute winter	SW34	15.002	SW35	-41.8	-0.654	-0.547	0.6517	
15 minute winter	SW35	10.005	SW_HYDROBRAKE	-26.9	0.612	-0.369	0.7979	
15 minute winter	SW_HYDROBRAKE	Hydro-Brake®	SW.EX01	19.0				
15 minute winter	SW.EX01	1.007	SW.EX02	19.0	0.796	0.309	0.4626	28.1

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW14	10	280.226	0.048	6.9	0.0346	0.0000	OK
15 minute winter	SW15	10	279.773	0.078	12.2	0.0468	0.0000	OK
15 minute winter	SW09	10	280.146	0.061	6.1	0.0890	0.0000	OK
15 minute winter	SW_INT03	10	279.885	0.053	12.1	0.0831	0.0000	OK
15 minute winter	SW10	10	280.119	0.052	4.6	0.0283	0.0000	OK
15 minute winter	SW11	10	279.914	0.075	9.1	0.0411	0.0000	OK
15 minute winter	SW12	10	280.111	0.044	4.6	0.0267	0.0000	OK
15 minute winter	SW13	11	279.795	0.153	18.0	0.0770	0.0000	SURCHARGED
15 minute winter	SW16	11	279.698	0.175	46.1	0.2440	0.0000	OK
15 minute winter	SW17	10	280.028	0.030	5.4	0.0175	0.0000	OK
15 minute winter	SW18	13	279.261	0.107	10.8	0.0647	0.0000	OK
15 minute winter	SW19	12	279.259	0.315	15.9	0.1769	0.0000	SURCHARGED
15 minute winter	SW20	12	279.259	0.323	64.3	0.4294	0.0000	SURCHARGED
15 minute winter	SW03	11	280.089	0.159	12.3	0.3146	0.0000	SURCHARGED
15 minute winter	SW04	11	280.100	0.178	12.3	0.3525	0.0000	SURCHARGED
15 minute winter	SW05	11	280.030	0.322	33.4	0.5755	0.0000	SURCHARGED
15 minute winter	SW01	10	280.257	0.048	8.4	0.0843	0.0000	OK
15 minute winter	SW02	10	280.065	0.067	16.7	0.1114	0.0000	OK
15 minute winter	SW06	11	279.986	0.314	57.2	0.4743	0.0000	SURCHARGED
15 minute winter	SW_INT01	11	279.886	0.236	57.2	0.2672	0.0000	SURCHARGED
15 minute winter	SW07	11	280.455	0.251	13.0	0.5281	0.0000	SURCHARGED
15 minute winter	SW_INT02	11	280.220	0.082	12.1	0.0930	0.0000	OK
15 minute winter	SW08	11	279.792	0.157	69.2	0.1778	0.0000	OK
15 minute winter	SW21	12	279.214	0.328	134.0	0.5272	0.0000	SURCHARGED
15 minute winter	SW22	12	279.093	0.310	8.0	0.4837	0.0000	SURCHARGED
15 minute winter	SW_INT04	12	279.090	0.355	11.3	0.5074	0.0000	SURCHARGED
15 minute winter	SW23	12	279.080	0.518	138.2	0.6771	0.0000	SURCHARGED
15 minute winter	SW24	10	280.289	0.044	4.6	0.0265	0.0000	OK
15 minute winter	SW25	10	280.298	0.052	4.6	0.0311	0.0000	OK
15 minute winter	SW26	10	280.087	0.075	9.1	0.0401	0.0000	OK
15 minute winter	SW27	11	279.943	0.131	18.0	0.0648	0.0000	OK
15 minute winter	SW28	11	279.784	0.072	22.5	0.0433	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	SW14	1.000	SW15	6.8	0.752	0.101	0.2650	
15 minute winter	SW15	1.001	SW16	11.9	0.552	0.260	0.5022	
15 minute winter	SW09	2.000	SW_INT03	6.0	0.974	0.326	0.1456	
15 minute winter	SW_INT03	2.001	SW16	12.0	1.968	0.224	0.0232	
15 minute winter	SW10	3.000	SW11	4.5	0.640	0.256	0.1627	
15 minute winter	SW11	3.001	SW13	8.9	0.666	0.502	0.2618	
15 minute winter	SW12	4.000	SW13	4.5	0.429	0.187	0.2496	
15 minute winter	SW13	3.002	SW16	17.5	1.058	0.981	0.0720	
15 minute winter	SW16	1.002	SW20	46.3	1.395	0.920	1.9152	
15 minute winter	SW17	5.000	SW18	5.4	0.732	0.038	0.1214	
15 minute winter	SW18	5.001	SW19	11.4	0.666	0.287	0.6664	
15 minute winter	SW19	5.002	SW20	15.7	0.271	0.219	0.1330	
15 minute winter	SW20	1.003	SW21	60.6	1.149	0.856	0.8588	
15 minute winter	SW03	6.000	SW05	11.4	0.892	0.582	0.2130	
15 minute winter	SW04	7.000	SW05	11.2	0.844	0.636	0.2467	
15 minute winter	SW05	6.001	SW06	33.4	0.841	0.833	0.2391	
15 minute winter	SW01	8.000	SW02	8.3	1.040	0.099	0.0650	
15 minute winter	SW02	8.001	SW06	16.6	0.559	0.194	0.3022	
15 minute winter	SW06	6.002	SW_INT01	57.2	1.438	1.437	0.1484	
15 minute winter	SW_INT01	6.003	SW08	57.2	1.570	1.410	0.0849	
15 minute winter	SW07	9.000	SW_INT02	12.1	1.560	1.530	0.0287	
15 minute winter	SW_INT02	9.001	SW08	12.0	1.846	0.870	0.0479	
15 minute winter	SW08	6.004	SW21	69.4	2.357	0.774	0.7791	
15 minute winter	SW21	1.004	SW23	128.7	2.903	0.397	0.2707	
15 minute winter	SW22	14.000	SW_INT04	8.2	0.600	0.458	0.0823	
15 minute winter	SW_INT04	14.001	SW23	15.3	1.051	0.861	0.0403	
15 minute winter	SW23	1.005	SW_HYDROBRAKE	137.3	1.950	0.387	0.6997	
15 minute winter	SW24	10.000	SW27	4.5	0.444	0.187	0.2420	
15 minute winter	SW25	11.000	SW26	4.5	0.641	0.255	0.1663	
15 minute winter	SW26	11.001	SW27	8.9	0.698	0.501	0.2538	
15 minute winter	SW27	10.001	SW28	17.8	1.398	1.003	0.1229	
15 minute winter	SW28	10.002	SW30	22.5	1.721	0.464	0.1330	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW29	10	279.682	0.022	2.7	0.0101	0.0000	OK
15 minute winter	SW30	12	279.169	0.211	27.5	0.2582	0.0000	SURCHARGED
30 minute winter	SW31	21	278.731	0.218	5.6	0.3361	0.0000	OK
30 minute winter	SW_INT05	21	278.731	0.244	11.0	0.3601	0.0000	SURCHARGED
30 minute winter	SW32	21	278.728	0.274	39.6	0.3952	0.0000	SURCHARGED
180 minute winter	SW33	144	278.605	0.255	0.5	0.2880	0.0000	OK
180 minute winter	SW.ATTENUATION	144	278.605	0.815	55.9	154.7943	0.0000	SURCHARGED
180 minute winter	SW34	144	278.604	0.854	56.2	0.9661	0.0000	SURCHARGED
30 minute winter	SW35	21	278.667	0.967	149.6	1.2582	0.0000	SURCHARGED
30 minute summer	SW_HYDROBRAKE	21	278.842	1.356	135.1	3.4505	0.0000	SURCHARGED
15 minute summer	SW.EX01	8	277.580	0.120	19.3	0.1711	0.0000	OK
15 minute summer	SW.EX02	16	277.506	0.106	19.3	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	SW29	12.000	SW30	2.7	0.613	0.045	0.0595	
15 minute winter	SW30	10.003	SW32	26.0	1.592	0.995	0.3525	
30 minute winter	SW31	13.000	SW_INT05	5.4	0.430	0.133	0.1685	
30 minute winter	SW_INT05	13.001	SW32	10.6	0.740	0.262	0.2167	
30 minute winter	SW32	10.004	SW35	38.3	1.625	0.295	0.4378	
180 minute winter	SW33	15.000	SW.ATTENUATION	-0.5	-0.012	-0.002	0.6503	
180 minute winter	SW.ATTENUATION	15.001	SW34	-55.9	-0.998	-0.796	0.6993	
180 minute winter	SW34	15.002	SW35	-56.2	-0.798	-0.736	0.7402	
30 minute winter	SW35	10.005	SW_HYDROBRAKE	-111.6	-1.585	-1.534	0.7982	
30 minute summer	SW_HYDROBRAKE	Hydro-Brake®	SW.EX01	19.3				
15 minute summer	SW.EX01	1.007	SW.EX02	19.3	0.800	0.314	0.4677	88.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.10%

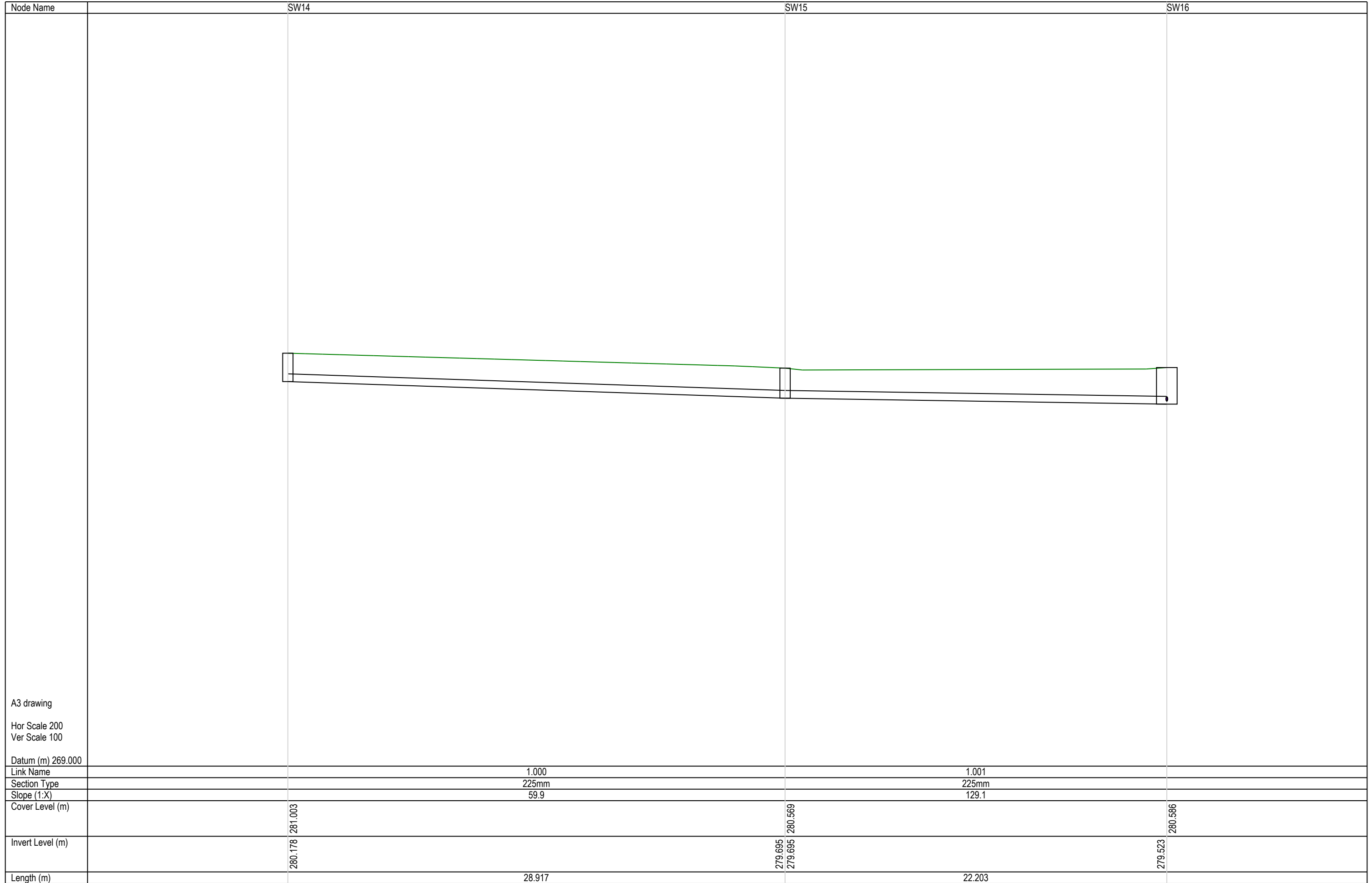
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW14	10	280.233	0.055	8.9	0.0393	0.0000	OK
30 minute summer	SW15	20	279.955	0.260	15.3	0.1565	0.0000	SURCHARGED
15 minute winter	SW09	10	280.156	0.071	7.9	0.1025	0.0000	OK
30 minute summer	SW_INT03	20	279.959	0.127	15.3	0.1982	0.0000	OK
15 minute winter	SW10	10	280.126	0.059	5.9	0.0324	0.0000	OK
30 minute summer	SW11	20	280.055	0.216	11.4	0.1184	0.0000	SURCHARGED
15 minute winter	SW12	10	280.117	0.050	5.9	0.0305	0.0000	OK
30 minute summer	SW13	20	280.006	0.364	22.2	0.1835	0.0000	SURCHARGED
30 minute summer	SW16	20	279.947	0.424	56.9	0.5909	0.0000	SURCHARGED
15 minute winter	SW17	10	280.032	0.034	6.9	0.0197	0.0000	OK
30 minute winter	SW18	21	279.583	0.429	12.0	0.2600	0.0000	SURCHARGED
30 minute winter	SW19	21	279.576	0.632	17.0	0.3550	0.0000	SURCHARGED
30 minute winter	SW20	21	279.575	0.639	66.2	0.8480	0.0000	SURCHARGED
15 minute winter	SW03	12	280.312	0.382	15.8	0.7580	0.0000	SURCHARGED
15 minute winter	SW04	12	280.322	0.400	15.8	0.7941	0.0000	SURCHARGED
30 minute summer	SW05	20	280.244	0.536	41.9	0.9588	0.0000	SURCHARGED
15 minute winter	SW01	10	280.264	0.055	10.8	0.0967	0.0000	OK
30 minute summer	SW02	20	280.212	0.214	21.1	0.3563	0.0000	OK
30 minute summer	SW06	20	280.198	0.526	68.5	0.7961	0.0000	SURCHARGED
30 minute summer	SW_INT01	20	280.098	0.448	67.1	0.5068	0.0000	SURCHARGED
15 minute winter	SW07	12	280.649	0.445	16.8	0.9349	0.0000	FLOOD RISK
30 minute summer	SW_INT02	20	280.397	0.259	13.9	0.2930	0.0000	SURCHARGED
30 minute summer	SW08	20	280.015	0.380	79.1	0.4296	0.0000	SURCHARGED
30 minute winter	SW21	21	279.526	0.640	136.2	1.0295	0.0000	SURCHARGED
30 minute winter	SW22	21	279.414	0.632	6.9	0.9843	0.0000	FLOOD RISK
30 minute winter	SW_INT04	21	279.409	0.674	11.4	0.9625	0.0000	SURCHARGED
30 minute winter	SW23	21	279.395	0.833	141.7	1.0883	0.0000	SURCHARGED
15 minute winter	SW24	10	280.295	0.050	5.9	0.0303	0.0000	OK
15 minute winter	SW25	10	280.305	0.059	5.9	0.0356	0.0000	OK
15 minute winter	SW26	11	280.107	0.095	11.7	0.0507	0.0000	OK
15 minute winter	SW27	11	280.037	0.226	23.2	0.1115	0.0000	SURCHARGED
30 minute summer	SW28	20	279.866	0.154	27.8	0.0929	0.0000	SURCHARGED

