Bishop Auckland Bus Station and Car Park

DRAINAGE STRATEGY REPORT

BL000034-JAC-XX-XX-RP-C-00001 | P01

16/12/22

Bishop Auckland Bus Station and Car Park

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1. Introduction

The purpose of this report is to present the basis of the foul and surface water drainage design proposals associated with a new bus station and car park in Bishop Auckland.

This project forms part of the wider regeneration of Bishop Auckland town centre. The proposed bus station and car park will be constructed in the location of the existing bus station, near the historical town centre. The bus station will provide improved facilities for tourists and locals. The carpark will provide parking provision for an anticipated increase in tourists as a result of several attractions currently under development in the town.

2. Site Description

The project site is situated toward the north of Bishop Auckland. The site is bound to the north by Clayton Street, to the east by the existing Newgate shopping centre, to the south by Saddler Street and the A689 to the west.

The existing project site is composed of an external bus station to the north, at grade carpark to the south and pedestrianised area to the east adjacent to the Newgate Centre. The site is predominantly hard paved with a small number of raised planters/tree pits in the pedestrian area close to the shopping centre.

The topographical survey indicates site levels fall significantly from west to east with a level difference across the site of approximately 6m.

3. Soil Conditions

The following sources of information have been used to provide historical borehole information:

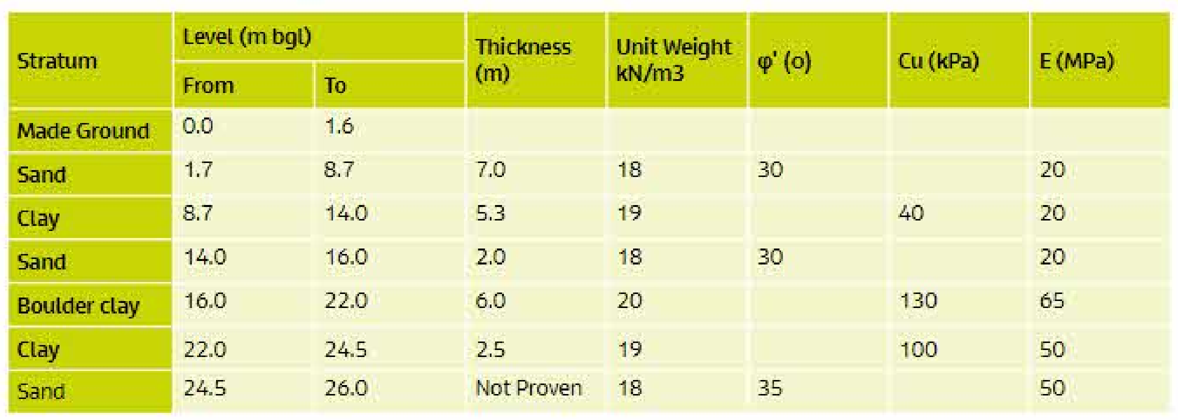
- BGS GeoIndex Onshore website
- BGS Maps Portal
- Coal Authority's Interactive Viewer

According to the BGS records, in the area of the proposed car park and bus station building, there are only records of shallow geotechnical investigation information of up to 3m in depth, undertaken for the purpose of the existing open space car parking and bus station. Therefore, deep exploratory holes located on the east side of the proposed site, namely NZ22NW174, NZ22NW176 and NZ22NW177, were mainly used to determine the ground model.

According to BGS (Bedrock geology 1:50:000), the site is underlined by Pennine Middle Coal Measures Formation. It comprises of interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone marine fossils at the base, and several such marine fossil-bearing mudstones in the upper half of the unit. The site surface is covered by superficial deposits according to BGS (superficial geology 1:50:000), described as Devensian Till. All nearby historical boreholes were drilled within this formation proven to be extent up to 26m depth.

The ground profile below (Figure 1) is mainly derived from the information on borehole log NZ22NW176 since it is the most adjacent to the proposed site works and presents the least favourable profile with the competent boulder clay layer encountered at greater depths. Field and laboratory tests were assessed from the aforementioned boreholes to derive the engineering properties summarized in the table below. The water table was assumed 3.00m BGL according to the borehole records.

Intrusive soil investigations are to be carried out as part of the preliminary works. These investigations will include infiltration testing and groundwater monitoring to help determine the feasibility and suitability of using infiltration techniques within the overall drainage strategy at detailed design stage.



Stratum	Level (m bgl)		Thickness (m)	Unit Weight kN/m3	φ' (o)	Cu (kPa)	E (MPa)
	From	To					
Made Ground	0.0	1.6					
Sand	1.7	8.7	7.0	18	30		20
Clay	8.7	14.0	5.3	19		40	20
Sand	14.0	16.0	2.0	18	30		20
Boulder clay	16.0	22.0	6.0	20		130	65
Clay	22.0	24.5	2.5	19		100	50
Sand	24.5	26.0	Not Proven	18	35		50

Figure 1: Ground Profile

4. Flood Risk

Fluvial:

In accordance with the Environment Agency’s indicative online flood maps, the Site is located within a Flood Zone 1 area, which is classed as having less than 1 in 1000 (<0.1%) chance of river flooding in any one year.

In accordance with Table 3 of the NPPF Technical Guidance all forms of development are considered appropriate within zone 1.

Please refer to Appendix A for EA Flood Map.

Surface Water:

The George Street/Saddler Street junction at the south-eastern corner of the site is susceptible to ‘low risk’ flooding from surface water according to the Long-Term Flood Risk information available on Gov.uk.

Low risk means that each year this area has a chance of flooding of between 0.1% and1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

This is the lowest corner of the site and therefore surface water flooding in this area is unlikely to affect the proposed development, as any surface water flooding will flow overland in a southerly direction along George Street and away from the development.

Reservoir:

In accordance with the Environment Agency’s indicative online flood maps, the Site is not located in an area at risk of flooding from reservoirs.

Local Drainage System Failure:

As noted in Section 6 of this report, the existing site discharges surface water at uncontrolled rates to the surrounding infrastructure. The proposed development will restrict surface water flows from the new development to equivalent greenfield runoff rates, offering a substantial load reduction on the receiving network and increased capacity downstream.

In the event of total failure of the existing network, overland flows from the site would flow to the lowest point in the southeastern corner towards George Street.

Ground Water:

According to the Durham County Councils Preliminary Flood Risk Assessment (PRFA) May 2016, no records of groundwater flooding have been found within the County of Durham.

The PFRA reports that in 2004, Defra commissioned Jacobs to carry out a detailed investigation into areas of potential ‘groundwater emergence’ throughout England. This study concluded that there were no areas of predicted groundwater flooding within this area.

The PFRA notes that there is a long history of coal mining within the northeast region, and it is understood that mine dewatering has recently ceased in some areas. This may lead to an increase in groundwater levels within historical mining areas of the County. The PFRA concludes (from strategic perspective) that there is a high level of uncertainty as to the long-term impacts of the cessation of dewatering upon groundwater levels, and there is no evidence that groundwater flooding will ensue.

5. Foul Water Drainage Strategy

Existing:

The Northumbrian Water asset records indicate an adopted combined sewer network which surrounds the site on all four sides.

The existing foul drainage network within the site is limited. The topographical survey indicates foul connections serving the small building containing facilities for the bus operators, the public toilet block and a small retail outlet which serves food and drinks.

All three of these facilities are shown to discharge to the existing combined sewer network along the northern boundary of the development site adjacent to Clayton Street.

Proposed:

The proposed bus station building forming part of the redevelopment scheme will contain public toilet facilities, staff toilet facilities and a small retail outlet. It is proposed to discharge foul flows from this building to the combined sewer network in Clayton Street via an indirect connection. (Indirect connection subject to the results of a line, level and condition survey of the existing lateral).

Proposed discharge rates and point of connection are subject to Northumbrian Waters approval.

Please refer to Appendix C for Drainage Strategy Layout

6. Surface Water Drainage Strategy

Existing:

Survey information indicates that the surface water runoff from the existing site is positively drained via surface level gullies and a below ground gravity pipe network. The existing surface water network is shown to fall from west to east eventually discharging to the existing combined sewer network at the corner of Saddler Street/George Street to the south-eastern corner of the site.

There is no indication or evidence of attenuation features or flow control structures in place within the existing surface water network. It is assumed that surface water runoff currently discharges unrestricted to the surrounding infrastructure.

Proposed:

It is proposed to maintain similar flow paths in line with the existing site. Surface water flows will be conveyed west to east via a below ground gravity piped network and discharge to the existing surface water lateral that serves the existing site.

In accordance with requirements of Durham County Councils Surface Water Management Plan (SWMP), it is proposed to restrict peak flows from the new development to equivalent greenfield runoff rates. Please refer to Appendix B for greenfield runoff estimation calculations

Due to the large level difference across the site, it is proposed to cascade the network with several flow controls and associated below ground attenuation at both the higher parking area to the west and at the bus station turning area to the east.

Peak flows from the proposed development will be restricted to less than or equal to the equivalent greenfield runoff rates for the respective 1in1yr, 1in30yr and 100yr return period events using a complex control chamber.

Attenuation will be provided to accommodate all storms up to and including the 100yr RP event with an additional 45% allowance for climate change.

There are a number of existing road gullies serving Saddler Street carriageway which are assumed to discharge to the existing on-site surface water drainage network. It is therefore proposed to introduce a new highway carrier drain in Saddler Street to serve all of the existing road gullies to separate the highway drainage from the new on-site drainage network.

Proposed discharge rates and points of connection are subject to Northumbrian Waters approval.

Please refer to Appendix C for Drainage Strategy Layout

7. Sustainable Urban Drainage Systems (SUDS)

It is proposed to implement a number of SUDS elements into the new surface water drainage scheme as outlined below:

Green Roof:

The roof above the bus station concourse area will utilise a sedum roof construction. Runoff from the green roof will subsequently discharge directly to the rain garden features to the north of the bus station.

Rainwater Harvesting:

The area of flat roof above the bus station accommodation block will collect and convey water to a rainwater harvesting system for reuse in the bus station facilities.

Rain Garden:

It is proposed to introduce a rain garden feature to the north of the bus station building. Flows from the green roof, overflow from the rainwater harvesting system, and localised hardstanding areas in the immediate vicinity north of the bus station building will be conveyed into the rain garden. There are also a number of smaller rain gardens to collect and convey runoff to the pedestrian area between the bus station and ground level car parking area. For the purposes of the preliminary design, it has been assumed at this stage that the rain gardens will be tanked with an impermeable liner. Intrusive soil investigations to be carried out as part of the preliminary works will include infiltration testing and groundwater monitoring to help determine the feasibility and suitability of using infiltration techniques within the overall drainage strategy.

Permeable Paving:

The parking bays to the ground level parking area to the west of the site will be constructed of permeable block paving. For the purposes of the preliminary design, it has been assumed at this stage that the permeable parking bays will be tanked with an impermeable liner. Intrusive soil investigations to be carried out as part of the preliminary works will include infiltration testing and groundwater monitoring to help determine the feasibility and suitability of using infiltration techniques within the overall drainage strategy.

8. Pollution Prevention

Compliance with the requirements of the simple index approach to pollution control outlined in Chapter 26 of the CIRIA SUDS Manual C753 is summarized below:

Land Use	Pollution Hazard Level	Total Suspended solids (TSS)	Metals	Hydro-Carbons
Commercial yard and delivery areas	Medium	0.7	0.6	0.7

Figure 2: Pollution Hazard Indices

Due to the size, layout, and topographical profile; the pollution mitigation process will be via a treatment management train formed of several propriety systems.

Trapped Gully Pots:

Within the access road to the west and bus turning area to the east, surface water will be drained via a series of trapped gully outlets. Trapped gullies will offer mitigation against the first flush and trap sediment/small oil spills within the gully pot. They are easily accessible and readily maintainable. Gully pots alone do not achieve the required mitigation indices in line with the requirements of the SUDS manual for the given land use.

Permeable Paving (Parking Bays):

All parking bays within the ground level car park are to be formed using permeable block paving. The SUDS Manual (CIRIA, 2015) recognises the effectiveness of concrete block permeable paving in removing pollution. For areas with low to medium pollution hazard level permeable block paving is more than sufficient on its own to provide an adequate pollution mitigation index.

Catchpits:

The flow control chambers used to limit peak flows to acceptable rates will be formed with a sump to aid sediment removal prior to the attenuation tank system, flow control device and downstream treatment system.

Oil Separator:

All run-off from the proposed development site will pass through a full retention separator such as the Klargester AquaTreat system or similar approved. The AquaTreat Full Retention GRP surface water treatment separators have been designed for use in SuDS schemes that require a full pollution treatment. This system helps to reduce pollution by removing TSS, Metals & Hydrocarbons from surface water entering the local watercourse or network.

Proprietary Treatment System	Total Suspended solids (TSS)	Metals	Hydro-Carbons
AquaTreat SWT010	0.85	0.75	0.99

Figure 3: Pollution Mitigation Indices

Please refer to Appendix F for AquaTreat Interceptor Mitigation certificates

By incorporating the above measures through a treatment management train approach, the receiving watercourse will be protected from excessive deposits of suspended solids, metals and hydro-carbons.

9. Maintenance

Management

SUDS management proposals will need to involve a framework for the maintenance of the Site, considering the SUDS, how the Site will change with time, and the operations required to achieve the management aims for the Site, particularly having regard to:

- The function of SUDS.
- How and why they work on the Site.
- Health and safety issues.
- Long-term expectations for the SUDS on Site.

Programme

SUDS maintenance should comprise:

- Regular maintenance – for day-to-day care of the SUDS
- Litter collection.
- Vegetation pruning.
- Inspection of inlets, outlets and control structures.

These activities are normally carried out monthly to coincide with regular landscape maintenance.

- Occasional tasks – to manage silt and vegetation:
- Silt control on hard surfaces, in silt traps and in general SUDS features.

The occasional task activities are to be undertaken on a frequency determined by regular inspection or specification.

Remedial work – to repair unforeseen defects that occur during the design life of the system due to damage or vandalism. Remedial action due to failure or damage will be required on an as necessary basis but should be minimal with good design, maintenance and the control of water flows through the development.

General

For this scheme, it is assumed that all parts of the drainage system are to be owned and maintained by the Site owner/operator, Durham County Council.

The below-ground surface water drainage system requires regular inspection/clearing to prevent blockages due to accumulation of silt. It is recommended that the following items are initially inspected and cleared by a suitably trained person in accordance with the outline maintenance schedule in Appendix I to establish a long-term inspection/clearing interval appropriate for this site.

- Trapped gullies
- Drainage channels

Catchpit chambers

Flow Control Devices

Attenuation Tanks

Petrol Interceptors

Rain Gardens

Permeable Paving

Outfall pipes to the public sewers

Inspection/clearing should also be carried out after every major storm event.

Maintenance Schedule

A preliminary maintenance schedule for this site can be found in Appendix I

This schedule is intended to give an overview of the operation and maintenance for the drainage features included within the proposed drainage strategy. Where proprietary products are specified the manufacturer’s instructions and recommendations should be followed.

The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation of the system. These activities and their frequency can then be adjusted to suit the specific site requirements.

10. Conclusion

In accordance with the Environment Agency's indicative flood map the Site is located within a Flood Zone 1 area, which is classed as having less than 1 in 1000 (<0.1%) chance of river flooding in any one year.

In accordance with Table 3 of the NPPF Technical Guidance all forms of development are considered appropriate within zone 1.

The surface water system to serve the proposed development will follow best practice using sustainable drainage systems (SUDS) to both intercept storm water at source and treat the runoff from roofs, hardstandings and other impermeable areas.

Preliminary soil information as documented in Section 3 of this report indicates a thick band of sand at reasonably shallow depths which may be conducive to infiltration and/or partial infiltration methods for the disposal of surface water runoff. However, the ground profile notes a potential layer of made ground in the near surface formation. Borehole logs also note the possibility of relatively high groundwater levels. For the purpose of the preliminary hydraulic design and ensuring adequate spacial provisions for SUDS within the scheme design, infiltration methods have not been considered at this stage. Intrusive soil investigations are to be carried out as part of the preliminary works. These investigations will include infiltration testing and groundwater monitoring to help determine the feasibility and suitability of using infiltration techniques within the overall drainage strategy at detailed design stage.

Peak flows from the proposed development will be restricted to less than or equal to the equivalent greenfield runoff rates for the respective 1in1yr, 1in30yr and 100yr return period events using a complex control chamber. The SUDS systems will be designed to accommodate all storms up to and including the 100yr RP event with a 45% allowance for climate change. Unaffected areas within the site planning boundary will remain unchanged and continue to discharge as existing.

By incorporating the above measures, the Proposed Development complies with the requirements of the National Planning Policy Framework by protecting the users of the development and reducing the flood risk to third parties beyond the Site. Appropriate levels of treatment will be provided within the combination of proposed SUDS measures to minimise the risk of contamination to the receiving watercourse.

Appendix A. EA Flood Mapping

Flood map for planning

Your reference	Location (easting/northing)	Created
Bishop Auckland	**420888/529963**	**13 Dec 2022 9:41**

Your selected location is in flood zone 1, an area with a low probability of flooding.

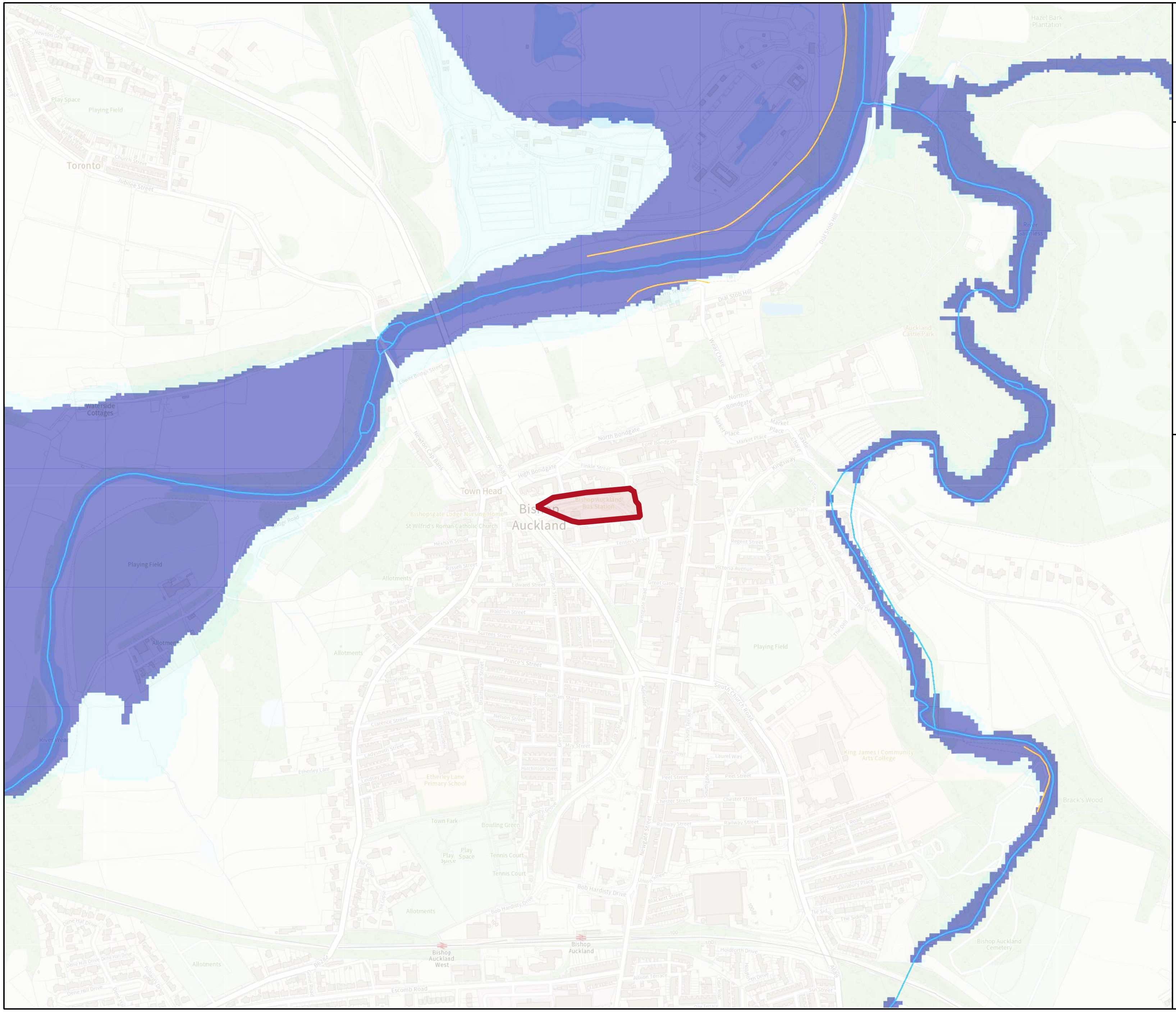
You will need to do a flood risk assessment if your site is any of the following:

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
Bishop Auckland

Location (easting/northing)
420888/529963

Scale
1:10000

Created
13 Dec 2022 9:41

- 🟥 Selected area
- ■ Flood zone 3
- □ Flood zone 2
- ■ Flood zone 1
- — Flood defence
- — Main river
- ▦ Water storage area

0 100 200 300m

Appendix B. Greenfiled Runoff Estimation

Print Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Stuart Clark
Site name:	Bishop Auckland
Site location:	Bishop Auckland

Site Details

Latitude:	54.66430° N
Longitude:	1.67778° W
Reference:	956217831
Date:	Dec 13 2022 09:37

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): 0.77

Methodology

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

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	670	670
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

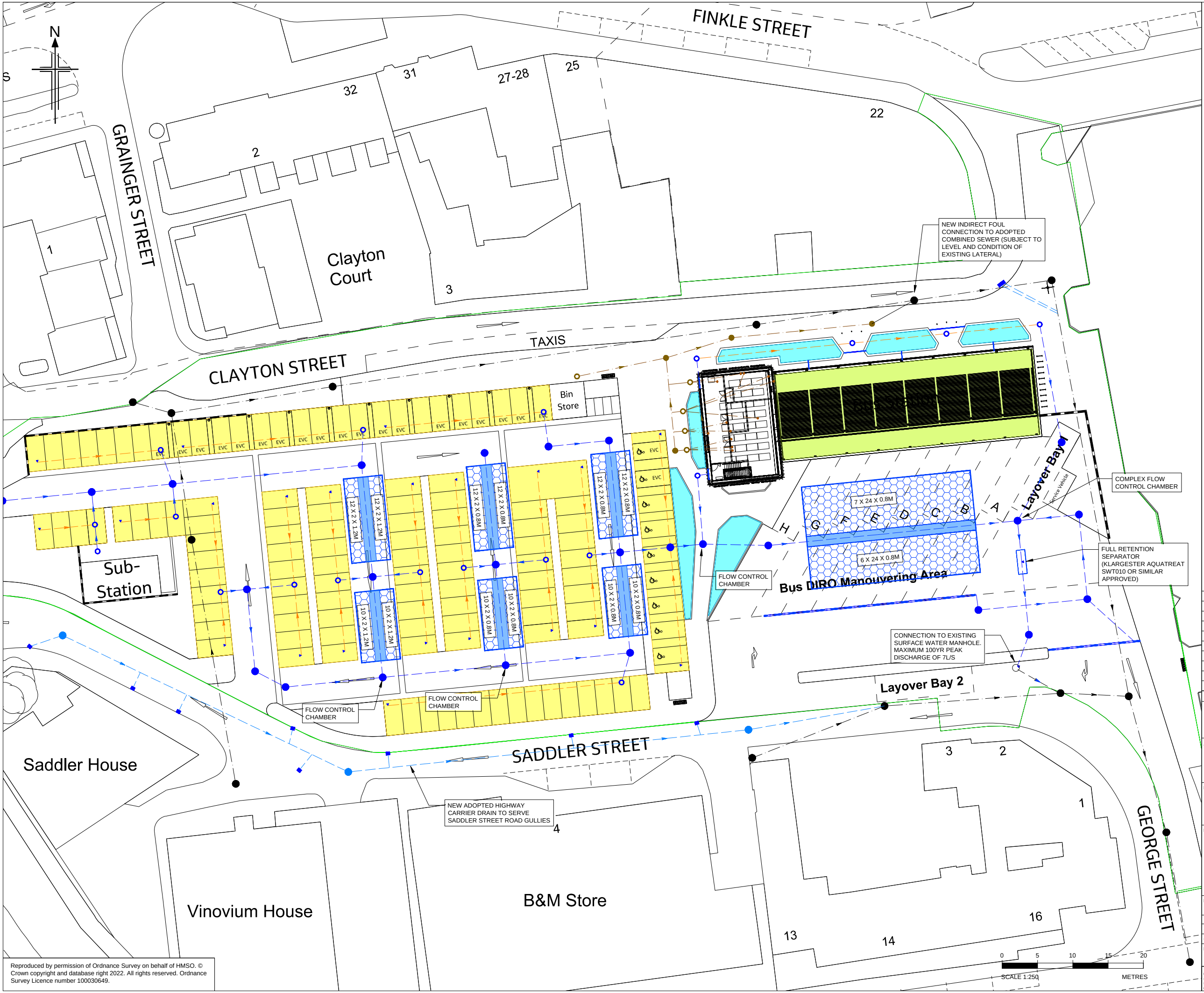
Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	3.53	3.53
1 in 1 year (l/s):	3.04	3.04
1 in 30 years (l/s):	6.18	6.18
1 in 100 year (l/s):	7.35	7.35
1 in 200 years (l/s):	8.37	8.37

Appendix C. Drainage Strategy



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1. THIS DRAWING IS TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS.
3. ALL DIMENSIONS ARE IN MILIMETRES UNLESS SHOWN OTHERWISE.
4. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM.
5. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING WORK ON SITE. ANY REQUIREMENTS FOR MODIFICATIONS OR ALTERATIONS ARE TO BE CARRIED OUT WITH THE APPROVAL OF PROJECT MANAGER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE AND LIABLE FOR TEMPORARY STABILITY OF THE STRUCTURE DURING ALL STAGES OF THE WORK. THE STEELWORK CONTRACTOR SHOULD ALLOW FOR ALL NECESSARY TEMPORARY BRACING AND PROPPING. DETAILS OF TEMPORARY WORKS TO BE SUBMITTED TO THE ENGINEER PRIOR TO INSTALLATION.

PROPOSED DRAINAGE STRATEGY

PEAK FLOWS FROM THE PROPOSED DEVELOPMENT WILL BE RESTRICTED TO MATCH THE CALCULATED GREENFIELD RUNOFF RATES FOR THE RESPECTIVE 1IN1YR, 1IN30YR AND 100YR RETURN PERIODS EVENTS AS FOLLOWS:

1 IN 1YR - 3.04L/S

1 IN 30 YR - 6.18L/S

1 IN 100 YR - 7.35L/S

ATTENUATION WILL BE PROVIDED TO ACCOMMODATE ALL STORMS UP TO AND INCLUDING THE 100YR RP EVENT WITH AN ADDITIONAL 40% ALLOWANCE FOR CLIMATE CHANGE.

LEGEND

ADOPTED DRAINAGE

● EXISTING ADOPTED COMBINED SEWER
● SURFACE WATER HIGHWAY DRAIN
■ SURFACE WATER ROAD GULLY

PRIVATE DRAINAGE

○ EXISTING SURFACE WATER NETWORK
● SURFACE WATER NETWORK
— PERFORATED COLLECTOR PIPE
● FOUL WATER NETWORK

SUDS

🟩 GREEN ROOF
🟦 RAIN GARDENS
🟨 PERMEABLE PAVING
▨ ATTENUATION TANKS

OTHER

— SITE BOUNDARY
— RETAINING WALL

P01	17/03/22	ISSUED FOR RIBA STAGE 3	NM	SC	GC	DB
P02	02/12/22	ISSUED FOR REVISED RIBA STAGE 3	SC	GC	MS	DB
Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd

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Client
Durham County Council

Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
DRAINAGE STRATEGY PLAN

Drawing Status	Suitable for Stage approval		Suitability S4
Scale	1:250	DO NOT SCALE	
Jacobs No.	BL000034		Rev P02
Client No.			

