SUSTAINABLE DRAINAGE ASSESSMENT AND OPERATION AND MAINTENANCE PLAN

Thomas Telford UTC

Morgan Sindall Construction

February 2021

CWA-20-196-SUDS-001

UC0030-CWA-XX-XX-RP-C-0001

Prepared by:	**A Hardy**
Authorised by:	**S Wedge**
Signed:	
Dated:	**15.02.21**

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CONTENTS

APPENDICES

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1.00 INTRODUCTION

1.01 CWA was commissioned by Morgan Sindall Construction to prepare a Sustainable Drainage Assessment and Operation and Maintenance Plan for the planning application for a new development on the site at the West Midlands Construction (WMC) University Technical College (UTC) on Cambridge Street in Wolverhampton.

1.02 The Sustainable Drainage Assessment and Operation and Maintenance Plan will be part of a planning application to be made to Wolverhampton City Council.

1.03 The proposed development is for a planning application comprising an expansion teaching building for the existing facilities, a sports hall, mixed use sports pitch and parking and infrastructure.

1.04 The development lies entirely within Flood Zone 1 where there is a low probability of fluvial flooding occurring.

1.05 This Sustainable Drainage Assessment and Operation and Maintenance Plan follows government and local guidance on development and is undertaken in consultation with the relevant bodies.

2.00 SITE LOCATION AND DESCRIPTION

2.01 The development site is 1.1ha in size of which 0.8ha is being redeveloped. It is located at Cambridge Street in Wolverhampton WV10 0JR. The Ordnance Survey National Grid reference to the centre of the site is E391880, N299461.

2.02 A site location Plan and aerial view can be found in **Appendix 1.**

2.03 The site comprises existing West Midlands Construction University Technical College and derelict land, on the former site of the M&B Springfield Brewery. The existing frontage remains as a listed building.

2.04 Parts of the existing UTC car parking area and sports pitch will be replaced by the new development, with the access bring retained.

2.05 The neighbouring land use is as follows:

- North Cannock Road and Sports fields.
- East Cambridge Street and residential.
- South Industrial units.
- West Rail line, canal, and industrial units

2.06 The site slopes from west at 137.00m AOD to east at 133.50mAOD with a noticeable embankment step midway across the site.

2.07 An existing access road has been installed around the north and west of the development plot.

2.08 A Topographical Survey can be found in **Appendix 2**.

3.00 DEVELOPMENT PROPOSALS

3.01 The development is subject to a planning application. Reference should be made to the Design and Access Statement[1] for further detail on the planning application.

3.02 The development will consist of a new teaching complex adjoining the existing facilities, which will be retained.

3.03 A new standalone sports facility building will be provided with an adjoined outdoor multi use sports pitch.

3.04 Parking will be revised to provide 43 parking spaces accessed via the existing junction to the north.

3.05 The listed brewery wall fronting Cambridge Street is to be retained.

3.06 A copy of the Illustrative Masterplan Option can be found in **Appendix 3**.

[1] Associated Architects, 2021, Thomas Telford UTC Design and Access Statement.

4.00 EXISTING GROUND CONDITIONS

4.01 Site Geology and Hydrology

4.01.1 Applied Geology have undertaken a ground investigation survey[2] on the site in February 2020.

4.02 Ground Conditions

4.02.1 Ground Geology

- Hardstanding or made ground to 0.3m
- Made ground to 0.3 to 3.4m
- Glacial Till to 2.1 to 9.0m
- Clent and Enville Sandstone and Mudstone formation from 8.43m

4.02.2 Hydrogeology (subsurface water features)

Groundwater was found to be between 1.23 and 1.72m below ground.

4.02.3 Soakaway Design

The deep made ground and high water table would preclude the practical use of soakaways on this site.

4.02.4 Hydrology (surface water features)

The canal is located within 10m of the west of the site, but separated from it by the rail line. The River Stour is approximately 2.5km to the west.

[2] Applied Geology, February 2020, Report on Ground Investigation at Thomas Telford UTC, Wolverhampton, AG3187-20-AL75

5.00 CONSULTATION AND POLICY

5.01 Drainage Authority

5.01.1 Severn Trent Water (STW) has been contacted for information regarding existing public storm and foul water sewers in the vicinity of the site.

5.01.2 A copy of the response from STW and the sewer records can be found in **Appendix 4.**

5.01.3 The sewer records provided by STW identify the following public sewers in the vicinity of the site:

- A 300mm diameter foul sewer in Cambridge Street suitable for direct or indirect sewer connection
- An unrecorded size storm sewer in Cambridge Street

5.01.4 Additional note:

Since 1st October 2011 many private sewers have been transferred into the ownership of the water authority as public sewers, where two or more properties in separate ownership are served by those sewers. Most of these former private sewers will not be shown on the public sewer records, therefore a full site survey should be carried out prior to any layout design or construction works to identify where these sewers may be and to avoid later delays and possible added costs.

5.02 Private Drainage

5.02.1 Two detailed CCTV surveys[3] [4] of the drainage on the site have been undertaken. This combined with historical design drawings for the existing UTC development, highlight a number of private sewers. This survey can be found in **Appendix 5**.

5.02.2 The existing site discharges storm water to the north into sewers in the road. This includes a flow control designed at 30 l/s restriction and an existing attenuation culvert sized at approximately 120m^3.

5.02.3 The existing site discharges foul sewerage to the south into the public sewer.

[3] Malcolm Hughes Chartered Land Surveyors, October 2020, Springfield Brewery Site Underground Survey 56212/UG

[4] Sewer Surveys UK, September 2020, Thomas Telford UTC, CCTV Drainage Survey 20/338.

5.03 Lead Local Flood Authority

5.03.1 The Lead Local Flood Authority (LLFA) Wolverhampton City Council (WCC).

5.03.2 The LLFA Local Policy is detailed in the Black Country Core Strategy[5] Policy ENV5 Flood Risk, Sustainable Drainage Systems and Urban Heat Islands. Key criteria in this policy are:

- Incorporate sustainable drainage Systems unless impact would be impractical, so as to improve water quality and reduce surface water runoff.
- Open up culverted watercourses.
- Reduces surface water flows back to equivalent greenfield rates.
- Create new green spaces, increase tree cover and or provide green roofs.

5.03.3 The LLFA also publish the Local Strategy for Flood Risk Management[6]. This reiterates the content of ENV5 and lists 6 key objectives for developments.

- Understand and communicate flood risks
- Manage the likelihood and impacts of flooding.
- Help citizens to manage their own risk.
- Ensure appropriate development.
- Improve flood prediction, warning and recovery.
- Work in partnership with others

5.03.4 WCC may use Staffordshire County Council (SCC) as their LLFA consultant. SCC were contacted for preapplication advice, but advised that they were unable to offer this at the time of request. See correspondence in **Appendix 6**.

5.03.5 SCC publish a SuDS Handbook[7] which has been considered in the design of this development. This includes a SuDS proforma, a copy of which is included in Appendix 6.

5.04 Environment Agency

5.04.1 The Environment Agency (EA) regulate main rivers and critical drainage areas and will be consulted as part of the planning application process. There are no key receptors in the vicinity of this development.

[5] Black Country Core Strategy, February 2011
[6] WSP, February 2016, Local Strategy for Flood Risk Management – The Black Country
[7] Staffordshire County Council, February 2017, Sustainable Drainage Systems (SuDS) Handbook

5.05 Applicable Policy and Guidance

5.05.1 National Planning Policy Framework

5.05.1.1 Planning Practice Guidance to the National Planning Policy Framework (NPPF) was introduced in March 2014 and was most recently updated in June 2019; it deals specifically with development planning zones. The NPPF requires that major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the lead local flood authority.
- Have appropriate proposed minimum operational standards.
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.
- Where possible, provide multifunctional benefits.

5.06 CIRIA C753 SuDS Manual

5.06.01 The SuDS Manual includes guidance for the planning, design, construction and maintenance of various types of sustainable drainage systems. Contained within the SuDS manual are various design checklists for the design of SuDS features, that seek to ensure correct design and efficient use of SuDS features proposed for a site.

6.00 FLOOD RISK

6.01 The site is located in Flood Zone 1, the lowest risk of flooding with a probability of less than 0.1% in any one year.

6.02 A detailed Flood Risk Assessment for the wider UTC site was undertaken by Hydrock in 2015[8]. The findings of this assessment have been considered in this design.

6.03 As the area to be developed falls below 1ha in size, a specific Flood Risk Assessment has not been considered necessary. In the event one was required, the site would **pass the Sequential Test** as it is located in Flood Zone 1, and the Exception Test would not be required.

Table 1 - Flood Risk Assessment Summary

Aspects of Flood Risk	Assessment/Comment
Area liable to flooding	The development site lies entirely within FZ1 of the Environment Agency Flood Zone Map.
Probability of flooding occurring	Flooding from surface water at the site will be considered during the level and drainage design.
Standard of existing flood defences and their effectiveness	N/A
Likely depth of flooding	N/A
Rates of flow likely to be involved	N/A
Likelihood of impacts to other areas, properties and habitats	Any increase in the surface area, SUDS will be used for surface water management.
Effects of climate	The effects of climate change on flooding at the site are likely to be limited, due to the use of SuDS techniques and the system will be designed for 1 in 100 year storm event plus 40% climate change.

[8] Hydrock, January 2015, Proposed University Technology College, Springfield Brewery, Wolverhampton, Flood Risk Assessment R/C14962/001.02

7.00 SUSTAINABLE DRAINAGE PROPOSALS

7.01 Storm Water Management and SuDS

7.01.1 Sustainable Drainage Systems (SuDS) involve the management of storm water from developments effectively in order to reduce the impact of run-off both to the site in question and properties downstream, and not to exacerbate existing problems. This is achieved by not increasing peak flows that will otherwise result from the development. The philosophy of SuDS is to mimic as closely as possible, the natural drainage from a site before development, and to ensure that storm water runoff is treated so there is no detriment to water quality of the receiving watercourse.

Using SuDS may provide water quantity and quality control, as well as increased amenity value. Appropriately designed and maintained schemes may improve the sustainable water management on site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream.
- Reducing the volume, rate of discharge, and the frequency of water flowing directly to watercourses or sewers from the developed sites.
- Improving water quality compared with conventional surface water sewers by removing pollutants.

7.01.2 The following section represents the considered views on suitable SuDS options appropriate to this site both as part of the detailed infrastructure scheme and outline illustrative masterplan. CIRIA C753[9] The SuDS Manual was consulted to examine the use of SuDS on this site. Conclusions are based on the assessment of the site and the evaluation of the relevant design requirements and regulatory consultation.

7.02 Potential SuDS Techniques Considered for this Site

7.02.1 Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.

Cost to the structure can be considerable and poor maintenance will leave it looking unsightly.

Not recommended for the site.

[9] CIRIA, 2016. The SuDS Manual C753

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7.02.2 Soakaways

Soakaways are square or circular excavations either filled with rubble or lined with brickwork, precast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can be grouped and linked together to drain large areas including highways. The supporting structure and backfill can be substituted by modular geocellular units. Soakaways provide storm water attenuation, storm water treatment and groundwater recharge.

Ground Investigation data has shown a depth of made ground and high water table across the site. The use of infiltration will not therefore be viable.

Not viable for the site.

7.02.3 Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal. Roadside swales can replace conventional gullies and drainage pipes.

Open water is not recommended for educational establishments due to safety concerns.

Not recommended for the site.

7.02.4 Pervious Pavements

Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored between infiltration to the ground, reuse or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment.

Due to the restricted site access, the use of permeable paving is not advisable due likely damage and loss of satisfactory function both during construction stage and in operation.

Not recommended for the site.

7.02.5 Permeable Pitches

Pervious pitches such as MUGAs provide a pavement suitable for the undertaking of sports, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored between infiltration to the ground, reuse or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment.

The large mixed use games pitch is ideally suited to being a permeable surface with an open graded subbase for water attenuation and quality enhancement.

Recommended and proposed for the site.

7.02.6 Geo-cellular/Modular Systems

Modular plastic geo-cellular systems with a high void ratio that can be used to create a below ground storage structure.

Modular tanks can be used for runoff attenuation but requires silt trap protection and a suitable means of access for cleaning and inspection.

Recommended and proposed for the site.

7.02.7 Ponds/Infiltration Basin

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Run off from each rain event is detained and treated in the pool. The retention time promotes removal through sedimentation and the opportunity for biological uptake mechanisms to reduce nutrient concentrations.

Open water is not recommended for educational establishments due to safety concerns and there is insufficient space on site for a viable size feature.

Not recommended for the site.

8.00 SUSTAINABLE DRAINAGE MAINTENANCE

8.01 The various SuDS features will remain privately owned and be maintained by the Development's Maintenance team. The exact details of this arrangement will be defined with the future development.

8.02 The SuDS operation and maintenance strategy will be in accordance with CIRIA C753 best practice, as tabled below:

Table 2 – SuDS Operation and Maintenance Requirements

Type of maintenance	Details	Frequency	Duration	Large plant required	Cost
Routine maintenance	Inspect flow control chamber for evidence of poor operation.	Monthly for 3 months then annually.	1 hr	*X*	Low
	Remove debris from catchment surface and sports pitch.	Monthly	0.5 day	*X*	Low
	Remove sediment from catch-pits, flow control sumps.	Annually, or as required by inspection	0.5 day	✓	medium
Remedial actions	Replace malfunctioning flow control parts.	As required	1 day	✓	medium
Monitoring	Inspect all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually	1 hr	*X*	Low
	Survey inside of attenuation tanks for sediment build up and remove if necessary.	Every 5 years or as required by inspection.	1 day	✓	medium

9.00 DRAINAGE STRATEGY

9.01 Drainage Strategy

9.01.1 The drainage strategy at the site must include consideration of the existing drainage infrastructure present.

9.01.2 It is intended that the existing UTC building drainage be retained with a separate outfall to that of the new development, thus retaining the historically agreed discharge rates of 30 l/s for that part of the site. Some localised diversion of drainage is required within the site to facilitate this including relocation of the existing attenuation provision.

9.01.3 In accordance with LLFA guidance, surface water discharge should be via natural means before consideration of discharge to a sewer network. As there are no watercourses accessible from the site and infiltration is not viable, discharge to the public sewer via the existing connection to Cambridge Street is proposed.

9.02 Proposed Surface Water Runoff Rate

9.02.1 The site consists of a total area of 1.09ha of which approximately 0.8ha is to be developed.

9.02.2 Based on the Modified Rational Method the existing site area brownfield run-off rate is estimated to be 151 l/s in the 50mm/hour intensity storm.

9.02.3 The design life for the development will be more than 40 years. Based on the Environment Agency Guidance for climate change published in February 2016[10], a climate change allowance of 40% should be considered.

9.02.4 Using IH124 methodology the following greenfield runoff rates are anticipated for the new development:

Event	1 in 1 yr	1 in 30 yr	1 in 100 yr	Q_{bar}
Rate l/s	4.37	10.52	13.52	5.26

9.02.5 It is therefore proposed to restrict the new development area to a total discharge rate equivalent to Q_{bar} at **5.3 l/s**

9.02.6 This discharge restriction is over 95% betterment on theoretical brownfield runoff rate.

[10] Gov.uk, 19 February 2016, Guidance Flood Risk Assessments: Climate Change Allowances

9.03 Attenuation Volume

9.03.1 Using hydraulic modelling software, the total required attenuation for the total development is **380m³** in a 100 year + 40% storm event.

9.03.2 This attenuation is provided via two below ground attention tanks at a total of 300m^3, and open graded granular storage below the sports pitch at a total of 80m^3.

9.03.3 The use of a petrol interceptor has not been deemed necessary as the parking area consists of less than 50 spaces and does not discharge to a sensitive receptor.

9.04 Exceedance Flows

9.04.1 The system is designed to contain the drainage in up to the design storm event. Should this be exceeded, overland flow will be directed away from the building to low points within the external parking and paved areas, from where it can be safely drained as the storm wanes.

9.05 Foul Drainage

9.05.01 The foul drainage for the new development will discharge via gravity at a new connection to the existing foul sewer to the north of the site. It is not feasible to direct flow to the existing site connection to the south, due to the constraints of the existing retained building.