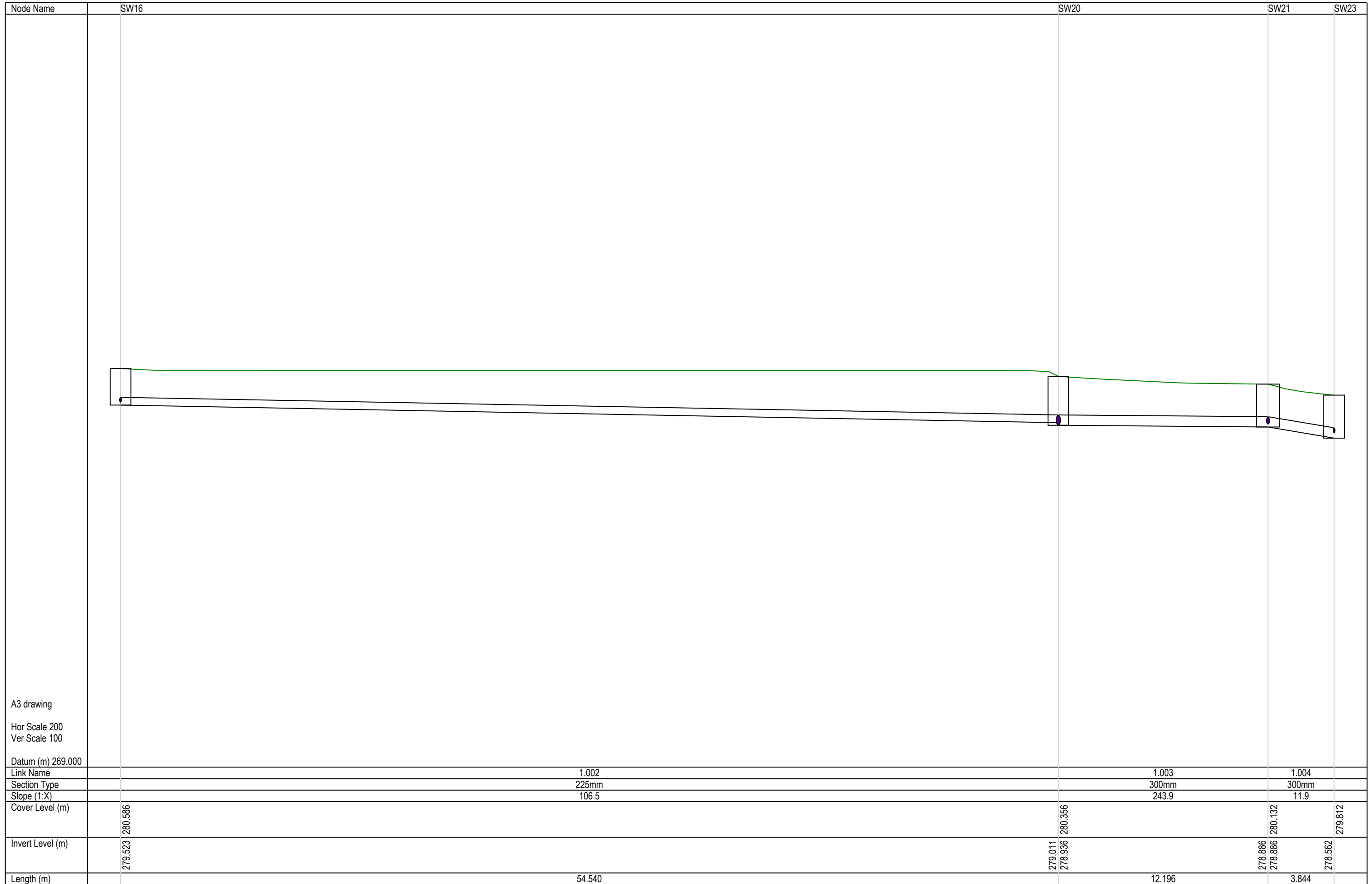
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW14	1.000	SW15	8.8	0.804	0.131	0.6684	
30 minute summer	SW15	1.001	SW16	14.6	0.574	0.319	0.8830	
15 minute winter	SW09	2.000	SW_INT03	7.8	1.000	0.423	0.2401	
30 minute summer	SW_INT03	2.001	SW16	14.9	1.935	0.278	0.0435	
15 minute winter	SW10	3.000	SW11	5.8	0.676	0.329	0.2671	
30 minute summer	SW11	3.001	SW13	10.9	0.696	0.617	0.3496	
15 minute winter	SW12	4.000	SW13	5.8	0.441	0.241	0.2608	
30 minute summer	SW13	3.002	SW16	20.9	1.191	1.175	0.0770	
30 minute summer	SW16	1.002	SW20	51.9	1.377	1.032	2.1691	
15 minute winter	SW17	5.000	SW18	6.9	0.778	0.049	0.2537	
30 minute winter	SW18	5.001	SW19	15.4	0.661	0.387	0.9088	
30 minute winter	SW19	5.002	SW20	23.1	0.329	0.321	0.1330	
30 minute winter	SW20	1.003	SW21	59.6	1.156	0.841	0.8588	
15 minute winter	SW03	6.000	SW05	13.4	0.921	0.685	0.2130	
15 minute winter	SW04	7.000	SW05	13.4	0.852	0.759	0.2467	
30 minute summer	SW05	6.001	SW06	40.6	1.021	1.012	0.2391	
15 minute winter	SW01	8.000	SW02	10.8	1.088	0.128	0.1795	
30 minute summer	SW02	8.001	SW06	20.6	0.677	0.242	0.4796	
30 minute summer	SW06	6.002	SW_INT01	67.1	1.687	1.686	0.1484	
30 minute summer	SW_INT01	6.003	SW08	66.3	1.670	1.634	0.0973	
15 minute winter	SW07	9.000	SW_INT02	13.9	1.774	1.763	0.0306	
30 minute summer	SW_INT02	9.001	SW08	12.9	1.875	0.938	0.0579	
30 minute summer	SW08	6.004	SW21	76.8	2.350	0.858	0.9091	
30 minute winter	SW21	1.004	SW23	129.1	2.970	0.398	0.2707	
30 minute winter	SW22	14.000	SW_INT04	5.8	0.553	0.328	0.0823	
30 minute winter	SW_INT04	14.001	SW23	11.3	0.966	0.632	0.0403	
30 minute winter	SW23	1.005	SW_HYDROBRAKE	140.0	1.989	0.395	0.6997	
15 minute winter	SW24	10.000	SW27	5.8	0.461	0.242	0.2681	
15 minute winter	SW25	11.000	SW26	5.8	0.680	0.329	0.2121	
15 minute winter	SW26	11.001	SW27	11.4	0.722	0.646	0.2963	
15 minute winter	SW27	10.001	SW28	22.0	1.359	1.245	0.1725	
30 minute summer	SW28	10.002	SW30	26.9	1.722	0.555	0.1806	

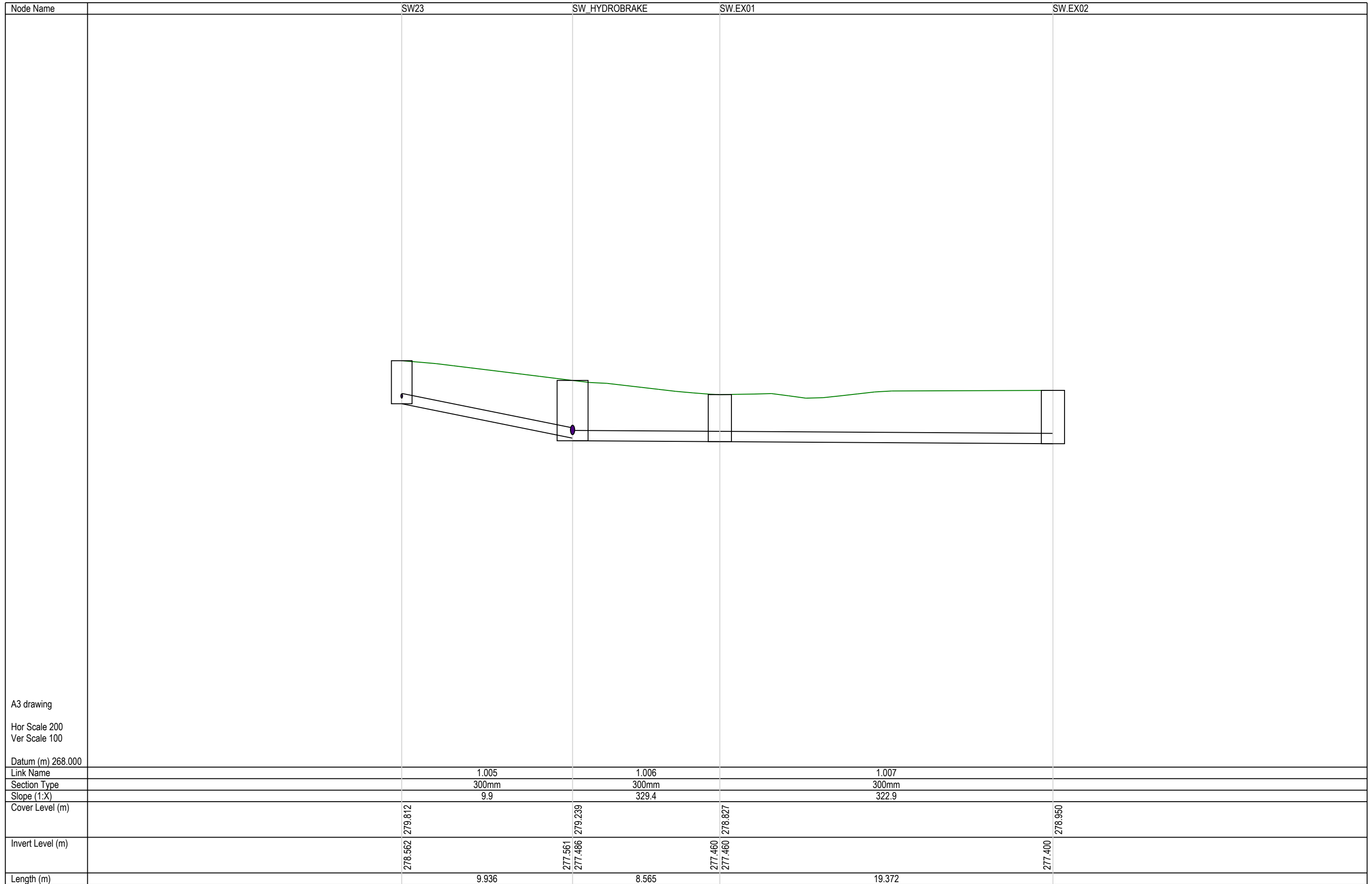
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.10%

