

University of Gloucestershire
**University of Gloucestershire, City
Campus**

Drainage Statement

GCC-ARUP-ZZ-XX-RP-C-0001

Issue | 9 December 2021

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 282739-00

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ARUP

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1 Introduction

Arup have been appointed by the University of Gloucestershire (UoG) to produce a drainage strategy for the Gloucester City Centre scheme.

This drainage strategy has been written in accordance with the requirements noted in Gloucestershire County Council's Standing Advice and Development Guidance and the Gloucestershire SuDS Design and Maintenance Guide.

The Lead Local Flood Authority (LLFA), Gloucestershire County Council, have also provided recommendations for the proposed planning application which is located in Appendix A.

2 Site Location

The site is bounded by King's Square to the east and major shopping streets to the south (The Oxbode) and west (Northgate Street). Access to the service yard is from St. Aldate Street to the North.

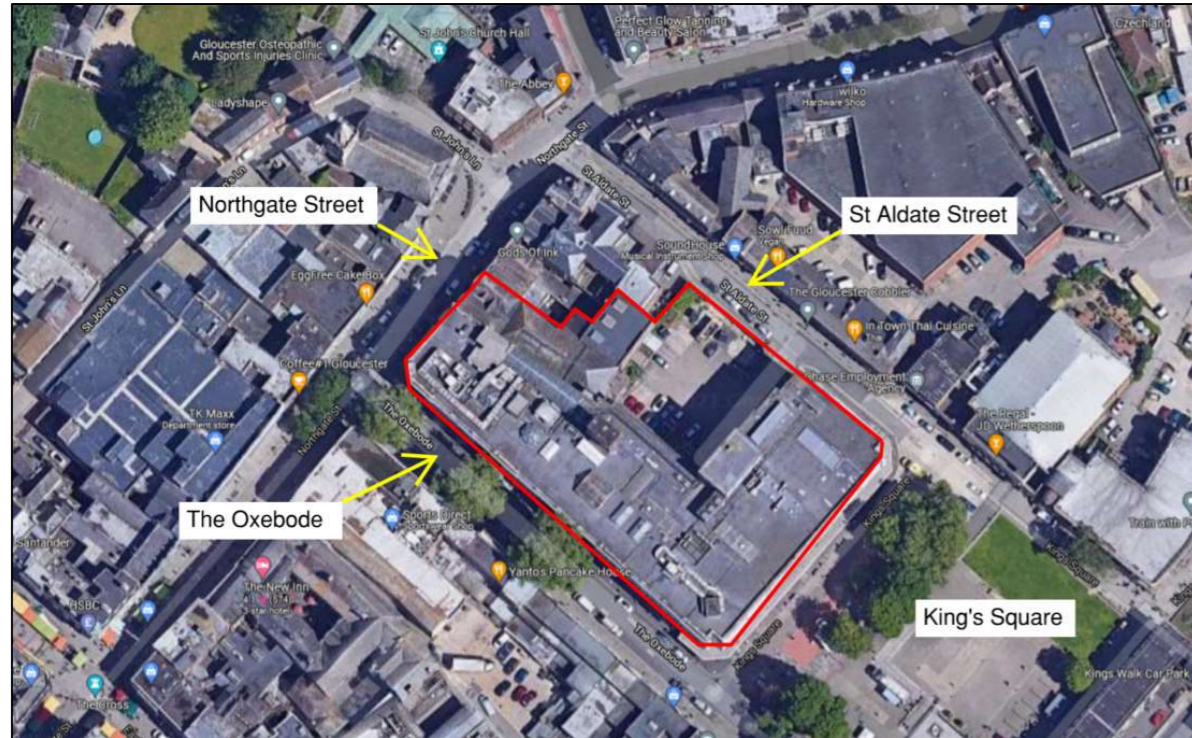


Figure 1: Site Location (Site Boundary in red)

3 Existing and Proposed Development

3.1 Existing Development

The site is the former Debenhams building which has since closed and is now unoccupied. The site lies within a 'U' shaped block of retail buildings forming the south-west and south-eastern blocks.

3.1.1 Topography

A topographical survey was undertaken by Ridge and Partners LLP in October 2021.

The courtyard levels range from between approximately 17.8 to 18.0 AOD, with the highest levels towards the northwest corner and centre of the courtyard. The topographical survey can be found in Appendix B.

3.1.2 Geology

The British Geological Survey (BGS) maps indicate that the site is underlain by superficial deposits of Alluvium. The underlying bedrock at the site is classified as the 'Lias Group - Mudstone, Siltstone, Limestone and Sandstone'. The history of the site development suggests that historical made ground may be present on the site.

3.2 Archaeology

A section of King's Square, which borders the site boundary is part of the National Heritage list for England, classed as a 'Scheduled Monument' and is a specific site of interest.