9.06 Design and Calculations

9.06.1 CWA have prepared a drainage strategy drawing see **Appendix 7**.

9.06.2 Detailed hydraulic calculations for a range of intensity and duration storms have been undertaken using Causeway FLOW software. These can be found in **Appendix 8.**

9.06.3 A S106 indirect connection approval will be required from STW for the storm and foul connections.

10.00 CONCLUSIONS

10.01 CWA was commissioned by Morgan Sindall Construction to prepare a Sustainable Drainage Assessment and Operation and Maintenance Plan for the planning application for a new development on the site at the West Midlands Construction University Technical College on Cambridge Street in Wolverhampton.

10.02 The proposed development is for a planning application comprising an expansion teaching building for the existing facilities, a sports hall, mixed use sports pitch and parking and infrastructure.

10.03 The existing UTC building drainage and outfall is to remain independent at the historically agreed 30 l/s restricted rate. Some on site drain division is however required.

10.04 Surface water for the new development will be designed to cater for storm events up to 1 in 100 plus 40% climate change. The new development areas will drain at a restricted rate of 5.3 l/s via vortex flow controls into the public sewer via existing site connections.

10.05 Approximately 380m^3 of attenuation is required on site, split between underground tanks and open graded stone below a permeable sports pitch.

10.06 The site does not pose any increased flood risk to the site itself or adjacent developments and is not susceptible to flooding by other techniques.

10.07 The use of SuDS has been considered and can be incorporated within the design. The following SuDS techniques are proposed for the site:

- Pervious sports pitches
- Attenuation storage tank

10.08 Soakaways and infiltration techniques are not suitable for the site due to depths of made ground and high water table.

10.09 This report has been prepared to meet the requirements of the National Planning Policy Framework (NPPF) and in accordance with CIRIA C753 the SuDS Manual.

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APPENDICES

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Appendix 1 – Location Plan and Aerial View

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CWA-20-196
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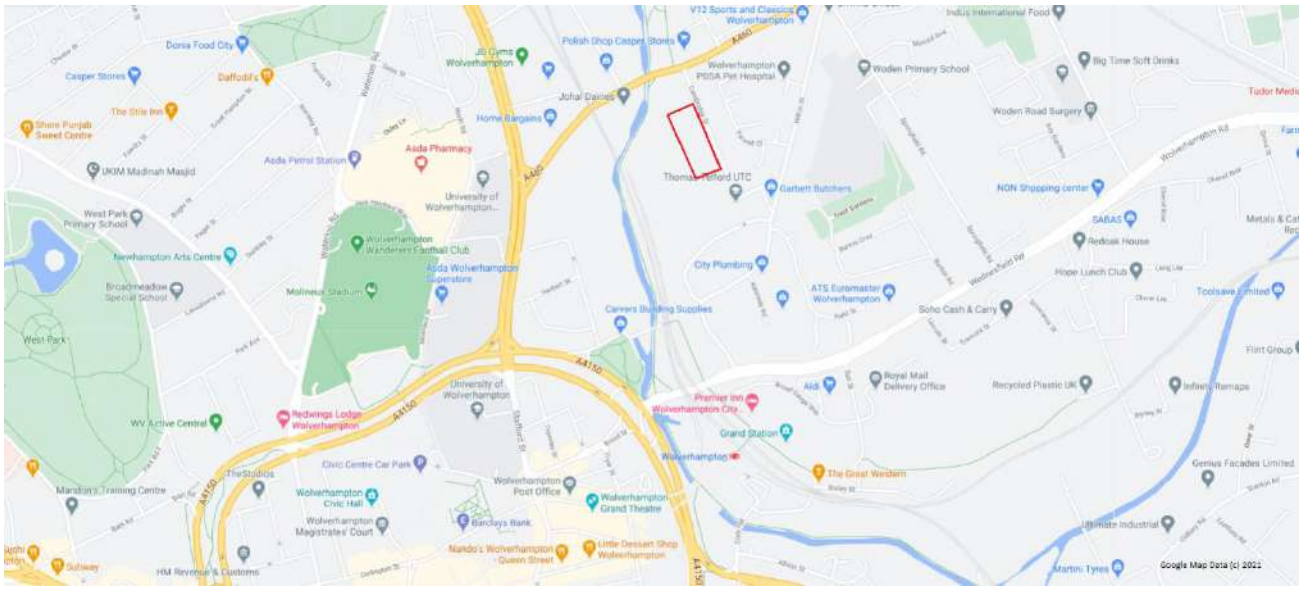
LOCATION PLAN



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Appendix 2 – Topographical Survey

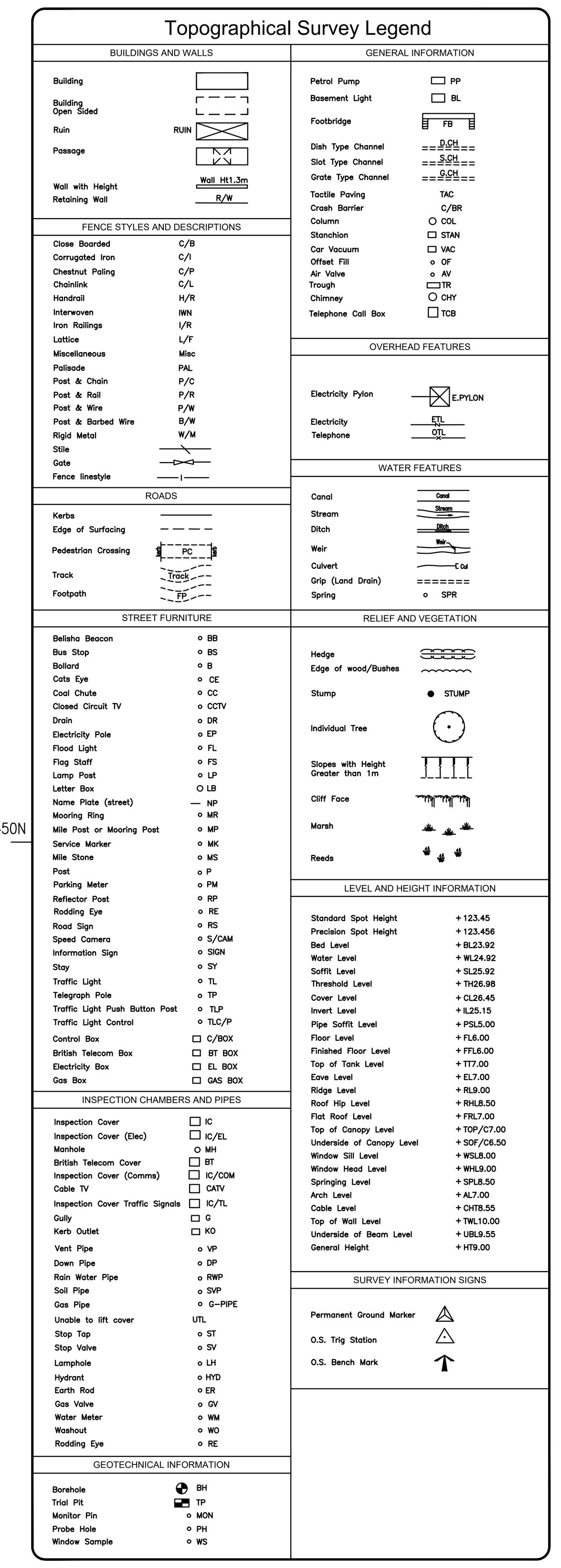
Survey Notes

Grid: Local Plane Metric related to National Grid at survey control SC1

Levels: OS Datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes

Topographical Survey Legend



Sheet Index

Rev.	Date	Description

MALCOLM HUGHES
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Accreditations

RICS THE SURVEY ASSOCIATION chartered ices FS 14126

Client
Morgan Sindall Construction & Infrastructures Ltd
4215 Waterside Centre Birmingham Business Park
Solihull, West Midlands, B37 7YN

Project
WEST MIDLANDS UTC

Drawing Title
Topographical Survey

Drawn By	IC	23/09/20	Survey Date: September 2020
Checked by	ED	24/09/20	Scale: 1 : 200

Drawing No: 56212/1 | Revision:

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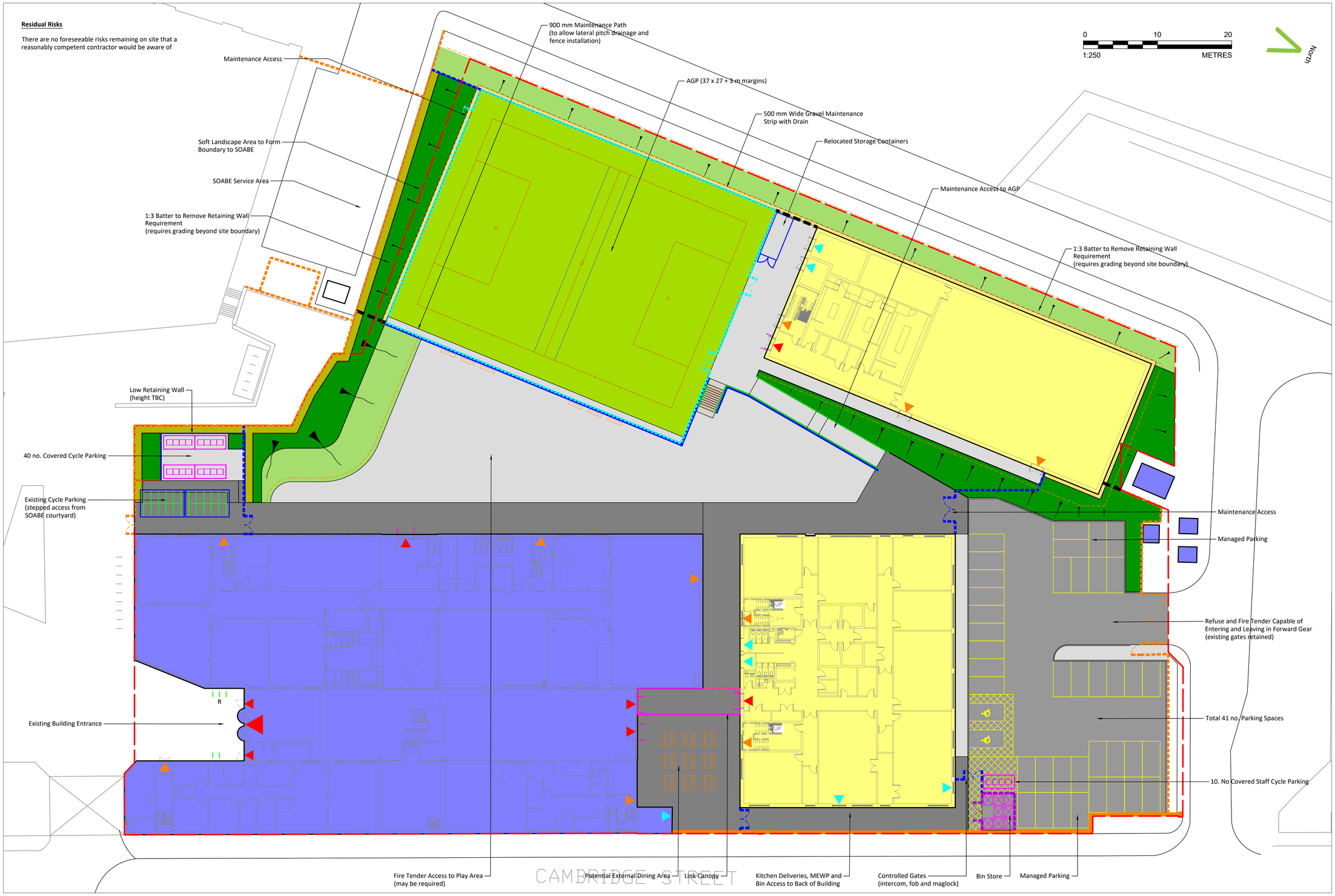
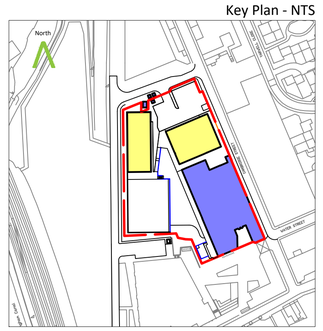
Appendix 3 – Masterplan

Residual Risks

There are no foreseeable risks remaining on site that a reasonably competent contractor would be aware of



Key Plan - NTS



DO NOT CONSTRUCT FROM THIS DRAWING

Drawing References

All drawings prefixed with; UC0030-AJM-EX-XX

1. DR-L-1001 - Site Boundary
2. DR-L-2211 - Landscape Masterplan
3. DR-L-3111 - BB103 Areas - Proposed
4. DR-L-3211 - Security Zones
5. DR-L-3221 - Key Movement
6. DR-L-3231 - Vehicle and Cycle Parking Facilities
7. DR-L-3241 - Maintenance and Emergency Vehicle Access
8. DR-L-4011 - External Materials Samples Board
9. DR-L-4111 - Hard Landscape Layout
10. DR-L-4211 - Street Furniture and Fencing Layout
11. DR-L-5211 - Soft Landscape Layout
12. DR-L-6111 - Site Levels
13. DR-L-6211 - Site Sections
14. DR-L-7211 - Sports Court Layout

Developed Design Deliverable References

1.1a, 1.1b, 1.1d, 2.5a, 2.5e

Drawing Notes

1. Site boundary identified on this drawing is provided by third parties and is interpolated between Ordnance Survey data and topographical survey data.
2. Drawing provided for illustrative purposes only to identify design intent only and is subject to change.
3. Extent of slopes, retaining wall, steps and ramps to be confirmed in line with detailed resolution of site levels and cut and fill balance requirements.
4. Fire tender access requirements to the existing and proposed buildings to be confirmed in line with Building Regulations.

General Notes

1. This drawing is based upon information provided by third parties and as such the accuracy and content cannot be guaranteed.
2. Site boundaries depicted on this drawing reflects the topographical survey and is to be confirmed by the Contracting Authority.
3. Do not scale from this drawing. Use figured dimensions only.

Notes Under CDM

1. The information presented on this drawing has been prepared with regards to the role of the Designer.
2. Where possible the design has taken care to eliminate hazards and reduce risk.
3. This drawing is to be read in conjunction with the Health and Safety File.