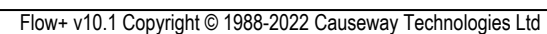
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW29	10	279.685	0.025	3.5	0.0115	0.0000	OK
30 minute summer	SW30	20	279.624	0.666	33.5	0.8136	0.0000	SURCHARGED
240 minute winter	SW31	196	279.040	0.527	2.5	0.8127	0.0000	FLOOD RISK
240 minute winter	SW_INT05	196	279.040	0.553	5.0	0.8158	0.0000	SURCHARGED
240 minute winter	SW32	196	279.040	0.586	18.2	0.8451	0.0000	SURCHARGED
240 minute winter	SW33	196	279.039	0.689	0.8	0.7792	0.0000	SURCHARGED
240 minute winter	SW.ATTENUATION	196	279.039	1.249	62.1	237.2924	0.0000	SURCHARGED
240 minute winter	SW34	196	279.039	1.289	62.5	1.4577	0.0000	SURCHARGED
240 minute winter	SW35	196	279.039	1.339	63.1	1.7417	0.0000	SURCHARGED
30 minute winter	SW_HYDROBRAKE	22	279.148	1.662	140.0	4.2294	0.0000	FLOOD RISK
15 minute summer	SW.EX01	18	277.580	0.120	19.3	0.1712	0.0000	OK
15 minute winter	SW.EX02	7	277.506	0.106	19.3	0.0000	0.0000	OK

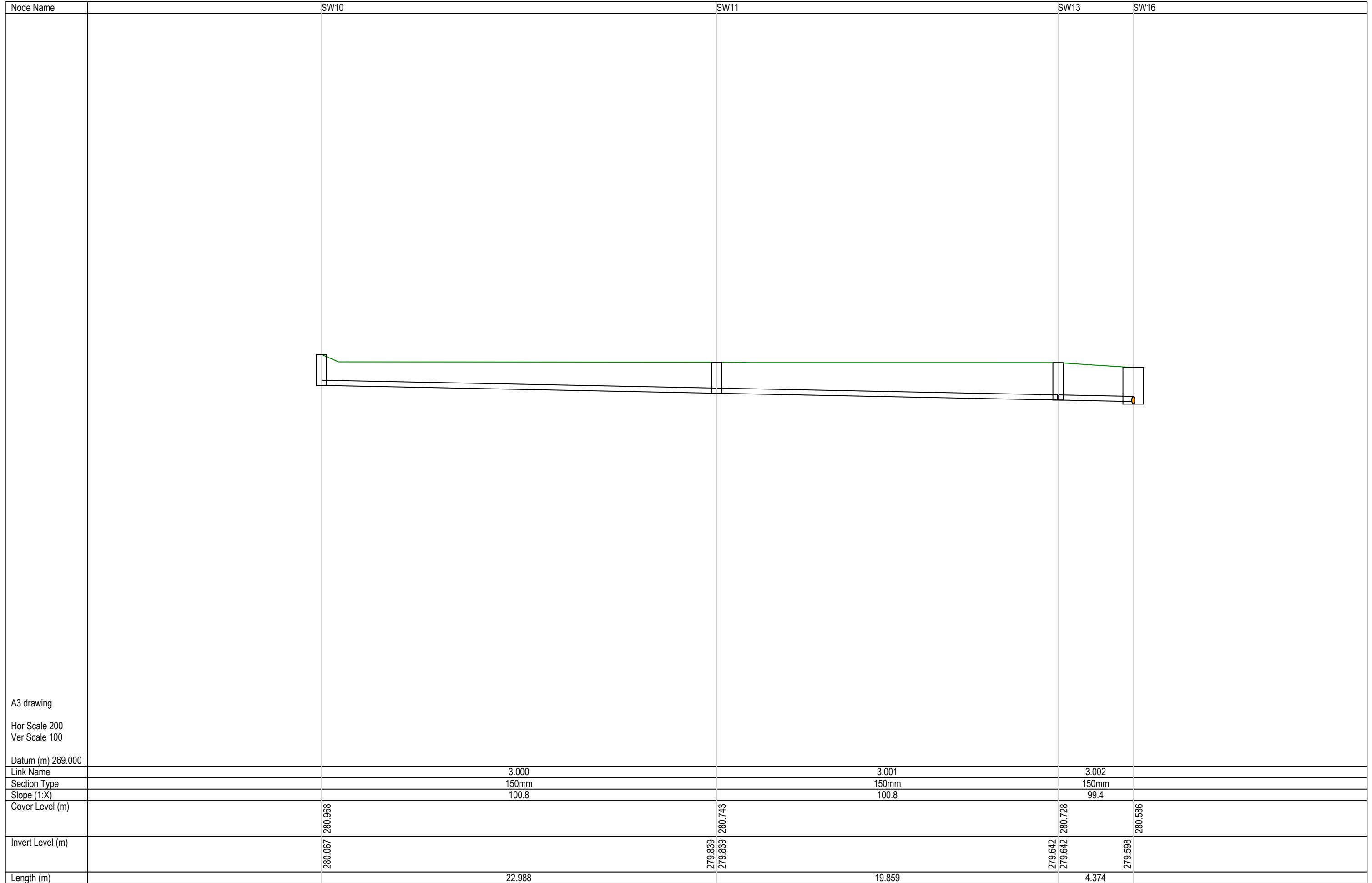
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW29	12.000	SW30	3.5	0.545	0.058	0.0607	
30 minute summer	SW30	10.003	SW32	29.1	1.655	1.117	0.3525	
240 minute winter	SW31	13.000	SW_INT05	2.5	0.389	0.062	0.1694	
240 minute winter	SW_INT05	13.001	SW32	5.0	0.629	0.123	0.2167	
240 minute winter	SW32	10.004	SW35	18.2	1.445	0.140	0.4378	
240 minute winter	SW33	15.000	SW.ATTENUATION	-0.8	-0.017	-0.003	0.6826	
240 minute winter	SW.ATTENUATION	15.001	SW34	-62.1	-0.886	-0.885	0.6993	
240 minute winter	SW34	15.002	SW35	-62.5	-0.887	-0.818	0.7402	
240 minute winter	SW35	10.005	SW_HYDROBRAKE	-42.9	0.726	-0.589	0.7982	
30 minute winter	SW_HYDROBRAKE	Hydro-Brake®	SW.EX01	19.3				
15 minute summer	SW.EX01	1.007	SW.EX02	19.3	0.800	0.314	0.4679	114.6