Drawing Number
BL000034-JAC-ZZ-ZZ-DR-C-01003

Appendix D. Sewer Records

NWG PROPERTY SOLUTIONS

NWG Property Solutions is part of Northumbrian Water Group (NWG)
Northumbrian Water and Essex & Suffolk Water are also part of NWG

84256

SITE OFF NEWTON CAP VIADUCT   BISHOP AUCKLAND

Site Enquiry

Plan

We enclose plan(s) showing the location of any Company apparatus in the vicinity of the area of your enquiry.

If your request for plan(s) is part of a C2 enquiry, or relates to development, information about connecting to our water and sewer networks and the protection of existing apparatus, details for further information can be found via the following link https://www.nwl.co.uk/developers.aspx

1. The company is not responsible for private water supply pipes, private drains and sewers that connect the property to the public sewerage system and does not hold details of these.

General Notes

A copy of the standard conditions for working near Company apparatus is enclosed for your information. If you require any further assistance to identify Company apparatus, then do not hesitate to make contact with the Area Office at the contact number shown in the standard conditions.

Important:- Please ensure this detail is made available to anyone carrying out any works which may affect our apparatus.

From the 1st October 2011 there may be lateral drains and/or public sewers which are not recorded on the public sewer map.

Signed.

[redacted]

On behalf of Northumbrian Water, Essex & Suffolk Water

[redacted]

[redacted]

Date: 30/MAR/2020
Ref: 1148443

STANDARD CONDITIONS FOR WORKING
NEAR NORTHUMBRIAN WATER APPARATUS

THE FOLLOWING CONDITIONS WILL APPLY TO ALL WORKS IN THE VICINITY OF COMPANY APPARATUS

NWG Property Solutions is part of Northumbrian Water Group (NWG)
Northumbrian Water and Essex & Suffolk Water are also part of NWG

1. Contact should be made with the appropriate Company Area Office prior to the commencement of any work. Arrangements can then be made for the local representative to visit the site and assist in the location and protection of any apparatus affected. The Company must be given two working days notice before any works, including trial holes, are carried out within their easements. Contact **0345 717 1100.**

2. The information shown on any plan provided by the Company is for general guidance only. The position of apparatus shown should not be relied upon as being precise. No service pipes are shown on plans.

3. The actual position of apparatus must be established by taking trial holes in all cases. No machine excavation will be permitted within 1 metre side of a main. The actual position of any apparatus must be found by hand excavation.

4. Where Company apparatus is exposed by excavation, support and protection measures are to be agreed on site. Where excavations are taken out below the invert of a main, adequate support is to be provided to prevent collapse of the excavation and subsequent undermining of the main. Special attention is to be given to the compaction of selected backfill material under the main and the company may require the use of lean mix concrete to replace inadequately compacted or unsuitable support backfill material. The compaction of selected backfill material under, around and up to a level of 300mm above the top of any main shall be carried out by hand. Upon completion of operations, any excavation is to be left open until after inspection by Company¿s representative.

5. No installation of plant may take place within the Company's easements without the prior consent of the Company and with all special conditions and arrangements being finalised before commencement of work.

6. Indiscriminate crossing of the main by heavy construction plant will not be permitted. Where applicable, Crossing Points must be agreed by the Company and any protective measures necessary taken before work begins.

7. Surface boxes and covers should not be removed without obtaining prior consent of the Company. All surface covers to washouts, valves, air valves, hydrants, stopcocks etc., are to be kept clear of obstruction and with free access at all times. If surface boxes or covers have been temporarily removed, positions should be clearly marked.

8. Where the levels of carriageway and footpath surfaces are raised or lowered, then the Company's surface covers must be adjusted as appropriate.

9. No pipes or cables are to be laid or structures placed directly over the line of Company apparatus.

10. Where drains, pipes or cables cross over or under any mains, a minimum clearance of 300mm must be maintained. Where it is necessary for any plant to lay parallel to the pipelines, a minimum distance of 1 metre shall be maintained between the outside of the pipeline and any plant being installed, except in the case of small diameter plant where N.J.U.G 7 dimensions apply. The Company must agree exceptions to these conditions in writing.

11. All crossing of the company's pipelines and easements shall be at right angles where possible. Where skew crossings are necessary, no more than 3 metres of the Company's pipeline shall be exposed at any time.

12. The Company will require three copies of proposal drawings showing the details of any proposed crossing of pipelines above 300mm diameter. The drawings must show the Company's pipelines in relation to the proposed works, to a scale of no less than 1:500 and no work shall commence until the Company has given approval.

13. Where it is necessary to carry out piling works closer than 6m to the Company' apparatus, or to carry out works using plant that is likely to damage the integrity of the Company's apparatus, the Company will require a method statement of the works shall be consulted before work commences.

14. Where the Company's pipeline is protected by a cathodic protection system, the Company will require a suitable joint testing programme to be agreed before the application of any cathodic protection scheme proposed by another authority or utility undertaking. If any bond-wires or test leads associated with the Company's cathodic protection system are damaged, disconnected or found to be in poor condition, the Company should be notified so that repairs can be made.

15. In the case of Trunk mains which cross development sites, no development is to take place within an agreed distance either side of the pipeline. A guide showing the easement widths for the various diameters and depths of pipe is available from the RASWA department.

16. No tree planting or landscaping work is done in close proximity to Company apparatus unless otherwise agreed in writing by the Company. A planting guide is available from the RASWA department.

17. In the event of any damage to any of the Company's plant the Company must be informed immediately. Where any damage occurs to Company apparatus, the appropriate remedial work will be carried out by the Company and charged to the promoter of the works.

18. Every effort should be made to secure the site against vandalism of the Company's plant.

19. A copy of these conditions is to be made available to all Contractors or Sub-Contractors working in the vicinity of Company apparatus.

Issue: RASWA 2. Oct. 02

Northumbrian Water Group Limited
Registered in England and Wales No 4760441
Registered office: Northumbria House,
Abbey Road, Pity Me, Durham, DH1 5FJ

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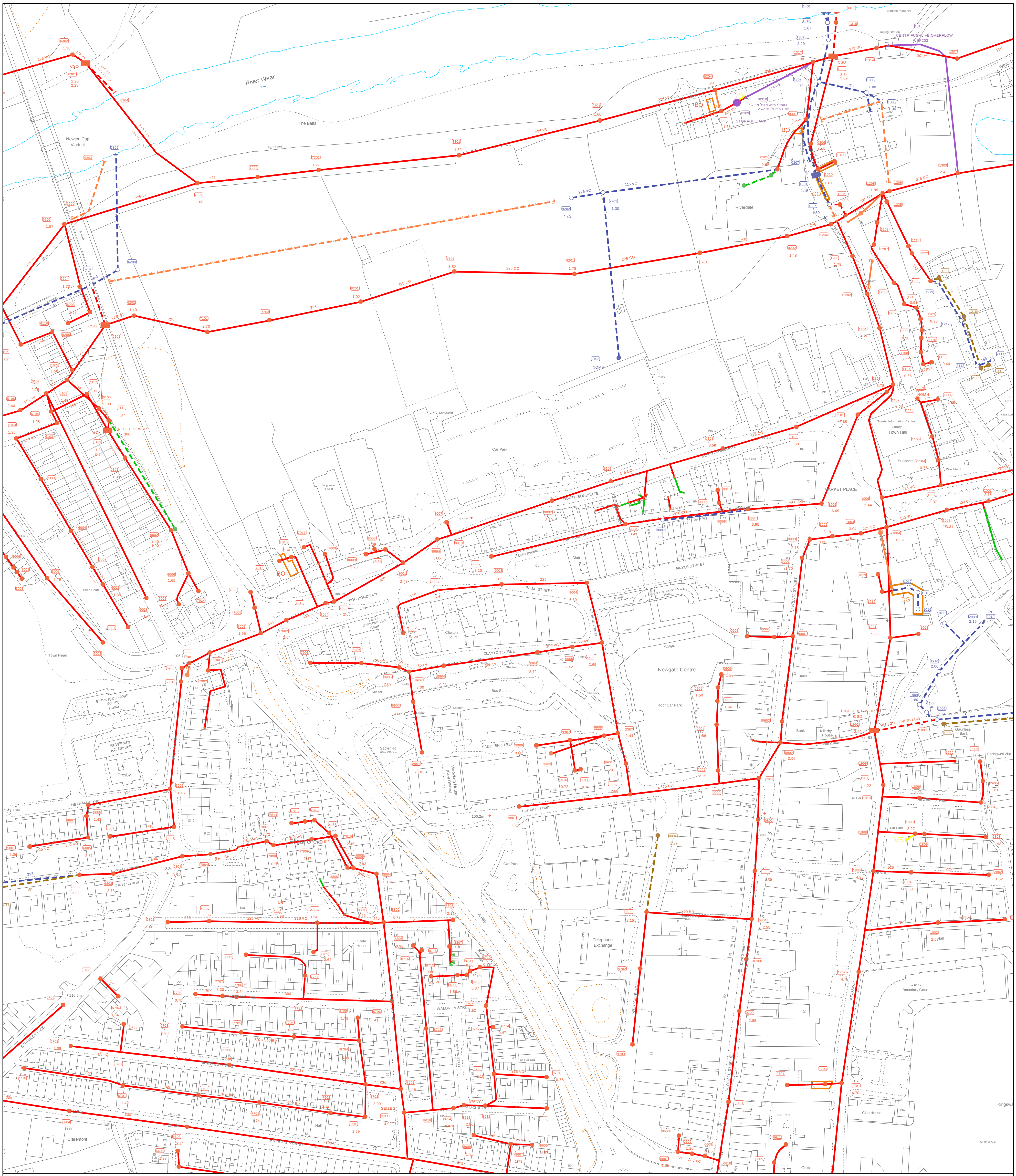


	NWL Responsibility			Private/Non NWL			Proposed	
Combined	——	——	Combined	——		Combined	——	
Foul	- - -	- - -	Foul	- - -		Foul	- - -	
Surface	- - -	- - -	Surface	- - -		Surface	- - -	
Treated Eff	——		Treated Eff	——				
Untreated Eff	——		Trade Eff	——				
Overflow	- - -		Watercourse	- - -				

Annotations
- Direction of flow
- Backdrop
- Abandoned
- Rising Main

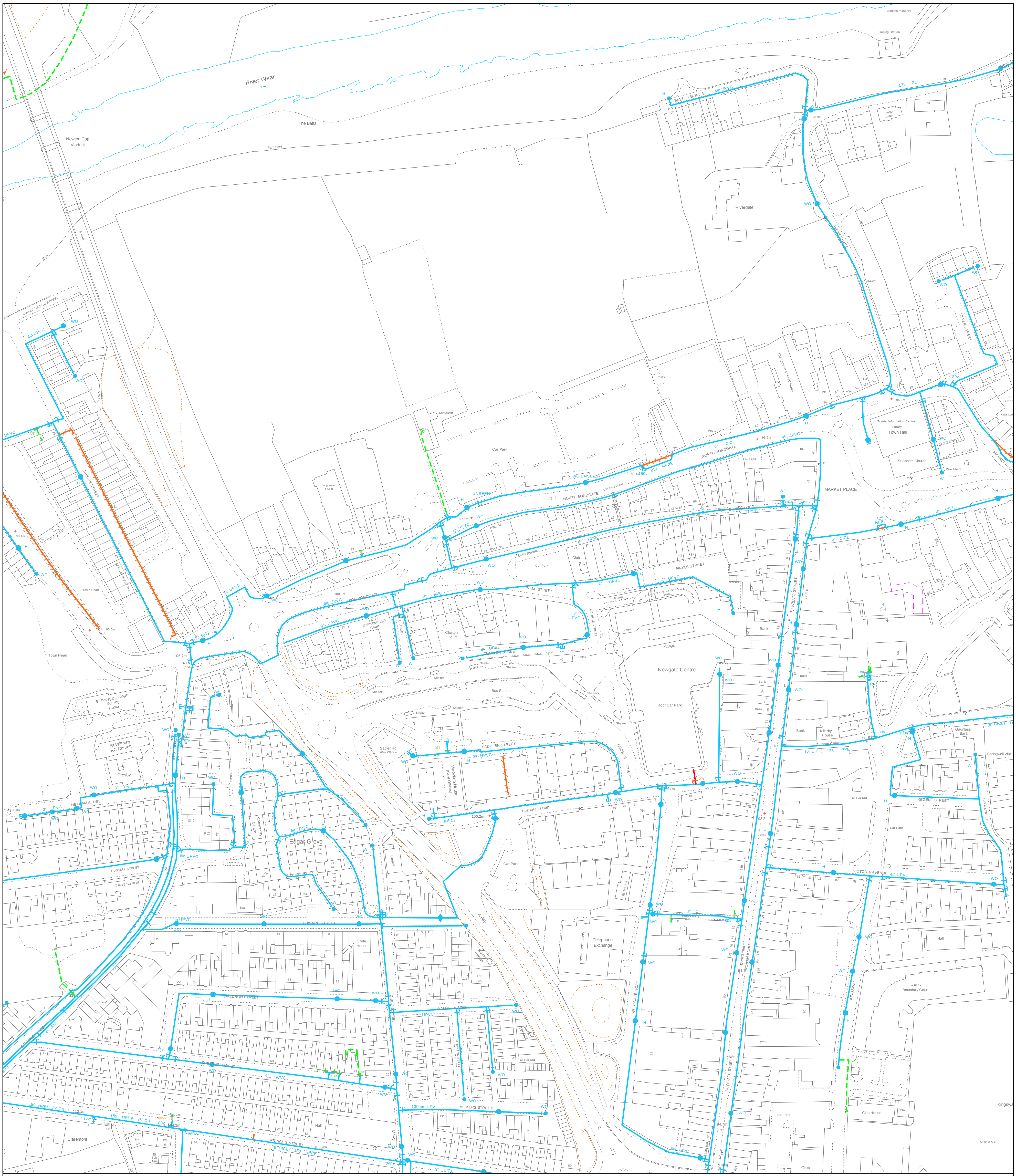
Symbols
- ● ■ Chambers
- Inlet/Outlet
- ■ Treatment Works
- ▲ Pumping Station
-] Capped End
- ■ Balancing Pond
- ▶ Termination Node
- ■ Rodding Eye
- ● Unknown End
- / Attribute Change
- ◆ Air Valve
- ● Property Connection
- ■ Lamp Hole
- ● Hatchbox
- ◎ Dual Usage Chamber

NORTHUMBRIAN WATER living water

User : LANGP
Date : 20/03/2020
Title : 0000
Map Sheet : NZ2030SE
Centre Point : 420904,530033

The material contained on this plot has been reproduced from an Ordnance Survey map with permission of the controller of H.M.S.O. Crown Copyright Reserved. Licence No.100022480. The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, it's servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. The Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions. Emergency Telephone Number: 0345 717 1100

25 m



Valves/Regulators
P1
P2
P3
P4

Fittings/Symbols

Storage/Operations

Network Types	
Distribution	
Treated	
Raw	
Fire	
Supply	

Specific Main Types	
Abandoned Asbestos	
Abandoned	
Out of Commission	
Private	
Proposed	

Area Types	
Water Quality	🟩
District Metering	🟥
Easement	

NORTHUMBRIAN WATER *living water*

User : LANGP
Title : 0000
Centre Point : 420904,530033

Date : 20/03/2020
Map Sheet : NZ2030SE

The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, it's servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. In the case of water mains Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions.
Emergency Telephone Number: 0345 717 1100

25 m

Appendix E. Hydraulic Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - SIte Network

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.336	Minimum Backdrop Height (m)	1.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm - SIte Network

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S23.000	20.267	1.043	19.4	0.018	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.001	12.697	0.519	24.5	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S24.000	7.855	0.530	14.8	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S25.000	3.795	0.163	23.3	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S24.001	4.650	0.289	16.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.002	11.512	0.248	46.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S26.000	17.550	1.111	15.8	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S26.001	5.093	0.085	59.9	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S27.000	7.855	0.642	12.2	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.000	50.00	4.15	100.260	0.018	0.0	0.0	0.0	2.30	40.6	3.2
S23.001	50.00	4.25	99.217	0.028	0.0	0.0	0.0	2.04	36.1	5.1
S24.000	50.00	4.05	99.517	0.000	0.0	0.0	0.0	2.63	46.5	0.0
S25.000	50.00	4.03	99.150	0.000	0.0	0.0	0.0	2.10	37.0	0.0
S24.001	50.00	4.08	98.987	0.000	0.0	0.0	0.0	2.52	44.6	0.0
S23.002	50.00	4.38	98.698	0.028	0.0	0.0	0.0	1.48	26.2	5.1
S26.000	50.00	4.11	99.646	0.000	0.0	0.0	0.0	2.55	45.0	0.0
S26.001	50.00	4.18	98.535	0.013	0.0	0.0	0.0	1.30	23.0	2.4
S27.000	50.00	4.05	99.409	0.000	0.0	0.0	0.0	2.90	51.2	0.0

Network Design Table for Storm - SIte Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S27.001	4.650	0.317	14.7	0.026	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.003	26.900	1.495	18.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S28.000	25.600	1.433	17.9	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S28.001	4.999	0.083	60.2	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.004	8.312	0.050	166.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S23.005	7.588	0.050	151.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S29.000	12.550	0.209	60.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S30.000	10.050	0.760	13.2	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S29.001	4.950	0.483	10.2	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S31.000	10.050	0.651	15.4	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S32.000	12.550	0.263	47.7	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S31.001	6.750	0.113	59.7	0.040	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.006	7.397	0.050	147.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S23.007	6.903	0.125	55.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S33.000	12.550	0.209	60.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S27.001	50.00	4.07	98.767	0.026	0.0	0.0	0.0	2.64	46.7	4.7
S23.003	50.00	4.57	98.450	0.072	0.0	0.0	0.0	2.39	42.2	12.9
S28.000	50.00	4.18	99.126	0.000	0.0	0.0	0.0	2.39	42.3	0.0
S28.001	50.00	4.24	97.693	0.019	0.0	0.0	0.0	1.30	22.9	3.4
S23.004	50.00	4.68	96.805	0.091	0.0	0.0	0.0	1.22	86.0	16.4
S23.005	50.00	4.78	96.755	0.091	0.0	0.0	0.0	1.27	90.1	16.4
S29.000	50.00	4.16	98.372	0.000	0.0	0.0	0.0	1.30	23.0	0.0
S30.000	50.00	4.06	98.923	0.000	0.0	0.0	0.0	2.79	49.2	0.0
S29.001	50.00	4.19	98.163	0.023	0.0	0.0	0.0	3.17	55.9	4.2
S31.000	50.00	4.06	98.312	0.000	0.0	0.0	0.0	2.58	45.5	0.0
S32.000	50.00	4.14	97.924	0.000	0.0	0.0	0.0	1.46	25.8	0.0
S31.001	50.00	4.23	97.661	0.040	0.0	0.0	0.0	1.30	23.0	7.3
S23.006	50.00	4.88	96.705	0.154	0.0	0.0	0.0	1.29	91.2	27.9
S23.007	50.00	4.93	96.655	0.154	0.0	0.0	0.0	2.12	149.9	27.9
S33.000	50.00	4.16	99.001	0.000	0.0	0.0	0.0	1.30	23.0	0.0

Network Design Table for Storm - SIte Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S34.000	7.550	0.624	12.1	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S33.001	3.750	0.506	7.4	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S35.000	10.049	0.938	10.7	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S36.000	12.551	0.209	60.1	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S35.001	6.750	0.112	60.3	0.038	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S33.002	11.653	0.146	80.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S33.003	4.854	0.061	79.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S33.004	13.831	0.173	80.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.008	17.500	0.405	43.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S37.000	9.000	0.050	180.0	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S37.001	6.900	0.050	138.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S38.000	10.050	0.563	17.9	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S39.000	12.550	0.318	39.5	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S38.001	4.550	0.076	59.9	0.022	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S34.000	50.00	4.04	99.916	0.000	0.0	0.0	0.0	2.91	51.5	0.0
S33.001	50.00	4.18	98.792	0.020	0.0	0.0	0.0	3.73	65.8	3.6
S35.000	50.00	4.05	99.336	0.000	0.0	0.0	0.0	3.10	54.7	0.0
S36.000	50.00	4.16	98.607	0.000	0.0	0.0	0.0	1.30	23.0	0.0
S35.001	50.00	4.25	98.398	0.038	0.0	0.0	0.0	1.30	22.9	6.9
S33.002	50.00	4.42	98.286	0.058	0.0	0.0	0.0	1.12	19.9	10.4
S33.003	50.00	4.49	98.140	0.058	0.0	0.0	0.0	1.13	19.9	10.4
S33.004	50.00	4.70	98.079	0.058	0.0	0.0	0.0	1.12	19.9	10.4
S23.008	50.00	5.08	96.605	0.212	0.0	0.0	0.0	2.00	79.3	38.3
S37.000	50.00	4.13	96.400	0.000	0.0	0.0	0.0	1.17	82.6	0.0
S37.001	50.00	4.21	96.350	0.000	0.0	0.0	0.0	1.34	94.5	0.0
S38.000	50.00	4.07	97.935	0.000	0.0	0.0	0.0	2.40	42.3	0.0
S39.000	50.00	4.13	97.690	0.000	0.0	0.0	0.0	1.61	28.4	0.0
S38.001	50.00	4.19	97.372	0.022	0.0	0.0	0.0	1.30	23.0	4.0

Network Design Table for Storm - SIte Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S40.000	12.550	0.383	32.8	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S41.000	10.050	0.408	24.6	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S40.001	7.150	0.409	17.5	0.034	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S37.002	7.150	0.050	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S37.003	7.150	0.050	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S23.009	17.700	0.525	33.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S42.000	33.267	1.865	17.8	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S42.001	4.359	0.073	59.7	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.010	7.150	0.050	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S23.011	7.150	0.050	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S43.000	22.493	1.495	15.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S43.001	4.954	0.083	59.7	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S43.002	8.607	0.895	9.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S43.003	7.441	0.050	148.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S43.004	8.459	0.050	169.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S44.000	10.050	0.183	54.9	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S45.000	12.550	0.209	60.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S40.000	50.00	4.12	97.242	0.000	0.0	0.0	0.0	1.76	31.2	0.0
S41.000	50.00	4.08	97.267	0.000	0.0	0.0	0.0	2.04	36.0	0.0
S40.001	50.00	4.17	96.859	0.034	0.0	0.0	0.0	2.42	42.8	6.1
S37.002	50.00	4.31	96.300	0.056	0.0	0.0	0.0	1.31	92.8	10.1
S37.003	50.00	4.40	96.250	0.056	0.0	0.0	0.0	1.31	92.8	10.1
S23.009	50.00	5.21	96.200	0.268	0.0	0.0	0.0	2.26	89.9	48.4
S42.000	50.00	4.23	98.403	0.000	0.0	0.0	0.0	2.40	42.3	0.0
S42.001	50.00	4.29	96.538	0.021	0.0	0.0	0.0	1.30	23.0	3.8
S23.010	50.00	5.30	95.600	0.289	0.0	0.0	0.0	1.31	92.8	52.1
S23.011	50.00	5.39	95.550	0.289	0.0	0.0	0.0	1.31	92.8	52.1
S43.000	50.00	4.14	98.223	0.000	0.0	0.0	0.0	2.61	46.1	0.0
S43.001	50.00	4.21	96.728	0.017	0.0	0.0	0.0	1.30	23.0	3.0
S43.002	50.00	4.25	96.645	0.017	0.0	0.0	0.0	3.27	57.8	3.0
S43.003	50.00	4.35	95.600	0.017	0.0	0.0	0.0	1.29	90.9	3.0
S43.004	50.00	4.46	95.550	0.017	0.0	0.0	0.0	1.21	85.2	3.0
S44.000	50.00	4.12	96.982	0.000	0.0	0.0	0.0	1.36	24.0	0.0
S45.000	50.00	4.16	97.008	0.000	0.0	0.0	0.0	1.30	23.0	0.0

Network Design Table for Storm - SIte Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S44.001	4.350	0.373	11.7	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.012	7.150	0.050	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S46.000	16.100	0.468	34.4	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S47.000	16.750	0.279	60.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.013	4.649	0.050	93.0	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S48.000	9.722	0.162	60.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.014	9.249	0.642	14.4	0.010	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S23.015	15.498	0.050	310.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S23.016	19.976	0.050	399.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S49.000	22.165	0.261	84.9	0.028	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S49.001	13.389	0.423	31.7	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S49.002	13.275	0.191	69.5	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S49.003	16.968	0.160	106.0	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S49.004	12.740	0.082	155.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S50.000	15.503	0.103	150.5	0.109	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S50.001	12.033	0.060	200.6	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S50.002	8.731	0.044	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S44.001	50.00	4.19	96.799	0.024	0.0	0.0	0.0	2.97	52.4	4.4
S23.012	50.00	5.48	95.500	0.330	0.0	0.0	0.0	1.31	92.8	59.5
S46.000	50.00	4.16	96.844	0.000	0.0	0.0	0.0	1.72	30.4	0.0
S47.000	50.00	4.21	96.434	0.000	0.0	0.0	0.0	1.30	23.0	0.0
S23.013	50.00	5.53	95.450	0.382	0.0	0.0	0.0	1.63	115.3	69.0
S48.000	50.00	4.12	96.194	0.000	0.0	0.0	0.0	1.30	23.0	0.0
S23.014	50.00	5.57	95.400	0.392	0.0	0.0	0.0	3.47	137.8	70.7
S23.015	50.00	5.80	94.533	0.392	0.0	0.0	0.0	1.15	182.8	70.7
S23.016	50.00	6.13	94.483	0.392	0.0	0.0	0.0	1.01	160.8	70.7
S49.000	50.00	4.26	95.550	0.028	0.0	0.0	0.0	1.42	56.5	5.1
S49.001	50.00	4.36	95.289	0.040	0.0	0.0	0.0	2.33	92.8	7.2
S49.002	50.00	4.50	94.866	0.046	0.0	0.0	0.0	1.57	62.5	8.4
S49.003	50.00	4.72	94.675	0.051	0.0	0.0	0.0	1.27	50.5	9.2
S49.004	50.00	4.92	94.515	0.051	0.0	0.0	0.0	1.05	41.6	9.2
S50.000	50.00	4.24	94.715	0.109	0.0	0.0	0.0	1.06	42.3	19.7
S50.001	50.00	4.42	94.537	0.177	0.0	0.0	0.0	1.11	78.2	32.0
S50.002	50.00	4.56	94.477	0.177	0.0	0.0	0.0	1.11	78.3	32.0

Network Design Table for Storm - SIte Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S23.017	5.868	0.059	99.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.018	10.351	0.104	99.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S23.019	4.724	0.035	135.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.017	50.00	6.22	94.433	0.620	0.0	0.0	0.0	1.01	17.8«	111.9
S23.018	50.00	6.39	94.374	0.620	0.0	0.0	0.0	1.01	17.8«	111.9
S23.019	50.00	6.49	94.270	0.620	0.0	0.0	0.0	0.86	15.3«	111.9