Rev.	Description:	Drawn:	Ckd:	Date:
P06	Proposed cycle parking amended; existing fencing updated; existing cycle parking identified	AJM	AM	17.01.21
P05	Trees to SOABE removed	AJM	AM	07.01.21
P04	Trees removed to west; maintenance path to east of AGP; fire doors relocated to north; fence adjusted	AJM	AM	21.12.20
P03	Updated GFP; boundary fence, tree and shrub planting adjusted	AJM	AM	08.12.20
P02	Updated link canopy and fence lines	AJM	AM	01.20.20
P01	First issue for information	AJM	AM	01.12.20

Legend

Red Line Boundary

Buildings and Structures

- Retained Buildings
- Proposed Buildings
- Principal/ Secondary Building Access and Egress
- Service Vehicle/ Kitchen and Plant/ Maintenance Access and Egress
- Fire Escape

Hard Landscape Elements

- Proposed Concrete Asphalt Vehicular Grade/ Car Park Grade
- Proposed Concrete Asphalt MEWP Grade / Concrete Bin Store
- Proposed Concrete Asphalt Pedestrian
- Proposed Steps
- Proposed Hazard Warning Paving (corduroy to steps)
- Proposed Artificial Grass
- Proposed Gravel Maintenance Strip

Street Furniture and Equipment

- Existing Cycle Canopy/ External Storage
- Proposed Cycle Shelter
- Existing Site Furniture (R = Relocation/ Provision TBC)
- Proposed Site Furniture (min. provision to meet building regulations)
- Potential Site Furniture (Provision TBC in line with cost plan)

Fences

- Existing Fencing
- Proposed Welded Mesh Boundary Fence (2.4 m high/ combined with wall)
- Proposed Welded Mesh Separation Fence (1.8 m high)
- Proposed Welded Mesh Sports Court Fence (4 m high)
- Proposed Timber Hit and Miss Fence (1.8 m high)

Soft Landscape Elements

- Proposed Ornamental Hedge Planting
- Proposed Ornamental Shrub Planting
- Proposed Amenity Grass

Site Levels

- Existing Retaining Wall
- Proposed Retaining / Bondary Walls
- Proposed Embankments (max. 1:3 gradient)
- Proposed Top/ Bottom of Slope

Client:
Morgan Sindall

Project Name:
Thomas Telford UTC

Description:
Landscape Masterplan

Project Number:	Creator:	Date:	Scale @ A1:
20010	AJM	01.12.20	1:250

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Status:	Suitability:	Revision:
FOR INFORMATION	S2	P06

Drawing Title: (UPRN) (Originator) (Zone) (Level) (Type) (Role) Number:
UC0030-AJM-EX-XX-DR-L-2211

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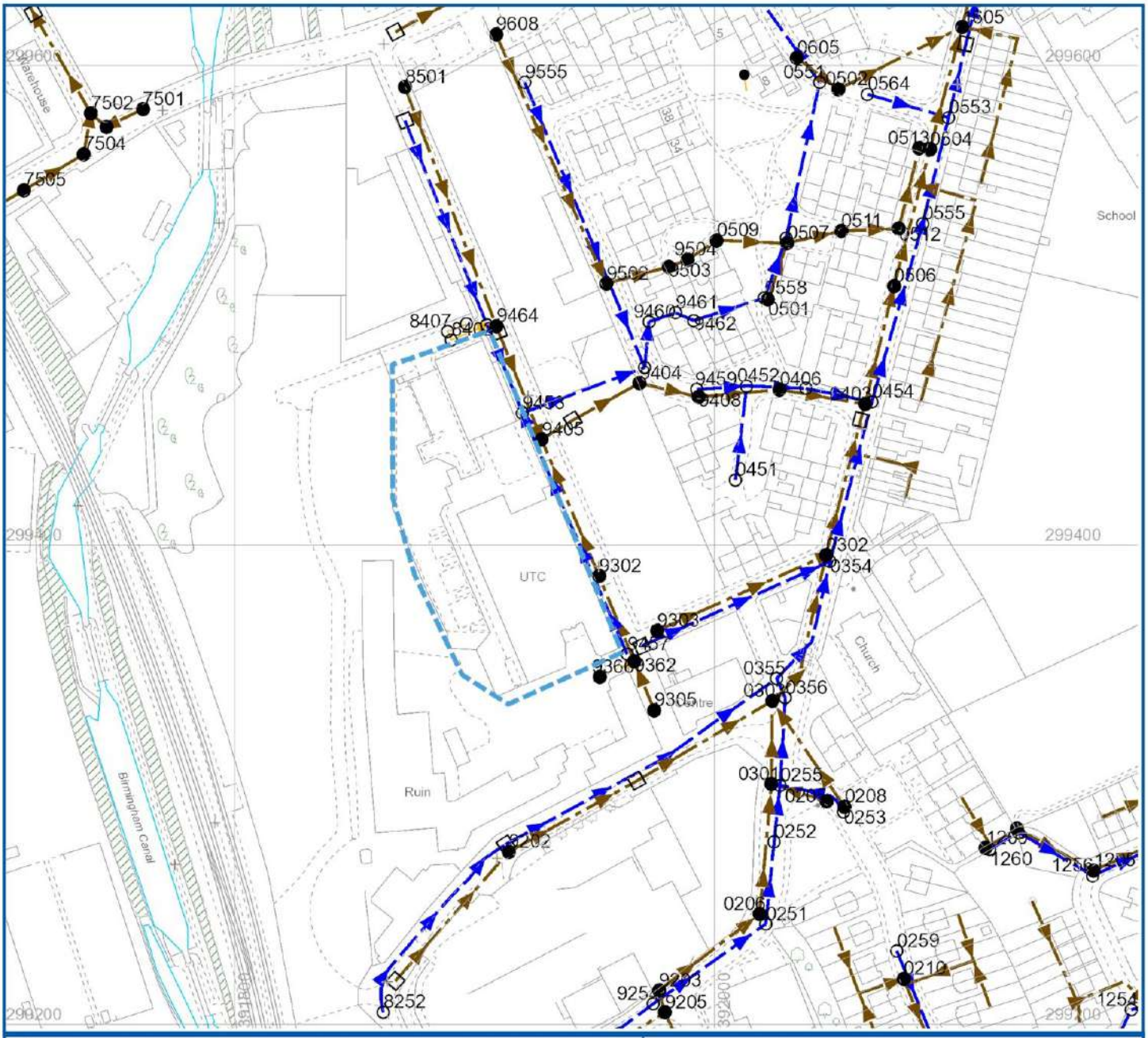
Appendix 4 – Sewer Records



LEGEND

LandlinePoint
- Spot Height
- Emergency Telephone
- Site Of Heritage
- Culvert
- Positioned Nonconiferous Tree
- Inland Water
- Roadside
- Overhead Construction
- Rail
- Positioned Coniferous Tree
- Boundary Post Or Stone
- Triangulation Point Or Pillar
- Historic Interest
- Landform
- Tidal Water
- Structure

LandlineTex

LandlineLine
- Polygon Closing Line
- Property Closing Line
- Bottom Of Slope
- Top Of Slope
- Step
- Mean High Water
- Traffic Calming
- Standard Gauge Track
- Bottom Of Cliff
- Top Of Cliff
- Mean Low Water
- Path
- Overhead Construction
- Culvert
- Pylon
- Ridge Or Rock Line
- Narrow Gauge Track
- Railway Buffer
- Tunnel Edge
- Line Of Posts
- Drain
- Default Line
- Building Outline
- Edge Line
- Road Or Track
- Building Division
- Inland water Line
- General Surface Natural Line
- Building Overhead Line
- Landform Natural Line
- Historic Interest Line
- Landform Manmade Line
- Unclassified

LandlineArea
- Other
- Mixed Woodland Fill
- Nonconiferous Tree Fill
- Coniferous Tree Fill
- Orchard Fill
- Coppice Or Osiers Fill
- Scrub Fill
- Boulders Fill
- Rock Fill
- Scree Fill
- Rough Grassland Fill
- Heath Fill
- Saltmarsh Fill
- Marsh Fill
- Reeds Fill
- Slope Fill
- Cliff Fill

Ancillary
- Balancing Lagoon
- Grease Trap
- Interceptor
- Screen

Chamber
- Flushing Chamber
- Scalaway
- Overflow

Fitting
- Blind Shaft
- Facility Connector
- Head Node
- Lamphole
- Sewerage Air Valve
- Sewerage Chemical Injection Point
- Sewerage Hatch Box
- Sewerage Pressure Washout
- Vent Column
- Waste Water Outfall

Control Valve
- Hydrobrake
- Penstock
- Sewerage Isolation Valve
- Sewerage Non Return Valve

Manhole
- Foul Bifurcation Manhole
- Combined Bifurcation Manhole
- Surface Water Bifurcation Manhole
- Dual Manhole
- Foul Single Manhole
- Combined Single Manhole
- Surface Water Single Manhole
- Twin Manhole
- Foul Adopted Manhole
- Combined Adopted Manhole
- Surface Adopted Manhole
- Transferred Manhole
- Unsurveyed Manhole

Operational Site

Waste Water Pump
- S104
- Transferred Asset
- S102
- Not STW
- Adopted Sewer
- None
- Highway Drain
- Not Private
- S24

Storage
- Disposal Site
- Off-Line Waste Water Storage
- On-Line Waste Water Storage
- Wet Well

Waste Water Process Structure
- Sewage Treatment Point
- Sewage Treatment Structure
- Sludge Treatment Point
- Sludge Treatment Structure

Gravity Sewer Pipe
- Foul Gravity Sewer
- Combined Gravity Sewer
- Surface Water Gravity Sewer
- S104 Surface Water Gravity Sewer
- S104 Combined Gravity Sewer
- S104 Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Surface Water Unsurveyed Pipe
- Combined Unsurveyed Pipe
- Foul Unsurveyed Pipe
- Transferred Surface Water Sewer
- Transferred Combined Sewer
- Transfered Foul Sewer

Severn Trent Water Limited

SEVERN TRENT

Asset Data Management
PO Box 5344
Coventry
CV3 9FT

Telephone: 0345 601 6616

SEWER RECORD

O/S Map Scale: 1:2,500

This map is centred upon:

Date of Issue: 03-08-20

X: 391940.60 **Y:** 299411.50

Disclaimer Statement:

1 Do not scale off this Map.

2 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.

3 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.

5 Ordnance Survey licence number: **100031673**

Sewer Node Sewer Pipe Data

Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SO91998406	0	0	0	S	U	U	0	0	0	31/12/1899 00:00:00
SO91999463	0	132.352	131.39	S	VC	C	150	0	41.22	31/12/1899 00:00:00
SO91998407	0	0	0	S	U	U	0	0	0	10/05/2007 00:00:00
SO91999366	0	0	0	F	U	U	0	0	0	11/05/2007 00:00:00
SO91998402	0	0	0	S	U	U	0	0	0	31/12/1899 00:00:00
SO91999464	0	130.736	130.69	F	VC	C	300	0	52.83	31/12/1899 00:00:00
SO91999362	0	131.094	130.56	F	VC	C	225	<UNK>	72.04	31/12/1899 00:00:00
SO92991610	<UNK>	<UNK>	<UNK>	F	VC	C	150	<UNK>	0	31/12/1899 00:00:00
SO92991211	<UNK>	<UNK>	<UNK>	F	VC	C	100	<UNK>	0	31/12/1899 00:00:00
SO91999709	<UNK>	<UNK>	<UNK>	F	VC	C	150	<UNK>	0	31/12/1899 00:00:00
SO91999108	139.0449	135.95	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91999110	138.49	135.7	134.84	F	VC	C	225	<UNK>	51.6	31/12/1899 00:00:00
SO91998152	138.7949	137.015	135.76	S	VC	C	225	<UNK>	53.27	31/12/1899 00:00:00
SO91999408	131.38	129.27	128.96	F	VC	C	300	<UNK>	109.16	31/12/1899 00:00:00
SO91999103	<UNK>	<UNK>	134.11	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91998101	139.2149	137.32	135.95	F	VC	C	225	<UNK>	60.41	31/12/1899 00:00:00
SO91999503	131.94	129.07	129.04	F	VC	C	150	<UNK>	284.67	31/12/1899 00:00:00
SO91999161	136.445	135.275	135.01	S	VC	C	225	<UNK>	188.74	31/12/1899 00:00:00
SO91999254	136.845	134.94	133.99	S	VC	C	300	<UNK>	60.55	31/12/1899 00:00:00
SO91997501	138	135.85	135.24	F	VC	C	225	<UNK>	27.87	31/12/1899 00:00:00
SO91999151	137.74	135.76	134.94	S	VC	C	300	<UNK>	41.93	31/12/1899 00:00:00
SO91999105	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91999203	136.815	133.85	132.92	F	VC	C	225	<UNK>	56.77	31/12/1899 00:00:00
SO91999650	<UNK>	<UNK>	127.32	S	VC	C	375	<UNK>	0	31/12/1899 00:00:00
SO91999405	133.2449	129.75	<UNK>	F	VC	C	300	<UNK>	0	31/12/1899 00:00:00
SO91999102	137.8099	134.84	134.16	F	VC	C	225	<UNK>	59.97	31/12/1899 00:00:00
SO91999555	<UNK>	<UNK>	130.08	S	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91999104	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91999157	138.755	137.355	137.04	S	VC	C	225	<UNK>	107.63	31/12/1899 00:00:00
SO91999205	136.9499	134.06	133.9	F	VC	C	225	<UNK>	58.81	31/12/1899 00:00:00
SO91999504	131.6649	129.04	128.83	F	VC	C	150	<UNK>	68.67	31/12/1899 00:00:00
SO91997102	145.8249	144.965	141.53	F	VC	C	100	<UNK>	16.25	31/12/1899 00:00:00
SO91999202	137.1	134.48	132.82	F	VC	C	225	<UNK>	36.78	31/12/1899 00:00:00
SO91998501	135.953	132.773	130.736	F	VC	C	300	<UNK>	52.42	31/12/1899 00:00:00
SO91997503	137.7599	135.24	135.01	F	VC	C	225	<UNK>	36.96	31/12/1899 00:00:00
SO91998103	142.2859	141.526	<UNK>	F	VC	C	100	<UNK>	0	31/12/1899 00:00:00
SO91997502	137.7949	134.445	133.35	F	CO	C	375	<UNK>	43.97	31/12/1899 00:00:00
SO91997504	137.6549	134.705	134.45	F	CO	C	375	<UNK>	66.38	31/12/1899 00:00:00
SO91999302	133.66	130.56	129.75	F	VC	C	225	<UNK>	76.36	31/12/1899 00:00:00
SO91999457	133.4199	132.12	131.39	S	VC	C	225	<UNK>	76.08	31/12/1899 00:00:00
SO91999305	134.55	131.4	131.094	F	VC	C	225	0	72.12	31/12/1899 00:00:00

Sewer Node Sewer Pipe Data

Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SO91998252	139.225	136.965	135.88	S	VC	C	150	<UNK>	83.14	31/12/1899 00:00:00
SO91999452	131.4499	130.05	129.55	S	VC	C	300	<UNK>	38.36	31/12/1899 00:00:00
SO91999459	131.3249	129.88	129.69	S	VC	C	225	<UNK>	110.26	31/12/1899 00:00:00
SO92990704	125.7099	122.1	121.19	F	VC	C	300	<UNK>	49.01	31/12/1899 00:00:00
SO92990651	129.82	127.26	124.98	S	VC	C	375	<UNK>	28.06	31/12/1899 00:00:00
SO92990551	129.4499	128.22	127.67	S	VC	C	375	<UNK>	96.38	31/12/1899 00:00:00
SO92990753	128.0099	125.34	125.13	S	VC	C	225	<UNK>	78.1	31/12/1899 00:00:00
SO92990653	130.0099	127.32	127.26	S	VC	C	375	<UNK>	247.83	31/12/1899 00:00:00
SO92990756	127.5699	124.98	123.34	S	VC	C	375	<UNK>	24.93	31/12/1899 00:00:00
SO92990602	129.99	126.03	124.61	F	VC	C	300	<UNK>	28.62	31/12/1899 00:00:00
SO92990708	128.3699	124.61	122.1	F	VC	C	300	<UNK>	25.61	31/12/1899 00:00:00
SO91999755	131.335	129.36	126.56	S	VC	C	225	<UNK>	31.85	31/12/1899 00:00:00
SO91999502	131.865	129.245	129.07	F	VC	C	150	<UNK>	149.61	31/12/1899 00:00:00
SO91999757	132.7749	130.895	130.05	S	VC	C	225	<UNK>	54.74	31/12/1899 00:00:00
SO91999652	132.212	130.05	126.97	S	VC	C	225	<UNK>	28.96	31/12/1899 00:00:00
SO91999601	132.5919	130.46	126.06	F	VC	C	225	<UNK>	24.71	31/12/1899 00:00:00
SO91999706	132.9149	130.785	130.48	F	VC	C	225	<UNK>	137.23	31/12/1899 00:00:00
SO91997505	136.945	<UNK>	134.71	F	CO	C	375	<UNK>	0	31/12/1899 00:00:00
SO91999608	133.86	130.79	129.28	F	VC	C	225	<UNK>	75.31	31/12/1899 00:00:00
SO91999453	133.235	131.385	130.08	S	VC	C	300	<UNK>	41.54	31/12/1899 00:00:00
SO92990501	130.9499	128.93	128.32	F	VC	C	150	<UNK>	40.85	31/12/1899 00:00:00
SO92990104	136.02	134.91	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO92990301	134.69	131.97	131.45	F	VC	C	225	<UNK>	66.73	31/12/1899 00:00:00
SO92991201	131.5399	129.15	127.97	F	VC	C	225	<UNK>	99.17	31/12/1899 00:00:00
SO92991207	133.3	131.48	130.96	F	VC	C	225	<UNK>	69.88	31/12/1899 00:00:00
SO92991601	125.7799	123.88	121.48	F	VC	C	<UNK>	<UNK>	31.13	31/12/1899 00:00:00
SO92991756	124.6399	122.8	122.31	S	VC	C	225	<UNK>	117.69	31/12/1899 00:00:00
SO91999462	131.1849	129.41	129.37	S	VC	C	300	<UNK>	774	31/12/1899 00:00:00
SO92990155	135.96	134.96	134.87	S	VC	C	225	<UNK>	208.56	31/12/1899 00:00:00
SO92990303	134.02	131.19	129.94	F	VC	C	300	<UNK>	53.42	31/12/1899 00:00:00
SO92990059	135.63	134.06	133.8	S	VC	C	225	<UNK>	88.5	31/12/1899 00:00:00
SO92990403	130.9299	128.37	127.27	F	VC	C	375	<UNK>	46.13	31/12/1899 00:00:00
SO92991112	133.6999	132.52	132.41	F	VC	C	225	<UNK>	189.91	31/12/1899 00:00:00
SO92991260	133.4799	131.32	131.24	S	VC	C	225	<UNK>	173.63	31/12/1899 00:00:00
SO92991011	133.6	131.68	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SO91999460	131.3849	129.555	129.54	S	VC	C	300	<UNK>	585	31/12/1899 00:00:00
SO92990103	135.82	134.95	134.94	F	VC	C	225	<UNK>	1276	31/12/1899 00:00:00
SO92990206	135.7299	132.89	132.02	F	VC	C	225	<UNK>	62.55	31/12/1899 00:00:00
SO92990451	131.9799	130.53	129.75	S	VC	C	225	<UNK>	50.62	31/12/1899 00:00:00
SO92990560	130.6399	128.96	128.22	S	VC	C	375	<UNK>	89.85	31/12/1899 00:00:00
SO92990151	134.86	132.7	131.47	S	CO	C	600	<UNK>	35.89	31/12/1899 00:00:00
SO92990152	134.86	133.16	132.7	S	VC	C	375	<UNK>	64.54	31/12/1899 00:00:00