Consultation with Cotswold Archaeology has been undertaken in order to ensure that the attenuation tank and permeable paving would not have a large impact on the Roman deposits beneath the site. They have reviewed the available information and provisionally advised that the proposed attenuation tank and permeable paving would most likely be above the level of any deposits.

3.2.1 Flood Risk

According to the Government's online mapping, the site is within Flood Zone 1, which is land classed as having a less than 1 in 1000 annual probability of river or sea flooding.

In terms of surface water flood risk for this site, this is classed as 'very low'. There is a small area of 'low' surface water risk to the south of the site along The Oxebody, this is outside the site boundary.

The site is approximately 300m southeast from the maximum reservoir flood risk extent west of Gloucester Cathedral.

According to the Level 2 SFRA report, the site is within the $\geq 75\%$ category for the susceptibility to groundwater flood emergence. This shows the proportion of each 1km grid square where geological or hydrogeological conditions show that groundwater might emerge.

However, Groundwater Emergence Maps (GEMs) do not cover the Gloucester City Council area and there are no records of groundwater flooding in Gloucester. Based on the available data, the risk is considered low.

3.3 Proposed Development

The UoG city campus development involves the renovation of the former Debenhams building on the corner of Northgate Street and The Oxebody.

The proposed development involves the refurbishment of the exterior of the building and change the use from Class E(a) to create circa 20,000m² of Class F.1(a), (d) and (e). The building will be used by a range of departments such as Health & Social Care, Libraries, Humanities and General teaching, and will also house a Student Union and Café.

4 Existing Drainage

4.1 Surface Water

Severn Trent Water maps (Appendix C) show an existing 225mm dia surface water sewer running easterly along the edge of the site, along The Oxebode. Based on record drawings this sewer takes the entire runoff from the existing roof of the Debenhams building. This surface water sewer then passes through the northern extent of Kings Square, adjacent to the site and connects to a combined sewer at the turning point in St Aldate Street.

The estimated discharge rates from the existing site have been calculated using Microdrainage software. FSR rainfall for the 1 in 100 year return period plus 40% climate change was used as the design criteria. The Microdrainage calculations are shown in Appendix C.

The estimated discharge rates for the entire site including the courtyard area have been calculated for the 1 in 1, 1 in 30 and 1 in 100 (plus 40% climate change allowance) storm scenarios, these are displayed in Table 1 below.

Table 1: Existing Brownfield Runoff Rates

Return Period	1 in 1	1 in 30	1 in 100 (+40% CC)
Discharge Rate (l/s)	46.2	113.4	205.1

4.2 Foul Water

Severn Trent Water maps (Appendix C) show an existing 225mm dia combined sewer flowing through the current service yard within the site in a northeasterly direction and connecting to a 300mm dia combined sewer which flows west along St Aldate Street towards Northgate Street, it is assumed all foul drainage from the entire former Debenhams building flows through this sewer.

5 Proposed Surface Water Drainage Strategy

5.1 Approach

The existing site is currently served by a combined drainage system. As part of the proposals, a separate foul and surface water drainage system will be constructed.

The two systems will remain separate until they reach the connection into the existing Severn Trent Water sewer at the northern boundary of the courtyard. The new drainage system will be designed and constructed in accordance with building regulations part H.

The surface water drainage approach for the development has been developed in accordance with Sustainable Drainage Systems (SuDS) principles to ensure the impact on flood risk is minimised and to maximise the amenity and environmental benefits.

The brownfield urban nature of this site presents a number of limitations on the form and scope of SuDS that can be incorporated in the site. We have worked around these restrictions, in collaboration with the Architects to identify a suitable approach.

5.2 SuDS Hierarchy

The National Planning Policy Framework (NPPF) drainage hierarchy guidance states that in the first instance, developments should aim to infiltrate water into the ground. These measures have all been considered and appropriateness for the development summarised below and in Table 2.

It is considered that the proposed development would be unsuitable for infiltration SuDS due to the underlying archaeology and geology.

With infiltration not possible, the next preferred solution is to discharge into a surface water body. The nearest potential discharge point to the site would be the River Severn, which is approximately 550m southwest of the site. The option is considered unachievable as the route would pass through heavily developed third party land and no feasible route has been identified.

With no opportunity for infiltration or discharge to a watercourse, the remaining option is to discharge into a surface water sewer, highway drain or other drainage system. The local sewage network is owned by Severn Trent Water and all sewers in the vicinity of the site are shown as foul on the plan, but these sewers receive significant surface water flows and effectively act as combined sewers.