Manhole Schedules for Storm - SIte Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SWP-1	101.310	1.050	Open Manhole	1200	S23.000	100.260	150				
SWP-2	100.271	1.054	Open Manhole	1200	S23.001	99.217	150	S23.000	99.217	150	
SWP-3	100.123	0.606	Junction		S24.000	99.517	150				
SWP-4	100.200	1.050	Open Manhole	1200	S25.000	99.150	150				
SWP-5	100.043	1.056	Open Manhole	1200	S24.001	98.987	150	S24.000	98.987	150	
								S25.000	98.987	150	
SWP-6	99.998	1.300	Open Manhole	1200	S23.002	98.698	150	S23.001	98.698	150	
								S24.001	98.698	150	
SWP-7	100.296	0.650	Junction		S26.000	99.646	150				
SWP-8	99.835	1.300	Open Manhole	600	S26.001	98.535	150	S26.000	98.535	150	
SWP-9	100.015	0.606	Junction		S27.000	99.409	150				
SWP-10	99.917	1.150	Open Manhole	600	S27.001	98.767	150	S27.000	98.767	150	
SWP-11	99.790	1.340	Open Manhole	1200	S23.003	98.450	150	S23.002	98.450	150	
								S26.001	98.450	150	
								S27.001	98.450	150	
SWP-12	99.776	0.650	Junction		S28.000	99.126	150				
SWP-13	98.977	1.284	Open Manhole	600	S28.001	97.693	150	S28.000	97.693	150	
SWP-14	98.879	2.074	Open Manhole	1200	S23.004	96.805	300	S23.003	96.955	150	
								S28.001	97.610	150	655
SWP-TANK 1	98.959	2.204	Junction		S23.005	96.755	300	S23.004	96.755	300	
SWP-16	99.033	0.661	Junction		S29.000	98.372	150				
SWP-17	99.622	0.699	Junction		S30.000	98.923	150				
SWP-18	99.388	1.225	Open Manhole	600	S29.001	98.163	150	S29.000	98.163	150	
								S30.000	98.163	150	
SWP-19	98.989	0.677	Junction		S31.000	98.312	150				
SWP-20	98.586	0.662	Junction		S32.000	97.924	150				
SWP-21	98.819	1.158	Open Manhole	600	S31.001	97.661	150	S31.000	97.661	150	
								S32.000	97.661	150	
SWP-22	99.135	2.430	Open Manhole	1200	S23.006	96.705	300	S23.005	96.705	300	
								S29.001	97.680	150	825
								S31.001	97.548	150	693
SWP-TANK 2	99.299	2.644	Junction		S23.007	96.655	300	S23.006	96.655	300	
SWP-24	99.669	0.668	Junction		S33.000	99.001	150				
SWP-25	100.479	0.563	Junction		S34.000	99.916	150				
SWP-26	100.197	1.405	Open Manhole	600	S33.001	98.792	150	S33.000	98.792	150	
								S34.000	99.292	150	500
SWP-27	99.973	0.637	Junction		S35.000	99.336	150				
SWP-28	99.269	0.662	Junction		S36.000	98.607	150				
SWP-29	99.658	1.260	Open Manhole	600	S35.001	98.398	150	S35.000	98.398	150	
								S36.000	98.398	150	
SWP-30	99.974	1.688	Open Manhole	1200	S33.002	98.286	150	S33.001	98.286	150	
								S35.001	98.286	150	
SWP-31	100.381	2.241	Open Manhole	1200	S33.003	98.140	150	S33.002	98.140	150	
SWP-32	99.994	1.915	Open Manhole	1200	S33.004	98.079	150	S33.003	98.079	150	

Manhole Schedules for Storm - SIte Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SWP-HB1	99.196	2.666	Open Manhole	1500	S23.008	96.605	225	S23.007	96.530	300	
								S33.004	97.906	150	1226
SWP-34	98.221	1.821	Open Manhole	1200	S37.000	96.400	300				
SWP-TANK 3	98.239	1.889	Junction		S37.001	96.350	300	S37.000	96.350	300	
SWP-36	98.634	0.699	Junction		S38.000	97.935	150				
SWP-37	98.347	0.657	Junction		S39.000	97.690	150				
SWP-38	98.521	1.149	Open Manhole	600	S38.001	97.372	150	S38.000	97.372	150	
								S39.000	97.372	150	
SWP-39	97.896	0.654	Junction		S40.000	97.242	150				
SWP-40	98.001	0.734	Junction		S41.000	97.267	150				
SWP-41	97.965	1.106	Open Manhole	600	S40.001	96.859	150	S40.000	96.859	150	
								S41.000	96.859	150	
SWP-42	98.289	1.989	Open Manhole	1200	S37.002	96.300	300	S37.001	96.300	300	
								S38.001	97.296	150	846
								S40.001	96.450	150	
SWP-TANK 4	98.360	2.110	Junction		S37.003	96.250	300	S37.002	96.250	300	
SWP-HB2	98.326	2.126	Open Manhole	1500	S23.009	96.200	225	S23.008	96.200	225	
								S37.003	96.200	300	
SWP-45	99.130	0.727	Junction		S42.000	98.403	150				
SWP-46	97.577	1.039	Open Manhole	600	S42.001	96.538	150	S42.000	96.538	150	
SWP-47	97.439	1.839	Open Manhole	1200	S23.010	95.600	300	S23.009	95.675	225	
								S42.001	96.465	150	715
SWP-TANK 6	97.425	1.875	Junction		S23.011	95.550	300	S23.010	95.550	300	
SWP-49	98.868	0.645	Junction		S43.000	98.223	150				
SWP-50	98.013	1.285	Open Manhole	600	S43.001	96.728	150	S43.000	96.728	150	
SWP-51	97.879	1.234	Open Manhole	1200	S43.002	96.645	150	S43.001	96.645	150	
SWP-52	97.553	1.953	Open Manhole	1200	S43.003	95.600	300	S43.002	95.750	150	
SWP-TANK 5	97.477	1.927	Junction		S43.004	95.550	300	S43.003	95.550	300	
SWP-54	97.653	0.671	Junction		S44.000	96.982	150				
SWP-55	97.662	0.654	Junction		S45.000	97.008	150				
SWP-56	97.733	0.934	Open Manhole	600	S44.001	96.799	150	S44.000	96.799	150	
								S45.000	96.799	150	
SWP-57	97.472	1.972	Open Manhole	1200	S23.012	95.500	300	S23.011	95.500	300	
								S43.004	95.500	300	
								S44.001	96.426	150	776
SWP-58	97.494	0.650	Junction		S46.000	96.844	150				
SWP-59	97.143	0.709	Junction		S47.000	96.434	150				
SWP-60	97.104	1.654	Open Manhole	1200	S23.013	95.450	300	S23.012	95.450	300	
								S46.000	96.376	150	776
								S47.000	96.155	150	555
SWP-61	97.264	1.070	Open Manhole	600	S48.000	96.194	150				
SWP-HB3	97.112	1.712	Open Manhole	1500	S23.014	95.400	225	S23.013	95.400	300	
								S48.000	96.032	150	557
SWP-63	96.688	2.155	Open Manhole	1500	S23.015	94.533	450	S23.014	94.758	225	

Manhole Schedules for Storm - SIte Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SWP-TANK 7	96.394	1.911	Junction		S23.016	94.483	450	S23.015	94.483	450	
SWP-65	97.337	1.787	Open Manhole	600	S49.000	95.550	225				
SWP-66	96.750	1.461	Open Manhole	600	S49.001	95.289	225	S49.000	95.289	225	
SWP-67	96.359	1.493	Open Manhole	600	S49.002	94.866	225	S49.001	94.866	225	
SWP-68	96.115	1.440	Open Manhole	600	S49.003	94.675	225	S49.002	94.675	225	
SWP-69	96.532	2.017	Open Manhole	1200	S49.004	94.515	225	S49.003	94.515	225	
SWP-70	96.174	1.459	Open Manhole	1200	S50.000	94.715	225				
SWP-71	95.990	1.453	Open Manhole	1200	S50.001	94.537	300	S50.000	94.612	225	
SWP-72	96.266	1.789	Open Manhole	1200	S50.002	94.477	300	S50.001	94.477	300	
SWP-CC1	96.346	1.913	Open Manhole	2400	S23.017	94.433	150	S23.016	94.433	450	
								S49.004	94.433	225	
								S50.002	94.433	300	
SWP-PI	96.248	1.874	Junction		S23.018	94.374	150	S23.017	94.374	150	
SWP-75	95.960	1.690	Open Manhole	1200	S23.019	94.270	150	S23.018	94.270	150	
SWP-EXTG	95.780	1.545	Open Manhole	0		OUTFALL		S23.019	94.235	150	

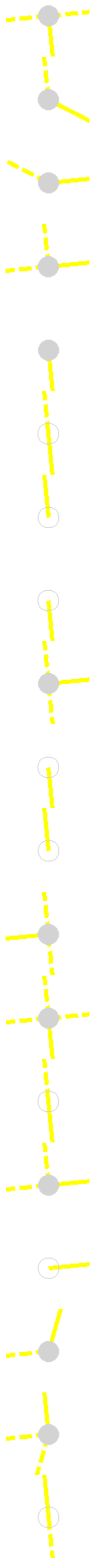
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWP-1	420798.397	529957.316	420798.397	529957.316	Required	
SWP-2	420816.281	529966.851	420816.281	529966.851	Required	
SWP-3	420821.559	529962.703			No Entry	
SWP-4	420829.751	529959.702	420829.751	529959.702	Required	
SWP-5	420829.376	529963.479	420829.376	529963.479	Required	
SWP-6	420828.916	529968.106	420828.916	529968.106	Required	
SWP-7	420821.224	529972.317			No Entry	
SWP-8	420838.688	529974.052	420838.688	529974.052	Required	
SWP-9	420833.015	529963.841			No Entry	
SWP-10	420840.832	529964.617	420840.832	529964.617	Required	

Manhole Schedules for Storm - SIte Network

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWP-11	420840.372	529969.245	420840.372	529969.245	Required	
SWP-12	420841.873	529974.368			No Entry	
SWP-13	420867.347	529976.899	420867.347	529976.899	Required	
SWP-14	420867.140	529971.904	420867.140	529971.904	Required	
SWP-TANK 1	420867.962	529963.632			No Entry	
SWP-16	420862.546	529968.081			No Entry	
SWP-17	420864.780	529945.592			No Entry	
SWP-18	420863.786	529955.593	420863.786	529955.593	Required	
SWP-19	420876.423	529946.749			No Entry	
SWP-20	420874.188	529969.238			No Entry	
SWP-21	420875.429	529956.749	420875.429	529956.749	Required	
SWP-22	420868.712	529956.082	420868.712	529956.082	Required	
SWP-TANK 2	420869.443	529948.721			No Entry	
SWP-24	420845.927	529966.430			No Entry	
SWP-25	420847.915	529946.429			No Entry	
SWP-26	420847.168	529953.942	420847.168	529953.942	Required	
SWP-27	420858.610	529944.979			No Entry	
SWP-28	420856.376	529967.468			No Entry	
SWP-29	420857.617	529954.979	420857.617	529954.979	Required	

Manhole Schedules for Storm - SIte Network

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWP-30	420850.900	529954.312	420850.900	529954.312	Required	
SWP-31	420852.052	529942.716	420852.052	529942.716	Required	
SWP-32	420856.362	529940.485	420856.362	529940.485	Required	
SWP-HB1	420870.126	529941.852	420870.126	529941.852	Required	
SWP-34	420884.554	529973.634	420884.554	529973.634	Required	
SWP-TANK 3	420885.444	529964.678			No Entry	
SWP-36	420882.592	529947.361			No Entry	
SWP-37	420880.358	529969.851			No Entry	
SWP-38	420881.599	529957.362	420881.599	529957.362	Required	
SWP-39	420892.001	529971.007			No Entry	
SWP-40	420894.235	529948.518			No Entry	
SWP-41	420893.241	529958.519	420893.241	529958.519	Required	
SWP-42	420886.126	529957.812	420886.126	529957.812	Required	
SWP-TANK 4	420886.833	529950.697			No Entry	
SWP-HB2	420887.540	529943.582	420887.540	529943.582	Required	
SWP-45	420870.846	529937.854			No Entry	
SWP-46	420903.950	529941.143	420903.950	529941.143	Required	
SWP-47	420905.153	529945.332	420905.153	529945.332	Required	
SWP-TANK 6	420904.447	529952.447			No Entry	

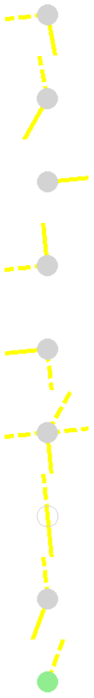


Manhole Schedules for Storm - SIte Network

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWP-49	420870.532	529977.215			No Entry	
SWP-50	420892.915	529979.439	420892.915	529979.439	Required	
SWP-51	420893.603	529974.533	420893.603	529974.533	Required	
SWP-52	420902.168	529975.384	420902.168	529975.384	Required	
SWP-TANK 5	420902.903	529967.979			No Entry	
SWP-54	420900.405	529949.131			No Entry	
SWP-55	420898.170	529971.620			No Entry	
SWP-56	420899.411	529959.132	420899.411	529959.132	Required	
SWP-57	420903.740	529959.562	420903.740	529959.562	Required	
SWP-58	420909.263	529976.290			No Entry	
SWP-59	420912.511	529943.601			No Entry	
SWP-60	420910.855	529960.269	420910.855	529960.269	Required	
SWP-61	420914.707	529970.420	420914.707	529970.420	Required	
SWP-HB3	420915.481	529960.729	420915.481	529960.729	Required	
SWP-63	420924.728	529960.531	420924.728	529960.531	Required	
SWP-TANK 7	420940.150	529962.064			No Entry	
SWP-65	420914.571	529986.996	420914.571	529986.996	Required	
SWP-66	420936.628	529989.188	420936.628	529989.188	Required	
SWP-67	420949.951	529990.511	420949.951	529990.511	Required	

Manhole Schedules for Storm - SIte Network

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWP-68	420963.161	529991.824	420963.161	529991.824	Required	
SWP-69	420966.272	529975.144	420966.272	529975.144	Required	
SWP-70	420954.479	529951.395	420954.479	529951.395	Required	
SWP-71	420969.906	529952.927	420969.906	529952.927	Required	
SWP-72	420968.716	529964.902	420968.716	529964.902	Required	
SWP-CC1	420960.028	529964.039	420960.028	529964.039	Required	
SWP-PI	420960.608	529958.199			No Entry	
SWP-75	420961.632	529947.898	420961.632	529947.898	Required	
SWP-EXTG	420960.014	529943.461			No Entry	



Area Summary for Storm - SIte Network

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
23.000	Classification	Soft Landscape	50	0.008	0.004	0.004
	Classification	Soft Landscape	50	0.013	0.007	0.011
	Classification	Hard Landscape	100	0.007	0.007	0.018
23.001	Classification	Roof	100	0.006	0.006	0.006
	Classification	Soft Landscape	50	0.005	0.002	0.009
	Classification	Soft Landscape	50	0.003	0.002	0.010
24.000	-	-	100	0.000	0.000	0.000
25.000	-	-	100	0.000	0.000	0.000
24.001	-	-	100	0.000	0.000	0.000
23.002	-	-	100	0.000	0.000	0.000
26.000	-	-	100	0.000	0.000	0.000
26.001	Classification	Soft Landscape	50	0.009	0.005	0.005
	Classification	Permeable Paving	100	0.009	0.009	0.013
27.000	-	-	100	0.000	0.000	0.000
27.001	Classification	Permeable Paving	100	0.011	0.011	0.011
	Classification	Soft Landscape	50	0.005	0.003	0.013
	Classification	Road	100	0.013	0.013	0.026
23.003	Classification	Hard Landscape	100	0.005	0.005	0.005
28.000	-	-	100	0.000	0.000	0.000
28.001	Classification	Permeable Paving	100	0.014	0.014	0.014
	Classification	Soft Landscape	50	0.009	0.005	0.019
23.004	-	-	100	0.000	0.000	0.000
23.005	-	-	100	0.000	0.000	0.000
29.000	-	-	100	0.000	0.000	0.000
30.000	-	-	100	0.000	0.000	0.000
29.001	Classification	Permeable Paving	100	0.013	0.013	0.013
	Classification	Soft Landscape	50	0.003	0.002	0.014
	Classification	Road	100	0.005	0.005	0.019
	Classification	Road	100	0.005	0.005	0.023
31.000	-	-	100	0.000	0.000	0.000
32.000	-	-	100	0.000	0.000	0.000
31.001	Classification	Permeable Paving	100	0.012	0.012	0.012
	Classification	Road	100	0.028	0.028	0.040
23.006	-	-	100	0.000	0.000	0.000
23.007	-	-	100	0.000	0.000	0.000
33.000	-	-	100	0.000	0.000	0.000
34.000	-	-	100	0.000	0.000	0.000
33.001	Classification	Permeable Paving	100	0.011	0.011	0.011
	Classification	Soft Landscape	50	0.010	0.005	0.016
	Classification	Road	100	0.004	0.004	0.020
35.000	-	-	100	0.000	0.000	0.000
36.000	-	-	100	0.000	0.000	0.000
35.001	Classification	Permeable Paving	100	0.012	0.012	0.012
	Classification	Road	100	0.025	0.025	0.038
33.002	-	-	100	0.000	0.000	0.000
33.003	-	-	100	0.000	0.000	0.000
33.004	-	-	100	0.000	0.000	0.000
23.008	-	-	100	0.000	0.000	0.000
37.000	-	-	100	0.000	0.000	0.000
37.001	-	-	100	0.000	0.000	0.000
38.000	-	-	100	0.000	0.000	0.000
39.000	-	-	100	0.000	0.000	0.000
38.001	Classification	Permeable Paving	100	0.013	0.013	0.013
	Classification	Soft Landscape	50	0.003	0.001	0.014
	Classification	Road	100	0.004	0.004	0.018
	Classification	Road	100	0.004	0.004	0.022
40.000	-	-	100	0.000	0.000	0.000
41.000	-	-	100	0.000	0.000	0.000
40.001	Classification	Permeable Paving	100	0.010	0.010	0.010

Area Summary for Storm - SIte Network

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Road	100	0.024	0.024	0.034
37.002	-	-	100	0.000	0.000	0.000
37.003	-	-	100	0.000	0.000	0.000
23.009	-	-	100	0.000	0.000	0.000
42.000	-	-	100	0.000	0.000	0.000
42.001	Classification	Permeable Paving	100	0.019	0.019	0.019
	Classification	Soft Landscape	50	0.004	0.002	0.021
23.010	-	-	100	0.000	0.000	0.000
23.011	-	-	100	0.000	0.000	0.000
43.000	-	-	100	0.000	0.000	0.000
43.001	Classification	Permeable Paving	100	0.012	0.012	0.012
	Classification	Soft Landscape	50	0.009	0.004	0.017
43.002	-	-	100	0.000	0.000	0.000
43.003	-	-	100	0.000	0.000	0.000
43.004	-	-	100	0.000	0.000	0.000
44.000	-	-	100	0.000	0.000	0.000
45.000	-	-	100	0.000	0.000	0.000
44.001	Classification	Permeable Paving	100	0.010	0.010	0.010
	Classification	Soft Landscape	50	0.002	0.001	0.011
	Classification	Road	100	0.009	0.009	0.020
	Classification	Road	100	0.004	0.004	0.024
23.012	-	-	100	0.000	0.000	0.000
46.000	-	-	100	0.000	0.000	0.000
47.000	-	-	100	0.000	0.000	0.000
23.013	Classification	Permeable Paving	100	0.017	0.017	0.017
	Classification	Soft Landscape	50	0.003	0.002	0.018
	Classification	Road	100	0.034	0.034	0.052
48.000	-	-	100	0.000	0.000	0.000
23.014	Classification	Hard Landscape	100	0.006	0.006	0.006
	Classification	Hard Landscape	100	0.003	0.003	0.010
23.015	-	-	100	0.000	0.000	0.000
23.016	-	-	100	0.000	0.000	0.000
49.000	Classification	Roof	100	0.015	0.015	0.015
	Classification	Hard Landscape	100	0.013	0.013	0.028
49.001	Classification	Hard Landscape	100	0.010	0.010	0.010
	Classification	Soft Landscape	50	0.004	0.002	0.011
49.002	Classification	Hard Landscape	100	0.005	0.005	0.005
	Classification	Soft Landscape	50	0.002	0.001	0.007
49.003	Classification	Hard Landscape	100	0.003	0.003	0.003
	Classification	Soft Landscape	50	0.002	0.001	0.004
49.004	-	-	100	0.000	0.000	0.000
50.000	Classification	Road	100	0.109	0.109	0.109
50.001	Classification	Road	100	0.068	0.068	0.068
50.002	-	-	100	0.000	0.000	0.000
23.017	-	-	100	0.000	0.000	0.000
23.018	-	-	100	0.000	0.000	0.000
23.019	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.667	0.620	0.620

Network Classifications for Storm - SIte Network

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S23.000	SWP-1	150	0.715	0.904	Unclassified	1200	0	0.900	Unclassified
S23.001	SWP-2	150	0.904	1.150	Unclassified	1200	0	0.904	Unclassified
S24.000	SWP-3	150	0.456	0.906	Unclassified				Junction
S25.000	SWP-4	150	0.851	0.906	Unclassified	1200	0	0.900	Unclassified
S24.001	SWP-5	150	0.906	1.150	Unclassified	1200	0	0.906	Unclassified
S23.002	SWP-6	150	1.150	1.200	Unclassified	1200	0	1.150	Unclassified
S26.000	SWP-7	150	0.500	1.150	Unclassified				Junction
S26.001	SWP-8	150	1.150	1.190	Unclassified	600	0	1.150	Unclassified
S27.000	SWP-9	150	0.456	1.000	Unclassified				Junction
S27.001	SWP-10	150	1.000	1.190	Unclassified	600	0	1.000	Unclassified
S23.003	SWP-11	150	1.190	1.774	Unclassified	1200	0	1.190	Unclassified
S28.000	SWP-12	150	0.500	1.134	Unclassified				Junction
S28.001	SWP-13	150	1.119	1.134	Unclassified	600	0	1.134	Unclassified
S23.004	SWP-14	300	1.738	1.904	Unclassified	1200	0	1.774	Unclassified
S23.005	SWP-TANK 1	300	1.904	2.130	Unclassified				Junction
S29.000	SWP-16	150	0.511	1.075	Unclassified				Junction
S30.000	SWP-17	150	0.549	1.075	Unclassified				Junction
S29.001	SWP-18	150	1.075	1.305	Unclassified	600	0	1.075	Unclassified
S31.000	SWP-19	150	0.527	1.008	Unclassified				Junction
S32.000	SWP-20	150	0.512	1.008	Unclassified				Junction
S31.001	SWP-21	150	1.008	1.437	Unclassified	600	0	1.008	Unclassified
S23.006	SWP-22	300	2.130	2.344	Unclassified	1200	0	2.130	Unclassified
S23.007	SWP-TANK 2	300	2.344	2.480	Unclassified				Junction
S33.000	SWP-24	150	0.518	1.255	Unclassified				Junction
S34.000	SWP-25	150	0.413	0.755	Unclassified				Junction
S33.001	SWP-26	150	1.255	1.538	Unclassified	600	0	1.255	Unclassified
S35.000	SWP-27	150	0.487	1.110	Unclassified				Junction
S36.000	SWP-28	150	0.512	1.110	Unclassified				Junction
S35.001	SWP-29	150	1.110	1.538	Unclassified	600	0	1.110	Unclassified
S33.002	SWP-30	150	1.538	2.091	Unclassified	1200	0	1.538	Unclassified
S33.003	SWP-31	150	1.765	2.091	Unclassified	1200	0	2.091	Unclassified
S33.004	SWP-32	150	1.140	1.765	Unclassified	1200	0	1.765	Unclassified
S23.008	SWP-HB1	225	1.901	2.366	Unclassified	1500	0	2.366	Unclassified
S37.000	SWP-34	300	1.482	1.589	Unclassified	1200	0	1.521	Unclassified
S37.001	SWP-TANK 3	300	1.589	1.689	Unclassified				Junction
S38.000	SWP-36	150	0.549	0.999	Unclassified				Junction
S39.000	SWP-37	150	0.507	0.999	Unclassified				Junction
S38.001	SWP-38	150	0.843	0.999	Unclassified	600	0	0.999	Unclassified
S40.000	SWP-39	150	0.504	0.956	Unclassified				Junction
S41.000	SWP-40	150	0.584	0.956	Unclassified				Junction
S40.001	SWP-41	150	0.956	1.689	Unclassified	600	0	0.956	Unclassified
S37.002	SWP-42	300	1.689	1.810	Unclassified	1200	0	1.689	Unclassified
S37.003	SWP-TANK 4	300	1.810	1.872	Unclassified				Junction
S23.009	SWP-HB2	225	1.539	1.901	Unclassified	1500	0	1.901	Unclassified
S42.000	SWP-45	150	0.558	0.889	Unclassified				Junction
S42.001	SWP-46	150	0.824	0.889	Unclassified	600	0	0.889	Unclassified
S23.010	SWP-47	300	1.528	1.575	Unclassified	1200	0	1.539	Unclassified
S23.011	SWP-TANK 6	300	1.575	1.672	Unclassified				Junction
S43.000	SWP-49	150	0.495	1.135	Unclassified				Junction
S43.001	SWP-50	150	1.084	1.135	Unclassified	600	0	1.135	Unclassified
S43.002	SWP-51	150	1.084	1.653	Unclassified	1200	0	1.084	Unclassified
S43.003	SWP-52	300	1.612	1.653	Unclassified	1200	0	1.653	Unclassified
S43.004	SWP-TANK 5	300	1.627	1.672	Unclassified				Junction
S44.000	SWP-54	150	0.521	0.784	Unclassified				Junction
S45.000	SWP-55	150	0.504	0.784	Unclassified				Junction
S44.001	SWP-56	150	0.784	0.896	Unclassified	600	0	0.784	Unclassified
S23.012	SWP-57	300	1.354	1.672	Unclassified	1200	0	1.672	Unclassified

Network Classifications for Storm - SIte Network

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S46.000	SWP-58	150	0.364	0.578	Unclassified				Junction
S47.000	SWP-59	150	0.514	0.799	Unclassified				Junction
S23.013	SWP-60	300	1.354	1.505	Unclassified	1200	0	1.354	Unclassified
S48.000	SWP-61	150	0.880	0.930	Unclassified	600	0	0.920	Unclassified
S23.014	SWP-HB3	225	1.487	1.705	Unclassified	1500	0	1.487	Unclassified
S23.015	SWP-63	450	1.461	1.705	Unclassified	1500	0	1.705	Unclassified
S23.016	SWP-TANK 7	450	1.455	1.468	Unclassified				Junction
S49.000	SWP-65	225	1.236	1.562	Unclassified	600	0	1.562	Unclassified
S49.001	SWP-66	225	1.236	1.421	Unclassified	600	0	1.236	Unclassified
S49.002	SWP-67	225	1.215	1.440	Unclassified	600	0	1.268	Unclassified
S49.003	SWP-68	225	1.215	1.792	Unclassified	600	0	1.215	Unclassified
S49.004	SWP-69	225	1.688	1.792	Unclassified	1200	0	1.792	Unclassified
S50.000	SWP-70	225	1.153	1.234	Unclassified	1200	0	1.234	Unclassified
S50.001	SWP-71	300	1.153	1.489	Unclassified	1200	0	1.153	Unclassified
S50.002	SWP-72	300	1.489	1.654	Unclassified	1200	0	1.489	Unclassified
S23.017	SWP-CC1	150	1.724	1.763	Unclassified	2400	0	1.763	Unclassified
S23.018	SWP-PI	150	1.540	1.724	Unclassified				Junction
S23.019	SWP-75	150	1.395	1.673	Unclassified	1200	0	1.540	Unclassified

Free Flowing Outfall Details for Storm - SIte Network

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S23.019	SWP-EXTG	95.780	94.235	94.160	0	0

Simulation Criteria for Storm - SIte Network

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	3
Number of Online Controls	4	Number of Storage Structures	20	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.336		

Online Controls for Storm - SIte Network

Hydro-Brake® Optimum Manhole: SWP-HB1, DS/PN: S23.008, Volume (m³): 5.2

Unit Reference	MD-SHE-0097-4500-1250-4500
Design Head (m)	1.250
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	96.605
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.250	4.5	Kick-Flo®	0.771	3.6
Flush-Flo™	0.372	4.5	Mean Flow over Head Range	-	3.9