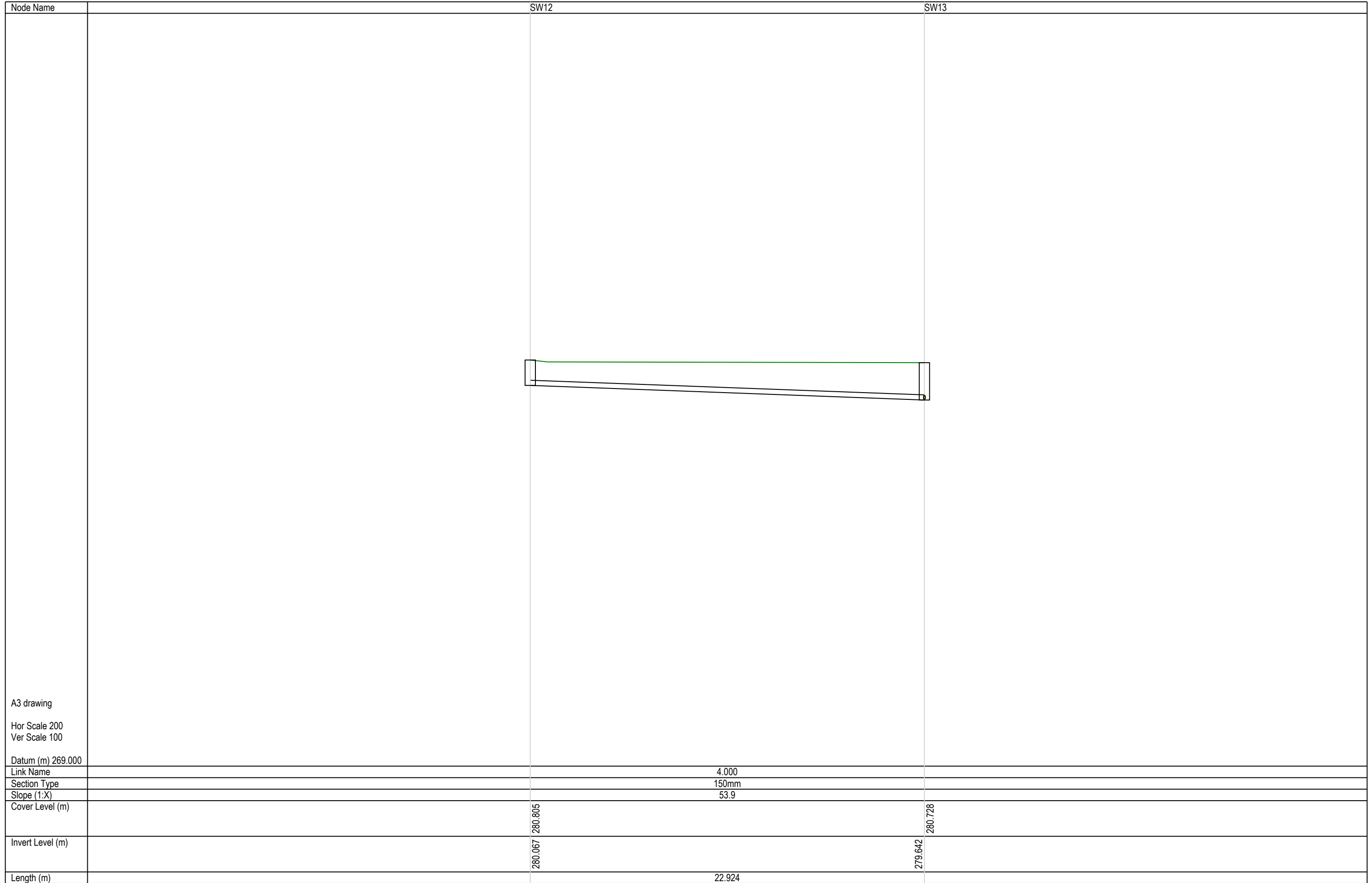




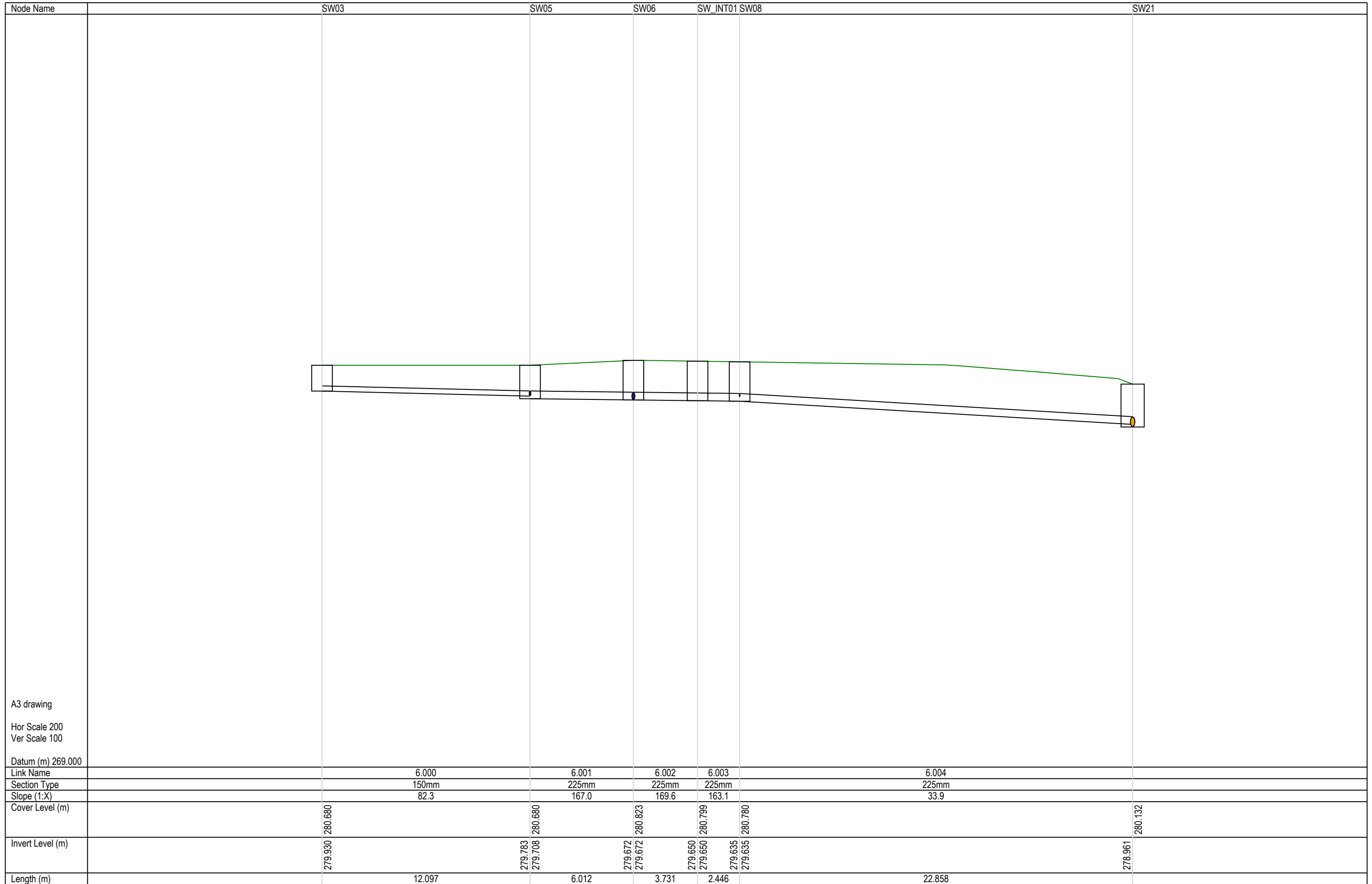


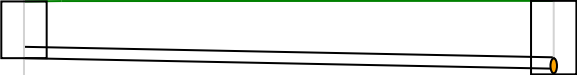


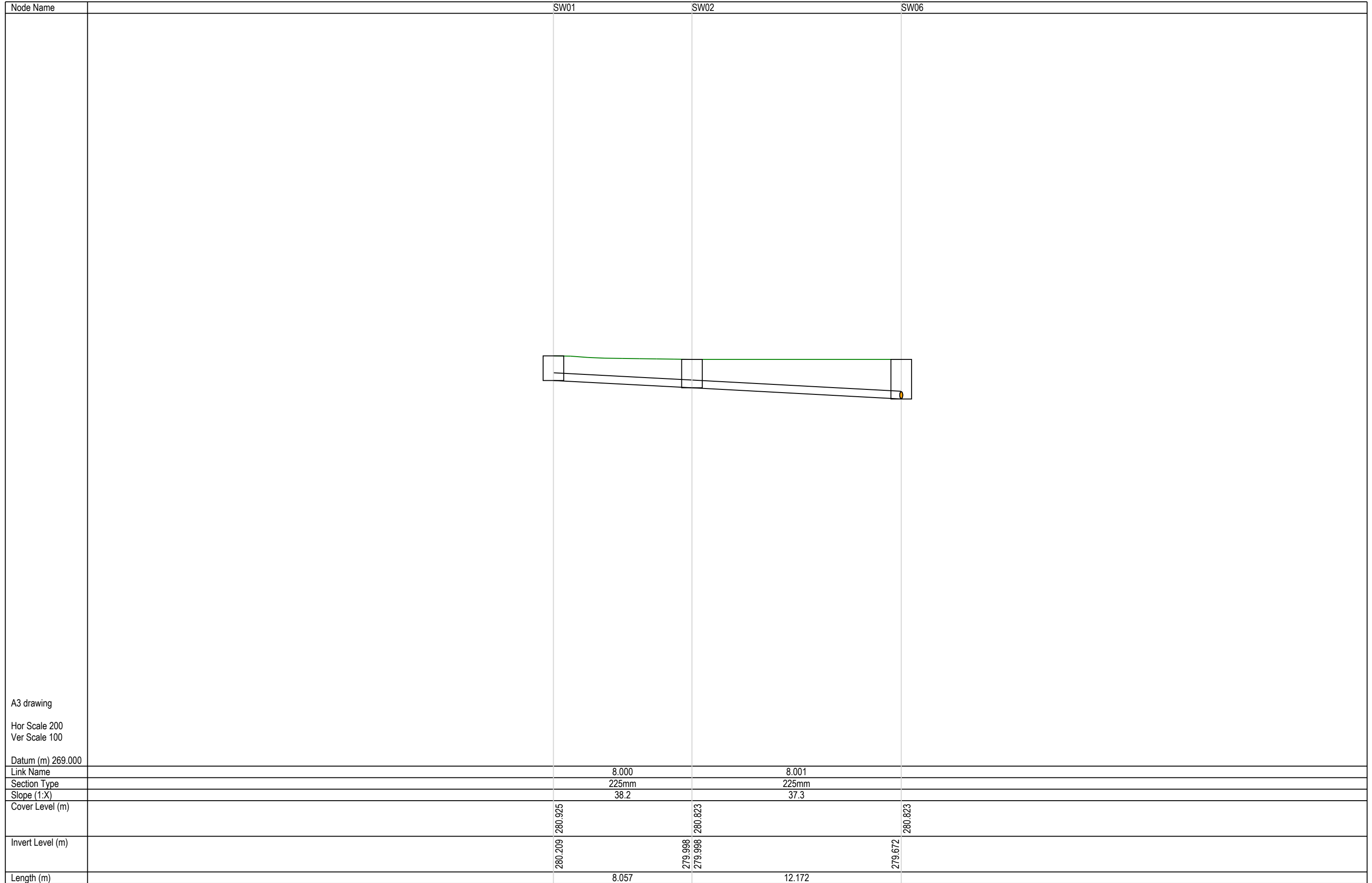


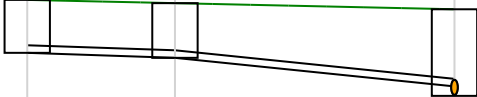


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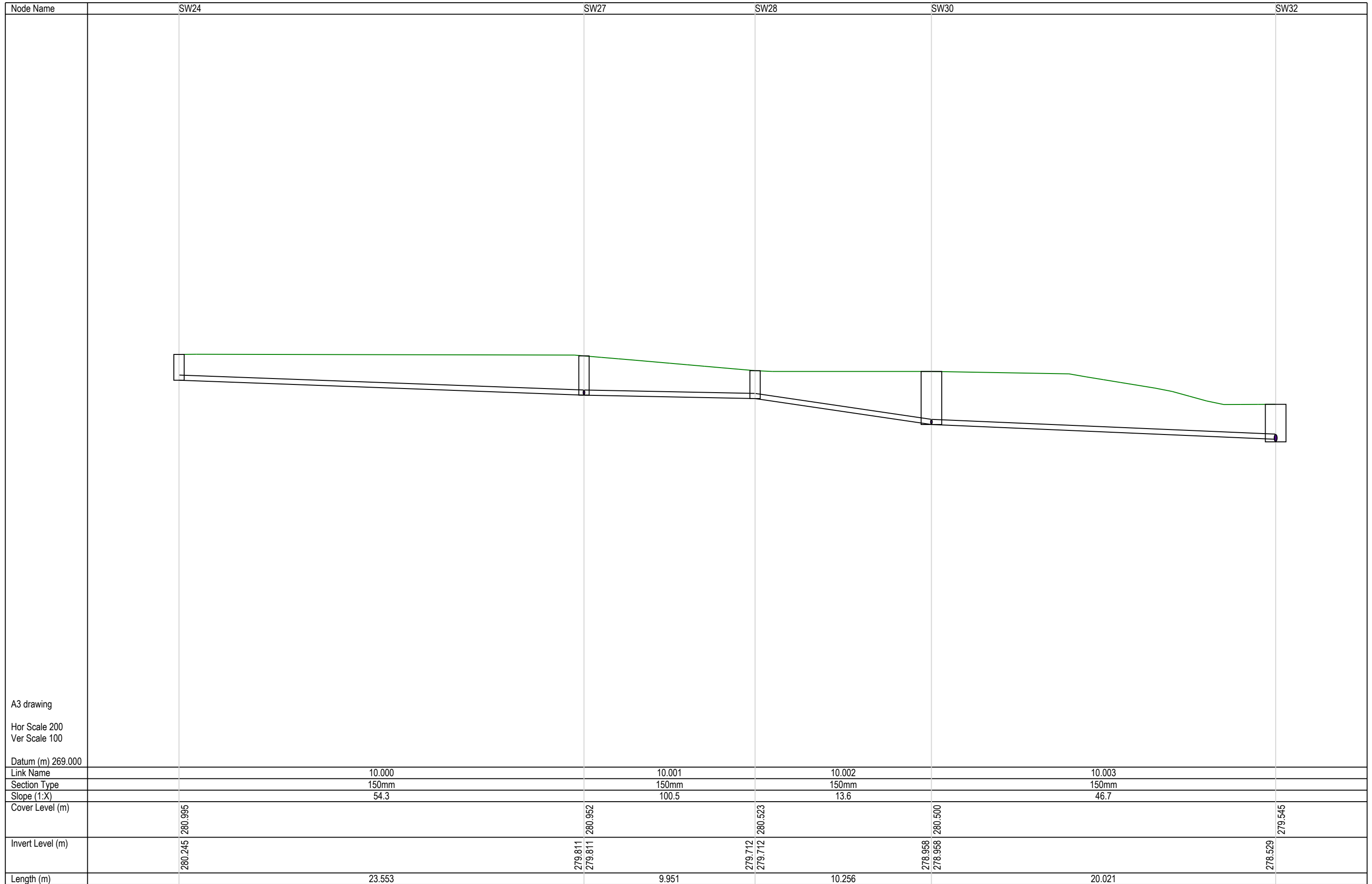


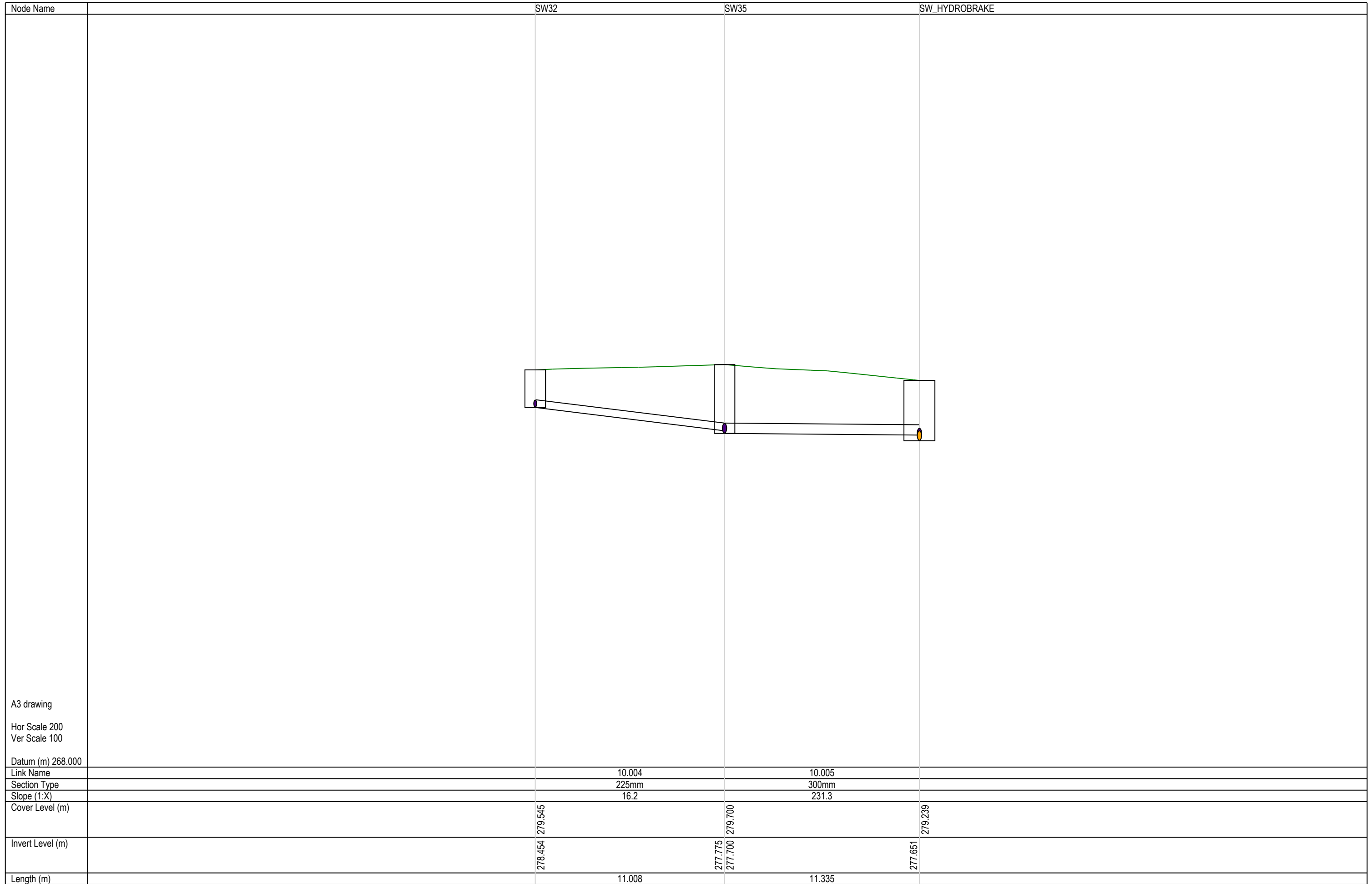
Node Name	SW04	SW05
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 269.000		
Link Name	7.000	
Section Type	150mm	
Slope (1:X)	100.8	
Cover Level (m)	280.672	280.680
Invert Level (m)	279.922	279.783
Length (m)	14.015	