Table 2: Summary of the SuDS Measures which were considered at the site

SuDS Measure	Appropriate for the development?
Swales	✗ The site area is constrained with no significant open space available
Soakaways	✗ The low permeability geology does not permit this.
Detention/ Infiltration basins	✗ The site area is constrained with no significant open space available

Permeable paving	✓ Permeable paving will be incorporated into the drainage design
Green/Blue Roofs	✓ Green/Blue roofs won't be incorporated into the development
Geo-cellular storage systems	✓ Attenuation tanks will be incorporated into the drainage design
Tree pits	✓ The site area is constrained with no significant open space available

In summary, the space available on the site which can be used for soft SuDS features is very limited. The lack of external areas and underlying archaeology and geology means SuDS features which infiltrate into the ground are not feasible. The identified preferred approach is to use a tanked permeable paving system and an attenuation tank with a restricted discharge into the public sewer. Other SuDS measures will be adopted where possible, albeit on a small scale.

5.3 Proposed Surface Water Strategy / Post-development Runoff

There are two proposed surface water networks to be utilised as part of the proposed drainage strategy, one of which is existing (along the The Oxeboe to the south) and one of which will connect into the existing combined sewer outside the site boundary to the north (at St Aldate Street).

One third of existing roof drainage will continue to drain into the surface water sewer at the south of the site. Two thirds of the proposed roof drainage will be redirected northerly. In addition, the courtyard catchment is proposed to drain into a new surface water network within the site (including the permeable paving at the proposed parking bays and attenuation tank), which will then drain into the existing combined sewer along St Aldate Street.

The proposed surface water system will be connected to the existing Severn Trent Water network via the existing combined sewer adjacent to the courtyard in St Aldate Street. The resultant flow from the connection will be 73l/s, with a flow control restriction in place to ensure a 40% reduction on brownfield runoff rates.

A drainage strategy drawing has been produced to provide a layout of the proposed surface water and foul drainage (Appendix D).

5.4 Proposed Attenuation Requirements

The pre-developed site is currently categorised as 'brownfield'. In accordance with Gloucestershire County Council's recommendation (Appendix A), the site will aim to serve a reduction from the existing pre-developed runoff rate by providing a 40% reduction in flows for the equivalent 1 year and 100 year storm events.

The attenuation has been sized to ensure that the system is able to accommodate the 1 in 100 year storm + 40% climate change allowance with the introduction of a flow control device at the outlet. The proposed surface water attenuation tank in the form of geocellular storage crates will accommodate a total of 105m³ storage.

The resultant flow from the attenuation tank will be 73l/s as shown in Table 3.

Table 3: Proposed Surface Water Rates

Runoff Rates		Proposed Sewer Route	Return Period: 1 in 100 (plus 40% CC)	% Reduction
Existing Brownfield Runoff Rates for Entire Site		N/A	205.1	N/A
Proposed Runoff Rates		Noted below	123	-40%
	Proposed Unattenuated Surface Water Flows	To connect into existing 225dia surface water to the south along The Oxebode.	50	N/A
	Proposed Attenuated Surface Water Flows	To utilise proposed attenuation tank system in courtyard and then connect into existing 225dia combined sewer along St Aldate Street.	73	N/A

7 Proposed Foul Drainage

A separate foul drainage system will be designed and constructed in accordance with Building Regs H and Sewers for Adoption 8th Edition, for the site. All proposed foul connections from the refurbishment will be connected via the existing 225mm diameter Severn Trent Water combined sewer which flows westerly towards Northgate street.

The proposed foul drainage peak flow for the proposed development has been calculated to be 8.74l/s.

A Section 106 application to connect into the existing system may be required.

8 Maintenance

A foul and surface water drainage system within the boundary of the site will be maintained privately by the owner/ occupier. A schedule of maintenance tasks will be issued for inclusion in the Operation and Maintenance Manuals on completion of the works.

8.1 Attenuation Tank

The attenuation tank system will be supplied, constructed and maintained by a specialist supplier.

The maintenance regime for the attenuation tank system will include as a minimum the following:

Inspection every 6 to 12 months, or after a significant rainfall event;

Catchpit and Inlets/Outlets to be inspected and cleared following inspection if required;

Check for cracks and leaks in the tank; and,

Filters to be replaced following inspection if required.

The inspections will either be undertaken by the supplier's maintenance team or the building owner's facilities team after they have been trained in the specific operations and maintenance requirements.

8.2 Permeable Paving

The permeable paving system will be supplied, constructed and maintained by a specialist supplier.

The maintenance regime for the attenuation tank system will include as a minimum the following:

Inspection every 6 to 12 months, or after a significant rainfall event;

If excessive silt and debris is found the surface will require cleaning in accordance with the paving manufacturers requirements. Note that the permeable paving is a tanked (lined) system and therefore the risk of contamination to the ground, or from the ground is mitigated

8.3 Other Drainage Components

Maintenance of other drainage components will be undertaken by the client's facilities team and will include as a minimum:

Gullies and linear channels to be inspected every 4 months and cleared as necessary;

Visual inspections of the gullies and linear channels should record locations where siltation is prevalent and additional care and removal should be undertaken as required at these locations;

Flow control device and non-return valve to be inspected and maintained in accordance with manufacturer's requirements.