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.1	0.800	3.7	2.000	5.6	4.000	7.8	7.000	10.1
0.200	4.2	1.000	4.1	2.200	5.9	4.500	8.2	7.500	10.4
0.300	4.5	1.200	4.4	2.400	6.1	5.000	8.6	8.000	10.8
0.400	4.5	1.400	4.7	2.600	6.3	5.500	9.0	8.500	11.1
0.500	4.4	1.600	5.0	3.000	6.8	6.000	9.4	9.000	11.4
0.600	4.3	1.800	5.3	3.500	7.3	6.500	9.8	9.500	11.7

Hydro-Brake® Optimum Manhole: SWP-HB2, DS/PN: S23.009, Volume (m³): 4.8

Unit Reference	MD-SHE-0097-4000-0850-4000
Design Head (m)	0.850
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	96.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.850	4.0	Kick-Flo®	0.554	3.3
Flush-Flo™	0.254	4.0	Mean Flow over Head Range	-	3.5

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	0.300	4.0	0.500	3.6	0.800	3.9	1.200	4.7
0.200	4.0	0.400	3.9	0.600	3.4	1.000	4.3	1.400	5.0

Hydro-Brake® Optimum Manhole: SWP-HB2, DS/PN: S23.009, Volume (m³): 4.8

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
1.600	5.4	2.400	6.5	4.000	8.2	6.000	10.0	8.000	11.5
1.800	5.7	2.600	6.7	4.500	8.7	6.500	10.4	8.500	11.8
2.000	6.0	3.000	7.2	5.000	9.2	7.000	10.8	9.000	12.1
2.200	6.2	3.500	7.7	5.500	9.6	7.500	11.1	9.500	12.4

Hydro-Brake® Optimum Manhole: SWP-HB3, DS/PN: S23.014, Volume (m³): 3.4

Unit Reference	MD-SHE-0107-5000-0900-5000
Design Head (m)	0.900
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	95.400
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.900	5.0	Kick-Flo®	0.590	4.1
Flush-Flo™	0.271	5.0	Mean Flow over Head Range	-	4.3

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.6	0.800	4.7	2.000	7.2	4.000	10.1	7.000	13.1
0.200	4.9	1.000	5.2	2.200	7.6	4.500	10.6	7.500	13.6
0.300	5.0	1.200	5.7	2.400	7.9	5.000	11.2	8.000	14.0
0.400	4.9	1.400	6.1	2.600	8.2	5.500	11.7	8.500	14.4
0.500	4.6	1.600	6.5	3.000	8.8	6.000	12.2	9.000	14.8
0.600	4.1	1.800	6.9	3.500	9.4	6.500	12.7	9.500	15.2

Complex Manhole: SWP-CC1, DS/PN: S23.017, Volume (m³): 12.6

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0090-3000-0500-3000
Design Head (m)	0.500
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	94.433
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.500	3.0	Flush-Flo™	0.157	3.0

Hydro-Brake® Optimum

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Kick-Flo®	0.355	2.6	Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	0.800	3.7	2.000	5.7	4.000	7.9	7.000	10.4
0.200	3.0	1.000	4.1	2.200	6.0	4.500	8.4	7.500	10.7
0.300	2.8	1.200	4.5	2.400	6.2	5.000	8.8	8.000	11.1
0.400	2.7	1.400	4.8	2.600	6.4	5.500	9.2	8.500	11.4
0.500	3.0	1.600	5.1	3.000	6.9	6.000	9.6	9.000	11.8
0.600	3.3	1.800	5.4	3.500	7.4	6.500	10.0	9.500	12.1

Orifice

Diameter (m) 0.054 Discharge Coefficient 0.600 Invert Level (m) 94.933

Storage Structures for Storm - SIte Network

Porous Car Park Manhole: SWP-8, DS/PN: S26.001

```
Infiltration Coefficient Base (m/hr) 0.00000             Width (m)   5.0
        Membrane Percolation (mm/hr)    1000            Length (m)  20.7
              Max Percolation (l/s)     28.8           Slope (1:X)  25.3
                      Safety Factor      2.0 Depression Storage (mm)     5
                           Porosity     0.30    Evaporation (mm/day)     3
                     Invert Level (m)  99.505    Cap Volume Depth (m) 0.200
```

Porous Car Park Manhole: SWP-10, DS/PN: S27.001

```
Infiltration Coefficient Base (m/hr) 0.00000             Width (m)   5.0
        Membrane Percolation (mm/hr)    1000            Length (m)  20.0
              Max Percolation (l/s)     27.8           Slope (1:X)  25.8
                      Safety Factor      2.0 Depression Storage (mm)     5
                           Porosity     0.30    Evaporation (mm/day)     3
                     Invert Level (m)  99.643    Cap Volume Depth (m) 0.200
```

Porous Car Park Manhole: SWP-13, DS/PN: S28.001

```
Infiltration Coefficient Base (m/hr) 0.00000             Width (m)   5.0
        Membrane Percolation (mm/hr)    1000            Length (m)  28.8
              Max Percolation (l/s)     40.0           Slope (1:X)  24.0
                      Safety Factor      2.0 Depression Storage (mm)     5
                           Porosity     0.30    Evaporation (mm/day)     3
                     Invert Level (m)  98.663    Cap Volume Depth (m) 0.200
```

Cellular Storage Manhole: SWP-TANK 1, DS/PN: S23.005

```
                     Invert Level (m)  96.755 Safety Factor  2.0
Infiltration Coefficient Base (m/hr) 0.00000      Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000
```

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	48.0	48.0	1.200	48.0	86.4	1.201	0.0	86.4

Porous Car Park Manhole: SWP-18, DS/PN: S29.001

```
Infiltration Coefficient Base (m/hr) 0.00000             Width (m)   5.0
        Membrane Percolation (mm/hr)    1000            Length (m)  25.0
              Max Percolation (l/s)     34.7           Slope (1:X)  58.8
                      Safety Factor      2.0 Depression Storage (mm)     5
                           Porosity     0.30    Evaporation (mm/day)     3
                     Invert Level (m)  98.912    Cap Volume Depth (m) 0.200
```

Porous Car Park Manhole: SWP-21, DS/PN: S31.001

```
Infiltration Coefficient Base (m/hr) 0.00000             Width (m)   5.0
        Membrane Percolation (mm/hr)    1000            Length (m)  25.0
              Max Percolation (l/s)     34.7           Slope (1:X)  36.2
                      Safety Factor      2.0 Depression Storage (mm)     5
                           Porosity     0.30    Evaporation (mm/day)     3
                     Invert Level (m)  98.381    Cap Volume Depth (m) 0.200
```

Cellular Storage Manhole: SWP-TANK 2, DS/PN: S23.007

Invert Level (m)	96.655	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	40.0	40.0	1.200	40.0	73.6	1.201	0.0	73.6

Porous Car Park Manhole: SWP-26, DS/PN: S33.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	22.5
Max Percolation (l/s)	31.3	Slope (1:X)	34.4
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.601	Cap Volume Depth (m)	0.200

Porous Car Park Manhole: SWP-29, DS/PN: S35.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	38.8
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.166	Cap Volume Depth (m)	0.200

Cellular Storage Manhole: SWP-TANK 3, DS/PN: S37.001

Invert Level (m)	96.350	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	48.0	48.0	0.800	48.0	73.6	0.801	0.0	73.6

Porous Car Park Manhole: SWP-38, DS/PN: S38.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	24.7
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	98.092	Cap Volume Depth (m)	0.200

Porous Car Park Manhole: SWP-41, DS/PN: S40.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	41.7
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	97.579	Cap Volume Depth (m)	0.200

Cellular Storage Manhole: SWP-TANK 4, DS/PN: S37.003

Invert Level (m)	96.250	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	40.0	40.0	0.800	40.0	62.4	0.801	0.0	62.4

Porous Car Park Manhole: SWP-46, DS/PN: S42.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	35.0
Max Percolation (l/s)	48.6	Slope (1:X)	18.8
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	97.258	Cap Volume Depth (m)	0.200

Cellular Storage Manhole: SWP-TANK 6, DS/PN: S23.011

Invert Level (m)	95.550	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	40.0	40.0	0.800	40.0	62.4	0.801	0.0	62.4

Porous Car Park Manhole: SWP-50, DS/PN: S43.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	32.0
Max Percolation (l/s)	44.4	Slope (1:X)	31.8
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	97.690	Cap Volume Depth (m)	0.200

Cellular Storage Manhole: SWP-TANK 5, DS/PN: S43.004

Invert Level (m)	95.550	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	48.0	48.0	0.800	48.0	73.6	0.801	0.0	73.6

Porous Car Park Manhole: SWP-56, DS/PN: S44.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	35.7
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	97.364	Cap Volume Depth (m)	0.200

Porous Car Park Manhole: SWP-60, DS/PN: S23.013

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	34.2
Max Percolation (l/s)	47.5	Slope (1:X)	33.1
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	96.772	Membrane Depth (mm)	0

Cellular Storage Manhole: SWP-TANK 7, DS/PN: S23.016

Invert Level (m)	94.483	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	312.0	312.0	0.800	312.0	371.2	0.801	0.0	371.2

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

Simulation Criteria

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

Number of Input Hydrographs 0
Number of Online Controls 4
Number of Offline Controls 0
Number of Storage Structures 20
Number of Time/Area Diagrams 3
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 17.000
Ratio R 0.336
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 45, 45, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S23.000	SWP-1	15 Summer	1	+45%					100.293	-0.117
S23.001	SWP-2	15 Summer	1	+45%					99.259	-0.108
S24.000	SWP-3	15 Summer	1	+45%					99.517	-0.150
S25.000	SWP-4	15 Summer	1	+45%					99.150	-0.150
S24.001	SWP-5	15 Summer	1	+45%					98.987	-0.150
S23.002	SWP-6	15 Summer	1	+45%	100/15 Summer				98.749	-0.099
S26.000	SWP-7	15 Summer	1	+45%					99.646	-0.150
S26.001	SWP-8	15 Summer	1	+45%	100/15 Summer				98.575	-0.110
S27.000	SWP-9	15 Summer	1	+45%					99.409	-0.150
S27.001	SWP-10	15 Summer	1	+45%	100/15 Summer				98.803	-0.114
S23.003	SWP-11	15 Summer	1	+45%	100/15 Summer				98.508	-0.092
S28.000	SWP-12	15 Summer	1	+45%					99.126	-0.150
S28.001	SWP-13	15 Summer	1	+45%	100/240 Summer				97.741	-0.102
S23.004	SWP-14	120 Summer	1	+45%	30/15 Summer				96.933	-0.172
S23.005	SWP-TANK 1	120 Summer	1	+45%	30/15 Summer				96.932	-0.123
S29.000	SWP-16	15 Summer	1	+45%					98.372	-0.150
S30.000	SWP-17	15 Summer	1	+45%					98.923	-0.150
S29.001	SWP-18	15 Summer	1	+45%					98.195	-0.118
S31.000	SWP-19	15 Summer	1	+45%					98.312	-0.150
S32.000	SWP-20	15 Summer	1	+45%					97.924	-0.150
S31.001	SWP-21	15 Summer	1	+45%	30/15 Summer				97.723	-0.088
S23.006	SWP-22	120 Summer	1	+45%	30/15 Summer				96.931	-0.074
S23.007	SWP-TANK 2	120 Summer	1	+45%	30/15 Summer				96.929	-0.026
S33.000	SWP-24	15 Summer	1	+45%					99.001	-0.150
S34.000	SWP-25	15 Summer	1	+45%					99.916	-0.150
S33.001	SWP-26	15 Summer	1	+45%	100/15 Summer				98.823	-0.119
S35.000	SWP-27	15 Summer	1	+45%					99.336	-0.150
S36.000	SWP-28	15 Summer	1	+45%					98.607	-0.150
S35.001	SWP-29	15 Summer	1	+45%	30/15 Summer				98.458	-0.090

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S23.000	SWP-1	0.000	0.11			4.1	OK	
S23.001	SWP-2	0.000	0.18			5.9	OK	
S24.000	SWP-3	0.000	0.00			0.0	OK*	
S25.000	SWP-4	0.000	0.00			0.0	OK	
S24.001	SWP-5	0.000	0.00			0.0	OK	
S23.002	SWP-6	0.000	0.25			5.9	OK	
S26.000	SWP-7	0.000	0.00			0.0	OK*	
S26.001	SWP-8	0.000	0.12		7	2.2	OK	
S27.000	SWP-9	0.000	0.00			0.0	OK*	
S27.001	SWP-10	0.000	0.13		9	4.5	OK	
S23.003	SWP-11	0.000	0.32			12.9	OK	
S28.000	SWP-12	0.000	0.00			0.0	OK*	
S28.001	SWP-13	0.000	0.18		7	3.2	OK	
S23.004	SWP-14	0.000	0.15			9.0	OK	
S23.005	SWP-TANK 1	0.000	0.07		55	4.5	OK*	
S29.000	SWP-16	0.000	0.00			0.0	OK*	
S30.000	SWP-17	0.000	0.00			0.0	OK*	
S29.001	SWP-18	0.000	0.09		8	4.1	OK	
S31.000	SWP-19	0.000	0.00			0.0	OK*	
S32.000	SWP-20	0.000	0.00			0.0	OK*	
S31.001	SWP-21	0.000	0.36		8	7.0	OK	
S23.006	SWP-22	0.000	0.16			10.0	OK	
S23.007	SWP-TANK 2	0.000	0.05		73	4.4	OK*	
S33.000	SWP-24	0.000	0.00			0.0	OK*	
S34.000	SWP-25	0.000	0.00			0.0	OK*	
S33.001	SWP-26	0.000	0.08		8	3.4	OK	
S35.000	SWP-27	0.000	0.00			0.0	OK*	
S36.000	SWP-28	0.000	0.00			0.0	OK*	
S35.001	SWP-29	0.000	0.34		8	6.6	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S33.002	SWP-30	15 Summer	1	+45%	30/15 Summer				98.367	-0.069
S33.003	SWP-31	15 Summer	1	+45%	30/15 Summer				98.230	-0.060
S33.004	SWP-32	15 Summer	1	+45%	30/15 Summer				98.160	-0.069
S23.008	SWP-HB1	120 Summer	1	+45%	1/15 Summer				96.936	0.106
S37.000	SWP-34	360 Summer	1	+45%	30/240 Summer				96.483	-0.217
S37.001	SWP-TANK 3	360 Summer	1	+45%	30/240 Summer				96.483	-0.167
S38.000	SWP-36	15 Summer	1	+45%					97.935	-0.150
S39.000	SWP-37	15 Summer	1	+45%					97.690	-0.150
S38.001	SWP-38	15 Summer	1	+45%					97.422	-0.100
S40.000	SWP-39	15 Summer	1	+45%					97.242	-0.150
S41.000	SWP-40	15 Summer	1	+45%					97.267	-0.150
S40.001	SWP-41	15 Summer	1	+45%	100/960 Summer				96.899	-0.110
S37.002	SWP-42	360 Summer	1	+45%	30/120 Winter				96.483	-0.117
S37.003	SWP-TANK 4	360 Summer	1	+45%	30/120 Summer				96.483	-0.067
S23.009	SWP-HB2	360 Summer	1	+45%	1/120 Summer				96.483	0.058
S42.000	SWP-45	15 Summer	1	+45%					98.403	-0.150
S42.001	SWP-46	30 Summer	1	+45%					96.584	-0.104
S23.010	SWP-47	360 Summer	1	+45%	30/60 Summer				95.724	-0.176
S23.011	SWP-TANK 6	360 Summer	1	+45%	30/30 Winter				95.722	-0.128
S43.000	SWP-49	15 Summer	1	+45%					98.223	-0.150
S43.001	SWP-50	30 Summer	1	+45%					96.771	-0.107
S43.002	SWP-51	30 Summer	1	+45%					96.667	-0.128
S43.003	SWP-52	360 Summer	1	+45%	30/60 Summer				95.718	-0.182
S43.004	SWP-TANK 5	360 Summer	1	+45%	30/60 Summer				95.718	-0.132
S44.000	SWP-54	15 Summer	1	+45%					96.982	-0.150
S45.000	SWP-55	15 Summer	1	+45%					97.008	-0.150
S44.001	SWP-56	15 Summer	1	+45%					96.832	-0.117
S23.012	SWP-57	360 Summer	1	+45%	30/15 Summer				95.723	-0.077
S46.000	SWP-58	15 Summer	1	+45%					96.844	-0.150
S47.000	SWP-59	15 Summer	1	+45%					96.434	-0.150
S23.013	SWP-60	360 Summer	1	+45%	30/15 Summer				95.726	-0.024
S48.000	SWP-61	15 Summer	1	+45%	100/240 Summer				96.194	-0.150
S23.014	SWP-HB3	360 Summer	1	+45%	1/15 Summer				95.726	0.101
S23.015	SWP-63	960 Summer	1	+45%	30/360 Summer				94.860	-0.123
S23.016	SWP-TANK 7	960 Summer	1	+45%	30/240 Summer				94.859	-0.074
S49.000	SWP-65	60 Summer	1	+45%					95.569	-0.206
S49.001	SWP-66	60 Summer	1	+45%					95.312	-0.202
S49.002	SWP-67	60 Summer	1	+45%	30/960 Winter				94.899	-0.192
S49.003	SWP-68	960 Summer	1	+45%	30/15 Summer				94.859	-0.041
S49.004	SWP-69	960 Summer	1	+45%	1/240 Summer				94.857	0.117
S50.000	SWP-70	960 Summer	1	+45%	30/15 Summer				94.859	-0.081
S50.001	SWP-71	960 Summer	1	+45%	1/960 Summer				94.858	0.021
S50.002	SWP-72	960 Summer	1	+45%	1/360 Summer				94.857	0.080
S23.017	SWP-CC1	960 Summer	1	+45%	1/15 Summer				94.857	0.274
S23.018	SWP-PI	1440 Winter	1	+45%					94.415	-0.109
S23.019	SWP-75	1440 Summer	1	+45%					94.321	-0.099

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S33.002	SWP-30	0.000	0.55			9.8	OK	
S33.003	SWP-31	0.000	0.65			10.1	OK	
S33.004	SWP-32	0.000	0.56			10.1	OK	
S23.008	SWP-HB1	0.000	0.06			4.5	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S37.000	SWP-34	0.000	0.00			0.0	OK	
S37.001	SWP-TANK 3	0.000	0.03		58	1.6	OK*	
S38.000	SWP-36	0.000	0.00			0.0	OK*	
S39.000	SWP-37	0.000	0.00			0.0	OK*	
S38.001	SWP-38	0.000	0.22		8	3.8	OK	
S40.000	SWP-39	0.000	0.00			0.0	OK*	
S41.000	SWP-40	0.000	0.00			0.0	OK*	
S40.001	SWP-41	0.000	0.16		7	5.8	OK	
S37.002	SWP-42	0.000	0.04			2.5	OK	
S37.003	SWP-TANK 4	0.000	0.05		77	3.3	OK*	
S23.009	SWP-HB2	0.000	0.05			3.9	SURCHARGED	
S42.000	SWP-45	0.000	0.00			0.0	OK*	
S42.001	SWP-46	0.000	0.20		8	3.5	OK	
S23.010	SWP-47	0.000	0.08			4.9	OK	
S23.011	SWP-TANK 6	0.000	0.10		178	6.2	OK*	
S43.000	SWP-49	0.000	0.00			0.0	OK*	
S43.001	SWP-50	0.000	0.15		8	2.8	OK	
S43.002	SWP-51	0.000	0.05			2.7	OK	
S43.003	SWP-52	0.000	0.01			0.8	OK	
S43.004	SWP-TANK 5	0.000	0.04		179	2.6	OK*	
S44.000	SWP-54	0.000	0.00			0.0	OK*	
S45.000	SWP-55	0.000	0.00			0.0	OK*	
S44.001	SWP-56	0.000	0.11		7	4.2	OK	
S23.012	SWP-57	0.000	0.11			6.8	OK	
S46.000	SWP-58	0.000	0.00			0.0	OK*	
S47.000	SWP-59	0.000	0.00			0.0	OK*	
S23.013	SWP-60	0.000	0.09		164	5.8	OK	
S48.000	SWP-61	0.000	0.00			0.0	OK	
S23.014	SWP-HB3	0.000	0.04			5.0	SURCHARGED	
S23.015	SWP-63	0.000	0.04			5.0	OK	
S23.016	SWP-TANK 7	0.000	0.03		516	4.5	OK*	
S49.000	SWP-65	0.000	0.02			0.9	OK	
S49.001	SWP-66	0.000	0.02			1.8	OK	
S49.002	SWP-67	0.000	0.05			2.7	OK	
S49.003	SWP-68	0.000	0.03			1.2	OK	
S49.004	SWP-69	0.000	0.03			1.1	SURCHARGED	
S50.000	SWP-70	0.000	0.08			2.9	OK	
S50.001	SWP-71	0.000	0.08			4.7	SURCHARGED	
S50.002	SWP-72	0.000	0.08			4.6	SURCHARGED	
S23.017	SWP-CC1	0.000	0.20			3.0	SURCHARGED	
S23.018	SWP-PI	0.000	0.17			3.0	OK*	
S23.019	SWP-75	0.000	0.26			3.0	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0
Number of Online Controls 4
Number of Offline Controls 0
Number of Storage Structures 20
Number of Time/Area Diagrams 3
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 17.000
Ratio R 0.336
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 45, 45, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S23.000	SWP-1	15 Summer	30	+45%					100.312	-0.098
S23.001	SWP-2	15 Summer	30	+45%					99.290	-0.077
S24.000	SWP-3	15 Summer	30	+45%					99.517	-0.150
S25.000	SWP-4	15 Summer	30	+45%					99.150	-0.150
S24.001	SWP-5	15 Summer	30	+45%					98.987	-0.150
S23.002	SWP-6	15 Summer	30	+45%	100/15 Summer				98.789	-0.059
S26.000	SWP-7	15 Summer	30	+45%					99.646	-0.150
S26.001	SWP-8	15 Summer	30	+45%	100/15 Summer				98.602	-0.083
S27.000	SWP-9	15 Summer	30	+45%					99.409	-0.150
S27.001	SWP-10	15 Summer	30	+45%	100/15 Summer				98.834	-0.083
S23.003	SWP-11	15 Summer	30	+45%	100/15 Summer				98.574	-0.026
S28.000	SWP-12	15 Summer	30	+45%					99.126	-0.150
S28.001	SWP-13	15 Summer	30	+45%	100/240 Summer				97.776	-0.067
S23.004	SWP-14	240 Summer	30	+45%	30/15 Summer				97.513	0.408
S23.005	SWP-TANK 1	240 Summer	30	+45%	30/15 Summer				97.512	0.457
S29.000	SWP-16	15 Summer	30	+45%					98.372	-0.150
S30.000	SWP-17	15 Summer	30	+45%					98.923	-0.150
S29.001	SWP-18	15 Summer	30	+45%					98.219	-0.094
S31.000	SWP-19	15 Summer	30	+45%					98.312	-0.150
S32.000	SWP-20	15 Summer	30	+45%					97.924	-0.150
S31.001	SWP-21	15 Summer	30	+45%	30/15 Summer				97.844	0.033
S23.006	SWP-22	240 Summer	30	+45%	30/15 Summer				97.512	0.507
S23.007	SWP-TANK 2	240 Summer	30	+45%	30/15 Summer				97.510	0.555
S33.000	SWP-24	15 Summer	30	+45%					99.001	-0.150
S34.000	SWP-25	15 Summer	30	+45%					99.916	-0.150
S33.001	SWP-26	15 Summer	30	+45%	100/15 Summer				98.843	-0.099
S35.000	SWP-27	15 Summer	30	+45%					99.336	-0.150
S36.000	SWP-28	15 Summer	30	+45%					98.757	0.000
S35.001	SWP-29	15 Summer	30	+45%	30/15 Summer				98.881	0.333

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S23.000	SWP-1	0.000	0.26			10.0	OK	
S23.001	SWP-2	0.000	0.48			15.7	OK	
S24.000	SWP-3	0.000	0.00			0.0	OK*	
S25.000	SWP-4	0.000	0.00			0.0	OK	
S24.001	SWP-5	0.000	0.00			0.0	OK	
S23.002	SWP-6	0.000	0.67			15.8	OK	
S26.000	SWP-7	0.000	0.00			0.0	OK*	
S26.001	SWP-8	0.000	0.41		4	7.5	OK	
S27.000	SWP-9	0.000	0.00			0.0	OK*	
S27.001	SWP-10	0.000	0.41		4	14.5	OK	
S23.003	SWP-11	0.000	1.00			40.1	OK	
S28.000	SWP-12	0.000	0.00			0.0	OK*	
S28.001	SWP-13	0.000	0.59		4	10.6	OK	
S23.004	SWP-14	0.000	0.23			13.9	SURCHARGED	
S23.005	SWP-TANK 1	0.000	0.05		179	2.8	SURCHARGED*	
S29.000	SWP-16	0.000	0.00			0.0	OK*	
S30.000	SWP-17	0.000	0.00			0.0	OK*	
S29.001	SWP-18	0.000	0.30		4	13.1	OK	
S31.000	SWP-19	0.000	0.00			0.0	OK*	
S32.000	SWP-20	0.000	0.00			0.0	OK*	
S31.001	SWP-21	0.000	1.14		3	22.4	SURCHARGED	
S23.006	SWP-22	0.000	0.15			9.2	SURCHARGED	
S23.007	SWP-TANK 2	0.000	0.05		191	4.6	SURCHARGED*	
S33.000	SWP-24	0.000	0.00			0.0	OK*	
S34.000	SWP-25	0.000	0.00			0.0	OK*	
S33.001	SWP-26	0.000	0.25		4	11.1	OK	
S35.000	SWP-27	0.000	0.00			0.0	OK*	
S36.000	SWP-28	0.000	0.10			2.4	SURCHARGED*	
S35.001	SWP-29	0.000	0.83		3	16.2	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S33.002	SWP-30	15 Summer	30	+45%	30/15 Summer				98.800	0.364
S33.003	SWP-31	15 Summer	30	+45%	30/15 Summer				98.518	0.228
S33.004	SWP-32	15 Summer	30	+45%	30/15 Summer				98.363	0.134
S23.008	SWP-HB1	240 Summer	30	+45%	1/15 Summer				97.513	0.683
S37.000	SWP-34	960 Summer	30	+45%	30/240 Summer				96.869	0.169
S37.001	SWP-TANK 3	960 Summer	30	+45%	30/240 Summer				96.869	0.219
S38.000	SWP-36	15 Summer	30	+45%					97.935	-0.150
S39.000	SWP-37	15 Summer	30	+45%					97.690	-0.150
S38.001	SWP-38	15 Summer	30	+45%					97.467	-0.055
S40.000	SWP-39	15 Summer	30	+45%					97.242	-0.150
S41.000	SWP-40	15 Summer	30	+45%					97.267	-0.150
S40.001	SWP-41	15 Summer	30	+45%	100/960 Summer				96.935	-0.074
S37.002	SWP-42	960 Summer	30	+45%	30/120 Winter				96.869	0.269
S37.003	SWP-TANK 4	960 Summer	30	+45%	30/120 Summer				96.869	0.319
S23.009	SWP-HB2	960 Summer	30	+45%	1/120 Summer				96.869	0.444
S42.000	SWP-45	15 Summer	30	+45%					98.403	-0.150
S42.001	SWP-46	15 Summer	30	+45%					96.630	-0.058
S23.010	SWP-47	360 Summer	30	+45%	30/60 Summer				96.157	0.257
S23.011	SWP-TANK 6	360 Summer	30	+45%	30/30 Winter				96.155	0.305
S43.000	SWP-49	15 Summer	30	+45%					98.223	-0.150
S43.001	SWP-50	15 Summer	30	+45%					96.805	-0.073
S43.002	SWP-51	15 Summer	30	+45%					96.688	-0.107
S43.003	SWP-52	360 Summer	30	+45%	30/60 Summer				96.152	0.252
S43.004	SWP-TANK 5	360 Summer	30	+45%	30/60 Summer				96.152	0.302
S44.000	SWP-54	15 Summer	30	+45%					96.982	-0.150
S45.000	SWP-55	15 Summer	30	+45%					97.008	-0.150
S44.001	SWP-56	15 Summer	30	+45%					96.861	-0.088
S23.012	SWP-57	360 Summer	30	+45%	30/15 Summer				96.160	0.360
S46.000	SWP-58	15 Summer	30	+45%					96.844	-0.150
S47.000	SWP-59	15 Summer	30	+45%					96.434	-0.150
S23.013	SWP-60	360 Summer	30	+45%	30/15 Summer				96.172	0.422
S48.000	SWP-61	15 Summer	30	+45%	100/240 Summer				96.194	-0.150
S23.014	SWP-HB3	360 Summer	30	+45%	1/15 Summer				96.172	0.547
S23.015	SWP-63	1440 Winter	30	+45%	30/360 Summer				95.113	0.130
S23.016	SWP-TANK 7	1440 Winter	30	+45%	30/240 Summer				95.111	0.178
S49.000	SWP-65	30 Summer	30	+45%					95.580	-0.195
S49.001	SWP-66	60 Summer	30	+45%					95.323	-0.191
S49.002	SWP-67	1440 Winter	30	+45%	30/960 Winter				95.116	0.025
S49.003	SWP-68	1440 Winter	30	+45%	30/15 Summer				95.117	0.217
S49.004	SWP-69	1440 Winter	30	+45%	1/240 Summer				95.122	0.382
S50.000	SWP-70	15 Summer	30	+45%	30/15 Summer				95.462	0.522
S50.001	SWP-71	15 Summer	30	+45%	1/960 Summer				95.226	0.389
S50.002	SWP-72	1440 Winter	30	+45%	1/360 Summer				95.121	0.344
S23.017	SWP-CC1	1440 Winter	30	+45%	1/15 Summer				95.123	0.540
S23.018	SWP-PI	1440 Winter	30	+45%					94.433	-0.091
S23.019	SWP-75	1440 Winter	30	+45%					94.345	-0.075