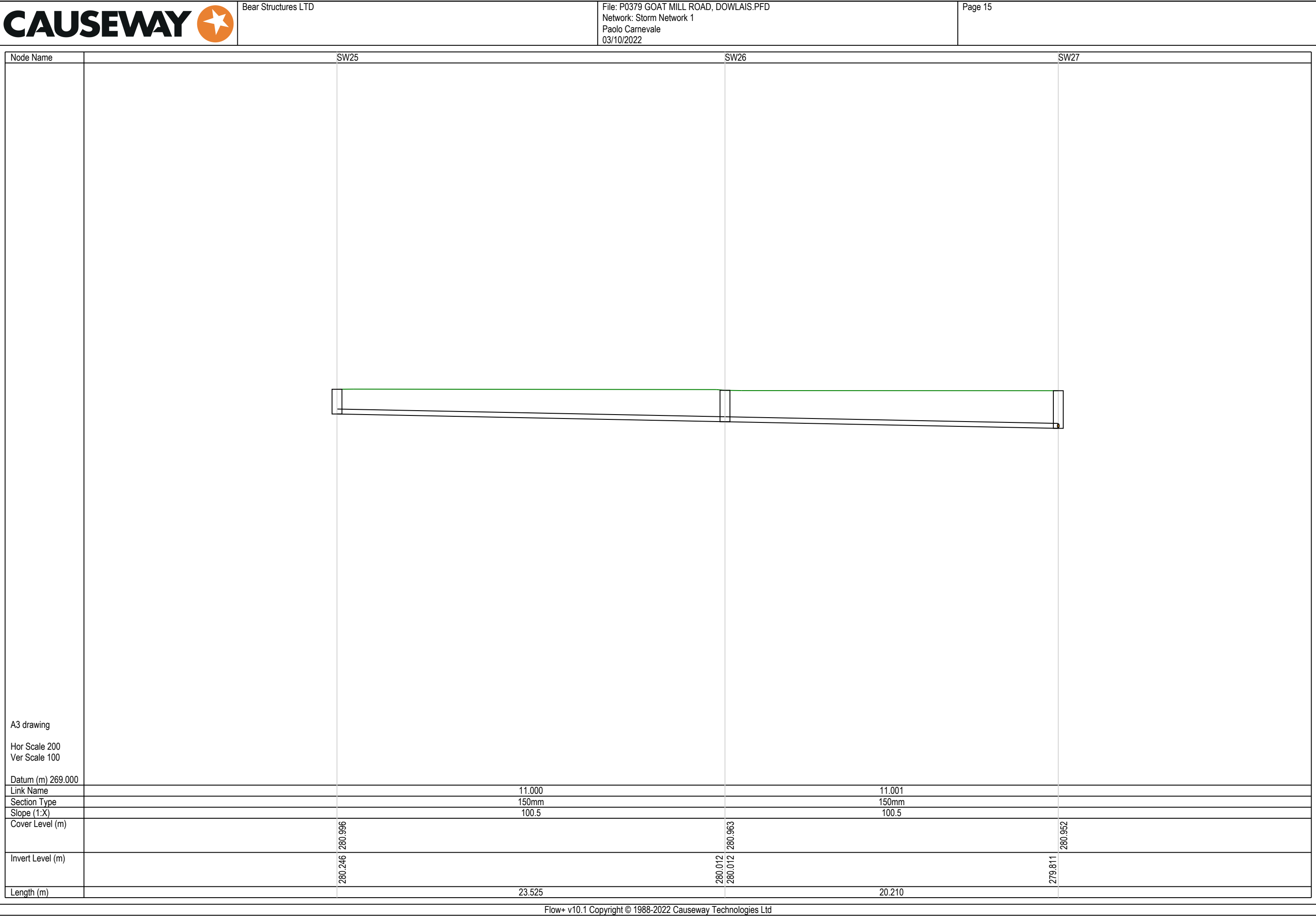


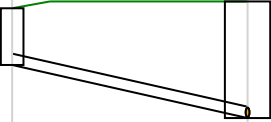
Node Name	SW07	SW_INT02	SW08
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 269.000 			
Link Name	9.000	9.001	
Section Type	100mm	100mm	
Slope (1:X)	59.2	19.6	
Cover Level (m)	280.904	280.861	280.780
Invert Level (m)	280.204	280.138	279.760
Length (m)	3.908	7.395	

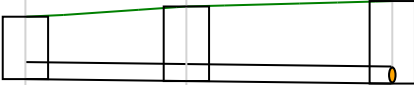
Node Name	SW22	SW_INT04	SW23
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 268.000			
	14.000	14.001	
	150mm	150mm	
	99.5	99.5	
	279.532	279.808	279.812
Invert Level (m)	278.782	278.735	278.712
Length (m)	4.675	2.289	

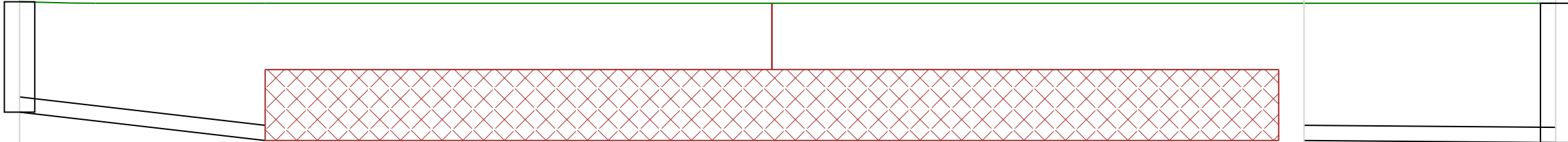


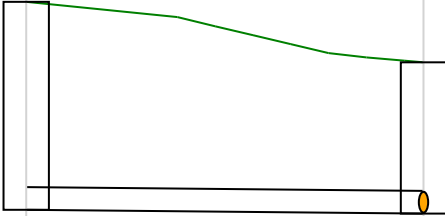


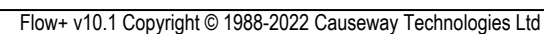


Node Name	SW29	SW30
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 269.000		
Link Name	12.000	
Section Type	150mm	
Slope (1:X)	8.9	
Cover Level (m)	280.410	280.500
Invert Level (m)	279.660	278.958
Length (m)	6.229	

Node Name	SW31	SW_INT05	SW32
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 268.000 			
Link Name	13.000	13.001	
Section Type	225mm	225mm	
Slope (1:X)	163.8	165.1	
Cover Level (m)	279.338	279.473	279.545
Invert Level (m)	278.513	278.487	278.454
Length (m)	4.259	5.448	

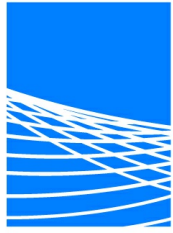
Node Name		SW33		SW.ATTENUATION	SW34
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 268.000					
Link Name		15.000		15.001	
Section Type		300mm		300mm	
Slope (1:X)		17.3		248.3	
Cover Level (m)		278.350		280.500	280.500
Invert Level (m)		277.790		277.790	277.750
Length (m)		9.693		9.930	

Node Name	SW34	SW35
A3 drawing Hor Scale 200 Ver Scale 100 Datum (m) 268.000		
Link Name	15.002	
Section Type	300mm	
Slope (1:X)	210.2	
Cover Level (m)	280.500	279.700
Invert Level (m)	277.750	277.700
Length (m)	10.511	





Appendix E



DRAINTech

helping to improve the drainage network

Drainage Survey Report

Job Number : 14679

Project Number: 1

Project Name: Goat Mill Rd, Dowlais

Company: Bear Structures

Site Date: 10-06-2022

Draintech Surveys Ltd| Atlantic House| Chamwood Park| Bridgend| CF31 3PL| 01656 767001| www.draintech.co.uk



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14679 GOAT MILL ROAD DOWLAIS	1	10/06/2022

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Project Information

Project Name
14679 GOAT MILL ROAD DOWLAIS**Project Number**
1**Project Date**
10/06/2022

Client

Company: Bear Structures
Contact: Paolo Carnevale

Site

Company: Draintech Surveys Ltd
Contact: Dennis Vokes

Contractor

Company: Draintech Surveys Ltd
Department: Process Co-Ordinator
Street: Atlantic House, Charnwood park
Town or City: CF31 3PL

Section Inspection - 10/06/2022 - MHS1X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
1	1	10/06/22	9:04	1	No Rain Or Snow	Not Specified	MHS1X
Operator		Vehicle		Camera	Preset Length	Legal Status	Alternative ID
DRAINTECH DV		DN66 FRK		Ibos	Not Specified	Not Specified	1

Town or Village:		Inspection Direction:	Downstream	Upstream Node:	MHS1
Road:	Goat Mill Road	Inspected Length:	42.59 m	Upstream Pipe Depth:	1.420 m
Location:		Total Length:	42.59 m	Downstream Node:	MHS2
Surface Type:		Joint Length:	1.00 m	Downstream Pipe Depth:	1.370 m
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	225 mm		
Flow Control:		Pipe Material:	Polyvinyl chloride		
Year Constructed:	Not Specified	Lining Type:	No Lining		
Inspection Purpose:	Investment planning	Lining Material:	No Lining		

Comments:
Recommendations:

Scale: 1:369	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.42 m MHS1						
	0.00	MH	Start node type, manhole, reference number : MHS1	00:00:08		
	0.00	REM	General remark: VIDEO HEADR INCORRECT PLEASE SEE REPORT	00:00:09		
	0.00	WL	Water level, 5% of the vertical dimension	00:00:09		
	0.70	DES	Settled deposits, fine, 5% cross-sectional area loss	00:00:09		1
	16.78	JN	Junction, at 9 o'clock, diameter 150mm	00:02:56		
	29.34	JN	Junction, at 10 o'clock, diameter 150mm: ROOTS WITHIN JUNCTION	00:02:56		
	29.34	RF	Roots, fine	00:02:56		2
	35.84	LR	Line deviates right: SLIGHTLY	00:02:56		
	42.42	DER	Settled deposits, coarse, 25% cross-sectional area loss	00:02:56		1
	42.59	SA	Survey abandoned: CAMERA TOPPLED OVER ATTEMPTING TO GET OVER DEBRIS	00:02:56		

Construction Features
Structural Defects
Miscellaneous Features
Service & Operational Observations

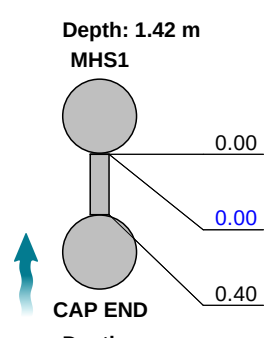
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	3	1.0	0.0	1.0	2.0