Sewer Node Sewer Pipe Data

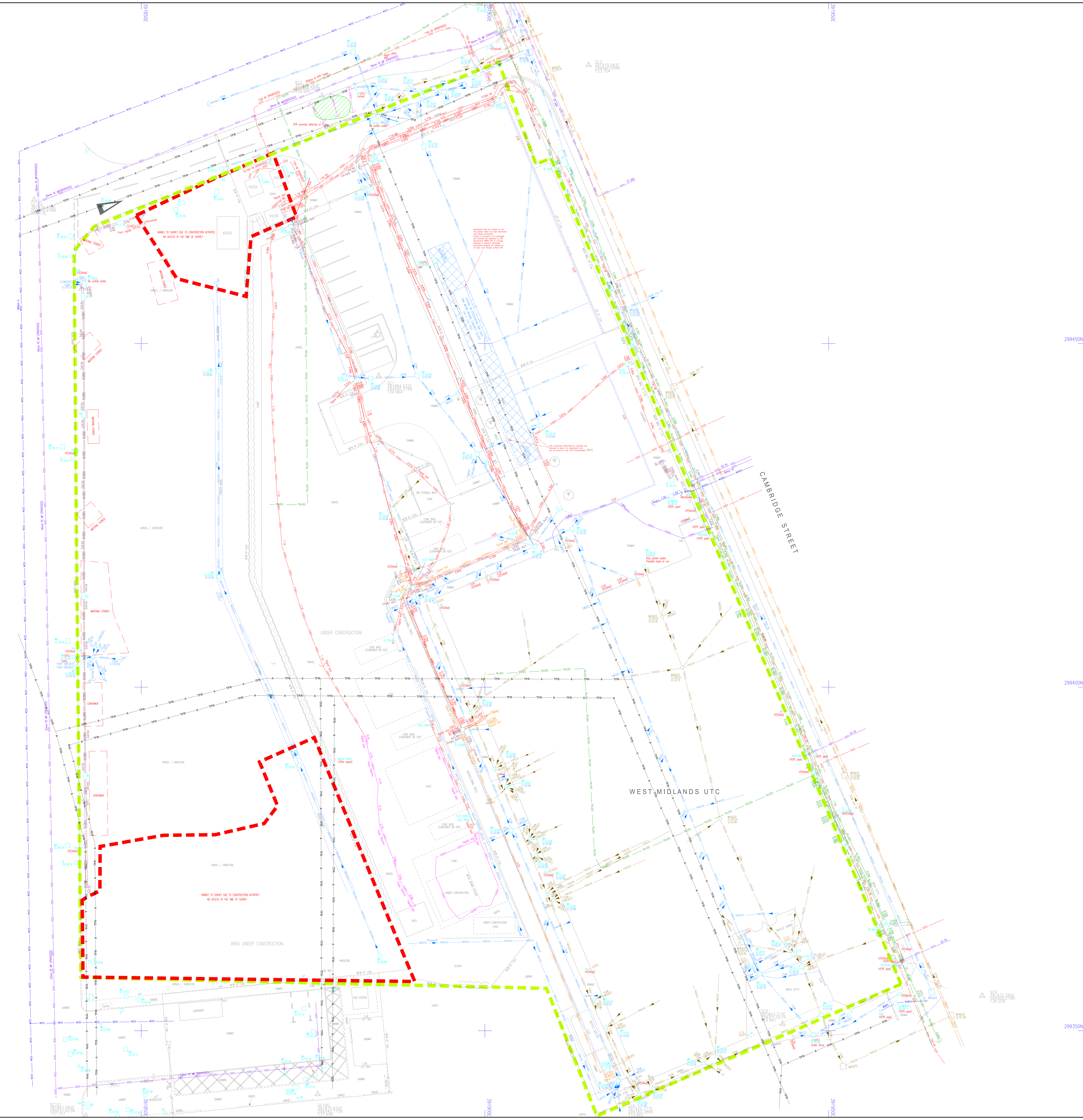
Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SO92990152	134.86	133.16	132.7	S	VC	C	375	<UNK>	64.59	31/12/1899 00:00:00
SO92990354	132.6499	131.19	129.28	S	VC	C	300	<UNK>	36.05	31/12/1899 00:00:00
SO92990512	129.36	127.79	127.06	F	VC	C	150	<UNK>	47.34	31/12/1899 00:00:00
SO92990555	129.0099	127.34	126.17	S	VC	C	225	<UNK>	38.97	31/12/1899 00:00:00
SO92991059	133.8	132.1	132.02	S	VC	C	225	<UNK>	226.13	31/12/1899 00:00:00
SO92991109	133.72	132.02	131.71	F	VC	C	225	<UNK>	143.87	31/12/1899 00:00:00
SO92991156	133.6799	131.93	131.79	S	CO	C	400	<UNK>	166.5	31/12/1899 00:00:00
SO92991161	133.55	132.14	132.04	S	VC	C	225	<UNK>	152.1	31/12/1899 00:00:00
SO92991652	125.773	124.28	123.7	S	VC	C	225	<UNK>	71.52	31/12/1899 00:00:00
SO91999303	133.8849	130.76	129.99	F	VC	C	225	<UNK>	100.29	31/12/1899 00:00:00
SO92990654	129.8	127.67	<UNK>	S	VC	C	375	<UNK>	0	31/12/1899 00:00:00
SO92990253	134.58	133.19	132.98	S	VC	C	225	<UNK>	144.1	31/12/1899 00:00:00
SO92990502	129.16	125.77	124.71	F	VC	C	300	<UNK>	54.59	31/12/1899 00:00:00
SO91999404	131.4499	128.78	129.3	F	VC	C	300	<UNK>	<UNK>	31/12/1899 00:00:00
SO92990251	135.6999	133.95	133.47	S	VC	C	300	<UNK>	71.63	31/12/1899 00:00:00
SO92990355	133.9199	132.26	131.2	S	VC	C	300	<UNK>	52.44	31/12/1899 00:00:00
SO92990452	131.1499	129.69	129.41	S	VC	C	225	<UNK>	87.93	31/12/1899 00:00:00
SO92990455	130.9499	129.41	129.26	S	VC	C	225	<UNK>	187.73	31/12/1899 00:00:00
SO92990507	130.4799	128.3	127.97	F	VC	C	150	<UNK>	70.21	31/12/1899 00:00:00
SO92990509	131.41	128.79	128.3	F	VC	C	150	<UNK>	60.04	31/12/1899 00:00:00
SO92990210	134.3399	133.12	132.55	F	VC	C	225	<UNK>	130.16	31/12/1899 00:00:00
SO92990302	132.58	129.94	128.58	F	VC	C	375	<UNK>	42.89	31/12/1899 00:00:00
SO92990506	129.66	127.25	125.87	F	VC	C	375	<UNK>	42.71	31/12/1899 00:00:00
SO92990553	127.8199	126.15	124.55	S	VC	C	225	<UNK>	19.71	31/12/1899 00:00:00
SO92990564	128.69	127.44	126.24	S	VC	C	225	<UNK>	29.3	31/12/1899 00:00:00
SO92991753	125.83	122.45	121.99	S	VC	C	450	<UNK>	110.26	31/12/1899 00:00:00
SO92991163	133.71	132.02	131.85	S	VC	C	225	<UNK>	143.94	31/12/1899 00:00:00
SO92991151	133.4799	131.19	130.17	S	CO	C	750	<UNK>	38.15	31/12/1899 00:00:00
SO92991158	133.74	132.01	131.96	S	VC	C	300	<UNK>	521.8	31/12/1899 00:00:00
SO92991256	132.44	130.9	129.81	S	VC	C	225	<UNK>	31.16	31/12/1899 00:00:00
SO92991258	133.25	131.15	130.92	S	VC	C	225	<UNK>	155.87	31/12/1899 00:00:00
SO91999461	131.285	129.505	129.41	S	VC	C	300	<UNK>	82.5	31/12/1899 00:00:00
SO92990757	129.27	126.97	125.34	S	VC	C	225	<UNK>	35.13	31/12/1899 00:00:00
SO92990205	134.66	132.15	132.04	F	VC	C	225	<UNK>	220	31/12/1899 00:00:00
SO92990454	130.94	129.25	127.35	S	VC	C	225	<UNK>	40.67	31/12/1899 00:00:00
SO92990513	128.6199	127.06	126.09	F	VC	C	150	<UNK>	4.67	31/12/1899 00:00:00
SO92991154	133.91	131.78	131.73	S	CO	C	400	<UNK>	366.4	31/12/1899 00:00:00
SO92991205	132.41	130.92	129.21	F	VC	C	225	<UNK>	19.82	31/12/1899 00:00:00
SO91997101	145.6979	141.18	144.11	F	BR	C	450	<UNK>	<UNK>	31/12/1899 00:00:00
SO92990156	136.02	134.87	134.1	S	VC	C	225	<UNK>	59.47	31/12/1899 00:00:00
SO92990705	128.75	126	125.4	F	VC	C	225	<UNK>	43.28	31/12/1899 00:00:00
SO92990208	134.63	131.82	131.47	F	VC	C	300	<UNK>	152.54	31/12/1899 00:00:00

Sewer Node Sewer Pipe Data

Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SO92990511	129.9799	127.97	127.81	F	VC	C	150	<UNK>	150.13	31/12/1899 00:00:00
SO92991010	133.8399	132.74	132.55	F	VC	C	225	<UNK>	145.58	31/12/1899 00:00:00
SO92991105	133.94	132.41	132.25	F	VC	C	225	<UNK>	144	31/12/1899 00:00:00
SO92991202	132.38	129.71	128.9	F	VC	C	225	<UNK>	99.4	31/12/1899 00:00:00
SO92991253	131.8399	129.73	128.18	S	VC	C	225	<UNK>	77.23	31/12/1899 00:00:00
SO92991254	132.55	130.13	129.21	S	CO	C	750	<UNK>	93.62	31/12/1899 00:00:00
SO92990252	135.13	133.4	132.94	S	VC	C	300	<UNK>	51.8	31/12/1899 00:00:00
SO92990255	134.6199	132.92	132.67	S	VC	C	300	<UNK>	146.28	31/12/1899 00:00:00
SO92990356	134.08	132.63	132.28	S	VC	C	300	<UNK>	25.06	31/12/1899 00:00:00
SO92990406	131.1	128.95	128.53	F	VC	C	300	<UNK>	86.48	31/12/1899 00:00:00
SO92990558	130.94	129.26	128.96	S	VC	C	375	<UNK>	88.57	31/12/1899 00:00:00
SO92990605	129.5399	126.74	126.01	F	VC	C	225	<UNK>	29.62	31/12/1899 00:00:00
SO92990259	134.24	132.16	131.83	S	CO	C	300	<UNK>	264.61	31/12/1899 00:00:00
SO92990504	128.2799	125.87	124.59	F	VC	C	375	<UNK>	41.27	31/12/1899 00:00:00
SO92991103	133.9799	132.53	132.41	F	VC	C	225	<UNK>	186.25	31/12/1899 00:00:00
SO92991152	134.0299	131.47	131.19	S	CO	C	600	<UNK>	186.43	31/12/1899 00:00:00
SO92991209	133.46	131.58	131.54	F	VC	C	225	<UNK>	386	31/12/1899 00:00:00
SO92991605	126.97	124.51	123.97	F	VC	C	375	<UNK>	123.8	31/12/1899 00:00:00
SO92991107	133.66	132.21	132.03	F	VC	C	225	<UNK>	136.83	31/12/1899 00:00:00
SO92991604	125.0299	121.91	121.59	F	VC	C	300	<UNK>	173.72	31/12/1899 00:00:00
SO92991100	<UNK>	<UNK>	<UNK>	F	VC	U	100	<UNK>	<UNK>	31/12/1899 00:00:00
<UNK>	<UNK>	<UNK>	<UNK>	F	VC	<UNK>	<UNK>	<UNK>	<UNK>	31/12/1899 00:00:00
<UNK>	<UNK>	<UNK>	<UNK>	S	VC	<UNK>	<UNK>	<UNK>	<UNK>	31/12/1899 00:00:00

CWA
Intelligent Engineering

Appendix 5 – CCTV Drainage Surveys



UNDERGROUND SERVICES KEY

Line	Service
TEL(B2)	British Telecom
COM(B2)	Communications Cable
ED(B2)	Empty Ducting
E(B2)	Electricity Cables
G(B2)	Gas Pipes
CWS(B2)	Sewer Combined
FWS(B2)	Sewer Foul
SWS(B2)	Sewer Surface Water
TL(B2)	Traffic Light Cables
U(B2)	Unidentified GPR or electro location trace
W(B2)	Water pipes
	End of trace
	Services survey boundary
	Area of No Access
	GPR Detected Anomaly
	GPR Detected Rebar
	GPR Detected Structural Feature
	GPR Detected Structure
	GPR Low Data

AR	Assumed Route	GPR	Ground Penetrating Radar
BD	Backdrop	TFR	Taken From Records
CR	Cable Riser	PE	Polyethylene Pipe
d	Depth	UTS	Unable To Survey
PR	Pipe Riser	UR	Unable To Rod
RS	Reducing Slab (Drainage)	UT	Unable To Trace
T	Tank	NVP	No Visible Pipes
VR	Vapour Recovery Point	VC	Vitrified Clay
UTL	Unable To Lift	CO	Concrete

DISCLAIMER

Electromagnetic and ground penetrating radar techniques have been used in the location of underground services shown on this survey plan. These are interpretive procedures and we recommend that trial excavations should be undertaken to to confirm identification, location and depth of services where these are critical.

Please note that not all buried pipes, cable and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other utilities.

All reasonable effort and care has been made in searching available record drawings. The completeness of the underground service information supplied to and by us cannot be guaranteed.

BSI PAS128:2014 QUALITY LEVELS

(A) = Verified by Inspection-trial pit, vacuum Excavation, Inspection Chamber/Manhole

(B1) = Detected with GPR & EML-High confidence position and depth

(B2) = Detected with either GPR or EML-Medium confidence position and depth

(B3) = Detected with GPR or EML (no depth - poor signal)

(B4) = Assumed route - Not detected - interpreted route

(C) = Record data located to Street Furniture - not detected

(D) = Record data not located- not detected

(P) = Post processed

NB: QL(A) is inferred at all MHs ICs etc. unless otherwise stated.