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S33.002	SWP-30	0.000	1.40			25.1	SURCHARGED	
S33.003	SWP-31	0.000	1.58			24.5	SURCHARGED	
S33.004	SWP-32	0.000	1.35			24.5	SURCHARGED	
S23.008	SWP-HB1	0.000	0.06			4.5	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S37.000	SWP-34	0.000	0.00			0.0	SURCHARGED	
S37.001	SWP-TANK 3	0.000	0.03		315	2.0	SURCHARGED*	
S38.000	SWP-36	0.000	0.00			0.0	OK*	
S39.000	SWP-37	0.000	0.00			0.0	OK*	
S38.001	SWP-38	0.000	0.72		4	12.5	OK	
S40.000	SWP-39	0.000	0.00			0.0	OK*	
S41.000	SWP-40	0.000	0.00			0.0	OK*	
S40.001	SWP-41	0.000	0.52		4	18.9	OK	
S37.002	SWP-42	0.000	0.03			2.1	SURCHARGED	
S37.003	SWP-TANK 4	0.000	0.06		341	3.7	SURCHARGED*	
S23.009	SWP-HB2	0.000	0.05			4.0	SURCHARGED	
S42.000	SWP-45	0.000	0.00			0.0	OK*	
S42.001	SWP-46	0.000	0.69		4	11.7	OK	
S23.010	SWP-47	0.000	0.10			5.9	SURCHARGED	
S23.011	SWP-TANK 6	0.000	0.11			6.6	SURCHARGED*	
S43.000	SWP-49	0.000	0.00			0.0	OK*	
S43.001	SWP-50	0.000	0.52		4	9.4	OK	
S43.002	SWP-51	0.000	0.19			9.4	OK	
S43.003	SWP-52	0.000	0.03			1.8	SURCHARGED	
S43.004	SWP-TANK 5	0.000	0.04			2.5	SURCHARGED*	
S44.000	SWP-54	0.000	0.00			0.0	OK*	
S45.000	SWP-55	0.000	0.00			0.0	OK*	
S44.001	SWP-56	0.000	0.36		4	13.6	OK	
S23.012	SWP-57	0.000	0.14			8.3	SURCHARGED	
S46.000	SWP-58	0.000	0.00			0.0	OK*	
S47.000	SWP-59	0.000	0.00			0.0	OK*	
S23.013	SWP-60	0.000	0.11			6.5	SURCHARGED	
S48.000	SWP-61	0.000	0.00			0.0	OK	
S23.014	SWP-HB3	0.000	0.04			5.0	SURCHARGED	
S23.015	SWP-63	0.000	0.04			5.0	SURCHARGED	
S23.016	SWP-TANK 7	0.000	0.04		970	6.6	SURCHARGED*	
S49.000	SWP-65	0.000	0.04			2.2	OK	
S49.001	SWP-66	0.000	0.06			4.6	OK	
S49.002	SWP-67	0.000	0.02			1.2	SURCHARGED	
S49.003	SWP-68	0.000	0.03			1.3	SURCHARGED	
S49.004	SWP-69	0.000	0.04			1.3	SURCHARGED	
S50.000	SWP-70	0.000	1.46			54.5	SURCHARGED	
S50.001	SWP-71	0.000	1.44			88.3	SURCHARGED	
S50.002	SWP-72	0.000	0.08			4.6	SURCHARGED	
S23.017	SWP-CC1	0.000	0.39			5.8	SURCHARGED	
S23.018	SWP-PI	0.000	0.33			5.8	OK*	
S23.019	SWP-75	0.000	0.49			5.8	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0
Number of Online Controls 4
Number of Offline Controls 0
Number of Storage Structures 20
Number of Time/Area Diagrams 3
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 17.000
Ratio R 0.336
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 45, 45, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S23.000	SWP-1	15 Summer	100	+45%					100.320	-0.090
S23.001	SWP-2	15 Summer	100	+45%					99.302	-0.065
S24.000	SWP-3	15 Summer	100	+45%					99.517	-0.150
S25.000	SWP-4	15 Summer	100	+45%					99.150	-0.150
S24.001	SWP-5	15 Summer	100	+45%					98.989	-0.148
S23.002	SWP-6	15 Summer	100	+45%	100/15 Summer				98.991	0.143
S26.000	SWP-7	15 Summer	100	+45%					99.646	-0.150
S26.001	SWP-8	15 Summer	100	+45%	100/15 Summer				98.877	0.192
S27.000	SWP-9	15 Summer	100	+45%					99.409	-0.150
S27.001	SWP-10	15 Summer	100	+45%	100/15 Summer				98.921	0.004
S23.003	SWP-11	15 Summer	100	+45%	100/15 Summer				98.860	0.260
S28.000	SWP-12	15 Summer	100	+45%					99.126	-0.150
S28.001	SWP-13	240 Winter	100	+45%	100/240 Summer				97.880	0.037
S23.004	SWP-14	240 Winter	100	+45%	30/15 Summer				97.879	0.774
S23.005	SWP-TANK 1	240 Winter	100	+45%	30/15 Summer				97.877	0.822
S29.000	SWP-16	15 Summer	100	+45%					98.372	-0.150
S30.000	SWP-17	15 Summer	100	+45%					98.923	-0.150
S29.001	SWP-18	15 Summer	100	+45%					98.228	-0.085
S31.000	SWP-19	15 Summer	100	+45%					98.312	-0.150
S32.000	SWP-20	15 Summer	100	+45%					97.931	-0.143
S31.001	SWP-21	15 Summer	100	+45%	30/15 Summer				97.942	0.131
S23.006	SWP-22	240 Winter	100	+45%	30/15 Summer				97.884	0.879
S23.007	SWP-TANK 2	240 Winter	100	+45%	30/15 Summer				97.856	0.901
S33.000	SWP-24	15 Summer	100	+45%					99.035	-0.116
S34.000	SWP-25	15 Summer	100	+45%					99.916	-0.150
S33.001	SWP-26	15 Summer	100	+45%	100/15 Summer				99.080	0.138
S35.000	SWP-27	15 Summer	100	+45%					99.336	-0.150
S36.000	SWP-28	15 Summer	100	+45%					98.757	0.000
S35.001	SWP-29	15 Summer	100	+45%	30/15 Summer				99.182	0.634

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S23.000	SWP-1	0.000	0.34			12.9	OK	
S23.001	SWP-2	0.000	0.62			20.3	OK	
S24.000	SWP-3	0.000	0.00			0.0	OK*	
S25.000	SWP-4	0.000	0.00			0.0	OK	
S24.001	SWP-5	0.000	0.00			0.0	OK	
S23.002	SWP-6	0.000	0.75			17.7	SURCHARGED	
S26.000	SWP-7	0.000	0.00			0.0	OK*	
S26.001	SWP-8	0.000	0.44		2	8.1	SURCHARGED	
S27.000	SWP-9	0.000	0.00			0.0	OK*	
S27.001	SWP-10	0.000	0.51		2	18.1	SURCHARGED	
S23.003	SWP-11	0.000	1.08			43.5	SURCHARGED	
S28.000	SWP-12	0.000	0.00			0.0	OK*	
S28.001	SWP-13	0.000	0.14		32	2.5	SURCHARGED	
S23.004	SWP-14	0.000	0.19			11.7	SURCHARGED	
S23.005	SWP-TANK 1	0.000	0.07		212	4.5	SURCHARGED*	
S29.000	SWP-16	0.000	0.00			0.0	OK*	
S30.000	SWP-17	0.000	0.00			0.0	OK*	
S29.001	SWP-18	0.000	0.39		4	16.9	OK	
S31.000	SWP-19	0.000	0.00			0.0	OK*	
S32.000	SWP-20	0.000	0.00			0.0	OK*	
S31.001	SWP-21	0.000	1.47		3	28.8	SURCHARGED	
S23.006	SWP-22	0.000	0.13			8.1	SURCHARGED	
S23.007	SWP-TANK 2	0.000	0.05		230	4.6	SURCHARGED*	
S33.000	SWP-24	0.000	0.02			0.4	OK*	
S34.000	SWP-25	0.000	0.00			0.0	OK*	
S33.001	SWP-26	0.000	0.30		3	13.5	SURCHARGED	
S35.000	SWP-27	0.000	0.00			0.0	OK*	
S36.000	SWP-28	0.000	0.14			3.2	SURCHARGED*	
S35.001	SWP-29	0.000	1.06		5	20.7	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S33.002	SWP-30	15 Summer	100	+45%	30/15 Summer				99.063	0.627
S33.003	SWP-31	15 Summer	100	+45%	30/15 Summer				98.670	0.380
S33.004	SWP-32	15 Summer	100	+45%	30/15 Summer				98.474	0.245
S23.008	SWP-HB1	240 Winter	100	+45%	1/15 Summer				97.896	1.066
S37.000	SWP-34	960 Winter	100	+45%	30/240 Summer				97.079	0.379
S37.001	SWP-TANK 3	960 Winter	100	+45%	30/240 Summer				97.078	0.428
S38.000	SWP-36	15 Summer	100	+45%					97.935	-0.150
S39.000	SWP-37	15 Summer	100	+45%					97.690	-0.150
S38.001	SWP-38	15 Summer	100	+45%					97.486	-0.036
S40.000	SWP-39	15 Summer	100	+45%					97.242	-0.150
S41.000	SWP-40	15 Summer	100	+45%					97.267	-0.150
S40.001	SWP-41	960 Winter	100	+45%	100/960 Summer				97.088	0.079
S37.002	SWP-42	960 Winter	100	+45%	30/120 Winter				97.091	0.491
S37.003	SWP-TANK 4	960 Winter	100	+45%	30/120 Summer				97.051	0.501
S23.009	SWP-HB2	960 Winter	100	+45%	1/120 Summer				97.114	0.689
S42.000	SWP-45	15 Summer	100	+45%					98.403	-0.150
S42.001	SWP-46	15 Summer	100	+45%					96.648	-0.040
S23.010	SWP-47	360 Winter	100	+45%	30/60 Summer				96.527	0.627
S23.011	SWP-TANK 6	480 Winter	100	+45%	30/30 Winter				96.351	0.501
S43.000	SWP-49	15 Summer	100	+45%					98.223	-0.150
S43.001	SWP-50	15 Summer	100	+45%					96.818	-0.060
S43.002	SWP-51	15 Summer	100	+45%					96.695	-0.100
S43.003	SWP-52	360 Winter	100	+45%	30/60 Summer				96.523	0.623
S43.004	SWP-TANK 5	480 Winter	100	+45%	30/60 Summer				96.351	0.501
S44.000	SWP-54	15 Summer	100	+45%					96.982	-0.150
S45.000	SWP-55	15 Summer	100	+45%					97.008	-0.150
S44.001	SWP-56	15 Summer	100	+45%					96.870	-0.079
S23.012	SWP-57	360 Winter	100	+45%	30/15 Summer				96.523	0.723
S46.000	SWP-58	15 Summer	100	+45%					96.844	-0.150
S47.000	SWP-59	360 Winter	100	+45%					96.520	-0.064
S23.013	SWP-60	360 Winter	100	+45%	30/15 Summer				96.520	0.770
S48.000	SWP-61	360 Winter	100	+45%	100/240 Summer				96.518	0.174
S23.014	SWP-HB3	360 Winter	100	+45%	1/15 Summer				96.518	0.893
S23.015	SWP-63	1440 Winter	100	+45%	30/360 Summer				95.229	0.246
S23.016	SWP-TANK 7	1440 Winter	100	+45%	30/240 Summer				95.227	0.294
S49.000	SWP-65	60 Summer	100	+45%					95.585	-0.190
S49.001	SWP-66	60 Summer	100	+45%					95.329	-0.185
S49.002	SWP-67	1440 Winter	100	+45%	30/960 Winter				95.231	0.140
S49.003	SWP-68	1440 Winter	100	+45%	30/15 Summer				95.233	0.333
S49.004	SWP-69	1440 Winter	100	+45%	1/240 Summer				95.238	0.498
S50.000	SWP-70	15 Summer	100	+45%	30/15 Summer				95.821	0.881
S50.001	SWP-71	15 Summer	100	+45%	1/960 Summer				95.447	0.610
S50.002	SWP-72	1440 Winter	100	+45%	1/360 Summer				95.237	0.460
S23.017	SWP-CC1	1440 Winter	100	+45%	1/15 Summer				95.238	0.655
S23.018	SWP-PI	1440 Winter	100	+45%					94.438	-0.086
S23.019	SWP-75	1440 Winter	100	+45%					94.352	-0.068

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S33.002	SWP-30	0.000	1.63			29.3	SURCHARGED	
S33.003	SWP-31	0.000	1.85			28.6	SURCHARGED	
S33.004	SWP-32	0.000	1.55			28.3	SURCHARGED	
S23.008	SWP-HB1	0.000	0.06			4.5	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S37.000	SWP-34	0.000	0.00			0.1	SURCHARGED	
S37.001	SWP-TANK 3	0.000	0.04		391	2.5	SURCHARGED*	
S38.000	SWP-36	0.000	0.00			0.0	OK*	
S39.000	SWP-37	0.000	0.00			0.0	OK*	
S38.001	SWP-38	0.000	0.93		5	16.1	OK	
S40.000	SWP-39	0.000	0.00			0.0	OK*	
S41.000	SWP-40	0.000	0.00			0.0	OK*	
S40.001	SWP-41	0.000	0.04		132	1.6	SURCHARGED	
S37.002	SWP-42	0.000	0.05			3.0	SURCHARGED	
S37.003	SWP-TANK 4	0.000	0.06		434	3.8	SURCHARGED*	
S23.009	SWP-HB2	0.000	0.05			4.0	SURCHARGED	
S42.000	SWP-45	0.000	0.00			0.0	OK*	
S42.001	SWP-46	0.000	0.89		4	15.1	OK	
S23.010	SWP-47	0.000	0.09			5.6	SURCHARGED	
S23.011	SWP-TANK 6	0.000	0.10			6.2	SURCHARGED*	
S43.000	SWP-49	0.000	0.00			0.0	OK*	
S43.001	SWP-50	0.000	0.67		4	12.1	OK	
S43.002	SWP-51	0.000	0.24			12.1	OK	
S43.003	SWP-52	0.000	0.02			1.5	SURCHARGED	
S43.004	SWP-TANK 5	0.000	0.04			2.3	SURCHARGED*	
S44.000	SWP-54	0.000	0.00			0.0	OK*	
S45.000	SWP-55	0.000	0.00			0.0	OK*	
S44.001	SWP-56	0.000	0.46		4	17.5	OK	
S23.012	SWP-57	0.000	0.12			7.6	SURCHARGED	
S46.000	SWP-58	0.000	0.00			0.0	OK*	
S47.000	SWP-59	0.000	0.01			0.1	OK*	
S23.013	SWP-60	0.000	0.10			6.4	SURCHARGED	
S48.000	SWP-61	0.000	0.01			0.1	SURCHARGED	
S23.014	SWP-HB3	0.000	0.05			5.5	SURCHARGED	
S23.015	SWP-63	0.000	0.04			5.0	SURCHARGED	
S23.016	SWP-TANK 7	0.000	0.05		1113	7.5	SURCHARGED*	
S49.000	SWP-65	0.000	0.06			3.0	OK	
S49.001	SWP-66	0.000	0.07			6.0	OK	
S49.002	SWP-67	0.000	0.03			1.5	SURCHARGED	
S49.003	SWP-68	0.000	0.04			1.7	SURCHARGED	
S49.004	SWP-69	0.000	0.04			1.6	SURCHARGED	
S50.000	SWP-70	0.000	1.92			71.5	SURCHARGED	
S50.001	SWP-71	0.000	1.87			115.0	SURCHARGED	
S50.002	SWP-72	0.000	0.10			6.0	SURCHARGED	
S23.017	SWP-CC1	0.000	0.46			6.8	SURCHARGED	
S23.018	SWP-PI	0.000	0.38			6.8	OK*	
S23.019	SWP-75	0.000	0.58			6.8	OK	

Appendix F. AquaTreat Interceptor Certificates

Stormwater Treatment Device Performance Declaration

Stormwater Treatment Devices compliant with Chapter 26 of the CIRIA SuDS manual

Testing carried out according to DIBt Stormwater Treatment Systems Approval Requirements Part 1:
“Systems for connection of motor vehicle circulation areas with a surface of max. 2000m² for subsequent infiltration into ground and water course”

Treatment Device Tested: AquaTreat SWT010 stormwater treatment device

General description: A device for the collection and retention of hydrocarbons, particulate and metals.

Envisaged application: Surface water runoff for trafficked areas for subsequent infiltration into ground and water course.

Pollutant(s) captured: Hydrocarbons, particulate, zinc and copper

Parameter	Value
Treatment device capacity:	2,450 l
Particulate storage capacity:	1,000 l
Hydrocarbons storage capacity:	100 l
Treatment flow rate:	10 l/s
Connectable area:	1,000 m2
Hydrocarbon retention	99.65%
Particulate retention efficiency	85.5%
Zinc retention efficiency*	64%
Copper retention efficiency*	64%

*Reduction of heavy metals by collecting and retaining suspended solids is assumed as 75%.

BRITISH WATER
expertise worldwide

Kingspan®

Certificate

Kingspan Environmental Ltd.
College Rd North, Aston Clinton, Aylesbury Bucks, HP225EW, Great Britian

Approval principles of DIBt
„Zulassungsgrundsätze für Niederschlagswasserbehandlungsanlagen Teil 1“
Version November 2017

AquaTreat SWT010
Connected surface area: 1,000 m²
PIA2020-NW-1911-1066

Particle retention (Millisil W4)	**85.50%**
Hydro carbon retention	**99.65 %**

Performance tested by:

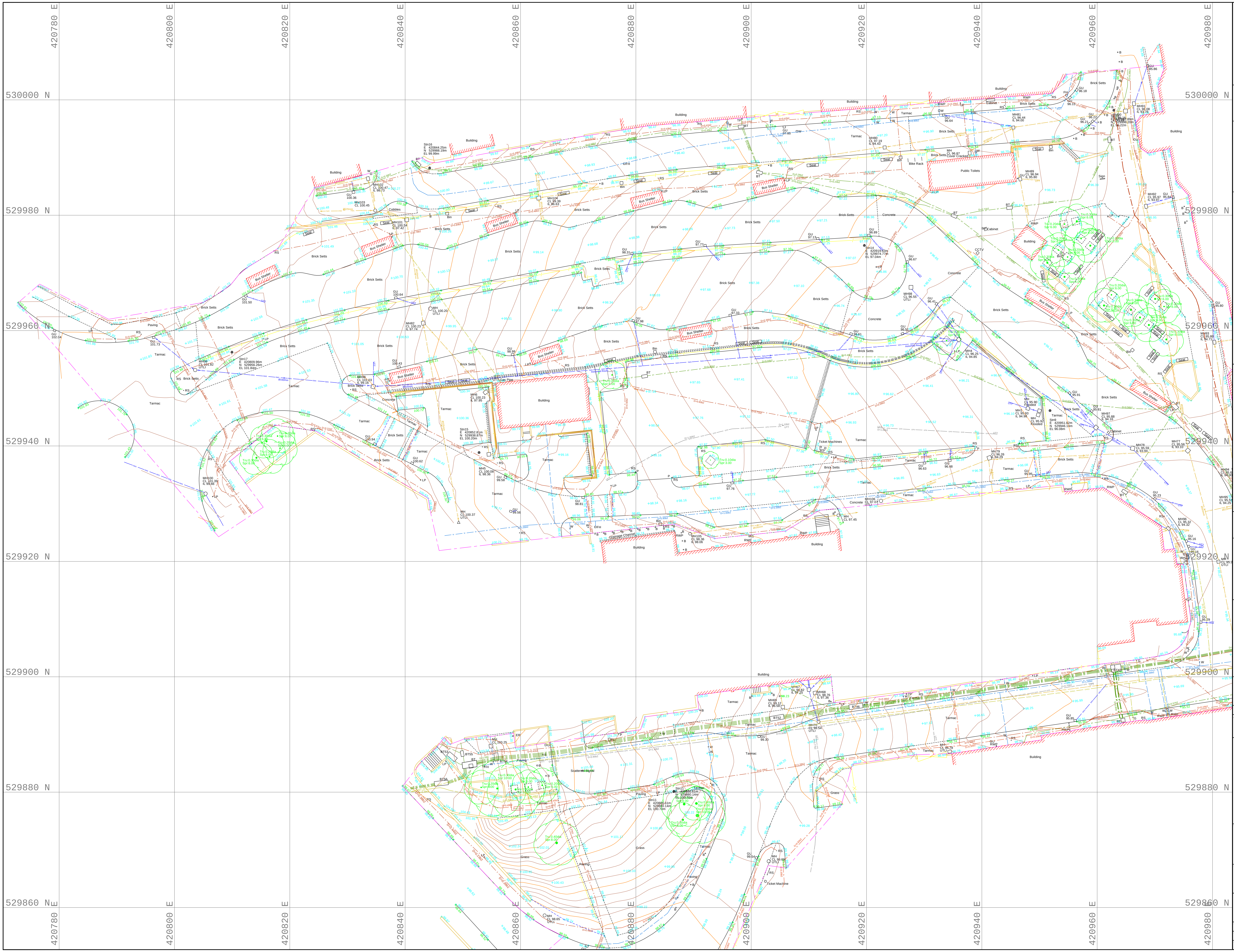
PIA – Prüfinstitut für Abwassertechnik GmbH
Hergenrather Weg 30
52074 Aachen
Germany

This document does not replace the test report.

[redacted]

Schmitz/Verschitz March 2021

Appendix G. Topo Survey



LEGEND

- Kerb / Hard Edge
- Change of Surface
- Wall
- Retaining Wall
- Security Fence
- Fence
- Building
- Overhead Feature
- Top of Embankment
- Bottom of Embankment
- Hedge
- Vegetation / Tree Canopy

Tree
(Gir: Refers to the Radius of the Tree Trunk)
(Spr: Refers to the Spread of the Canopy)
(Ht: Refers to the Height of the Tree)
Gate
Outfall
Tree Stump

AB 35.30 Air Brick Level
+35.30 Level
CL 35.30 Cover Level
IL 35.30 Invert Level
TL 35.30 Threshold Level
+35.30 Top of Kerb
TW 35.30 Top of Wall Level

B	Bollard	GU	Gully
BH	Borehole	IC	Inspect. cover
BM	Bench Mark	KO	Kerb Outlet
BS	Bus Stop	LP	Lamp Post
BT	Telecom cover	MH	Manhole
CT	Cable TV cover	MK	Marker
EP	Electric pole	OF	Outfall
ER	Earthing rod	P	Post
FH	Fire Hydrant	RE	Rodding Eye
FS	Flagstaff	RS	Road Sign
G	Gas Cover	TP	Telecom pole
⊕	Survey station	W	Water cover

Utilities

BT	British Telecom
	BT Overhead
CATV	Cable TV
CCTV	Closed Circuit TV
CSDR	Combined Service Drainage Route
COMM	Communications
E	Electric
	Electric Overhead
FD	Field Drain
FWS	Foul Water Drainage Route
GAS	Gas
SL	Street Lighting
SWS	Surface Water Drainage Route
W	Water
MSR	Multi Service Route
MST	Multi Service Trench
ED	Empty Ducting
GPR	GPR Anomaly Possible Utility
UDR	Unknown Drainage Route
UKN	Unknown Utility
BT(a)	Assumed BT
CATV(a)	Assumed Cable
E(a)	Assumed Electric
GAS(a)	Assumed Gas
SL(a)	Assumed Street Lighting
UKN(a)	Assumed Unknown
W(a)	Assumed Water
BT(r)	BT - Taken from Records
CATV(r)	Cable - Taken from Records
E(r)	Electric - Taken from Records
GAS(r)	Gas - Taken from Records
SL(r)	Street Lighting - Taken from Records
W(r)	Water - Taken from Records
	Survey Extents

All below ground details shown have been identified from above ground without excavation. Spatial Geomatics use electro-magnetic and /or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessary clear of services or features but are an indication that no items have been identified during our investigation. All reasonable care and normal good practice should still be employed during design and construction.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access cannot be achieved for tracing may not be shown and alternative locating methods should be used.

Spatial Geomatics has used all reasonable care to research available services records but completeness or use of the services records supplied to or by Spatial Geomatics cannot be guaranteed. Therefore Spatial Geomatics cannot be held responsible for any features annotated as 'Taken from Record' (R).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to invert, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from record when available.

All services, drainage and utility routes are assumed straight between access points, unless otherwise stated. The number of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

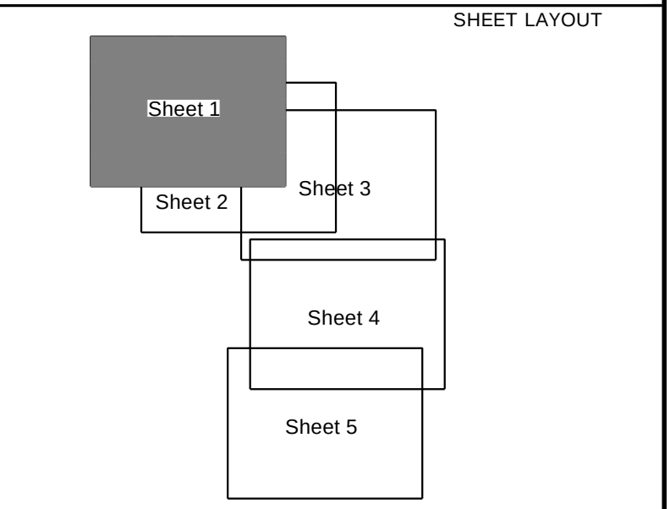
Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at time of survey.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Spatial Geomatics immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage detail and connections prior to commencing work.