Section Inspection - 10/06/2022 - CAP ENDX

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
2	1	10/06/22	10:01	1	No Rain Or Snow	Not Specified	CAP ENDX
Operator		Vehicle		Camera	Preset Length	Legal Status	Alternative ID
DRAINTECH DV		DN66 FRK		Ibos	Not Specified	Not Specified	2

Town or Village:		Inspection Direction:	Upstream	Upstream Node:	CAP END
Road:	Goat Mill Road	Inspected Length:	0.40 m	Upstream Pipe Depth:	
Location:		Total Length:	0.40 m	Downstream Node:	MHS1
Surface Type:		Joint Length:	3.00 m	Downstream Pipe Depth:	1.420 m
Use:	Surface water	Pipe Shape:	Circular	Dia/Height:	225 mm
Type of Pipe:		Pipe Material:	Polyvinyl chloride	Lining Type:	No Lining
Flow Control:		Lining Material:	No Lining		
Year Constructed:	Not Specified				
Inspection Purpose:	Investment planning				

Comments:
Recommendations:

Scale:	1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
							
		0.00	MH	Start node type, manhole, reference number : MHS1	00:00:13		
		0.00	WL	Water level, 0% of the vertical dimension	00:00:14		
		0.40	OCF	Finish node type, other special chamber reference number: CAP END: LINE IS CAPPED OFF	00:00:19	1	

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 10/06/2022 - CAP ENDX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Upstream	CAP ENDX	1	



1, 00:00:19, 0.40 m

Finish node type, other special chamber reference number:
CAP END, LINE IS CAPPED OFF

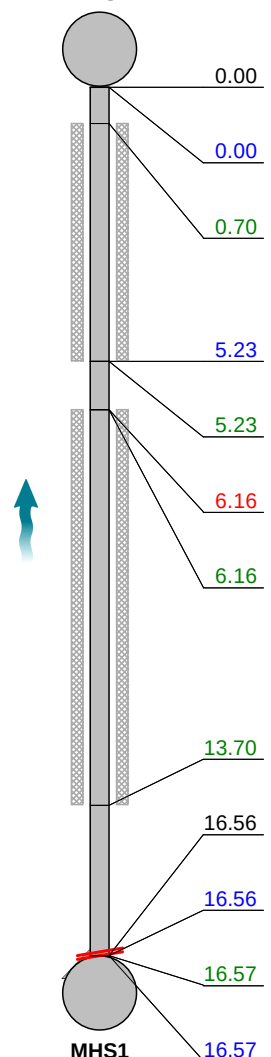
Section Inspection - 10/06/2022 - MHS1X

Item No. 3	Insp. No. 1	Date 10/06/22	Time 10:20	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHS1X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 3

Town or Village:		Inspection Direction: Upstream		Upstream Node: MHS1	
Road: Goat Mill Road		Inspected Length: 16.57 m		Upstream Pipe Depth: 1.420 m	
Location:		Total Length: 16.57 m		Downstream Node: MHS2	
Surface Type:		Joint Length: 3.00 m		Downstream Pipe Depth: 1.370 m	
Use: Surface water			Pipe Shape: Circular		
Type of Pipe:			Dia/Height: 225 mm		
Flow Control:			Pipe Material: Polyvinyl chloride		
Year Constructed: Not Specified			Lining Type: No Lining		
Inspection Purpose: Investment planning			Lining Material: No Lining		

Comments:

Recommendations:

Scale: 1:144	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.37 m MHS2 						
	0.00	MH	Start node type, manhole, reference number : MHS2	00:00:08		
	0.00	WL	Water level, 5% of the vertical dimension	00:00:08		
	0.70	S01	DER Settled deposits, coarse, 15% cross-sectional area loss, Start	00:00:13		
	5.23	WL	Water level, 10% of the vertical dimension	00:01:24		
	5.23	F01	DER Settled deposits, coarse, 15% cross-sectional area loss, End	00:01:25		1
	6.16	OJM	Open joint, medium	00:01:39		1
	6.16	S02	DER Settled deposits, coarse, 15% cross-sectional area loss, Start	00:01:44		
	13.70	F02	DER Settled deposits, coarse, 15% cross-sectional area loss, End	00:03:24		1
	16.56	JN	Junction, at 1 o'clock, diameter 150mm	00:05:24		
	16.56	WL	Water level, 5% of the vertical dimension	00:05:27		
	16.57	DER	Settled deposits, coarse, 25% cross-sectional area loss	00:05:41		1
	16.57	SA	Survey abandoned: REACHED POINT OF SURVEY 1 OVERLAP	00:05:44		
MHS1 Depth: 1.42 m						

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

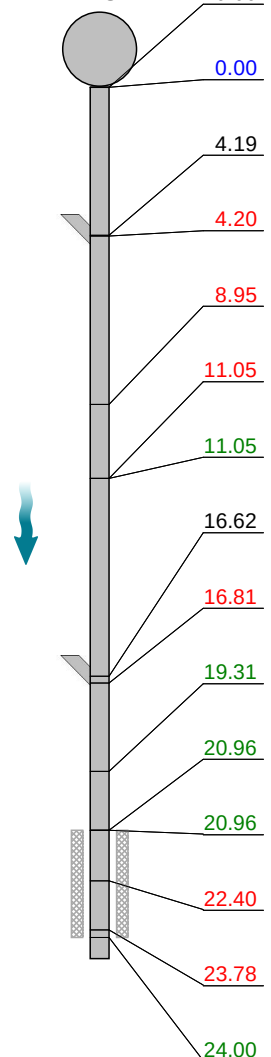
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
1	1.0	0.1	1.0	1.0	3	0.0	0.0	0.0	1.0

Section Inspection - 10/06/2022 - MHS2X

Item No. 4	Insp. No. 1	Date 10/06/22	Time 10:33	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHS2X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 4

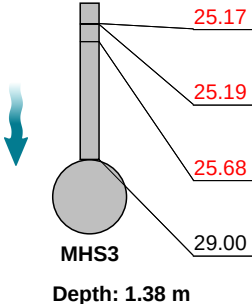
Town or Village:		Inspection Direction: Downstream		Upstream Node: MHS2	
Road: Goat Mill Road		Inspected Length: 29.00 m		Upstream Pipe Depth: 1.370 m	
Location:		Total Length: 29.00 m		Downstream Node: MHS3	
Surface Type:		Joint Length: 3.00 m		Downstream Pipe Depth: 1.380 m	
Use: Surface water			Pipe Shape: Circular		
Type of Pipe:			Dia/Height: 225 mm		
Flow Control:			Pipe Material: Polyvinyl chloride		
Year Constructed: Not Specified			Lining Type: No Lining		
Inspection Purpose: Investment planning			Lining Material: No Lining		

Comments:
Recommendations:

Scale: 1:213	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.37 m						
	0.00	MH	Start node type, manhole, reference number : MHS2	00:00:07		
	0.00	WL	Water level, 5% of the vertical dimension	00:00:08		
	4.19	JN	Junction, at 2 o'clock, diameter 150mm	00:00:51		
	4.20	OJL	Open joint, large	00:01:00	1	1
	8.95	FC	Fracture, circumferential, from 12 to 1 o'clock	00:01:51		3
	11.05	FL	Fracture, longitudinal, at 12 o'clock	00:02:16		3
	11.05	RF	Roots, fine	00:02:18		2
	16.62	JN	Junction, at 3 o'clock, diameter 150mm	00:03:31		
	16.81	OJM	Open joint, medium	00:03:41	2	1
	19.31	DER	Settled deposits, coarse, 10% cross-sectional area loss	00:04:05		1
	20.96	DER	Settled deposits, coarse, 10% cross-sectional area loss	00:04:20		1
	20.96	S01	DES Settled deposits, fine, 5% cross-sectional area loss, Start	00:04:22		
	22.40	FC	Fracture, circumferential, from 12 to 1 o'clock	00:04:44		3
	23.78	FC	Fracture, circumferential, from 10 to 11 o'clock	00:05:08		3
	24.00	F01	DES Settled deposits, fine, 5% cross-sectional area loss, End	00:07:08		1

Section Inspection - 10/06/2022 - MHS2X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
4	1	10/06/22	10:33	1	No Rain Or Snow	Not Specified	MHS2X
Operator		Vehicle		Camera	Preset Length	Legal Status	Alternative ID
DRAINTECH DV		DN66 FRK		Ibos	Not Specified	Not Specified	4

Scale: 1:213  MHS3 Depth: 1.38 m	Position [m]	Code	Observation	MPEG	Photo	Grade
	25.17	FC	Fracture, circumferential, from 12 to 1 o'clock	00:05:32		3
	25.19	FC	Fracture, circumferential, from 11 to 12 o'clock	00:06:17		3
	25.68	FC	Fracture, circumferential, from 12 to 1 o'clock	00:06:34		3
29.00	MHF	Finish node type, manhole reference number: MHS3		00:07:08		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
9	80.0	9.8	283.0	3.0	4	1.0	0.0	1.0	2.0

Section Pictures - 10/06/2022 - MHS2X

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
4	Downstream	MHS2X	1	



1, 00:01:00, 4.20 m
Open joint, large



2, 00:03:41, 16.81 m
Open joint, medium

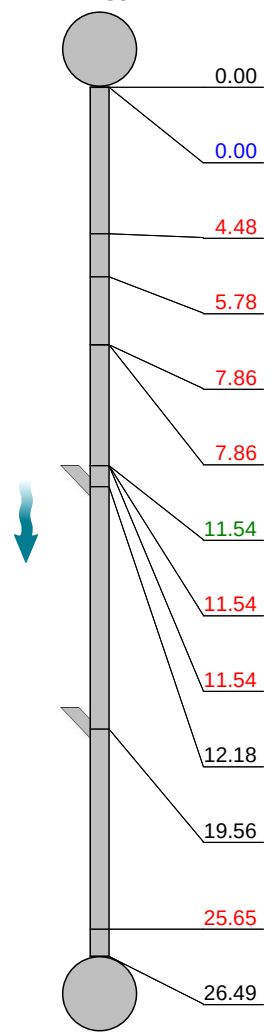
Section Inspection - 10/06/2022 - MHS3X

Item No. 5	Insp. No. 1	Date 10/06/22	Time 10:59	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHS3X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 5

Town or Village:		Inspection Direction: Downstream		Upstream Node: MHS3	
Road: Goat Mill Road		Inspected Length: 26.49 m		Upstream Pipe Depth: 1.380 m	
Location:		Total Length: 26.49 m		Downstream Node: MHS4	
Surface Type:		Joint Length: 3.00 m		Downstream Pipe Depth: 1.580 m	
Use: Surface water			Pipe Shape: Circular		
Type of Pipe:			Dia/Height: 300 mm		
Flow Control:			Pipe Material: Polyvinyl chloride		
Year Constructed: Not Specified			Lining Type: No Lining		
Inspection Purpose: Investment planning			Lining Material: No Lining		

Comments:

Recommendations:

Scale: 1:230	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.38 m MHS3						
						
	0.00	MH	Start node type, manhole, reference number : MHS3	00:00:15		
	0.00	WL	Water level, 5% of the vertical dimension	00:00:17		
	4.48	FC	Fracture, circumferential, from 12 to 1 o'clock	00:01:00		3
	5.78	FC	Fracture, circumferential, from 12 to 1 o'clock	00:01:27		3
	7.86	D	Deformed sewer/drain, 5%	00:01:56		1
	7.86	FC	Fracture, circumferential, from 12 to 1 o'clock	00:01:57		3
	11.54	DEE	Attached deposits, encrustation, from 7 to 5 o'clock, 5% cross-sectional area loss	00:03:00		1
	11.54	FC	Fracture, circumferential, from 1 to 4 o'clock	00:03:09		3
	11.54	H	Hole in drain/sewer, from 1 to 3 o'clock	00:03:10	1	4
	12.18	JN	Junction, at 1 o'clock, diameter 150mm	00:03:41		
	19.56	JXB	Junction defective, connecting pipe is blocked, at 3 o'clock, diameter 150mm: POLYTHENE WITHIN JUNCTION	00:04:57	2	
	25.65	JDM	Joint displaced, medium	00:06:39		1
	26.49	MHF	Finish node type, manhole reference number: MHS4	00:07:09		
MHS4 Depth: 1.58 m						

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
7	120.0	9.1	241.0	4.0	1	0.0	0.0	0.0	1.0

Section Pictures - 10/06/2022 - MHS3X

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
5	Downstream	MHS3X	1	



1, 00:03:10, 11.54 m
Hole in drain/sewer, from 1 to 3 o'clock



2, 00:04:57, 19.56 m
Junction defective, connecting pipe is blocked, at 3 o'clock, diameter 150mm, POLYTHENE WITHIN JUNCTION

Section Inspection - 10/06/2022 - MHS4X

Item No. 6	Insp. No. 1	Date 10/06/22	Time 11:23	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHS4X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 6