NOTES

Where services are non-metallic or not proven on site, positions are taken from records, trench scars & surface detail.

Where stated, depth estimations are typically to the centre or top of the service. Depths to gravity sewers and drains are typically to invert levels, unless otherwise stated.

Where Ground Penetrating Radar (GPR) is quoted the depth is recorded to the assumed external crown of the feature.

The diagram below describes the depth information in more detail.

Where the precise position or depths of these features are critical to the design or siteworks they must be verified by the use of trial excavations.

Pipe sizes which cannot be obtained by visual survey are taken from utilities record drawings or marker plates where available.

Services shown as Taken From Records have not been proven on site.

The CAD layering may contain further information.

All data collected using GPR has been post-processed.

All utilities inspected and measured at IC's or MH's are

considered to be QLA for a radius up to 5m from the chamber wall

TYPICAL FEATURE DEPTH ANNOTATION

ELECTRO-MAGNETIC DETECTION	GRAVITY DRAIN (VISUAL OBSERVATION)	GROUND PENETRATING RADAR
APPROX. DEPTH TO CENTRE CABLE/FIBRE OPTIC	APPROX DEPTH TO INVERT	APPROX DEPTH TO EXTERNAL CROWN

Survey Notes

Grid: Local Plane Metric related to National Grid at survey control SC1

Levels: OS Datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes

Topographical Survey Legend

BUILDINGS AND WALLS: Building; Building Open Sided; Ruin (RUIN); Passage; Wall with Height (Wall Ht1.3m); Retaining Wall (R/W)

FENCE STYLES AND DESCRIPTIONS: Close Boarded C/B; Corrugated Iron C/I; Chestnut Paling C/P; Chainlink C/L; Handrail H/R; Interwoven IWN; Iron Railings I/R; Lattice L/F; Miscellaneous Misc; Palisade PAL; Post & Chain P/C; Post & Rail P/R; Post & Wire P/W; Post & Barbed Wire B/W; Rigid Metal W/M; Stile; Gate; Fence linestyle

ROADS: Kerbs; Edge of Surfacing; Pedestrian Crossing (PC); Track; Footpath (FP)

STREET FURNITURE: Belisha Beacon BB; Bus Stop BS; Bollard B; Cats Eye CE; Coal Chute CC; Closed Circuit TV CCTV; Drain DR; Electricity Pole EP; Flood Light FL; Flag Staff FS; Lamp Post LP; Letter Box LB; Name Plate (street) NP; Mooring Ring MR; Mile Post or Mooring Post MP; Service Marker MK; Mile Stone MS; Post P; Parking Meter PM; Reflector Post RP; Rodding Eye RE; Road Sign RS; Speed Camera S/CAM; Information Sign SIGN; Stay SY; Traffic Light TL; Telegraph Pole TP; Traffic Light Push Button Post TLP; Traffic Light Control TLC/P; Control Box C/BOX; British Telecom Box BT BOX; Electricity Box EL BOX; Gas Box GAS BOX

INSPECTION CHAMBERS AND PIPES: Inspection Cover IC; Inspection Cover (Elec) IC/EL; Manhole MH; British Telecom Cover BT; Inspection Cover (Comms) IC/COM; Cable TV CATV; Inspection Cover Traffic Signals IC/TL; Gully G; Kerb Outlet KO; Vent Pipe VP; Down Pipe DP; Rain Water Pipe RWP; Soil Pipe SVP; Gas Pipe G-PIPE; Unable to lift cover UTL; Stop Tap ST; Stop Valve SV; Lamphole LH; Hydrant HYD; Earth Rod ER; Gas Valve GV; Water Meter WM; Washout WO; Rodding Eye RE

GEOTECHNICAL INFORMATION: Borehole BH; Trial Pit TP; Monitor Pin MON; Probe Hole PH; Window Sample WS

GENERAL INFORMATION: Petrol Pump PP; Basement Light BL; Footbridge FB; Dish Type Channel D.CH; Slot Type Channel S.CH; Grate Type Channel G.CH; Tactile Paving TAC; Crash Barrier C/BR; Column COL; Stanchion STAN; Car Vacuum VAC; Offset Fill OF; Air Valve AV; Trough TR; Chimney CHY; Telephone Call Box TCB

OVERHEAD FEATURES: Electricity Pylon E.PYLON; Electricity ETL; Telephone OTL

WATER FEATURES: Canal; Stream; Ditch; Weir; Culvert (Cul); Grip (Land Drain); Spring SPR

RELIEF AND VEGETATION: Hedge; Edge of wood/Bushes; Stump STUMP; Individual Tree; Slopes with Height Greater than 1m; Cliff Face; Marsh; Reeds

LEVEL AND HEIGHT INFORMATION: Standard Spot Height +123.45; Precision Spot Height +123.456; Bed Level +BL23.92; Water Level +WL24.92; Soffit Level +SL25.92; Threshold Level +TH26.98; Cover Level +CL26.45; Invert Level +IL25.15; Pipe Soffit Level +PSL5.00; Floor Level +FL6.00; Finished Floor Level +FFL6.00; Top of Tank Level +TT7.00; Eave Level +EL7.00; Ridge Level +RL9.00; Roof Hip Level +RHL8.50; Flat Roof Level +FRL7.00; Top of Canopy Level +TOP/C7.00; Underside of Canopy Level +SOF/C6.50; Window Sill Level +WSL8.00; Window Head Level +WHL9.00; Springing Level +SPL8.50; Arch Level +AL7.00; Cable Level +CHT8.55; Top of Wall Level +TWL10.00; Underside of Beam Level +UBL9.55; General Height +HT9.00

SURVEY INFORMATION SIGNS: Permanent Ground Marker; O.S. Trig Station; O.S. Bench Mark

Sheet Index

Rev.	Date	Description
A	14/10/20	Client's sewer record added
B	14/10/20	Amendments made to attenuation tank annotation at clients' request

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CHARTERED LAND SURVEYORS
65 Cross Street, Sale, Manchester
M33 7HF, Tel: 0161 905 1265
www.malcolmhughes.co.uk
survey@mhls.co.uk

Accreditations: RICS; THE SURVEY ASSOCIATION; chartered ices; RISQS QUALIFIED; bsi ISO 9001 Quality Management FS 14126

Client
Morgan Sindall Construction & Infrastructures Ltd
4215 Waterside Centre Birmingham Business Park
Solihull, West Midlands, B37 7YN

Project
West Midlands UTC Wolverhampton
Springfield Brewery site

Drawing Title
Underground Services Survey

Drawn By	PS	07/10/20	Survey Date: September 2020
Checked by	DJ	08/10/20	Scale: 1 : 200

Drawing No: 56212/UG | Revision:

MANHOLE SCHEDULE

MANHOLE REFERENCE	COVER LEVEL	INVERT LEVEL	TYPE	CHAMBER DIA (min)	COVER GRADE (min)	EASTING	EASTING
S1	134.08	133.26	CP	1050	B125 (R)	391948.96E	299348.64N
S2	134.14	132.65	B	1200	B125 (R)	391939.49E	299359.59N
S3	134.12	132.24	B	1200	D400	391912.59E	299423.00N
S4	133.91	132.20	B	1200	D400	391907.31E	299420.71N
S5	133.80	132.95	B	1200	B125	391919.47E	299342.67N
S6	133.80	132.64	B	1200	B125	391903.99E	299379.16N
S7	133.80	132.40	B	1200	B125	391889.53E	299413.25N
S8	134.06	132.13	CP	1050	D400	391902.12E	299435.22N
S9	134.92	132.65	CP	1050	B125	391883.04E	299444.71N
S10	134.60	133.11	CP	1050	D400	391882.25E	299472.23N
S11	134.69	132.50	B	1200	D400	391889.99E	299445.37N
S12	134.07	132.02	FLOW CONTROL	1350	B125	391908.08E	299437.60N
S13	134.53	131.72	B	1200	B125	391890.75E	299479.02N
S14	134.09	131.62	B	1200	D400	ON LINE OF EXG PIPE	
F1	133.86	132.50	PPIC	450	B125	391897.88E	299396.13N
F1A	134.30	133.32	PPIC	450	D400	LOCATE ON SITE	
F2	133.88	132.28	PPIC	450	B125	391901.25E	299388.19N
F3	133.88	133.00	PPIC	450	B125	LOCATE ON SITE	
F4	133.88	133.00	PPIC	450	B125	LOCATE ON SITE	
F5	133.88	133.00	PPIC	450	B125	LOCATE ON SITE	
F6	133.88	133.00	PPIC	450	B125	LOCATE ON SITE	
F7	133.86	132.06	PPIC	450	B125	391909.79E	299368.13N
F8	133.90	133.00	PPIC	450	B125	LOCATE ON SITE	
F9	133.80	131.85	PPIC	450	B125	391921.50E	299340.47N
F10	133.87	133.00	PPIC	450	B125	LOCATE ON SITE	
F11	134.14	131.64	B	1200	B125	391950.96E	299351.25N
F12	134.21	131.21	B	1200	B125	ON LINE OF EXG PIPE	
F13	134.20	133.40	PPIC	450	B125	391922.87E	299417.89N
F14	134.24	133.30	PPIC	450	B125	391925.82E	299410.65N
F15	134.24	132.74	PPIC	450	B125	391928.76E	299403.20N
F16	134.24	132.46	PPIC	450	B125	391934.30E	299381.08N
F17	134.19	132.23	PPIC	450	B125	391944.67E	299366.38N
F18	134.20	132.25	B	1200	B125	391947.29E	299359.08N
F19	134.20	132.35	PPIC	450	B125	LOCATE ON SITE	
F20	133.90	133.00	PPIC	300	B125	LOCATE ON SITE	
F21	133.87	133.00	PPIC	300	B125	LOCATE ON SITE	

R - DENOTES COVER TO BE RECESSED TO ACCOMMODATE BLOCK PAVING

LEGEND

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING SEWER TO BE ABANDONED
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER INSPECTION CHAMBER
- PROPOSED SURFACE WATER CHANNEL WITH SUMP
- PROPOSED SURFACE WATER LAND DRAIN WITH PERFORATED PIPE. SEE DETAIL
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER MANHOLE
- PROPOSED FOUL WATER INSPECTION CHAMBER
- PROPOSED VULCATHENE CONNECTION
- LENGTH OF EXISTING CULVERT TO BE RETAINED FOR ATTENUATION
- EXISTING RAIN WATER DOWN PIPE
- ROAD GULLY
- YARD GULLY
- PROPOSED RAIN WATER DOWN PIPE
- PROPOSED FOUL WATER FLOOR GULLY
- PROPOSED FOUL WATER POP UP CONNECTION

NOTES:

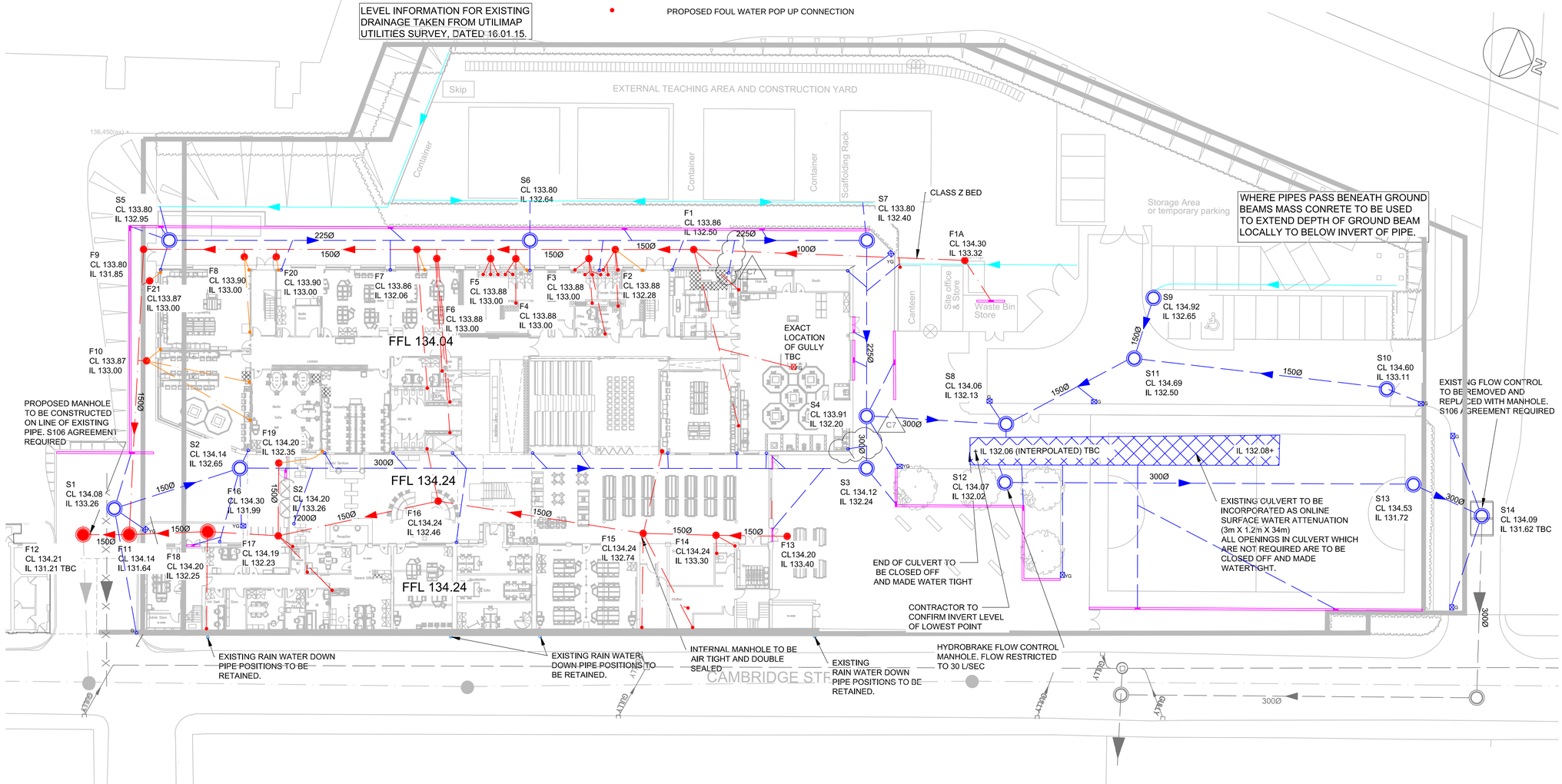
1. THIS DRAWING IS NOT TO BE SCALED.
2. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND LEVELS ON SITE.
3. PIPE DIAMETERS AND INVERT LEVELS OF EXISTING DRAINAGE TO BE CONFIRMED.
4. 'MARKED UP' DRAWINGS ARE TO BE PROVIDED TO THE ENGINEER UPON COMPLETION TO ENABLE PRODUCTION OF 'AS BUILT' DRAWING IN ACCORDANCE WITH CONSTRUCTION (DESIGN & MANAGEMENT): 2007 REGULATIONS 22(j).
5. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT AND DIVERSION WORKS AS NECESSARY, TO ALL EXISTING SERVICES TO THE SATISFACTION OF THE PUBLIC UTILITIES.
6. THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER RUN-OFF INTO EXCAVATION AND FROM GROUNDWATER BY MEANS OF SUMPS, PUMPING AND DE-WATERING AS APPROPRIATE, IN ORDER TO KEEP THE EXCAVATION AS REASONABLY DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS,
7. ALL EXTERNAL DRAINAGE WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH 'CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY' 7th EDITION FOR ADOPTABLE DRAINAGE, AND TO THE RELEVANT PROJECT SPECIFICATION AS DIRECTED BY THE ENGINEER FOR PRIVATE DRAINAGE.
8. PIPE MATERIAL SHALL BE AS FOLLOWS:
   100Ø TO 225Ø - CLAYWARE TO BS EN 295
   300Ø AND ABOVE - CONCRETE TO BS EN 1916.