N
APPROX.

SHEET LAYOUT



REV.	DETAILS	BY	DATE
C	Topographic and Utility Survey of Private Carpark Added	RT	Oct 21
B	Utilities Added	RT	Sept 21

GRID
Station 1 Established using GPS
Survey Orientated to North

DATUM
Ordnance Survey Level Datum
Established using GPS

Spatial Geomatics
2 Pont Park
Ponteland
Newcastle upon Tyne
NE20 0JX
TEL: 01661 823000 FAX: 01661 898137
email: info@sgl.uk.com
web site: www.sgl.uk.com

FS 542097

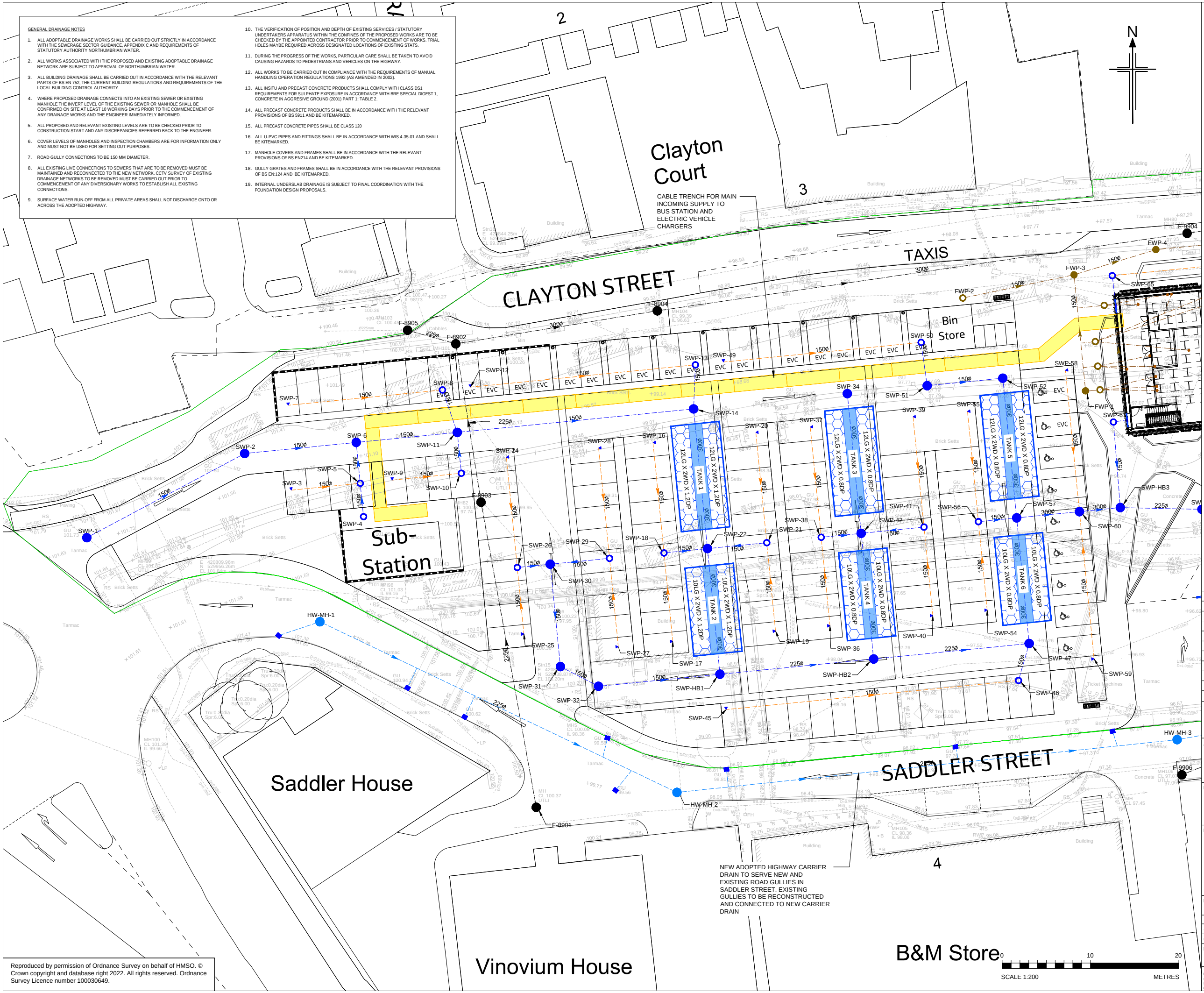
CLIENT:
Durham County Council

PROJECT TITLE:
Bishop Auckland Bus Station
Bishop Auckland
County Durham

DRAWING TITLE:
Topographical Survey

SURVEYED BY: KM	DRAWN BY: KM	QA APPROVED: GT
SCALE: 1:200 (A0)	SURVEY DATE: July 2021	
DRAWING NUMBER: 2161200.dwg	SHEET NUMBER: 1	REV: C

Appendix H. Scheme Drawings



CABLE TRENCH FOR MAIN
INCOMING SUPPLY TO
BUS STATION AND
ELECTRIC VEHICLE
CHARGERS

NEW ADOPTED HIGHWAY CARRIER
DRAIN TO SERVE NEW AND
EXISTING ROAD GULLIES IN
SADDLER STREET. EXISTING
GULLIES TO BE RECONSTRUCTED
AND CONNECTED TO NEW CARRIER
DRAIN

GENERAL DRAINAGE NOTES

1. ALL ADOPTABLE DRAINAGE WORKS SHALL BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE SEWERAGE SECTOR GUIDANCE, APPENDIX C AND REQUIREMENTS OF STATUTORY AUTHORITY NORTHUMBRIAN WATER.
2. ALL WORKS ASSOCIATED WITH THE PROPOSED AND EXISTING ADOPTABLE DRAINAGE NETWORK ARE SUBJECT TO APPROVAL OF NORTHUMBRIAN WATER.
3. ALL BUILDING DRAINAGE SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT PARTS OF BS EN 752, THE CURRENT BUILDING REGULATIONS AND REQUIREMENTS OF THE LOCAL BUILDING CONTROL AUTHORITY.
4. WHERE PROPOSED DRAINAGE CONNECTS INTO AN EXISTING SEWER OR EXISTING MANHOLE THE INVERT LEVEL OF THE EXISTING SEWER OR MANHOLE SHALL BE CONFIRMED ON SITE AT LEAST 10 WORKING DAYS PRIOR TO THE COMMENCEMENT OF ANY DRAINAGE WORKS AND THE ENGINEER IMMEDIATELY INFORMED.
5. ALL PROPOSED AND RELEVANT EXISTING LEVELS ARE TO BE CHECKED PRIOR TO CONSTRUCTION START AND ANY DISCREPANCIES REFERRED BACK TO THE ENGINEER.
6. COVER LEVELS OF MANHOLES AND INSPECTION CHAMBERS ARE FOR INFORMATION ONLY AND MUST NOT BE USED FOR SETTING OUT PURPOSES.
7. ROAD GULLY CONNECTIONS TO BE 150 MM DIAMETER.
8. ALL EXISTING LIVE CONNECTIONS TO SEWERS THAT ARE TO BE REMOVED MUST BE MAINTAINED AND RECONNECTED TO THE NEW NETWORK. CCTV SURVEY OF EXISTING DRAINAGE NETWORKS TO BE REMOVED MUST BE CARRIED OUT PRIOR TO COMMENCEMENT OF ANY DIVERSIONARY WORKS TO ESTABLISH ALL EXISTING CONNECTIONS.
9. SURFACE WATER RUN-OFF FROM ALL PRIVATE AREAS SHALL NOT DISCHARGE ONTO OR ACROSS THE ADOPTED HIGHWAY.
10. THE VERIFICATION OF POSITION AND DEPTH OF EXISTING SERVICES / STATUTORY UNDERTAKERS APPARATUS WITHIN THE CONFINES OF THE PROPOSED WORKS ARE TO BE CHECKED BY THE APPOINTED CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS. TRIAL HOLES MAYBE REQUIRED ACROSS DESIGNATED LOCATIONS OF EXISTING STATS.
11. DURING THE PROGRESS OF THE WORKS, PARTICULAR CARE SHALL BE TAKEN TO AVOID CAUSING HAZARDS TO PEDESTRIANS AND VEHICLES ON THE HIGHWAY.
12. ALL WORKS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF MANUAL HANDLING OPERATION REGULATIONS 1992 (AS AMENDED IN 2002).
13. ALL INSITU AND PRECAST CONCRETE PRODUCTS SHALL COMPLY WITH CLASS DS1 REQUIREMENTS FOR SULPHATE EXPOSURE IN ACCORDANCE WITH BRE SPECIAL DIGEST 1, CONCRETE IN AGGRESIVE GROUND (2001) PART 1: TABLE 2.
14. ALL PRECAST CONCRETE PRODUCTS SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS 5911 AND BE KITEMARKED.
15. ALL PRECAST CONCRETE PIPES SHALL BE CLASS 120
16. ALL U-PVC PIPES AND FITTINGS SHALL BE IN ACCORDANCE WITH WIS 4-35-01 AND SHALL BE KITEMARKED.
17. MANHOLE COVERS AND FRAMES SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS EN214 AND BE KITEMARKED.
18. GULLY GRATES AND FRAMES SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS EN:124 AND BE KITEMARKED.
19. INTERNAL UNDERSLAB DRAINAGE IS SUBJECT TO FINAL COORDINATION WITH THE FOUNDATION DESIGN PROPOSALS.

1. THIS DRAWING IS TO BE PRINTED IN COLOUR.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS.
3. ALL DIMENSIONS ARE IN MILIMETRES UNLESS SHOWN OTHERWISE.
4. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM.
5. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING WORK ON SITE. ANY REQUIREMENTS FOR MODIFICATIONS OR ALTERATIONS ARE TO BE CARRIED OUT WITH THE APPROVAL OF PROJECT MANAGER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE AND LIABLE FOR TEMPORARY STABILITY OF THE STRUCTURE DURING ALL STAGES OF THE WORK. THE STEELWORK CONTRACTOR SHOULD ALLOW FOR ALL NECESSARY TEMPORARY BRACING AND PROPPING. DETAILS OF TEMPORARY WORKS TO BE SUBMITTED TO THE ENGINEER PRIOR TO INSTALLATION.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

C3	Proximity of construction zone and foundations to existing foul water sewer.
C5	Encountering unrecorded buried services
C7	Unexploded WWII Ordnance (UXO)
C9	Contaminated ground, potentially including asbestos from previous development on the site
C10	Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
C11	Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

MAINTENANCE / CLEANING

M10	Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
M11	Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

DECOMMISSIONING / DEMOLITION

D1	Contaminated air, water spray in proximity of public access routes.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

LEGEND

ADOPTED DRAINAGE

●	EXISTING ADOPTED COMBINED SEWER
●	SURFACE WATER HIGHWAY DRAIN
■	SURFACE WATER ROAD GULLY

PRIVATE DRAINAGE

●	SURFACE WATER MANHOLE
○	SURFACE WATER INSPECTION CHAMBER
▬	SURFACE WATER LINEAR DRAIN
●	SURFACE WATER RWP
▼	SURFACE WATER RODDING EYE
– – –	PERFORATED COLLECTOR PIPE
●	FOUL WATER MANHOLE
○	FOUL WATER INSPECTION CHAMBER
●	FOUL WATER SVP/SS

OTHER

─	SITE BOUNDARY
▬	RETAINING WALL

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	17/03/22	ISSUED FOR RIBA STAGE 3	NM	SC	GC	DB
P02	02/12/22	ISSUED FOR REVISED RIBA STAGE 3	SC	GC	MS	DB

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www.jacobs.com

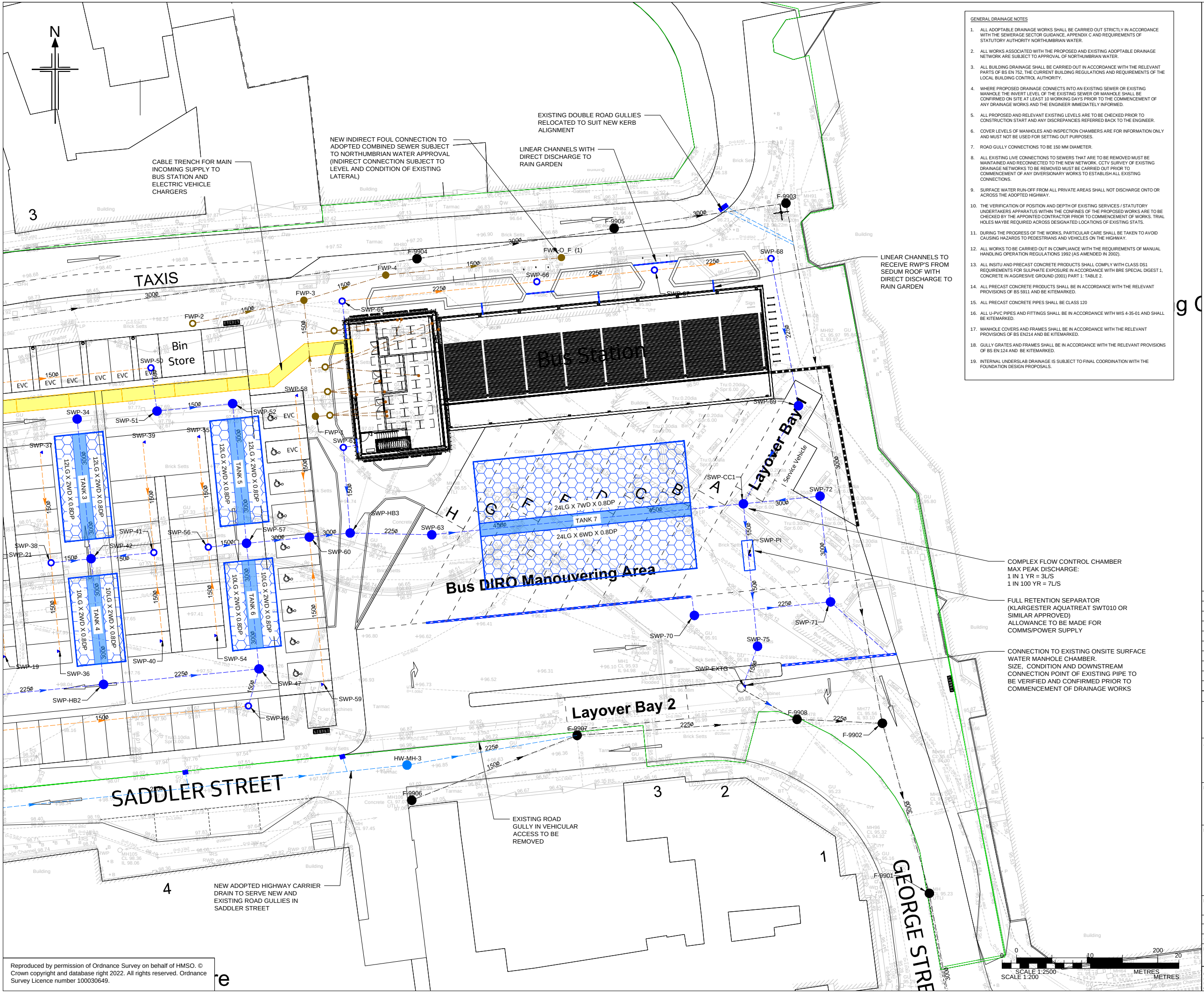
Client
Durham County Council

Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
DRAINAGE
GENERAL ARRANGEMENT PLAN
SHEET 1

Drawing Status	Suitable for Stage approval		Suitability S4
Scale	1:200	DO NOT SCALE	
Jacobs No.	BL000034		Rev P02
Client No.			

Drawing Number
BL000034-JAC-ZZ-ZZ-DR-C-01001



GENERAL DRAINAGE NOTES

1. ALL ADOPTABLE DRAINAGE WORKS SHALL BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE SEWERAGE SECTOR GUIDANCE, APPENDIX C AND REQUIREMENTS OF STATUTORY AUTHORITY NORTHUMBRIAN WATER.
2. ALL WORKS ASSOCIATED WITH THE PROPOSED AND EXISTING ADOPTABLE DRAINAGE NETWORK ARE SUBJECT TO APPROVAL OF NORTHUMBRIAN WATER.
3. ALL BUILDING DRAINAGE SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT PARTS OF BS EN 752, THE CURRENT BUILDING REGULATIONS AND REQUIREMENTS OF THE LOCAL BUILDING CONTROL AUTHORITY.
4. WHERE PROPOSED DRAINAGE CONNECTS INTO AN EXISTING SEWER OR EXISTING MANHOLE THE INVERT LEVEL OF THE EXISTING SEWER OR MANHOLE SHALL BE CONFIRMED ON SITE AT LEAST 10 WORKING DAYS PRIOR TO THE COMMENCEMENT OF ANY DRAINAGE WORKS AND THE ENGINEER IMMEDIATELY INFORMED.
5. ALL PROPOSED AND RELEVANT EXISTING LEVELS ARE TO BE CHECKED PRIOR TO CONSTRUCTION START AND ANY DISCREPANCIES REFERRED BACK TO THE ENGINEER.
6. COVER LEVELS OF MANHOLES AND INSPECTION CHAMBERS ARE FOR INFORMATION ONLY AND MUST NOT BE USED FOR SETTING OUT PURPOSES.
7. ROAD GULLY CONNECTIONS TO BE 150 MM DIAMETER.
8. ALL EXISTING LIVE CONNECTIONS TO SEWERS THAT ARE TO BE REMOVED MUST BE MAINTAINED AND RECONNECTED TO THE NEW NETWORK. CCTV SURVEY OF EXISTING DRAINAGE NETWORKS TO BE REMOVED MUST BE CARRIED OUT PRIOR TO COMMENCEMENT OF ANY DIVERSIONARY WORKS TO ESTABLISH ALL EXISTING CONNECTIONS.
9. SURFACE WATER RUN-OFF FROM ALL PRIVATE AREAS SHALL NOT DISCHARGE ONTO OR ACROSS THE ADOPTED HIGHWAY.
10. THE VERIFICATION OF POSITION AND DEPTH OF EXISTING SERVICES / STATUTORY UNDERTAKERS APPARATUS WITHIN THE CONFINES OF THE PROPOSED WORKS ARE TO BE CHECKED BY THE APPOINTED CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS. TRIAL HOLES MAYBE REQUIRED ACROSS DESIGNATED LOCATIONS OF EXISTING STATS.
11. DURING THE PROGRESS OF THE WORKS, PARTICULAR CARE SHALL BE TAKEN TO AVOID CAUSING HAZARDS TO PEDESTRIANS AND VEHICLES ON THE HIGHWAY.
12. ALL WORKS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF MANUAL HANDLING OPERATION REGULATIONS 1992 (AS AMENDED IN 2002).
13. ALL INSITU AND PRECAST CONCRETE PRODUCTS SHALL COMPLY WITH CLASS DS1 REQUIREMENTS FOR SULPHATE EXPOSURE IN ACCORDANCE WITH BRE SPECIAL DIGEST 1, CONCRETE IN AGGRESIVE GROUND (2001) PART 1: TABLE 2.
14. ALL PRECAST CONCRETE PRODUCTS SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS 5911 AND BE KITEMARKED.
15. ALL PRECAST CONCRETE PIPES SHALL BE CLASS 120
16. ALL U-PVC PIPES AND FITTINGS SHALL BE IN ACCORDANCE WITH WIS 4-35-01 AND SHALL BE KITEMARKED.
17. MANHOLE COVERS AND FRAMES SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS EN214 AND BE KITEMARKED.
18. GULLY GRATES AND FRAMES SHALL BE IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS EN:124 AND BE KITEMARKED.
19. INTERNAL UNDERSLAB DRAINAGE IS SUBJECT TO FINAL COORDINATION WITH THE FOUNDATION DESIGN PROPOSALS.

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6. THE CONTRACTOR SHALL BE RESPONSIBLE AND LIABLE FOR TEMPORARY STABILITY OF THE STRUCTURE DURING ALL STAGES OF THE WORK. THE STEELWORK CONTRACTOR SHOULD ALLOW FOR ALL NECESSARY TEMPORARY BRACING AND PROPPING. DETAILS OF TEMPORARY WORKS TO BE SUBMITTED TO THE ENGINEER PRIOR TO INSTALLATION.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

C3 Proximity of construction zone and foundations to existing foul water sewer.
C5 Encountering unrecorded buried services
C7 Unexploded WWII Ordnance (UXO)
C9 Contaminated ground, potentially including asbestos from previous development on the site
C10 Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
C11 Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

MAINTENANCE / CLEANING

M10 Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
M11 Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

DECOMMISSIONING / DEMOLITION

D1 Contaminated air, water spray in proximity of public access routes.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

LEGEND

ADOPTED DRAINAGE

- EXISTING ADOPTED COMBINED SEWER
- SURFACE WATER HIGHWAY DRAIN
- SURFACE WATER ROAD GULLY

PRIVATE DRAINAGE

- EXISTING SURFACE WATER MANHOLE
- SURFACE WATER MANHOLE
- SURFACE WATER INSPECTION CHAMBER
- SURFACE WATER LINEAR DRAIN
- SURFACE WATER RWP
- SURFACE WATER RODDING EYE
- PERFORATED COLLECTOR PIPE
- FOUL WATER MANHOLE
- FOUL WATER INSPECTION CHAMBER
- FOUL WATER SVP/SS

OTHER

- SITE BOUNDARY
- RETAINING WALL

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	17/03/22	ISSUED FOR RIBA STAGE 3	NM	SC	GC	DB
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Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
DRAINAGE GENERAL ARRANGEMENT PLAN SHEET 2

Drawing Status	Suitable for Stage approval		Suitability S4
Scale	1:200	DO NOT SCALE	
Jacobs No.	BL000034		Rev P02
Client No.			

Drawing Number
BL000034-JAC-ZZ-ZZ-DR-C-01002

PRIVATE SURFACE WATER NETWORK

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Dia (mm)	Chamber Type	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipe Out Gradient (1 in X)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Pipes In Backdrop (mm)	Cover Grade
SWP-1	101.31	1.05	1200	PC RING	100.26	150	19.4				D400
SWP-2	100.271	1.054	1200	PC RING	99.217	150	24.5	99.217	150		D400
SWP-3	100.123	0.606	150	RODDING EYE	99.517	150	14.8				
SWP-4	100.2	1.05	1200	PC RING	99.15	150	23.3				D400
SWP-5	100.043	1.056	1200	PC RING	98.987	150	16.1	98.987	150		D400
								98.987	150		
SWP-6	99.998	1.3	1200	PC RING	98.698	150	46.4	98.698	150		D400
								98.698	150		
SWP-7	100.296	0.65	150	RODDING EYE	99.646	150	15.8				
SWP-8	99.835	1.3	600	PPIC	98.535	150	59.9	98.535	150		D400
SWP-9	100.015	0.606	150	RODDING EYE	99.409	150	12.2				
SWP-10	99.917	1.15	600	PPIC	98.767	150	14.7	98.767	150		D400
SWP-11	99.79	1.34	1200	PC RING	98.45	150	18	98.45	150		D400
								98.45	150		
								98.45	150		
SWP-12	99.776	0.65	150	RODDING EYE	99.126	150	17.9				
SWP-13	98.977	1.284	600	PPIC	97.693	150	60.2	97.693	150		D400
SWP-14	98.879	2.074	1200	PC RING	96.805	300	166.2	96.955	150		D400
								97.61	150	655	
SWP-TANK 1	98.959	2.204		CRATES	96.755	300	151.8	96.755	300		
SWP-16	99.033	0.661	150	RODDING EYE	98.372	150	60				
SWP-17	99.622	0.699	150	RODDING EYE	98.923	150	13.2				
SWP-18	99.388	1.225	600	PPIC	98.163	150	10.2	98.163	150		D400
								98.163	150		
SWP-19	98.989	0.677	150	RODDING EYE	98.312	150	15.4				
SWP-20	98.586	0.662	150	RODDING EYE	97.924	150	47.7				
SWP-21	98.819	1.158	600	PPIC	97.661	150	59.7	97.661	150		D400
								97.661	150		
SWP-22	99.135	2.43	1200	PC RING	96.705	300	147.9	96.705	300		D400
								97.68	150	825	
								97.548	150	693	
SWP-TANK 2	99.299	2.644		CRATES	96.655	300	55.2	96.655	300		
SWP-24	99.669	0.668	150	RODDING EYE	99.001	150	60				
SWP-25	100.479	0.563	150	RODDING EYE	99.916	150	12.1				
SWP-26	100.197	1.405	600	PPIC	98.792	150	7.4	98.792	150		D400
								99.292	150	500	
SWP-27	99.973	0.637	150	RODDING EYE	99.336	150	10.7				
SWP-28	99.269	0.662	150	RODDING EYE	98.607	150	60.1				
SWP-29	99.658	1.26	600	PPIC	98.398	150	60.3	98.398	150		D400
								98.398	150		
SWP-30	99.974	1.688	1200	PC RING	98.286	150	80	98.286	150		D400
								98.286	150		
SWP-31	100.381	2.241	1200	PC RING	98.14	150	79.6	98.14	150		D400
SWP-32	99.994	1.915	1200	PC RING	98.079	150	80	98.079	150		D400
SWP-HB1	99.196	2.666	1500	PC RING	96.605	225	43.2	96.53	300		D400
								97.906	150	1226	
SWP-34	98.168	1.818	1200	PC RING	96.35	300	180				D400
SWP-TANK 3	98.239	1.939		CRATES	96.35	300	138	96.3	300		
SWP-36	98.634	0.699	150	RODDING EYE	97.935	150	17.9				
SWP-37	98.347	0.657	150	RODDING EYE	97.69	150	39.5				
SWP-38	98.521	1.149	600	PPIC	97.372	150	59.9	97.372	150		D400
								97.372	150		
SWP-39	97.896	0.654	150	RODDING EYE	97.242	150	32.8				
SWP-40	98.001	0.734	150	RODDING EYE	97.267	150	24.6				
SWP-41	97.965	1.106	600	PPIC	96.859	150	17.5	96.859	150		D400
								96.859	150		
SWP-42	98.289	1.989	1200	PC RING	96.3	300	143	96.3	300		D400
								97.296	150	846	
								96.45	150		
SWP-TANK 4	98.36	2.11		CRATES	96.25	300	143	96.25	300		
SWP-HB2	98.326	2.126	1500	PC RING	96.2	225	33.7	96.2	225		D400
								96.2	300		
SWP-45	99.13	0.727	150	RODDING EYE	98.403	150	17.8				
SWP-46	97.577	1.039	600	PPIC	96.538	150	59.7	96.538	150		D400
SWP-47	97.439	1.839	1200	PC RING	95.6	300	143	95.675	225		D400
								96.465	150	715	
SWP-TANK 6	97.425	1.875		CRATES	95.55	300	143	95.55	300		
SWP-49	98.868	0.645	150	RODDING EYE	98.223	150	15				
SWP-50	98.013	1.285	600	PPIC	96.728	150	59.7	96.728	150		D400