8.4 General Maintenance Requirements

The general maintenance requirements for the surface water drainage elements are noted below:

Inspections to enable general de-silting and cleaning should be undertaken especially in late autumn/ early winter following trees shedding their leaves. This applies to both pipes systems and sustainable drainage features (e.g. pond inlets/outlets etc);

Inspections should be undertaken after heavy storm events which are likely to lead to a high rate of debris being built up in the system;

Disposal of sediment from silt traps etc. should be in accordance with waste management regulations;

The visual inspections and cleaning operations should comply with BS EN 752:2008 and the project Health and Safety file;

Whilst structural failure of components is not anticipated within the design life, inspections should look for signs of structural damage. This requirement becomes more prevalent as the age of the structure increases; and

In the event of any spillage or contaminants entering the drainage system the Adoption Authority and the Environment Agency should be notified.

9 Conclusion

A separate sewer system for foul and surface water will be constructed to serve the development.

Foul flows are proposed to connect into the existing Severn Trent Sewer which flows south to north through the courtyard.

One third of the surface water flows from the roof are proposed to drain into the 225mm diameter combined sewer to the south of the site.

Two thirds of the surface water flows from the roof plus the courtyard are proposed to drain into the combined sewer situated along St Aldate Street to the north of the site.

In terms of surface water discharge, the SuDS hierarchy has been considered and concluded that water will be discharged to a combined sewer outside the site boundary.

SuDS in the form of permeable paving and an attenuation tank have been incorporated into the strategy.

Proposed flows:

For the 1 in 100 year scenario (plus 40% climate change), a 40% betterment from existing brownfield rates will be achieved in accordance with Gloucestershire County Council's recommendation (Appendix A)

Appendix A

Gloucestershire County Council
Recommendations

Lead Local Flood Authority

Shire Hall
Gloucester
GL1 2TH

Adam Smith
Gloucester City Council
Planning
Shire Hall
Westgate Street
Gloucester
GL1 5TG

Please ask for: [REDACTED]

Phone: [REDACTED]

Our Ref: G/2021/049016

Your Ref:
21/01156/PREAPP/LLFA

Date: 5 November 2021

Dear Adam Smith,

TOWN AND COUNTRY PLANNING ACT 1990 LEAD LOCAL FLOOD AUTHORITY RECOMMENDATION

LOCATION: Debenhams 30 - 44 Northgate Street Gloucester GL1 1SQ
PROPOSED: Refurbishment works to the exterior of the building and change of use to create circa 20,000m² of Class F.1(a), (d) and (e) uses from Class E(a)

In response to the request for pre-application advice on surface water drainage on the above application the Lead Local Flood Authority (LLFA) can advise as follows.

A surface water drainage strategy is required for all applications and for sites greater than 1 ha or those within the Environment Agency's flood zones 2 or 3, a site specific flood risk assessment (FRA) is also required. Guidance on FRAs can be found at: <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>.

The Risk of Flooding from Surface Water (RoFfSW) maps from the Environment Agency can be found here: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>.

The drainage strategy should comply with the principles of Sustainable Drainage Systems (SuDS) hierarchy for surface water. In doing so, consideration should be given first to infiltration, then discharge to a watercourse, then connecting to a public surface water sewer and finally connecting to a public combined sewer (with the necessary permissions from the relevant water company) if there are no other viable options. Where connections require crossing of third party land, agreement in principle from the relevant party should be included.

Where necessary, infiltration tests should be completed to BRE Digest 365 standard and the results provided. Please note that discharging to an ordinary watercourse (which includes ditches) may require Land Drainage Consent from the LLFA. If the strategy is to discharge into a watercourse then there would need to be proof that the site will still be able to drain or there is sufficient storage onsite for when the watercourse is in high flow or when the watercourse is in flood. If the site doesn't currently drain into the watercourse then we would need to provide proof that the risk of flooding is not increased as a result of increasing the discharge into it.

There should be no surface water flooding on site for rainfall events up to and including the 1 in 30 year event and no internal flooding to properties (including basements) up to the 1 in 100 year event (plus 40% for climate change). Development should not increase flood risk outside of the site. Exceedance flow routes for events greater than the 1 in 100 year storm should be identified and should avoid properties including gardens. When developing next to a watercourse, it is recommended an 8m strip of land be kept free for maintenance purposes.

Any attenuation features should be shown including calculations for stored volumes and discharge rates. For greenfield developments, the peak discharge rate up to the 1 in 100 year rainfall event (plus 40% for climate change) should never exceed the peak greenfield runoff rate for the same event. For brownfield developments, the peak discharge rate from the development up to the 1 in 100 year rainfall event (plus 40%) should be as close as is reasonably practicable to the greenfield runoff rate for the same event. If this is not feasible then Gloucestershire County Council will accept a 40% reduction over the pre development discharge rate. It should never exceed the pre-development discharge rate for the same event.