Town or Village:		Inspection Direction: Downstream		Upstream Node: MHS4	
Road: Goat Mill Road		Inspected Length: 28.52 m		Upstream Pipe Depth: 1.580 m	
Location:		Total Length: 28.52 m		Downstream Node: MHS5	
Surface Type:		Joint Length: 3.00 m		Downstream Pipe Depth: 1.680 m	
Use: Surface water			Pipe Shape: Circular		
Type of Pipe:			Dia/Height: 300 mm		
Flow Control:			Pipe Material: Polyvinyl chloride		
Year Constructed: Not Specified			Lining Type: No Lining		
Inspection Purpose: Investment planning			Lining Material: No Lining		

Comments:

Recommendations:

Scale: 1:247	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.58 m MHS4						
0.00		MH	Start node type, manhole, reference number : MHS4	00:00:00		
0.00		WL	Water level, 5% of the vertical dimension	00:00:14		
						
25.23		WL	Water level, 10% of the vertical dimension	00:02:37		
26.34		S01	DER Settled deposits, coarse, 20% cross-sectional area loss, Start	00:02:47		
28.52		F01	DER Settled deposits, coarse, 20% cross-sectional area loss, End	00:03:22		1
28.52		MHS5	Finish node type, manhole reference number: MHS5	00:03:24		
Depth: 1.68 m						

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

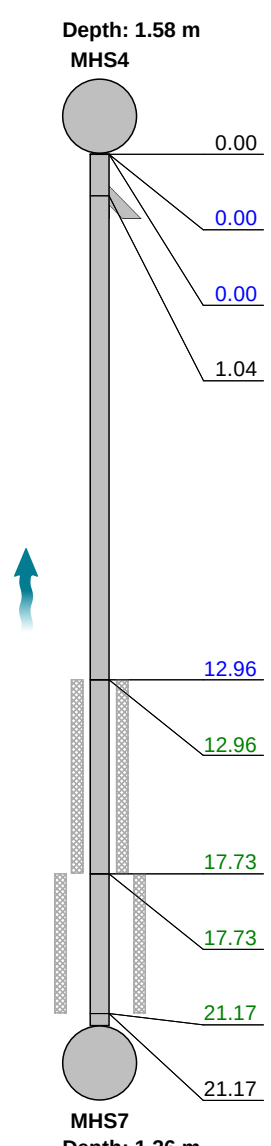
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	0.0	0.0	0.0	1.0

Section Inspection - 10/06/2022 - MHS7X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
7	1	10/06/22	13:07	1	No Rain Or Snow	Not Specified	MHS7X
Operator		Vehicle		Camera	Preset Length	Legal Status	Alternative ID
DRAINTECH DV		DN66 FRK		Ibos	Not Specified	Not Specified	7

Town or Village:		Inspection Direction:	Upstream	Upstream Node:	MHS7
Road:	Goat Mill Road	Inspected Length:	21.17 m	Upstream Pipe Depth:	1.360 m
Location:		Total Length:	21.47 m	Downstream Node:	MHS4
Surface Type:		Joint Length:	3.00 m	Downstream Pipe Depth:	1.580 m
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	300 mm		
Flow Control:		Pipe Material:	Polyvinyl chloride		
Year Constructed:	Not Specified	Lining Type:	No Lining		
Inspection Purpose:	Investment planning	Lining Material:	No Lining		

Comments:
Recommendations:

Scale:	1:186	Position [m]	Code	Observation	MPEG	Photo	Grade
							
		0.00	MH	Start node type, manhole, reference number : MHS4	00:00:06		
		0.00	REM	General remark: VIDEO HEADR INCORRECT PLEASE SEE REPORT	00:00:07		
		0.00	WL	Water level, 5% of the vertical dimension	00:00:07		
		1.04	JN	Junction, at 11 o'clock, diameter 150mm	00:00:31		
		12.96	WL	Water level, 10% of the vertical dimension	00:01:43		
		12.96	S01	DES Settled deposits, fine, 10% cross-sectional area loss, Start	00:01:45		
		17.73	F01	DES Settled deposits, fine, 10% cross-sectional area loss, End	00:02:22		1
		17.73	S02	DER Settled deposits, coarse, 10% cross-sectional area loss, Start	00:02:22		
		21.17	F02	DER Settled deposits, coarse, 10% cross-sectional area loss, End	00:03:26		1
		21.17	MHF	Finish node type, manhole reference number: MHS7	00:03:28		

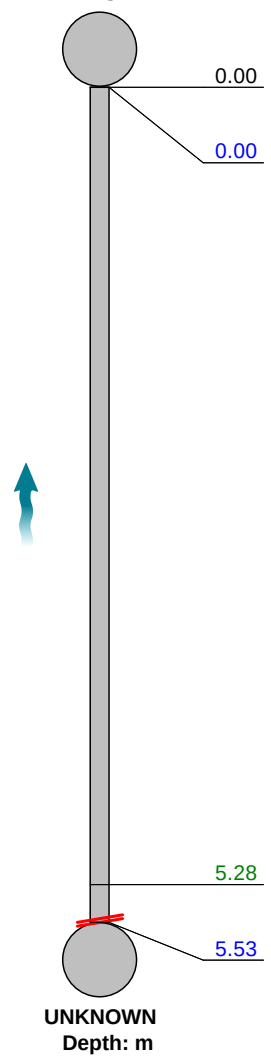
Construction Features
Structural Defects
Miscellaneous Features
Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	2	0.0	0.0	0.0	1.0

Section Inspection - 10/06/2022 - UNKNOWNX

Item No. 8	Insp. No. 1	Date 10/06/22	Time 13:41	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR UNKNOWNX
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 8

Town or Village:		Inspection Direction: Upstream		Upstream Node: UNKNOWN	
Road: Goat Mill Road		Inspected Length: 5.53 m		Upstream Pipe Depth:	
Location:		Total Length: 5.53 m		Downstream Node: MHS7	
Surface Type:		Joint Length: 3.00 m		Downstream Pipe Depth: 1.360 m	
Use: Surface water		Pipe Shape:		Circular	
Type of Pipe:		Dia/Height:		150 mm	
Flow Control:		Pipe Material:		Polyvinyl chloride	
Year Constructed: Not Specified		Lining Type:		No Lining	
Inspection Purpose: Investment planning		Lining Material:		No Lining	
Comments: LINE MAY TAKE KERB DRAINAGE					
Recommendations:					

Scale: 1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.36 m MHS7						
0.00		MH	Start node type, manhole, reference number : MHS7	00:00:12		
0.00		WL	Water level, 20% of the vertical dimension	00:00:13		
						
5.28		RM	Roots, mass, 35% cross-sectional area loss	00:00:43	1	1
5.53		SA	Survey abandoned: DUE TO ROOTS	00:00:53		
UNKNOWN Depth: m						

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	0.0	0.0	0.0	1.0

Section Pictures - 10/06/2022 - UNKNOWNX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
8	Upstream	UNKNOWNX	1	



1, 00:00:43, 5.28 m
Roots, mass, 35% cross-sectional area loss

Section Inspection - 10/06/2022 - MHF2X

Item No. 9	Insp. No. 1	Date 10/06/22	Time 15:42	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHF2X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 9

Town or Village:		Inspection Direction: Upstream		Upstream Node: MHF2	
Road: Goat Mill Road		Inspected Length: 5.25 m		Upstream Pipe Depth:	
Location:		Total Length: 5.25 m		Downstream Node: MHF3	
Surface Type:		Joint Length: 1.00 m		Downstream Pipe Depth: 2.180 m	
Use: Foul		Pipe Shape:		Circular	
Type of Pipe:		Dia/Height:		150 mm	
Flow Control:		Pipe Material:		Vitrified clay pipe (i.e. all clayware)	
Year Constructed: Not Specified		Lining Type:		No Lining	
Inspection Purpose: Investment planning		Lining Material:		No Lining	
Comments: MHF 2 UTR - Unable to raise					
Recommendations:					

Scale: 1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 2.18 m MHF3						
0.00		MH	Start node type, manhole, reference number : MHF3	00:00:07		
0.00		WL	Water level, 5% of the vertical dimension	00:00:08		
0.10		S01 DEG	Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, Start: PATCHY	00:00:08		
5.25		F01 DEG	Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, End: PATCHY	00:00:28		1
5.25		MHF	Finish node type, manhole reference number: MHF2	00:00:29		
MHF2 Depth: m						

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	0.0	0.0	0.0	1.0

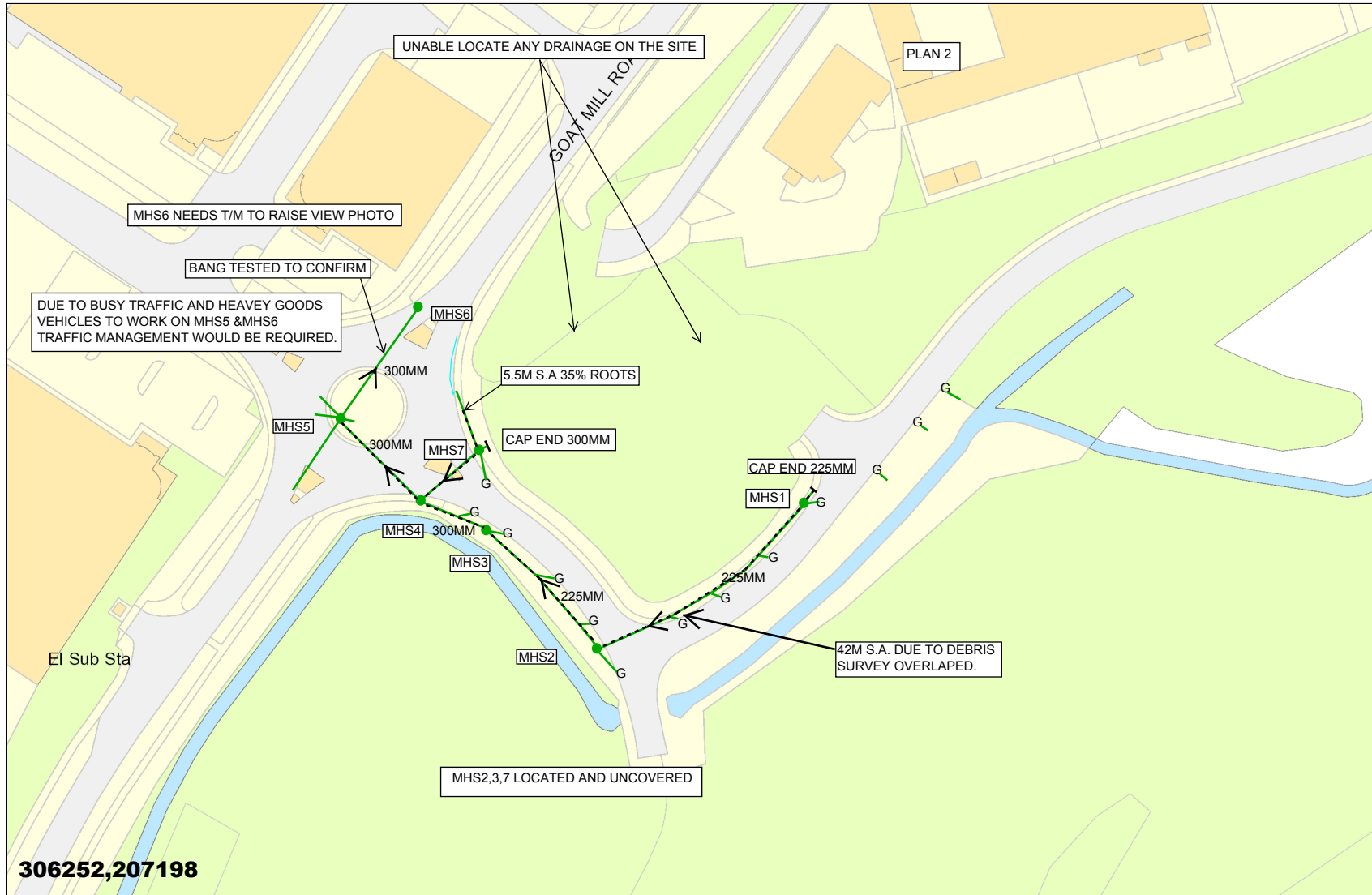
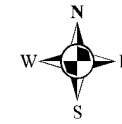
Section Inspection - 10/06/2022 - MHF4X

Item No. 10	Insp. No. 1	Date 10/06/22	Time 15:50	Client's Job Ref 1	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR MHF4X
Operator DRAINTECH DV		Vehicle DN66 FRK		Camera Ibos	Preset Length Not Specified	Legal Status Not Specified	Alternative ID 10