PRIVATE SURFACE WATER NETWORK

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Dia (mm)	Chamber Type	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipe Out Gradient (1 in X)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Pipes In Backdrop (mm)	Cover Grade
SWP-51	97.879	1.234	1200	PC RING	96.645	150	9.6	96.645	150		D400
SWP-52	97.553	1.953	1200	PC RING	95.6	300	148.8	95.75	150		D400
SWP-TANK 5	97.477	1.927		CRATES	95.55	300	169.2	95.55	300		
SWP-54	97.653	0.671	150	RODDING EYE	96.982	150	54.9				
SWP-55	97.662	0.654	150	RODDING EYE	97.008	150	60				
SWP-56	97.733	0.934	600	PPIC	96.799	150	11.7	96.799	150		D400
								96.799	150		
SWP-57	97.472	1.972	1200	PC RING	95.5	300	143	95.5	300		D400
								95.5	300		
								96.426	150	776	
SWP-58	97.494	0.65	150	RODDING EYE	96.844	150	34.4				
SWP-59	97.143	0.709	150	RODDING EYE	96.434	150	60				
SWP-60	97.104	1.654	1200	PC RING	95.45	300	93	95.45	300		D400
								96.376	150	776	
								96.155	150	555	
SWP-61	97.264	1.07	600	PPIC	96.194	150	60				D400
SWP-HB3	97.112	1.712	1500	PC RING	95.4	225	14.4	95.4	300		D400
								96.032	150	557	
SWP-63	96.688	2.155	1500	PC RING	94.533	450	310	94.758	225		D400
SWP-TANK 7	96.394	1.911			94.483	450	399.5	94.483	450		
SWP-65	97.337	1.787	600	PPIC	95.55	225	84.9				D400
SWP-66	96.75	1.461	600	PPIC	95.289	225	31.7	95.289	225		D400
SWP-67	96.359	1.493	600	PPIC	94.866	225	69.5	94.866	225		D400
SWP-68	96.115	1.44	600	PPIC	94.675	225	106	94.675	225		D400
SWP-69	96.532	2.017	1200	PC RING	94.515	225	155.4	94.515	225		D400
SWP-70	96.174	1.459	1200	PC RING	94.715	225	150.5				D400
SWP-71	95.99	1.453	1200	PC RING	94.537	300	200.6	94.612	225		D400
SWP-72	96.266	1.789	1200	PC RING	94.477	300	200	94.477	300		D400
SWP-CC1	96.346	1.913	2400	PC RING	94.433	150	99.5	94.433	450		D400
								94.433	225		
								94.433	300		
SWP-PI	96.248	1.874	1200DIAx3000LG	GRP	94.374	150	99.5	94.374	150		D400
SWP-75	95.96	1.69	1200	PC RING	94.27	150	135	94.27	150		D400
SWP-EXTG	95.78	1.545	TBC	TBC	OUTFALL	225	TBC	94.235	150		

PRIVATE FOUL WATER NETWORK

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Dia (mm)	Chamber Type	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipe Out Gradient (1 in X)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Pipes In Backdrop (mm)	Cover Grade
FWP-1	97.317	1.982	1200	PC RING	95.185	150	80.1				D400
FWP-2	98.058	1.008	600	PPIC	96.9	150	59.9				D400
FWP-3	97.65	2.48	1200	PC RING	95.02	150	80.8	95.02	150		D400
								96.685	150	1665	D400
FWP-4	97.313	2.263	1200	PC RING	94.9	150	80	94.9	150		D400
FWP-5	96.726	TBC	1200	PC RING	OUTFALL	150	TBC	TBC	150		D400

ADOPTED SURFACE WATER NETWORK

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Dia (mm)	Chamber Type	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipe Out Gradient (1 in X)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Pipes In Backdrop (mm)	Cover Grade
HW-MH-1	101.372	1.397	1200	PC RING	99.150	225	20.9	99.150	150		D400
HW-MH-2	99.25	1.425	1200	PC RING	98.525	225	25.3	97.825	225		D400
HW-MH-3	96.918	1.343	1200	PC RING	97.825	225	16.2	95.575	225		D400

PRIVATE SURFACE WATER NETWORK - FLOW CONTROLS

Manhole Name	Flow Rate	Design Head	Storm Event	Control Type
SWP-HB1	4.5l/s	1.250m	100yr+45%cc	Vortex
SWP-HB2	4.0l/s	0.850m	100yr+45%cc	Vortex
SWP-HB3	5.0l/s	0.900m	100yr+45%cc	Vortex
SWP-CC1	3l/s	0.500m	1yr+45%cc	Vortex
	7l/s	0.800m	100yr+45%cc	Orrifice

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

C3	Proximity of construction zone and foundations to existing foul water sewer.
C5	Encountering unrecorded buried services
C7	Unexploded WWII Ordnance (UXO)
C9	Contaminated ground, potentially including asbestos from previous development on the site
C10	Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
C11	Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

MAINTENANCE / CLEANING

M10	Exposure to gases built up in the existing sewers. Unconsciousness leading possibly to death.
M11	Exposure of Contractor to foul water sewage. Contraction of diseases e.g. leptospirosis (Weils Disease)

DECOMMISSIONING / DEMOLITION

D1	Contaminated air, water spray in proximity of public access routes.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

P01	17/03/22	ISSUED FOR RIBA STAGE 3	NM	SC	GC	DB
P02	02/12/22	ISSUED FOR REVISED RIBA STAGE 3	SC	GC	MS	DB
Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd

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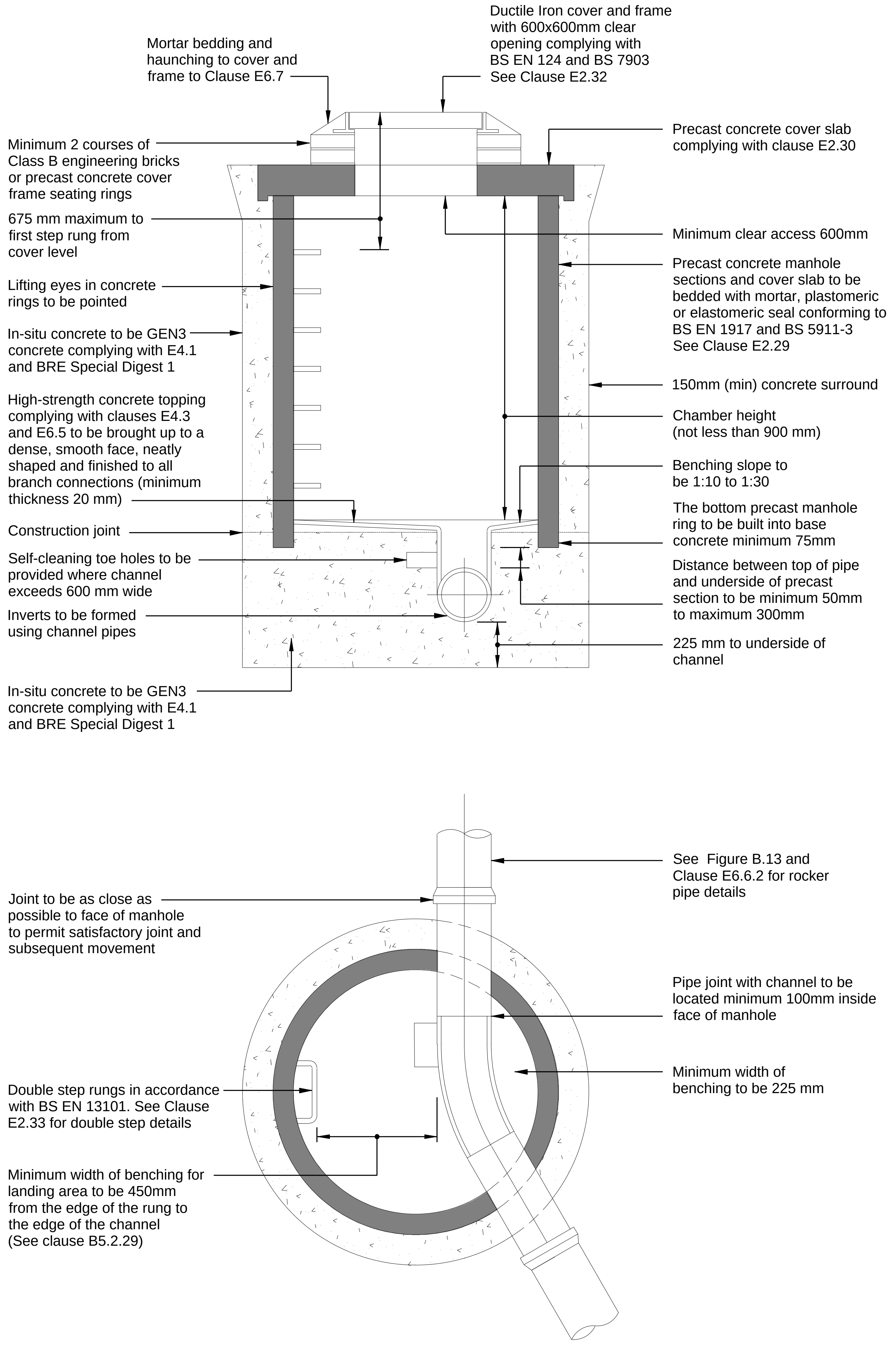
Client
Durham County Council

Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
MANHOLE SCHEDULE

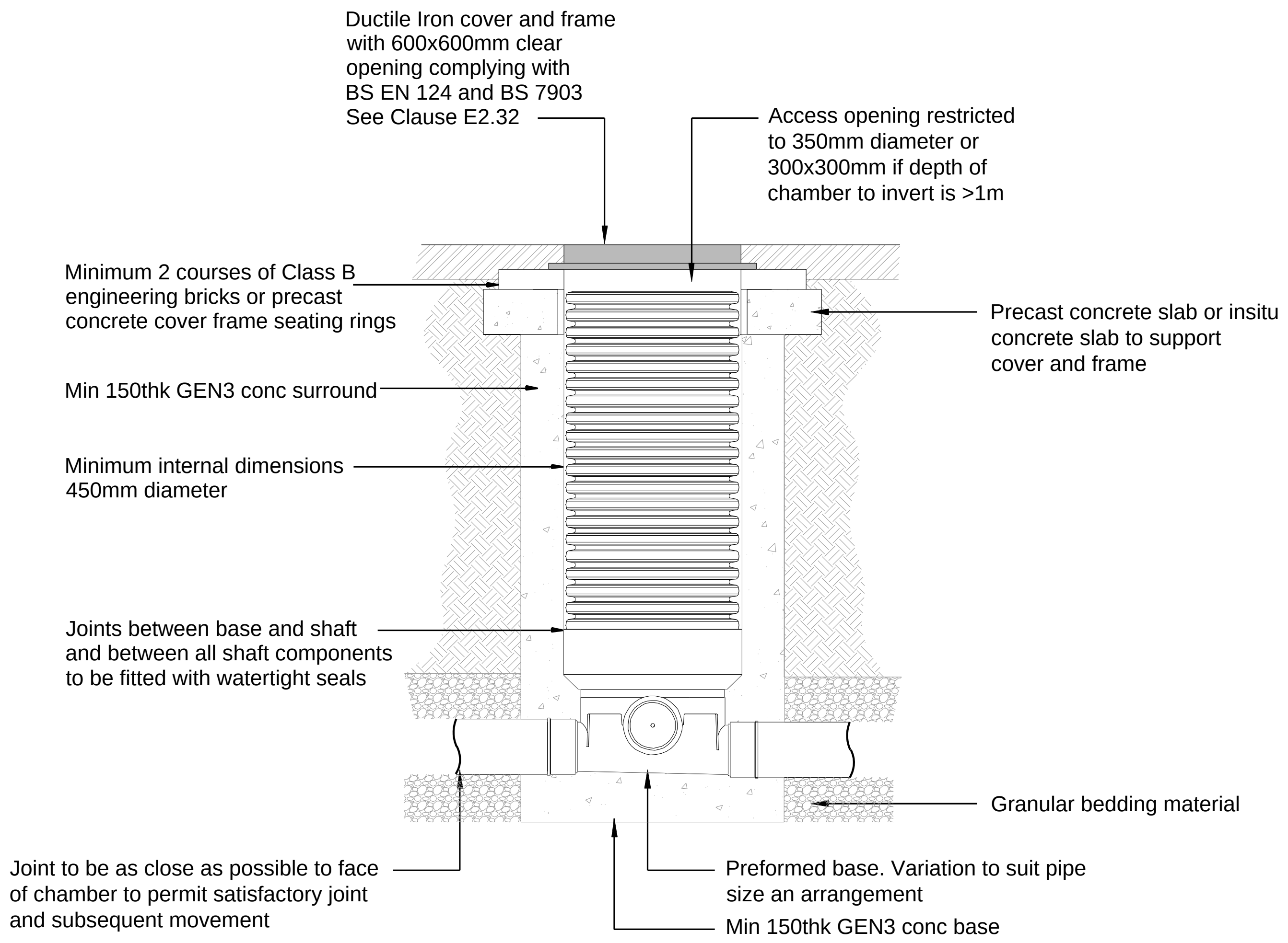
Drawing Status	Suitable for Stage approval	Suitability S4
Scale	N/A	DO NOT SCALE
Jacobs No.	BL000034	Rev P02
Client No.		

Drawing Number
BL000034-JAC-ZZ-ZZ-SH-C-52001



TYPICAL MANHOLE DETAIL

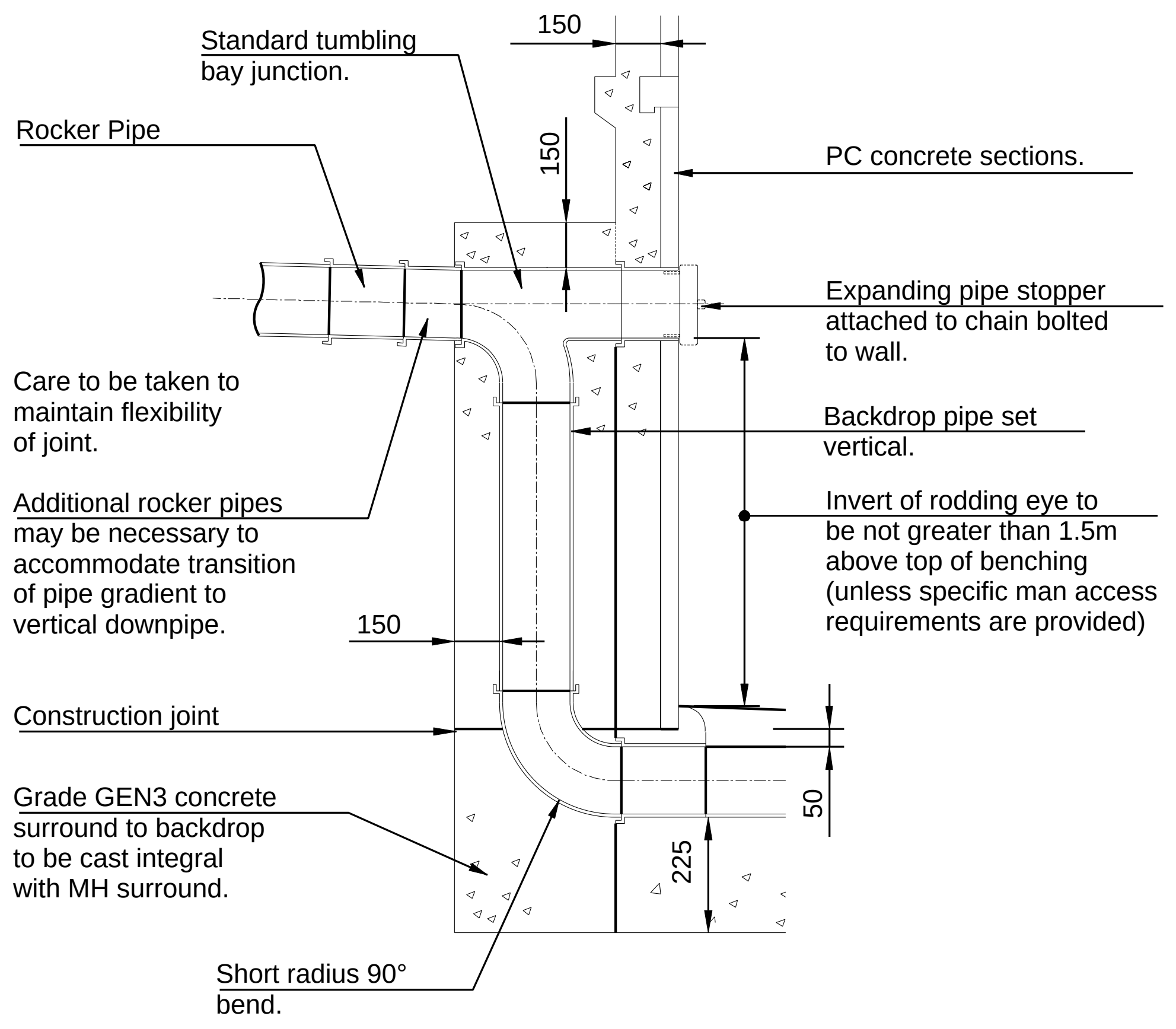
Depth from cover level to soffit of pipe 1.5m - 3.0 m



POLYPROPYLENE INSPECTION CHAMBER DETAILS

Note

Max. depth of chamber 3000mm but can be cut to suit.



TYPICAL VERTICAL BACKDROP DETAIL

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6. CLAUSE REFERENCES SHOWN ON THIS DRAWING ARE TO THE SEWERAGE SECTOR GUIDANCE, APPENDIX C, UNLESS OTHERWISE SHOWN.

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	16/12/22	ISSUED FOR PLANNING APPLICATION	SC	GC	MS	DB

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Durham County Council

Project
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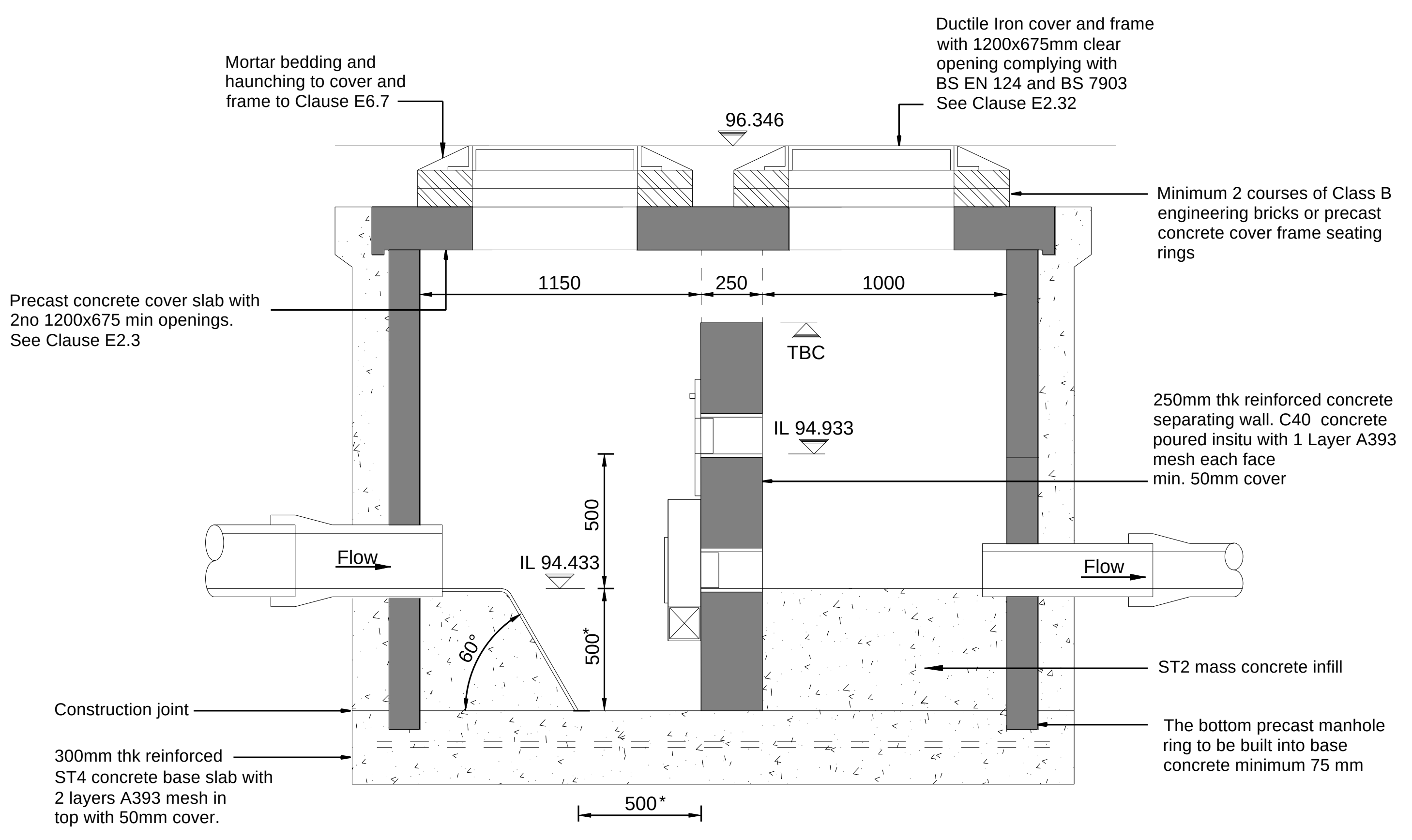
BUS STATION & CAR PARK

Drawing title
PRIVATE DRAINAGE DETAILS

Drawing Status: Suitable for Stage approval
Suitability: S4
Scale: 1:20
DO NOT SCALE
Jacobs No.: BL000034
Client No.:
Rev: P01
Drawing Number: BL000034-JAC-ZZ-ZZ-DR-C-10001



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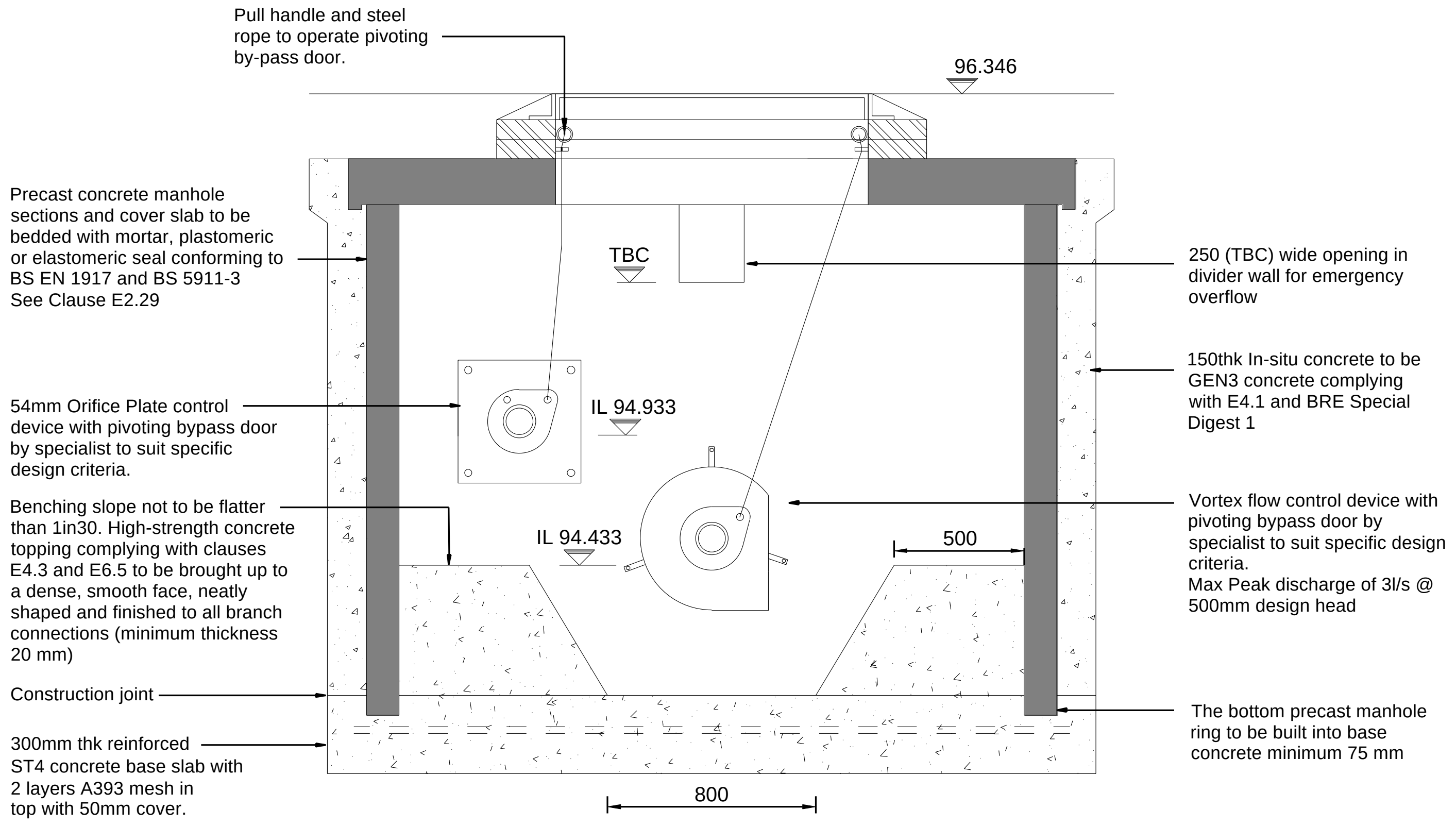