For greenfield developments, the runoff volume up to the 1 in 100 year, 6 hour rainfall event (plus 40% climate change) should not exceed the greenfield runoff volume for the same event. For brownfield sites the runoff volume up to the 1 in 100 year, 6 hour event (plus 40% climate change) should be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume. Where this isn't practicable, the runoff volume should be reduced by 40% of the existing volume and should never exceed it.

The strategy should not result in any deterioration in water quality and the use of SuDS should improve water quality wherever possible. Information provided by the SuDS manual, CIRIA C753, should be considered when designing the SuDS system.

Please note, Gloucester City Council has the Gloucester City Plan, which was published for public consultation in November 2019. Information about flooding, sustainable drainage, and wastewater within the Plan can be found at the following website:

<https://gloucester.inconsult.uk/consult.ti/cityplan.presub/viewCompoundDoc?docid=11065236&sessionid=&voteid=&partId=11068980>

For more information and to access our "Standing Advice and Development Guidance" and "Gloucestershire SuDS Design and Maintenance Guide" documents please visit our website: <http://www.gloucestershire.gov.uk/planning-and-environment/flood-risk-management/surface-water-drainage-and-major-planning-applications/>.

NOTE 1 :The Lead Local Flood Authority (LLFA) will give consideration to how the proposed sustainable drainage system can incorporate measures to help protect water quality, however pollution control is the responsibility of the Environment Agency

NOTE 2 : Future management of Sustainable Drainage Systems is a matter that will be dealt with by the Local Planning Authority and has not, therefore, been considered by the LLFA.

NOTE 3: Any revised documentation will only be considered by the LLFA when resubmitted through suds@gloucestershire.gov.uk e-mail address. Please quote the planning application number in the subject field.