   N.B PVCu PIPES TO BE EN 1401-1:1998 MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER. PIPES OF LESS THAN 400MM DIAMETER TO HAVE A RESISTANCE OF 270 BAR.
9. ALL FOUL PIPES ARE TO BE 100Ø UNLESS STATED OTHERWISE OR TO SUIT ABOVE GROUND PIPEWORK. SURFACE WATER PIPE DIAMETERS ARE AS INDICATED

   PIPE GRADIENTS UNLESS SHOWN ARE:

   FOUL:
   MINIMUM GRADIENT WITHOUT W.C. TO BE 1:40,
   MINIMUM GRADIENT WITH W.C. TO BE 1:80,

   SURFACE WATER:
   MINIMUM GRADIENT 1:80.
10. CLAY AND CONCRETE PIPES SHALL BE BEDDED ON CLASS S BEDDING UNLESS COVER IS LESS THAN 1.2m IN TRAFFICKED AREAS, THEN CLASS Z BEDDING.
11. UPVC PIPES SHALL BE BEDDED ON CLASS P BEDDING UNLESS COVER IS LESS THAN 1.2m IN TRAFFICKED AREAS, THEN CLASS Q BEDDING.
12. BACKFILL TO TRENCHES MAY BE SUITABLE EXCAVATED MATERIAL IN LANDSCAPED AREAS & UNDER DRIVEWAYS, PATIOS ETC.
    TYPE 1 GRANULAR MATERIAL TO BE USED UNDER HARDSTANDINGS AND ROADS.
13. ROAD GULLY CONNECTIONS SHALL BE 150mm DIAMETER AND WITH CLASS Z BEDDING.
14. ROAD GULLIES SHALL BE TRAPPED 450mm DIAMETER x 900mm DEEP WITH CLASS D400 FRAME AND GRATING TO BS EN 124.
15. ALL MANHOLE AND DRAINAGE CHANNEL COVERS SHALL COMPLY WITH BS EN 124. FOR DETAILS OF COVER TYPE & LOCATION, PLEASE REFER TO THE MANHOLE SCHEDULE.
    MANHOLE COVERS WITHIN BLOCK PAVED AREAS & BUILDINGS SHALL BE RECESSED, DOUBLE SEALED WITHIN BUILDING.
16. VENTILATION SHALL BE PROVIDED AT THE HEAD OF FOUL DRAINAGE RUNS.
    FOR SETTING OUT OF SOIL AND RAINWATER PIPES, SEE ARCHITECT'S LAYOUT.
17. ACCESS FOR RODDING/ JETTING SHALL BE PROVIDED TO ALL SOIL AND RAINWATER DOWNPIPES ABOVE FINISHED FLOOR LEVEL.
18. FOR DETAILS OF MANHOLE TYPES AND PIPE BEDDING ETC, SEE STANDARD DETAIL DRAWING(S).
19. COVER LEVELS SHOWN ARE APPROXIMATE.
    COVER LEVELS FOR MANHOLES WITHIN LANDSCAPED AREAS SHOULD BE CHECKED WITH THE LANDSCAPE ARCHITECTS.
    COVERS SHOULD BE ADJUSTED TO MATCH SURROUNDING FINISH LEVELS.
20. THE CONTRACTOR IS TO PROTECT EXISTING BURIED PIPES (PARTICULARLY SHALLOW PIPES) AND TREE ROOTS FROM DAMAGE CAUSED BY LOADS IMPOSED BY CONSTRUCTION.
21. DESIGN OF THE DRAINAGE CHANNELS IS INDICATIVE ONLY. DETAILED DESIGN SHALL BE UNDERTAKEN BY THE CONTRACTOR'S PREFERRED CHANNEL MANUFACTURER/ SUPPLIER.



Rev	Date	Description	By	Ckd
C7	05.01.16	RWP ADDED AND RWP RELOCATED	GW	JH
C6	18.11.15	RWP ADDED AND RWP RELOCATED	JH	CB
C5	09.11.15	F21 AND FOUL CONNECTION ADDED	JH	CB
C4	15.10.15	RWP ADDED, FOUL CONNECTIONS UPDATED TO REPLICATE ARCHITECTS DRAWING, FFL REVISED	JH	CB
C3	09.09.15	FOUL CONNECTION TO INTERVIEW ROOM ADDED	JH	CB
C2	28.08.15	DRAINAGE ADDED TO SITE CANTEEN, LAYOUT RE-POSITIONED, COORDS UPTED ACCORDINGLY	JH	CB
C1	24.07.15	DRAINAGE LAYOUT UPDATED BASED ON REVISED POP-UP LOCATIONS AND REVISED FFL	JH	CB
P5	02.06.15	DRAINAGE LAYOUT UPDATED BASED ON POP-UP LOCATIONS AND REVISED FFL	GH	JH
P4	17.04.15	DWG NO. FORMERLY C14962-C-009 DRAINAGE LAYOUT REVISED BASE ON REVISED LEVEL DESIGN	GH	JH
P3	28.01.15	DRAINAGE STRATEGY REVISED BASE ON LANDSCAPE ARCHITECT LAYOUT & TO INCORPORATE EXISTING CULVERT.	GH	JH
P2	20.01.15	DISCHARGE RATE REDUCED TO 50l/s	GH	JH

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Client :
Local Focus Global Strength

Project Title:
WEST MIDLANDS CONSTRUCTION UNIVERSITY TECHNOLOGY COLLEGE

Drawing Title:
PROPOSED DRAINAGE LAYOUT

Drawing Status:
CONSTRUCTION

Hydrock Job No:
C14962

Drawn	Checked	Scale @ A1	Date	Issue Date
GJH	JH	1:250	06.01.15	16.01.15

Drawing Number: W030D-SE-HYD-69-X-001
Revision: C7

CWA
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Appendix 6 – LLFA Correspondence

Andrew Hardy

From: Flood Risk Management Team <flood.team@staffordshire.gov.uk>
Sent: 01 December 2020 11:39
To: Andrew Hardy
Subject: RE: Request for Pre-application advice - Thomas Telford UTC, Wolverhampton

Good morning Andrew,

Thank you for your enquiry. We are unable to offer a pre-application advice service direct to applicants for development sites outside of Staffordshire. Our agreement with City of Wolverhampton Council relates to Statutory consultations only, but they can request pre-application advice from us for a fee when we have the capacity to deliver this.

Unfortunately, due to current workload, we are not able to offer the pre-application service at this time.

We apologise for the inconvenience.

Staffordshire County Council

Kind regards

Flood Risk Management Team, Staffordshire County Council
Office Location: Lichfield Highways, Trent Valley Road, Lichfield, WS13 6EU
Postal Address: 2 Staffordshire Place, Tipping Street, Stafford, ST16 2DH

✉: flood.team@staffordshire.gov.uk
: www.staffordshire.gov.uk

Providing a Flood Risk Management service for Staffordshire County, Sandwell, Walsall and Wolverhampton Councils.

From: Andrew Hardy <ahardy@cwa-eng.com>
Sent: 01 December 2020 08:58
To: Flood Risk Management Team <flood.team@staffordshire.gov.uk>
Subject: Request for Pre-application advice - Thomas Telford UTC, Wolverhampton

Dear Flood Team

We are developing a new build extension block and associated external sports facilities for the existing Thomas Telford UTC education building at Cambridge Street in Wolverhampton. We understand that Staffordshire County Council act as LLFA for the City of Wolverhampton.

We would like to seek pre-application advice with regard to this development prior to the issue of a formal planning submission in the coming months. We are aware of your SuDS Handbook and the best practice advice given within it, and would look to observe this with the new development. Our main requirement for pre-application advice, would be to understand and seek agreement for the integration of this new build element with the existing drainage systems, without impeding the established development.

We note that a review of the draft strategy has a charge of £360+vat.

Please can you confirm that that SCC are the correct authority acting as LLFA for this area, and that the Developer Online Advice/Data Request Form is the most appropriate means of requesting this advice.

Thank you for your assistance.

Regards

Andrew

Andrew Hardy
Associate Director

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T: 0121 270 6962
ahardy@cwa-eng.com
www.cwa-eng.com

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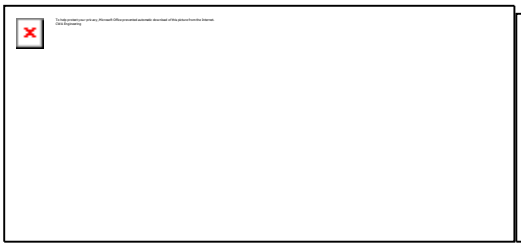
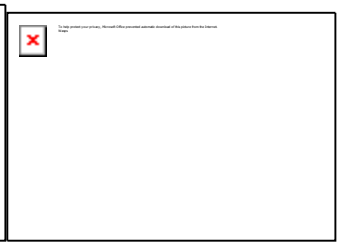
B3 1NQ





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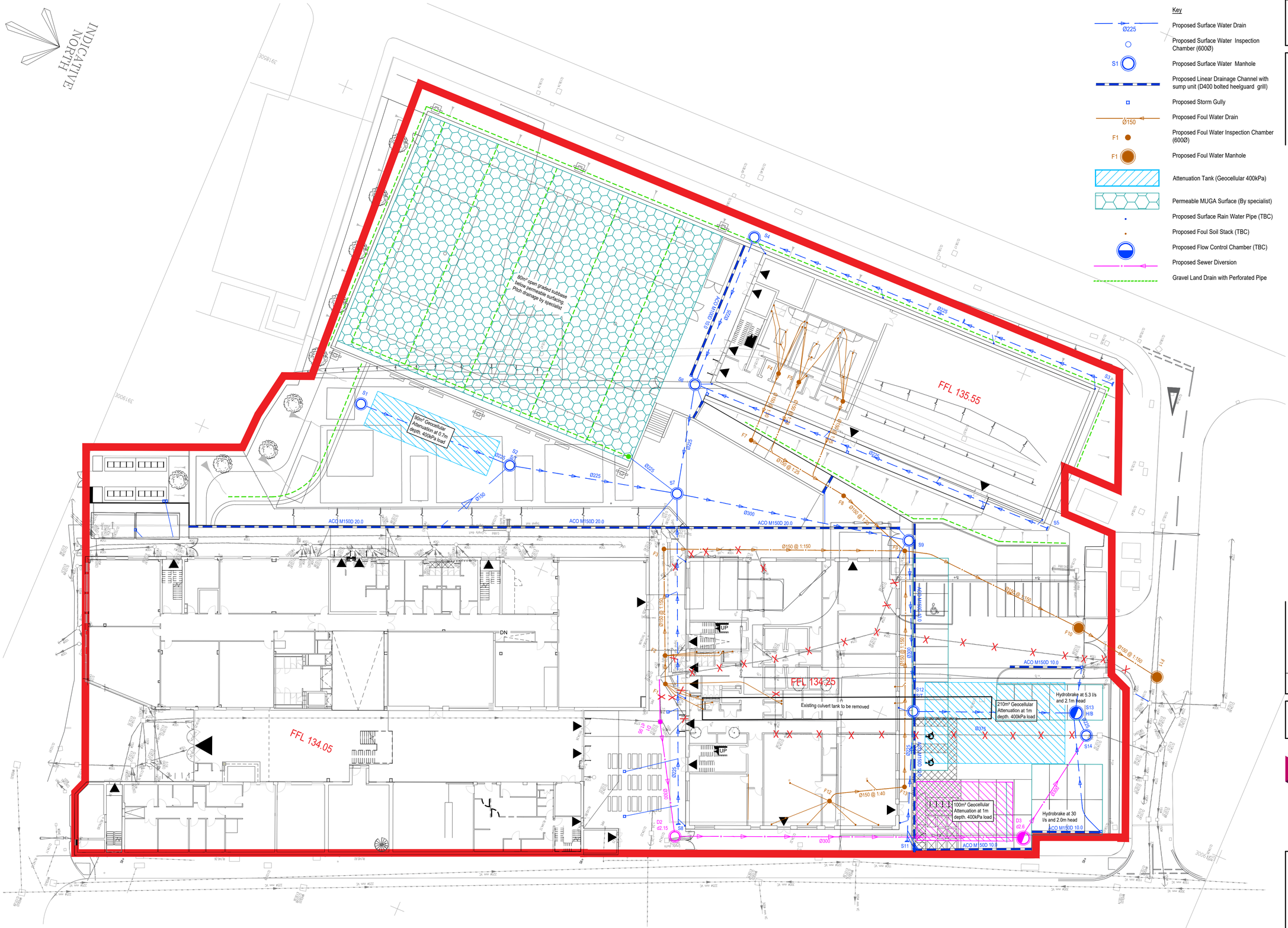
Appendix 7 – Drainage Strategy Drawing



Key

- Ø225 — Proposed Surface Water Drain
- Proposed Surface Water Inspection Chamber (600Ø)
- S1 — Proposed Surface Water Manhole
- Proposed Linear Drainage Channel with sump unit (D400 bolted heelguard grill)
- Proposed Storm Gully
- Ø150 — Proposed Foul Water Drain
- F1 — Proposed Foul Water Inspection Chamber (600Ø)
- F1 — Proposed Foul Water Manhole
- Attenuation Tank (Geocellular 400kPa)
- Permeable MUGA Surface (By specialist)
- Proposed Surface Rain Water Pipe (TBC)
- Proposed Foul Soil Stack (TBC)
- Proposed Flow Control Chamber (TBC)
- Proposed Sewer Diversion
- Gravel Land Drain with Perforated Pipe

NOTES

1. This drawing is to be read in conjunction with all relevant Architects, Engineers and other specialist details and specifications.
2. Do not scale from this drawing.
3. Drawing issued for preliminary discussions only, further to approval from Planning, Local Authority, Sewerage Undertaker, Environment Agency and any other governing parties. Following receipt of further information and comments the scheme may be revised.
4. Drawing based upon AJM Landscape Architects layout drawing: Ref: UC0030-AJM-EX-XX-DR-L-2211 Rev: P04. All setting out is to be based on Architects information unless otherwise stated.
5. Topographical Survey data drawing is from Malcolm Hughes Surveys Reference 55003/UG Dated January 2020. The survey information used in the preparation of this drawing is not warranted. The contractor shall check all dimensions and levels on site.
6. The location and level of all existing services are to be identified prior to construction and the engineer advised of any clashes.
7. All external drainage works shall be constructed in accordance with Sewers for Adoption, including demarcation chambers BS.EN.752 together with the Sewerage Undertaker's requirements.
8. S106 approval required prior to any connection works to public sewer.
9. Prior to commencing work on the drainage, all existing drains, sewers manholes and outfalls to remain shall be located, identified and a CCTV condition survey carried out. Where necessary, protection to the existing drainage infrastructure shall be provided.
10. For details of manhole types and pipe bedding etc., see standard detail drawing(s).
11. All pipework with less than 1.2m cover in trafficked areas, or less than 0.9m cover in public open space, to have concrete surround or similar protection. The contractor is to protect existing and new buried pipes (particularly shallow pipes) and tree roots from damage caused by loads imposed by construction plant.
12. All concrete to drainage, manholes bases, surrounds etc to be in accordance with the BRE special digest 1 - Concrete in aggressive ground. Refer to site investigation report for sulphate requirements.
13. All pipes shall be clay to BS EN 295 or concrete to BS 5911 unless otherwise stated. Plastic pipes may be used subject to the approval of the Sewerage Undertaker.
14. All abandoned sewers are to be grouted up or removed
15. All manhole and drainage channel covers shall comply with BS.EN.124. Manhole covers within block paved areas & buildings shall be recessed.
16. Ventilation shall be provided at the head of foul drainage runs. Access for rodding/jetting shall be provided to all soil and rainwater downpipes above finished floor level.
17. All pipes within the building footprint to be 100mmØ and laid at a gradient of 1 in 40 unless stated otherwise on this drawing.
18. The discharge rate of 5.26 l/s based upon Q_{bar} greenfield equivalent rate for the development area of 1.09ha.
19. Existing drainage to be diverted and 30 l/s flow restriction maintained. Existing attenuation to be replaced.
20. Attenuation storage of 300m³ is based on 1 in 100 year + 40% return period. A 100mm dia vent pipe is required, and maintained access from both ends. Additional permeable storage below sports pitches required.
21. Soakaways are not viable due to the deep made ground and potential mobilisation of contamination.
22. Refer to drawing CWA-20-196-532 for manhole schedules.