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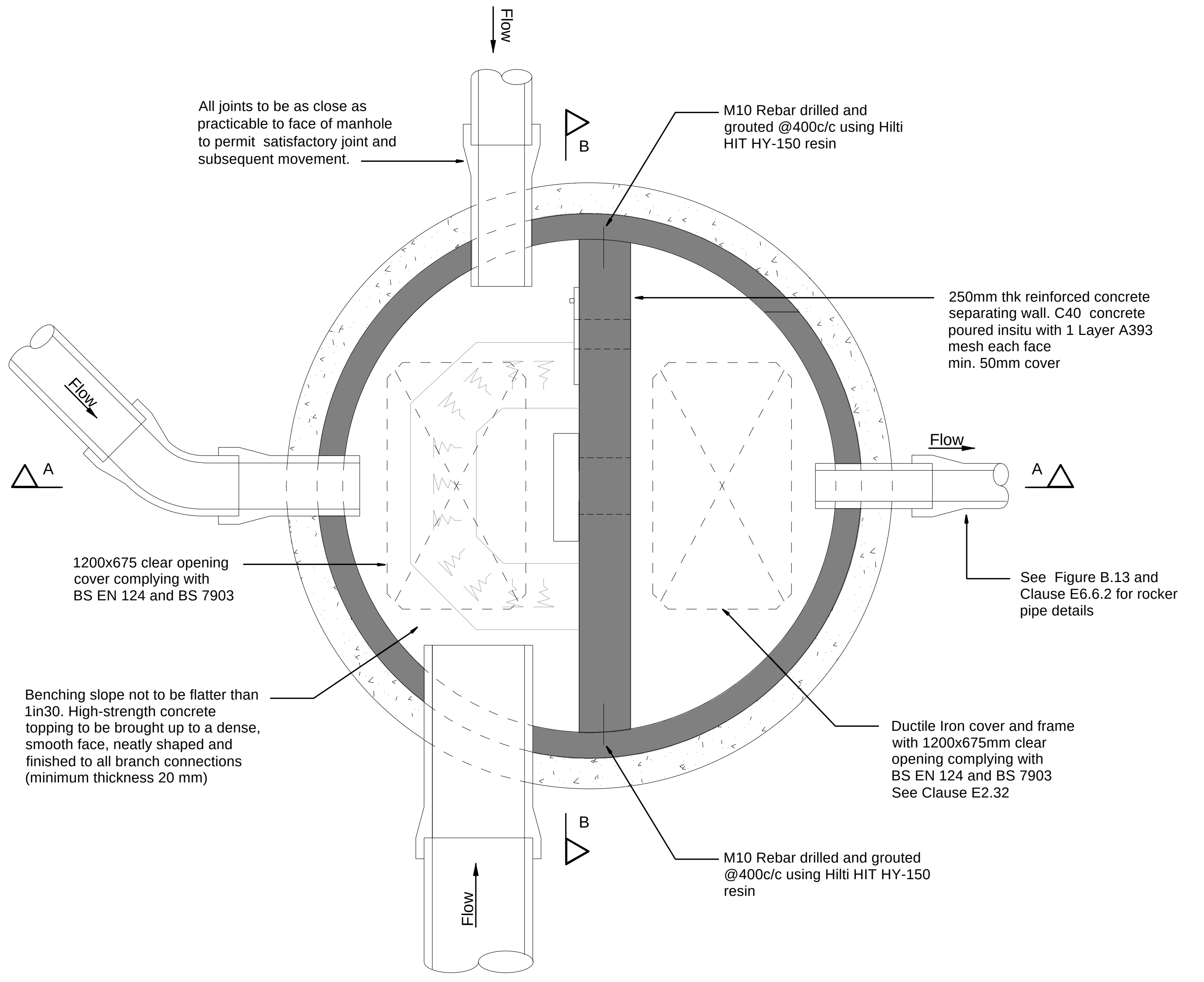
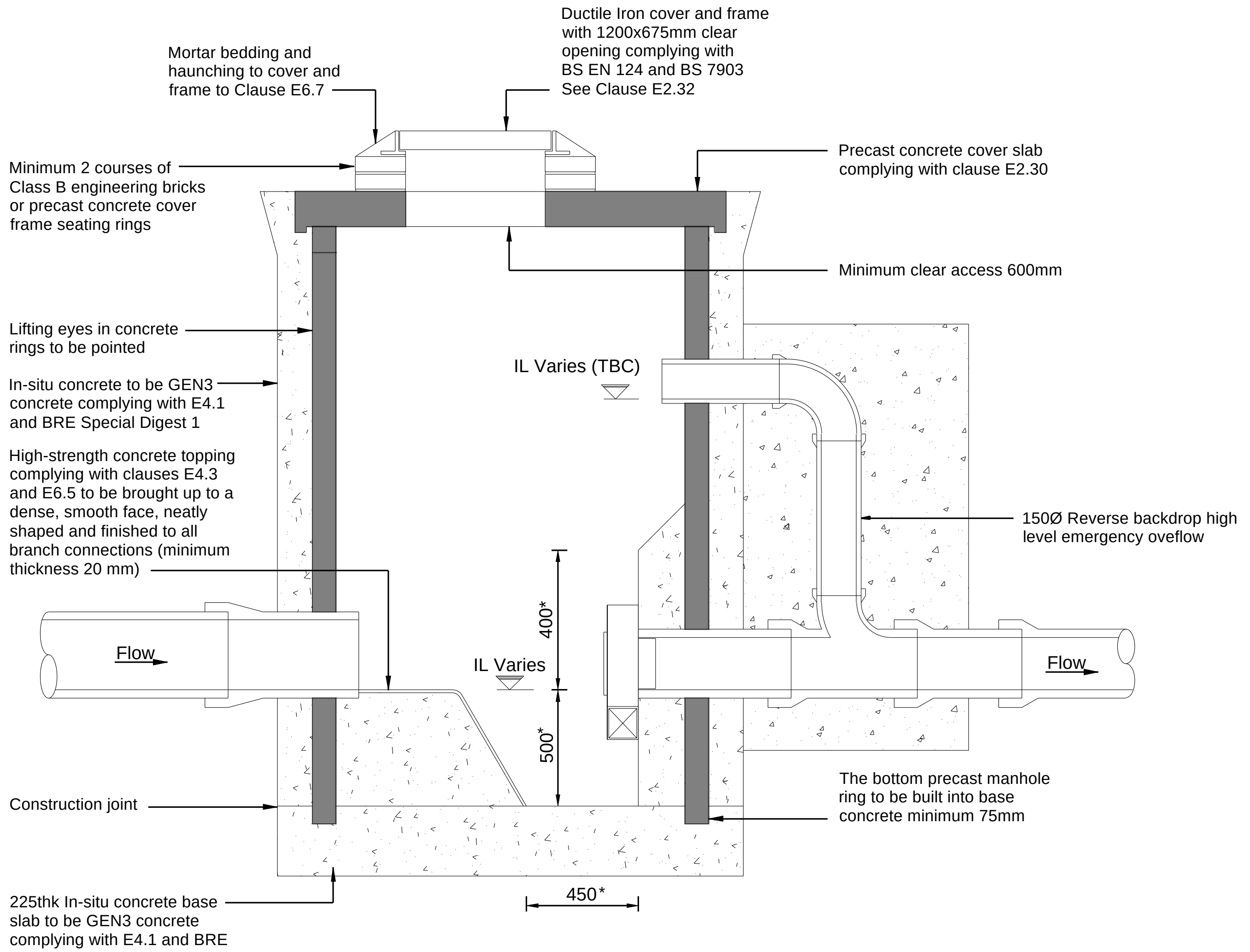


COMPLEX FLOW CONTROL CHAMBER DETAIL (MHSWP-CC1)

* Dimensions indicative subject to manufacturers details for specific device.



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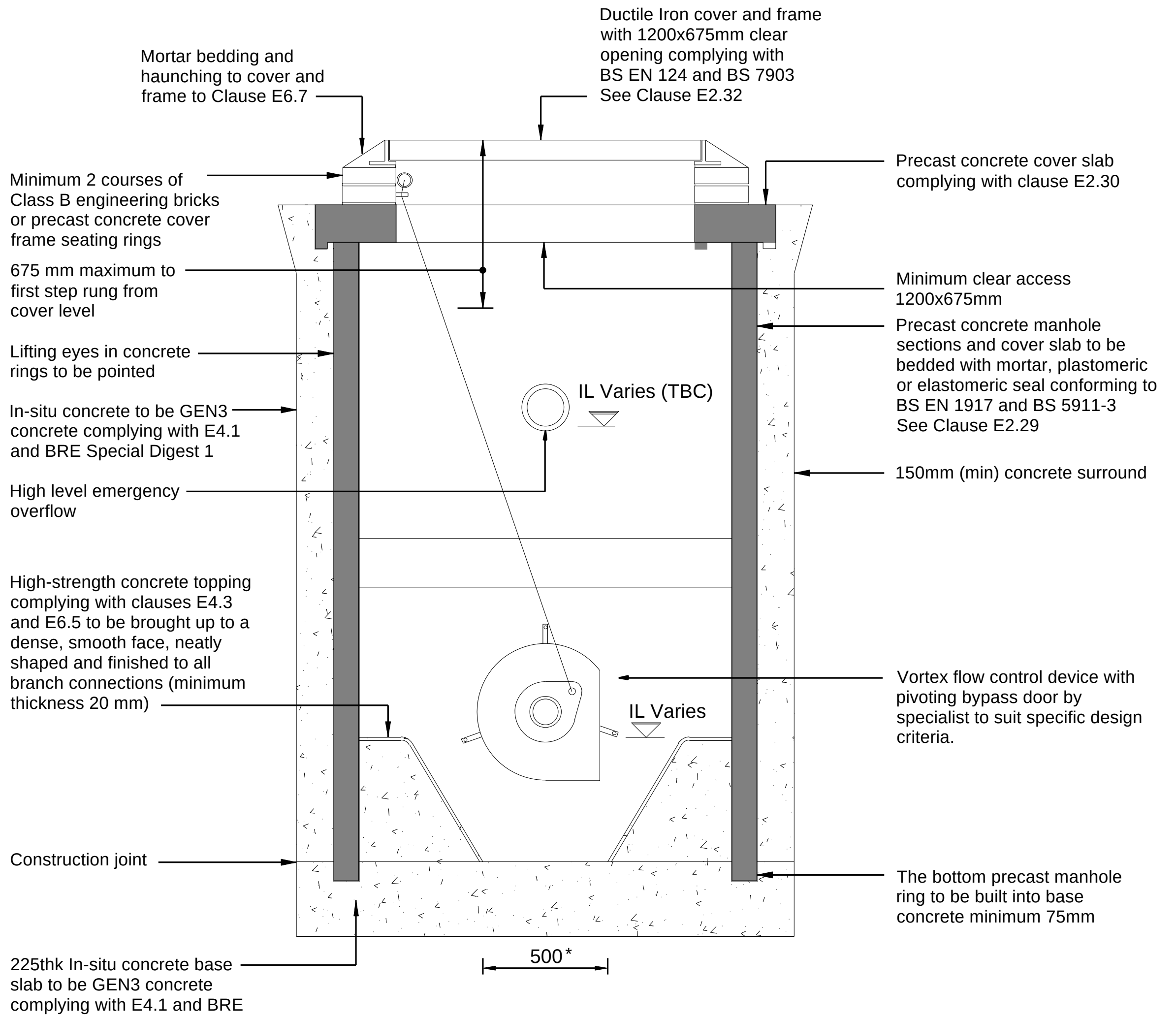

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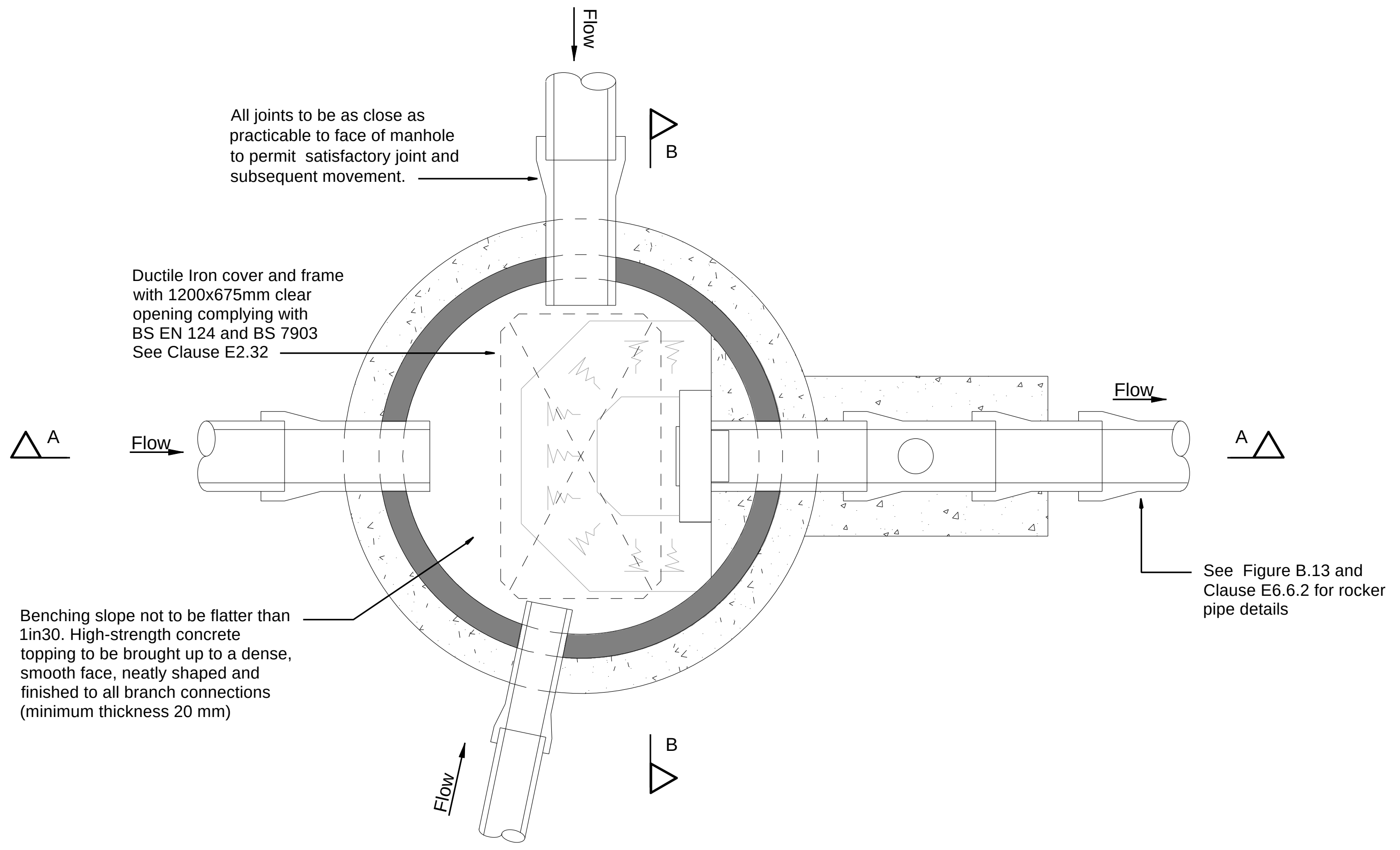

TYPICAL FLOW CONTROL CHAMBER DETAIL (MHSWP-HB1,HB2 & HB3)

* Dimensions indicative subject to manufacturers details for specific device.

PRIVATE SURFACE WATER NETWORK - FLOW CONTROLS				
Manhole Name	**Flow Rate**	**Design Head**	**Storm Event**	**Control Type**
SWP-HB1	4.5l/s	1.250m	100yr+45%cc	Vortex
SWP-HB2	4.0l/s	0.850m	100yr+45%cc	Vortex
SWP-HB3	5.0l/s	0.900m	100yr+45%cc	Vortex
SWP-CC1*	3l/s	0.500m	1yr+45%cc	Vortex
SWP-CC1*	7l/s	0.300m	100yr+45%cc	Orrifice

* SWP- CC1 is a complex flow control chamber with 2no control devices (Refer to detail).

Control 1: Vortex flow control to restrict flows to 3l/s for all storms up to and including the 1in1yr RP event with additional allowance for 45% climate change. (Design head of 500mm)

Control 2: Orifice plate flow control device. Maximum combined flow of both devices to restrict flows to 7l/s for all storms up to and including the 1in100yr RP event with additional allowance for 45% climate change. (Total combined design head for both devices is 800mm)

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2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS.
3. ALL DIMENSIONS ARE IN MILIMETRES UNLESS SHOWN OTHERWISE.
4. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM.
5. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING WORK ON SITE. ANY REQUIREMENTS FOR MODIFICATIONS OR ALTERATIONS ARE TO BE CARRIED OUT WITH THE APPROVAL OF PROJECT MANAGER.
6. CLAUSE REFERENCES SHOWN ON THIS DRAWING ARE TO THE SEWERAGE SECTOR GUIDANCE, APPENDIX C, UNLESS OTHERWISE SHOWN.

0 0.5 1 2

SCALE 1:25 MILLIMETRES

P01	16/12/22	ISSUED FOR PLANNING APPLICATION	SC	GC	MS	DB
Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd

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Client
Durham County Council

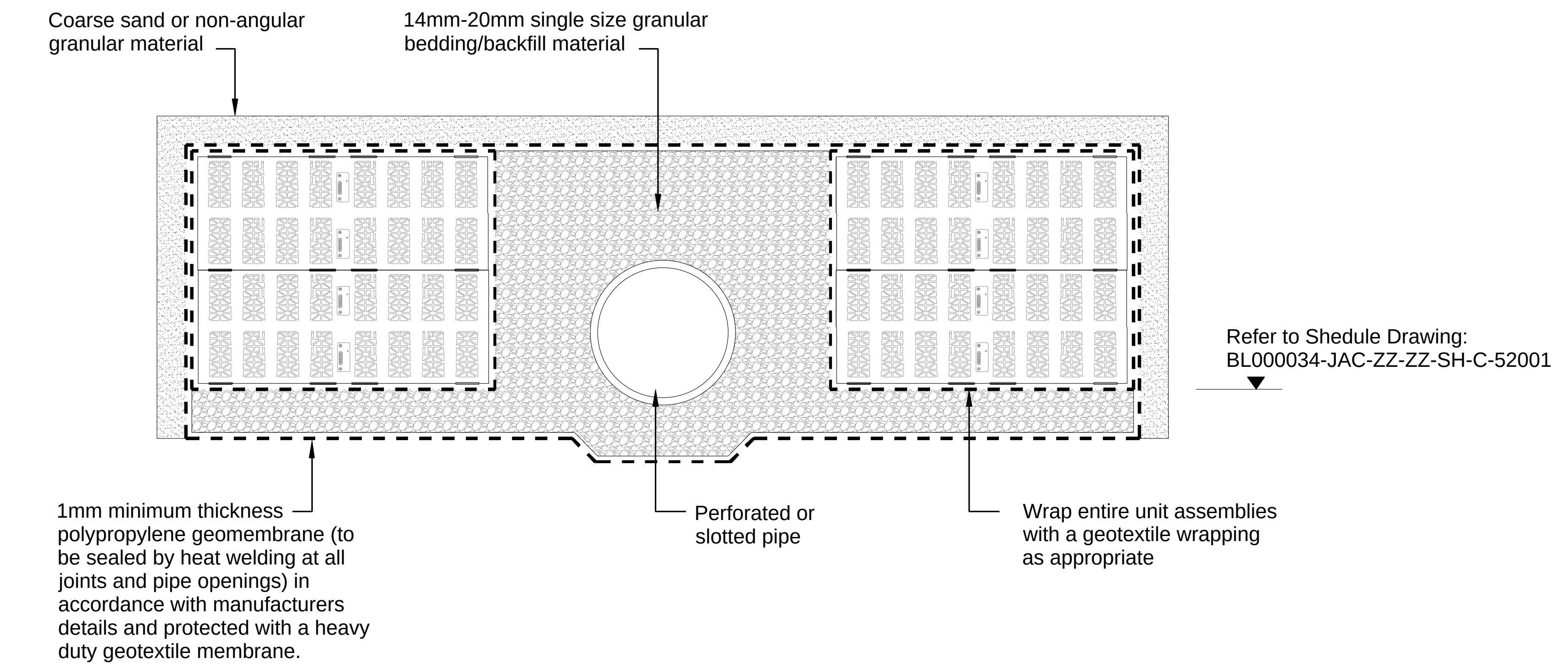
Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
FLOW CONTROL DETAILS

Drawing Status
Suitable for Stage approval
Suitability
S4

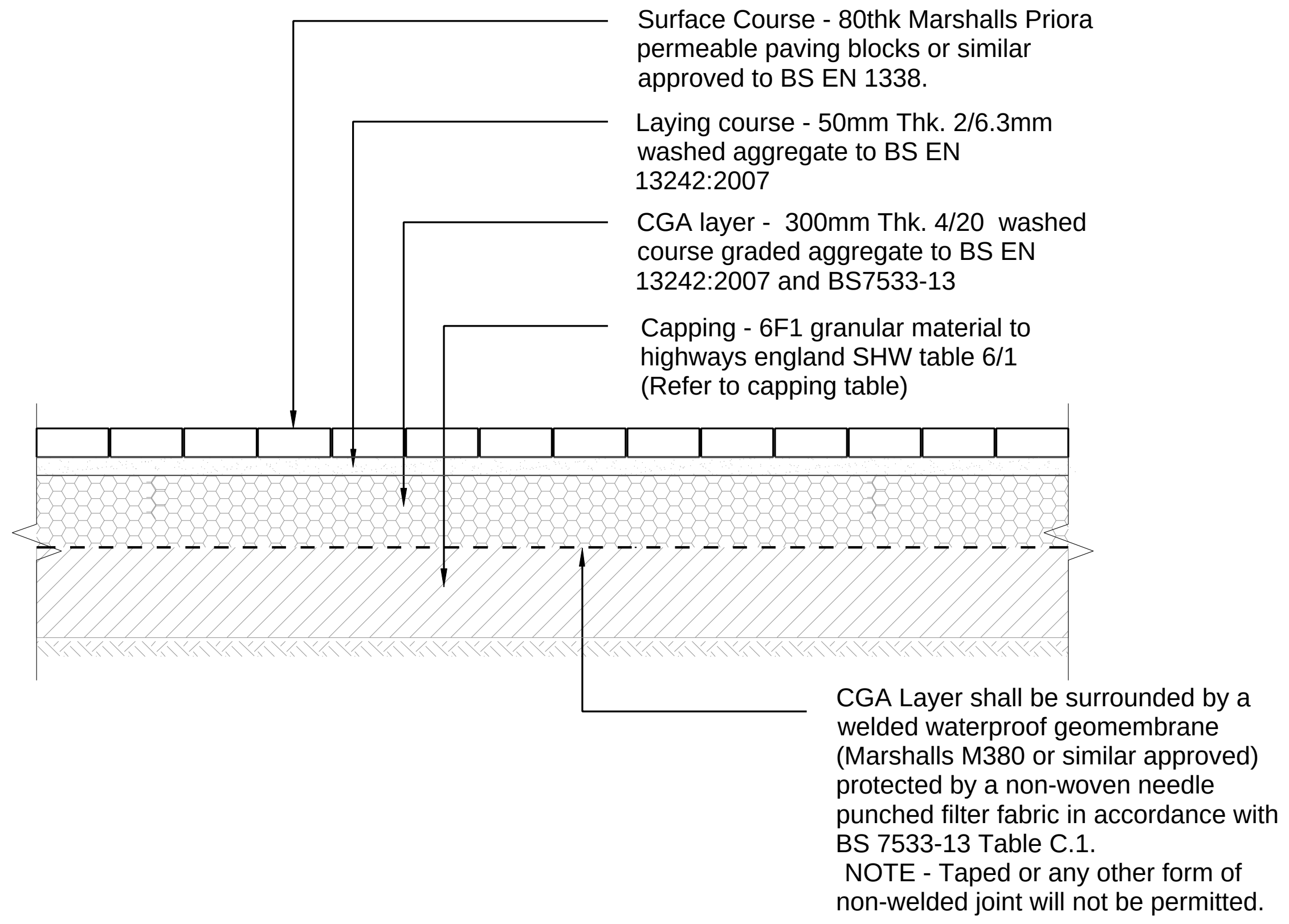
Scale
1:25
DO NOT SCALE
Jacobs No.
BL000034
Client No.
Rev
P01

Drawing Number
BL000034-JAC-ZZ-ZZ-DR-C-10003



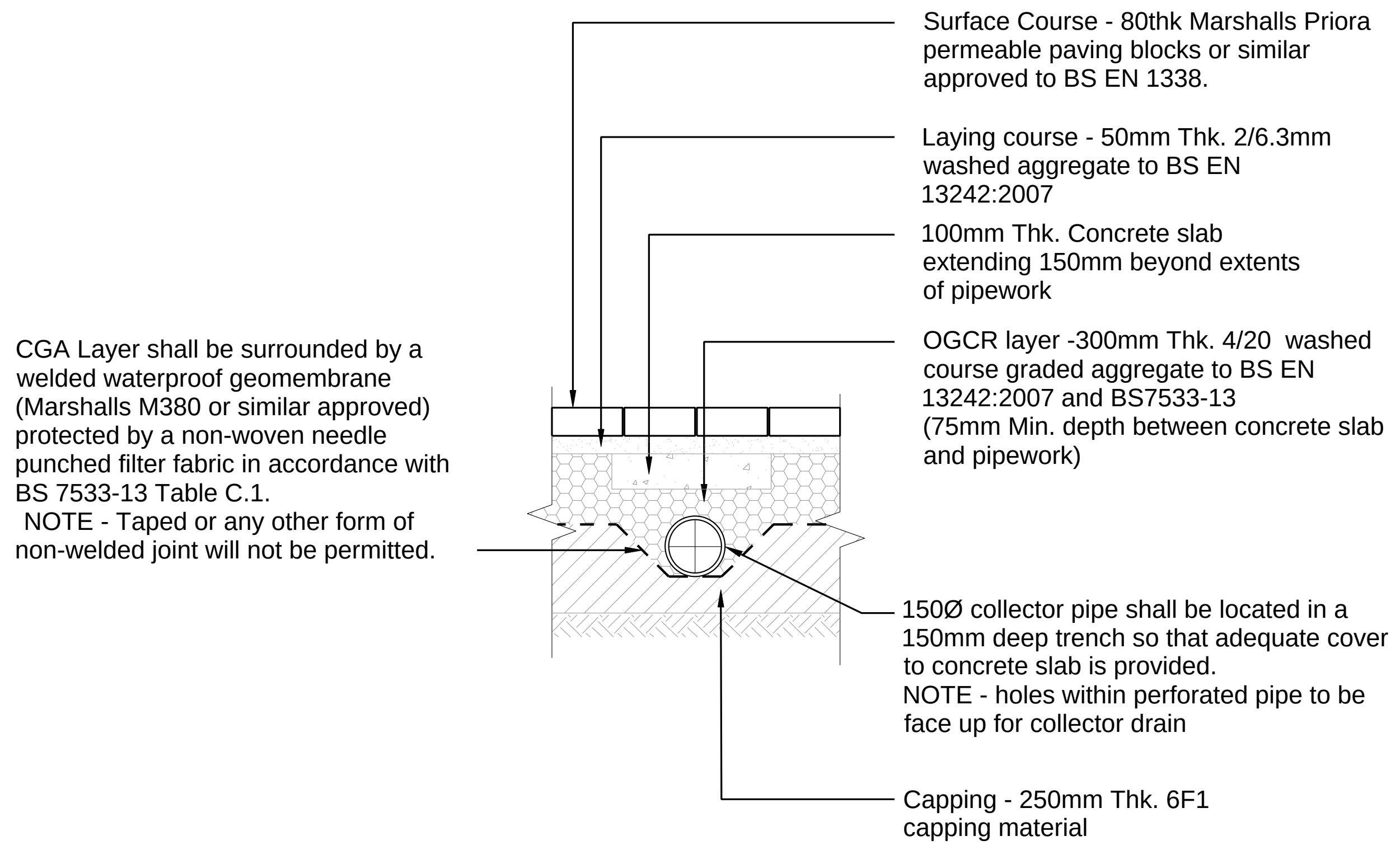
ONLINE ATTENUATION TANK DETAIL

For tank locations, plan dimensions and depths refer to drainage layout drawings:
BL000034-JAC-ZZ-ZZ-DR-C-01001
BL000034-JAC-ZZ-ZZ-DR-C-01002



PERMEABLE PAVING STORAGE PARKING BAY TYPICAL SECTION

CAPPING LAYER THICKNESS TABLE FOR TYPE 'C' PERMEABLE PAVING	
SUBGRADE CBR VALUE (%)	CAPPING LAYER THICKNESS (MM)
≥5	-
≥4	150
≥3	225
≥2	350
≥1	600



PERMEABLE PAVING STORAGE COLLECTOR DRAIN TYPICAL SECTION

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Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	16/12/22	ISSUED FOR PLANNING APPLICATION	SC	GC	MS	DB

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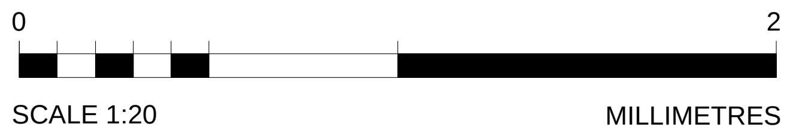
Project
BISHOP AUCKLAND
BUS STATION & CAR PARK

Drawing title
ATTENUATION DETAILS

Drawing Status: Suitable for Stage approval
Suitability: S4
Scale: 1:20 DO NOT SCALE
Jacobs No.: BL000034
Client No.:
Rev: P01
Drawing Number: BL000034-JAC-ZZ-ZZ-DR-C-10004



Appendix I. Maintenance Schedule

The following maintenance schedules are based on the recommended guidance for operation and maintenance of drainage assets in accordance with The Suds Manual – CIRIA C753, 2015.

Drainage Channels and Gullies

Maintenance Schedule	Required Action	Typical Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection including channel outlet boxes.	Half yearly and after large storms.
Regular Maintenance/Inspection	Litter and debris removal	Monthly or as required.
	Check and remove large vegetation growth near channel runs.	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be re-profiled to provide a flat area or berm adjacent to the paving.	3-monthly, 48 hours after large storms.
Remedial Action	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.

Pipes and Manholes

Maintenance Schedule	Required Action	Typical Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	Once, upon completion of development
	Inspect for evidence of poor operation via water level in chambers. If required take remedial action.	3-monthly, 48 hours after large storms.
Occasional Maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

Green Roofs

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Rainwater Harvesting System

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

Attenuation Tanks

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Permeable Concrete Block Paving

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/ or weed growth - if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Flow Control Chambers

Maintenance Schedule	Required Action	Typical Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance \ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause blockage/risk to performance)	Monthly
	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

Oil/Petrol Separator

Maintenance Schedule	Required Action	Typical Frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary - indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Raingardens

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years