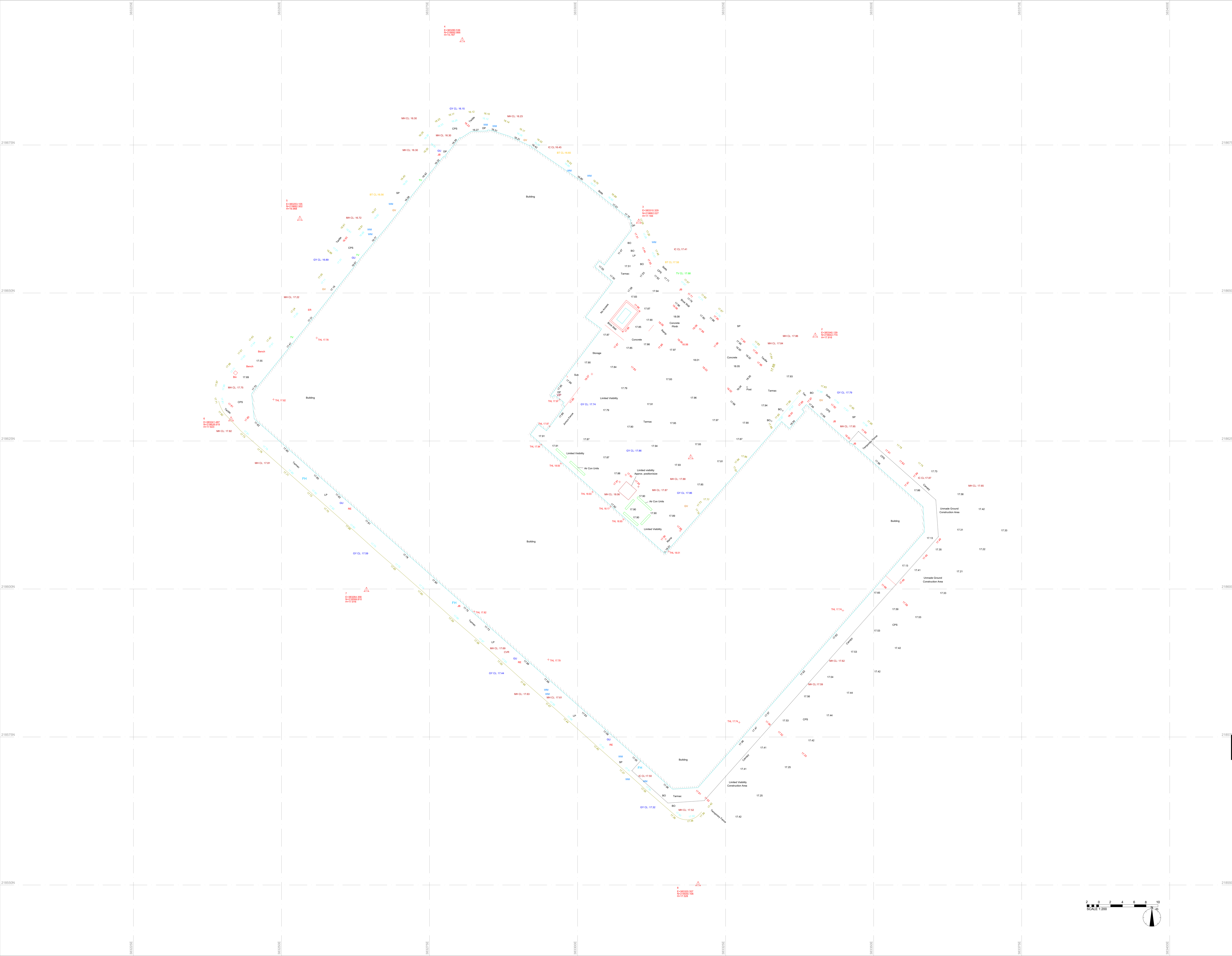
Yours sincerely,

A solid black rectangular box used to redact the signature of the Flood Risk Management Officer.

Flood Risk Management Officer

Appendix B

Topographical Survey



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DRAWING NOTES

TOP OF HERE	OVERHEAD CABLES
BOTTOM OF HERE	OVERHEAD CABLES
BUILDING GROUP	OVERHEAD CABLES

GENERAL ABBREVIATIONS

ACU	AIR CURTAIN	AV	AIR VENT
AD	AIR DUCT	BP	BENCH MARK
AO	AIR OUTLET	BS	BENCH MARK
AT	AIR TREATMENT	BT	BENCH MARK
CA	CABLE ACCESS	CA	CABLE ACCESS
CD	CABLE DUCT	CD	CABLE DUCT
CE	CABLE ENTRY	CE	CABLE ENTRY
CF	CABLE FEED	CF	CABLE FEED
CH	CABLE HOLE	CH	CABLE HOLE
CI	CABLE IDENTIFICATION	CI	CABLE IDENTIFICATION
CL	CABLE LABEL	CL	CABLE LABEL
CM	CABLE MANAGEMENT	CM	CABLE MANAGEMENT
CO	CABLE ORGANIZATION	CO	CABLE ORGANIZATION
CP	CABLE PROTECTION	CP	CABLE PROTECTION
CR	CABLE ROUTING	CR	CABLE ROUTING
CS	CABLE SECURITY	CS	CABLE SECURITY
CT	CABLE TREATMENT	CT	CABLE TREATMENT
CU	CABLE UNDERGROUND	CU	CABLE UNDERGROUND
CV	CABLE VENT	CV	CABLE VENT
CA	CABLE ACCESS	CA	CABLE ACCESS
CD	CABLE DUCT	CD	CABLE DUCT
CE	CABLE ENTRY	CE	CABLE ENTRY
CF	CABLE FEED	CF	CABLE FEED
CH	CABLE HOLE	CH	CABLE HOLE
CI	CABLE IDENTIFICATION	CI	CABLE IDENTIFICATION
CL	CABLE LABEL	CL	CABLE LABEL
CM	CABLE MANAGEMENT	CM	CABLE MANAGEMENT
CO	CABLE ORGANIZATION	CO	CABLE ORGANIZATION
CP	CABLE PROTECTION	CP	CABLE PROTECTION
CR	CABLE ROUTING	CR	CABLE ROUTING
CS	CABLE SECURITY	CS	CABLE SECURITY
CT	CABLE TREATMENT	CT	CABLE TREATMENT
CU	CABLE UNDERGROUND	CU	CABLE UNDERGROUND
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CR	CABLE ROUTING	CR	CABLE ROUTING
CS	CABLE SECURITY	CS	CABLE SECURITY
CT	CABLE TREATMENT	CT	CABLE TREATMENT
CU	CABLE UNDERGROUND	CU	CABLE UNDERGROUND
CV	CABLE VENT	CV	CABLE VENT

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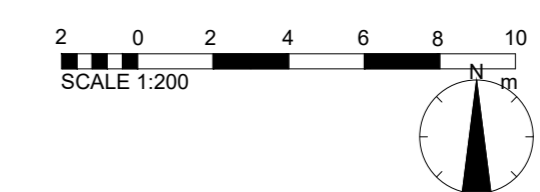


CLIENT:
UNIVERSITY OF GLOUCESTERSHIRE

PROJECT:
**FORMER DEBENHAMS BUILDING
KINGS SQUARE
GLOUCESTER**

TITLE:
TOPOGRAPHICAL SURVEY

DRAWN BY: SG	SCALE: 1:200	@ A0
CHECKED BY: DP	DATE: 12/10/2021	
STATUS: INFORMATION		
DRAWING No:	PROJECT:	ORG:
5015806	RDG	XX
ST	PL	B
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Appendix C

Severn Trent Water Sewer
Record



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673 Date: 25/08/21 Scale: 1:1250 Map Centre: 383318,218623 Data updated: 14/08/21 Our Ref: 633050 - 3 Wastewater Plan A4