Rev.	Amendments	Date	By	Chkd.
P06	Floor gullies added. Channel drains amended	20.01.21	AH	ME
P05	Updated to represent PAS1192	18.01.21	AT	ME
P4	Updated masterplan	14.01.21	AH	ME
P3	Revised scheme and split tank	07.12.20	AH	ME
P2	Revised scheme for comment	22.10.20	AH	ME
P1	Issued for comment	06.08.20	AH	ME

Drawing Status

PRELIMINARY

CWA
Intelligent Engineering
Lancaster House, 67 Newhall Street, Birmingham, B3 1NQ
Tel: 0121 270 6962 Email: enquiries@cwa-eng.com

Thomas Telford UTC Extension

Proposed Drainage Strategy

CWA Drawing Number: CWA-20-196-530
Revision: P06

Project No.	Originator	Volume	Level	Type	Role	Number
UC0030	-CWA	-EX	-XX	-DR	-C	-0530

Drawn by: AH Checked by: APH
Date: AUG20 Scale: 1:250 @ A1

All RWP and SVP points shown, to be confirmed by Architect

Node Name	Easting (m)	Northing (m)	CL (m)	Depth (m)	MH Dia (mm)	Cover Type	MH Type	IL (m)	Dia (mm)
S1	391888.829	299368.734	134.250	1.150	1200	675x676 D400	Type 2 Silt Trap	 133.100	 150
S2	391888.631	299390.593	134.120	1.670	1200	675x676 D400	Type 2 Silt Trap	132.450 132.732 132.450	150 150 150
S3	391846.300	299461.615	135.500	1.400			Rodding Eye	 134.100	 150
S4	391847.184	299409.107	135.500	2.333	1200	675x676 D400	Type 2	133.217 133.167	150 150
S5	391867.741	299461.186	135.400	1.300			Rodding Eye	 134.100	 150
S6	391868.725	299409.475	135.500	2.547	1200	675x676 D400	Type 2	133.231 132.953 132.953	150 150 150
S7	391883.303	299413.004	134.000	1.955	1500	675x676 D400	Type 2	132.045 132.804 132.145 132.220 132.070	225 150 225 150 300
S8	391924.732	299430.400	134.288	1.488			Rodding Eye	 132.800	 225
S9	391877.020	299444.131	134.340	2.400	1500	675x676 D400	Type 2	131.940 131.940	300 300
S11	391912.735	299459.073	134.340	1.940			Rodding Eye	 132.400	 225
S12	391899.914	299453.763	134.340	2.510	1500	675x676 D400	Type 2 Silt Trap	132.166 131.830 131.830	225 300 375
S13	391891.560	299474.130	134.600	2.843	1500	1200x1200 D400	Hydrobrake 5.3 l/s at 2.1m head	131.757 131.757	375 375
S14	391891.866	299476.981	134.550	2.802	1500	675x676 D400	Type 2	131.748 131.748	375 375
Existing	391891.008	299478.990	134.500	2.760	1200	675x676 D400	Existing	131.740 131.740	375 375

Node Name	Easting (m)	Northing (m)	CL (m)	Depth (m)	MH Dia (mm)	Cover Type	MH Type	IL (m)	Dia (mm)
F1	391907.709	299421.623	134.100	0.500	600	430x430 C250	Type 3	 133.600	 150
F2	391904.096	299420.216	134.100	0.526	600	430x430 C250	Type 3	133.574 133.574	150 150
F3	391889.956	299414.308	134.100	0.628	600	430x430 C250	Type 3	133.472 133.472	150 150
F4	391862.791	299419.292	135.550	0.750	750x675	430x430 C250 Double Sealed	Type 4	 134.800	 150
F5	391862.787	299422.389	135.550	0.750	750x675	430x430 C250 Double Sealed	Type 4	 134.800	 150
F6	391862.997	299428.859	135.550	0.750	750x675	430x430 C250 Double Sealed	Type 4	 134.800	 150
F7	391872.558	299419.460	135.200	0.847	600	430x430 C250	Type 3	134.353 134.436 134.409 134.353	150 150 150 150
F8	391874.908	299433.956	134.500	0.734	600	430x430 C250	Type 3	133.766 133.766	150 150
F9	391878.553	299444.511	134.100	0.843	600	430x430 D400	Type 3	133.330 133.394 133.257 133.257	150 150 150 150
F10	391878.831	299470.339	134.700	1.615	1200	675x675 D400	Type 4	133.085 133.085	150 150
F12	391913.502	299448.338	134.250	0.450	750x675	430x430 C250 Double Sealed	Type 2	 133.800	 150
F13	391907.782	299456.915	134.100	0.558	1200	430x430 D400	Type 3	133.542 133.542	150 150
F11	391874.398	299480.684	134.500	1.490	1200	675x675 D400	Type 2	133.010	150

Node Name	Easting (m)	Northing (m)	CL (m)	Depth (m)	MH Dia (mm)	Cover Type	Manhole Type	IL (m)	Pipe Dia (mm)
D1	391911.684	299424.240	135.000	2.700	1500	675x675 D400	Type 2	 132.300	 225
D2	391922.151	299428.590	134.500	2.420	1500	675x675 D400	Type 2	132.230 132.080	225 375
D3	391899.414	299482.076	134.400	2.550	1500	675x675 D400	Type 2	131.850 131.850	375 375

NOTES

1. Refer to drawing CWA-20-196-530 for drainage layout.

Rev.	Amendments	Date	By	Chkd.
P04	Cover levels updated. S10 deleted	20.01.21	AH	ME
P03	Updated to represent PAS1192 numbering system	18.01.21	AT	ME
P2	Updated masterplan to suit P04	14.01.21	AH	ME
P1	Issued for comment	06.08.20	AH	ME

Drawing Status

PRELIMINARY

CWA
Intelligent Engineering

Lancaster House, 67 Newhall Street, Birmingham, B3 1NQ
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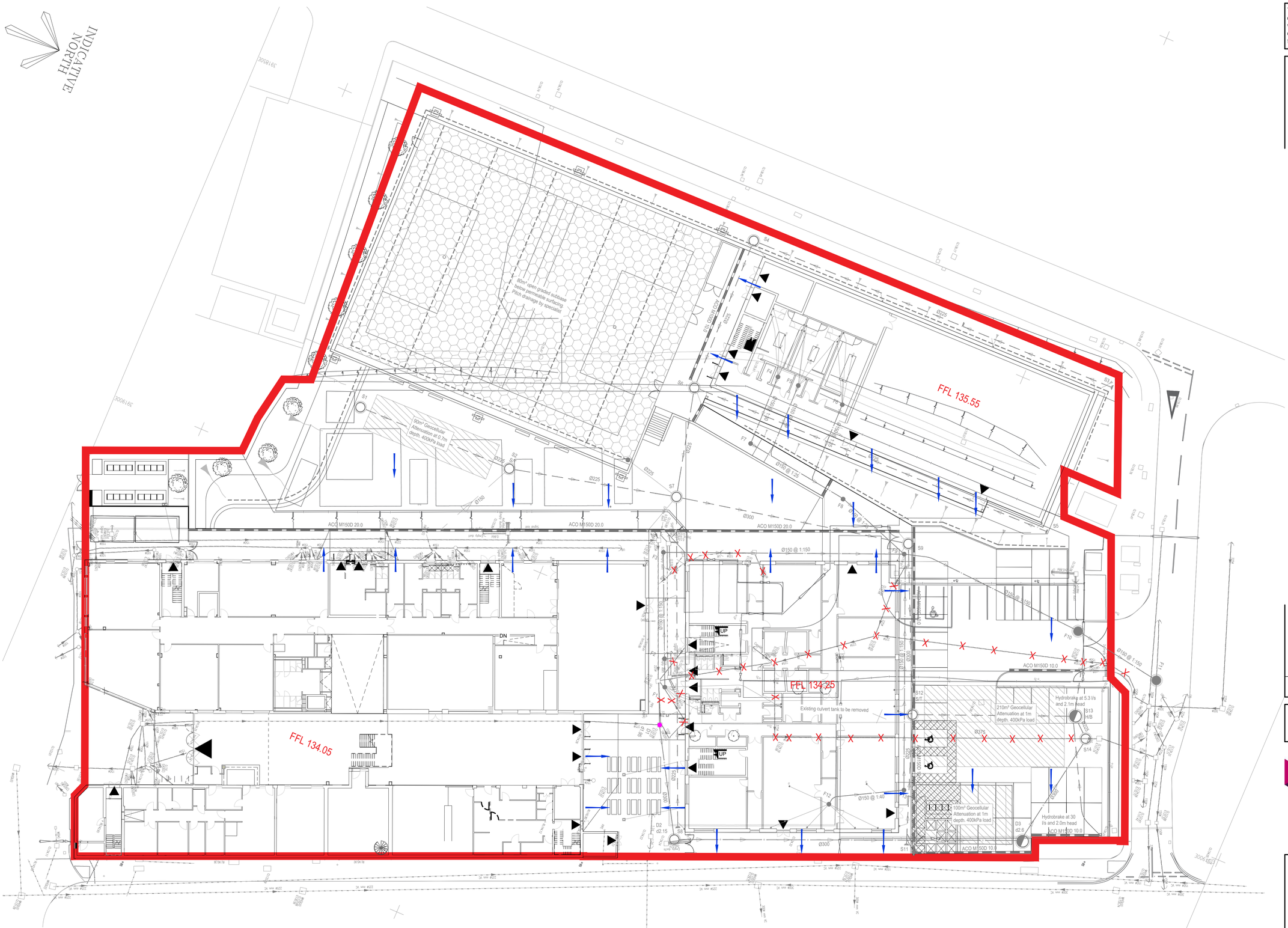
Thomas Telford UTC Extension

Proposed Drainage Schedules

CWA Drawing Number						Revision
CWA-20-196-532						P04
Project No.	Originator	Volume	Level	Type	Role	Number
UC0030	-CWA	-EX	-XX	-DR	-C	-0532

Drawn by	AH	Checked by	ME
Date	AUG20	Scale	NTS @ A1



NOTES

1. This drawing is to be read in conjunction with all relevant Architects, Engineers and other specialist details and specifications.
2. Do not scale from this drawing.
3. Drawing issued for preliminary discussions only, further to approval from Planning, Local Authority, Sewerage Undertaker, Environment Agency and any other governing parties. Following receipt of further information and comments the scheme may be revised.
4. Drawing based upon AJM Landscape Architects layout drawing: Ref: UC0030-AJM-EX-XX-DR-L-2211 Rev: P04. All setting out is to be based on Architects information unless otherwise stated.
5. Topographical Survey data drawing is from Malcolm Hughes Surveys Reference 55003/UG Dated January 2020. The survey information used in the preparation of this drawing is not warranted. The contractor shall check all dimensions and levels on site.
6. The location and level of all existing services are to be identified prior to construction and the engineer advised of any clashes.
7. All external drainage works shall be constructed in accordance with Sewers for Adoption, including demarcation chambers BS.EN.752 together with the Sewerage Undertaker's requirements.

Key

Exceedance Flow Route

Rev.	Amendments	Date	By	Chkd.
P1	Issued for comment	15.02.21	JF	APH

Drawing Status

PRELIMINARY

CWA
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Thomas Telford UTC Extension

Exceedance Flow Route

CWA Drawing Number						Revision
CWA-20-196-600						P01
Project No.	Originator	Volume	Level	Type	Role	Number
UC0030	-CWA	-EX	-XX	-DR	-C	-0600

Drawn by	JF	Checked by	APH
Date	FEB 21	Scale	1:250 @ A1

CWA
Intelligent Engineering

Appendix 8 – Drainage Calculations

Drainage Design Report

Flow

v8.1

Network	Storm Network
Filename	C:\Users\ahardy\OneDrive - CWA\Andy Desktop\CWA-20-196-SWS FINAL SCHEME 2.pfd
Username	Andrew Hardy (ahardy@cwa-eng.com)
Last analysed	20/01/2021 10:30:11
Report produced on	20/01/2021 10:31:39

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Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	
Enforce best practice design rules	

Link Name	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node Name	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node Name	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	10.929	59.4	150	Circular	134.250	133.100	1.000	134.250	132.916	1.184	S1	1200		Manhole	Adoptable	Tank1	1200		Manhole	Adoptable
1.001	10.930	59.4	150	Circular	134.250	132.916	1.184	134.120	132.732	1.238	Tank1	1200		Manhole	Adoptable	S2	1200		Manhole	Adoptable
2.000	12.155	81.0	150	Circular	133.940	132.600	1.190	134.120	132.450	1.520	G1	1200		Manhole	Adoptable	S2	1200		Manhole	Adoptable
1.002	23.036	100.2	150	Circular	134.120	132.450	1.520	134.000	132.220	1.630	S2	1200		Manhole	Adoptable	S7	1500		Manhole	Adoptable
3.000	24.816	168.8	225	Circular	135.678	134.275	1.178	135.419	134.128	1.066	Pitch	1200		Manhole	Adoptable	Outlet	1200		Manhole	Adoptable
3.001	8.527	4.3	225	Circular	135.419	134.128	1.066	134.000	132.145	1.630	Outlet	1200		Manhole	Adoptable	S7	1500		Manhole	Adoptable
4.000	52.515	59.5	150	Circular	135.500	134.100	1.250	135.500	133.217	2.133	S3	1200		Manhole	Adoptable	S4	1200		Manhole	Adoptable
4.001	21.544	100.7	150	Circular	135.500	133.167	2.183	135.500	132.953	2.397	S4	1200		Manhole	Adoptable	S6	1200		Manhole	Adoptable
5.000	51.720	59.5	150	Circular	135.400	134.100	1.150	135.500	133.231	2.119	S5	1200		Manhole	Adoptable	S6	1200		Manhole	Adoptable
4.002	14.999	100.7	150	Circular	135.500	132.953	2.397	134.000	132.804	1.046	S6	1200		Manhole	Adoptable	S7	1500		Manhole	Adoptable
6.000	44.933	59.5	225	Circular	134.288	132.800	1.263	134.000	132.045	1.730	S8	1200		Manhole	Adoptable	S7	1500		Manhole	Adoptable
1.003	31.755	244.3	300	Circular	134.000	132.070	1.630	134.340	131.940	2.100	S7	1500		Manhole	Adoptable	S9	1500		Manhole	Adoptable
1.004	24.838	225.8	300	Circular	134.340	131.940	2.100	134.340	131.830	2.210	S9	1500		Manhole	Adoptable	S12	1500		Manhole	Adoptable
8.000	13.877	59.3	225	Circular	134.340	132.400	1.715	134.340	132.166	1.949	S11	1200		Manhole	Adoptable	S12	1500		Manhole	Adoptable
1.005	11.419	285.5	375	Circular	134.340	131.830	2.135	134.530	131.790	2.365	S12	1500		Manhole	Adoptable	Tank2	1500		Manhole	Adoptable
1.006	10.595	321.0	375	Circular	134.530	131.790	2.365	134.600	131.757	2.468	Tank2	1500		Manhole	Adoptable	S13	1500		Manhole	Adoptable
1.007	2.867	318.6	375	Circular	134.600	131.757	2.468	134.550	131.748	2.427	S13	1500		Manhole	Adoptable	S14	1500		Manhole	Adoptable
1.008	2.185	273.1	375	Circular	134.550	131.748	2.427	134.500	131.740	2.385	S14	1500		Manhole	Adoptable	Existing	1200		Manhole	Adoptable
1.009	7.883	56.3	375	Circular	134.500	131.740	2.385	134.250	131.600	2.275	Existing	1200		Manhole	Adoptable	Street	1200		Manhole	Adoptable