Town or Village:		Inspection Direction: Upstream		Upstream Node: MHF4	
Road: Goat Mill Road		Inspected Length: 22.33 m		Upstream Pipe Depth:	
Location:		Total Length: 22.33 m		Downstream Node: MHF2	
Surface Type:		Joint Length: 1.00 m		Downstream Pipe Depth:	
Use: Foul		Pipe Shape: Circular			
Type of Pipe:		Dia/Height: 150 mm			
Flow Control:		Pipe Material: Vitrified clay pipe (i.e. all clayware)			
Year Constructed: Not Specified		Lining Type: No Lining			
Inspection Purpose: Investment planning		Lining Material: No Lining			
Comments: MHF2 UTR - Unable to raise					
Recommendations:					

Scale:	1:194	Position [m]	Code	Observation	MPEG	Photo	Grade																																																																								
Depth: m MHF2 0.00 0.00 0.00 0.20 3.35 4.23 16.20 17.15 17.70 22.08 22.33 22.33 <tr><td>MH</td><td>Start node type, manhole, reference number : MHF2</td><td>00:00:07</td><td></td><td></td><td></td></tr> <tr><td>REM</td><td>General remark: VIDEO HEADR INCORRECT PLEASE SEE REPORT</td><td>00:00:08</td><td></td><td></td><td></td></tr> <tr><td>WL</td><td>Water level, 5% of the vertical dimension</td><td>00:00:08</td><td></td><td></td><td></td></tr> <tr><td>S01 DEG</td><td>Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, Start: PATCHY</td><td>00:00:13</td><td></td><td></td><td></td></tr> <tr><td>RMJ</td><td>Roots, mass at joint, 20% cross-sectional area loss</td><td>00:00:28</td><td></td><td></td><td>1</td></tr> <tr><td>RTJ</td><td>Roots, tap at joint</td><td>00:01:16</td><td></td><td></td><td>4</td></tr> <tr><td>REM</td><td>General remark: WATER ON LENS CAN STILL VIEW PIPE</td><td>00:01:16</td><td></td><td></td><td></td></tr> <tr><td>CN</td><td>Connection other than junction, at 11 o'clock, diameter 100mm</td><td>00:02:29</td><td></td><td></td><td></td></tr> <tr><td>FCJ</td><td>Fracture, circumferential at joint, from 12 to 1 o'clock</td><td>00:02:56</td><td></td><td></td><td>3</td></tr> <tr><td>CL</td><td>Crack, longitudinal, at 4 o'clock</td><td>00:03:37</td><td></td><td></td><td>2</td></tr> <tr><td>F01 DEG</td><td>Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, End: PATCHY</td><td>00:03:48</td><td></td><td></td><td>1</td></tr> <tr><td>MHF</td><td>Finish node type, manhole reference number: MHF4</td><td>00:03:49</td><td></td><td></td><td></td></tr>								MH	Start node type, manhole, reference number : MHF2	00:00:07				REM	General remark: VIDEO HEADR INCORRECT PLEASE SEE REPORT	00:00:08				WL	Water level, 5% of the vertical dimension	00:00:08				S01 DEG	Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, Start: PATCHY	00:00:13				RMJ	Roots, mass at joint, 20% cross-sectional area loss	00:00:28			1	RTJ	Roots, tap at joint	00:01:16			4	REM	General remark: WATER ON LENS CAN STILL VIEW PIPE	00:01:16				CN	Connection other than junction, at 11 o'clock, diameter 100mm	00:02:29				FCJ	Fracture, circumferential at joint, from 12 to 1 o'clock	00:02:56			3	CL	Crack, longitudinal, at 4 o'clock	00:03:37			2	F01 DEG	Attached deposits, grease, from 7 to 5 o'clock, 5% cross-sectional area loss, End: PATCHY	00:03:48			1	MHF	Finish node type, manhole reference number: MHF4	00:03:49			
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Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
2	40.0	2.2	50.0	3.0	3	5.0	0.2	5.0	4.0



306252,207198

LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

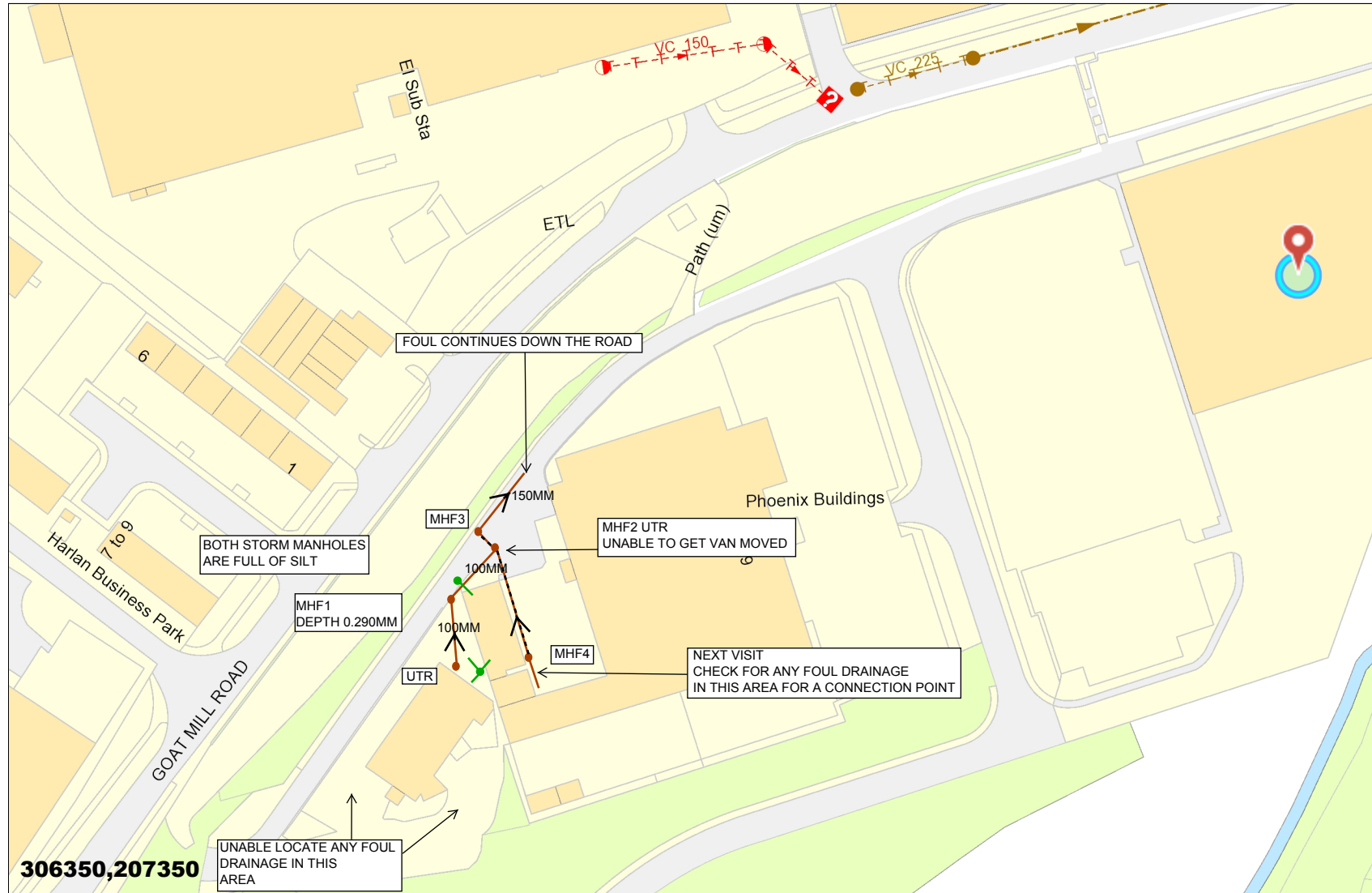
- Foul
- Surface Water
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Special Purpose
- Unknown End
- Change, Combined Overflow
- Outfall, FOUL
- Lamp Hole, Foul
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby the company, is done so in accordance with statutory requirements of sections 198 and 199 of the water industry Act 1991 based upon the best information available and in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a drain sewer or disposal main laid before 1 September 1989, or if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the company's right to be compensated for any damage to its apparatus.

**EXACT LOCATION OF
ALL APPARATUS TO
BE DETERMINED ON
SITE**

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Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be Asbestos Cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation



306350,207350

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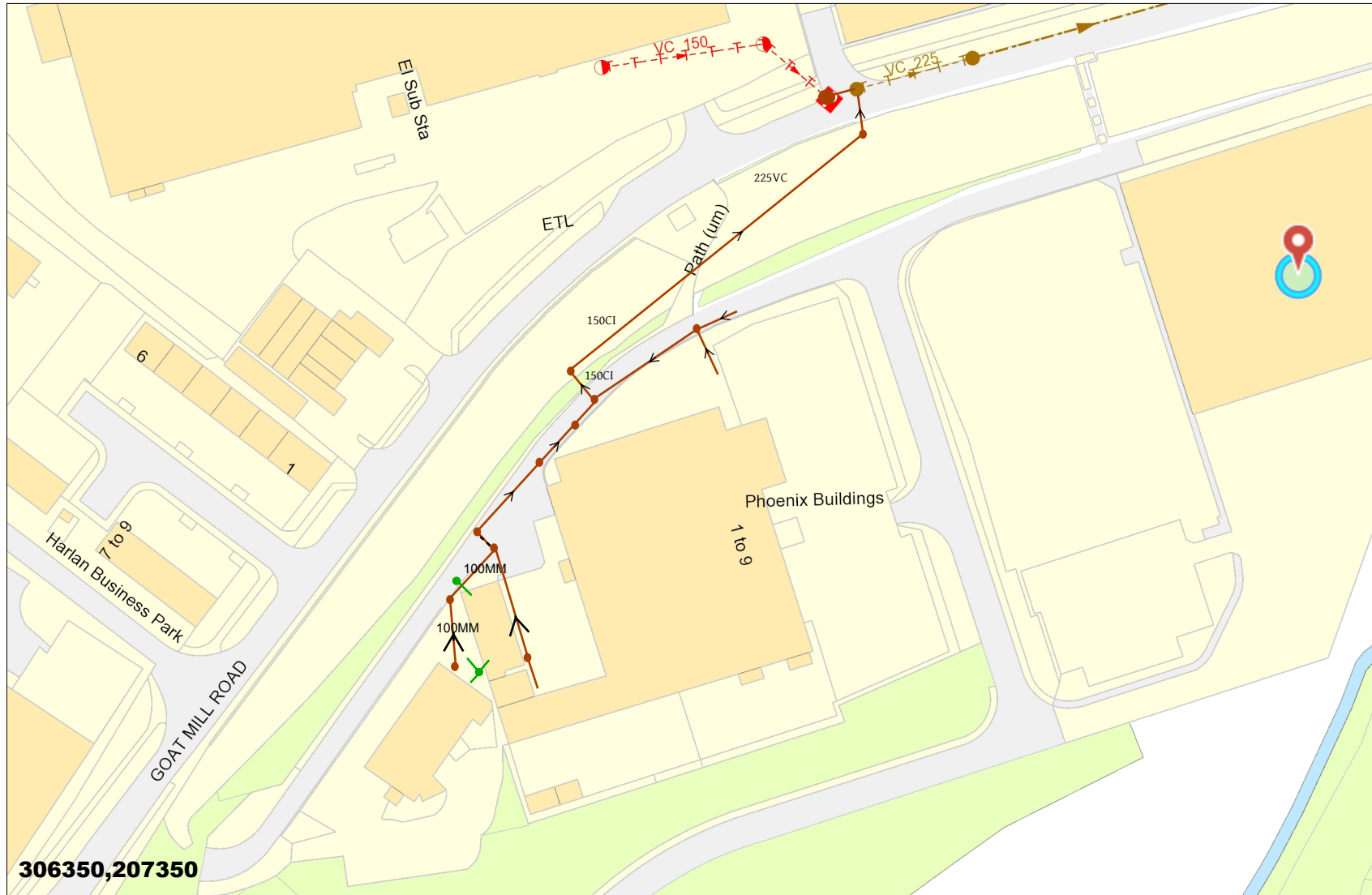
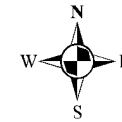
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Appendix F



LEGEND

Clean Water

-  Sluice Val
-  Air Val, SINGLE
-  Tap
-  Pressure Reducing Valve
-  Meter
-  BULK Meter
-  FH
-  Cap
-  Existing Main
-  NON COMPANY

Sewerage External

-  Foul
-  Surface Water
-  Combined
-  Rising Main
-  Private
-  Treatment Works
-  Pumping Station
-  Special Purpose
-  Unknown End
-  Change, Combined Overflow
-  Outfall, FOUL
-  Lamp Hole, Foul
-  Private Sewer Transfer
-  Lateral Drain
-  Inspection Chamber

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