Do not scale off this Map. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012. Private pumping stations, which form part of these sewers or lateral drains, will transfer to ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets. These assets may not be displayed on the map. Reproduction by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and database right 2004. All rights reserved. Ordnance Survey licence number: 100031673 Document users other than SEVERN TRENT WATER business users are advised that thi

Public Foul Gravity/Lateral Drain	→ → → → →	Highway Drain	→ → → → →	Manhole Foul	●
Public Combined Gravity/Lateral Drain	→ → → → →	Overflow Pipe	→ → → → →	Manhole Surface	○
Public Surface Water Gravity/Lateral Drain	→ → → → →	Disposal Pipe	→ → → → →	Abandoned Pipe	-----
Pressure Foul	→ → → → →	Culverted Water Course	→ → → → →	Section 104 sewers are shown in green	
Pressure Combined	→ → → → →	Pumping Station	▲ ▲ ▲ ▲ ▲	Private sewers are shown in magenta	
Pressure Surface Water	→ → → → →	Fitting	■		

5059 Gloucester



SEVERN

TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:

0800 783 4444 (24 hours)

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991 (a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main or other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
1501	C	19.84	17.73	2.11
1516	C	-	0	0
1517	C	-	0	0
1602	C	19.85	16.74	3.11
2501	C	19.4	17.51	1.89
2502	C	17.66	14.19	3.47
2503	C	18.79	16.14	2.65
2506	C	-	0	0
2507	C	-	0	0
2508	C	-	0	0
2509	C	-	0	0
2511	C	-	0	0
2513	C	-	0	0
2516	C	-	0	0
2518	C	-	0	0
2519	C	-	0	0
2521	C	-	0	0
2523	C	-	0	0
2524	C	-	0	0
2526	C	-	0	0
2527	C	-	0	0
2530	C	-	0	0
2531	C	-	0	0
2533	C	-	0	0
2601	C	18.5	15.73	2.78
2602	C	17.53	14.33	3.2
2603	C	15.85	0	0
2604	C	16.31	0	0
2606	C	17.89	14.39	3.5
2607	C	18.01	4.19	0
2608	C	-	0	0
2609	C	-	0	0

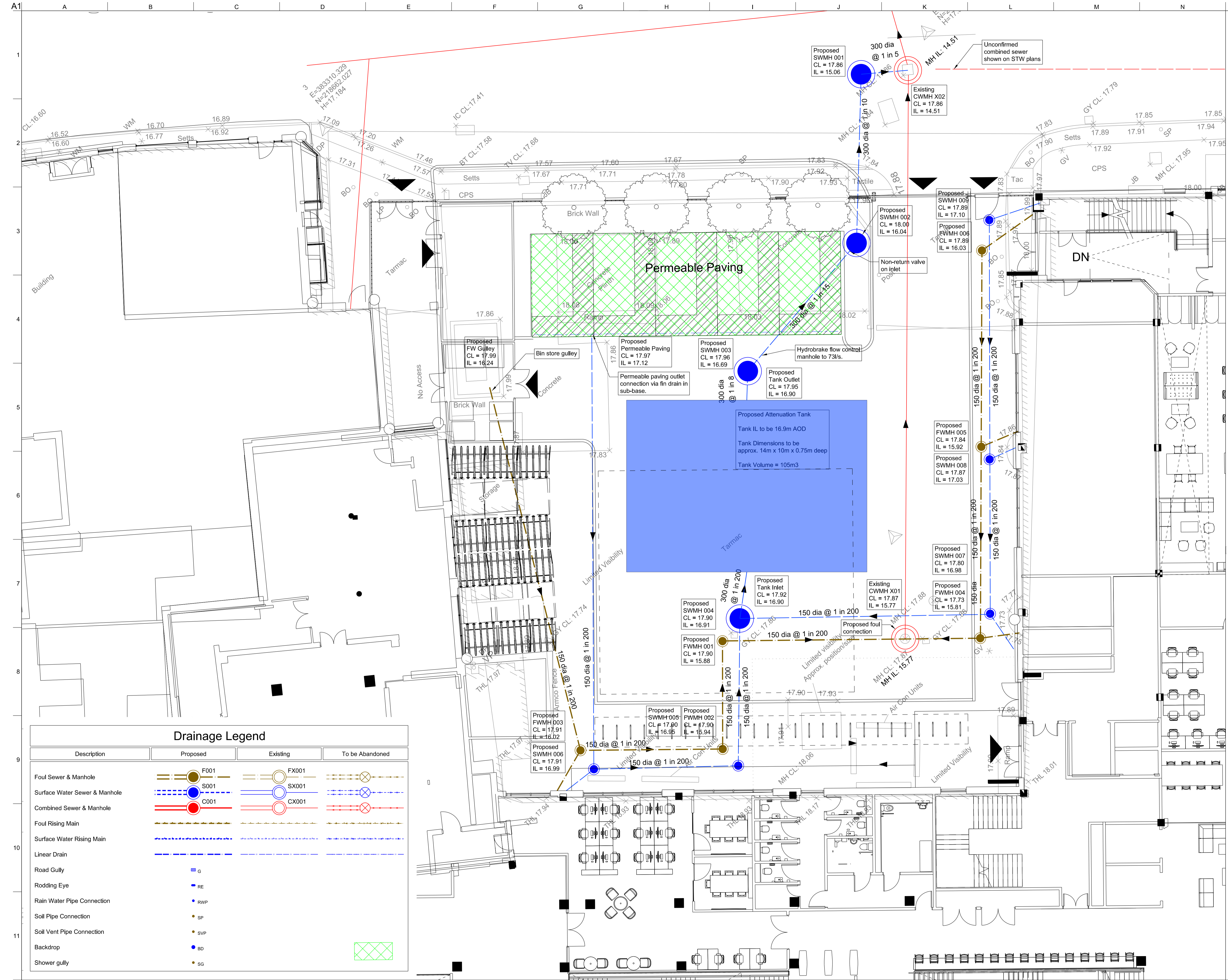
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2611	C	-	0	0
2612	C	-	0	0
2613	C	-	0	0
2614	C	-	0	0
2615	C	-	0	0
2616	C	-	0	0
2618	C	-	0	0
2619	C	0	0	0
3502	C	17.39	13.93	3.46
3506	C	17.51	13.91	3.6
3511	C	17.34	13.94	3.4
3512	C	16.78	13.46	3.32
3601	C	17.9	14.51	3.39
3602	C	17.87	15.77	2.1
3603	C	17.28	13.38	3.9
3604	C	17.33	13.41	3.92
3605	C	17.86	14.31	3.55
3608	C	-	0	0
3611	C	-	0	0
3612	C	-	0	0
3615	C	-	0	0
3616	C	-	0	0
3618	C	-	0	0
3619	C	-	0	0
3620	C	-	0	0
3621	C	-	0	0
3710	C	-	0	0
4501	C	15.78	13.42	2.36
4502	C	16.24	13.47	2.77
4503	C	16.02	13.68	2.34
4504	C	16.18	13.01	3.17
4506	C	16.75	12.99	3.76