Node Name	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Node Type	MH Type		Link ID	IL (m)	Dia (mm)	Link Type
S1	391888.829	299368.734	134.250	1.150	1200		Manhole	Adoptable					
									0	1.000	133.100	150	Circular
Tank1	391888.730	299379.663	134.250	1.334	1200		Manhole	Adoptable	1	1.000	132.916	150	Circular
									0	1.001	132.916	150	Circular
S2	391888.631	299390.593	134.120	1.670	1200		Manhole	Adoptable	1	2.000	132.450	150	Circular
									2	1.001	132.732	150	Circular
									0	1.002	132.450	150	Circular
G1	391899.677	299385.521	133.940	1.340	1200		Manhole	Adoptable					
									0	2.000	132.600	150	Circular
Pitch	391865.815	299385.290	135.678	1.403	1200		Manhole	Adoptable					
									0	3.000	134.275	225	Circular
Outlet	391881.240	299404.730	135.419	1.291	1200		Manhole	Adoptable	1	3.000	134.128	225	Circular
									0	3.001	134.128	225	Circular
S3	391846.300	299461.615	135.500	1.400	1200		Manhole	Adoptable					
									0	4.000	134.100	150	Circular
S4	391847.184	299409.107	135.500	2.333	1200		Manhole	Adoptable	1	4.000	133.217	150	Circular
									0	4.001	133.167	150	Circular
S5	391867.741	299461.186	135.400	1.300	1200		Manhole	Adoptable					
									0	5.000	134.100	150	Circular
S6	391868.725	299409.475	135.500	2.547	1200		Manhole	Adoptable	1	5.000	133.231	150	Circular

									2	4.001	132.953	150	Circular
									0	4.002	132.953	150	Circular
S7	391883.303	299413.004	134.000	1.955	1500		Manhole	Adoptable	1	6.000	132.045	225	Circular
									2	4.002	132.804	150	Circular
									3	3.001	132.145	225	Circular
									4	1.002	132.220	150	Circular
									0	1.003	132.070	300	Circular
S8	391924.732	299430.400	134.288	1.488	1200		Manhole	Adoptable					
									0	6.000	132.800	225	Circular
S9	391877.020	299444.131	134.340	2.400	1500		Manhole	Adoptable	1	1.003	131.940	300	Circular
									0	1.004	131.940	300	Circular
S11	391912.735	299459.073	134.340	1.940	1200		Manhole	Adoptable					
									0	8.000	132.400	225	Circular
S12	391899.914	299453.763	134.340	2.510	1500		Manhole	Adoptable	1	8.000	132.166	225	Circular
									2	1.004	131.830	300	Circular
									0	1.005	131.830	375	Circular
Tank2	391895.583	299464.329	134.530	2.740	1500		Manhole	Adoptable	1	1.005	131.790	375	Circular
									0	1.006	131.790	375	Circular
S13	391891.560	299474.130	134.600	2.843	1500		Manhole	Adoptable	1	1.006	131.757	375	Circular
									0	1.007	131.757	375	Circular
S14	391891.866	299476.981	134.550	2.802	1500		Manhole	Adoptable	1	1.007	131.748	375	Circular
									0	1.008	131.748	375	Circular
Existing	391891.008	299478.990	134.500	2.760	1200		Manhole	Adoptable	1	1.008	131.740	375	Circular
									0	1.009	131.740	375	Circular

Street	391890.781	299486.870	134.250	2.650	1200		Manhole	Adoptable	1	1.009	131.600	375	Circular

Rainfall Methodology	FSR		Return Period (years)	Climate Change (%)
FSR Region	England and Wales		30	0
M5-60 (mm)	20.000		100	0
Ratio-R	0.400		100	40
Summer CV	0.750			
Winter CV	0.840			
Analysis Speed	Normal			
Skip Steady State	x			
Drain Down Time (mins)	240			
Additional Storage (m³/ha)	20.0			
Storm Durations (mins)	15			
	30			
	60			
	120			
	180			
	240			
	360			
	480			
	600			
	720			
	960			
	1440			
Check Discharge Rate(s)	x			
1 year (l/s)				
30 year (l/s)				
100 year (l/s)				
Check Discharge Volume	x			
100 year 360 minute (m³)				

Hydro-Brake®												
Node	**Flap Valve**	**Online / Offline**	**Replaces Downstream Link**	**Loop to Node**	**Invert Level (m)**	**Design Depth (m)**	**Design Flow (l/s)**	**Objective**	**Sump Available**	**Product Number**	**Min Outlet Diameter (m)**	**Min Node Diameter (mm)**
S13	x	Online			131.757	2.100	5.3	(HE) Minimise upstream storage		CTL-SHE-0093-5300-2100-5300	0.150	1200

Depth/Area/Inf Area									
Node	Base Inf Coefficient (m/hr)	Side Inf Coefficient (m/hr)	Safety Factor	Porosity	Invert Level (m)	Time to half empty (mins)	Depth (m)	Area (m²)	Inf. Area (m²)
Tank1	0.00000	0.00000	2.0	0.95	132.916	208	0.000	90.0	0.0
							1.000	90.0	0.0
							1.001	0.0	0.0
Tank2	0.00000	0.00000	2.0	0.95	131.790		0.000	210.0	0.0
							1.000	210.0	0.0
							1.001	0.0	0.0
Pitch	0.00000	0.00000	2.0	0.30	134.275	0	0.000	1400.0	0.0
							0.250	1400.0	0.0
							0.251	0.0	0.0

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034
30 year 480 minute summer	24.324	6.428
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
100 year 15 minute summer	348.738	98.681
100 year 15 minute winter	244.728	98.681
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418

100 year 360 minute winter	26.315	10.418
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year +40% 15 minute summer	488.233	138.153
100 year +40% 15 minute winter	342.620	138.153
100 year +40% 30 minute summer	320.551	90.705
100 year +40% 30 minute winter	224.948	90.705
100 year +40% 60 minute summer	214.603	56.713
100 year +40% 60 minute winter	142.577	56.713
100 year +40% 120 minute summer	129.587	34.246
100 year +40% 120 minute winter	86.094	34.246
100 year +40% 180 minute summer	97.729	25.149
100 year +40% 180 minute winter	63.526	25.149
100 year +40% 240 minute summer	75.977	20.078
100 year +40% 240 minute winter	50.477	20.078
100 year +40% 360 minute summer	56.677	14.585
100 year +40% 360 minute winter	36.841	14.585
100 year +40% 480 minute summer	43.979	11.622
100 year +40% 480 minute winter	29.219	11.622
100 year +40% 600 minute summer	35.604	9.738
100 year +40% 600 minute winter	24.327	9.738
100 year +40% 720 minute summer	31.433	8.424
100 year +40% 720 minute winter	21.125	8.424
100 year +40% 960 minute summer	25.432	6.697
100 year +40% 960 minute winter	16.847	6.697
100 year +40% 1440 minute summer	18.055	4.839
100 year +40% 1440 minute winter	12.134	4.839

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.34%

Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	9	133.207	0.107	13.8	0.1988	0.0000	OK	1.000	Tank1	13.9	1.835	0.603	0.0848	
30 minute winter	Tank1	23	132.971	0.055	11.3	4.7764	0.0000	OK	1.001	S2	6.1	1.073	0.264	0.0621	
15 minute winter	S2	11	132.547	0.097	13.2	0.1451	0.0000	OK	1.002	S7	13.3	1.008	0.747	0.3319	
15 minute summer	G1	1	132.600	0.000	0.0	0.0000	0.0000	OK	2.000	S2	0.0	0.000	0.000	0.0705	
120 minute winter	Pitch	86	134.342	0.067	15.4	28.5162	0.0000	OK	3.000	Outlet	6.3	1.093	0.159	0.1526	
120 minute winter	Outlet	86	134.153	0.025	6.3	0.0277	0.0000	OK	3.001	S7	6.3	1.039	0.025	0.1778	
15 minute winter	S3	10	134.163	0.063	8.6	0.0931	0.0000	OK	4.000	S4	8.4	1.027	0.364	0.6449	
15 minute winter	S4	12	133.706	0.539	20.5	0.7719	0.0000	SURCHARGED	4.001	S6	15.6	0.889	0.884	0.3793	
15 minute winter	S5	10	134.163	0.063	8.6	0.0949	0.0000	OK	5.000	S6	8.4	1.116	0.364	0.6324	
15 minute winter	S6	12	133.512	0.559	34.1	0.7865	0.0000	SURCHARGED	4.002	S7	31.5	1.790	1.781	0.2614	
360 minute winter	S7	352	132.469	0.424	16.8	0.9869	0.0000	SURCHARGED	1.003	S9	16.7	0.765	0.237	2.2362	
15 minute winter	S8	10	132.859	0.059	10.4	0.0904	0.0000	OK	6.000	S7	10.2	0.354	0.151	1.0791	
360 minute winter	S9	352	132.468	0.528	18.1	1.0655	0.0000	SURCHARGED	1.004	S12	17.3	0.600	0.235	1.7491	
15 minute winter	S11	10	132.472	0.072	13.8	0.1114	0.0000	OK	8.000	S12	13.6	1.293	0.202	0.1464	
360 minute winter	S12	352	132.468	0.638	20.5	1.2798	0.0000	SURCHARGED	1.005	Tank2	20.1	0.787	0.170	1.2595	
360 minute winter	Tank2	352	132.468	0.678	20.1	136.4503	0.0000	SURCHARGED	1.006	S13	4.3	0.087	0.038	1.1686	
360 minute winter	S13	352	132.468	0.711	4.5	1.5313	0.0000	SURCHARGED	Hydro-Brake®	S14	4.3				
60 minute summer	S14	114	131.795	0.047	4.3	0.0830	0.0000	OK	1.008	Existing	4.3	0.674	0.036	0.0141	
60 minute summer	Existing	114	131.774	0.034	4.3	0.0389	0.0000	OK	1.009	Street	4.3	0.889	0.016	0.0383	71.2
60 minute summer	Street	114	131.633	0.033	4.3	0.0000	0.0000	OK							

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.34%

Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	10	133.227	0.127	18.9	0.2372	0.0000	OK	1.000	Tank1	18.9	1.858	0.818	0.1105	
30 minute winter	Tank1	22	132.983	0.067	14.7	5.8398	0.0000	OK	1.001	S2	8.6	1.171	0.374	0.0806	
15 minute winter	S2	13	132.787	0.337	18.0	0.5027	0.0000	SURCHARGED	1.002	S7	16.5	1.024	0.932	0.4055	
15 minute winter	G1	13	132.787	0.187	4.3	0.2115	0.0000	SURCHARGED	2.000	S2	-4.3	-0.289	-0.217	0.2140	
120 minute winter	Pitch	84	134.358	0.083	20.2	35.0479	0.0000	OK	3.000	Outlet	9.5	1.228	0.238	0.2025	
120 minute winter	Outlet	84	134.158	0.030	9.5	0.0335	0.0000	OK	3.001	S7	9.5	1.082	0.038	0.1827	
15 minute winter	S3	12	134.179	0.079	11.2	0.1173	0.0000	OK	4.000	S4	11.0	1.032	0.476	0.7086	
15 minute winter	S4	12	134.080	0.913	26.7	1.3068	0.0000	SURCHARGED	4.001	S6	19.3	1.095	1.090	0.3793	
15 minute winter	S5	10	134.173	0.073	11.2	0.1104	0.0000	OK	5.000	S6	11.0	1.123	0.476	0.6746	
15 minute winter	S6	12	133.804	0.851	42.8	1.1964	0.0000	SURCHARGED	4.002	S7	38.8	2.203	2.192	0.2614	
360 minute winter	S7	360	132.786	0.741	22.3	1.7268	0.0000	SURCHARGED	1.003	S9	21.2	0.778	0.299	2.2362	
15 minute winter	S8	10	132.867	0.067	13.5	0.1033	0.0000	OK	6.000	S7	13.3	0.447	0.197	1.1174	
360 minute winter	S9	360	132.786	0.846	22.9	1.7061	0.0000	SURCHARGED	1.004	S12	22.6	0.596	0.307	1.7491	
360 minute winter	S11	360	132.786	0.386	2.5	0.5951	0.0000	SURCHARGED	8.000	S12	2.5	0.796	0.037	0.5519	
360 minute winter	S12	360	132.786	0.956	26.6	1.9171	0.0000	SURCHARGED	1.005	Tank2	26.2	0.844	0.222	1.2595	
360 minute winter	Tank2	360	132.786	0.996	26.2	200.3919	0.0000	SURCHARGED	1.006	S13	3.7	0.083	0.034	1.1686	
360 minute winter	S13	360	132.786	1.029	4.6	2.2156	0.0000	SURCHARGED	Hydro-Brake®	S14	4.3				
30 minute winter	S14	222	131.795	0.047	4.3	0.0830	0.0000	OK	1.008	Existing	4.3	0.674	0.036	0.0141	
30 minute summer	Existing	145	131.774	0.034	4.3	0.0389	0.0000	OK	1.009	Street	4.3	0.889	0.016	0.0383	66.7
30 minute summer	Street	145	131.633	0.033	4.3	0.0000	0.0000	OK							

Results for 100 year +40% Critical Storm Duration. Lowest mass balance: 99.34%

Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S1	464	133.844	0.743	2.9	1.3836	0.0000	SURCHARGED	1.000	Tank1	2.9	0.876	0.126	0.1924	
480 minute winter	Tank1	464	133.843	0.927	17.6	80.3457	0.0000	SURCHARGED	1.001	S2	-15.8	-0.898	-0.684	0.1924	
480 minute winter	S2	464	133.843	1.393	16.3	2.0761	0.0000	FLOOD RISK	1.002	S7	-15.0	-0.852	-0.845	0.4055	
480 minute winter	G1	464	133.843	1.243	0.3	1.4062	0.0000	FLOOD RISK	2.000	S2	-0.3	-0.024	-0.015	0.2140	
60 minute winter	Pitch	45	134.384	0.109	46.1	46.1824	0.0000	OK	3.000	Outlet	16.0	1.416	0.400	0.2916	
60 minute winter	Outlet	45	134.166	0.038	16.0	0.0430	0.0000	OK	3.001	S7	16.0	0.599	0.063	0.1884	
15 minute winter	S3	13	134.977	0.877	15.7	1.3046	0.0000	SURCHARGED	4.000	S4	12.4	1.017	0.538	0.9245	
15 minute winter	S4	13	134.790	1.622	33.1	2.3218	0.0000	SURCHARGED	4.001	S6	24.1	1.369	1.362	0.3793	
15 minute winter	S5	13	134.525	0.425	15.7	0.6443	0.0000	SURCHARGED	5.000	S6	14.0	1.120	0.608	0.9105	
15 minute winter	S6	12	134.324	1.371	53.9	1.9276	0.0000	SURCHARGED	4.002	S7	49.1	2.792	2.778	0.2614	
480 minute winter	S7	464	133.843	1.798	25.8	4.1895	0.0000	FLOOD RISK	1.003	S9	25.0	0.742	0.354	2.2362	
480 minute winter	S8	464	133.843	1.043	2.0	1.6000	0.0000	SURCHARGED	6.000	S7	2.0	0.137	0.030	1.7870	
480 minute winter	S9	464	133.843	1.903	27.0	3.8374	0.0000	SURCHARGED	1.004	S12	26.7	0.538	0.363	1.7491	
480 minute winter	S11	464	133.842	1.442	2.7	2.2252	0.0000	SURCHARGED	8.000	S12	2.7	0.776	0.040	0.5519	
480 minute winter	S12	464	133.842	2.012	31.1	4.0367	0.0000	SURCHARGED	1.005	Tank2	30.7	0.846	0.261	1.2595	
480 minute winter	Tank2	464	133.841	2.051	30.7	203.2242	0.0000	SURCHARGED	1.006	S13	4.9	0.084	0.044	1.1686	
480 minute winter	S13	464	133.842	2.085	6.6	4.4908	0.0000	SURCHARGED	Hydro-Brake®	S14	5.2				
480 minute winter	S14	464	131.800	0.051	5.2	0.0910	0.0000	OK	1.008	Existing	5.2	0.711	0.043	0.0162	
480 minute winter	Existing	464	131.778	0.038	5.2	0.0428	0.0000	OK	1.009	Street	5.2	0.938	0.020	0.0440	177.9
480 minute winter	Street	464	131.636	0.036	5.2	0.0000	0.0000	OK							