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4507	C	16.14	12.98	3.16
4508	C	15.48	13.75	1.73
4509	C	15.64	13.84	1.8
4510	C	15.67	14.12	1.55
4514	C	15.65	12.84	2.81
4515	C	15.51	11.72	3.79
4517	C	16.71	13.05	3.66
4519	C	15.45	11.85	3.6
4604	C	14.82	13.06	1.76
4611	C	14.85	11.36	3.49
4612	C	15.13	11.47	3.66
4613	C	15.38	12.43	2.95
4615	C	-	0	0
4616	C	-	0	0
4617	C	-	0	0
4618	C	-	0	0
4619	C	-	0	0
4714	C	-	0	0
4715	C	-	0	0
4716	C	-	0	0
1603	F	20.03	18.94	1.09
4601	F	15	13.81	1.19
4605	F	15.1	13.55	1.55
4705	F	-	0	0
4706	F	-	0	0
2505	S	17.7	14.35	3.35
2605	S	17.84	14.61	3.23
3504	S	17.62	16.69	0.93
3507	S	17.6	15.37	2.23
3508	S	17.56	14.11	3.45
3509	S	17.55	13.85	3.7
4512	S	15.39	13.7	1.69

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4602	S	15.06	13.36	1.7
4603	S	14.87	13.08	1.79
4606	S	15.07	14.36	0.71

Appendix D

Proposed Drainage Layout
GCC-ARUP-ZZ-XX-D-R-CD-
0001



Drainage Legend

Description	Proposed	Existing	To be Abandoned
Foul Sewer & Manhole	F001	FX001	
Surface Water Sewer & Manhole	S001	SX001	
Combined Sewer & Manhole	C001	CX001	
Foul Rising Main			
Surface Water Rising Main			
Linear Drain			
Road Gully	G		
Rodding Eye	RE		
Rain Water Pipe Connection	RWP		
Soil Pipe Connection	SP		
Soil Vent Pipe Connection	SVP		
Backdrop	BD		
Shower gully	SG		

P01	08/12/21	CD	PAL	JJM
Issued for Planning				
Rev	Date	By	Chkd	Appd

ARUP

Client
University of Gloucestershire

Project Title
Gloucester City Centre Campus

Drawing Title
Courtyard Attenuation Sketch

Scale at A1
1:100

Role
Civil Engineering

Suitability
S2 - Suitable for Information

Arup Job No
282739-00

Rev
P01

Name
SK-C-01

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